Annual Report 2016-17

Jatayu Conservation Breeding Centre
Pinjore, Haryana

A joint project of

Forest Department, Haryana

and

Bombay Natural History Society

CONTENTS

Executive summary

The Jatayu Conservation Breeding Centre, Pinjore, located at Jodhpur village on the edge of the Bir Shikargaha Wildlife Sanctuary is a collaborative project of the Forest Department, Haryana and Bombay Natural History Society. The centre was established to save the three Critically Endangered Gyps species of vultures viz. White-backed vulture, Gyps bengalensis, Long-billed vulture, Gyps indicus and Slender-billed vulture, Gyps tenuirostris, from looming extinction. The main objective of the centre is to keep and breed 25 pairs of each of the three species and release 100 pairs of each of the species, within ten years from the beginning of the release programme. The release programme will begin, at the earliest, from 2018, one year from now.

The centre has a Governing Council which is chaired by the Addl. Chief Secretary, Department of Forests, Government of Haryana. The Chief Wildlife Warden is the Member Secretary.

The 9th meeting of the Governing Council of Jatayu Conservation Breeding Centre (JCBC), Pinjore was held under the Chairmanship of Sh. R. R. Jowal, IAS, *Addl. Chief Secretary, Forests, Government of Haryana on 15th September 2016 at the old Secretariat, Chandigarh.*

15 vultures were transported to Vulture Conservation Breeding Centre, Bhopal, Madhya Pradesh, on 5th October 2016. This transfer marked the third such event and the first where adult birds were transferred. The flock of vultures transferred also included two known pairs of Long-billed vultures which had bred before at JCBC, Pinjore. This was done for genetic management of the Gyps vultures in captivity.

A two day workshop was held on Vulture Conservation and Reintroduction Programme on 21-22nd November 2016 at Panchkula, Haryana under the chairmanship of the Principal Chief Conservator of Forests and Chief Wildlife Warden, Haryana to discuss about the reintroduction of vultures in the wild and request for help from the neighbouring states. Major stake holders, involving all the six neighboring states and the Union Territory of Chandigarh, were invited to deliberate on the ways and means of making the habitat safe for the captive bred vultures, which will be released from the centre.

During the breeding season of 2016-17, a total of 34 vulture nestlings hatched and fledged.

The Ministry of Environment, Forests and Climate Change provided funding for the running cost of Jatayu Conservation Breeding Programme, Pinjore, through the centrally sponsored scheme of Government of India along with an assurance that this funding will be provided annually.

The Vulture Programme also received funding from the Royal Society for the Protection of Birds, U.K.

The Chief Wildlife Warden, Haryana was the Project Leader of the Programme. Dr. Vibhu Prakash was the Project Manager and was assisted by Dr. Mandar Kulkarni, Centre Manager, Ms. Nikita Prakash, Scientist 'C', Drs. Parag Deori, Avinash Timung, Meghna Pemmaiah and Debashish Saikia Veterinarians, Ms. Sarbani Roy, Ms. Monomita Mukherjee, Mr. Shivam Sarkar and Mr. Dinesh Diggal were the Biologists, Mr. Niranjan Dalei, Administrative Officer assisted by Mr. Balakram Sharma, Administrative Asssitant and Mr. Lalit Sharma, Technical Assistant and Mr. Jaikishan Sharma, Supervisor. There are seven vulture keepers and two driver cum vulture keepers to assist in the smooth functioning of the centre.

This report covers the period from 1st September 2016 to 31st March2017.

Workshop on Vulture Conservation and Reintroduction Programme held on 21-22 November 2016, Panchkula, Haryana

A. Introduction

VCBC

* Founded in 1883, the BNHS is India's largest conservation non- governmental organization (NGO) with headquarters at Mumbai, engaged in nature conservation, education and research in natural history.

Objectives

- To establish a founder population of 25 pairs of each of the three endangered vulture species viz. White-backed vulture, Long-billed vulture and Slender-billed vulture.
- To produce a population of at least 200 birds of each of the three species, to be reintroduced into the

The Jatayu (Vulture) Conservation Breeding Centre (VCBC) is a joint project of the Bombay Natural History Society (BNHS) and the Haryana Forest Department. It is a collaborative initiative of a Government agency and a Non-Governmental Organisation, to save the three species of vultures, the White-backed, Long-billed and Slender-billed, from looming extinction.

The VCBC, earlier known as Vulture Care Centre, was established in September 2001 with the UK Government grant of the Darwin Initiative for the Survival of Species, to investigate the dramatic declines in India's *Gyps* species of vultures.

Subsequent to the release of the South Asia Vulture Recovery Plan in February 2004, the centre was renamed Jatayu Conservation Breeding Centre (VCBC) as conservation breeding 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 recognised as a rescue centre for vultures in the year 2007 by the Central Zoo Authority. The centre was renamed as Jatayu Conservation Breeding Centre following the decision in the sixth governing council of the centre.

The centre is situated at the base of the Shivalik ranges of Himalayan foothills. It lies on the outskirts of the Bir Shikargaha Wildlife Sanctuary, 8 km from Pinjore, off the Chandigarh-Shimla highway. It spreads over 5 acres of Haryana Forest Department's land in village Jodhpur. The centre is ideally located away from human habitations, and yet is easily accessible from the main city so the day to day requirements of the centre can be easily organised.

Mission

To release 100 pairs each, of the three species of vultures, in the next fifteen years, to establish and secure viable wild populations of resident *Gyps*, in an environment free of diclofenac and other poisons.

Funding and Partners

It is a collaborative project of the Forest Department, Haryana and BNHS. The Forest Department ensures the administrative support and facilitates to work at the centre whereas; BNHS organizes funding and manages the centre. The project this year was largely funded by the MoEF&CC with support from the Royal Society for the Protection of Birds (RSPB), and technical support was provided by the Institute of Zoology, Zoological Society of London, UK and the International Centre for Birds of Prey, UK.

B. 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 releases. A minimum of 60 founder birds of each species would be required to establish 25 breeding pairs of each species at each breeding centre. To allow for mortality in captivity and any sex imbalance in the founder birds, 60 birds of each species are required from the wild to initiate a centre. This captive population would eventually lead to the restoration of a single wild population of 100 pairs, 16 or more years later. The first release is expected in 2018.

Releases would not begin until a minimum of 10 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 are most likely to breed.

Vultures in colony aviary at the centre

C. Progress of breeding at the centre

The breeding at the centre commenced in 2005-2006 when two pairs of White-backed vultures laid an egg each but they did not hatch. During 2006-2007 four pairs of White-backed vultures laid an egg each but only two hatched. The nestlings however, did not survive. The first successful fledging at the centre occurred during 2007-08 when two nestlings of White-backed vultures fledged, after which, in 2008-09, 3 White-backed nestlings fledged, in 2009-10, 9 nestlings fledged, 3 each of White-backed, Long-billed and Slender-billed, 14 nestlings including 6 White-backed and 8 Long-billed fledged in 2010-11 and 16 nestlings including 4 White-backed, 9 Long-billed and 3 Slender-billed fledged in 2011-12. In 2012-13, 20 nestlings including 8 White-backed, 9 Long-billed and 3 Slender-billed fledged. In 2013-14 a total of 23 nestlings fledged at the centre. In 2014-15, a total of 39 nestlings fledged at the centre. In 2015-16 also a total of 39 nestlings fledged at the centre. In 2016-17, a total of 34 nestlings fledged at the centre.

A White-backed vulture nestling hatched and reared at the centre

D. Highlights of 2016-17

1. 9th Governing council Meeting held on 15th September 2016

The 9th meeting of the Governing Council of Jatayu Conservation Breeding Centre, Pinjore was held under the Chairmanship of Shri. R. R. Jowal, IAS, Addl. Chief Secretary, Forests, Government of Haryana on 15th September, 2016 at the old Secretariat, Chandigarh.

The meeting commenced at 13:00 hours and the following were present.

1. Dr. Amarinder Kaur, IFS, Principal Chief Conservator of Forests, Haryana
2. Dr. P.P. Bhojvaid, IFS, Addl. Principal Chief Wildlife Warden, Haryana (Member Secretary)
3. Mr. M. L. Rajvanshi, IFS, Conservator of Forests (Wildlife), Panchkula, Haryana
4. Mr. M. P. Gupta, Dy. Drug Controlling Authority, Government of Haryana
5. Dr. D. P. Chhikara, Joint Director (ADM), Animal Husbandry, Government of Haryana
6. Mr. Chris Bowden, Director, Vulture Programme, Royal Society for Protection of Birds, U.K.
7. Ms. Jemima Parry-Jones, Director, International Birds of Prey Centre, Newent, U.K.
8. Dr. Mahajan, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar
9. Dr. Vibhu Prakash, Principal Scientist, Bombay Natural History Society (Project Manager, Jatayu Conservation Breeding Programme)
10. Mr. Mandar Dilip Kulkarni, Centre Manager, Jatayu Conservation Breeding Centre, Pinjore, Haryana.

The following action points were advised by the Chairman for the Programme

1. A meeting should be immediately called of the Chief Wildlife Wardens of the neighbouring states to jointly evaluate the habitat in a radius of 100 km from the centres so that the vultures could be reintroduced in the wild by end of this year.

2. A demi-official letter should be drafted for the Chairman to be sent to the Secretaries, Food and Drug Administrations, of Government of Haryana, Punjab, Uttarakhand, Uttar Pradesh and Chandigarh about vulture conservation and need to ensure that human formulations of diclofenac are not misused for treating cattle in their states.

3. Surplus siblings of the birds should be sent to other centres in collaboration with Central Zoo Authority as soon as possible

4. A National Coordination Committee for Vulture Reintroduction Programme should be immediately set up.

5. A demi-official letter should be drafted on the behalf of the Chairman to be sent to the Secretary, Environment and Forests, MoEF&CC, Government of India and also to Secretary, Telecommunications, Government of India requesting expediting the permission for putting PTTs on the vultures to be released in wild**.**

2. Transfer of 15 critically endangered Gyps species of vultures from JCBC, Pinjore to VCBC, Bhopal, Madhya Pradesh on 5th October 2016

On 5th October 2016, a flock of 15 vultures (10 Long-billed and five White-backed vultures) were transferred from JCBC Pinjore to VCBC, Bhopal. The birds were transported by road and reached Bhopal on the morning of 6th October 2016. This transfer marked the third such event and the first where adult birds were transferred. The flock of vultures transferred also included two known pairs of Long-billed vultures which had bred before at Pinjore. This was done for genetic management of the *Gyps* vultures in captivity. The transferred birds were first housed in the quarantine aviary to monitor them, regularly, check their health and ensure that they did not carry any infections.

Pre transport preparations at JCBC Pinjore

Health check of the vultures to be transported

A thorough health check of the vultures to be transferred was done during the annual health check of vultures at JCBC Pinjore. This involved external clinical examination and analysis of blood samples for hematology and biochemistry parameters. The normal clinical and blood parameters indicated that all the vultures were healthy and free of disease.

Permissions for vulture transport

Following the health check, the proposed list of vultures to be transferred was submitted to the Chief Wildlife Warden, Haryana. Permission for transport of the vultures was duly obtained on 28/09/2016 from the Chief Wildlife Warden, Haryana. The permission also included a transit pass, permitting BNHS to transport 10 Long-billed Vulture and 5 White-backed vultures by road or air, and was valid for a period of 10 days.

Selection of mode of transport

Vehicle selected for transport of vultures

The distance between Bhopal and Pinjore is roughly 1000 km. Given the long distance, transport by air was the preferred mode. However, due to the lack of direct flights between Chandigarh to Bhopal and the existing flights having a long lay-over time at Delhi, all the contacted airlines refused to transport vultures. Hence, it was decided that the best and safest mode of transport for the vultures would be by road in an air conditioned vehicle. Thus, an air conditioned caravan (Tempo Traveller) was contacted and his availability on 5th October 2016 was confirmed. He was also briefed about the nature of work and was told about the precautions to be taken.

Transport of the vultures

The vultures were scheduled to be transported from Pinjore on the morning of 5th October 2016. To prepare them for transport, the birds were kept off feed for more than 24 hours. Based on the findings of their health check, it was certified that all the vultures were free of any infectious disease and were fit for transport in the standard vulture transport boxes. At 5:45 am on the 5th, all the vultures to be transported were caught and were clinically examined for any injuries. They were then kept in the vulture transport boxes. A first aid/ emergency treatment kit was prepared consisting of life saving drugs such as dexamethasone, atropine injections, respiratory stimulants such as doxapram, NSAID meloxicam, normal saline, ringer lactate solution, dextrose solution, syringes, cotton rolls, and hand sanitizers. The transport team left Pinjore at 7:00 am.

Throughout the transport, the team stopped every six hours and randomly checked three vultures every time to see if the birds were fine. The route chosen for transport was Pinjore- Delhi- Agra- Gwalior- Jhansi- Lalitpur- Bina- Vidisha- Bhopal, which was the shortest route. An average speed of 50 km/hr was maintained throughout the transport, with the vehicle never exceeding 80 km/hr. This was to ensure smooth transport of the vultures.

Pre transport preparations at VCBC Bhopal

Housing

Quarantine facility of VCBC Bhopal

As with every newly acquired vulture, this batch of vultures was also to be housed in the quarantine aviaries prior to bringing them to the centre. The quarantine facility consisted of two quarantine aviaries of dimensions 20x20x18' each. Each aviary could hold up to 10 vultures. The two aviaries had a common layer of netlon between them, which was covered by

green shade net. The structure was a temporary one, made of a framework of interlocking iron pipes, on which netlon was fixed with the help of fastening iron wire. Perches wound with coconut rope were provided in the aviary, for the birds to perch on. One water trough was provided in each aviary, for the birds to drink and bathe in. A watchman's shed was also set up as a temporary structure, to ensure round the clock presence of staff at the quarantine facility whenever vultures were kept there. These aviaries were constructed in February 2016, and were already in place for receiving additional vultures. The aviaries were covered with green shade net of 90% density (20x10' at the top of each aviary, and entire length of two sides). The sides for covering were selected so as to offer shade during the afternoon, when the temperature was maximum. The shade net reduced the intensity of direct sunlight by a considerable margin. The flooring in the aviary was of sand. As sand does not retain heat for long, the floor under shade would quickly cool down, and would be comfortable for the birds when they would be around the water troughs. Finally, to prevent the structure from collapsing in case of strong winds or storm, the central iron pole on each side of the aviary was tethered to a strong support such as a tree, using a thick rope. The quarantine facility was marked by placement of display board, with appropriate description, in front of the aviary. Water troughs were cleaned, painted with lime and filled with fresh water on the evening before the scheduled arrival of the vultures.

Intimation to M.P. Forest Department regarding arrival of vultures

The Chief Wildlife Warden of Madhya Pradesh was informed about the transport of vultures by a letter from Chief Wildlife Warden of Haryana. He was also personally updated on 01/10/2016 about the vulture transport. The Director of Van Vihar National Park, who is the Project Supervisor, was informed about the upcoming arrival of birds from Pinjore after the permission to transport them was obtained from the Haryana Forest Department.

Release of transported vultures in the quarantine aviary


Director VVNP visiting the quarantine aviary at the Centre

The transported vultures reached the quarantine facility at 11:00 am on 6th October 2016. The weather was pleasant and the temperature at the time was 29° C. The boxes containing the vultures were taken out from the vehicle and were placed in shade. All the vultures were checked again and were found to be fine. The Forest Department officials were informed about the arrival of vultures. The Director of Van Vihar National Park was requested to release the vultures in the quarantine aviaries. He reached the quarantine facility at around 12:15 pm. He was explained the plan for release of vultures in the aviaries. It was suggested that the Director would release at least 2 birds each in each aviary. A few minutes before arrival of the Director, two vulture boxes were placed in each aviary, at the desired angle of release. He released two White-backed vultures and two Long-billed vultures in the aviary, assisted by staff of the centre. After this, BNHS staff released the remaining vultures in the aviaries, followed by offering them meat. The Director left shortly as he had to attend to other commitments at Van Vihar.

Behaviour of vultures after release in the quarantine aviary

The vultures released in the aviaries immediately took to the higher perches. There was brief moment of disturbance initially as the vultures took a short while to settle. However, as everyone left with only one vulture attendant to observe the birds from a distance, the White-backed vultures settled down earlier and started feeding within 3 hours of their release in the aviary. A few Long-billed vultures fed on small amount of meat in the evening and all the vultures fed normally the following morning. After this, normal daily routine was established for the vultures.

3. Workshop on Species 360 hosted by JCBC, Pinjore

JCBC Pinjore hosted the Species 360 workshop from 23rd to 25th March 2017. Participants from Chatbir Zoo, Punjab and staff of JCBC, Pinjore attended the workshop. Mr. Moinuddin Ahmad was the resource personnel. The participating Zoos updated their inventory by entering their collections in the Species 360 Programme. Sarahan Zoo was also invited but they could not attend the workshop.

E. Vultures at the centre

There were 258 vultures at the centre as on 31st March 2017 of which 87 were White-backed vultures, 134 Long-billed vultures and 37 Slender-billed vultures. The centre had successfully hatched 32 nestlings by March 2017 in this breeding season of 2016-17 and this spike in numbers could be attributed to successful exchange of first clutch nestlings hatched in incubators for second clutch eggs, carried out in February 2017.

F. Breeding at the centre

The breeding season of vultures at the centre commenced from the month of September, just as it would in the wild. The established pairs in the Colony Aviaries were observed defending their nest ledges and perching together most of the time. They copulated frequently on the nest ledges, collected nesting material and build nests. During the year 2016-17, all the three species attempted breeding at the centre.

A 2 week old White-backed vulture nestling

A total of 34 nestlings including 17 Long-billed, 13 White-backed, and 4 Slender-billeds hatched and successfully fledged.

A total of 39 pairs including 20 of Long-billed Vulture, 13 of White-backed vulture and 6 of Slender-billed vulture were recorded during the breeding season of 2016-17.

A total of 43 fertile eggs were laid of which 28 eggs (13LB, 10WB, 5SB) were of first clutch and 15 eggs (9LB, 4WB, 2SB) were of second clutch.

A total of 22 eggs (10L, 9W, 3S) of first clutch and 12 eggs (7LB, 4WB and 1SB) of second clutch could hatch successfully resulting in 34 nestlings (17L,13 W, 4S) successfully hatched and fledged.

G. Husbandry and care

Aviary maintenance is critically important for ensuring the good health of the captive vultures. All protocols as laid out in Vulture Conservation Breeding Programme manual published by Central Zoo Authority were followed at the centre for good husbandry and care practices.

Thorough cleaning of colony aviaries

1. Cleaning of aviaries

a. Routine cleaning

All aviaries were cleaned twice a month outside breeding season and once a month during the breeding season. During the routine cleaning, the

left over carcasses were removed, water troughs were emptied, scrubbed and painted with lime, any repairs of the perches, nest cots and other miscellaneous repairs like pruning of trees, repairs of doors, bamboos, pipelines were carried out.

b. Thorough cleaning

Thorough cleaning of aviaries was done twice in a year i.e. pre-breeding and post breeding seasons when the aviaries were overhauled thoroughly. The sand on the floor was raked after which 2" of fresh sand was spread on floor, all vegetation was uprooted; walls were scrubbed of all fecal matter and painted with lime, water troughs

2. Feeding the vultures

Vultures were fed on freshly slaughtered skinned goat carcasses. The entire carcass of the goat was provided to the vultures from the feeding hatch. On an average, each vulture was provided with approximately 5 kg of meat per week depending on the body weight; spread over two days. To ensure that there was no diclofenac in the tissues of the goat carcasses, a herd of goats was kept in the care of the centre for at least ten days before it was slaughtered.

The food was provided two times a week. Extra food was provided during breeding season i.e from October onwards. The bones of the carcasses offered to vultures were also smashed before offering to vultures. This helped vultures in taking bones which was a source of calcium. The calcium requirement increases during the breeding season. The meat expense at Pinjore was over INR one crore.

Food expense at the centre from April 2016 to March 2017

Meat Expenses from April -2016 to March-2017		
April-2016	4208 KG @ Rs.240/ KG	₹ 10,09,920.00
May-2016	4277 KG @ Rs.240/ KG	₹ 10,26,480.00
June-2016	3851 KG @ Rs.240/ KG	₹ 9,24,240.00
July-2016	3907 KG @ Rs.240/ KG	₹ 9,37,680.00
August-2016	2989 KG @ Rs.240/ KG	₹ 7,17,360.00
September-2016	3168 KG @ Rs.240/ KG	₹ 7,60,320.00
October-2016	2880 KG @ Rs.240/ KG	₹ 6,91,200.00
November-2016	3089 KG @ Rs.240/ KG	₹ 7,41,360.00
December-2016	3053 KG @ Rs.240/ KG	₹ 7,32,720.00
January-2017	3626 KG @ Rs.240/ KG	₹ 8,70,240.00
February-2017	3108 KG @ Rs.240/ KG	₹ 7,45,920.00
March-2017	3539 KG @ Rs.240/ KG	₹ 8,49,360.00
	Total	₹ 1,00,06,800.00

3. Provision of nest material


Providing nest material in colony aviary

To fulfil the continuous need of nest material for building nests, nest material was provided regularly, to ensure its presence on aviary floor at all times. At the onset of breeding season, nest material was provided every week which was reduced to once a fortnight during the mid or late breeding season.

The nest material included the twigs and green leaves of locally available trees, like neem *Azadirachta indica*, pine *Pinus roxiburgii*, lantana *Lantana camera*, silk cotton *Bombax ceiba* banyan *Ficus bengalensis*, acacia *Acacia catechu*, flame of the forest *Butea monosperma* and grasses.

H. Annual Health Check

All the birds at the centre were caught and given a health check once a year. The annual health check for 2016 was conducted from 10th to 14th September 2016 at the centre. In the health check vultures were examined clinically to assess their health status and to provide necessary veterinary care to any compromised vultures.

Annual health check comprises of detailed physical clinical examination, blood collection for evaluation of haematological parameters, blood biochemistry and DNA sexing. Blood was collected from selected vultures from each aviary.

Detailed clinical examination included assessment of pectoral and femoral muscles, recording of body weight, inspection of eyes, nares, crop, legs, abdomen, cloaca etc. for any possible abnormalities. Foot pads were examined for the presence of pododermities and body feathers were examined for the presence of ectoparasites during the exercise. Any kind of abrasion occurred during catching was treated with anti-biotic ointment. Anti-parasitic spray was used in case of ectoparasitic infestation under both wings and body.

Method

Physical examinations of vulture

All vultures were physical examined by hand palpation on pectoral and thigh muscles, neck, crop, bones joints, and abdomen. Close examination of eyes, nares, foot pads, and cloaca were practiced to sort out possible abnormalities. Body weight of vultures was recorded to find out the health

status of the birds.
The presence of ectoparasitic infestations was graded as:

1. Grade "O" for no ectoparasitic infestation
2. Grade "1" for mild ectoparasitic infestation without necessary treatment
3. Grade "2" for considerable ectoparasitic infestation with treatment recommendation
4. Grade "3" for severe ectoparasitic infestation with highly recommended treatment.

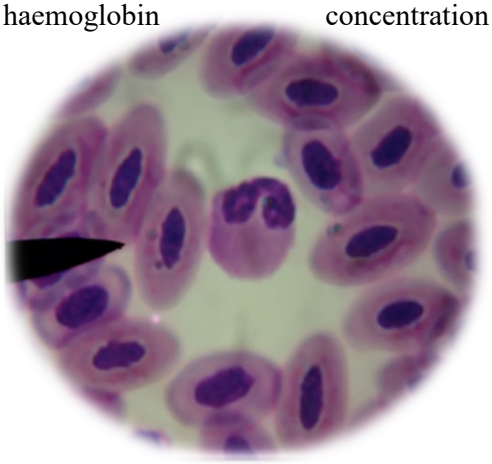
**Treatment with frontline spray was recommended for grade “2” and above level of infestation.

The birds were weighed by Pesola Weighing Balance and heart rates were noted by using clinical stethoscope.

Haematology

Blood was collected from medial metatarsal vein and stored in Ethylene Diamine Tetra-acetic Acid (EDTA) vacutainer. Two blood smears were prepared immediately from last few drops of blood from the syringes after transferring the whole blood into the vacutainer.

Haematological parameters considered for estimation were packed cell volume (PCV), haemoglobin (Hb), total erythrocyte count (TEC), total leucocyte count (TLC), differential leucocyte count (DLC), mean cell volume (MCV), mean cell haemoglobin (MCH) and mean cell haemoglobin concentration (MCHC).



Blood smear stained with diff-quick method magnified 1000 times under

1. Packed Cell Volume (PCV)

Microcentrifuge Method: - Micro capillary tubes were filled up to 3/4th length by EDTA blood and were sealed at one end with soap. Centrifugation was done by keeping sealed end towards periphery of the rotor head at 8,000-10,000 rpm for 5 minutes. Reading of capillary tubes was taken on PCV reader scale.

2. Haemoglobin Estimation (Hb)

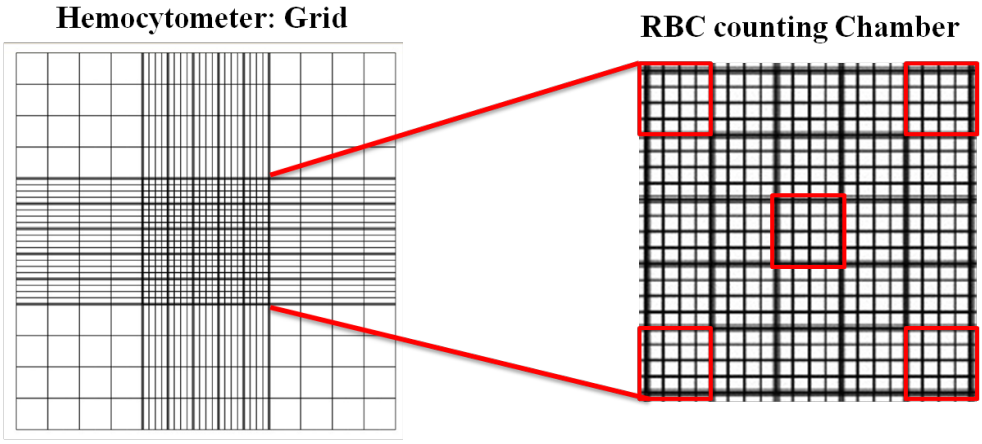
Hemocue machine method: A sophisticated portable HemoCue machine gave the percentage of
haemoglobin instantly when a cuvette charged with a drop of blood was inserted into the machine.

Or
Sahli's method: – N/10 HCl was taken in Sahli's tube up to 2g reading and then 20µl blood should be added to and, mixed properly by stirring rod. The aliquot should be kept still in a dark area for 1-2 min.e matched with standard colour column of haemometer.

3. Total Erythrocyte Count (TEC)

Neubauer Haemocytometer Method: - Aliquot was prepared by adding 20µl blood to 4 ml normal saline to make 1:200 dilutions. The aliquot was then allowed to mix gently by rolling in blood mixer for 5 minutes. Finally, haemocytometer was charged with aliquot and the red blood cells were counted in 5 squares (5× 16 =80 smallsquares) under the 40X microscope.

Calculation = Number of RBC counted / 100 × 10^{12} /L

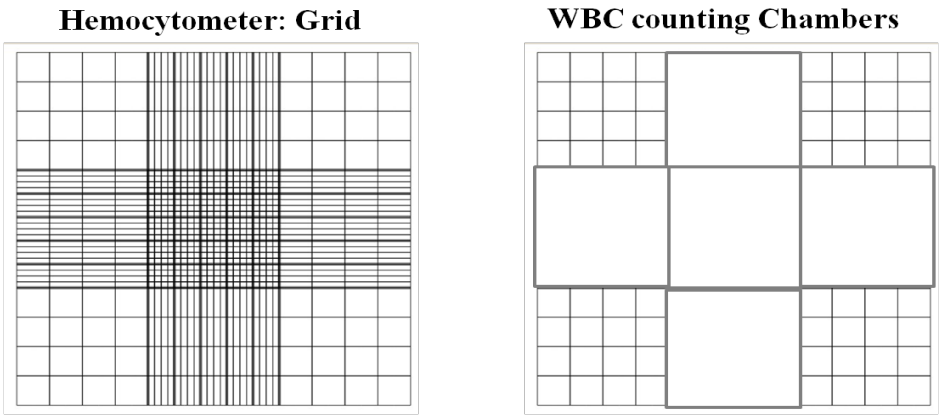


RBC counting chamber of Haemocytometer

4. Total Leucocyte Count (TLC)

Neubauer Haemocytometer Method: - A total of 100µl of blood was added to 1.9 ml 1% Ammonium oxalate solution to get 1:20 dilutions. The aliquot was mixed for 7 minutes in blood mixer and then kept undisturbed for 5 minutes. The haemocytometer was charged with diluted blood and WBCs were counted in 4 squares (4× 16= 64 big squares) under the 40X microscope.

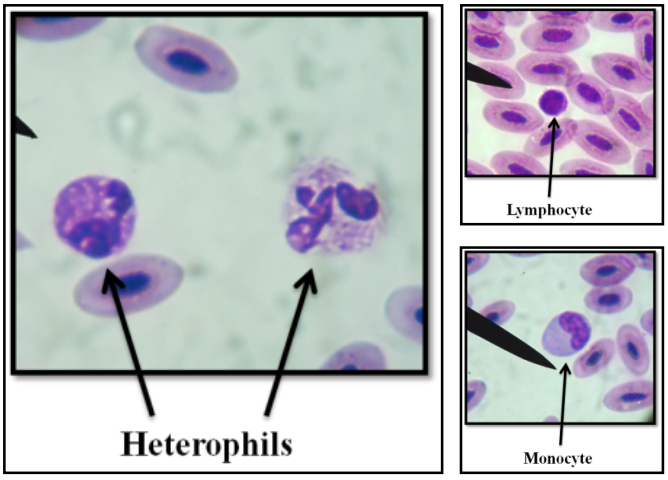
Calculation = Number of WBCs counted / 20 × 10^{9} / L



WBC counting chambers of Haemocytometer

5. Differential Leucocyte Count (DLC)

Diff Quick Method: - The blood smears was first fixed in methanol and then serially stains in Stain-A and Stain-B for 10 seconds and 1-2 minutes respectively. Finally, stained blood smear was examined under the 100X oil immersion microscope.



Different type of leucocytes under 1000 X magnification

6. Other parameters

Mean cell volume (femtolitre) = $\frac{\text{PCV x 10}}{\text{RBC}}$

Mean cell haemoglobin (picogram) = $\frac{\text{Hb x 10}}{\text{RBC}}$

Mean cell haemoglobin concentration (g/L) = $\frac{\text{Hb x 100}}{\text{PCV}}$

7. Blood biochemistry

For serum biochemistry whole blood was stored in red capped clot activator vacutainer. Blood was allowed to clot for about 2 hours in room temperature. Finally serum was separated from whole blood by processing in micro-centrifuge machine at 2000 rpm for 10 minutes. All serum samples were sent to Veterinary Pathology Laboratory for bio-chemical parameters estimation. Bio-chemical parameters considered should be blood urea, serum creatinine, serum uric acid, serum bilirubin total, serum bilirubin direct, serum bilirubin indirect, SGOT (kinetic)/ Aspartate Amino transferage, SGPT (kinetic)/ Alanine amino transferage, serum alkaline phosphatase, serum sodium and serum potassium.

RESULTS & DISCUSSIONs

a. Clinical examination of vulture

i. Clinical examination of White-backed vultures

A total of 32 White-backed vultures were examined clinically. The mean±SE of body weight was 4.28±0.11kg. The maximum weight recorded was 5.3 kg and minimum was 3.4 kg and they were within the normal range

The ectoparasitic infestations recorded in vultures were grade “0” infestation 19, grade “1” infestation 11 and grade “2” was 1.

Flattening of dermal papillae was observed on 3 WBV with ring no. J61, B91 and A39. Cracks on dermal papillae of central footpad was noticed on B50 WBV. The WBV with ring no. VG had twisted talons and long nails were clipped off by nail clippers. On the ventral side of neck of J59 WBV, there was a moderately hard pendulous tissue lump. However, the tissue lump did not obstruct the cervical oesophagus of the bird.

During the health check, new rings were fitted to metatarsus of 9 WBVs.

ii. Clinical examination of Long-billed vultures

A total of 76 Long-billed vultures were examined clinically. The mean±S.E. of body weights was 4.58 ± 0.06. The maximum weight recorded was 6.2 kg and minimum was 3.2 kg.

The ectoparasitic infestations recorded in vultures were grade "0" infestation 41 and grade "1" 35. None of the long-billed vulture had grade "2"or "3" infestation.

The LBV with ring no. D25 had a heal scab on left central footpad. Flattening of dermal papillae on left central footpad was observed B06 LBV.

New rings were fitted on 7 LBVs.

iii. Clinical examination of Slender-billed vultures

A total of 16 Slender-billed vultures were clinically examined. The mean±S.E. of body weights was 4.8 ±0.12. The maximum weight recorded was 5.6 kg and minimum was 4.0 kg.

The ectoparasitic infestations recorded in vultures were grade "0" infestation 8 and grade "1" was 8. None of the slender-billed vulture had grade "2"or "3" infestation.

New rings were fitted on 6 SBVs. None of the vulture had any clinical problems.

b. Haematology

For haematology blood samples were collected from 11 White-backed vultures, 33 Long-billed vultures and 5 Slender-billed vultures.

i. White-backed vulture

The mean±S.E. of erythrocyte count, leucocyte count, heamoglobin estimation and packed cell volume (PCV) were 2.69±0.12 $x10^{12}$/l,15.55±1.32 $x10^{9}$/l, 15.65±0.38 g/dl and 43.82±0.97% respectively. The Differential leucocytes results showed that the mean±S.E. heterophils were 68.36±2.63%, lymphocyte 27.64±2.09%, monocyte 4.45 ±0.77%, eosinophil 0.00%, and basophil 0.00%. The mean±S.E. of MCH(pg) 59.40±3.01, MCV(fl) 166.25 ±8.05, and MCHC(g/dl) 35.83±1.02.

ii. Long-billed vulture

The mean±S.E. of erythrocyte count, leucocyte count, heamoglobin, and Packed Cell Volume (PCV) were recorded as 2.55±0.10 $x10^{12}$/l, 12.60±0.77 $x10^{9}$/l, 15.28±0.30 g/dl and 42.70±0.90% respectively. The Differential leucocytes results showed that the mean±S.E. heterophils were 66.77±2.32%, lymphocyte 29.68±2.27%, Monocyte 3.52 ±0.47%, eosinophil 0.03±0.03% and basophil 0.00%. The mean±S.E. of MCH(pg) 63.38±3.07, MCV(fl) 178.96 ±9.70, and MCHC(g/dl) 35.92±0.50.

iii. Slender-billed vulture

The mean±S.E. of erythrocyte count, leucocyte count, heamoglobin, PCV were 2.72±0.33 $x10^{12}$/L, 11.07±1.58 $x10^{9}$/L, 14.86 ±0.58g/dl and 40.80±1.88 % respectively. The Differential leucocytes results showed that the mean±S.E. of heterophils 63.80±5.27%, lymphocyte 34.40 ±5.16 %, monocyte 1.80±0.37%, eosinophil 0.00%, basophil 0.00%. The mean±S.E.

of MCH (pg) 58.66±9.25%, mean±S.E. MCV (fl) 160.21±24.33, and MCHC (g/dl) 36.51±0.93.

Conclusion

All the vultures were in sound health condition. No vulture was found to have any abnormal blood parameters. Body weights of the vultures were within the normal range and ectoparasite infestations were not severe. These findings conclude that present routine husbandry and care at the centre is satisfactory.

Mortality at the centre

A Slender-billed vulture H-28, got injured in the colony aviary 5 on 30/03/17 at the centre. It caught hold of the net on the ceiling and fell 'head on' on the ground as it could not balance itself when it released its hold. There was blood in its mouth. Bird was brought to hospital room and was immediately treated with emergency drugs

1. 1ml adrenaline injected i/v ly
2. 1ml Dexona injected i/v ly
3. 1ml dyrephyllin injected i/v ly
4. Masking with oxygen
5. Pumping with ambu bag

The bird however did not survive. The post mortem was carried out the same day and the important findings of the post mortem were Hemorrhages in abdominal and Thoracic cavity were prominent, no enlargement of liver and Hemoptysis. The cause of mortality appeared to be traumatic shock due to massive internal hemorrhages and also hemorrhages in cerebellum.

I. Safety testing of NSAIDS on vultures

Progress Report on project "Assessing the Safety to Vultures (Gyps Spp.) of Non-Steroidal Anti-Inflammatory Drugs in Veterinary Use in India" at Vulture Conservation Breeding Centre, Pinjore, Haryana.

Introduction

Nine species of vultures are found in India, of which four species are listed by IUCN as Critically Endangered and one as Endangered (IUCN 2011). Indiscriminate use of non steroidal anti-inflammatory drugs such as diclofenac in the Indian subcontinent was held responsible for catastrophic decline in populations of three species of the resident *Gyps* vultures (Oriental white-backed vulture *Gyps bengalensis*, Long-billed vulture *G. indicus* and Slender-billed vulture *G. tenuirostris*) to the extent that they are now considered critically endangered. Another NSAID, ketoprofen has been found to produce nephrotoxicity similar to diclofenac in one of the Gyps species (*Gyps africanus*) and is likely to be toxic to all gyps vultures. The drug aceclofenac is metabolised to diclofenac or its derivatives in rats, human and monkeys and thus is a potential threat to *Gyps* vultures, although conversion of aceclofenac to diclofenac as one of the metabolite in cattle and buffalo needs to be proved. While interventions by imposing a ban on the veterinary use of these toxic drugs is one aspect to support *Gyps* vulture conservation in the Indian subcontinent, the other aspect that warrants immediate investigation is safety testing of the other molecules such as analgin, ibuprofen, nimesulide being used in the veterinary practice. Meloxicam was found to be a

relatively safer NSAID but 50% of the veterinary formulations are marketed in combination with paracetamol, the safety of which, to Gyps vultures, is yet to be established. Identification of NSAIDs that are safe for vultures and suitable for treating domesticated ungulates will be of benefit to vulture conservation as well as to mankind, as the promotion of a range of safe NSAIDs will greatly help in the prevention of the use of veterinary diclofenac and the misuse of human diclofenac for veterinary treatment.

For the safety testing of the drugs analgin, ibuprofen, nimesulide and paracetamol Himalayan Griffon (*Gyps himalayensis*) can serve as a surrogate species in accordance of the phylogenic relations of all the *Gyps* vulture species and their response to drugs like diclofenac and meloxicam. Once the drugs have been found safe for Himalayan Griffon in experimental trials, only then will their safety be assessed in *Gyps bengalensis*.

Objectives

The main Research Inquiries of the Project were:

1. Whether four previously untested NSAIDs in veterinary use in India pose a toxicity risk to *Gyps himalayensis* and *Gyps bengalensis*

2. Whether analgin, a common veterinary drug used in early 90s is safe to *Gyps* vultures?

3. Whether paracetamol present in large number of veterinary drug formulations including meloxicam is safe to *Gyps* vultures?

4. Whether two other molecules nimesulide and ibuprofen pose a toxicity risk?

5. Whether aceclofenac known to metabilize to diclofenac in rat and human is metabolized to diclofenac in cattle/buffalo?

6. Whether proximal renal tubule cells of vulture can be immortalized to develop a model for in vitro screening of new molecules?

Progress made during the year 2016-17 in the project by Bombay Natural History Society at Vulture Conservation Breeding Centre, Pinjore, Haryana

The Himalayan Griffon which is a surrogate species of the critically endangered Gyps species of vultures will be utilized for the safety testing of the various NSAIDs. The Himalayan Griffons will be housed at the Vulture Conservation Breeding Centre of Bombay Natural History Society. The following aviaries and other structures were constructed for the housing and trapping of birds at VCBC, Pinjore.

A. Construction of Aviaries

i. Construction of Quarantine Aviary

A temporary quarantine aviary was constructed about 5 km from the Vulture Centre in Nandpur village on Haryana Forest Department land after taking due permission from the Forest Department. The construction commenced from 1/01/2017 and it took almost a week to complete it. The aviary was 40x40x14' and was largely of strong plastic netting. There was a double door protection for the prevention of the escape of the birds. The wooden perches,

wounded with coconut ropes, were provided at a height of 10'.Tree stumps were also provided on the ground as perches. Two water troughs were provided for the vultures to drink and bathe in. The flooring of the aviary was of mud and sand. Screen cloth was provided on the two sides of the aviary for preventing any disturbance from humans or animals. Shade netting was also provided on the roof. The aviary was fenced all around with chain link iron mesh to keep dogs, cattle and humans away.

Vulture keeper hut

An abandoned vulture guard quarter 50 m from the aviary was utilized as vulture keeper hut. One room and kitchen were repaired. New electric connections, water connections and fittings were done for the comfortable stay of the vulture keepers. Cots, beds and water containers were organized for the stay of the vulture keeper. Two vulture keepers were stationed there since January 2017, one during the day and the other at night. An additional keeper was kept during the day when the vultures were moved in the aviary on 6/02/2017.

ii. Construction of holding aviary

a. Permission requested for utilization of forest land and construction of holding aviaries from the Haryana Forest Department

The permission for utilization of forest land and construction of aviaries near the Vulture Conservation Breeding Centre, Pinjore, was requested during the month of May 2016 (13/5/2016) which was granted during the month of September 2016 (28/09/2016) by the Chief Wildlife Warden of Haryana. The construction of the aviaries was initiated in the month of January 2017 and the construction was completed by the end of February 2017.

iii. Construction of Aviaries for housing vultures

Five aviaries of dimensions 20 x 20 x 16' were constructed for housing 20 birds. Each aviary housed 4 vultures. The aviaries had brick walls on two sides, and on the remaining two sides, the solid walls were up to 4' height, on which there is an iron mesh with an inner lining of bamboo. There was a water trough in each aviary. Other fixtures in the aviaries included 3 perches of various lengths placed at different heights, one wooden cot woven with jute matting and 2 stumps for vultures to perch on. The aviaries had a small gallery each (8 x 6x 8') for entrance and for providing double door protection. The aviaries had welded iron mesh at the top, a foot below which there was a layer of netlon.

iv. Perimeter Fence

The entire area around the aviaries was fenced with chain link fence for keeping stray and wild animals away and also the curious human beings. The fence was about 6' high with a mesh size of 2.6 x 2.6".

v. Watchman's room

The watchman's room was in front of the entrance gate and was of 10x10x10'. A vulture keeper cum watchman was always present at the facility.

vi. Aviary for Trapping of Birds

The Himalayan Griffons were captured in a big 90x16x30' aviary. It was made up of only netlon (a strong plastic netting) and GI pipes. The aviaries had double door protection, a food hatch and couple of water troughs.

The aviary had various perches for vultures to perch on. The aviary had water troughs which were bigger than the ones in colony aviaries.

B. Catching of Himalayan Griffon

Food was put out for free ranging Himalayans from 12 December 2016 onwards outside the aviary constructed to trap vultures. Four non-releasable White-backed Vultures and one Long-billed Vulture were kept in the aviaries as decoy birds to attract the wild birds to the aviary. The free ranging Himalayan Griffon were fed for 25 days outside the aviary and once they got used to feeding and interacting with the handicapped vultures, the front door of the aviary was remotely pulled up while sitting in a nearby hide on 6/2/2017. The non-releaseable vultures were confined to the back portion of the aviary with the help of netting on 9/1/2017 so that they would not walk out while the front door was lifted. The free ranging Himalayan Griffons gradually started going inside the aviary and feed alongwith the handicapped birds. More than 50 vultures were recorded inside the aviary when ever food was offered. On the 6/02/2017, the aviary gate was remotely pulled down and 20 Himalayan Griffon were captured in one attempt. The vultures were thereafter caught with the help of a net and put in wooden boxes and transported to the quarantine facility which was 5 km away from the centre at Nandpur village.

a. Transportation of the vultures to Quarantine facility

The birds after they were caught in the nets were kept in top opening wooden boxes of dimension 2.6'x1.6x2'. The boxes were transported to the quarantine facility in a pick-up truck the same day that is on 6/02/2017 The birds were released in the aviary after they reached the facility. The water was filled up in the water trough before the birds were released in the aviary. Perches were also fitted before the birds were released.

b. Feeding the Himalayan Griffons

The birds were not fed on the day they were released in the quarantine facility. They were subsequently fed on skinned goat carcasses twice a week on Thursdays and Sundays. Each vulture was given 5 kg of meat per week.

c. Health Check

All the birds were caught and were given a health check by the veterinarians from IVRI and BNHS on the 10/02/2017. All the birds were bled for carrying out hematology and blood biochemistry. All the birds were found to be healthy.

d. Shifting the birds to the aviaries

i. Health check

The vultures were given a health check on 8/03/2017. Some vultures were found to be suffering from avian pox but were recovering.

e. Catching and shifting of birds to the holding aviaries

Ten Himalayan Griffons were shifted on the 8/03/2017 to the newly constructed holding aviaries and the rest were shifted on 14/03/2017. Five birds were kept in each of the four aviaries and one aviary was kept empty.

f. Husbandry and Care

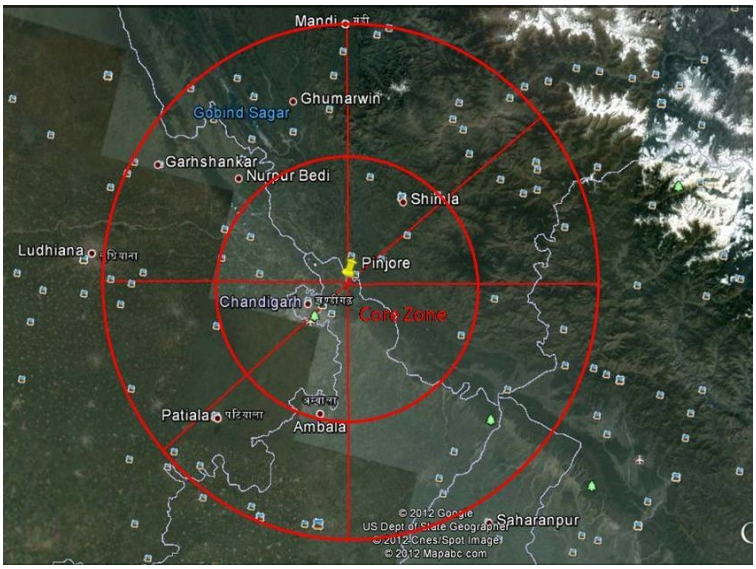
Similar protocols followed at the Vulture Conservation Breeding Centre were followed. The vultures were visually observed thrice a day by the veterinarian and the vulture keeper. All vultures were ringed and micro-chipped for identification.

The vultures were fed twice a week on skinned goat meat. Each vulture got 5 kg of meat per week. This worked out to be at the rate of 5% of their body weight per day. The water in the water trough was topped every day and was cleaned every third day.

Examination of Himalayan Griffon

J. Preparation for the Release Programme

The critically endangered white-backed vultures will be released in the wild only after ensuring that enough habitat and food are available for vultures and the prevalence of the vulture toxic drugs especially NSAIDs is low in the cattle carcasses, the principal food of the vultures in a radius of 100 km from Jatayu Conservation Breeding Centre, Pinjore**.**



Area falling in the 100 km radius of the release site

Workshop on the Vulture Conservation and Reintroduction programme held on 21 and 22 November 2018 at Panchkula

Introduction

The population of vultures in our country crashed during mid nineties because of the poisoning of their principal food, cattle carcasses by veterinary drug diclofenac. We had lost 99% of the population due to this drug by 2007. The vultures get exposed to this drug when they feed on carcass of a cattle died within 72 hours of administration of this drug. The residues of the drug which remain in the carcasses are enough to cause renal failure and mortality in vultures.

The Haryana Forest Department has pioneered the vulture conservation efforts in the country and has successfully for the first time ever bred three species of critically endangered species of vultures in captivity in its Jatayu Conservation Breeding Centre at Pinjore. With the ban in place now on the veterinary use of diclofenac and the restriction on the vial size of the drug for human use to 3mL ampoule, has made the environment relatively safe for vultures.

The Jatayu Conservation Breeding Centre houses over 241 birds of the three species. On an average about 39-40 birds are added every year because of the success in breeding of all the three critically endangered Gyps species of vultures in the country. Based on the pharmacy and cattle carcass surveys, it appears that the prevalence of vulture toxic drug has come down substantially and with the restriction on the vial size of human formulation to just 3 ml, to prevent its misuse in cattle, the prevalence of diclofenac in the system is likely to go down further. Hence it was decided to initiate the Vulture Reintroduction Programme. The

progamme was initiated by the Honorable Chief Minister of Haryana when he released the birds in the pre-release aviary 0n 13 November 2015. Two Himalayan Griffon were released by Honorable Chief Minister of Haryana and Honorary Union Forest Minister on the 3 June 2016.

It is planned to release the critically endangered White-backed vultures in the wild from JCBC, Pinjore in early 2017. This would however be done only after ensuring that enough habitat and food are available for vultures and the prevalence of the vulture toxic drugs especially NSAIDs is low in the cattle carcasses, the principal food of the vultures in a radius of 100 km from Jatayu Conservation Breeding Centre, Pinjore.

Seeking support and action of the State Governments of neighbouring states

The birds are likely to be released from the Jatayu Conservation Breeding Centre. Six states namely Himachal, Punjab, Uttarakhand, Uttar Pradesh and Haryana and Union Territory of Chandigarh fall within the 100 km radius from the centre which is a minimum a distance which vultures could easily cover within a day. The cooperation of all these states will be

required if the Vulture Release progamme is to succeed, specially of the three departments i.e., the Forest Department, Animal Husbandry department and Food and Drug Administration in each of the states.

The Forest Department of Haryana will spearhead the Programme and will implement the release programme with the technical help of Bombay Natural History Society. The habitat in a radius of 100 km from the centre will be evaluated first to see if there is enough food and habitat for vultures, no major threat of diclofenac or other toxic NSAIDs poisoning of their preferred food, cattle carcasses, before the vulture could be released in wild.

A two days seminar/workshop, of the major stake holders, on the Reintroduction Programme of vultures, involving all the six neighboring states and the union Territory of Chandigarh, at Panchkula, on 21-22 November 2016, to deliberate on the ways and means of making the habitat safe for the captive bred vultures, which will be released from the centre.

Objective of the Workshop

To prepare a working plan, to evaluate the habitat in an area of 100 km radius from the centre and initiate measures to ensure that the habitat is suitable for the release of captive bred vultures from Vulture Centre.

Proceedings of Workshop on Vulture Conservation and Reintroduction programme organized on 21st and 22nd November 2016 at Panchkula, Haryana

The two day workshop on the Vulture Conservation and Reintroduction programme was held on 21st and 22nd 2016 at Red Bishop Tourist Complex, Panchkula. The workshop was in preparation for the release of the Critically Endangered Gyps species of vulture, Oriental White-backed in the wild. The senior forest and wildlife officers from the neighboring states of Punjab, Himachal, Uttar Pradesh and Uttarakhand deliberated with the Haryana team on evaluating the habitat in a radius of 100 km from the vulture centre. It was important to make sure that there was enough food, roosting and resting habitats, low prevalence of toxic NSAIDs and no other threat to vultures in the area, The vultures from the breeding centre will be released once this was ensured by systematic evaluation. The Dy. Drug Controller General of India, and Drug Controllers from the neighboring states attended the workshop to decide on the effective implementation of the ban on the veterinary use of the drug diclofenac in treating cattle and prevention of the misuse of multi-dose vials of human formulations in treating cattle. The Directors of animal husbandry and Dairy or their representatives from all the neighbouring states also joined the deliberations to ensure judicious use of veterinary NSAIDs in treating cattle and prevent the use of toxic NSAIDs in treating livestock.

Dr. Amarinder Kaur, IFS, Principal Chief Conservator of Forests, Haryana, said that the

Jatayu Conservation Breeding Centre had succeeded in breeding all the three species of critically endangered vultures and now the time had come to start the reintroduction of vultures in the wild. The Haryana Forest Department and BNHS would not successfully implement the vulture reintroduction programme on their own, unless there was full support of the Drug Controlling Authorities and the Animal Husbandry Departments of all the neighbouring states as the veterinary use of NSAIDs would have to be done very cautiously.

Dr. Bhojvaid, IFS, PCCF&CWLW, Haryana, said that unless there was permission to put the

Satellite Transmitters on the captive bred vultures it would not be possible to release them in the wild. He said that the Himalayan Griffons released in the wild by Mr. Prakash Javadekar, Honourable Union Minister of State for Environment, Forests and Climate Change, from the Jatayu Conservation Breeding Centre, launching the Asia First 'Gyps Vulture Reintroduction programme' could be followed only for 45 days because they did not have tracking devices. These vultures will be closely monitored for the next few months after the release and thereafter vultures will periodically be released in the wild to augment the wild population.

Dr. D. N. Singh, IFS, Member Secretary, Central Zoo Authority congratulated the team of

Haryana Forest Department and Bombay Natural History Society for such dedicated and good work. He emphasized that the Central Zoo Authority is a strong supporter of the programme and will be supporting the programme in the future as well, he also asked the Haryana team to share their expertise with other vulture conservation breeding centres as well. He said that Pinjore centre is the coordinating zoo for Vulture Conservation Breeding Programme of Central Zoo Authority and provides technical support to other seven vulture centres. It is important that the birds from this centre should be released in the wild as well as should be sent to other vulture centres for genetic management.

Mr. Dhirender Singh, IFS, PCCF&CWLW, Punjab, said that the vulture population crashed in the country due to the veterinary use of the drug diclofenac and the conservation breeding programme was set up as an insurance against extinction. The Government of India moved quickly and banned the veterinary use of the drug in 2006. There was evidence of drastic reduction in the use of the drug based on the scientific investigation of the cattle carcass tissue samples and this release will actually test the efficacy of the Government efforts.

Dr. Deepak Apte, Director, BNHS India said the Conservation Breeding of Vultures was being done systematically and scientifically in near natural conditions. He said it is important the habitat around the centre was safe for vultures and PTTs were deployed before they were released in wild. Unless the permissions for importing and deploying PTTs were in place, it would not be possible to release birds in the wild.

Dr. Toby Galligan, RSPB, U.K., said that was important to take up safety testing of various veterinary NSAIDs whose toxicity to vultures was not known. He said he was pleased to

know that the Vulture Centre in collaboration with the Indian Veterinary Research Institute, Izzatnager, was going to undertake safety testing of drugs which had not been tested on vultures so far, to make sure that the release programme was successful by preventing the use of any other drug found toxic to vultures.

The way vultures will be released is called a Soft Release/Reintroduction programme. They were first released in a pre-release aviary, where they had an unobstructive view of the surroundings on the 13th November 2015 by the Honourable Mr. Manohar Lal, Chief Minister of Haryana. This helped them in getting used to the habitat in which they would be released in the wild in future. At the Conservation Breeding Centre, they were kept in aviaries where they had little view of the habitat around. Among the 10 vultures released in the aviary, there were two Himalayan Griffons, which were brought as juveniles and as sick birds and have been in captivity for last ten years. Rest were all White-backed Vultures, of which six had hatched in captivity at the centre and are 2-3 years of age. The remaining two White-backed vultures were brought as rescued adult birds from the wild about ten years ago but have not bred so far. These wild caught vultures would act as guide birds for these captive hatched birds when they would be released in the wild. The two Himalayan Griffons were released on the 3rd June 2016.

Diclofenac is a non-steroidal anti-inflammatory drug which is given to cattle in inflammation and pain but is extremely toxic to vultures. The vultures get exposed to the drug when they feed on the carcases of an animal which died within 72 hours of the administration of the drug. The drug causes renal failure in vultures even at very low concentration and causes Visceral Gout and the birds die within a few days. The drug was banned by Government of India for veterinary use in 2006 but the vultures continued to die, though at a slower rate, because of the misuse of multi-dose vials of diclofenac for human formulations. Fortunately, the multi-dose vials for human use were banned by the Drug Controller General of India on the 17 July 2015. This would certainly bring down the prevalence of the drug in cattle carcasses and the environment would be safe for vultures. Over 11% carcasses of cattle had residues of diclofenac before the ban but by 2013 less than 2% of carcasses had residues of diclofenac. According to scientific studies carried out by BNHS and its national and international partners, if the prevalence of diclofenac is less than 0.8%, then it would be safe for vultures. It is very hopeful that the prevalence will go down below 0.8% with the recent ban on the multi-dose vials of human formulation of diclofenac. The centre has monitored the prevalence of diclofenac and was instrumental in the safety testing of Vulture Safe Drug, meloxicam.

These birds were bred in the Jatayu Conservation Breeding Centre which was established close to Bir Shikargah Wildlife Sanctuary in the year 2001. This was the first centre of its kind in the world to hold and breed the three species of critically endangered Gyps vultures for the first time ever. The centre was established as an extreme conservation measure to ensure the prevention of extinction of the species. They pair for life and the pair gives one egg per year out of which only 50% survive. If the egg is lost within three weeks they lay again. The centre took advantage of this and removed the first clutch of eggs and incubated it

artificially, the second clutch was hatched by the parents. This way the centre attempted to double the productivity.

The Technical Sessions on the 21 November 2016

There were three presentations during the first technical session giving the back ground information on crash in vulture population, the future plan for reintroduction and preparation for reintroduction of vultures in the wild.

The presentations were, "On the crash in vulture population and conservation measures taken to prevent their possible extinction" by Ms. Nikita Prakash, Scientist 'C'

"On the reintroduction programme of the Jatayu Conservation Breeding Programme".
Dr. Mandar D. Kulkarni, Scientist 'C'

"On how to prepare a safe environment for released and wild *Gyps* vultures.
Dr. Toby Galligan, Conservation Scientist, Royal Society for Protection of Birds, UK

The Panel discussions were followed after the technical presentations

Panel Discussions

A. Removal of Toxic NSAIDs from Vulture Food in an area of 100 km radius from the Vulture Centre

Chairman: Mr. Binaya Samantray, Dy. Drugs Controller (India)

Panel Members: Mr. Sanjiv Kumar, Asst. Comm. Drugs, FDA (Punjab), Mr. Narender Kumar Ahuja, Asst. Drug Controller (Haryana), Mr. Amit Duggal, Senior DCO(Chandigarh), Mr. R. K. Choudhary, ADC (Himachal)

Dr. Vibhu Prakash gave a brief presentation on the status of the two Himalayan Griffons which were released from the centre in the month of June, 2016. He also discussed about the plans of determining the the prevalence of diclofenac and other toxic NSAIDs in an area of 100 km radius from the centre. He gave details of the findings of recent pharmacy survey which was carried out by the JCBC, team. The vulture toxic drug was still available for veterinary use and also other drugs whose toxicity is still unknown. The talk was followed by a panel discussion of the experts on the possibility of minimizing the use of vulture toxic drugs.

The following were the main issues discussed by the panelist and the participants.

1. Is it possible to enforce sale of diclofenac only on prescriptions?

The responses of the Panelists were

Dr. Binaya Samantray, Dy. Drug Controller, India agreed that this was already a requirement for Schedule 'H' drug of Drug and Cosmetic Act however it was easily overlooked. Therefore more awareness and advocacy campaigns would be helpful for effective enforcement of such requirement. All the panelists were in agreement with the Dy. Drug Controller.

The Action Points were

1. Aggressive awareness and advocacy campaigns were required to change mindset of users.
2. The purchase of large quantity of human formulations of diclofenac should be recorded by sellers or distributers and the relevant drug controlling authorities should be alerted.
3. The chemists should scrutinize the prescription carefully before dispensing diclofenac injection for human use.
4. The information of vulture population will be collected on an identified day in all the states at forest beat level, similarly information of food availability, habitat availability and toxic NSAIDs availability will be carried out on the same day in all the states.

2. Could meloxicam be subsidised to compete with the price of diclofenac?

The responses of the Panelist were

All the panelists agreed that this must be done. Dr. Narendra Ahuja, Drug Controller, Haryana pointed out that a letter can be drafted to the National Pharmaceuticals Pricing Authority (NPPA) regarding this and with the evidence and request help to save vultures. He also pointed out that this forum could be a very good platform to raise such issues with them. They could help us in lowering the price of meloxicam. All the panelists were in agreement. Lowering the price of meloxicam may discourage the use of diclofenac by paravet and quacks.

3. Is free distribution of meloxicam possible by an NGO?

The responses of the Panelists were:

Dr. Binaya said that it was not possible for an NGO as it is a schedule 'H' drug of Drug and Cosmetic Act. Dr. Ahuja added that this could be done by the Animal husbandry Department in collaboration with BNHS for the welfare of vultures. There was a general agreement to this view point.

The Dy. Drug Controller General of India said that NGO cannot do it as they would not have license to sell or buy drugs according the Drug and Cosmetic Act but the funds could be provided to Animal Husbandry Department to procure meloxicam in bulk quantity and distribute to all veterinary dispensary of the state free of cost for dispensing.

4. Is the meloxicam recipe good enough or do we need to change it?

The responses of the Panelists were

Dr. Munish Batta, Dr. Niraml Singh and Dr. Sandeep Rattan pointed out that the available meloxicam formulations were very good and were preferred because of this it is used in nervous animals like macaques and canines. All the panelists said that the available formulations of meloxicam were good and results were satisfactory.

They all agreed that the available meloxicam formulations do not cause pain on It is a preferred drug for treatment in primates and canines.

5. Other toxic NSAIDS to vultures

The responses of the Panelists were

Dr. Aditi Sharma, Sr. Vet Officer, Rajaji National Park commented that we must look for more safe alternatives first and then we should think about banning a molecule. Identification of safe alternatives for vultures as well as other animals should be our priority. It was agreed by all but there was a great concern that looking for new safe molecule will be very difficult.
It was agreed that Clinical trials should be conducted by IVRI and pharmaceutical manufacturers of all the veterinary NSAIDs to establish safety of the drugs on vultures

B. Panel Discussion: Estimation of Food Availability in an area of 100 km radius

Chairman: Dr. Nidhi Srivastava, IFS, Conservator of Forests, Punjab

Panel Members
Dr. R. M. More, Dy. Director, Animal Husbandry Department, Haryana,
Dr. M. P. Singh, Veterinary Officer, Animal Husbandry Department, Punjab,
Dr. Munish Batta, Asst. Director of Sheep and Wool Department, Himachal Pradesh,
Dr. Sandeep Rattan, Asst. Director Animal Husbandry Department, Himachal Pradesh,
Dr. D. C. Guru Rani, Animal Husbandry Department, Uttarakhand,

Dr. Aditi Sharma, Senior Vet Officer, Rajaji Tiger Reserve,
Dr. Nirmal Singh, Veterinary Officer, Animal Husbandry Department, Chandigarh.

The following issues were discussed by the participants and the panelists.

Dr. Mandar gave a brief presentation on the planed methodology to estimate the food availability for vultures in an area of 100 km radius from the centre. He emphasized that the support from the Forest Department would be crucial for this. He also discussed about the findings of the sample survey which was carried out by the JCBC, team. There appears to be plenty for food for vultures in the region.

This talk was followed by a panel discussion by the experts on food availability to vultures.

C. Panel Discussion

Does Animal Husbandry Department have Mortality records of the livestock?

The responses of the Panelists were

Dr. Rattan, Dr. Batta, and Dr. Sharma pointed out that the Animal Husbandry Department does not have this data because of large number of cattle were stray and there were number of disposal methods practiced by the cattle owners. Dr. Sharma pointed out that this could become a crucial part of the Animal Census event which is going to be carried out in July, 2017 where in the surveyor could also ask about the annual mortality and disposal method to the cattle owner. All the panelists were in agreement with her.

Dr. P P. Bhojvaid pointed out that this must be an interdepartmental effort and all the departments if could work together then can gather some meaningful information about the mortality data. This was crucial to find out the food availability to vultures

Dr. Dhadwal and Dr. Guru Rani pointed out that this data could be collected from the hide and bone contractors or from the municipal corporations.

Dr. Sharma also suggested that the patrolling Forest Guards could help in noting down this data.

1. Mortality records of wild animals

Dr. Sanatan Sonkar pointed that the records of the dead wild animals was very difficult to get as earlier soaring vultures were indicators of this, however now in the near absence of vultures it is very difficult to get information on dead wild animals. Dr. Sharma also pointed out that the animals in Schedule 1of Wildlife Protection Act 1972, have to go through a post-mortem and then they are incinerated. So it is not going to be easy to get mortality data on dead wild animals for estimating the food availability to vultures.

2. Food availability in and around protected areas in Uttarakhand

Suggestions: In Uttarakhand the Forest Department has made sure that the protected areas as well as the areas adjoining the protected area should also be considered while collecting the information about food availability. This is because the villagers are not allowed to dump cattle carcasses in open in protected areas.

D. Panel Discussion: Estimation of Vulture Populations in an area of 100 km radius from the centre and estimation of habitat

Chairman: Dr. Atul Srivastava, IFS, Director, Van Vihar National Park

Panel Members: Mr. Ramveer Singh, IFS, Conservator of Forests (Wildlife), Gurugram, Mr. Sanatan Sonkar, IFS, Director, Rajaji Tiger Reserve.

Dr. Mandar gave a presentation on the methods of estimating the vulture population in an area of 100 km radius from the centre. He emphasized that the support from the Forest Department would be crucial for this. He also briefed about the findings of the sample survey which was issues were discussed by the panelists.

1. Population Census by Forest Department

The Forest Department should initiate work on vulture conservation by carrying out estimation of vulture population as it has been carried out in Madhya Pradesh. The Bombay Natural History Society will technically support the efforts however the Forest Department at each of the states has to take the initiative.

2. Existing information on the forest composition including tree species, tree height and girth of the trees

Mr. M. L. Rajvanshi, IFS, Conservator of Forests (Wildlife), Panchkula and Dr. Srivastava agreed that this data would be available with the Forest Department and it could be shared with the BNHS team for evaluating the vulture habitat.

3. Other Threats

i. Information on mining activity which might impact vultures

Dr. Srivastava highlighted that any disturbance including mining or any other human activities can be a problem for cliff nesting birds and therefore beforehand information on this would be ideal for reintroduction programmes. However, this information is sometimes available with the department and sometimes is not and therefore it must be checked locally. Everyone agreed to him.

ii. High Tension wire and Power pylons

Dr. Sharma pointed out that this work could be done through the Forest Guards as well as BNHS team could do such work. Dr. Prakash agreed to her and also commented that if found that the the high tension wires were a problem, then efforts should be made to impress upon the authorities to make the transmission lines safe for vultures. One of the ways could be to have larger conductors so the distance between the two wires could be increased which will prevent the vultures from touching two wires even if they open their wings.

iii. Kite String injuries (Removal could be voluntary work)

Dr. Prakash also pointed out that kite strings left behind entangled in the trees are very dangerous for vultures and therefore before the beginning of the reintroduction programme it must be made sure that areas where kite flying is popular, the kite strings should be removed periodically from the trees He also pointed out the crucial role of Forest department in this.

E. Panel Discussion: Targeted advocacy and awareness initiatives

1. How to make the decision makers and other stakeholders aware about vulture conservation and re-introduction programme

2. Unanimously it was agreed that the Bombay Natural History Society and the Forest Department of Haryana should organize more workshops like these to spread the message to as many as decision makers possible. It was also pointed out that the monthly meetings of the veterinary officers could be used as a platform for spreading awareness among them. The IFS refreshers courses, state Forestry services refreshers courses or if required 7 days special refreshers courses could also be arranged by the Forest Department Haryana and the other states involved for vulture conservation.

The Forest Department of each state will also make sure to publicize the vulture conservation efforts and vulture situation in India by using programme like Krishi Darshan broadcasted on Door Darshan and through newspapers and magazines. The BNHS must take initiatives by publishing popular articles in magazines like Sanctuary, Forest News etc.

BNHS could be contacted for resource material and detailed information on vultures by the Forest Departments.

Participants of workshop on "Vulture Conservation & Reintroduction Programme"
21-22 November, 2016, Panchkula, Haryana

State	Name	Designation	Organization
Chandigarh	Dr.Nirmal Singh Bika	Veterinary Officer	AH Dept., Chandigarh
	Amit Duggal	Sr. DCO	Chandigarh
Punjab	Dr. M.P.Singh	V.O., Directorate	AH Dept., Punjab
	Ms. Nidhi Srivastava, IFS	CF (WL)	PPA circle, Punjab
	Mr. Sanjiv Kumar	Asst. Comm. (Drugs)	FDA, Punjab
Haryana	Mr. Rajkumar Tangra	DFO (WL), Hisar	Forest Dept.
	Mr. Pavan Grover	DFO (WL), Rohtak	Forest Dept.
	Mr. Shyam Sunder	DWLO, Gurgaon	Forest Dept.
	Dr.Ashok Khasa	Veterinary Surgeon	HVS-1, Rewari
	Dr. R.M.Mor	Deputy Director	AH Department
	Mr. R.K.Singh	APPCF	Forest Dept.
	Mr. Narender kr. Ahuja	ASDC	FDA, Haryana
Uttarakhand	Dr. D.C.Gururani	Joint Director	AH Dept., Uttarakhand
	Mr. P.K.Patro	DFO, Dehradun	Forest Dept.
	Mr. Sanatan Sonkar	Director	Rajaji Tiger Reserve,Dehradun
	Dr. Aditi Sharma	Senior Veterinary Officer	Rajaji Tiger Reserve,Dehradun
	Mr. Sharan Pal Singh Kunwar	Range Officer	Rajaji Tiger Reserve,Dehradun
	Mr. Ajai Saxena	SDO	Rajaji Tiger Reserve,Dehradun
	Akash Kr. Verma	DCF, Trans Forest Division, Uttarakhand	Forest Dept.
	Dr. Uday Gaur	Forest Range Officer, Dehradun Division	Forest Dept.
	J.S.Rawat	Forest Range Officer, Dehradun Division	Forest Dept.
Himachal Pradesh	Dr. Munish Batta	Asst. Director	AH Department, H.P.
	Mr. D.S.Dhadwal	DFO(HQ), Dharamshala, H.P	Wildlife Circle-Dharamshala, H.P.
	Dr. Sandeep Rattan	Asst. Director	AH Department, H.P.
Uttar Pradesh	Mr. R.R.Gautam	DFO	Siwalik, Saharanpur, UP
Other Dignitaries	Dr. B.K.Samantaray	Dy. Drugs Controller, India	Govt. of India
	Dr. Atul Srivastava	Director	Van Vihar, NP, Bhopal
	Vikram Jit Singh	Reporter	The Times of India
	Dr. Deepak Apte	Director	BNHS
	Chris Bowden		RSPB
	Toby Galligan		RSPB

K. Recruitment in Vulture Programme

Two research biologists were recruited for the Vulture Reintroduction Programme. They will be involved in collection of information of the vulture populations, habitat availability and prevalence on toxic drugs in a radius of 100 km from release site which is close to the centre. They would also be involved in advocacy and awareness programmes. The staff recruited were Mr. Shivam Sarkar and Mr. Dinesh Diggal in October 2016.

Two new Veterinarians were also recruited during the period. Drs. Ms. Meghna Pemmaiah joined from November 2016 and Mr. Debashish Saikia joined from February 2018.

Mr. Shivam Sarkar and Ms Sharbani Roy resigned from the Programme in December 2016 while Meghna, Monomita and Dinesh resigned in January2017.

L. Visitors at the centre

Several batches of the Indian Forest Service trainees of most of the forest schools in the country visited the centre and understand the breeding programme. The list is as follows:

A batch of Forest Department trainees during a visit to centre

List of visitors at the Centre from September 2016 to March 2017					
Sr. No.	**Date**	**Visitor**	**No. of persons**	**Purpose**	**Interaction By**
1	13th September 2016	Ghanshyam Shukla IFS, CF Rohtak Haryana.	1	To understand the programme	Dr. Vibhu Prakash
2	18th October 2016	Dr. A.K. Sharma I.V.R.I.	1	To understand the programme	Dr. Vibhu Prakash

3	15th December 2016	Charan Singh Kalka, State Secretary (BJP) Haryana.	5	To understand the programme	Nikita Prakash
4	20th December 2016	Karan Dev Kamboj MOS, F&S, Forest.	1	To understand the programme	Dr. Vibhu Prakash
5	21st January 2017	M.K Joshi, IFS CASFOS, Dehradun Uttrakhand.	46	To understand the programme	
6	2nd February 2017	Dr. Aarjav Sharma Director NBAGR, Karnal , Haryana.	3	To understand the programme	Nikita Prakash, Mathur, Dr. Mandar Kulkarni.
7	11th February 2017	Mr. Yashpal RFO, Forest Traning Institute, Pinjore Haryana.	30	To understand the programme	Dr. Mandar Kulkarni
8	13th February 2017	Dr. D.S Dhadwal DFO, WL Circle Himachal Pradesh.	5	To understand the programme	Dr. Vibhu Praaksh
9	4th March 2017	Mr. Yashpal Range Forest Officer, FTI Pinjore Haryana.	30	To understand the programme	Dr. Mandar Kulkarni
10	7th March 2017	Dr. Padam B. Chand Visiting Professor Kathmandu Foresting College, Kathmandu, Nepal.	44	To understand the programme	Dr. Mandar Kulkarni
11	8th March 2017	Dr. M.S. Sankanur Dr. S.K. Sinha BSC,Forestry COF, ACHF, Navseri Agricultural University, Gujarat.	32	To understand the programme	Dr. Mandar Kulkarni
12	12th March 2017	Dr. Manoj V. Nair Scientist, Wildlife Institute of India, Dehradun.	20	To understand the programme	Dr. Vibhu Prakash

M. Project Staff

Project staff

The Chief Wildlife Warden was the Project Leader, Dr. Vibhu Prakash, Principal Scientist, BNHS, is the over-all In-Charge of the Conservation Breeding Programme. He was supported by Dr. Mandar Dilip Kulkarni, Centre Manager, Ms. Nikita Prakash, Scientist C, Drs. Parag Deori, Avinash Timung, Meghna Pemmaiah, Debashis Saikia, Veterinarian, Ms. Sarbani Roy, Ms. Monomita Mukherjee, Mr. Shivam Sarkar and Mr. Dinesh Diggal, Research Biologists, Mr. Niranjan Dalei, Administrative Officer, Mr. Balakram sharma, Administrative Assistant and Mr. Lalit Sharma, Technical Assistant. They are supported by Mr. Jaikishan Sharma, Supervisor, and seven Vulture Keepers, Mr. Tek Singh, Mr. Prakash Chand, Mr. Ravi Kumar, Mr. Sukhdev, Mr. Manohar Singh, Mr. Devidutt, Mr. Mansur Hassan and two Driver cum Vulture Keepers, Mr. Krishna Sharma and Mr. Md. Kasim

N. Annual Plans for 2017-18

The ultimate aim of the Conservation Breeding Programme is to reintroduce vultures in the wild. The centre, in the coming years, will endeavour to create facilities and breed vultures in good numbers for the success of the release programme.

1. It is proposed to construct one more colony aviary. This big colony aviary will be required to house the nestlings produced every year at the centre.
2. Advocacy and Awareness programmes will be carried out in an area of 100 km radius from the centre to make the area free of diclofenac in preparation for the release of vultures
3. Strong advocacy will be conducted with Drug Controller General of India to get the multi-dose vials banned for human use to prevent there misuse in treating cattle.

O. Financial Expenses

Expense statement of Jatayu Conservation Breeding Centre, Pinjore, Haryana, 1st April 2016 to 31st March 2017

A total of Rs. 164.96 Lakhs were spent during the period. The maximum expenses incurred were for freshly slaughtered goats offered to vultures. Goat meat is expensive and costs Rs. 240/- kg. This is being done to make sure that the vulture food does not have diclofenac in it. The expense on utilities is high because of travel and running costs at the centre. The project accounts are audited as a part of BNHS accounts.The project received a total amount of Rs. 164.96 Lakhs for running the centre and reintroduction programme.

Expense Statement for the year 2016-17 (in Lakhs)

SN	Budget Heads	Amount Sanctioned	Expenses
1.	Construction and Maintenance	Rs. 5.50	Rs. 3.91
2.	Staff	Rs. 30.00	Rs. 23.54
3.	Vulture Food	Rs. 100.00	Rs. 75.41
4.	Utilities and misc.	Rs. 24.20	Rs. 08.86
5.	Travel	Rs. 7.26	Rs. 1.43

Expense Statement for Release Programme for the year 2016-17 (in Lakhs)

SN	Budget Heads	Amount Sanctioned	Expenses
1.	Staff	Rs. 16.69	Rs. 16.43
2.	Travel Cost for Monitoring staff(hiring of vehicles, lodging and boarding expenses of coordinator and biologists	Rs. 10.00	Rs. 8.71
3.	Meeting and workshop	Rs. 9.68	Rs. 1.68
4.	Awareness material	Rs. 2.42	Rs. 1.17
5.	Report and Publications	Rs. 1.21	Rs. 0.00
6.	Food for Vultures	Rs. 0.0	Rs. 0.00
7.	Miscellaneous (including postage, stationary, etc)	Rs. 10	Rs. 2.45
8	BNHS administrative Fee (15% of the total cost)	Rs. 34	21.37
	Total Cost of APO including State Share and Flexi Fund	260.64	164.96

VCBC, Pinjore Proposed Budget for the Year 2017-18 (in Lakhs)

SN	Budget Heads	Amount Sanctioned
1.	Construction and Maintenance	Rs. 6.5
2.	Staff	Rs. 55.92
3.	Vulture Food	Rs. 134
4.	Utilities and misc.	Rs. 26.6
5.	Travel	Rs. 7.99
6.	Total Recurring Cost	Rs. 231.01
7.	BNHS Admin Cost	Rs. 34.65
8.	Grand Total	Rs. 265.66
9.	Capital Cost Construction of Aviary	Rs. 35
	Total Recurring and Capital Cost	R. 300.65

Proposed Budget for the Release Programme for the year 2017-18 (in Lakhs)

SN	Budget Heads	Amount Budgeted
1.	Staff	Rs. 18.36
2.	Travel Cost for Monitoring staff(hiring of vehicles, lodging and boarding expenses of coordinator and biologists	Rs. 15.30
3.	Meeting and workshop	Rs. 10.64
4.	Awareness material	Rs. 2.66
5.	Equipment (PTT) (Platform Terminal Transmitter)	Rs. 40
6,.	Stationary	Rs. 0.26
7.	Communication	Rs. 1.33
5.	Report and Publications	Rs. 1.99
6.	Food for Vultures	Rs. 10.68
7.	Miscellaneous (including postage, stationary, etc)	Rs. 13.91
8	BNHS administrative Fee (15% of the total cost)	Rs. 17.28
	Total Cost of APO including State Share and Flexi Fund	132. 74

A total of Rs 300.00 Lakhs have been budgeted for the year 2017-18 by the BNHS. The funds will be raised largely by MoEF&CC.

A cost of Rs. 1.32 cores has been budgeted for the Vulture Release Programme. This will include cost of purchase of equipment for monitoring, cost of conducting awareness programmes in a radius of 100 km from the release site and also carrying out carcass sampling to monitor prevalence of diclofenac in the cattle carcasses. The cost will also include the cost of purchase of 8 Platform Transmitting Terminals (satellite tags) for monitoring the released vultures. One PTT costs about Rs. 5 Lakhs.