

# Vulture Conservation Action Plan for Nepal 2009 - 2013

**Government of Nepal,**  
Ministry of Forest and Soil Conservation,  
Department of National Parks and Wildlife Conservation  
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## Acronyms and Abbreviations

BCN	Bird Conservation Nepal
BNHS	Bombay Natural History Society, India
CNP	Chitwan National Park
DDA	Department of Drug Administration
DLS	Department of Livestock Services
DNPWC	Department of National Parks and Wildlife Conservation
IUCN	International Union for Conservation of Nature
IVRI	Indian Veterinary Research Institute, Bareilly
MLE	Maximum Likely level of Exposure
MoEF	Ministry of Environment and Forests, India
MoFSC	Ministry of Forest and Soil Conservation, Nepal
NSAID	Non Steroidal Anti Inflammatory Drugs
NTNC	National Trust for Nature Conservation
OSP	Ornithological Society of Pakistan, Pakistan
RSBP	Royal Society for Protection of Birds, UK
TPF	The Peregrine Fund, US
VCBC	Vulture Conservation and Breeding Center
WII	Wildlife Institute of India, Dehradun
ZSL	Zoological Society of London
AWBV	African White-backed Vulture
WRV	White-rumped Vulture
LBV	Long-billed Vulture
SBV	Slender-billed Vulture
HGV	Himalayan Griffon Vulture
EGV	Eurasian Griffon Vulture

## Foreword

## **Acknowledgements**

**Executive Summary**

## Chapter 1: The Context

### 1.1. Introduction and Background

Vultures play a highly important ecological role through the rapid consumption of animal carcasses. They also have an important cultural role in consumption of human dead bodies in the form of sky burials within Nepal and Tibet. Vultures are the primary consumers of carrion in Asia and Africa, with an individual *Gyps* vulture consuming around 1kg of tissue every three days (Mundy *et al.* 1992).

Nine species of vultures have been recorded from South Asia, of which eight are resident and one migratory. Nepal supports six resident vulture species (white-rumped vulture *Gyps bengalensis*, slender-billed vulture *Gyps tenuirostris*, Egyptian vulture *Neophron percnopterus*, red-headed vulture *Sarcogyps calvus*, Himalayan griffon vulture *Gyps himalayensis*, and Lammergeier *Gypaetus barbatus*), one winter visitor (Cinereous vulture *Aegypius monachus*) and one passage migrant (Eurasian griffon vulture *Gyps fulvus*). The long-billed vulture *Gyps indicus* is not found in Nepal.

Species	Range countries	Resident/Migratory	Conservation status
White-rumped vulture	Nep, Ind, Pak, Ban	Resident breeder	Critically Endangered
Slender-billed vulture	Nep, Ind, Ban	Resident breeder	Critically Endangered
Long-billed vulture	Ind, Pak	Resident breeder	Critically Endangered
Himalayan griffon vulture	Nep, Ind, Pak	Resident breeder	Unspecified
Eurasian griffon vulture	Nep, Ind, Pak	Winter visitor	Unspecified
Red-headed vulture	Nep, Ind	Resident breeder	Critically Endangered
Egyptian vulture	Nep, Ind, Pak	Resident breeder	Endangered
Cinereous vulture	Nep, Ind, Pak	Winter visitor	Near Threatened
Lammergeier	Nep, Ind, Pak	Resident breeder	Least Concern

*Table 1.1 Status of vultures in Indian Sub-continent, indicating species, range countries within the Indian Sub-continent, resident or migratory status and conservation classification (country abbreviations are: Nep = Nepal, Ind = India, Pak = Pakistan, Ban = Bangladesh)*

Within Nepal, India and Pakistan vulture populations have undergone dramatic declines in numbers since the mid 1990s, with declines in excess of 97% for three resident species (white-rumped, slender-billed and long-billed vulture *Gyps indicus* now confined in India). In India, numbers of white-rumped vultures have declined by 99.9% from 1992 to 2007 (Prakash *et al.* 2007). Monitoring of vultures in Nepal indicates declines of a similar magnitude with a >90% decrease in numbers up to 2001 (Baral *et al.* 2004). As a consequence, these three *Gyps* vulture species were listed by IUCN, the World Conservation Union, in 2000 as Critically Endangered (IUCN 2007).

Extensive research undertaken within India, Pakistan and Nepal has established that the non-steroidal anti inflammatory drug (NSAID) diclofenac is the main, and perhaps the only, cause of the population declines (Green *et al.* 2004; Oaks *et al.* 2004; Shultz *et al.* 2004). Vultures are exposed to diclofenac when they feed from carcasses of livestock that have died within a few days of treatment and contain toxic residues of the drug (Oaks *et al.* 2004). Diclofenac is used for a variety of painful and inflammatory conditions in both veterinary and human medicine. Vultures that consume sufficient tissue from treated carcasses die from the effects of diclofenac-induced kidney failure, with clinical signs of visceral gout prevalent in all birds (Oaks *et al.* 2004; Swan *et al.* 2006a). It is clear that vultures cannot survive as long as diclofenac use continues. Hence, the first and immediate conservation priority must be to prevent the exposure of vultures to diclofenac.

The loss of a major scavenger from the ecosystem will affect the balance between populations of other scavenging species and/or result in increase in putrefying carcasses. In the absence of other carcass disposal mechanisms (burial, burning, mechanical processing), the decline in vultures has resulted in an increase in the number of putrefying animal carcasses in rural areas. Populations of feral dogs, the main scavenging species in the absence of vultures, have increased within India (Indian Livestock Census 2003) with packs of several hundred animals observed around carcass dumps (R. Cuthbert pers obs). Increase of rabies incidence, reported frequently in the newspapers, in Nepal may be an outcome of the increased number of feral dogs. Both increases in putrefying carcasses and changes in the scavenger populations also have associated disease risks for wildlife, livestock and humans, including the spread of rabies and livestock borne diseases like anthrax, TB and brucellosis (Prakash *et al.* 2003; Anderson *et al.* 2005).

## **1.2. Efforts and Achievements**

### ***1.2.1. National and Regional Meetings***

After identifying diclofenac as the major cause of the decline of vulture populations, a group of national and international organizations (Bird Conservation Nepal (BCN), Bombay Natural History Society (BNHS), Royal Society of Protection of Birds (RSPB), Zoological Society of London (ZSL), The Peregrine Fund (TPF) and Ornithological Society of Pakistan (OSP)) issued a Manifesto in January 2004 (Vulture Rescue 2004). This called for immediate action from the governments of all *Gyps* vulture range states to prevent the veterinary use of diclofenac. In February 2004, two important international meetings were held to review the scientific evidence - the first was a Vulture Summit in Kathmandu and was convened by the TPF and BCN and the second was an International South Asian Recovery Plan Workshop convened by the BNHS group (ISARPW 2004). Key recommendations made by these meetings include: a) government authorities in all range states shall introduce legislation to prohibit all veterinary uses of diclofenac, and b) that captive populations of all three affected *Gyps* species be established immediately in South Asia for breeding and reintroduction to a diclofenac-free environment.

In early 2006, an International Conference on Vulture Conservation was held in Delhi and made following recommendations: a) the Governments of the respective countries take immediate steps to completely phase out veterinary Diclofenac, b) urgently establish vulture conservation breeding centres for the three endangered species, c) conduct a reliable population estimate at State, country and regional levels, d) strengthen education and awareness campaigns, e) strengthen sharing of information amongst the stakeholders, and f) setting up of a regional Task Force to initiate collaborative vulture conservation initiatives in the region.

Following the recommendations and extensive advocacy programme, the Board Members of the National Board for Wildlife recommended a ban on the veterinary use of diclofenac in India in 17 March 2005. In May 2006, a directive from the Drug Controller General of India was circulated to relevant officials for withdrawal of manufacturing licences for veterinary diclofenac. Similarly, the Government of Nepal - Department of Drug Administration (DDA) announced a ban on the manufacture and import of diclofenac in Nepal in June 2006. In the same announcement, the DDA also circulated information to all the country's pharmaceutical manufacturers to produce the safe alternative drug meloxicam.

### ***1.2.2. Alternative Drugs***

Following the ban on diclofenac efforts were taken to promote the safe alternative drug in order to rapidly effect a change on diclofenac use. In order to identify alternative NSAIDs surveys were made of the veterinary use of NSAIDs for the clinical treatment of captive vultures, raptors and other birds within zoos and wildlife rehabilitation centres. Survey results identified the NSAID meloxicam as a potential alternative. Meloxicam had been given to 39 *Gyps* vultures from six species and at least 700 individuals from 54 other raptor and scavenging bird species with no ill effects (Cuthbert *et. al.* 2006).

Within Nepal, the pharmaceutical company Medivet on their own initiative ceased production of diclofenac prior to the manufacturing ban, and began actively developing the manufacture of meloxicam under the brand name 'Melox'. Surveys of pharmacies in lowland areas of Nepal indicate that meloxicam has become widely available as a veterinary NSAID but not yet as widely available as for diclofenac previously (BCN unpublished data). Regular monitoring of veterinarians, pharmaceutical outlets and carcasses is necessary to determine the uptake of meloxicam and other NSAIDs in Nepal.

### ***1.2.3. In-situ Conservation***

In-situ conservation efforts, in combination with conservation advocacy and awareness programmes, may play an important role to help ensure that at least some of the small remaining vulture populations remain extant. Two in-situ measures have been proposed to reduce mortality in the wild: a) the exchange of diclofenac for meloxicam in areas surrounding natural breeding colonies, and b) provision of safe food near the breeding colony areas. The Peregrine Fund in Pakistan provided donkeys and mules for a colony of white-



rumped vultures during the 2003/04 breeding season. The results indicated that the provision of clean food was helpful to reduce mortality from diclofenac (Gilbert *et al.* 2007).

A more comprehensive approach has been initiated in Nepal in East Nawalparasi District, and expanded in a smaller scale in Palpa, Rupandehi, Dang and Kailali Districts. In Nawalparasi an extensive diclofenac for meloxicam swapping programme has led to an estimated 90% reduction in veterinary diclofenac stocks in Nawalparasi District. In conjunction with this and an advocacy programme targeted at vets, pharmacists and farmers, a vulture feeding area, or “*Jatayu Restaurant*”, has been established in close proximity to the breeding colony at Pithouli village, East Nawalparasi. The restaurant acquires old cattle that are no longer fit to work. These cattle are herded and cared for until their natural death, when they are then used as a safe diclofenac free source of food for vultures in the area.

#### ***1.2.4. Ex-situ Conservation***

The workshop to prepare an Asian Vulture Recovery Plan held in India in February 2004 recommended the establishment of captive holding and captive breeding facilities for three species of *Gyps* vultures at six sites in South Asia. These centres would serve as sources for reintroduction of vultures after the removal of the cause of mortality from the environment.

Realizing the rapid decline (25-48% per annum) of wild populations (Green *et al.* 2004) and urgent need to establish breeding centres, Vulture Conservation Breeding Centres (VCBC) were established by the BNHS and Haryana Forest Department at Pinjore, Haryana State, India. This program was launched with the financial and technical support from the RSPB, ZSL, and National Bird of Prey Trust (NBPT). Two additional centers have been established at Raju Bhat Khawa (Buxa Tiger Reserve), West Bengal in 2006, and Rani Forest in Assam State in 2007. These three centres currently hold 175 vultures of critically endangered species. Actions to establish a VCBC have also been initiated in Pakistan and this centre currently holds less than 10 birds. The Department of National Parks and Wildlife Conservation (DNPWC), Nepal in collaboration with National Trust for Nature Conservation (NTNC), BCN, RSPB and ZSL has established a VCBC at Kasara adjacent to Chitwan NP's headquarters. The centre currently has two holding aviaries that hold seven pair of white-rumped vulture. DNPWC has now plan of capture additional 15 pairs of chicks of white-rumped and slender billed vultures.

### **1.3. Challenges and Opportunities**

#### ***1.3.1. Population Decline***

Despite the ban on veterinary diclofenac production in 2006 and other conservation activities, populations of vultures continue to decline across India, Pakistan and Nepal. Results from field surveys indicate that in 2007 populations of white-rumped vultures in India had declined by more than 99.9% in comparison to numbers recorded in 1991-93 (Prakash *et al.* 2007). Populations of long-billed and slender-billed vultures also declined by

96.8% over the same period. The average annual rate of decline in India was 44% for white-rumped vultures, and 16% for slender-billed and long-billed vultures.

Monitoring of breeding numbers of vultures in Pakistan also indicated similar levels of decline, with white-rumped vultures declining by more than 99% from 2000 to 2006 (The Peregrine Fund 2007). Less information is currently available for Nepal; however vulture breeding sites monitored in Palpa, Syangja and Tanahu Districts indicate continued declines in Nepal. The rapid rate and continued declines in all monitored vulture populations in Nepal and South Asia indicate the urgent need for conservation actions to be fully implemented to prevent vulture species becoming extinct in South Asia.

### ***1.3.2. Risk of continued use of Diclofenac***

The ban on manufacturing and importation of diclofenac in Nepal, India and Pakistan has not outlawed the continued use or sale of veterinary diclofenac. Diclofenac formulations for veterinary use - both injectable and bolus forms typically have a shelf life of 2 years and if extensive stockpiles of diclofenac remain within Nepal then diclofenac could continue to be legally used. Knowledge on the scale of remaining stocks of diclofenac in Nepal and India is unknown, but if large amounts remain then diclofenac use could continue legally on a large scale. The potential for mislabeling of manufacturing dates of diclofenac preparations may also lead to current stocks of diclofenac remaining in the system for longer than is desired. The extent, or occurrence, of this problem is currently unknown.

Diclofenac is widely used as effective anti-inflammatory analgesic in human medicine and it is not feasible to completely phase out human use. Diclofenac manufactured for human use is also known to be used for veterinary purpose. As long as the human use of diclofenac continues, the possibility of diversion of human diclofenac formulations to veterinary uses is likely to occur. This applies most specifically to injectable diclofenac formulations, as bolus preparations (orally delivered) of the dosage and size to be used for livestock treatment is likely to be specific to the veterinary sector. Preventing the diversion of human diclofenac in to the veterinary sector remains a major challenge.

### ***1.3.3. Other causes of population decline***

Diclofenac is not the only source of vulture mortality or the only cause of failed nesting attempts, although it is the main, if not the only, cause of the massive decline in populations (Green *et al.* 2007). Other sources of mortality include poisoning through feeding on deliberately poisoned carcasses that are placed out to kill other animals (e.g. dogs), the felling of nesting trees especially those with active breeding attempts, disturbance and destruction of nests to prevent vultures nesting above agricultural land and dwellings, exclusion from feeding sites through disturbance or alternative carcass disposal methods (burial), and direct persecution and hunting of vultures either for medicinal purposes. In the past, when a large and healthy vulture population existed in Nepal, these additional sources of mortality would have been minor and the population was able to withstand them. However, with a very small remaining and still declining population, such additional sources of mortality may play a more significant role.

### ***1.3.4. International Cooperation***

As vultures know no international boundaries, their conservation is only possible through trans-boundary cooperation between vulture range countries across South Asia. The strong international collaboration between governments, conservation groups, scientists and bird lovers as well as the sharing of knowledge and skills has raised common belief that these species can be brought back from the brink of extinction.

## **Chapter 2: VULTURE CONSERVATION ACTION PLAN**

### **2.1 Goal and Objectives**

The goal of this Vulture Conservation Action Plan (VCAP) is to prevent the extinction of vulture species by ensuring re-introduction, safe food supply, maintenance of suitable habitat and better understanding of the ecological importance of these birds in Nepal.

The objectives of the VCAP are:

1. Securing of complete and effective ban on veterinary diclofenac and promotion of alternative safe NSAIDs
2. Increase awareness of the ecological significance of vultures and the need for their conservation among the general public
3. Ensure viable breeding population of vultures in the wild through habitat management and safe food supply
4. Build up viable breeding population of vultures through captive breeding and re-introduction
5. Establish a sound scientific knowledge base of the ecology of vultures

**Objective I:** Securing of complete and effective ban on veterinary diclofenac and promotion of alternative safe NSAIDs

### *Issues*

#### Use of diclofenac

Without the complete removal of diclofenac, the main causative agent of the vulture declines, vulture populations in Nepal and South Asia will continue to decline and at least three species of *Gyps* vulture will become extinct in the wild. Populations of four other species, resident or migratory to Nepal, will also be likely to decline without the elimination of diclofenac from Nepal and neighboring countries.

#### Enforcement

Nepal has already taken key actions to prevent the use of diclofenac through a ban on the manufacturing and importation of veterinary diclofenac into the country since June 2006. A key loop-hole in achieving a complete end to veterinary diclofenac use is that while banning the manufacture and importation of diclofenac are two important steps, it will be impossible to achieve a complete cessation without a ban on the sale and use of veterinary diclofenac in Nepal. Allowing its sale and use is providing a loophole for the continued use of diclofenac stocks. Because of trade agreements and extensive open borders between India, enforcing such actions will be difficult, however alerting customs officials and border officials to this issue needs to be undertaken.

#### Inadequate promotion of alternative NSAIDs

Despite the availability of meloxicam as an alternative NSAID there is evidence for the continued use of diclofenac. Additionally, some veterinary practitioners are unwilling to switch to meloxicam, preferring to stick with the “tried and tested” diclofenac. Practical issues also make diclofenac more attractive in some instances. For example, the injection form of diclofenac is still cheaper than meloxicam; diclofenac is a faster acting painkiller allowing a more rapid recovery of the treated animal; and confusion remains on dosages and whether pregnant animals can be safely administered meloxicam. These factors are hindering the uptake and switch to meloxicam, and remain present in South Asia

#### Leakage of human diclofenac

The leakage of human diclofenac products in to the veterinary sector is another issue. The majority of this problem is likely to be in the form of using human injectable diclofenac formulations, as human diclofenac cannot easily be used to replace bolus formulations that are commonly used. The extent to which injectable forms of human diclofenac are used in Nepal is currently unknown; however evidence from India suggests that human drugs are still commonly used for treating animals (N. Shan, BNHS, unpublished data). A ban on the veterinary use of diclofenac will help tackle this problem, however (in the absence of a ban on human diclofenac) serious consideration needs to be given to making human diclofenac more expensive and harder to use as a veterinary drug. This could take the form of legislation to restrict the volume of

injectable human formulations to make their use impractical and more expensive when treating livestock.

### ***Strategy***

Different government bodies and conservation partners should combine their resources and efforts to restrict the importation and illegal use of diclofenac and enforce the ban on veterinary diclofenac. Further, the licensing of other non-tested veterinary NSAIDs in Nepal should not be allowed. Tested, safe alternative NSAIDs like meloxicam, which is already in production, should be promoted widely.

### **Activities**

1. Enforcement to restrict illegal importation and use of diclofenac and other non-tested veterinary NSAIDs
  - i) *Enforce the ban on the use of diclofenac and non-tested NSAIDs*
  - ii) *Monitor the prevalence and use of NSAIDs in veterinary practices and pharmacies across Nepal*
  - iii) *All remaining veterinary diclofenac stocks from the pharmaceutical and veterinary sectors removed and replaced by safe alternative NSAIDs*
  - iv) *Develop clear guidelines on the use and efficacy of other NSAIDs in collaboration with the pharmaceutical industry*
  
2. Restriction on use of human diclofenac products in the veterinary sector
  - i) *Restrict production of human diclofenac in large vial sizes (>30ml)*
  - ii) *Diclofenac produced for human use labeled "not for veterinary use".*

**Objective II:** Increase awareness of the ecological significance of vultures and the need for their conservation among the general public

### ***Issues***

#### Ignorance

Ignorance of vultures and their conservation issues among the veterinary sector, related institutions and the general populace is hindering sustained and effective conservation. The veterinary sector at the local level is not fully aware of the ban on diclofenac and availability of the alternative safe NSAID meloxicam.

#### Cultural belief

In some communities, vultures are regarded as bearers of ill luck and their presence and sighting are associated with death. This belief is also an obstacle in securing the confidence of the community in vulture conservation.

### ***Strategy***

Vulture conservation related materials should be produced highlighting the ecological role of vultures, the ramifications of a decline in scavengers for rural communities and animal and human health. Materials should also highlight about the cause of the problem and solutions.

### **Activities**

1. Communities sensitized on the plight and ecological importance of vultures
  - i) *Develop Information Education and Communication (IEC) package for community awareness*
  - ii) *Train to develop Local Resource Persons (LRPs) at community level capable of implementing the IEC*
  - iii) *Conduct awareness campaign at community level*
  - iv) *Conduct awareness campaign in schools*
  - v) *Organize study tours among key persons of related institutions to observe vulture breeding center and Jatayu restaurant and share current challenges of vulture conservation*
2. Encouraged veterinary practitioners and pharmaceuticals to use NSAIDs safe for vultures
  - i) *Organize awareness raising workshops for veterinary practitioners and pharmaceuticals*
  - ii) *Organize regular district level meetings for veterinary practitioners to discuss issues pertaining to vulture conservation*
  - iii) *Declare and enforce high vulture population districts as 'diclofenac free districts'*
3. Conservation partners continue to sensitize the local communities in their respective working areas
  - i) *Organize workshop and seminars to sensitize conservation partners on vulture issues*
  - ii) *Conservation partners' include vulture conservation in their conservation programs*
  - iii) *Radio Program on Vulture conservation*

**Objective III:** Ensure viable breeding population of vultures in the wild through habitat management and safe food supply

### ***Issues***

#### **Risk of contaminated food**

Vultures feed exclusively on carcasses and vultures feeding in the wild are exposed to high level of risk of feeding on a carcass contaminated with diclofenac. Vultures exposed to diclofenac contaminated carcasses of livestock die within a few days of feeding. Even a low percentage (<1%) of livestock carcasses contaminated with diclofenac can cause significant declines in vulture populations.

#### **Habitat destruction**

Anthropogenic disturbances leading to destruction of suitable roosting and nesting trees as well as harassment have a marked impact on vultures and their survival.

### Lack of direct benefit to locals

The general populace is ignorant of the ecological importance of vultures and sees no direct economic and human and animal health benefits of vulture conservation. Conservation efforts cannot be successful without the active involvement of local communities. Economic incentives could be one of the means to attract local communities to this endeavor.

### ***Strategy***

Mechanism to involve local communities in *in-situ* conservation (e.g. establishment of vulture restaurants) having dual benefits to vultures and local community need to be promoted. Conserving and restoring of habitats through safeguarding their nesting colonies, prohibition on felling tall nesting trees, plantation of suitable trees and minimizing disturbances.

### **Activities**

1. Mechanisms to involve local communities in in-situ conservation developed and implemented
  - i) *Develop guidelines for establishing and managing community based safe feeding sites (or vulture restaurants)*
  - ii) *Support communities to establish and operate vulture restaurants in areas with large vulture population*
  - iii) *Develop community based monitoring guidelines*
  - iv) *Train LRPs in community based monitoring and mobilize*
  - v) *Implement the community based monitoring guideline*
2. Breeding habitat and nesting sites protected
  - i) *Incorporate vulture conservation mechanism in operation plans of CFs and BZCFs.*
  - ii) *Declare sites in CFs and BZCFs with large vulture colonies as protected vulture breeding colonies*
  - iii) *Take necessary measures to avoid all kinds of disturbances*
  - iv) *Plantation of trees suitable for vulture roosting and nesting*
  - v) *Monitor the nesting sites of vultures.*

**Objective IV:** Build up viable breeding population of vultures through captive breeding and re-introduction

### ***Issues***

### Population



Vulture populations have declined to the extent that some species are likely to be extinct if urgent measures are not taken. One of the measures is captive breeding and reintroduction of vultures into the wild after the outside environment is deemed safe for them.

### Avian Influenza

The avian influenza outbreak has been reported in the neighboring countries like India and Bangladesh and recently in eastern Nepal. Though the effect of influenza has been so far only been reported in domestic poultry, its effect on other bird species is largely unknown. The outbreak of avian influenza could eventually affect the vultures both in captive and in wild populations. As the captive breeding centre is located in the Chitwan valley, a major poultry production area, there is potentially a high risk to the captive breeding vultures.

### ***Strategy***

The establishment of a vulture conservation breeding centre within Nepal and re-introducing vultures into the wild after ensuring the major threats (principally diclofenac) in the environment are addressed. The release of birds is anticipated to eventually lead to the restoration of a single wild population of around 100 pairs 16 or more years later.

Careful consideration needs to be given to the long-term commitment and funding such a centre would require, which may necessitate keeping birds in captivity for 15-20 years. Consideration also needs to be given to making sure that efforts to establish a captive facility do not undermine other conservation efforts that have already been implemented in Nepal, such as *in-situ* conservation activities and the removal of diclofenac. Vultures should only be procured from those areas of Nepal where populations cannot be protected and where there is evidence for continued declines and threats.

The avian influenza has been emerging as new threat to bird populations. The outbreak of influenza could eventually affect the vultures in captivity. Therefore preventive measures are urgently required to reduce the risk to birds within the VCBC, as well as legal dispensation to ensure that captive and wild vulture populations are not affected by designated actions in the event of an outbreak (culling of poultry and captive birds within a 5 km radius of a point of outbreak).

### **Activities**

- 1) Establishment of vulture conservation and breeding center (VCBC)
  - i) *Breeding and quarantine aviary constructed*
  - ii) *Train human resource for capture, aviary management and veterinary care*
  - iii) *Deploy sufficient human resources for VCBC management*
  - iv) *Capture and retain 25 pairs each of white-rumped and slender-billed vultures in VCBC, Kasara*
  - v) *Sufficient diclofenac free food supplied to vultures in captivity*
  - vi) *Regular health check up and treatment of vultures carried out*

- vii) *Preventive measures adopted in case of outbreak of avian influenza (Emergency Fund)*
  - viii) *Monitor vultures in captivity through CCTV*
  - ix) *Visitor information centre established*
- 2) Re-introduction of vulture bred in captivity into the wild
    - i) *Formulation of vulture release plan*
  - 3) Benefit to local communities from association with VCBC ensured
    - i) *Train local communities in rabbit and guinea pig farming*
    - ii) *Provide support for rabbit and guinea pig farming at community level*

**Objective V:** Establish a sound scientific knowledge base of the ecology of vultures

### ***Issues***

#### Lack of sufficient information

The scientific information available on vultures in Nepal is scant and limited to specific sites and localities. Appropriate conservation efforts cannot be achieved without strong knowledge base on this species.

#### Inadequate skilled human resource

Inadequate human resources, technical skills and physical capacity to gather and process necessary information on vultures.

### ***Strategy***

Enhance knowledge and information base on vultures based on scientific research using tested methods at regular intervals and strengthen necessary human and physical capacity for enhancing continuous work on vultures. In addition, efforts should be made to establish an effective networking mechanism and institutional arrangements for information sharing and coordination.

### **Activities**

1. A central database on vulture established and made operational
  - i) *Design and develop a central database on vultures of Nepal*
  - ii) *Regularly update database based on monitoring and research findings*
2. Network on vultures and regular information exchange mechanism established
  - i) *Organize annual meet of vulture conservation partners (National )*
  - ii) *Share annual progress and research findings among conservation partners and donors*
  - iii) *6-monthly progress report and vulture conservation newsletter produced*

3. Scientific research and monitoring of remaining breeding colonies and vulture populations trends assessed and documented
  - i) *Identify nesting colonies of vultures with geo reference*
  - ii) *Monitor identified nesting colonies of all vulture species*
  - iii) *Monitor population trends of vultures (all species) through regular transect surveys*
  - iv) *Undertake sampling of livestock carcasses that are available to vultures to quantify levels of diclofenac contamination*

## **Objective VI: International Collaboration and Fund Raising**

### ***Issue***

Weak collaboration among vulture range countries and related partner organizations and inadequate financial resources has hindered effective management of natural habitat and captive breeding of vultures.

### ***Strategy***

Establish effective collaboration among vulture range countries and related partner organization and build up a mechanism to ensure necessary funding for *in-situ* and *ex-situ* conservation.

### **Activities**

1. Establish effective collaboration among vulture range countries
  - i) *Develop electronic data-base for sharing knowledge and information*
  - ii) *Organize regional/international workshop in one of the vulture range country to share experiences*
  - iii) *Organize exchange visits among field staffs working in captive breeding centers and responsible managers*
2. Ensure adequate funding
  - i) *Develop proposals jointly to raise funds for activities of the vulture action plan*
  - ii) *Develop mechanism for member sponsored vulture feeding program*

## References

- Anderson, M.D., Piper, S.E. and Swan, G.E. (2005). Non-steroidal anti-inflammatory drug use in South Africa and possible effects on vultures. *South African Journal of Science* 101: 112-114
- Baral, H.S., Giri, J.B. and Virani, M.Z. (2004). On the decline of Oriental White-backed Vultures *Gyps bengalensis* in lowland Nepal. In: Chancellor, R.D. & Meyburg, B-U. (Eds). *Raptors Worldwide*. WWGBP/MME pp215-219.
- Cuthbert, R., Parry-Jones, J., Green, R.E. and Pain, D.J. (2006). NSAIDs and scavenging birds: potential impacts beyond Asia's critically endangered vultures. *Biology Letters* doi:10.1098/rsbl.2006.0554
- Gilbert, M., Watson, R.T., Ahmed, S., Asim, M. and Johnson, J.A. (2007). Vulture restaurants and their role in reducing diclofenac exposure in Asian vultures. *Bird Conservation International* 17: 63-77.
- Green, R.E., Newton, I., Shultz, S., Cunningham, A.A., Gilbert, M., Pain, D.J., and Prakash, V. (2004). Diclofenac poisoning as a cause of vulture population declines across the Indian subcontinent. *J. Appl. Ecol.* 41: 793-800.
- Green, R.E., Taggart, M.A., Senacha, K.R., Pain, D.J., Jhala Y., and Cuthbert, R. (2007). Rate of decline of the oriental white-backed vulture *Gyps bengalensis* population in India estimated from measurements of diclofenac in carcasses of domesticated ungulates. *PloS One* 2(8), e686. doi:10.1371/journal.pone.0000686
- ILC (2003). *Agricultural Statistics at a Glance 2003 and 17th Indian Livestock Census 2003*, Dept. of Animal & Dairying, Ministry of Agriculture, Govt. of India
- ISARPW (2004). Report on the International South Asian Recovery Plan Workshop. *Buceros* 9(1) pp 48.
- IUCN (2007). <http://www.iucn.org>
- Johnson J.A., Lerner H.R.L., Rasmussen P.C. and Mindell D.P. (2006). Systematics within *Gyps* vultures: a clade at risk. *BMC Evolutionary Biology* 6: 65 doi: 10.1186/1471-2148-6-65
- Mundy, P., Butchart, D, Ledger, J., and Piper, S. (1992). *The vultures of Africa*. Academic Press.
- Noble, S. and Balfour, J.A. (1996). Meloxicam. *Drugs* 51: 424-430.
- Oaks, J. L., M. Gilbert, M. Z. Virani, R. T. Watson, C. U. Meteyer, B. Rideout, H. L. Shivaprasad, S. Ahmed, M. J. I. Chaudhry, M. Arshad, S. Mahmood, A. Ali, and A. A. Khan. (2004). Diclofenac residues as the cause of vulture population decline in Pakistan. *Nature* 427:630-633.
- Prakash, V., Pain, D.J., Cunningham, A.A., Donald, P.F., Prakash, N., Verma, A., Gargi, R., Sivakumar, S. and Rahmani, A. R. (2003). Catastrophic collapse of Indian white-backed *Gyps bengalensis* and long-billed *Gyps indicus* vulture populations. *Biological Conservation* 109(3): 381-390.
- Prakash, V., Green R. E., Pain D.J., Ranade, S. P, Saravanan S., Prakash, N, Venkitachalam, R., Cuthbert R., Rahmani A. R., Cunningham A. A. (2007) Recent changes in populations of resident *Gyps* vultures in India. *Journal of the Bombay Natural History Society*104: 129-135.
- Shultz, S., Baral, H.S., Charman, S., Cunningham, A.A., Das, D., Ghalsasi, D.R., Goudar, M.S., Green, R.E., Jones, A., Nighot, P., Pain, D.J. and Prakash, V. (2004). Diclofenac poisoning is widespread in declining vulture populations across the Indian subcontinent. *Proceedings of the Royal Society of London B (Supplement)*, 271: S458-S460.

Swan, G.E., Cuthbert, R., Quevedo, M., Green, R.E., Pain, D.J., Bartels, P., Cunningham, A.A., Duncan, N., Meharg, A.A., Oaks, J.L., Parry-Jones, J., Shultz, S., Taggart, M.A., Verdoorn, G. and Wolter, K. (2006a). Toxicity of diclofenac to *Gyps* vultures. *Biol. Lett.* DOI: 10/1098/rsbl.2005.0425.

# Appendices

1. PICTURES OF SPECIES
2. GRAPHS OF DECLINE
3. MAPS
4. PHYLOGENY

## Appendix 1

*Threatened vultures within Nepal: Top left white-rumped vulture, top right slender-billed vulture, bottom left red-headed vulture and bottom right Egyptian vulture, (photos: Richard Cuthbert, James Irons, Anand Chaudhary and [http://www.neophron.com/gallery/05\\_07.jpg](http://www.neophron.com/gallery/05_07.jpg), respectively)*



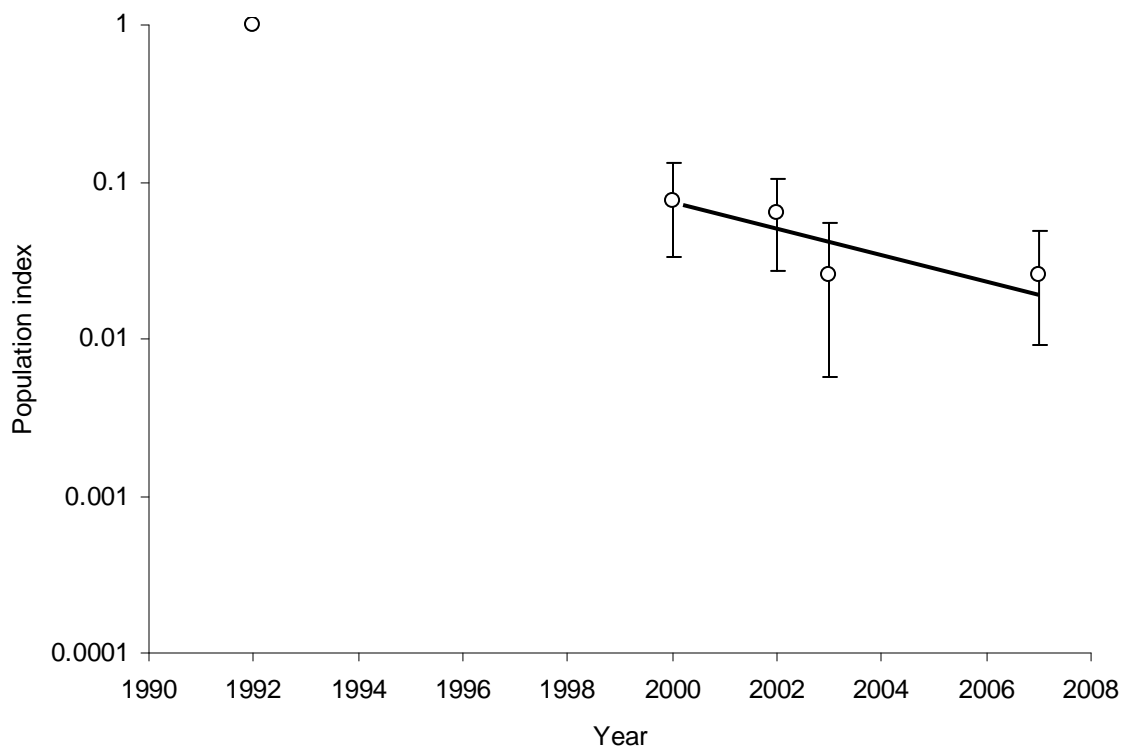
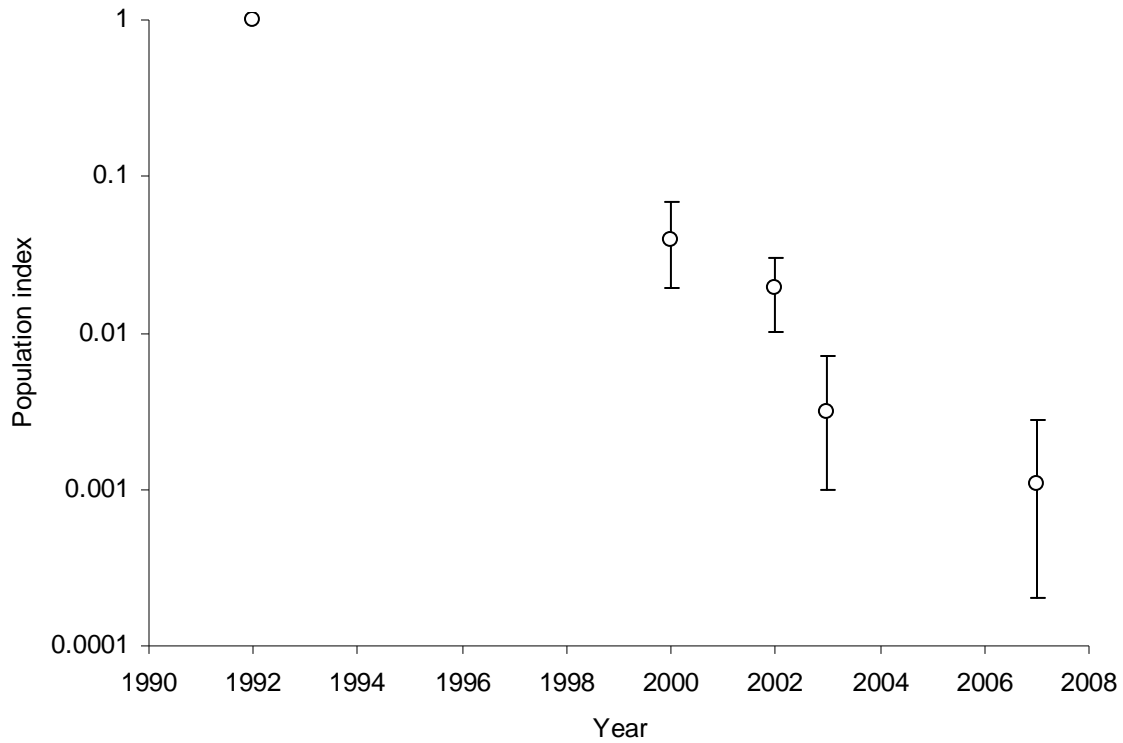
*Other vultures within Nepal: Top left cinereous vulture, top right Eurasian griffon vulture, bottom left Himalayan griffon vulture and bottom right Lammergeier, (photos: Tulsi Subedi, [http://blog.lifejacketadventures.com/wp-content/uploads/2008/06/griffon\\_vulture1.jpg](http://blog.lifejacketadventures.com/wp-content/uploads/2008/06/griffon_vulture1.jpg), Jianqian Dong-Orientalbirdimages.org and Richard Bartz respectively)*





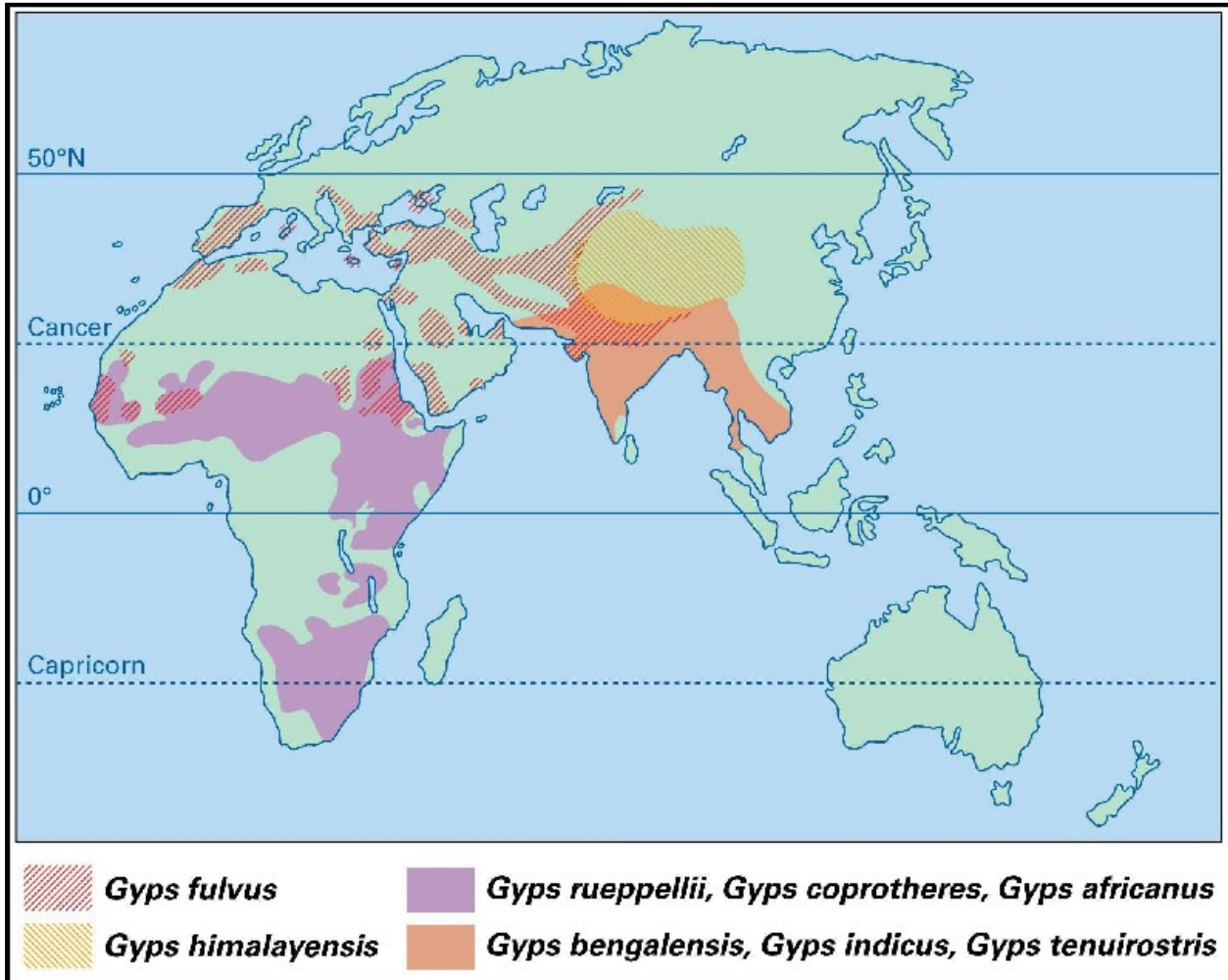
## Appendix 2

*Graphs of population declines for Gyps bengalensis (top graph) and combined Gyps indicus/tenuirostris (lower graph) based upon road-transects undertaken across central and northern India in 1991-93, 2000, 2002, 2003 and 2007 (see Prakash et al. 2007). The y-axis of both graphs is plotted on a log-scale which is an index of population size in comparison with vulture numbers in 2002. Error bars are 95% confidence intervals around the mean.*



Appendix 3

Range map for the eight species of *Gyps vulture* indicating the geographic distribution of the three Critically Endangered resident species in Asia (*Gyps bengalensis*, *Gyps indicus* and *Gyps tenuirostris*), the three resident species within Africa (*Gyps rueppellii*, *Gyps coprotheres* and *Gyps africanus*) and the migratory *Gyps fulvus* and *Gyps himalayensis*



Appendix 4:

*Phylogeny for the eight species within the genus Gyps vultures based on combined mt ND2 and cytB datasets (A) and combined CR, ND2, and cytB datasets (B). Out groups in the phylogenetic tree are the hooded vulture Necrosytes monachus, red-headed vulture Sarcogyps calvus, Cinereous vulture Aegypius monachus, lappet-faced vulture Torgos tracheliotos, and white-headed vulture Trionoceps occipitalis (Johnson et al. 2006).*

