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JULY-SEPTEMBER, 2022

BNHS INDIA CONSERVING NATURE SINCE 1883

BOMBAY NATURAL HISTORY SOCIETY

VULTURE CONSERVATION IN ASIA

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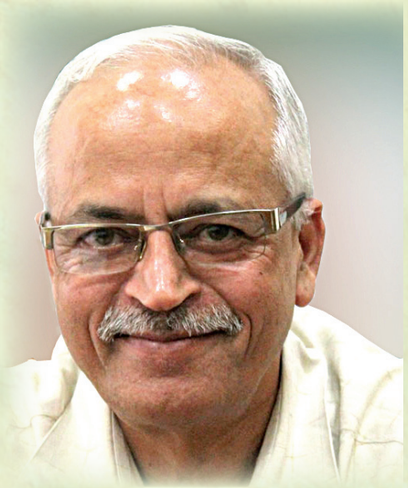

We dedicate this issue to the late

Dr R.D. Jakati, IFS (Retd)

for his incredible support to the

BNHS Vulture Conservation Programme

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BNHS Vulture Conservation in ASIA

Editorial...

Living embodiments of the legendary *Jatayu* from the epic *Ramayana*, vultures have enjoyed a special place in the Indian ethos for ages. Being obligate scavengers, they forage primarily on carcasses of domestic and wild animals, thereby reducing the chances of disease spread to humans. Thus, they are the 'sanitary engineers' of nature.

Till the early 1990s, India had tens of millions of vultures. However, since the mid-1990s, vulture populations crashed at an alarming rate. The main cause was the veterinary use of a non-steroidal anti-inflammatory drug (NSAID), diclofenac. Vultures feeding on carcasses of domesticated cattle treated with diclofenac died due to visceral gout and kidney failure. By 2005, of the nine vulture species found in the Indian subcontinent, four species, namely the White-rumped, Long-billed (now Indian Vulture), Slender-billed, and Red-headed, had to be categorized as Critically Endangered, as their populations plummeted by 99.9%.

Bombay Natural History Society (BNHS) and the Royal Society for the Protection of Birds (RSPB), UK, established an ambitious vulture conservation breeding programme as an insurance against imminent extinction of select *Gyps* vultures from the Indian subcontinent. The Government of Haryana was forthcoming in providing necessary support and permission to establish the Jatayu Vulture Conservation Breeding Centre at Pinjore, on the outskirts of Chandigarh. The late Dr R.D. Jakati, IFS, was instrumental in setting up this centre in 2004. Dr Vibhu Prakash and his wife Mrs Nikita Prakash of BNHS have worked at this centre for nearly two decades and have aptly demonstrated their commitment to vulture conservation by successfully breeding more than 320 vultures. Today, the VCBC-Pinjore houses more than 400 vultures belonging to three *Gyps* species.

Subsequently, with the support of the RSPB and the Governments of West Bengal, Assam, and Madhya Pradesh, three more vulture conservation breeding centres (VCBCs) were established and are being presently managed by BNHS at Rajabhatkhawa in Buxa Tiger Reserve, Rani, on the outskirts of Guwahati, and Van Vihar in Bhopal. In all, more than 800 birds are now housed in these four breeding centres. Parallelly, through the Action Plan for Vulture Conservation (2006) developed by the Ministry of Environment, Forest & Climate Change (MoEF&CC) and supported by the Central Zoo Authority, VCBCs have been established at Nandankanan Zoo in Odisha, Sakkarbaug Zoo in Gujarat, and Birsa Munda Zoo in Jharkhand. Currently, the Governments of Karnataka, Uttar Pradesh, and Tripura are in the process of setting up three more VCBCs.

In 2006, the veterinary use of diclofenac was banned by the Government of India. The Drug Controller General of India (DCGI), based on the recommendation of the MoEF&CC, discontinued the veterinary use of diclofenac. In 2015, Govt of India also banned the production of diclofenac vials larger than 3 ml size, to prevent the misuse of human-use formulations for veterinary purposes. Although the use of diclofenac in veterinary treatment has been reduced, there are at least 14 other NSAIDs in veterinary use. Of them, aceclofenac is a pro-drug of diclofenac. Once cattle are administered aceclofenac, this drug is converted almost completely into diclofenac within a few hours of ingestion in the body of the cattle. Some other NSAIDs, such as nimesulide and ketoprofen, have also been proven to be vulture-toxic. So far, only two NSAIDs, namely meloxicam and tolfenamic acid, have been found to be vulture-safe. Due to the prevalence of vulture-toxic NSAIDs in the environment, release of captive-bred vultures in the wild is risky. This is a serious logistical and financial predicament for the Government and associated civil society organizations that are implementing the Vulture Conservation Breeding Programme since 2004.

Despite all these adversities, fortunately, vulture safe drugs (tolfenamic acid and meloxicam) are now available in the market. However, these drugs are yet to become popular among veterinary practitioners. While efforts are underway to ban some more vulture-toxic NSAIDs, the BNHS team is engaged in popularizing the vulture-safe alternatives in designated vulture safe zones. Though BNHS has made a significant contribution in furthering the cause of vulture conservation, our efforts to save these Critically Endangered species have been miniscule in the context of the enormity of the problem. The good news is that vultures have not gone extinct. However, their population is yet to recover from the catastrophic decline. Road transect surveys carried out by BNHS over the past 15 years have demonstrated that though the vulture population has stabilized, their numbers are yet to increase. Increasing vulture numbers requires a much more concerted effort than is being practiced currently by a few individuals, organizations, and governments. The entire country needs to come forward, address the issues responsible for the decline of vultures, and make India a safe place for these magnificent birds that are crucial to the health of our environment.

Bivash Pandav, PhD

Vultures across the World

Text: **Christopher G.R. Bowden and Andre Botha**

Chris Bowden has worked on threatened birds for the RSPB (UK) for over 30 years. He helped establish SAVE and has worked on Asian vultures since 2004.

Andre Botha manages the Vultures for Africa Programme at the Endangered Wildlife Trust since 2004. He is also Director Southern Hemisphere of the US-based Raptors Research Foundation and is Vice-Chair of the Technical Advisory Group of the CMS Raptors Memorandum of Understanding.

Chris and Andre are Co-chairs of the IUCN Vulture Specialist Group

About Vultures

All the 23 species of vultures and condors worldwide are relatively large, long-lived birds, with predominantly bald heads, having evolved to prey almost exclusively on carrion – they are raptors, but, in most instances, not predators. Their adaptations to survive on dead animals include a highly specialized digestive tract, and extremely acidic stomach contents. These most proficient of all vertebrate scavengers clean up natural and man-made organic waste, playing an important role in our ecosystems. Vultures are distributed very widely over five continents, illustrating their successful place in the wider environment, and they are well-known, familiar, and prominent in numerous cultures – having both positive and negative significance, and are often misunderstood.

The seven species of vultures and condors of the Americas are distant relatives of the Old World vultures, having evolved quite independently from those in Europe, Africa, and Asia – a classic case of convergent evolution. They generally have a better sense of smell, which is used to help them detect carcasses. The 16 Old World vultures range over much of Africa, Asia, and southern Europe. Eight of these are more closely related and placed in the genus *Gyps*. All of these rely predominantly on their extremely acute eyesight for locating prey, they continually watch each other, as well as other species of vultures and avian scavengers, to see if food has been located in the landscape – and so make good use of social networking.

Abbreviations used in the article:

NT: Near Threatened; **EN**: Endangered; **CR**: Critically Endangered; **LC**: Least Concern; **VU**: Vulnerable.

The world's 23 vulture species are widely distributed across five continents

Griffon Vultures feeding in the manner typical of Gyps species

TULSI SUBEDI

Bearded Vulture
***Gypaetus barbatus* (NT)**
Unlike most vultures, the Bearded Vulture does not have a bald head. Found in mountains across southern Europe, Africa, and Asia, these striking birds are non-migratory. This is possibly the only bird species that specializes in feeding on bone marrow.

ANDRE BOTHA

Egyptian Vulture
***Neophron percnopterus* (EN)**
The Egyptian Vulture is the only member of the genus *Neophron*. It feeds mainly on carrion, but is an opportunistic feeder and will prey on small mammals, birds, and reptiles. It is one of only a few species known to use tools, primarily stones, to break the eggs of large birds like the ostrich.

ANDRE BOTHA

Red-headed Vulture
***Sarcogyps calvus* (CR)**
The Red-headed Vulture is mainly found in the Indian subcontinent, with small disjunct populations in some parts of Southeast Asia. It usually occurs singly or in pairs in forested areas.

White-headed Vulture
***Trigonoceps occipitalis* (CR)**
The White-headed Vulture is endemic to Africa. The species is long-lived and appears to be loyal to a territory where it remains resident. It nests in trees.

ANDRE BOTHA

ANDRE BOTHA

Hooded Vulture
***Necrosyrtes monachus* (CR)**
The Hooded Vulture is one of the smallest species of vultures, and confined to Africa. Being smaller than many other vultures, it is quicker to take off, and is often the first to find carrion.

CHRIS BOWDEN

Himalayan Griffon
***Gyps himalayensis* (NT)**
The Himalayan Griffon (or Himalayan Griffon Vulture) is native to the Himalaya and the adjoining Tibetan Plateau, although its immatures disperse widely to lowland areas. Usually seen singly or in small groups, it is the principal scavenger at Tibetan sky burials.

White-rumped Vulture
***Gyps bengalensis* (CR)**
The White-rumped Vulture (or Oriental White-backed Vulture) was earlier considered the most abundant large raptor in the world, occurring across South and Southeast Asia. Adults have a black body with white back and white neck ruff feathers.

ANDRE BOTHA

White-backed Vulture
***Gyps africanus* (CR)**
White-backed Vultures (or African White-back Vulture) are an African species found throughout sub-Saharan Africa, often seen moving in flocks. They can only eat soft tissues, as the beak is not sufficiently adapted to tear through tough skin or break through bones.

YATHIN S.K.

SUNIL SINGHAL

Indian Vulture
***Gyps indicus* (CR)**
The Indian (or Long-billed) Vulture is a large non-migratory species, occurring in south-eastern Pakistan and otherwise confined to much of India. These vultures breed almost exclusively on cliff ledges.

Palm-nut Vulture
***Gypohierax angolensis* (LC)**
Palm-nut Vulture is the only vulture not entirely dependent upon scavenging, instead being mainly fruit-eating.

ANDRE BOTHA

VIBHU PRAKASH

Slender-billed Vulture
***Gyps tenuirostris* (CR)**
Slender-billed Vulture was, until recently, thought to be a subspecies of Indian Vulture. They nest on trees and their range spans along the southern edge of the Himalaya, east to Cambodia. They are the rarest vulture species in the Old World.

Cape Vulture
***Gyps coprotheres* (VU)**
This large vulture is endemic to southern Africa. Like all Gyps vultures, they typically lay one egg per year after reaching sexual maturity.

ANDRE BOTHA

ANDRE BOTHA

Rüppell's Vulture
***Gyps rueppelli* (CR)**
This vulture lives across open woodland habitats in central Africa. It is social and feeds together in large groups. It also nests and roosts communally.

SIDDU

Griffon Vulture
***Gyps fulvus* (LC)**
The Griffon Vulture (earlier known as Eurasian Griffon) is a large Old World species that has a wide range across parts of Europe, Africa, the Middle East, and Asia. It is a partial migrant, with some populations moving south in winter.

ANDRE BOTHA

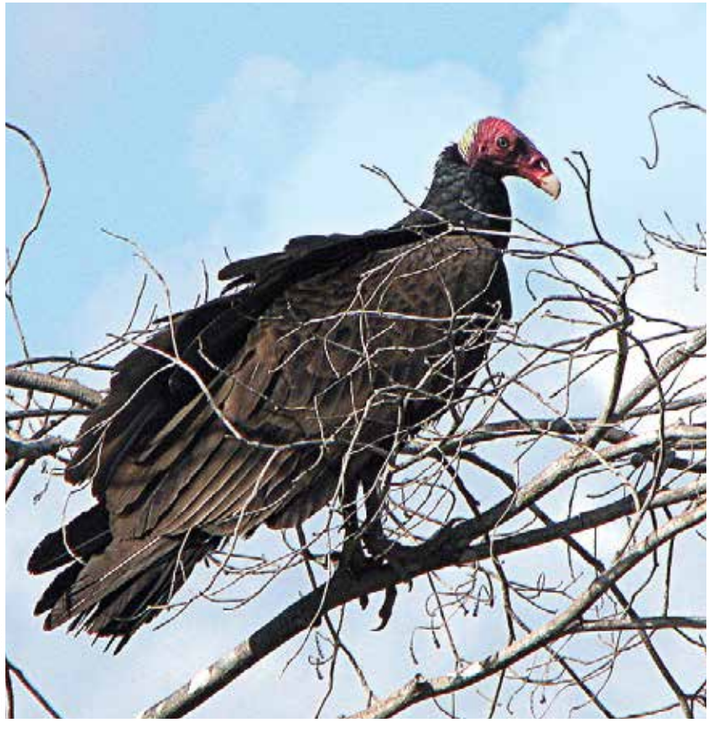
Cinereous Vulture
***Aegypius monachus* (NT)**
Cinereous Vulture is a widespread and large Old World species, native to parts of southern Europe and across much of Asia. These vultures make huge nests, usually in trees; and like most vultures, both parents tend to incubation and nesting duties.

ANDRE BOTHA

Lappet-faced Vulture
***Torgos trachelioto* (EN)**
The Lappet-faced is a large species of vulture found in parts of sub-Saharan African and the Arabian Peninsula. It is able to tear apart tough muscles and hides better than many other scavengers.

American Black Vulture
***Coragyps atratus* (LC)**
The American Black Vulture is distributed from south-eastern United States to South America. It soars high while searching for food. In areas populated by humans, it also feeds at garbage dumps.

HANS HILLEWAERT



ALEX POPOVKIN

Turkey Vulture
***Cathartes aura* (LC)**
Turkey Vulture is the most common vulture in the Americas, found in open and semi-open areas. While soaring, it holds its wings in a V-shape.

Lesser Yellow-headed Vulture
***Cathartes burrovianus* (LC)**
The preferred habitats of Lesser Yellow-headed Vulture include wet grasslands, mangroves, and swamps. It locates carrion like other New World vultures, predominantly using its sense of smell.

BERNARD DUPONT

TONY CASTRO

Greater Yellow-headed Vulture
***Cathartes melambrotus* (LC)**
The Greater Yellow-headed Vulture occurs across parts of Central and South America. It does not build its own nest, and almost always roosts on dead tree limbs.

Andean Condor
***Vultur gryphus* (VU)**
Andean Condors are native to the Andes mountain range in western South America. They are exceptionally huge and enigmatic scavengers, like other species of condors and vultures.


EMILIO DEL PRADO

ANDRE BOTHA

California Condor
***Gymnogyps californianus* (CR)**
The California Condor became extinct in the wild, but has been the focus of a major conservation breeding effort in USA, which is showing signs of success, despite the ongoing serious threat of lead poisoning from hunting ammunition.

King Vulture
***Sarcoramphus papa* (LC)**
King Vulture is a colourful species, inhabiting a variety of habitats including rainforests through much of South America and parts of Central America.


ANDRE BOTHA

Threats and Status worldwide

Vultures are one of the most threatened groups of birds in the world, and the predominant threat worldwide is poisoning, specifically through poison baits, as well as deliberate and unintentional poisoning (which includes NSAIDs), collisions and electrocution from man-made infrastructure typically for power, targeted hunting for body parts and belief-based use, and reduced availability of carrion for food. Thirteen of the 23 species of vultures are globally threatened with extinction (either Critically Endangered, Endangered or Vulnerable) with five of these from Africa, and five from Asia. Asia supports a high proportion of the world's vulture species, including four that are Critically Endangered.

The threats and prominence of vultures worldwide have led to numerous action plans being developed, and the establishment of several important networks. The IUCN Species Survival Commission created the IUCN Vulture Specialist Group in 2012. The SAVE consortium (see *Coordinating a Response to the Asian Vulture Crisis: Creation of the SAVE consortium* page 56) was created in 2011, and the Convention of Migratory Species developed the Multi-species Action Plan for all 16 Old World species in 2017. There is much work needed across their range to save this spectacular and important set of species. ■

What have vultures done for us?

Text: **David Houston**

Vultures are magnificent, imposing, and extremely useful birds, but they rarely get good press. Charles Darwin first saw the Turkey Vulture of the New World during his voyage on *The Beagle*, and in 1832, described them as "these disgusting birds, with their bald, scarlet heads, formed to revel in putridity". Part of the reason for our lack of appreciation lies in our mistaken impression of how vultures earn their living. We are most likely to see them rummaging about in garbage dumps, or view them on television, gathered round a lion kill hoping to snatch a few scraps of meat. These impressions do not suggest that they are particularly useful birds.

VANDAN JHAVERI

Vultures are magnificent, imposing, and extremely useful birds, but they rarely get good press (Image: White-rumped Vulture)

David Houston was Professor of Zoology at the University of Glasgow in Scotland, specializing in field studies on vultures.

ASIF N. KHAN

Road transect surveys in Nepal have given strong evidence of population recovery associated with the ban on diclofenac and subsequent advocacy work (Image: Eurasian Griffon)

But most vulture species evolved to fulfill an important role in wildlife ecosystems.

Originally, all savannah and woodland areas of the planet were dominated by herds of large grazing mammals, such as Blackbuck in India, American Bison in North America, or wildebeest in Africa. Because the grass and other vegetation on which these animals depended varied seasonally in its nutritional value due to changes in rainfall or temperature, these large ungulate herds were migratory. This allowed them to move large distances with these seasonal changes, and continue to find suitable grazing. The herds in turn supported a community of predatory mammals, which preyed on them. But all the evidence we have from current carnivore population studies shows that mammalian predators are rarely able to travel the same great distances as their prey, and so they are not responsible for the deaths of the majority of the grazing animals. Far more of the ungulates died from disease, malnutrition, accidents, or just old age than were ever killed by a predator.

Vultures specialized in finding the carcasses of these animals that died from natural causes. They did this extremely efficiently, because they could fly, and from the air could scan huge areas for food. Because vultures rely on soaring flight, and rarely need to flap their wings, they use very little energy when they are flying. So they can search from the air far more efficiently than any mammal could, which needs to use much more energy running or walking to reach a source of food. Thus, once a dead animal had been located, vultures were able to gather in such large groups that they could effectively dispose of the soft tissues even of large carcasses within a few hours. Not all vulture species feed in this way, some are territorial, but the abundant species of vultures developed this long-distance traveller lifestyle. In most such natural ecosystems, the scavenging birds were probably responsible for consuming far more of the dead ungulates than were accounted for by all types of mammalian predators combined.

One of the most important ecosystem services provided by vultures to humans is scavenging; vultures are the most efficient scavengers

RAJAT BHARGAVA

Feral dog population has increased significantly soon after the drastic decrease in vultures

This was all before the massive increase in the numbers of our own species, as civilizations spread around the world. *Homo sapiens* populations have increased to such an extent over the last 10,000 years due to the development of agriculture and industrialization, that we are now in a new era in the history of life on earth – the Anthropocene. This is the era when a single species, *Homo sapiens*, is changing ecosystems around the world in a profound way. Not even the dinosaurs caused the scale of ecological and environmental change for which humans are now responsible. One of these impacts has been the replacement of large wild animal communities with domesticated livestock. So the original environment in which vultures evolved has largely been replaced by farmed land. Vultures now have to feed either on the limited numbers of wild animals remaining, mainly confined to protected wildlife reserves, or adapt to feeding on fallen domestic livestock. Vultures have now to travel great distances to seek such carcasses.

India is perhaps unusual because, for cultural and religious reasons, cattle are not consumed by a large proportion of the human population, and so dead cows are often available to vultures as food. But in India, as elsewhere in the world, humans have introduced new causes of mortality, from electrocution on power lines, disturbance or destruction of potential nest sites, unintended poisoning from control of predatory mammals, deliberate poisoning to obtain birds for juju or superstitious medical treatments and beliefs, and most dramatically in Asia, through the unforeseen consequences of the introduction of toxic drugs such as diclofenac, ketoprofen, and possibly other related drugs for veterinary care of domestic livestock.

Vultures evolved in conditions in which their natural mortality rate was very low. The larger vultures rear only a single chick each breeding season. Provided their mortality rate is low, such a strategy will succeed. But now that human activities have contributed to so many new causes of mortality for vultures, the low 'birth' rate has become a problem for their survival. Within a few years, a species can decline dramatically in this way, as has the Indian White-rumped Vulture, whose population has declined by 99% over a decade, such that the species is now Critically Endangered.

Does this matter? Vultures are a textbook example of keystone species, i.e., animals that play such a crucial role in ecosystem functions that if they are lost, it will lead to changes in many other members of the ecosystem. There are many unexpected consequences of losing these efficient scavengers. It is difficult to obtain reliable data for studies like this, and many of the assumptions made in developing such estimates need further study. In India, the loss of the scavenging activity of vultures has led to a marked increase in the number of free-ranging dogs, caused by the increase in food available to them from uneaten cattle carcasses. This may result in an increase in deaths from rabies, which is largely contracted from dog bites. Apart from the scale of human tragedy that this represents, attempts to quantify the impact have suggested that the economic cost to the Indian economy of the loss of vultures might have been "*$35 billion over a 13-year period*". We need much better data before we can be confident of such figures, but the scale of the economic and human cost to India is obviously substantial. Many carrion flies breed in animal carcasses, and the flies which emerge are likely to carry bacteria into homes, leading to food contamination and diarrhoeal diseases, and spread of eye infections. The foul fluids which leach from rotting animal carcasses will also contaminate ground water, and shallow village wells are more likely to be impacted. If these health risks are to be avoided, new ways will need to be found to dispose of dead livestock; this would entail considerable economic cost.

An unknown consequence of the widespread availability of carrion, now that it is not consumed by vultures, is the probable rise in the number of rats and smaller carnivores. If their numbers are sustained by the increased abundance of meat from animal carcasses, this will increase the predation rate on other animals, such as ground-nesting birds, snake and lizard populations, amphibians, and large insects. Many of these smaller animals are already threatened by a range of environmental changes, and increased predation risk is yet another problem they will probably now face. We should also not forget the cultural importance of vultures. This is most extreme in the case of the Parsi community, who relied on vultures for their traditional funeral rites in their Towers of Silence (see *Vultures in Life & Death: Sky Burials & Towers of Silence,* page 144) as was the case for some Native American tribes who laid their dead out for condors to consume.

Provided the environmental issues are addressed, it is perfectly possible for healthy, sustainable vulture populations to exist in modern agricultural and industrial societies. Spain, in particular, has spectacular populations of Griffon Vulture today, which now largely feed on carcasses of domestic livestock provided for them: conveniently rendering cheap and efficient carcass disposal for farmers. Vultures are spectacular members of the wildlife community, and with an increasing appreciation of the benefits to our mental health from visits to national parks, wildlife reserves, and the natural environment in general, they have the potential to be good visitor attractions. For several decades, vultures have been viewed at close range by tourists at feeding stations established in South Africa, France, and Spain, and these provide easily managed opportunities to promote general environmental and conservation issues. Charles Darwin might not have appreciated the Turkey Vulture, but he was clearly impressed by watching Andean Condors in South America, writing 'It is truly wonderful to see these magnificent birds soaring overhead." It is our duty to ensure that vultures continue to inspire us and benefit us all. ■

Vultures are keystone species … there are several unexpected consequences of losing these efficient scavengers

PARAMVIR SINGH

The Parsi community has relied on vultures for their traditional funeral rites in their Towers of Silence

The status of vultures in South & Southeast Asia

Text: **John Mallord**

Most species of vultures worldwide are gregarious, nesting in loose colonies in trees or on cliff-faces and rocky outcrops. When feeding, they are also sociable creatures, with flocks of hundreds of birds to be found feeding at carcasses. Their sociability is seen as an adaptation to their scavenging lifestyle, increasing the chances of a carcass being found and attracting birds from a vast area. Historically, vultures have been one of the most abundant groups of birds on the planet; more recently, however, a variety of causes have led to them being one of the most threatened,

RAJAT BHARGAVA

Historically, vultures have been one of the most abundant groups of birds on our planet

John Mallord is a Senior Conservation Scientist at the RSPB (BirdLife UK), leading the organization's research into Asia's vultures.

RON DEBNAM

Considered common in the first half of the 20th century, vulture populations subsequently declined to zero in Yangon, Myanmar

with 12 of the 23 species found worldwide listed on the IUCN Red List of globally Threatened Species, as Critically Endangered, Endangered or Vulnerable. This means that, based upon the best available scientific data, these 12 species are considered to be at high risk of extinction to differing degrees, if there is no conservation action to save them.

Of the nine species of vultures regularly occurring in Asia, four are Critically Endangered (White-rumped *Gyps bengalensis*, Slender-billed *G. tenuirostris*, Indian *G. indicus* and Red-headed *Sarcogyps calvus*, whose recent declines have been caused by unintentional poisoning due to veterinary use of the non-steroidal anti-inflammatory drug (NSAID) diclofenac (see *Monitoring diclofenac & other NSAIDs impacting Gyps Vultures* page 106). All four species are confined to South and Southeast Asia. In addition, the widespread Egyptian Vulture *Neophron percnopterus* is listed as Endangered, while the Bearded *Gypaetus barbatus*, Cinereous *Aegypius monachus*, and Himalayan Griffon vultures *G. himalayensis* are Near Threatened, and Eurasian Griffon *G. fulvus*, with an increasing global population, is listed as of Least Concern.

Distribution and abundance of vultures in South Asia

With the mythical vulture Jatayu's important role in the Hindu epic, *The Ramayana* (see *Ecological*

GOUTAM NARAYAN

Thousands of vultures waiting for the arrival of 'fresh' food at carcass dumps in Delhi

and Cultural Significance of Vultures page 150), their role in disposing of the dead within Parsi culture (see *Vultures in Life & Death: Sky Burials & Towers of Silence* page 144), and the service they provide by cleaning the environment of cattle carcasses, vultures have been an important part of Indian society for millennia. Although historically, as elsewhere, vultures would have been more reliant on natural sources of food, a switch to the carcasses of domestic livestock occurred as wild ungulate

12 of the 23 species of vultures found worldwide are listed as Critically Endangered, Endangered, or Vulnerable on the IUCN Red List

COURTESY: BIRD CONSERVATION NEPAL

A team of surveyors looking for vultures during a road transect survey

populations declined, and the number of domestic cattle soared which, coupled with the Hindu prohibition on eating beef, provided an abundant food supply to scavenging birds. An indication of their abundance comes from photographs that show thousands of vultures waiting for the arrival of 'fresh' food at carcass dumps in Delhi.

Extrapolating from population estimates obtained since the catastrophic declines of vultures caused by diclofenac poisoning, it is likely that the numbers of White-rumped and Indian Vultures could both be counted in tens of millions as recently as the early 1990s. Subsequently, however, these species declined by 99.9% (White-rumped) and 96.8% (Indian and Slender-billed combined) between 1992 and 2007, with population estimates in the low tens of thousands for both species. Since the Slender-billed was confirmed as a full species separate from the Indian Vulture in 2001, the former has been understood to be less abundant and widespread, confined to the northern parts of the Subcontinent, and estimated to number around 1,000 individuals at present.

Vultures play an important ecological role as scavengers, and have been an integral part of human society for millennia. Without concerted conservation efforts, some of these species could be lost forever

In both India and Nepal, vultures have been surveyed by undertaking road transect surveys, where a team of surveyors are driven (relatively) slowly along highways and (in India) along tracks within protected areas. Two people usually stand in the back of a pick-up truck, surveying for up to a kilometre on each side of the road, instructing the driver to stop the vehicle whenever a large raptor is spotted. The team then identify the bird(s), ageing it if possible, take a GPS reading of the location, then carry on. Since 2006, when the Government of India banned the veterinary use of diclofenac, repeated road transect surveys carried out by BNHS suggest that the rapid decline of White-rumped Vultures has slowed, with evidence that numbers may even have stabilized, although populations of Indian Vulture (now regarded as a Subcontinent endemic) and Slender-billed Vulture have continued to decline, although at a much lower rate.

The population density, and hence population size, of the other Critically Endangered species, the Red-headed Vulture, have always been lower than the aforementioned Gyps species, due to its strong territoriality. Although there is no direct evidence of diclofenac toxicity in this species, the timing, rate, and widespread nature of its declines strongly suggest that the drug was also

S. BALACHANDRAN

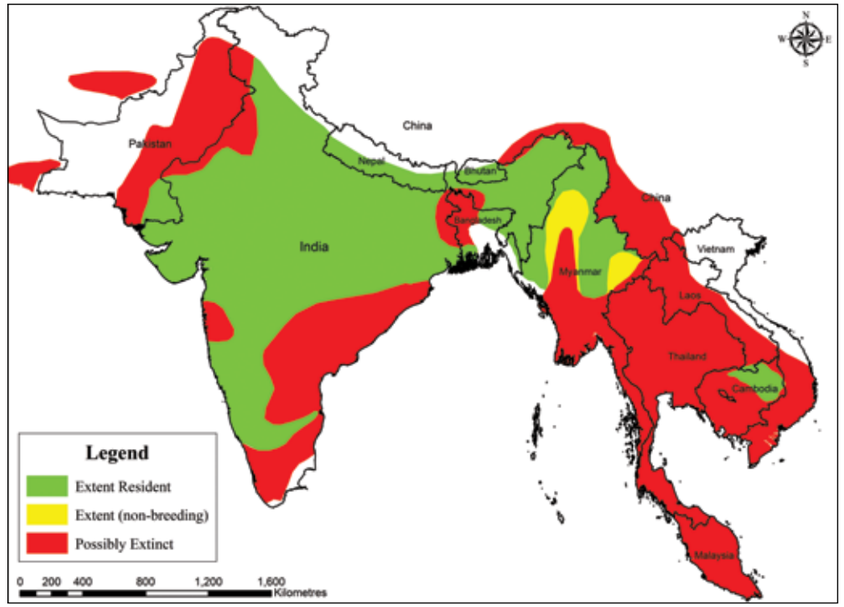
Vultures are specialized for rapidly locating and consuming carcasses (Image: White-rumped Vulture)

the cause of the species' decline in India, which was estimated to be 41% per year since 1999. As a result, it has been estimated that the global population, still largely to be found in India, is unlikely to exceed 15,000 individuals.

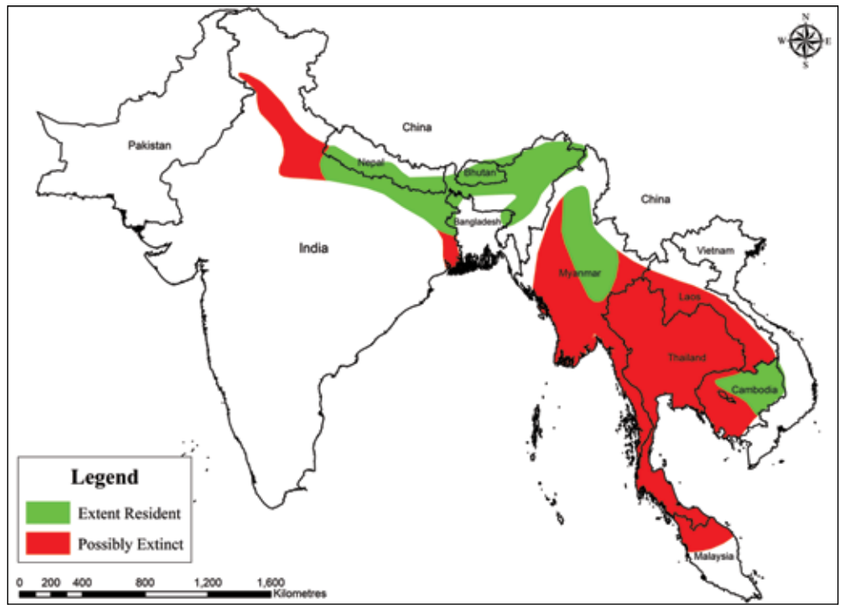
The population declines of these four species have been accompanied by a contraction of the species' ranges, especially in south and east India. This is also true in neighbouring countries, with only small populations remaining in Pakistan, Nepal, Bhutan, and Bangladesh. In Pakistan, there are now only single breeding colonies of White-rumped and Indian Vultures, both in Sindh Province. There is evidence of increases

TULSI SUBEDI

Red-headed Vulture



MAP PREPARED BY: ROHAN BHAGAT



MAP PREPARED BY: ROHAN BHAGAT

Maps indicating the distribution of *Gyps bengalensis* (above) and *Gyps tenuirostris* (below)

in the number of breeding birds at colonies of both species; but this is likely to be partly due to immigration. These increases coincided with the ban on diclofenac. Despite such increases, the populations are likely to number just a few hundred birds. Road transect surveys in Nepal have given the strongest evidence of a population recovery associated with the ban on diclofenac and subsequent advocacy work carried out as part of the Vulture Safe Zone programme in the

country (see *Hopes are High: Collapse & Return of Vultures in Nepal* page 74). This is statistically significant for White-rumped Vulture, but not so for Slender-billed Vulture, due to the low number of birds recorded, but the pattern of decline and subsequent increase followed a similar pattern to that of White-rumped Vulture, so overall, the signs are positive for both species. Although seven vulture species used to be regularly recorded in Bangladesh, the only species now breeding is White-rumped Vulture, which is thought to number around 260–300 individuals.

Distribution and abundance of vultures in Southeast Asia

Of the four Critically Endangered species confined to the region, all but the Indian Vulture (which is endemic to the Indian Subcontinent) historically had ranges that extended throughout much of mainland Southeast Asia as far as peninsular Malaysia, with the Red-headed Vulture previously occurring as far south as Singapore. Populations of vultures began to disappear from Southeast Asia earlier than elsewhere in their range, and for different reasons to South Asia, as the veterinary use of diclofenac has not historically been common. Considered common in the first half of the 20th century, vulture populations subsequently declined, mainly due to food limitation as ungulate populations, which constituted the birds' main source of food, disappeared through the conversion of natural habitats to cultivation, and also unsustainable hunting.

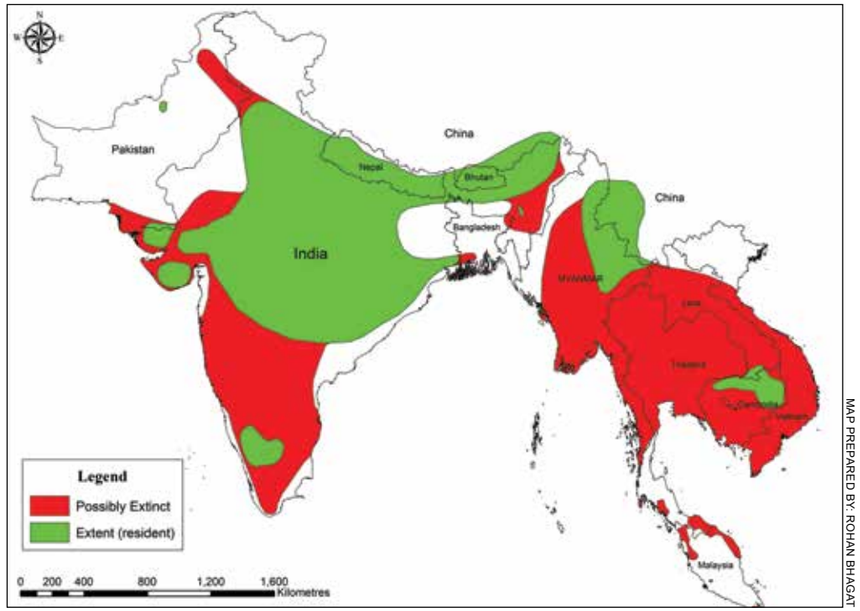
Within Southeast Asia, all three species are now confined to Myanmar and Cambodia, with occasional overspill into Laos and Vietnam. To estimate the size of these remnant populations, surveyors have taken advantage of the fact that, as part of the conservation management of these birds, a safe source of food is provided at the so-called vulture restaurants, or supplementary feeding sites, which attract birds from far and wide, sometimes in large numbers. Based on the numbers of birds counted using these

RAJAT BHARGAVA

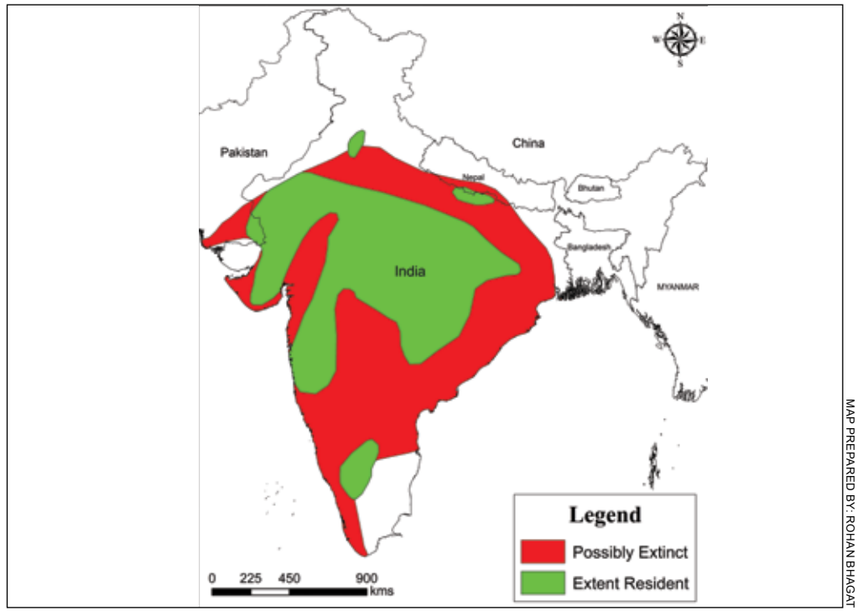
Egyptian Vulture

DHRITIMAN MUKHERJEE

Cinereous Vulture



MAP PREPARED BY: ROHAN BHAGAT



MAP PREPARED BY: ROHAN BHAGAT

Maps indicating the distribution of *Sarcogyps calvus* (above) and *Gyps indicus* (below)

feeding sites in both Myanmar and Cambodia, the total vulture populations in both countries are estimated to be only a few hundred, with White-Rumped Vulture being the most abundant species, followed by the Slender-billed and then the Red-headed. Although historically food limitation would have driven population declines, poisoning now constitutes the greatest threat to vulture populations in Cambodia, while the main threats to vultures in Myanmar are not entirely

clear (see *Conservation of Asian Vultures in Myanmar* page 86). Poisoning tends to be unintentional, usually from cattle carcasses laced with poison that is intended to target predators.

Other vulture species in Asia

Five other species of vulture occur in Asia, all of which have ranges that extend well beyond the boundaries of the region. Egyptian Vultures occurring in the region consist of two separate populations: one migratory, breeding in northern India and Nepal, as well throughout Asia; and a resident population in the Indian Subcontinent. The timing, rate, and extent of the decline (>90%) in India suggest that this species was another victim of diclofenac poisoning. It is thought that several thousand pairs of breeding birds still remain in the Indian subcontinent. Two other species, Bearded Vulture and Himalayan Griffon, commonly breed at high altitudes within the region, with altitudinal movements bringing these birds, especially Himalayan Griffon, into the lowlands of India, Pakistan, and Nepal in winter. Due to the remoteness of their breeding populations, there is inadequate information regarding their status and trends. Bearded Vulture is considered locally common and widespread in the Indian and Nepal Himalayas, with a population of around 500 birds estimated for the latter. Evidence from the Upper Mustang region of Nepal suggests rapid declines in breeding populations of Himalayan Griffon, known to be susceptible to diclofenac, which were consistent with poisoning by the drug being the cause. The vulture community of Asia is completed by two species that are predominantly winter visitors to the region, Cinereous Vulture, a widespread breeder across Central and northern Asia into southern Europe, and Eurasian Griffon, a common and increasing species across northern and central Asia, parts of Africa and southern Europe.

In conclusion, it may be said that vultures play an important ecological role as scavengers, and have been an integral part of human society, both in Asia and elsewhere for millennia. However,

AVINASH BHAGAT

Indian Vulture

TULSI SUBEDI

Bearded Vulture

of the nine species that occur in the region, populations of the majority of them have been in decline in recent decades. Without concerted conservation efforts, some of these species could be lost forever. ■

Threats to South Asia's Vultures – Past and Present

Text: **Roger Safford and Christopher G.R. Bowden**

Roger Safford is Coordinator of the BirdLife International Preventing Extinctions Programme; he co-authored the Multi-species Action Plan to Conserve African-Eurasian Vultures. He has been working on species conservation for 34 years.

Chris Bowden has worked on threatened birds for the RSPB (UK) for over 30 years. He helped establish SAVE and has worked on Asian vultures since 2004.

For most of recent history, until the last years of the 20th century, South Asia's vultures seemed to be living without major threats. As recently as the 1980s, one species, the White-rumped Vulture, was believed to be the most abundant large bird of prey in the world, with a population in tens of millions. The other species were locally common too. None seemed to be under any threat of extinction – the very idea of vultures reaching the brink of extinction in South Asia was inconceivable.

Population collapse

But then it happened. Monitoring led by BNHS revealed that the three species of Gyps vulture restricted to South and Southeast Asia began to collapse in the early to mid-1990s at a rate, estimated in the early 2000s, of 50% per year. Many large colonies disappeared completely, and global extinction seemed a real possibility. The situation was made more frightening by a fundamental problem: the cause of the decline was unknown, making effective conservation measures impossible to identify. The cause of the collapse of South Asia's vultures was one of the most urgent yet puzzling problems conservation science had faced. The scientific literature summarised here is extensive. This review draws primarily from SAVE documents and the Multi-species Action Plan to Conserve African-Eurasian Vultures (2017), but as far as possible also covers developments since then.

YEDRA BAYANA

Sick-looking wild vultures with drooping necks was an early clue that led to the finding that vulture populations had declined drastically

Vultures are long-lived, and such declines involved the deaths of many adults. So the focus was to find out why adults were dying, and an early clue was the observation of sick-looking wild vultures with drooping necks, followed by the finding of an accumulation of uric acid crystals – commonly known as gout – in the tissues, especially around the liver and viscera. But gout is a symptom, not a diagnosis: many factors can cause it. A disease, or pollution, perhaps? Researchers in India and Pakistan tested dead vultures, and found pathogens not recorded before in these birds, and also tested for a wide range of toxic environmental pollutants (heavy metals and many pesticides), but could not connect these to the declines. In 2002, to many authorities, an infectious disease still seemed the most likely problem.

> Presently, 14 out of the 23 vulture species all over the world are threatened with extinction, with the most rapid decline occurring in Asia and Africa

The breakthrough

A research team led by Dr Lindsay Oakes, brought together by The Peregrine Fund and the Ornithological Society of Pakistan, started to examine livestock drugs, given to cattle, to which vultures would be exposed. One such was a non-steroidal anti-inflammatory drug (NSAID) diclofenac, used in livestock (and in humans) to reduce pain, inflammation, and fever. The team analysed kidney samples from 38 White-rumped Vultures found dead in Pakistan between 2000 and 2002, and found that all of 25 birds that died with visceral gout had detectable diclofenac residues in the kidney. By contrast, none of the 13 birds that died without visceral gout had detectable diclofenac. Diclofenac caused kidney failure, with rapidly fatal consequences. The kidney failure led to gout, manifested in the form of the characteristic uric acid crystals deposited on and within internal organs, especially the liver.

SACHIN P. RANADE

Is there a 'vulture-safe' NSAID which is an effective pain killer for cattle? (Image: Juvenile White-rumped Vulture)

The findings were quickly announced at a conference of raptor experts in Hungary in May 2003. To those present, it was a pivotal moment in raptor conservation history; the applause was led by Professor Ian Newton, one of the world's most eminent authorities on birds of prey, later to become Chairman of the SAVE (Saving Asia's Vultures from Extinction) consortium.

BNHS quickly replicated the findings in India, and the role of diclofenac was clear ... or was it? It is one thing to show that a factor can cause birds to die, but quite another to prove that such deaths can cause whole populations

CHRIS BOWDEN/RSPB

Dogs at carcass dump in Chandigarh, India. With vultures gone, feral dogs have an endless supply of food

of abundant species to crash. Concentrations of diclofenac in cattle tissues decline quickly, soon after treatment. Could there really be enough diclofenac in the vultures' food supply to account for what was happening?

The answer – a clear 'Yes' – was provided by simulation modelling of a vulture population, and tissue sampling of dead cattle. This revealed that less than 1% of livestock carcasses would have to carry lethal concentrations of diclofenac to have caused the observed declines, while it was estimated that 5–10% of carcasses would have had high concentrations of this drug. In other words, the actual level of diclofenac contamination was more than enough to make veterinary use of this drug the sole cause of the declines.

NSAIDs: a complex threat

The subsequent advocacy co-ordinated by SAVE, eventually leading to bans on veterinary diclofenac in all four South Asian countries, is covered elsewhere in this issue (see *Monitoring diclofenac & other NSAIDs impacting Gyps Vultures* page 106). The problem has been diagnosed, the drug responsible banned and a safe alternative found. Job done? Sadly not! Removing a popular, effective, and cheap veterinary drug was never going to be easy. One reason for continued exposure of vultures to diclofenac in India after the ban was the illegal sale for veterinary use of diclofenac formulated for use in human medicine in large multiple-dose vials convenient for injecting cattle. However, following advocacy efforts of BNHS and SAVE in 2015, the Government of India banned the manufacture of human-use formulations of diclofenac in multiple-dose vials (anything larger than 3 ml), so this loophole has been closed. Other than this, the continued use of veterinary diclofenac can be attributed to vets using the tiny human-use vials, tablets, or indeed

Recent studies have shown signs of success in South Asia's vulture conservation ...

to the pro-drug of diclofenac which remains in legal use – aceclofenac [A pro-drug is a medication that the body converts into a pharmacologically active drug after it is administered; aceclofenac metabolizes into diclofenac after administration and is thus equally harmful.].

But what of other NSAIDs? As many an arthritis sufferer knows, there are dozens, ranging from the ubiquitous aspirin, to the latest generation of highly effective painkillers. Could these be in veterinary use or waiting in the wings to take the place of the banned diclofenac? If so, are they toxic to vultures too? And is there a 'vulture-safe' NSAID, effective in cattle, which could be recommended instead?

These questions led to a new field of raptor research, termed 'safety-testing' of veterinary drugs. The first safe alternative was quickly identified – meloxicam – and having this alternative option was probably key to Governments agreeing the diclofenac bans. Recently, tolfenamic acid was also confirmed as being safe at concentrations likely to be encountered in cattle carcasses. Unfortunately, others, notably aceclofenac, nimesulide and ketoprofen (by rigorous trials), were confirmed to be toxic to vultures. Ketoprofen has now been banned in Bangladesh. However, bans are needed elsewhere and on the other drugs, and many other NSAIDs remain untested while new ones are being developed and brought into veterinary use from time to time. Identification of more vulture-safe veterinary drugs is just as important.

Drug safety-testing and necropsy of various wild birds of prey have now shown that all five Gyps vulture species assessed are susceptible to diclofenac. Eagles in the genus *Aquila* (such as the Steppe Eagle, well-known in India) with diclofenac in their tissues have also died of the same symptoms. Two rather different Indian vulture species, Egyptian and Red-headed, have not been tested but their population trends have largely mirrored those of the Gyps species, although with less extreme declines; this is consistent with them also being poisoned, but their slightly different diet composition reduces the NSAIDs' impact.

Light at the end of the tunnel?

Recent studies have shown signs of success in South Asia's vulture conservation. Since the ban in India, exposure of vultures to diclofenac through carcasses, in terms of its prevalence and concentration, has declined but not ceased. Vulture populations in India have had mixed fortunes: surveys in 2015 suggested that the population of White-rumped Vultures may have stabilised or may be increasing slowly, while Indian and Slender-billed Vultures have been continuing to decline, albeit probably more slowly than they did earlier.

From Nepal, the best news so far for Asian vultures emerged in 2019: the rapid declines of White-rumped and Slender-billed Vulture

ADITYA ROY

Sale of diclofenac for use in human medicine in large multiple-dose vials was convenient for injecting cattle

COURTESY: BIRD CONSERVATION NEPAL

The most frequent cause of vulture mortality outside South Asia is poison baits

populations in the 2000s ceased in the early 2010s and these species are now increasing. Veterinary pharmacy surveys (both open and undercover) suggested that the availability of diclofenac had been greatly reduced over much of the birds' range in the country by 2011. Community-based advocacy and awareness-raising actions, government support, and possibly also the provisioning of safe food, may have contributed to this remarkable turnaround by augmenting the effects of changes in the regulation of toxic veterinary drugs. This great success in Nepal is described in more detail in (*Hopes are High: Collapse & Return of Vultures in Nepal* page 74).

In short, there are signs that the transition towards a livestock sector free of diclofenac is working to turnaround the fortunes of Asian vultures. Helped by a combination of government regulation with education, advocacy, and monitoring, these species have turned the corner from decline to recovery. But it is not yet time to reduce efforts: the drug has not disappeared from use entirely, and other drugs, known or suspected to be toxic to Gyps vultures and not yet banned, are also threats to vulture populations.

Other threats?

Could there be other threats, now or in the future? Across many parts of Eurasia and Africa, vultures are suffering declines, mostly unrelated to NSAIDs. Could some of the same factors threaten South Asia's vultures? The short answer is that they could, and conservationists must be vigilant, but the dominance of the diclofenac threat in causing the declines in South Asia remains very clear.

The most frequent cause of vulture mortality outside South Asia is poison baits. Farmers whose crops are raided by large wild herbivores, and herders whose livestock fall prey to predators, occasionally resort to poisoning those animals to deal with the problem. Vultures are unintended victims, consuming either the poisoned baits or the carcasses of animals that have died from poisoning.

This conflict is a more common concern in Africa and also Southeast Asia (where small numbers of vultures survive mainly in Cambodia), but a disturbing number of cases have come to light, especially in north-east India and Nepal in recent years. The targets are often feral dogs and jackals, whose numbers may have increased because there is more carrion around, following the decline in vultures. However, such poisoning cannot account for the vultures' population collapse across South Asia, although it undoubtedly has a significant impact in some areas.

Looking to the future, increasing electrification and renewable energy generation – so vital to regional development and combating climate change – is leading to hazards for vultures and other soaring birds, which are known to die from collisions with wind turbines and powerlines, or to be electrocuted on pylons and wires. There are now guidelines for energy developers to minimise the impact of energy projects on wildlife, including large birds like vultures. Among other birds threatened by energy infrastructure is the iconic Great Indian Bustard.

STEFFEN OPPEL

Electrocution of vultures by power lines is unfortunately a far too common occurrence worldwide

We know that vultures can live with humans, as they did so in the recent past, in vast numbers in South Asia; they do not depend on untouched wilderness. The food supply remains strong (albeit too often contaminated). Vulture numbers prior to the crash were so high because they benefited from the carcasses of the millions of domestic cattle disposed of every year. Although it is unlikely that they will ever return close to those levels, evidence suggests that, despite changing carcass disposal practices and other factors, there is still enough food to support far more vultures than there are at present. There are also significant populations of wild ungulates (antelopes and wild/feral cattle) that could sustain vulture populations. Therefore, food shortages are a matter of local rather than national concern for vultures. There also seems to be no shortage of suitable habitat, nesting, and roosting sites.

In the end we may conclude that one and only one factor can account for the fate of South Asia's vultures over the last 25 years, without the involvement of other causes – the decline because of the use of veterinary diclofenac; and the slowing and the beginnings of the reversal of the decline because of the ban on diclofenac. Indian and other South Asian Governments have set an example to the rest of the world on tackling this threat, while the Indian Veterinary Research Institute, 'together with BNHS and SAVE, has played a key role in safety-testing. Other NSAIDs are toxic to vultures too; withdrawing all toxic NSAIDs may not be welcomed by the pharmaceutical industry, but it will not hurt the livestock sector, as at least two safe and affordable alternatives are available (and veterinarians and conservationists are working hard to identify more). And when the toxic drugs are removed, the vultures can recover. It is now time to finish the job! ■

Addressing the African Vulture Crisis Challenges and Progress

Text & Photographs: **Andre Botha**

Africa boasts a rich diversity of 11 vulture species that range in size from the magnificent Lappet-faced Vulture *Torgos tracheliotus* to the smaller Hooded Vulture *Necrosyrtes monachus* and Egyptian Vulture *Neophron percnopterus*. There are four species belonging to the genus *Gyps*, namely the African White-backed Vulture *G. africanus*, Rüppell's Vulture *G. ruepellii*, Cape Vulture *G. coprotheres*, and the Eurasian Griffon *G. fulvus*. Almost all of these species are obligate scavengers that feed on the carcasses of dead animals and other biological waste; but one species, the Palm-nut Vulture *Gypohierax angolensis*, is partly vegetarian and feeds on the husks of the fruit of various palms, in addition to scavenging.

Cape Vulture

Andre Botha manages the Vultures for Africa Programme at the Endangered Wildlife Trust since 2004. He is also Director Southern Hemisphere of the US-based Raptors Research Foundation and is Vice-Chair of the Technical Advisory Group of *the CMS Raptors Memorandum of Understanding.*

Despite the diversity of species and the presence of vultures in the African skies being perceived as an integral part of most landscapes other than the equatorial rainforests, these birds are under severe threat. A paper published on African vultures in 2015 has shown that these birds are in serious decline. The primary threats to Africa's vultures are complex, and include deliberate and unintentional poisoning, persecution for use in belief-use trade and for food, decline in food supply, habitat modification, and electrocutions and collisions with power lines and wind turbines.

The decline in African vulture populations varies in intensity in different regions and countries, with several studies showing smaller-scale declines in protected areas. Vulture populations in North and West Africa have all but collapsed. Belief-based use and trade in vulture

Lappet-faced Vulture

Hooded Vulture

A decapitated vulture that was poisoned for belief-use purposes in southern Africa

body parts for various purposes is known to be the main driver behind the decline across West Africa. Studies in East Africa are similarly bleak, and estimates for Kenya indicate that vultures have declined at an average of 66% over the past 10–30 years in both protected and non-protected areas. In southern Africa, the Egyptian Vulture is believed to be extinct as a breeding species. Six of the 11 species of African vultures were listed as either Endangered (2) or Critically Endangered (4), according to BirdLife International, 2021.

As populations plummet across Africa, efforts to conserve them have been limited and fraught with difficulty. Movement studies of African Gyps vultures, specifically Rüppell's, African White-backed, and Cape vultures, have shown that these birds forage over vast areas, spanning multiple countries in the course of a single year. Their extensive movements, coupled with communal feeding, means that a single poisoned carcass in an area could actually have a regional impact on vulture populations. Several large-scale poisoning incidents in various parts of the continent (as captured in the African Wildlife Poisoning Database) reflects this fact, with incidents in Botswana (537 mortalities), Zambia (800+ mortalities), and Guinea-Bissau (2500+ mortalities) between 2019–2021. These large-scale losses stem from single incidents of poisoning related to illegal wildlife trade, human-

African White-backed Vulture

The decline in African vulture populations varies in intensity in different regions and countries … the efforts to conserve them have been limited and fraught with difficulty

wildlife conflict, and belief-based use of vulture body parts. High mortality rates are compounded by the fact that vultures have one of the slowest breeding rates of any birds, so even small population declines require decades to recover.

Wildlife conservation typically struggles to make the African agenda, and when it does, as a Kenyan wildlife official recently stated, "We are so busy saving rhinos and elephants, when we get to vultures we are just tired." Tired or not, there will be consequences for Africans when the vultures are gone. As vultures are pivotal in the scavenger food chain, their absence will affect carcass decomposition and possibly see an increase in rates of disease transmission. In 2017, under the leadership of the Convention on Migratory Species (CMS) Raptors MoU, the IUCN SSC Vulture Specialist Group and BirdLife International, a Multi-species Action Plan (MsAP) for the Conservation of African-Eurasian Vultures was adopted by all range countries at the 12th CMS Conference of the Parties (COP) in the Philippines. However, engagement in terms of the implementation of this plan by African governments has been limited and, if conservation efforts are to have any population-level impacts, more African governments must take immediate action to reduce threats to vultures and safeguard existing protected areas and other key vulture habitats from human impacts.

Protected areas are vital for the survival of most species of African vultures, but most protected areas in Africa lack adequate enforcement, by well-equipped and motivated staff. Further efforts to conserve these imperilled birds should involve high-level government

Rüppell's Vulture

White-headed Vulture

Palm-nut Vulture

African White-backed Vulture

representatives who have the authority (and the will) to impose tighter regulations on the use of toxic agricultural pesticides, to increase punitive actions against those involved in the persecution of vultures, to restrict trade in vulture body parts, and to work in partnership with scientists to develop vulture-friendly energy infrastructure.

There has, however, been an encouraging groundswell of conservation action focused on vultures in Africa, but these actions have largely been driven by the NGO sector working with a range of partners and stakeholders in a number of African countries. More needs to be done, especially in terms of addressing threats and filling the substantial knowledge gaps that exist about vulture populations in many parts of the continent. Countries such as Zimbabwe have, however, published a government-endorsed vulture conservation strategy, and others such as South Africa, Kenya, and Botswana are in the process of drafting such plans. The implementation of these strategies, within the framework of the CMS Vulture MsAP, must promote greater cooperation across international borders and engage all relevant stakeholders to have a chance of success. Over the last four years, more than 6,000 people have received training in the combat of wildlife poisoning and management of human-wildlife conflict, one of the most prominent drivers of vulture poisoning. Energy utilities in at least eight African countries have been engaged, but much more needs to be done.

Protected areas are vital for the survival of most species of African vultures, but most protected areas in Africa lack adequate enforcement, and equipped and motivated staff

There is, however, reason for optimism despite the many challenges that are faced by African vultures and the people trying to conserve them. An example of this is the recent down-listing of the Cape Vulture from Endangered to Vulnerable status by the IUCN Red List authority. This is possible due to a stable-to-increasing population of this species over most of its range in southern Africa, thanks to concerted conservation action focused on the species. Such action has been implemented by a wide range of partners, both from government and the public sector, over the last 50 years. Likewise, by mid-2021, Eurasian Griffon had started breeding in Morocco after an absence of more than 40 years as a breeding species, thanks to a reintroduction programme managed by a range of partner organizations with support from government. The success that has been achieved through this work brings hope to our efforts to conserve other species as well across the continent, and to ensure that African vultures continue to grace the continent's skies with their presence and beauty in perpetuity. ■

Bearded Vulture

Recovery and current status of vultures in Europe

Text: **Julien Terraube and Olivier Duriez**
Photographs: **Olivier Duriez**

Julien Terraube is a Research Officer at the VCF; he is involved in a variety of projects investigating the ecology and conservation of European vulture species.

Olivier Duriez is a researcher specializing in vulture ecology and behaviour. He works on Conservation Biology at the University of Montpellier.

Europe holds five vulture species as breeders: Egyptian Vulture *Neophron percnopterus*, Bearded Vulture *Gypaetus barbatus*, Griffon Vulture *Gyps fulvus*, Cinereous Vulture *Aegypius monachus* and Rüppell's Vulture *Gyps rueppelli*, now considered a regular breeder in the South of the Iberian Peninsula.

Over the last century, vulture populations have undergone dramatic declines across Europe due to human persecution, poisoning, and a decline in food resources resulting from land-use changes. As a result, local extinctions were recorded for all vulture species in several European countries after World War II. For example, the Bearded Vulture disappeared from the Alps in 1913 and from the Balkans in 2000s, while the Cinereous Vulture went extinct in France at the end of the 19th century. Even the once widespread Griffon Vulture disappeared from the Alps and large parts of the Balkans during the 20th century.

Two Griffons and one Cinereous Vulture, waiting for feeding

Aviary specially built for vulture reintroduction, overhanging the Verdon Canyon in French Alps

However, starting from the end of the 1970s, this dire conservation status was reversed by legal species protection, reintroduction programmes, and supplementary feeding stations aimed at palliating the lack of food resources. Since then, vulture populations have recovered and established healthy populations in large parts of their historical distribution in Europe. The first success was the reintroduction of Griffon Vultures in the Massif Central, France in 1981, followed by reintroductions of Cinereous and Bearded vultures. The Bearded Vulture has also made a remarkable comeback across the Alps. Griffon Vulture populations are increasing in several countries of the Balkan Peninsula. The Egyptian Vulture remains the most vulnerable vulture species in Europe, with a 50% decline across its range in the last 40 years, despite the stabilization or increase of some populations in Western Europe.

We will look into details about the population trends for species that occur in Europe and in the range states that border the Mediterranean Sea. The sources of the estimates include published reports from governmental and non-governmental organizations; unpublished data presented at conferences and workshops; personal communications with vulture experts; and other verifiable, but unpublished.

Vulture populations have undergone dramatic declines across Europe over the last century

Egyptian Vulture *Neophron percnopterus*

The total population estimate in Europe is between 2,688 and 2,931 breeding pairs. The largest European population is located in Spain (1,400–1,600 pairs), and there is no new data of the Spanish population since the last census carried out in 2018. Although the population seems to be stable at the national scale, there are significant variations in population trends among the autonomous communities of Spain. Population declines were recorded in 7 of the 15 autonomous communities where the species is present during the breeding season. The decline was highest in the most important strongholds for the species in Spain, namely Castilla-y-Leon, Aragon, and Extremadura. Population monitoring is therefore needed in these areas to assess current population trends and potential recovery in the future.

In Italy, Egyptian Vulture populations are stable or increasing slightly since 2018 (Table 1). However, local population declines are again being recorded in France after long-term population stability or increase (Table 1). For example, over the last 10 years, one territory loss was recorded per year in the western Pyrenees, the most densely populated area in France. This species remains vulnerable to anthropogenic threats and is dependent on continued conservation efforts in Western Europe.

The Egyptian Vulture population is overall stable in the Balkan countries with small yearly fluctuations (Table 1). New research published in 2021 has highlighted that though population reinforcement was able to postpone extinction of the species in the Balkans, actions improving survival probability, particularly of juveniles, were also required to stabilize this population in the long-term.

A global international conservation approach is crucial for this species and is currently being adopted, at least among Balkan countries. Additional data on dispersal rates and connectivity between western and eastern European populations would help in improving conservation actions.

Egyptian Vulture flying in front of breeding cliffs in France

Table 1: Current minimum estimates (year of the last estimate in brackets) and short-term trends (last 5 years since last estimate) of the breeding population of Egyptian Vultures across Europe

Country	Population size (number of breeding pairs)	Short-term population trend (2018–2021)
Albania	5 (2021)	Stable
Bulgaria	26 (2021)	Stable
France	85 (2021)	Small decline
Greece	5 (2021)	Stable
Israel	50–70 (2021)	Small increase
Italy	13 (2021)	Moderate increase
North Macedonia	12 (2021)	Stable
Portugal	67–90 (2018)	Moderate decline
Spain	1400–1600 (2018)	Stable

Bearded Vulture *Gypaetus barbatus*

Overall, the European population of Bearded Vultures have maintained a positive status during the last five years, with a total population of 465 breeding pairs (Table 2).

Spain holds the largest population with 163 breeding pairs, mostly located in the Pyrenees, at the border with France where 50 more pairs breed. The population seems to be stable or slightly increasing in the Pyrenees, while new breeding territories were recorded in areas where the species was recently reintroduced (e.g., 5 new pairs in Andalusia, 2 in Asturias, 1 in La Rioja), all within the historical distribution range.

Bearded Vulture populations have been increasing in the Alps (4 new breeding pairs since 2018 in Switzerland, 7 in Austria, 4 in Italy, and 13 in France). Overall, 2021 marked a new success for the Bearded Vulture reintroduction project in the Alps with 62 occupied territories producing a record number of 44 fledglings. The positive dynamic in France is also driven by the Pyrenean population.

The status of insular populations is weaker. In Crete, the population has shown an increase from 2018, from 7 to 10 breeding pairs. On contrast, the species is on the verge of extinction in Corsica with 1–2 pairs lost over the last years and with low productivity in the last two remaining pairs.

Table 2: Current minimum estimates (year of the last estimate in brackets) and short-term trends (last 5 years since last estimate) of the breeding population of Bearded Vultures across Europe

Country	Population size (number of breeding pairs)	Short-term population trend (2018–2021)
Andorra	1 (2021)	Stable
Austria	9 (2021)	Moderate increase
France	76 (2021)	Moderate increase
Greece	10 (2021)	Moderate increase
Italy	16 (2021)	Moderate increase
Spain	163 (2021)	Moderate increase
Switzerland	25 (2021)	Small increase

Immature Bearded Vulture flying over the Massif Central, France

Griffon Vulture *Gyps fulvus*

The Griffon Vulture is by far the most common species in Europe, with a total population between 35,000 and 42,000 pairs. The species has shown a steady increase in populations in Spain and France since 2014 (Table 3). The population trend in Spain is positive, with a 17.6–26% increase over the decade 2008–2018. However, the growth rate is lower than those obtained during the national censuses in the 1980s. This suggests that the Spanish population of Griffon Vulture could be reaching carrying capacity and will stabilize over the coming years. Interestingly, a group of Griffon Vultures has colonized the Balearic Islands in 2008 and has now established an expanding breeding population about 20 pairs.

Griffon Vulture flying over the breeding colonies of the Jonte Canyon in Massif Central

The population in France is also increasing, with a geographic expansion linked to the past reintroduction projects that ended in 1993 in Massif Central, and in 2007 in the Alps, accompanied by an overall increase in the number of breeding pairs at the national scale (Table 3). A striking 51% increase in the number of breeding pairs was recently recorded in the French Pyrenees between 2012 and 2019.

In the Balkans, the population trends for this species are also overall positive, but spatial variations in population growth rates are observed between countries, with strongest increases in Bulgaria and Serbia and decreasing trends in Greece and North Macedonia in the period 1980–2019. However, short-term population trends since the last update (2018–2021) seem to be positive in all the Balkan countries except for North Macedonia (Table 3).

Table 3: Current minimum estimates (year of the last estimate in brackets) and short-term trends (last 5 years since last estimate) of the breeding population of Griffon Vultures *Gyps fulvus* across Europe

Country	Population size (number of breeding pairs)	Short-term population trend (2018–2021)
Bulgaria	163 (2020)	Large increase
Croatia	121 (2021)	Small increase
Cyprus	3-4 (2021)	Stable
France	2848 (2021)	Moderate increase
Greece	359 (2021)	Small increase
Israel	48 (2021)	Small increase
Italy	270–290 (2021)	Moderate increase
North Macedonia	7 (2021)	Moderate decline
Portugal	1124–1210 (2017–2018)	Large increase
Serbia	230–233 (2020)	Large increase
Spain	30,100–35,500 (2019)	Moderate increase

A small group of Griffon Vulture and a Cinereous Vulture feeding on a dead sheep, deposited at a farmer's natural recycling station in France

Cinereous Vulture *Aegypius monachus*

Cinereous Vulture has made a remarkable increase since 2000 in Europe, with a total population size of 2,739–2,749 breeding pairs. The stronghold of the species is Spain, with 2,544 pairs recorded in 2018. Yearly monitoring of local populations showed that the Spanish breeding population has continued to grow in several areas. For example, in 2020, striking increases in the number of breeding pairs were recorded in the two most important breeding colonies in Europe located in Extremadura (+51% in Sierra de San Pedro and +24% in the Monfragüe National Park since 2016, VCF 2020). After a 50-year absence, around 20 breeding pairs were recorded in 2022 in the Sierra de la Demanda near Burgos, where a reintroduction project led by GREFA started 5 years ago. In France and Portugal, populations continue to increase with 16 and 5–15 additional breeding pairs recorded respectively since 2018 (Table 4).

Table 4: Current minimum estimates (year of the last estimate in brackets) and short-term trends (last 5 years since last estimate) of the breeding population of Cinereous Vultures across Europe

Country	Population size (number of breeding pairs)	Short-term population trend (2018–2021)
Bulgaria	1 (2021)	Small increase
France	53 (2020)	Moderate increase
Greece	31 (2020)	Stable
Portugal	30–40 (2021)	Moderate increase
Greece	359 (2021)	Small increase
Spain	2544 (2018)	Moderate increase

In eastern Europe, the population is stable in Greece where the only breeding colony is located in Dadia Forest National Park (31 breeding pairs estimated in 2020). In addition, the reintroduction project of this species that was launched in Bulgaria in 2018 resulted in the recent formation of six breeding pairs and the successful breeding of one pair in 2021 (Table 4).

New population estimates are not available for Turkey, but local experts recently highlighted an overall declining population trend with low breeding success and high mortality rates in a closely monitored population.

Conclusion

Overall, the Griffon, Bearded, and Cinereous vultures have a positive conservation status in core areas of Western Europe since the last population assessment. Egyptian Vulture populations have recovered in numerous areas, however, this is not the case in some regions. These positive results are linked to coordinated conservation efforts (including legal protection and increased food availability) and reintroduction projects that have helped restore these core vulture populations throughout the European continent. As a consequence, the Bearded and Egyptian vultures were down listed by BirdLife International to lower threat categories (to Near Threatened and Endangered respectively) in 2021.

Positive trends have also been observed in populations of Eastern Europe. The return of the Cinereous Vulture as a breeding species in Bulgaria is a good example of such recent progresses. However, the illegal use of poison remains a major threat to vultures in the Balkan countries. Recent research has also shown that the current stability of Egyptian Vulture populations observed in the Balkans depend closely on intensive conservation actions. Low annual survival probability due to poisoning, electrocution, and direct persecution increases extinction risk of these populations at the medium-term. Such results highlight the vulnerability of vulture populations in Eastern Europe and the importance of implementing national anti-poisoning road maps.

Continued monitoring is necessary to record recovery of vulture populations or to detect sudden negative changes in recovery trends

Additionally, vultures are also particularly vulnerable to ingesting lead in areas with intensive hunting throughout Europe and are good indicators of the risk of poisoning from lead ammunition. For example, in south central Europe, 44% of the samples collected on raptor carcasses (252 carcasses of 4 raptor species, i.e., Golden Eagle, Bearded Vulture, Griffon Vulture, and Cinereous Vulture) showed lead concentrations above threshold limit level in at least one tissue, and 26.2% had values indicating clinical poisoning. Recent research has also shown that lead poisoning is able to reduce Griffon Vulture population size in Europe by 12.1%. Promotion and enforcement of the transition to lead-free ammunition is therefore a priority for vulture conservation in Europe. Vulture poisoning using baits is still recorded in some countries (Spain, Italy, Balkans), however, special police canine teams, specialized in searching poison baits, were successful in reducing these threats in recent years. Yet this major threat may increase in others countries (e.g., France) due to human conflicts with predators of livestock such as wolf and bear.

Domestic sheep is the main food source of vultures at feeding stations in France

Another important reason for the success in restoring vulture populations in Europe is the establishment of vulture restaurants and the involvement of farmers to provide livestock carrion to the birds. Yet the situation varies between countries. While some countries such as Portugal and Italy mostly rely in a few large collective feeding stations, others such as Spain have adopted much less constrained regulations, allowing farmers to leave carrion in the field as such, making it available to vultures in so-called Scavenger Feeding Zones. The situation in France is intermediate, with the use of natural Recycling Feeding Stations by Vultures at individual farms.

Large populations of Griffon Vultures live in the Pyrenees

Continued and additional monitoring is necessary to monitor closely the recovery of vulture populations, or detect sudden negative changes in recovery trends with the emergence of new threats, such as from windfarm collisions, increased human-vulture conflicts linked to interactions with livestock and amplified by social media, or the re-emergence of old threats such as poison. This is crucial to monitor the effectiveness of conservation actions implemented to restore populations of European vulture species.

Further monitoring and research should focus on the establishment of the Critically Endangered Rüppell's Vulture in the Iberian Peninsula. Increased attention is also urgently needed on the monitoring of vulture populations in North Africa and Turkey as a first step to develop efficient conservation actions. ■

Acknowledgements

We thank all organizations and partners that have contributed data or expertise to provide an indication of recent population size and trends for these four vulture species across Europe.

Action Plan for Vulture Conservation in India, 2020–2025

Text: **Bivash Ranjan and Vibhu Prakash**

Bivash Ranjan, an Indian Forest Service officer of 1989 batch of Uttar Pradesh Cadre is the Additional Director General of Forests (Wildlife) at the MoEF&CC, Government of India. He was earlier Deputy Director General of Forests (Central Region), Lucknow and has made significant contribution in the field of wildlife conservation.

Vibhu Prakash joined BNHS in 1980. His main area of interest has been birds of prey. He was the first to identify crash in vulture population in mid-nineties and since then has been leading BNHS efforts on vulture conservation.

If one had suggested developing an Action Plan for Vulture Conservation a few decades ago, the idea would have been laughed at! In the 1980s, vultures were ubiquitous in India and one of the species, the White-rumped Vulture, was considered the most common large bird of prey in the world. Over the next two decades, the vulture populations across India crashed at a speed and scale that was unprecedented in the animal world. Fast forward to 2006, there were barely a few thousand birds left in India, down from *c.* 40 million in the 1980s. It took almost 10 years of intensive research by scientists, globally, to discover the cause of this unprecedented vulture mortality – poisoning from a most unsuspected source – cattle carcasses treated with the non-steroidal anti-inflammatory drug, diclofenac.

SACHIN P. RANADE

Slender-billed Vulture

COURTESY: MoEF&CC

Release of Action Plan for Vulture Conservation 2020–2025; L-R: Dr Vibhu Prakash Deputy Director, Vulture Conservation Programme, BNHS, Mr S.P. Yadav IFS, Member Secretary, Central Zoo Authority, Mr Soumitra Dasgupta IFS, ADG Forests (Wildlife), Mr Babul Supriyo Minister of State MoEF&CC, Dr Sanjay Kumar IFS, DG Forests & Spl Secy, and Dr Amit Mallick IFS, IG NTCA

The catastrophic decline in vulture populations prompted the Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India, to formulate the first Action Plan for Vulture Conservation in 2006 (APVC 2006; updated further in 2020), giving hope to the global conservation community against the imminent risk of extinction of vultures. APVC 2006 incorporated most of the findings and recommendations of the International South Asia Vulture Recovery Plan (2004), prepared by scientists and conservation practitioners from around the world.

Action Plan for Vulture Conservation 2006 (APVC 2006)

Summary: APVC 2006 assessed (a) the scientific evidence of cause of crash in vulture populations, (b) the existing infrastructure and expertise available to undertake large-scale vulture conservation efforts, and (c) listed institutions that could help in the conservation efforts. It prioritized the conservation actions needed to stem the continuous decline and to revive vulture populations, and laid down the following seven 'action steps' to arrest the decline of vulture populations:

1. Remove the main cause for vulture mortality, i.e., the drug diclofenac from vulture food
2. Prevent the misuse of human formulations of diclofenac for treating cattle
3. Monitor the remnant populations of vultures at different locations
4. Set up and expand the Vulture Conservation Breeding Programme
5. Prevent further mortality in vultures
6. Raise awareness on vulture conservation, especially among users of veterinary formulations of NSAIDs
7. Monitor implementation of the Action Plan.

The MoEF&CC, in coordination with State Forest Departments and technically supported by the Bombay Natural History Society (BNHS), took all the necessary measures to implement the action steps and succeeded in arresting the decline in the vulture populations by 2011.

The catastrophic decline in vulture populations prompted the Ministry of Environment, Forest and Climate Change, Government of India, to formulate the first Action Plan for Vulture Conservation in 2006

COURTESY: VCBC, PINJORE

Dr Vibhu Prakash addressing forest officer trainees at VCBC, Pinjore

Action Plan for Vulture Conservation 2020–2025

While all the action steps of APVC 2006 were successfully implemented, there were still a number of extant and emerging factors hampering vulture conservation efforts in the country. Therefore, the need was felt to revise the action plan for vulture conservation, to continue the current actions and to expand the scope of some of its objectives. To address these issues, the MoEF&CC developed the Action Plan for Vulture Conservation in India, 2020–2025 (APVC 2020–2025). The Action Plan was released by Shri Babul Supriyo, the then Hon'ble Minister of State for Environment, Forest and Climate Change, Govt. of India, on November 9, 2020, in the presence of senior MoEF&CC officials.

Salient features of APVC 2020–2025

The APVC 2020–2025 was drawn up with insights from other international action plans such as the Multi-Species Action Plan to Conserve African-Eurasian Vultures (Vulture MsAP) of the Convention of Migratory Species (CMS), the SAVE Blueprint for the Recovery of South Asia's Critically Endangered Gyps Vultures, and the Vulture Conservation Action Plan for Nepal 2015–19. It is a comprehensive plan which delineates the actions required for conservation of vultures in the country and defines the timeline for achieving goals. Most importantly, it fixes the responsibility of executing actions on the concerned Ministries, State Governments, and various scientific institutions. MoEF&CC, Ministry of Health & Family Welfare (MoH&FW), and Ministry of Fisheries, Animal husbandry & Dairying (MoFAH&D) have been tasked to jointly undertake vulture conservation efforts in the country.

a. Review of current status of vulture conservation and the actions required

APVC 2020–2025 offers a detailed review of APVC 2006, and records what further action is needed to improve the conservation status of vultures. It prioritizes the following urgent actions for vulture conservation:

1. Prevention of poisoning of cattle carcasses, the principal food of vultures
2. Enhancement of Vulture Conservation Breeding Programme in the country
3. Regular monitoring of vultures across the country
4. Enhancement of the Vulture Safe Zone (VSZ) network by creating at least one VSZ in each state and continuing to work on existing VSZs.
5. Identification and prevention of other causes of mortality in vultures

APVC 2020–2025 lists 'poisoning' of cattle carcasses by toxic NSAIDs as the biggest concern in vulture conservation in the country, based on scientific evidence. APVC 2020–2025 recognizes that poisoning of cattle carcasses by NSAIDs can be prevented only with help from MoH&FW and MoFAH&D. There is an urgent need for the MoH&FW to follow best practices in the sale, distribution, licensing of drugs for veterinary use, and the MoFAH&D to do the same for administration of drugs in cattle and disposal of carcasses. There is an immediate need for synergy between these concerned ministries to enable effective vulture conservation in India. APVC 2020–2025 recommends the following immediate actions by Central Government ministries to prevent the poisoning of cattle carcasses:

MoH&FW (Drug Controller General)

- Safety testing of new NSAID molecules on wild scavenging birds prior to market launch
- Establishing a coordinated and efficient regulatory mechanism for ban on drugs found toxic to vultures
- Ensuring sale of veterinary NSAIDs only on prescription. It is recommended that NSAIDs be moved to Schedule X of the Drug and Cosmetics Act 1940.

MoFAH&D (Commissioner, Animal Husbandry)

- Administration of only recommended veterinary doses
- Scientific management of carcass dumps

MoEF&CC

- Management of wild animal carcasses in protected and non-protected areas

Though the acute toxicity of diclofenac and other NSAIDs have been established only for *Gyps* vultures, all the nine species of vultures occurring in India are likely to be susceptible to diclofenac and other known toxic veterinary NSAIDs, namely, aceclofenac, nimesulide and ketoprofen, as they are closely related genetically, and all of them scavenge on carcasses of domestic and wild ungulates. Unlike the APVC 2006, APVC 2020–2025 recommends undertaking conservation efforts for all nine vulture species in the country.

The 2020–2025 Vulture Conservation Action Plan is comprehensive and delineates the actions required and the timeline for achieving the goals

b. Vulture Conservation Breeding Programme

APVC 2020–2025 advocates expansion of the Vulture Conservation Breeding Programme to include Red-headed Vulture and Egyptian Vulture, and establishment of more centres to cover the entire geographic area of the country. Apart from conservation breeding, the centres also cater to in-situ conservation efforts, thus acting as catalysts for conservation in areas around the centres.

PAUL INSUA-CAO

Sensitization of pharmacists

c. Periodic estimation of vulture populations in the country

Currently, there are no coordinated efforts aimed at estimating the population of vultures across the country. Such estimates are important for the managers of protected areas and senior forest officers to convince decision makers about the necessity of resource allocation for vulture conservation.

d. Vulture Safe Zone (VSZ) Programme

The VSZ Programme was initiated for conservation of remnant vulture population, reintroduction of captive-bred vultures into the wild, and as means of raising awareness about the plight of vultures. However, work on establishing VSZs has not started in all the States and requires a lot more urgency.

e. Other causes of mortality

APVC 2020–2025 takes cognizance of causes of vulture mortality other than contamination of cattle carcasses by diclofenac / other vulture-toxic NSAIDs. Poisoning of dead domestic animals by the owners to kill a rogue predator is often a problem for vultures in some parts of the country. Though it is not as serious a problem as NSAID contamination, it does need attention. Expansion of infrastructure, including renewable energy, and accidental death of vultures and other birds from collision is also a cause of concern. APVC 2020–2025 recommends collection of systematic information on vulture mortality to determine the extent of the problem and possible remedial measures. After receipt of information, mapping of mortality and its causes can lead to appropriate evidence-based scientific management prescriptions.

f. Institutional mechanism for implementation of APVC 2020–2025

The implementation of APVC 2020–2025 is possible only when there is an effective strategy and timeline for achieving all the conservation actions. To meet this need, the concerned Ministries have been designated as part of a National Committee for implementation of the Action Plan. This Committee is chaired by the Secretary, MoEF&CC and includes the Drug Controller General of India (DCGI) and the Commissioner, Animal Husbandry, as its members. The Committee is responsible for devising strategies to implement the proposed actions and to issue guidelines and directions to State Committees for implementation of instructions. The State Committees are chaired by the Principal Chief Conservator of Forests (PCCF Wildlife) and the Chief Wildlife Wardens of the States and include the State Drug Controllers and Director of Animal Husbandry as members. Both State and National committees may consult members from other ministries and institutions for inputs on specific action points. The National Committee also acts as the executive committee for the existing National Vulture Recovery Committee (NVRC), which has members from various stakeholder groups and is chaired by an Additional Director General (ADG) of Forests, MoEF&CC. The National Committee periodically reviews the work of the State Committees and monitors their progress.

g. Duration of APVC 2020–2025 and mid-term review

APVC 2020–2025 recommends a midterm implementation review by a committee headed by the Inspector General (Wildlife) to suggest course correction in the strategies by mid-2023. The Plan expires in 2025, but has provisions of extension by 5 years.

h. Expected Outcome after five years of implementation of APVC 2020–2025

APVC 2020–2025 aims to achieve ambitious goals at the end of five years of implementation. The expected achievements are:

1. All existing molecules of NSAIDs should have been safety tested, and restrictions should be in place on the veterinary use of the ones found to be toxic to vultures.
2. NSAIDs should be put in Schedule-X of the Drugs and Cosmetics Act 1940, i.e. they should be available on prescription of veterinarians only, and one copy of the prescription should be retained by the chemist.
3. Livestock should be treated by qualified veterinarians following the best practices, including administration of prescribed doses of drugs to animals.
4. A robust regulatory mechanism should exist by which all vulture-toxic NSAIDs are automatically banned for veterinary use.
5. Disposal of domestic carcasses should be scientifically managed and vultures should not be exposed to contaminated carcasses.
6. The carcasses of wild ungulates should be left out in the open in protected areas and reserved forests for scavengers.
7. The locations for the proposed vulture safe zones should have been identified in all the States and all the species of vultures should be covered in at least two States. Vulture populations should be monitored in all the proposed vulture safe zones, and monitoring of the prevalence of various veterinary drugs should also be carried out through pharmacy surveys and cattle carcass sampling.
8. The additional Vulture Conservation Breeding Centres proposed in the APVC 2020–2025 and the existing centres should be fully functional and should follow the standard protocols developed by the Central Zoo Authority.
9. Vulture reintroduction programme should continue, and released vultures should be monitored by satellite tracking. There should not be any drug-related mortality.
10. The baseline information on the population trends must be established for all the nine species of vultures in the country, both at the national level and at the State level. Coordinated nation-wide counts should be carried out every four-five years.
11. Populations of none of the vulture species should be declining.

The National Committee headed by Secretary (Wildlife), MoEF&CC, is expected to announce the status on the above goals during the National Vulture Recovery Committee meeting in 2025. Hopefully by then, following the effective and complete implementation of APVC 2020–2025, all the species of vultures will have a safe conservation status and there will not be any need for the extension of any aspect of the Action Plan. This may sound futuristic and improbable today, but given the commitment of the various stakeholders, it is possible that a miracle may happen in the natural world! ■

VULTURE CONSERVATION IN ASIA

RAJAT BHARGAVA

The Action Plan for Vulture Conservation 2020–2025, has provisions of extension by 5 years, but let the need for it never arise as, hopefully, all the species of vultures will be safe by then

Coordinating a Response to the Asian Vulture Crisis:

Creation of the SAVE consortium

Text: **Christopher G.R. Bowden**

There have been few faster, more dramatic and wide scale declines of any species than those of the South Asian resident Gyps vulture populations since the 1990s. Once scientists unravelled the main cause of the declines (see *The status of vultures in South & Southeast Asia* page 22), it was essential that a coherent and science-driven response should quickly be put into action across South Asia, based upon well understood priorities and actions that could realistically be implemented. This meant traversing a complex set of political, inter-organizational, vested interests of the pharmaceutical industry as well as veterinary and rural livestock-owners.

Ironically, the key challenge was to bring the conservation community (including governments) together to agree on the major focal actions! An array of NGOs, with some government backing, had taken the crucial first steps to get veterinary diclofenac banned in the four South Asian countries (Bangladesh, India, Nepal, and Pakistan), and viable numbers of founder captive stock into breeding centres. However, there was still the need for a wider, transparent, and recognized framework to coordinate actions among the different actors involved in vulture conservation. With this in mind, the SAVE consortium – Saving Asian Vultures from Extinction – was created. SAVE was launched in February 2011 at high profile events in Delhi and Kathmandu with 14 founding partners, including national and international expertise, and attended by senior politicians. The partnership has met each year in the region (virtually during the pandemic) since then and grown from the original 14 to 25 active partners.

COURTESY: RSPB

COURTESY: RSPB

Launch events in Delhi (above) and Kathmandu (below) were attended by the then Indian Environment Minister, Shri Jairam Ramesh, and Nepal's Speaker of the House

Why the need for a consortium?

There were several reasons and recognized needs that prompted the decision to create and formalize a consortium. Despite the clear evidence of the main cause of the population decline (the drug diclofenac used to treat pain and swelling in livestock), there remained some reluctance to accept this as the main and ongoing threat. It was, therefore, important to have a recognized and scientifically respected forum with a clear identity, one that could be a credible voice for vulture conservation in the region, and which could keep a clear, transparent, and scientifically backed focus on what was most needed to conserve these species. One important channel for that voice is an up-to-date and informative website (www.save-vultures.org) providing resources to support SAVE partners, as well as for others interested or involved in the conservation of South Asia's vultures.

The creation of a forum would help identify the priority actions to save vultures and coordinate their implementation, while annual meetings would build trust and understanding between partners, maintaining wider perspectives and allowing transparent opportunities for updating priorities. As a starting point, the SAVE partners jointly developed a Blueprint for Recovery of Asia's Globally Threatened Vultures, which lists the actions needed and who is going to do them. This blueprint is reported against and updated annually when the consortium comes together, and so measures progress against the goal of bringing back vulture populations.

Another value of the SAVE partnership is that a central consortium helps donors and governments know where to direct their resources,

RAJAT BHARGAVA

The unprecedented declines of vultures across Asia demanded a strong, cohesive, and scientifically-based response from a wide range of NGOs and governments

Chris Bowden has worked on threatened birds for the RSPB (UK) for over 30 years. He helped establish SAVE and has worked on Asian vultures since 2004.

CHRIS BOWDEN/RSPB

Dr Vibhu Prakash was the first to identify the crash in vulture population in India; he leads the BNHS efforts on vulture conservation

to create the most impact. Several range-state governments and government institutions have become formal SAVE Partners and have actively used, participated, and engaged with SAVE.

The Scope of SAVE

SAVE set out to coordinate efforts for the three Critically Endangered Gyps vultures: White-rumped Vulture *Gyps bengalensis*, Indian Vulture *Gyps indicus*, and Slender-billed Vulture *Gyps tenuirostris*. However, reporting has also included work on the Critically Endangered Red-headed Vulture *Sarcogyps calvus*, which has an entirely overlapping range with the Gyps vultures, and there is evidence that it faces the same threats. In 2019, it was also agreed that the scope should extend to all globally threatened vulture species, so Egyptian Vulture *Neophron percnopterus* is also now included, being listed as Endangered.

SAVE is a consortium of like-minded, regional and international organizations created to oversee and co-ordinate conservation, campaigning, and fundraising activities to help South Asia's vultures

The initial geographical focus of SAVE was the four South Asian countries named above, that support most of the three resident Gyps vultures and where diclofenac had been shown to be the main threat. Outside of South Asia, the only countries with significant populations of the target vulture species are Cambodia and Myanmar, so it has been logical to include partners from those countries, despite diclofenac not being the main threat there. It is hoped that Bhutanese and Laos partners will also join SAVE in the near future.

Key elements needed to initiate SAVE

The organizations already actively working and providing significant resources were the ones responsible for creating the consortium. BNHS, one of the founding organizations of SAVE, was among the first to bring the plight of India's vultures to the attention of the Indian public and the world. From the outset, BNHS had close support from the UK's Royal Society for the Protection of Birds (RSPB), which supports the SAVE Programme Manager position to facilitate and proactively coordinate the consortium. The Programme Manager originating from outside the region has certain advantages of neutrality, and needs to be accepted by all the potential partners in this role.

The appointment of the SAVE Chair as a respected figurehead is also important, and SAVE has been fortunate that world-renowned and well-established raptor scientists and conservationists have accepted this role each for a four-year term, namely Professors Ian Newton and David Houston. Professor Rhys Green of Cambridge University, UK, took on this role in 2019, having played a key role in the programme since 2003.

A manifesto was drafted at the outset, outlining the central priorities and principles of SAVE, together with terms of reference and methods of working. These were developed by the founding partners and became part of the agreement for the 14 founding partners to sign up to. A logo was also designed to further confirm a sense of identity.

Composition of SAVE and how it works

SAVE has categories of partners that reflect their relative or geographical involvement. These are: 1) Core Partner – those most fundamental to the implementation of priority actions, and carrying a position on the SAVE Board; 2) Government Partner – for the range state government bodies and forest departments; 3) Project Partner – for other key organizations working across the region; and 4) Associate Partner – for locally-based organizations that are playing a role in implementing priority actions. Unlike Core and Project Partners, SAVE Associates are invited on a two-year renewable basis, designed to highlight priority work on the ground to potential donors and supporters. Inclusivity is a guiding principle for all categories and the consortium encourages the involvement of all organizations actively involved in the conservation of vultures in South Asia.

The SAVE Board comprises representatives of Core Partners and makes overall decisions guiding the direction of SAVE and its mission to protect Asian vultures. The Board, and SAVE in general, is supported by a Technical Advisory Committee formed of a network of experts who ensure that the best advice is made available for decision-making, e.g. on vulture ecology, breeding, releases, and pharmacology. There is also a Fundraising, Advocacy and Communications Committee, which is gradually becoming more active. Composition of Board and both committees is posted on the website www.save-vultures.org/who-we-are2?

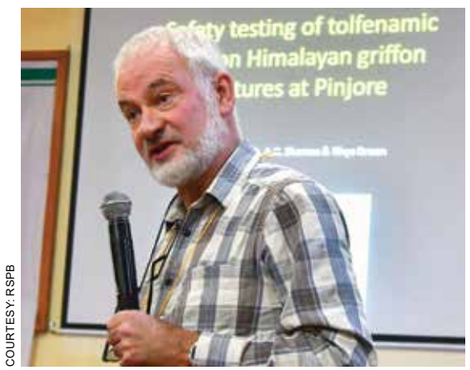
Main achievements and challenges

Since starting up in 2011, the partnership has met annually with 40–50 attendees each year, charting the progress so far in turning around the fate of Asian vultures, through updates of all participants to the SAVE Blueprint. The meetings also provide guidance and ensure consistency of practices based upon the latest scientific understanding. Over the years, the partnership has grown from 14 to 25 signed-up partners, and extends to Cambodia and more recently Myanmar. Three Government bodies have also formally signed up among the partners.

Great progress has been made over recent years. Breeding programmes, especially in India, are developing well and rapidly approaching the release phase. Vulture Safe Zones, developed originally in Nepal, are being extended to all countries, following major success in reducing diclofenac use there, and the Nepalese vulture populations responding with the first significant recoveries. In Bangladesh, Vulture Safe Zones have been taken to a new level through legal recognition and gazettement by the government, and the drug ketoprofen being banned within these areas, which is a step ahead of neighbouring countries. Cambodia too has engaged well and

CHRIS BOWDEN/RSPB

Jemima Parry-Jones of International Centre for Birds of Prey, UK, an expert in raptor captive breeding and raptor biology, addressing a gathering at the 9th SAVE meeting



COURTESY: RSPB

Professor Rhys Green of Cambridge University took on the role of SAVE Chair in 2019

Composition of the SAVE Partnership

SAVE Core Partners (Board)

Bird Conservation Nepal (BCN)

BNHS India

Bangladesh National Vulture Recovery Committee (BNVRC)

The International Centre for Birds of Prey (ICBP)

Royal Society for the Protection of Birds (RSPB)

WWF Pakistan

Hawk Conservancy Trust (HCT)

Cambodia Vulture Working Group

National Trust for Nature Conservation Nepal (NTNC)

Myanmar Vulture Working Group

BirdLife International

Project Partners (including Research)

Zoological Society of London

Wildlife Conservation Society

The Peregrine Fund

NatureLife Cambodia

Project Partners

Environmental Research Institute (UK)

Indian Veterinary Research Institute

VULPRO & University of Pretoria (both South Africa).

SAVE Associates

Arulagam

The Corbett Foundation

Neo Human Foundation

Prokriti O Jibon

Government Partners

Bangladesh Forest Department

Department of National Parks & Wildlife Conservation (Nepal)

CHRIS BOWDEN/RSPB

SAVE Partners in session updating the regional Blueprint Recovery Plan

was able to respond to diclofenac appearing in veterinary use with a quickly implemented ban.

SAVE Blueprint

Recovery Plan for Asia's Globally threatened vultures is the backbone of SAVE and how it functions. It has now been adopted by the Inter-Governmental Regional Steering Committee, which is a body of the four involved South Asian countries created in 2012. More recently, SAVE has been recognized through international environmental agreements – the Convention of Migratory Species and Raptors MoU – and the SAVE Blueprint is directly integrated into the Vulture Multi-species Action Plan, which covers all African and Eurasian vultures. All of these are important international endorsements of the consortium's efforts and successes.

Despite the success, there are several challenges to our work moving forward. SAVE has yet to attract any significant funding and currently relies heavily on resources from RSPB. However, with growing commitments from vulture-range governments, there are encouraging signs that this may be starting to change. Each partner does carry out its own fundraising and these efforts are strengthened by SAVE's role in coordination. The fact that SAVE is seen to be influenced by outsiders or may appear exclusive can also hamper the programme being accepted in some cases. The area over which the partnership operates perhaps means that this is inevitable. In recent years, Associate Partners have been introduced and encouraged, and this has been one way to be more inclusive.

Probably, the biggest remaining challenge is that the veterinary drug regulation systems in all vulture-range countries do not yet operate using the precautionary principle. This means that bans on other known vulture-toxic NSAIDs have not occurred, despite good evidence and consistent lobbying. However, SAVE has enabled the establishment of a multi-country research programme (including surveys of NSAIDs in cattle carcasses and pharmacies, vulture population monitoring along road-transects, and vulture post-mortem protocols). This programme has resulted in positive outcomes, and continues to provide the scientific basis from which we can focus and reinforce our messages, and effectively share knowledge and experiences across borders.

For more information about the SAVE consortium and for the latest news please visit save-vultures.org ■

Resident Gyps Vulture Conservation Breeding Programme in India:
Insurance against Extinction

Text: **Vibhu Prakash and Nikita V. Prakash**

Vibhu Prakash joined BNHS in 1980. His main area of interest has been birds of prey. He was the first to identify the crash in vulture population in the mid-nineties, and since then has been leading BNHS efforts on vulture conservation.

Nikita V. Prakash is Scientist C with the BNHS Vulture Conservation Programme. She leads the artificial incubation and double clutching of Gyps vulture eggs and has helped to hatch and raise over 300 nestlings.

On February 12–13, 2004, BNHS organized an International South Asian Vulture Recovery Plan workshop at Parwanoo, Himachal Pradesh, to formulate a strategic plan for three resident Gyps species of vultures (White-rumped Vulture, Indian Vulture, and Slender-billed Vulture) that were hurtling towards extinction in the Indian subcontinent. The workshop was attended by renowned experts on vulture conservation from the Royal Society for Protection of Birds (RSPB), UK, Zoological Society of London (ZSL), UK, National Birds of Prey Centre (NBPC), UK, Hawk Conservancy, UK, The Peregrine Fund (TPF), USA, Washington State University, USA, and University of Glasgow, UK. Experts of the IUCN Conservation Breeding Specialist Group and IUCN Reintroduction Specialist Group were also present. There was representation from the Ministry of Environment, Forest and Climate Change, Government of India (MoEF&CC), Forest Departments of Haryana, Himachal Pradesh, Assam, and Gujarat, Wildlife Institute of India (WII), and Zoological Survey of India (ZSI). There were conservation organizations from within the country and from neighbouring countries, including Nature Conservation of Nashik, Wildlife Trust of India, Bird Conservation Nepal, and Ministry of Agriculture, Forests and Fisheries, Cambodia.

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Himalayan and White-rumped Vultures

SHIVJOT SINGH

Drone image of the BNHS Vulture Conservation Breeding Centre, Pinjore, Haryana

Despite the grim situation for vultures, the mood amongst the workshop participants was that of hope, since by then there was clear evidence of what was causing the crash in vulture populations in India – diclofenac, a non-steroidal anti-inflammatory drug (NSAID), used as a veterinary pain killer. Scientists had for almost 10 years been groping in the dark to find out the cause of the population crash, until researchers at The Peregrine Fund, a US based NGO working in Pakistan, conclusively proved that diclofenac was the culprit. Subsequently, the RSPB, ZSL and Poultry Diagnostic Research Centre (PDRC), working in India also confirmed that diclofenac was indeed the cause of the crash in vulture populations.

Need for a Vulture Conservation Breeding Programme

Even though the cause of decline had been identified, there remained a real possibility of the three resident Gyps species going extinct in India, since 97% of the populations had been lost within a decade. During the deliberations on a recovery action plan, the discussions focused upon principal causes of the recent catastrophic declines, and the activities required to counter them. The major recommendations of the workshop included an immediate ban on the veterinary use of diclofenac and identification of an alternative drug safe for vultures, to avoid further decline in vulture populations. However, the participants felt that such measures were unlikely to be adequate to prevent an extinction,

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Ground view of the BNHS Vulture Conservation Breeding Centre

since the vultures were declining at a rate of 50% per year – the fastest decline ever recorded in any vertebrate species. In addition, the rate of decline was 10 times higher than the extinction threshold mortality rate of 5% for such slow breeding birds. Hence, it was recommended that as many wild individuals of the three species as possible be captured, to be followed by a Vulture Conservation Breeding Programme (VCBP). Since BNHS was leading vulture conservation efforts in India ever since the crash was noticed in the mid-nineties, the Society decided to take up the VCBP for the country.

The Concept

The envisaged VCBP intended taking into captivity a certain number of pairs of each of the three Gyps species, to be housed at different locations in India for captive breeding. With time, the offspring and a few adults would be released into the wild, after ensuring that the threats in their habitats were addressed. Breeding programmes are not the best of conservation interventions, but have proved crucial in saving species when it was difficult to save them in their natural habitats, because of looming threats. Species like the Californian Condor, a New World vulture, owes its continued existence to a successful breeding programme, as do the Mauritius Kestrel and many other species.

Commitments prior to taking up the Conservation Breeding Programme: Right from the onset, it was evident that conservation breeding and subsequent reintroduction would be a long-term and expensive undertaking, and a prudent assessment of the personnel and finances available was necessary. It was also understood that since vultures reproduce slowly, the establishment of an adequate number of birds to be released into the wild would take a considerable amount of time, necessitating commitment in terms of decades rather than years.

Consequently, prior to initiating the programme, it was ensured that adequate facilities, expertise, and funding were available. It was also decided to establish several sites, in case individuals in one captive population were lost due to disease or other potential disasters. BNHS had gained enough experience in captive holding, husbandry, and care of vultures by setting up the first Vulture Care Facility at Pinjore in 2001, as part of our efforts to identify the causes of vulture mortality, so initiating the programme was less problematic. The facility was already in place to hold some birds, and there were hospital aviaries and veterinary facilities to take care of sick and injured birds. Our staff, consisting of Project Manager, veterinarians, and vulture keepers, were well-trained in handling vultures. Moreover, the first author was trained in captive management and care of raptors and vultures at National Birds of Prey Centre, Newent (now called the International Centre for Birds of Prey) for three months in 2001. RSPB, the Birdlife Partner in UK, promised technical and financial support for running the Conservation Breeding Programme.

> An immediate ban on the veterinary use of diclofenac and identification of a safe alternative drug for vultures avoided further decline in vulture populations

Plan of Vulture Conservation Breeding Programme

Population size and age composition of founder populations: A simple deterministic model for a captive vulture population and a wild population derived from the captive population, indicated that if 600 pairs of each of the three species were released into the wild, they would form a self-sustaining population. A breeding centre with 25 pairs would be capable of producing a derived wild population of 100 pairs in about 10 years after the initial release. Releases would not begin until a minimum of 16 years had elapsed since the capture of the founding stocks, as most of the founders would be taken as nestlings or juveniles. To allow for mortality in captivity and unequal numbers of the sexes taken from the wild, it would be necessary to take about 60 birds of each species from the wild to initiate a centre, which would eventually lead to the restoration of a single wild population of 100 pairs, 16 or more years later. A preliminary evaluation of the proposed captive breeding and release programme indicated that this strategy would preserve a high proportion of the original genetic diversity of the vulture population.

Vultures are slow breeding, long-lived birds; their age can be determined based on the colour of their plumage and shape of the feathers only till

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(L-R): Adult Slender-billed, Indian and White-rumped vultures at the VCBC

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A pair of White-rumped Vulture

they are 5–6 years old. In a breeding programme, it is important to have birds of known age. It was, therefore, decided to have 70–85% of the founder population as month-old nestlings or first year birds, 10–15% subadults (2–4 years old), and the rest as adults. The adults and subadults were expected to act as guide birds for the nestlings and juveniles, both during the breeding as well as the release programme.

Components of the Conservation Breeding Programme

Location of the VCBC: It was decided to convert the Vulture Care facility at Pinjore into the first Vulture Conservation Breeding Centre (VCBC) in India. The Haryana Forest Department was quick to give us permission to utilize an additional four acres of land adjoining the Vulture Care Centre. In designing aviaries and other facilities in the centres, we were fortunate to get help and advice from Ms Jemima Parry-Jones, Director of National Birds of Prey Centre, Newent, UK, and an authority on captive breeding of raptors and vultures.

Infrastructure for housing birds in VCBC: Construction of the first colony aviary (the main aviaries of the conservation breeding facilities) started in September 2004. Colony aviaries measure 100 x 40 x 20 ft, and can house 30–35

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Releasing a White-rumped Vulture from a transport box into an aviary

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View of the main colony aviary of the breeding facility

adult vultures. As these are social birds and live in flocks, the aviaries are designed to be sufficiently spacious for birds to carry out their routine activities and to breed. Usually, adult and subadult birds are housed in these aviaries. Colony aviaries contain four water troughs, concrete nesting ledges, as well as nesting cots made of jute netting with wooden frames. An adequate number of perches are provided at different heights; they are always wound with coconut rope to give a rough surface for the vultures to perch on. This prevents pressure sores, which lead to bumble foot, which could make the bird lame. Bumble foot is a big problem when holding large birds of prey in captivity, since they remain perched most of the time, whereas in the wild they are airborne for over 60% of the time. There are other aviaries of different sizes for different purposes as well – holding aviaries that house up to six birds, and breeding aviaries to house a pair of breeding birds. There are also smaller aviaries that are used as hospital aviaries to treat injured and sick

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Rough surface is provided for vultures to perch on to prevent pressure sores

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Egg being removed for artificial incubation and double clutching

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Swapping of nestling with second clutch egg at VCBC

birds, and some of these are also used as nursery aviaries to house nestlings.

Collection of founder populations of vultures: In 2004, we began building the founder stock of vultures at VCBC-Pinjore, with four nestlings of White-rumped Vulture that were brought to the Centre from Haryana. We started collecting our founder stock from different parts of the country (primarily Haryana, Rajasthan, Madhya Pradesh, Maharashtra, and Gujarat) to ensure good genetic diversity. Several White-rumped were rescued from Gujarat, by animal charities after they were injured by kite strings. Indian Vulture were collected largely from Madhya Pradesh, Rajasthan, Maharashtra, Haryana, and Gujarat. Slender-billed Vulture could be collected only from Assam.

Transport of vultures from collection sites to the VCBC: Vultures were transported by air or in air-conditioned vehicles. Air India and Jet Airways were helpful in transporting birds, and they frequently had aircraft with pressurized holding areas, where live birds could be kept. The vultures were transported in rectangular top-open wooden boxes with small holes on all sides for ventilation. Small holes prevent accidental injury to the fingers of vulture handlers.

Introduction of vultures into the VCBC: When birds arrive at the Centre, they are first taken to a quarantine facility, away from the main VCBC. This facility has temporary aviaries built of netlon. Quarantine is essential for preventing spread of diseases in the VCBC, so the birds are kept in quarantine aviaries for at least 45 days, which is the incubation period of Ranikhet disease – one of the most prevalent avian diseases in India, and with the longest incubation period. The 45-day quarantine ensures that any diseases that the birds may harbour would manifest themselves. At the end of the quarantine, all birds introduced in the VCBC are ringed and micro-chipped for identification.

Feeding of vultures at VCBC: Vultures are fed on the meat of goats that have been in the care of VCBC for 10 days before they are offered to the birds, to ensure that the meat is free from

diclofenac. Even if the goats were treated with diclofenac when brought to the VCBC, the drug would be excreted within 72 hours. Extreme care is taken to ensure that the meat provided to vultures is free of diclofenac. Each vulture is fed about 4 kg of meat twice a week. The feeding schedule is designed to mimic conditions in the wild, as vultures do not get food every day. Vultures are social birds, but there is no hierarchy; hungry birds are dominant and are allowed to eat first. Vultures love to bathe in clean water after feeding or when there is strong sunlight. It is, therefore, important that the water troughs are kept clean with an overflow every day. After bathing, vultures expose their wings to sunlight to get rid of ectoparasites and for thermoregulation. Whenever there is strong wind, they spread their wings and jump to exercise, as is typical for all raptors. This helps to keep pectoral and femoral muscles in good shape.

Vultures are slow breeding and long-living birds and their age can be determined only till they are 5–6 years old, based on the colour of their plumage and shape of the feathers

i. **Sequence of events during breeding season – vulture courtship and pair formation**: Vultures are not sexually dimorphic; the male and female look alike, but among themselves they have no problem in identifying sexes! Gyps vultures start pairing when they are three to four years old. Usually, the male offers a twig to the female, and if she accepts it, they pair for life. They select a nest cot and are usually seen together. They may make a nest during the breeding season and lay a single egg. However, fertile eggs are laid only when they are over five years old. A White-rumped Vulture pair was the first to start breeding at VCBC-Pinjore, in 2005. The first successful breeding happened in 2008. The first successful breeding of Slender-billed Vulture was in 2009, while that of Indian Vulture was in 2011.

ii. **Commencement of breeding season and nest building**: The breeding season commences from October for all three species. They start defending the nest cot and may start nest building. Both sexes take equal part in all the nesting activities. Some pairs make huge nests, but some only with a few sticks.

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An Indian Vulture incubating. The egg hatches in 55 days

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Nestlings being reared in the nursery aviary

iii. **Incubation and nestling period**: Vultures lay one egg per year, and eggs are usually laid in December. The egg hatches after an incubation period of about 55 days, by end January. Vulture nestlings hatch with a sparse coat of down feathers. Their thermoregulation is not well developed, so they are brooded by their parents for about 45 days. Both the parents share equal responsibility in incubation and raising nestlings. The nestling feeds from day one on meat regurgitated by the parents. The nestling can either pick up food from the nest or grab it from the parent's beak. The average hatch weight of a nestling is *c.* 150 gm, but within three months it increases to over 4 kg. Such a high growth rate requires a lot of calcium. Parents regularly feed pieces of bone to the nestling to provide it with enough calcium for normal growth. The nestling is able to stand up when it is over 50 days old. If there is calcium deficiency, the nestling may develop metabolic bone disease and will not be able to stand – it is unlikely to survive. White-rumped nestlings fledge in about 110 days, Indian Vulture in about 130 days, and Slender-billed in about 150 days. Most of the chicks fledge by June. Just before fledging from the nest, the nestlings are marked with a leg ring and microchip in their breast muscles. Identification is important in a conservation breeding programme to avoid inbreeding, and all records related to captive-bred birds are kept in an electronic database. All the nestlings are removed from the colony aviary within a month of fledging, and housed in holding aviaries. Fledglings, if allowed to remain in the colony aviary, disturb breeding birds by throwing away the nest material.

iv. **Artificial incubation, double clutching, and chick swapping**: Vultures lay one egg per year, but if the egg is lost within a month of laying due to certain reasons, they tend to lay again. We exploit this tendency of the birds, and remove the first clutch egg for artificial incubation, and a second clutch egg is laid after three weeks or so. The eggs are incubated in octagon hot air incubators, which are run at 36.3 to 36.9 °C. The incubation room is thermo-controlled and temperature is maintained between 19–21 °C. The chick hatches in about 55 days. It is hand reared for 10 days and given back to the parents on the nest, after removing the second egg which is laid by then. This is called double clutching and chick swapping. It is possible to foster-rear the chick by giving it to another pair, as vultures have no olfactory sense and do not recognize their nestlings. The second egg is incubated artificially. This is how we attempt to get at least one chick per pair.

Current status of the Vulture Conservation Breeding Programme

The BNHS's Vulture Conservation Breeding Programme has been very successful. There are 817 vultures of three species housed at the various centres (Table 1). The centres at Pinjore, Rajabhatkhawa, Rani, and Bhopal have most of the captive population of vultures. The highest number of all the three Gyps species are housed at Pinjore. The Rani centre has a substantial number of Slender-billed Vulture, which is probably the most endangered species among vultures. Over 531 nestlings have hatched and fledged from the centres managed by BNHS till 2022. All the three species have been captive-bred, or raised artificially. Artificial incubation, double clutching, and chick swapping is practised only at the Pinjore centre.

The Central Zoo Authority has designated VCBC-Pinjore as the coordinating Zoo for its Vulture Conservation Breeding Programme. CZA decided to set up five more centres in the country at different zoos with technical support from VCBC-Pinjore. The centres at Van Vihar Zoo, Bhopal; Nandankanan Zoo, Odisha; Nehru Zoological Park, Telangana; and Sakkarbaugh Zoo, Junagarh were sanctioned in 2007. The centre at Muta in Ranchi, Jharkhand, was sanctioned in 2009. CZA, with the help of VCBC-Pinjore, published a Working Manual for Vulture Conservation Breeding Programme in 2012, which gives guidelines and protocols for establishing and running such a programme.

VCBC-Pinjore also functions as a training facility for biologists and veterinarians so that when permission and land is obtained, they can be sent to establish VCBCs in other states. It also ensures uniformity in the design of the centre, husbandry, and care protocols. For example, Sachin P. Ranade was sent to set up the VCBC at Rajabhatkhawa, West Bengal in 2005, which he managed to establish by 2006 on the lines of VCBC-Pinjore. He was with the VCBC-Pinjore as a biologist since 2001 and had experience of all

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Feeding a piece of bone to the chick to fulfil calcium requirement (Still image from a video footage)

aspects of work at a conservation breeding centre. Similarly, Dr Debojit Das, Veterinarian, was sent to Rani, Assam, to establish the centre in 2007. Dr Rohan D. Shringarpure started operations at VCBC-Bhopal in 2013.

Preparing to reintroduce captive-bred vultures into the wild: The ultimate objective of the VCBP

The primary aim of the Programme – besides having captive populations as a safeguard against total extinction – is the reintroduction of captive-bred populations of vultures into the wild to augment the existing wild population. The

Table 1: Vultures at the centres in 2022

Species	Pinjore	Buxa	Rani	Bhopal	Hyderabad	Junagarh	Nandankanan	Total
White-rumped Vulture	138	93	86	19	12	45	0	393
Indian Vulture	209	35	0	41	0	7	18	310
Slender-billed Vulture	52	18	44	0	0	0	0	114
Total	399	146	130	60	12	52	18	817

Where 0 – means not housed

Table 2: Total number of nestlings hatched at the centres until 2022

Species	Pinjore	Buxa	Rani	Bhopal	Total
White-rumped Vulture	133	73	48	4	258
Indian Vulture	173	22	0	14	209
Slender-billed Vulture	38	6	20	0	64
Total	344	101	68	18	531

programme has been successful in breeding a good number of vultures every year, and the prevalence of diclofenac in cattle carcasses, the principal food for vultures, has come down due to various measures taken. We have now initiated steps for reintroduction of captive-bred vultures into the wild. The following steps are being undertaken by the BNHS and supporting agencies to ensure the survival of the released birds:

i. **Ban and restriction on use of vulture-toxic NSAIDs**: While the Vulture Conservation Breeding Programme was being established, BNHS was taking steps to make the environment safe for the ultimate release of vultures. BNHS succeeded in persuading the Government of India to ban the veterinary use of diclofenac in 2006; this was gazetted in 2008. In 2015, the Government also restricted the vial size of human-use formulations to just 3 ml, to prevent their misuse in treating cattle. These measures will certainly reduce the use of diclofenac. BNHS, in collaboration with the Indian Veterinary Research Institute and RSPB, UK, also succeeded in safety testing of the drug meloxicam on vultures in 2006, and found it to be safe. Similarly, safety testing of another NSAID, tolfenamic acid on vultures was done recently and it was found to be safe. Unfortunately, three more veterinary NSAIDs have been found to be toxic and have caused mortality to vultures. Aceclofenac is a pro-drug of diclofenac and gets converted into diclofenac in a few hours on administration, so it is as toxic as diclofenac. Nimesulide also proved to be toxic to vultures in experiments done in South Africa and India. Ketoprofen was found to be toxic to vultures in South Africa. Pharmacy surveys carried out in different parts of the country over the years indicate that the use of diclofenac is going down, and the vulture-safe meloxicam is becoming popular; however, aceclofenac and nimesulide continue to be prominently used in veterinary care. Human-use formulations of diclofenac are still misused in many states, especially in Uttar Pradesh, Punjab, and Assam. Attempts are being made to persuade the Drug Controller General of India through the MoEF&CC to ban the veterinary use of these toxic drugs.

ii. **Testing the safety of the environment by releasing captive-bred vultures near Conservation Breeding Centres**: We have done test release of vultures from the Pinjore and Rajabhatkhawa centres. On October 8, 2020, eight birds were released from VCBC-Pinjore with tracking devices, four with GPS satellite tags (Platform Transmitter Terminal), and four with GSM tags that work on mobile phone technology. None of the birds died of NSAIDs poisoning; however, three birds died of other causes. Ten birds were released from VCBC-Rajabhatkhawa in February 2021 with satellite tags, and 10 more in July 2022. So far, the birds are doing fine, roaming within 100 km of the Centre. We will wait for another year or so, and if there are no drug related mortalities, more birds will be released. Monitoring of prevalence of vulture-toxic drugs in the 100 km area from the release aviaries will continue.

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Free-ranging vultures are attracted to the area outside the release aviary

Conclusion

Considerable progress has been made towards vulture conservation since 2004. Objectives of the International South Asian Vulture Recovery Plan have been achieved – veterinary use of diclofenac has been banned and the Vulture Conservation Breeding Programme has been successful in breeding all the three Gyps species in captivity. As a result, the probability of the three species going extinct is quite low, even if a catastrophe strikes their wild populations.

But we are only halfway in the conservation journey. The next phase is the release of captive-bred vultures in the wild, which has its own set of challenges, the most important being the new NSAID threats that have emerged. Like diclofenac, banning these drugs and eliminating them from veterinary use may take decades as well. It is quite likely that until the environment becomes safe for vultures, we will see a combination of release of captive-bred vultures along with strengthening of the conservation breeding programme. The Action Plan for Vulture Conservation 2020–2025 rightly recognizes this and makes appropriate recommendations. ■

Hopes are High:
Collapse & Return of Vultures in Nepal

Text: **Krishna Prasad Bhusal**

Vultures, the most efficient scavenging birds, play an important ecological role in nature through the consumption of animal carcasses. They also play an important cultural role in Nepal and Tibet as they consume human dead bodies in 'sky burials' (see *Vultures in Life & Death: Sky Burials & Towers of Silence* page 144). In Hindu mythology, a vulture is said to be the vehicle of God Shani (Saturn); and in the story of the Ramayana, it was a vulture that fought with Ravana to try to prevent the abduction of Sita to Lanka.

Gyps vultures, once among the most numerous of large raptors in the world, nearly went extinct across South Asia in the late 1990s through widespread poisoning by diclofenac, a non-steroidal anti-inflammatory drug (NSAID). The monitoring of vulture species through the road transect method in lowland areas of Nepal revealed declines of 91% for White-rumped Vulture and 96% for Slender-billed Vulture between 1995 and 2011.

ANKIT BILASH JOSHI/BCN

The primary challenge was to remove diclofenac from the veterinary ecosystem (Image: White-rumped Vulture, Red-headed Vulture, and Slender-billed Vulture)

Krishna Prasad Bhusal has an MSc in Zoology. He began his career by studying vultures and their conservation. He has been working for Bird Conservation Nepal for a decade and is a member of IUCN Vulture Specialist Group.

Bird Conservation Nepal (BCN), partnering with communities, veterinary professionals, other conservation organizations, and government agencies, has been working since 2002 to halt and reverse vulture decline. In the beginning, the primary challenge was in removing diclofenac from the veterinary ecosystem. There was ignorance of the issue across government, civil society, and the private sector. The sheer geographical scale of the problem brought about its own challenges. Our vulture recovery programme initiated an integrated approach, involving advocacy, education, monitoring, research, captive breeding, supplementary feeding and site protection to help the implementation of Nepal's Vulture Conservation Action Plan.

Government of Nepal banned the production and use of veterinary diclofenac in 2006, and prepared and implemented the first Vulture Conservation Action Plan for Nepal (2009–2013)

Policy and Advocacy

To address the lack of understanding of the causes of vulture decline across the nation, right through regional and local governments, the private sector, and communities required a carefully thought out policy and advocacy approach. Considering the scale and complexity, it was critical to foster good relations with decision makers and engage with advocates to lobby and raise awareness at all levels. Approaches used included meetings, presentations, debates, and other awareness raising activities.

DEVENDRA CHAPAGAIN/BCN

Bird Conservation Nepal is partnering with communities, veterinary professionals, other conservation organizations, and government agencies for vulture conservation

The Government of Nepal banned the production and use of veterinary diclofenac in 2006, and prepared and implemented the first Vulture Conservation Action Plan for Nepal (2009–2013). The reviewed Action Plan (2015–2019) has been successfully implemented and the

ANKIT BILASH JOSHI/BCN

In Hindu mythology, a vulture is said to be the vehicle of God Shani (Image: Slender-billed Vulture)

third updated Action Plan is underway. The main objective of these Action Plans is to prevent the extinction of vulture species by ensuring a safe food supply, planning the release of captive-bred birds, maintaining suitable habitats, and ensuring better understanding of the ecological importance of these birds in Nepal, with the aim of reviving viable populations of vultures in the wild.

Conservation Breeding and Releases

The unprecedented scale and speed of population declines has rendered both the resident Gyps vulture species of Nepal as Critically Endangered. In order to ensure their survival, it was necessary to bring vultures into captivity for conservation breeding. The vulture captive breeding programme was established as insurance against the continuing decline of Gyps vultures. Birds were taken as fledglings from the wild to stock the breeding centre in 2008, 2009, and 2010. These captive vultures started to breed in 2012.

Nepal has led the release of captive vultures alongside wild birds, with each bird fitted with telemetry tags to monitor movements. In 2017, 2018, and 2019, we celebrated our success in conservation breeding by releasing 16 captive-reared and 15 captive-bred Critically Endangered White-rumped Vultures, becoming the first country to complete the cycle of catching, breeding, and releasing vultures back into the wild in Asia.

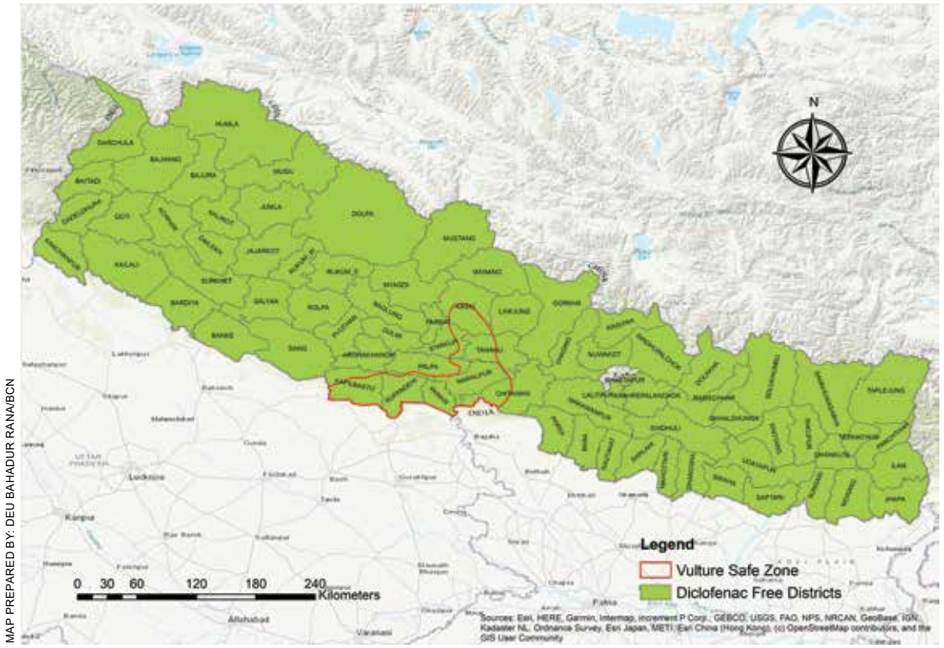
The released birds, along with 30 wild White-rumped Vultures fitted with satellite tags, have enabled us to confirm that the provisional Vulture

ISHWARI PRASAD CHAUDHARY/BCN

RAJENDRA GURUNG/BCN

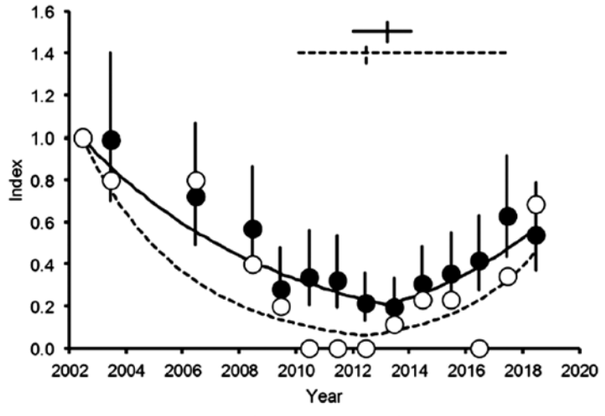
JYOTENDRA JYU THAKURI/BCN

Captive-bred White-rumped Vultures fitted with satellite tag backpack and wing-tags were released and are now free-living in nature



Diclofenac-free districts and Vulture Safe Zones

Safe Zones (pVSZ: see below) are genuinely proving safe for vultures, being free of diclofenac and other toxic NSAIDs. The movements and survival of both released and wild vultures have been monitored, with the wild birds ranging over 200 km from the release site, except one which even travelled *c.* 1,100 km to Jammu and Kashmir in India. Their continued survival tells us that the food that they are eating is safe and, crucially, free from vulture-toxic NSAIDs. In contrast to the wide-ranging wild birds, all the released captive birds have remained in and around the release site, their movements limited to a few kilometres. Although this has told us little about the safety of the wider pVSZ, the planned release of captive birds is vital to build up a population of local breeding birds.



Annual index values for populations of White-rumped (WRV: filled circles) and Slender-billed (SBV: open circles) Vultures in Nepal for 2002–2018. Reproduced from Galligan *et al.* 2019 Bird Conservation International

Vulture Safe Zones

The eventual recovery of vultures in Asia depends on the possibility of protecting and retaining small but key vulture populations in the wild by creating Vulture Safe Zones (VSZs), that is an area surrounding one or more wild vulture nesting colonies, large enough to encompass the mean foraging range completely free of diclofenac use.

Nepal initiated the pioneering idea of working with local communities to establish VSZs in

YAM NEPALI/JATAYU RESTAURANT

Vulture Conservation Team ready to release a wild White-rumped Vulture after fitting it with a satellite tag

BHUPAL NEPALI/BCN

Communities around Vulture Restaurants have implemented sustainable living practices in their villages

2009. The impact was validated by the results of monitoring the presence of harmful drugs in pharmacies/veterinary practices and carcass dumps. VSZs emerged from an innovative concept to create diclofenac-free areas, clearing district by district, province by province, across the country. Out of 77 districts, 74 have been declared as Diclofenac Free Districts (DFDs) – these are verified through monitoring reports and declaration certificates. Thus, more than 98% of Nepal's area has been cleared as DFDs.

BCN established the world's first community managed Vulture Safe Feeding Site (VSFS) or 'Vulture Restaurant' in 2006 in Nawalparasi district, and similar efforts have been replicated at six other sites in Nepal. These Vulture Restaurants collect old and unproductive cows from nearby villages, keep them for at least seven days to ensure they are diclofenac-free, and these are fed to vultures after their natural death. This neatly links biodiversity conservation with an income generating livelihood. The communities around Vulture Restaurants developed a clear and strategic plan to conserve vultures and other wildlife by implementing sustainable living practices in the village communities. The vision was that these areas become model sustainable conservation and eco-tourism zones – a prime example of how people not only exist but develop and thrive while conserving and protecting the environment that sustains them.

KRISHNA BHUSAL/BCN

Captive White-rumped Vulture coming out from release aviary and feeding with wild vultures during the release event

ANKIT BILASH JOSHI/BCN

The eventual recovery of vultures in Asia depends on the possibility of protecting and retaining small but key vulture populations in the wild by creating Vulture Safe Zones (Image: White-rumped Vulture)

Success of the Vulture Safe Zones approach

Not long after the catastrophic declines in vulture populations began, BCN started monitoring vulture species throughout Nepal, using major roads as a series of transects, along which vultures were counted. A peer-reviewed paper published in 2019 at Bird Conservation International presented 14 years data that shows a decrease in the sale of diclofenac in veterinary pharmacies, an increase in sale of meloxicam (a vulture-safe alternative to diclofenac), and an increase in numbers of White-rumped and Slender-billed vultures. The paper shows population declines between 2002 and 2012–13, followed by partial recoveries between 2012–13 and 2018. Partial recovery was greater than it would have been due to reproduction alone, suggesting that the populations are being bolstered by immigration as well.

> Nepal initiated the pioneering idea of working with local communities to establish VSZs in 2009

The diclofenac ban alone did not bring about this positive change. We worked hard to advocate vulture conservation and educate communities on the vulture-toxic NSAID problem. Our aim was to rid Nepal of diclofenac and prevent another vulture-toxic NSAID taking its place. We achieved this through a wide-ranging programme of engagement with communities, local decision makers and authorities, veterinarians and farmers, small conservation organizations and national media outlets. We pushed for the substitution of diclofenac with meloxicam, managed Vulture Safe Feeding Sites, developed vulture ecotourism, and celebrated vultures and their ecosystem services. It is these activities, on the back of the ban, that have truly benefited Nepal's vultures. Trans-boundary collaboration in vulture conservation with India has greatly improved, not only between conservation bodies but at governmental level, as vultures roam far and wide and do not know international boundaries. ■

The Vulture Restoration Project in Pakistan

Text: **Muhammad Jamshed Iqbal Chaudhry and Campbell Murn**

Muhammad Jamshed Iqbal Chaudhry is Senior Manager Research and Conservation at WWF-Pakistan and is leading the Vulture Restoration Project in Pakistan.

Campbell Murn is Head of Conservation and Research at the Hawk Conservancy Trust, where his work focuses on the conservation of raptors and in particular vultures.

Pakistan covers nearly 900,000 sq. km, extending from the Arabian Sea to the Karakoram Mountain range on the edge of the desert plateau of Central Asia. Because of its dimensions and wide range of topographies, Pakistan has a variety of habitats, from coastal mangroves in the south to some of the highest mountains in the world in the northeast. There are three of the world's eight biogeographic regions in the country, the Palaearctic, Afro-Tropical and Indo-Malayan, and these diverse habitats are home to 174 mammals, nearly 200 species of freshwater fish, and 177 amphibian and reptile species. Pakistan is also home to 668 bird species, and many of these are supported by the country's network of 55 Important Bird Areas (IBAs).

SUDEEP ATHAWALE

White-rumped Vultures

The avifauna of Pakistan includes eight vulture species, three of which are Critically Endangered: White-rumped Vulture *Gyps bengalensis*, Indian Vulture *G. indicus*, and Red-headed Vulture *Sarcogyps calvus*. Of the five other species, the Egyptian Vulture *Neophron percnopterus* is Endangered, the Cinereous Vulture *Aegypius monachus*, Bearded Vulture *Gypaetus barbatus* and Himalayan Griffon *Gyps himalayensis* are Near Threatened, and the Eurasian Griffon (or Griffon Vulture) *Gyps fulvus* is listed as Least Concern.

Vultures, their status and recent history in Pakistan

It is now well-known that across most of South Asia, vulture populations suffered major declines since the 1990s, and were at high risk of extinction, particularly the Gyps vultures. Vultures in Pakistan were no exception, disappearing from many parts of the country, and during the early 2000s, these declines were dramatic. For example, between 2001 and 2007, rates of decline across the three largest White-rumped Vulture colonies in Pakistan ranged from 10% to an astounding 60% per year. Two of these colonies, Changa Manga (in the Punjab Province, about 80 km south-west of Lahore) and Dholewala (also in Punjab Province, about 90 km north-west of Multan), were extinct by the 2003–04 breeding season. They had declined from over 700 active nests and 400 active nests respectively in 2000–01. A third breeding colony, Toawala (about 50 km northeast of Multan), which numbered over 400 breeding pairs in 2000–01, declined to just 84 pairs in 2005–06. By mid-April 2007, only two active nests remained at Toawala. One nest had an adult incubating an addled egg; the other nest had a chick next to the remains of a dead adult. Following the loss of Changa Manga colony, Toawala colony became the largest known colony of White-rumped Vulture, and its demise in 2007 highlighted the reality of continued population declines of vultures in Pakistan.

It is now proven and well known that the cause of these vulture declines was veterinary diclofenac. This non-steroidal anti-inflammatory drug was used to treat cattle and other domestic livestock, which are the main food for vultures. If vultures feed from a livestock carcass that has recently been treated with diclofenac, they are poisoned. In the early 2000s, it was the late

COURTESY: WWF-PAKISTAN

COURTESY: WWF-PAKISTAN

The main aviary at Changa Manga Vulture Breeding Centre in Punjab Province, Pakistan (Image: White-rumped Vulture)

Dr Lindsay Oaks of the Peregrine Fund with his team working in Pakistan, who established the link between diclofenac and vulture deaths, a landmark discovery in the field of conservation medicine. This led to the ban on veterinary use of diclofenac in Pakistan and in neighbouring India and Nepal, and marked the advent of new conservation efforts to complement the captive breeding programmes by banning the use of veterinary diclofenac to eliminate it from the environment.

Establishing the Gyps Vulture Restoration Project

In 2004, WWF-Pakistan launched the Gyps Vulture Restoration Project in Pakistan. Its immediate objective was to conserve a viable population of White-rumped Vultures in a safe and secure environment. Plans for Pakistan's first conservation breeding facility for vultures began in 2005. Government approval, land allocation, facility design, fundraising, and staff selection took place over the following 18 months. Subsequently, the Vulture Restoration Project, Pakistan, joined as a core partner of SAVE (Saving Asia's Vultures from Extinction) – the regional conservation consortium established in 2011 to address the Asian Vulture Crisis.

The Changa Manga Vulture Breeding Centre

This vulture breeding centre is located in a secluded area of Changa Manga forest, approximately 80 km southwest of Lahore. The location of the centre is significant, given the history of the former breeding colony of vultures in the forest, previously the largest known White-rumped Vulture colony in Pakistan. Government and local officials, and project partners, attended the opening of the facility in April 2007. There is currently one large communal aviary at the facility (Fig. 1), which is 38 m long, 6.5 m high, and increases in width from 14 m to 27.5 m. There are four smaller aviaries designed to hold pairs of vultures. More recently, a large new aviary is under construction, which will be capable of accommodating 30–40 vultures.

WWF-Pakistan launched the Gyps Vulture Restoration Project in Pakistan in 2004 to conserve a viable population of White-rumped Vultures

The project is a partnership between a wide range of participants, led by WWF-Pakistan, with the Punjab Wildlife and Parks Department and the Hawk Conservancy Trust (UK). WWF-Pakistan is the project manager and staff provider, while the Hawk Conservancy Trust provides funding and technical support. The Environment Agency (Abu Dhabi) and WWF-US provided initial keystone funding for the construction of the facility.

COURTESY: WWF-PAKISTAN

Indian Vultures in the Karoonjhar Hills, Sindh Province, Pakistan

The Centre houses only White-rumped Vultures, which have been breeding every year since 2014. There are four well-established pairs that produce up to four chicks each year, but with potential for three other pairs, the Centre's target of 5–10 chicks each year is within view. Although smaller than its counterparts in the SAVE partnership, the Changa Manga Vulture Breeding Centre established an important safety-net population and will provide for the eventual release of captive-bred vultures into the wild in Vulture Safe Zones.

Vulture Safe Zones (VSZs)

The establishment of Vulture Safe Zones (VSZs) is one of the key activities of the SAVE partnership and the process aims to create large areas that are free of diclofenac, around the extant vulture populations. Since 2012, Sindh Province in southeast Pakistan has been the focus of field-based efforts for vulture conservation in Pakistan, centred on the creation of a VSZ around the remaining breeding populations of wild vultures in Sindh. These efforts are based near the town of Nagar Parkar.

Nagar Parkar is in the southeast part of Tharparkar district, Sindh, and covers an area of nearly 4,000 sq. km at the crossroads of Thar Desert and the Great Rann of Kutch. The landscape is dominated by the imposing contrast between the pink and grey granitic rock of the enormous Karoonjhar Hills and the relatively flat surrounding areas of sand, silt, and salt. Six of the eight vulture species of Pakistan can be found in the Nagar Parkar area, in particular the three Critically Endangered species, which makes it a key site for vulture conservation in Pakistan.

COURTESY: WWF-PAKISTAN

A group of schoolboys displaying vulture awareness posters

Monitoring of the vultures in the Nagar Parkar area is conducted by WWF-Pakistan, with local participation by the Parkar Foundation, Pakistan, a community-based NGO that helps provide key conservation activities in the VSZ.

The White-rumped Vultures of Nagar Parkar, one of the few remaining breeding colonies in Pakistan used to nest on Kandi/Khejri (*Prosopis cineraria*) trees growing in agricultural fields around the villages. The colony was spread across an area approximately 10 km northwest of the Karoonjhar Hills, but in recent years there have been no active nests, although the birds are still present. Indian Vultures are also found in the area, and Nagar Parkar has Pakistan's only breeding colony of this species, which nests on the cliffs of Karoonjhar Hills that lie south-east of Nagar Parkar town. In the early 2000s, when monitoring of this colony began, there were approximately 350 nests. The number of nests has decreased to approximately 75 in recent years.

Vulture Conservation Initiatives in Nagar Parkar Vulture Safe Zone

The community outreach efforts conducted in the VSZ aim to reduce the use of veterinary drugs that are unsafe for vultures, and to improve animal husbandry. For this, awareness programmes are undertaken for local livestock

COURTESY: WWF-PAKISTAN

Livestock health camp and promotion of vulture-safe veterinary drugs in Nagar Parkar VSZ, Pakistan

COURTESY: WWF-PAKISTAN

VSZ Officer Ramesh Ver from the Parkar Foundation conducting a community awareness session in the Nagar Parkar Vulture Safe Zone

owners and pharmacy providers, focusing on the harmful effects of diclofenac and the importance of vultures to the environment. This work is being conducted by the Parkar Foundation, which was established and is managed by WWF-Pakistan.

This work continues each year to an increasing number of farmers and other community members. This is a major achievement for a comparatively remote area of Pakistan, where villages and small towns are spread across a large area. Additional awareness-raising sessions are being undertaken that engage with hundreds of schoolchildren and their teachers each year. The over-arching objective of all of these sessions is to develop a sense of ownership with respect to vulture conservation and protection of other natural resources of the area, among the students, teachers, farmers, and local communities.

Successful meetings are continuing with a range of veterinary practitioners, which enable sharing of essential information about the harmful effects of some veterinary drugs on vultures. The meetings are also an opportunity to highlight the government directive banning these drugs within the Vulture Safe Zone. Although Pakistan banned veterinary diclofenac in 2006, other veterinary-use drugs, such as ketoprofen and aceclofenac, are also harmful to vultures. The Health Department of the Government of Sindh province has also banned the use of these two drugs in District Tharparkar including Nagar Parkar Vulture Safe Zone in 2017 – a major achievement for vulture conservation in the area.

A major positive outcome following several years of this outreach programme is reflected in the results obtained from the undercover surveys of medical stores and other pharmaceutical outlets. These surveys monitor the availability of veterinary drugs that are harmful to vultures, yet are available within the Vulture Safe Zone. The surveys showed that veterinary diclofenac was not available, and that the vulture-safe drug meloxicam was being sold at all stores. Unfortunately, several other vulture-unsafe drugs such as aceclofenac and ketoprofen were on sale, which highlights the need for the outreach and extension work to continue and intensify.

In other areas of Pakistan, work on addressing the removal of unsafe veterinary drugs is in progress. WWF-Pakistan completed a major Conclusion survey of pharmaceutical outlets across the entire Punjab Province in 2020, which revealed that the vulture safe drug meloxicam is widely available in the province. Work on establishing a second VSZ in north-east Pakistan, not far from Islamabad, began after pharmacy surveys revealed the presence of diclofenac and ketoprofen in all the surveyed stores, as well as other vulture-unsafe veterinary drugs in many outlets. Encouragingly, the vulture-safe meloxicam was also widely available. With a breeding colony of White-rumped Vultures in the study area, there is a significant amount of work needed to make this area safe for vultures, which has the enthusiastic support of the concerned Wildlife Department.

> Surveys monitor the availability of veterinary drugs harmful to vultures within the Vulture Safe Zone

COURTESY: WWF-PAKISTAN

COURTESY: WWF-PAKISTAN

Trees lopped for animal fodder; the vulture nests are threatened by this activity (Image: Indian Vulture)

Conclusion

Like the rest of South Asia, Pakistan's vulture population suffered a huge decline in the 1990s, which carried over to the 2000s. Despite this, and the significant challenges that remain to ensure the safety of vultures in the wild, progress continues. Along with the other partners in SAVE consortium, the future for vultures in South Asia shows promise of improvement each year. ■

Conservation of Asian Vultures in Myanmar

Text: **Thiri Dae We Aung and Ngwe Lwin**

Thiri Dae We Aung is the Executive Director of the Biodiversity and Nature Conservation Association (BANCA), Myanmar. She has led many species conservation projects including for Gurney's Pitta, Green Peafowl, Yellow-breasted Bunting, Helmeted Hornbill, and Baer's Pochard.

Ngwe Lwin is with Fauna & Flora International, and is the Programme Manager for its Indawgyi Programme. He has more than 15 years of conservation experience focusing on primatological research, community-based conservation and collaborative protected area gazettement/ management.

Myanmar is one of the last remaining countries in Southeast Asia where vultures can be seen in reasonable numbers, with three resident vulture species: the White-rumped, Slender-billed, and the Red-headed. It is the largest country in mainland Southeast Asia, bordered by Bangladesh and India to the north-west, the People's Republic of China to the north-east, and the Lao People's Democratic Republic (Laos) and Kingdom of Thailand to the south-east.

The geography of Myanmar is highly varied, with more than 40% of the country being mountainous, great alluvial plains in the central region, and a very long coastline. Temperature, precipitation, and humidity vary greatly – the Taninthayi coast in the south receives about 5,000 mm rainfall annually, while the arid central dry zone receives only 500–750 mm. Such diverse topography and climatic conditions create numerous ecosystems and support an incredible diversity of associated species. Nevertheless, as with much of the region, rapid economic development, among other factors, is putting great pressure on the natural resources and biodiversity. Among the 1,136 bird species recorded (including nine endemics) in Myanmar, 64 species are listed as globally threatened, of which 12 are listed as Critically Endangered, including its three vulture species.

THEIN AUNG/WWG

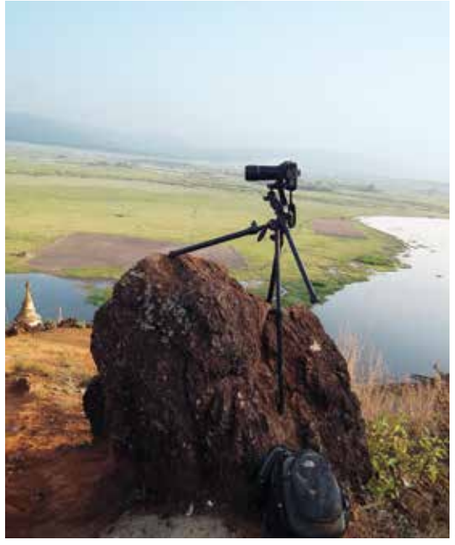
Himalayan Griffon

JEREMY HOLDEN/FFI

Grassland habitat, feeding ground of Asian vulture species in the northern part of Indawgyi Biosphere Reserve

Gyps vultures were once abundant in Myanmar, and the White-rumped Vulture was considered to be its most common vulture in the early 20th century. It has declined in recent decades due to a variety of factors, including a reduction in available carrion, persecution in some areas, and possibly wildlife trade. The population sizes of these three vulture species in Myanmar are not well-known, and may be relatively small compared to populations in South Asia. But these populations are now more significant because of their effective extinction

Vultures are now mainly found in two areas in Myanmar: around Indawgyi Lake and further north in the northern Kachin State, and in Shan State to the east



NGWE LWIN/FFI

Grassland habitat in Indawgyi Biosphere Reserve

ASIF N. KHAN

Red-headed Vulture

in all other Southeast Asian range states (except Cambodia) while viable populations still remain in Myanmar.

Vultures are now mainly found in two areas in Myanmar: around Indawgyi Lake and further north in the northern Kachin State, and in Shan State to the east. Vultures have been quite regularly surveyed in different parts of the country since the emergence of the vulture crisis in South Asia. In the late 1990s, the Wildlife Conservation Society (WCS) surveyed Kachin State and upper Sagaing Region using 'vulture restaurants', i.e., leaving dead animal carcasses to attract vultures, and counting the individual birds that come to feed. Unfortunately, the surveys coincided with an outbreak of foot-and-mouth disease which killed many cattle. This created an overabundance of carcasses for vultures to feed on, so they did not concentrate in numbers at the vulture restaurants. WCS has supported site-based vulture conservation in Kamaing plain, around Indawgyi Lake and Hukaung Valley Tiger Sanctuary (all in Kachin State), including community-based protection of a nesting site, but security issues have limited further work on vultures in most of those areas.

One of Myanmar's first national nature conservation organizations, the Biodiversity and Nature Conservation Association (BANCA), along with BirdLife International, conducted vulture surveys till the early 2010s, again using 'vulture restaurants' in Kachin and Shan states. From late 2006 into 2007, 136 individuals were recorded, most of which were White-rumped Vulture and Himalayan Griffon, but also recorded were 21 Slender-billed and two Red-headed vultures. In 2014, another Myanmar NGO, Friends of Wildlife (FoW) surveyed Kachin and Shan states and recorded 219 vultures, comprising 112 White-rumped, 81 Himalayan Griffon, 22 Slender-billed, three Red-headed, and one Cinereous. These figures remain indicative, as the national population numbers and trends remain difficult to estimate/ascertain due to the sparsity of data and differing survey methods.

Traditionally, people in Myanmar do not like vultures because they are perceived as harbingers of bad luck or polluters of the environment. Some cut down the nesting trees of vultures for these reasons. They are not aware of the benefits that vultures bring, particularly in keeping the environment clean. So conserving these species often needs to start by reversing negative perceptions. The danger of vultures being poisoned by diclofenac has been well understood by all vulture surveyors in Myanmar after it was identified as the main factor contributing to the vulture decline in South Asia. For this reason, the vulture surveys in Myanmar were usually accompanied by investigations into the possible use of NSAIDs that are lethal for vultures. Fortunately, NSAID use for livestock was introduced in Myanmar only in 2018, hence all the surveys undertaken till then did not record its use in the country.

The first Myanmar Vulture Conservation Action Plan was prepared in 2007 by multiple stakeholders from government, and national and international NGOs

Vultures around Indawgyi Lake

With an area of 120 sq. km, Indawgyi Lake is Southeast Asia's third largest lake, fed by the still largely well-forested hills that surround it. These forests and wetlands provide habitats for a myriad endemic and rare birds, fish, turtles, primates, and other mammals. The biological and ecological significance of the area is well-recognized by its numerous international designations: Important Bird Area, Key Biodiversity Area, Ramsar Wetland of International Importance, and UNESCO Man and Biosphere Reserve, among others.

More than 160 bird species have been recorded around Indawgyi Lake, including many globally threatened species, the Slender-billed and White-rumped vultures among them. The lake is renowned for its waterfowl in particular, and during the winter hosts tens of thousands of ducks and geese. There are also important habitats around the lake for ungulates, such as the seasonally flooded grassland to the north, which is critical for the Hog Deer *Axis porcinus*, an Endangered species. This type of habitat has almost disappeared throughout Southeast Asia, having been converted to human settlements and agriculture throughout its range. These grasslands also provide pasture for cattle for four villages during the dry season from February to May. The cattle that occasionally die provide rich pickings for vultures. Cattle owners do not usually attempt to remove the carcasses, leaving the clean-up job to the vultures. Although there is no evidence of cattle carcasses being left out in the rainy season, vultures are still encountered in this area at that time, indicating that there are sufficient food sources. Further research is needed to determine the other sources of food for the vulture populations, but it is apparent that the landscape around Indawgyi Lake provides a good home for them. In April 2019, the Indawgyi Lake area was recognized as Myanmar's first provisional Vulture Safe Zone.

Over the past 18 years, the maximum counts recorded for each vulture species were 30 Slender-billed, 20 White-rumped, and 23 Himalayan Griffon and the recent records in the early 2018 showed 12 Slender-billed vulture, 13 White-rumped vulture, and one Himalayan Griffon Nevertheless, there appears to have been a decline from the first to the second decade of the millennium for both Slender-billed and White-rumped vultures. Within the last 10 years, the

THEIN AUNG/WWG

THEIN AUNG/WWG

Himalayan Griffon in Shwetagon Pagoda, Yangon

cattle population has declined by about 70%, as agricultural practices changed from traditional to modern methods, and the grazing area shrinking due to land-use change. These could be the major factors responsible for the decline of vulture populations. Diclofenac was not found to be the cause for the decline earlier, but has become an emerging threat from 2019 when evidence of its use to treat cattle was recorded in four villages. During the dry season (from February to May), any of free ranging cattle in the grassland was received for their health. Therefore, it can be assumed that feeding on free ranging cattle in the grassland would not seriously affect vultures. Overall, though the vulture population seems to be declining, the Indawgyi area still holds a viable population of vultures. And more recently, these birds have become the focus of attention by conservation organizations like Fauna & Flora International, which is working in the area.

NGWE LWIN/FFI

Grassland habitat in Indawgyi Biosphere Reserve

Vultures of Shan State

Shan State in the east of Myanmar is largely a high-elevation plateau bordered by China, Laos, and Thailand on the north, east, and south respectively. As in Kachin State, due to unrest among ethnic groups, undertaking surveys is difficult in many parts of the state. The main areas where vultures are known to occur are in the west of the state. Vultures are usually observed in abandoned fields and shifting cultivation, often close to human habitats, and surrounded by degraded forests. Many of the people living in these landscapes are of Nepali ethnicity and do not eat beef, and so the carcasses of dead cattle are left out for scavengers, as is the common practice in India and Nepal.

Friends of WildLife surveyed sites around Mie Yaw and Naung Pho Mei villages in southern Shan State in 2014 using 'vulture restaurants'. They recorded 78 vultures, comprising 51 White-rumped, 13 Slender-billed, 11 Himalayan Griffon, and three Red-headed. In 2019, a team from Mandalay University recorded 38 vultures in Mong Yai township of northern Shan State, mostly White-rumped, including several juveniles which indicated breeding success. An upsurge in local unrest makes survey work difficult in this area now. Since 2020, BANCA is leading vulture view point surveys in southern Shan to establish a vulture conservation programme in the state. BANCA will be accompanied by personnel of the Myanmar Veterinary Association for surveys of pharmacies, local veterinarians, and farmers on NSAID usage.

Coming together to protect vultures in Myanmar

During the past two decades, the plight of vultures in Asia has been on the conservation agenda in Myanmar, but focus has been sporadic. In 2007, the first Myanmar Vulture Conservation Action Plan was prepared by multiple stakeholders from government, and national and international NGOs led by BirdLife International and BANCA, and a few short-term projects were undertaken. Interest in protecting vultures has recently increased, with a coming together of the conservation community around the issue, and the founding of the Myanmar Vulture Working Group (MVWG) in October 2018, currently chaired by BANCA. Soon after, in November 2018, the MVWG was formally admitted to the Saving Asian Vultures from Extinction (SAVE) Partnership.

The MVWG has since supported the convening of a national vulture conservation workshop in April 2019, hosted by the Forestry Department in Naypyitaw, Myanmar's seat of government, to review and update the 2007 Action Plan. That meeting included district government officers from Kachin and Shan states, and significantly, included a large representation from the veterinary community. This provided the opportunity to present the danger from diclofenac to vultures, which was previously not understood by those with veterinary training. However, at the moment, an imminent ban on diclofenac does not seem feasible and the workshop concluded that more time was needed to understand the usefulness and potential impact of the ban in Myanmar. The Myanmar Veterinary Association and Myanmar Veterinary Council were both accepted as members of the MVWG, and the University of Veterinary Science was proposed as a member. This promises to build a strong alliance between the conservation and veterinary communities to address vulture conservation issues in Myanmar, especially in relation to NSAIDs. Soon after, a seminar was held at the University of Veterinary Sciences to raise awareness of the issue of some NSAIDs for vultures. ■

The Myanmar Vulture Conservation Action Plan (2019–2025) endorsed by the Myanmar Forest Department is now available on the SAVE website www.save-vultures.org.

THIRI DAE WE AUNG/BANCA

A village by the Salween River in northern Shan State where White-rumped Vulture was recorded

Trends and Conservation of Vultures in Cambodia

Text: **Ny Naiky and Bou Vorsak**

Ny Naiky joined BirdLife International Cambodia Programme in 2016 as Project Assistant. At present, she is Flagship Species Project Coordinator.

Bou Vorsak is currently CEO of NatureLife Cambodia (official partner of BirdLife in Cambodia). He has contributed to the designation of two Ramsar sites, protected landscapes, and wildlife sanctuaries each in Cambodia.

Cambodia is one of the last remaining countries in Southeast Asia with viable populations of vultures, with three resident species, the White-rumped Vulture *Gyps bengalensis*, Slender-billed Vulture *Gyps tenuirostris*, and Red-headed Vulture *Sarcogyps calvus*, all of which are Critically Endangered. Vulture conservation in Cambodia is guided by the Cambodia Vulture Action Plan, initiated by the Cambodia Vulture Working Group (CVWG) and spanning a 10-year period (2016–2025). The CVWG was formed in 2004, and aims to ensure the long-term survival of these three species of vultures within the Kingdom of Cambodia. It is a collaboration of conservation NGOs and Cambodian Government bodies, the core members being NatureLife Cambodia (formerly BirdLife International Cambodia Programme), the Angkor Centre for Conservation Biodiversity (ACCB), the World Wide Fund for Nature (WWF) Cambodia, Wildlife Conservation Society (WCS) Cambodia Programme, and Rising Phoenix. NatureLife Cambodia is a coordinator of the CVWG.

COURTESY: BIRDLIFE CAMBODIA

White-rumped and Slender-billed Vulture

COURTESY: BIRDLIFE CAMBODIA

Vulture Restaurants are playing an important role in providing supplemental safe food for vultures

Main Threats

A long history of human persecution has pushed vultures to the most remote parts of their range in Cambodia, close to the international borders. The three vulture species are now confined to open deciduous dipterocarp forest in the remotest parts of Cambodia. Their absence from open areas, and from large swathes of even apparently suitable deciduous forest, is probably due in part to the extremely low density of wild prey species, except in such distant and well-protected areas. However, this cannot be the only reason, since the birds also frequently forage on the carcasses of free-ranging domestic animals, which are abundant in such areas. The main threats to the vulture population in Cambodia are now poisoning, habitat loss, and low food availability. The use of diclofenac in livestock was seen as a potential threat when it became available in the country for veterinary use.

Poisoning: Local communities living around protected areas rely on forest products and wild animals for food. Although hunting and poisoning wildlife is illegal in Cambodia, poisoning is an easy and effective hunting approach, and so is often favoured for catching wild animals for food and trade. Cambodians do not eat nor trade vultures, and many believe that vultures are unclean, smelly animals and that they bring bad luck, so they are not targeted in this way, but a poisoned carcass left in the forest unintentionally becomes food for vultures. This is the main threat to the vulture populations in Cambodia and the main reason for their recent decline.

Low food availability: All the three resident vulture species are carrion eaters, feeding on carcasses of a range of species, especially ungulates. The numbers of wild mammals have significantly decreased in the last few decades

> The main threats to the vulture population in Cambodia are now poisoning, habitat loss, and low food availability

COURTESY: BIRDLIFE CAMBODIA

CVWG organises Vulture Restaurants at four key sites in Cambodia, one to four times each month

COURTESY: BIRDLIFE CAMBODIA

Red-headed Vulture feeding on a carcass

because of hunting and habitat loss. Additionally, the numbers of domestic cattle grazing freely in the forests have also decreased. Traditionally, livestock owners would release their domestic cattle into the forest for a six-month period after the harvesting season. If cattle died during that time, they would become sources of food for vultures. But as agriculture has developed in Cambodia, more people are turning to the use of mechanized hand tractors for ploughing, so the numbers of domestic livestock have fallen, reducing another source of food for vultures. At Siem Pang Wildlife Sanctuary, for example, which is now the major stronghold for vultures in Cambodia, each household would normally have kept about five cows and buffaloes for agricultural work. But in recent years, nearly half the households have started to use mechanized hand tractors (power tillers) instead of livestock.

Habitat Loss: Vultures are well adapted to the dry deciduous forest, which is typical of much of the lowland landscape in Cambodia. This habitat is being rapidly depleted due to logging, the development of Economic Land Concessions

(ELCs), ELCs are defined as a long-term lease that allows a concessionaire to clear land in order to develop industrial-scale agriculture, granted for various activities including large-scale plantations, animal husbandry, and building factories to process agricultural products, and small-scale agricultural expansion of rice fields. In turn, this is leading to decline in the populations of mammal species which provide carrion that vultures feed upon. In addition, the practices which lead to habitat loss increase the number of people living in close proximity to the forest, and thus, the likelihood of hunting wildlife.

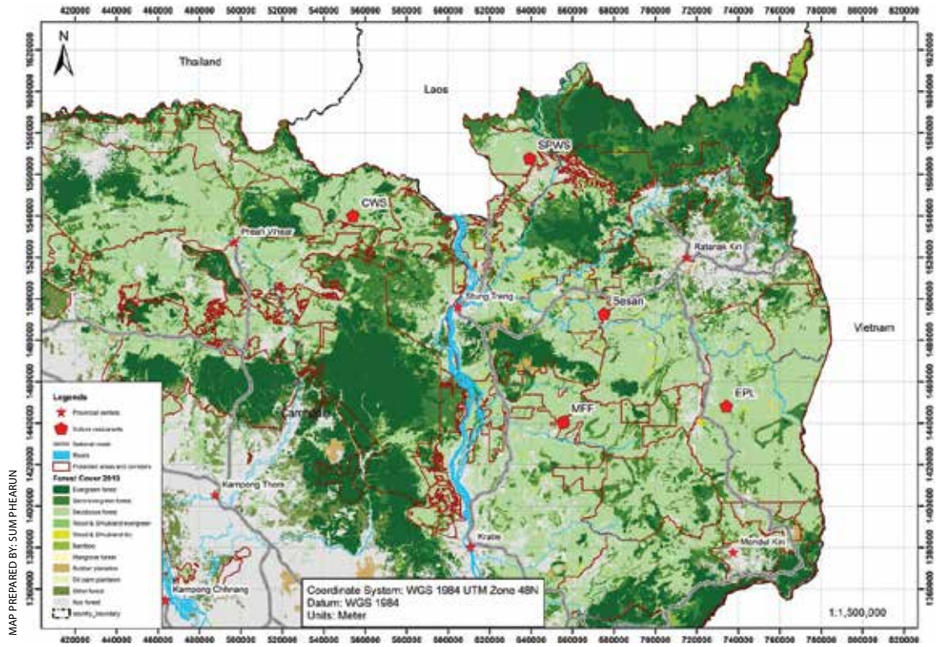
Diclofenac: Diclofenac and other forms of non-steroidal anti-inflammatory drugs (NSAIDs) are now well-known as a major threat to vultures in South Asia. The use of diclofenac as a veterinary drug has been the main cause of vulture decline in South Asia, and even though this has not been an issue so far in Cambodia, CVWG took immediate advocacy action to ban using and importing diclofenac as a veterinary drug in the country. The first case of diclofenac for animal treatment in Cambodia was recorded in March 2018. After one year of working with the Department of Animal Health and Production, and the Ministry of Agriculture Forestry and Fishery, the Cambodian government issued a proclamation on September 15, 2019 to ban the use and import of diclofenac as a veterinary drug.

Conservation Action and Monitoring

Vulture conservation in Cambodia has focused on key priority activities that would help alleviate the threats facing vultures, namely food supplementation (vulture restaurants); monitoring of population trends; nest surveys, monitoring, and protection; and public campaigns against poisoning.

Vulture Restaurants and Vulture Census

Vulture conservation interventions are implemented across eight project sites: (i) Siem Pang Wildlife Sanctuary (SPWS) and (ii) Lomphat Wildlife Sanctuary (LWS) which are supported by NatureLife Cambodia and Rising Phoenix;



Vulture Restaurant locations in 2018

COURTESY: BIRDLIFE CAMBODIA

Vultures perch on tall tree before landing and feeding on the carcasses at the Vulture Restaurant at Siem Pang Wildlife Sanctuary

(iii) Chhaeb Wildlife Sanctuary (CWS) and (iv) Kulen Promtep Wildlife Sanctuary (KPWS) supported by WCS; (v) Srepok Wildlife Sanctuary (SWS), (vi) Phnom Prich Wildlife Sanctuary (PPWS) and (vii) Mekong Flooded Forest Landscape (MFF) supported by the World Wide Fund for Nature (WWF); and (viii) the Sesan Important Bird and Biodiversity Area and biodiversity corridor supported by ACCB. Together, these sites across the north and northeast of Cambodia comprise the Cambodian range of the three resident extant vulture species.

The central component of vulture conservation actions in Cambodia is the operation of permanent supplemental-feeding stations (vulture restaurants), five of which are in operation at present. The carcasses provided increase the food availability for vultures, which may improve breeding and fledging success, supporting the recovery of vulture populations. At each site, the responsible organization pledges to provide a minimum of one cow carcass per month, and also conducts five censuses per year (in March, and twice in June, September and December) to collect data for generating population estimates and trends. Data on the number of each species, sex, age, and presence of wing-tags and rings on birds, is recorded at each site.

The highest count during a census event for all species in 2018 was 141 vultures. This is significantly below the 14-year mean (the mean of highest per-year single counts) of 215.8 (2004 to 2017) (CVWG Annual Report 2018), and the second lowest since records began, with 2017 being the lowest (121). A caveat of this data is that the number of operating vulture restaurants has periodically fluctuated over time (there were seven operating restaurants in 2014, reducing to six in 2015, with two more sites ceasing operations in 2017 and 2018). However, the sites that closed did so due to the low number of vultures attending and it is believed that very few, if any, vultures were missed because of this.

Analysis of long-term trends concluded that White-rumped Vulture counts initially rose to a peak in 2010, before suffering a steep decline;

The first case of diclofenac for animal treatment in Cambodia was recorded in March 2018

Slender-billed Vulture counts showed a similar peaking in 2013, but a much less pronounced pattern. For both species, the declines were steepest at the sites in the south and east of the vultures' range. Red-headed Vulture counts were highest around 2007 to 2009, after which they declined, but were found to be more evenly distributed across their range. The overall vulture population appears to have declined since 2014, mainly due to a reduction of White-rumped Vultures recorded at census restaurants. As this species makes up the majority of vultures in Cambodia, proportional drops in that species would evidently have the greatest overall effect.

Nest surveys, monitoring, and protection

Every breeding season, CVWG core member field staff and trained members of local communities conduct surveys to search for vulture nests. Nest locations from previous breeding seasons are visited early in the season to check on continued nesting activity. Further, the field teams search other forested areas to identify new or previously unrecorded vulture nests. This method relies heavily on knowledge from local communities and information gathered by the project field staff during other field work. If local community members find new nests and report them to CVWG nest teams, they are rewarded with a nest finders' one-off payment of US$ 5–15, and where suitable or feasible, the nest finders can be employed throughout the breeding season to either monitor or guard the nest until nest fledging or failure. The decision to employ people as nest monitors or nest guardians must be considered carefully, as nest guardians have proven very effective in some areas, while in others they have sometimes had a net-negative effect on fledging success.

A total of 21 active nests were discovered during the 2018 breeding season. The fledging success across the country was 80% for Red-headed Vulture, 70% for Slender-billed Vulture, and 50% for White-rumped Vulture, which suggests that more attention needs to be paid to monitoring and protecting the nests of White-rumped Vultures. With 2 of 21 nests failing due to anthropogenic disturbance it would seem that CVWG partner's nest protection 2017–18 was better than some previous years in this regard, but zero nests disturbed must be achieved given the low population numbers. Overall, the nest fledging success has been less in the past few previous years than in 2014–15, which is not the desired result.

COURTESY: BIRDLIFE CAMBODIA

Slender-billed Vulture nest in Siem Pang Wildlife Sanctuary

Ongoing Conservation Strategies

The Cambodia Vulture Action Plan was finalized in 2016 and is endorsed by all core members of CVWG. For the period from 2016 to 2025, the top priority actions are

1. To protect core vulture habitat,
2. To campaign against illegal poisoning,
3. To work on advocacy for a change in negative attitudes towards vultures,
4. To monitor populations,
5. To ensure the enforcement of the ban of veterinary diclofenac, and
6. To conduct research to develop a deeper understanding of the threats facing vultures in Cambodia. ■

Saving the Vultures of Bangladesh through Vulture Safe Zones

Text: **Sakib Ahmed and A.B.M. Sarowar Alam**

Sakib Ahmed works with IUCN Bangladesh in the Vulture Conservation Initiative. Co-authored (with the second author) VULTURES AND VULTURE SAFE ZONES OF BANGLADESH, available on IUCN and SAVE websites.

A.B.M. Sarowar Alam is leading the IUCN Bangladesh's Vulture Conservation Initiative. Co-authored (with the first author) VULTURES AND VULTURE SAFE ZONES OF BANGLADESH, available on IUCN and SAVE websites.

The torrential rain had just stopped and sunlight filtered through the bright canopy above, forming columns of light spiralling down to the moist forest floor. The humidity was stifling, and the forest was eerily silent, as if held under a spell. The birds had fallen silent and not a leaf stirred. The mighty *Dipterocarpus* reached up towards the zenith, and stood like a silent sentinel. The only sound came from our footsteps, as we sloshed through the puddles left by the recent downpour. Leeches devoured our blood. The feeling of being watched was all too real, and looking up towards the canopy, we could see massive figures with long necks peering down at us. They were White-rumped Vultures, and we were in the heart of one of the two Vulture Safe Zones of Bangladesh, which is also among the last vulture breeding colonies of the country, deep inside the Rema-Kalenga Wildlife Sanctuary.

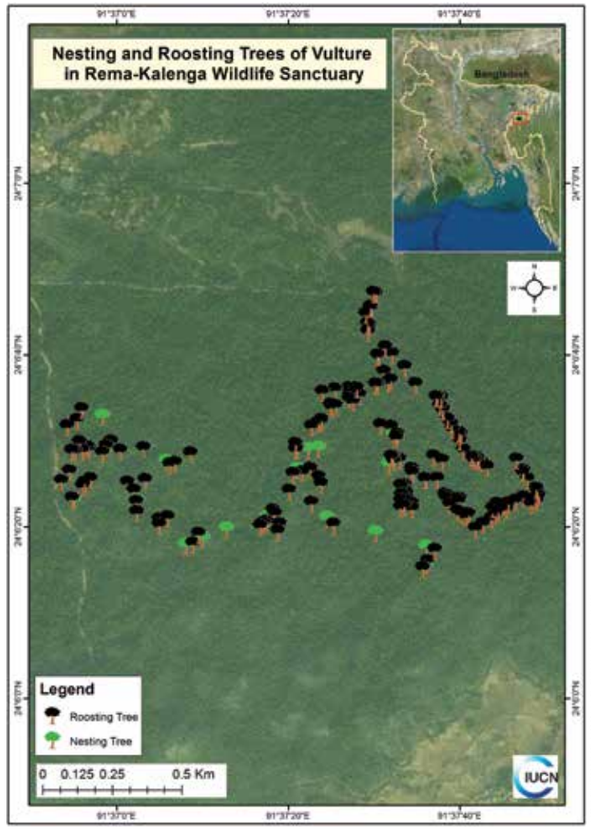
A.B.M. SAROWAR ALAM

Vulture populations of Bangladesh, like elsewhere in South Asia, faced a disastrous crash (Image: White-rumped Vulture)

During the 1990s and 2000s, South Asia's vulture numbers experienced a massive and catastrophic decline, which resulted in the loss of over 99% of the vulture population. Vulture populations of Bangladesh also faced a similar disastrous crash, causing local extinction of the Red-headed Vulture, one of the seven species in the country. Of the six remaining, two are considered resident, the White-rumped and the Slender-billed. Both of them are globally Critically Endangered. The population of White-rumped Vulture in Bangladesh now stands at a mere 260; however, it seems to be stable due to massive conservation efforts on all fronts. As for the Slender-billed Vulture, its numbers are unknown; the species was sighted again in 2014 after the last record from 2010. In 2014, it was seen nesting, and since then, there have been one or two records of Slender-billed Vulture every year, though no nests were recorded thereafter.

Bangladesh is situated in the fertile delta of three mighty rivers, the Ganga, Brahmaputra, and the Meghna. Its geographical location, the tropical climate, and the monsoon rains, all contribute to making Bangladesh a highly biodiverse country. The flora and fauna of the Indian subcontinent and Southeast Asia overlap in Bangladesh, which forms a transitional zone. At the same time, Bangladesh is one of the most densely populated countries in the world, with over a thousand people per square kilometre. This high population density has strained the natural resources of the country, and destruction of key habitats is a persistent issue.

The threats faced by the vultures of Bangladesh are innumerable, but the primary threat is from the veterinary painkiller diclofenac, which has been the sole reason for the unprecedented vulture tragedy of South Asia. When diclofenac, a non-steroidal anti-inflammatory drug (NSAID), is administered to cattle, and if the cattle dies within a certain period of time and is consumed by vultures, it is fatal to the scavengers – death comes from kidney failure. In 2010, veterinary-use diclofenac was banned in Bangladesh to address this issue. Unfortunately, another NSAID, ketoprofen that replaced diclofenac was found to be equally harmful to vultures.



MAP PREPARED BY: IUCN BANGLADESH

Conservation efforts for vultures have been ongoing since 2014, spearheaded by the IUCN in Bangladesh, and supported by the Bangladesh Forest Department and Bangladesh National Vulture Recovery Committee

A.B.M. SAROWAR ALAM

A pair of White-rumped Vultures and nest

Other threats in Bangladesh include habitat loss, resulting in loss of nesting areas or disturbance during the breeding period, which in turn leads to abandonment of nests, food shortage as wild ungulates are rare, and government laws mandating burial of dead domestic animals.

Although Bangladesh is a Muslim majority country, when cattle die in rural areas, they are usually thrown into a river to be carried away, or dumped in an open field for scavengers. The law of the land pertaining to livestock makes it mandatory for dead cattle to be buried, but this is not always followed or enforced. So if a flock of vultures consume a cattle carcass with diclofenac in its system, the whole flock is at risk of being wiped out. Burying dead cattle poses another problem, as the practice makes food even scarcer for vultures.

On a positive note, conservation efforts have been in full force since 2014, spearheaded by the International Union for Conservation of Nature (IUCN) in Bangladesh and supported by the Bangladesh Forest Department, as well as the Bangladesh National Vulture Recovery Committee (BNVRC) under the Ministry of Environment, Forest and Climate Change (MoEFCC). IUCN has been involved in Asia's fight to conserve its vultures, by organizing the Regional Vulture Symposium in 2012 held in

A.B.M. SAROWAR ALAM

White-rumped Vultures and Himalayan Griffons feeding on a cattle carcass

Delhi. IUCN contributed towards the formation of the Regional Steering Committee in 2012, initially with the governments of Bangladesh, India, Nepal, and Pakistan.

Thereafter, IUCN Bangladesh initiated the country's first vulture conservation programme in 2014, where it has played an instrumental role in establishing Vulture Safe Zones, reducing toxic drugs, engaging the local community, ensuring safe supplemental food, rescuing sick or injured vultures, and most importantly, preparing the Bangladesh Vulture Conservation Action Plan (2016–2025) which provides a long-term framework and vision to conserve Bangladesh's vultures.

Establishing Vulture Safe Zones

To plan and establish Vulture Safe Zones (VSZs), surveys were undertaken to locate the extant vulture breeding colonies. The VSZs are areas established specifically to ensure that the threats from diclofenac and other harmful NSAIDs are mitigated. VSZs centre around one or more vulture nesting colonies.

Surveys conducted throughout the country resulted in the location of two extant vulture colonies. One was in Rema-Kalenga Wildlife

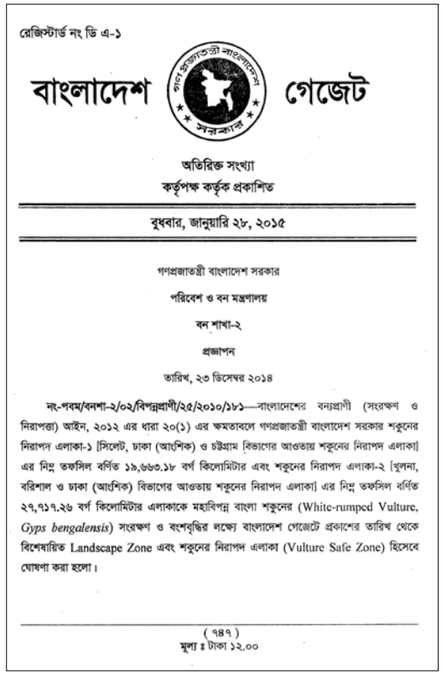
MAP PREPARED BY: IUCN BANGLADESH

Two Vulture Safe Zones in Bangladesh

> The Government of Bangladesh has declared two VSZs under specialized Landscape Zones for the conservation of vultures

Sanctuary, a beautiful 1,795 ha tropical forest in north-eastern Bangladesh, and another in the world's largest mangrove forest, the Sundarban mangroves in southern Bangladesh. Although these are two very different habitats, the White-rumped Vulture population in each of the breeding colonies is around 110 to 120 individuals, with other individuals entering from India or being spotted outside the VSZs.

It was imperative for the VSZs to have legal status in order for them to meet their desired objectives. To do so, several steps were carried out, which involved collecting baseline data and information on threats through surveys, and consultations with all probable stakeholders. The meetings started with local communities, local leaders, local government offices, all the way to the national level, including top officials from various government bodies including the MoEF&CC, Department of Livestock, the Directorate General of Drug Administration, universities, researchers, and conservationists. Their inputs were taken into account, along with the data from the baseline surveys, and a final proposal was developed and submitted to the Government of Bangladesh. Finally, in January 2015, the Government of Bangladesh declared two VSZs under specialized Landscape Zones,



রেজিস্টার্ড নং ডি এ-১

বাংলাদেশ গেজেট

অতিরিক্ত সংখ্যা
কর্তৃপক্ষ কর্তৃক প্রকাশিত

বুধবার, জানুয়ারি ২৮, ২০১৫

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

পরিবেশ ও বন মন্ত্রণালয়

বন শাখা-২

প্রজ্ঞাপন

তারিখ, ২৩ ডিসেম্বর ২০১৪

নং-পবম/বনশা-২/০২/বিপন্নপ্রাণী/২৫/২০১০/১৮১—বাংলাদেশের বন্যপ্রাণী (সংরক্ষণ ও নিরাপত্তা) আইন, ২০১২ এর ধারা ২০(১) এর ক্ষমতাবলে গণপ্রজাতন্ত্রী বাংলাদেশ সরকার শকুনের নিরাপদ এলাকা-১ [সিলেট, ঢাকা (আংশিক) ও চট্টগ্রাম বিভাগের আওতায় শকুনের নিরাপদ এলাকা] এর নিম্ন তফসিল বর্ণিত ১৯,৬৬৩.১৮ বর্গ কিলোমিটার এবং শকুনের নিরাপদ এলাকা-২ [খুলনা, বরিশাল ও ঢাকা (আংশিক) বিভাগের আওতায় শকুনের নিরাপদ এলাকা] এর নিম্ন তফসিল বর্ণিত ২৭,৭১৭.২৬ বর্গ কিলোমিটার এলাকাকে মহাবিপন্ন বাংলা শকুনের (White-rumped Vulture, *Gyps bengalensis*) সংরক্ষণ ও বংশবৃদ্ধির লক্ষ্যে বাংলাদেশ গেজেটে প্রকাশের তারিখ থেকে বিশেষায়িত Landscape Zone এবং শকুনের নিরাপদ এলাকা (Vulture Safe Zone) হিসেবে ঘোষণা করা হলো।

(৭৪৭)
মূল্য ঃ টাকা ১২.০০

Copy of the Gazette notification for the declaration of Vulture Safe Zones in Bangladesh

A.B.M. SAROWAR ALAM

Vulture awareness billboards in Vulture Safe Zone 1

which are areas where special emphasis is given for the conservation of rare and threatened wildlife or ecosystems, through a gazette notification under Article 20(1) of the Bangladesh Wildlife (Conservation and Protection) Act, 2012.

These two are the first and only Government approved VSZs, making the conservation of the area and the species mandatory for the Government itself. The north-eastern VSZ (19,663 sq. km) and the Sundarban VSZ (27,717 sq. km) both share boundaries with India, making trans-boundary initiatives of utmost importance. Each VSZ is managed by a management structure that involves the local community and local government office under the umbrella of the Vulture Conservation Team and the Bangladesh Government, through the Bangladesh National Vulture Recovery Committee (BNVRC) established under the MoEF&CC. VSZs will also act as a stepping stone for other conservation activities, as a commitment has been made by the Government through declaring the VSZs to give special emphasis to the protection of vultures.

Eradicating diclofenac from markets

Now that the VSZs have been declared, the Government is responsible for ensuring that they function properly, the main objective being to ensure that no veterinary drugs harmful to vultures persist inside these specialized zones. Although veterinary diclofenac was banned in 2010 throughout Bangladesh, it was only after the declaration of the VSZs that a complete halt in production and supply could be ensured.

To start with, undercover pharmacy surveys were conducted in 2014, which revealed an alarming presence of diclofenac in over 7% of the veterinary painkiller market, while ketoprofen was at an even more dangerous 25%. The priority was the urgent elimination of all diclofenac from the market. Following this, massive awareness raising activities were undertaken in the local communities, led by IUCN Bangladesh with in-depth involvement of the government, especially the Forest Department, Department of Livestock, and the Directorate General of Drug Administration. Community-based village Vulture Conservation Teams (VCT) were engaged and every small village and bazar in the VSZs was visited, reaching out to all local veterinarians and

RASEL AHAMMED

International Vulture Awareness Day is celebrated in key areas all across the country

pharmacy owners. Posters, leaflets, and brochures were handed out, local schools were painted with murals of vultures, and school books were handed out to the children. International Vulture Awareness Day was celebrated in key areas all over the country. The campaigns focused on spreading the news of the ban on the drug, reduction in the use of ketoprofen, and promotion of a safe alternative, the NSAID meloxicam.

The result of this huge effort was a decrease in diclofenac use, which reflected in the results of the second undercover survey, where diclofenac was found to make up less than 1% of the veterinary drug market in the VSZs, while meloxicam was found to have increased significantly. We realized that further efforts were needed to totally get rid of diclofenac from the market, so another round of awareness programmes was initiated. During the third and latest undercover survey in April 2018, no veterinary diclofenac was found in the market, meloxicam was more than 33%, but ketoprofen had reached 62%.

Targeting and Banning Ketoprofen

From the undercover surveys, it was obvious that ketoprofen was replacing diclofenac in the VSZs. Ketoprofen is known to be equally toxic to vultures as diclofenac. Hence, it became imperative that measures be taken against this drug as well. In January 2017, following a similar process as with diclofenac, ketoprofen was also declared banned for veterinary use in the two VSZs. These two areas are the only places in Asia where ketoprofen is banned. The move was hailed as a major milestone for vulture conservation and was applauded by national and international conservation bodies. The government also started to inform its local veterinary and livestock offices of the ban on ketoprofen in the VSZs. Awareness campaigns were continued in the important areas, disseminating knowledge about vultures and the toxic effects of these drugs. Again, this was facilitated by the legal status given

COURTESY: IUCN BANGLADESH

Ketoprofen is known to be equally toxic to vultures as diclofenac

In February 2021, the Prime Minister of Bangladesh, Sheikh Hasina, approved a proposal that made Bangladesh the first country to ban ketoprofen to save vultures

to the VSZs, and with the VSZs well established, more focused actions were undertaken.

Finally, in November 2019, the MoEF&CC, along with IUCN, organized a meeting with 13 top veterinary pharmaceutical companies of the country, as well as the Directorate General of Drug Administration, Department of Livestock, Ministry of Health, and other stakeholders to discuss a countrywide ban on ketoprofen. In the meeting, it was unanimously agreed that ketoprofen should be banned for the sake of vultures. Following the meeting, MoEF&CC submitted a proposal for the national ban on ketoprofen.

In February 2021, the Hon'ble Prime Minister of Bangladesh, Sheikh Hasina, approved a proposal in a Cabinet meeting, making Bangladesh the first country to ban ketoprofen nationally to save vultures. This was hailed as a major conservation success by national and international conservation communities.

Mainstreaming Meloxicam

Along with large scale awareness campaigns in the VSZ for the reduction of ketoprofen, efforts were made to mainstream meloxicam. In order to do so, the private sector was approached by the government. Renata and ACME, two of the largest pharmaceutical companies in the country, were approached to join forces to support vulture conservation by boosting their meloxicam production. The formulation of meloxicam was provided free to Renata by the vulture conservation initiative of IUCN with support from SAVE, so that they could produce their own brand of meloxicam. ACME printed a pro-vulture slogan on their meloxicam packaging. Both the companies have also taken part in vulture conservation awareness campaigns and workshops organized by IUCN. Representatives of ACME and Renata attended the workshops conducted in veterinary schools of agricultural universities across the country.

KAZI ZENIFAR AZMIRI

Himalayan Griffon being released into the wild

SAKIB AHMED

Wing-tagged Himalayan Griffon being released from the Vulture Rescue Centre

The two companies have also subsidized their meloxicam formulations for IUCN Bangladesh as part of their corporate responsibility, and through advocacy by IUCN. Renata has given a 35% subsidy on its brand Melocam, while ACME has given a 30% subsidy on Melvet. IUCN distributed these subsidized drugs to about 1,200 local pharmacies and vets in both VSZs. All these efforts resulted in an increase in the market share of meloxicam and decrease in ketoprofen. Where initially only two companies produced meloxicam, 13 companies are now producing it. The Government of Bangladesh has decided that meloxicam will be mainstreamed further, while ketoprofen will be banned throughout the country by 2021.

Conclusion

Although the White-rumped Vulture population in Bangladesh is only about 260, the conservation efforts undertaken, especially the establishment of government approved VSZs, have helped the species, which can now be considered stable in Bangladesh. Furthermore, the Government through the Forest Department has ensured that its key breeding habitats are protected by enforcing laws, constructing eco-friendly fencing around the colonies, and establishing patrols through Vulture Conservation Teams. Vulture Feeding Stations were also established in the VSZs to provide safe supplementary food during the breeding season, and plantation programmes were undertaken to enrich vulture habitat. This has led to an increase in the breeding success of the species to 57%.

Establishing Vulture Safe Zones and giving them legal status has been the key catalyst in the conservation of vultures in Bangladesh, which was initiated by IUCN. Through the VSZ as the main platform, other landscape level conservation activities have been initiated. Bangladesh has already banned ketoprofen, first in VSZs, and then across the country. Now it is time eradicate it, like diclofenac. This will certainly be a major win for vulture conservation and will set an example for the world to follow. Lastly, more concentrated efforts towards conservation of habitats and breeding grounds will continue inside the VSZs to ensure that the vultures have a safe home and safe food. If we can ensure that vultures are completely safe in the VSZ, we can ensure their survival everywhere. ■

Monitoring diclofenac & other NSAIDs impacting Gyps Vultures

Text: **John Mallord**

Identifying the non-steroidal anti-inflammatory drug (NSAID) diclofenac as the sole cause of the catastrophic declines of populations of Gyps vultures across South Asia was obviously a major step in the conservation of these Critically Endangered species. But it was only the beginning. Fortunately, the Governments of India, Pakistan, Nepal, and Bangladesh acted quickly by banning the veterinary use of this drug. Later, India followed up by banning large (more than 3 ml) vials of diclofenac, supposedly intended for human use. However, as we learn elsewhere in this issue of *Hornbill*, diclofenac remains available (illegally) for veterinary use. Other veterinary NSAIDs are available that have also been shown (or are suspected) to be toxic to vultures; and, until recently, there has only been one vulture-safe alternative, meloxicam. In this article, I discuss the ongoing measures that are being taken to monitor the availability of different NSAIDs in pharmacies, and their occurrence in vulture food. I also introduce the methods we use to test the safety to vultures of other NSAIDs, to identify both toxic drugs, and to continue to search for drugs that are not harmful, to give vets and livestock owners a choice of vulture-safe alternatives.

S. BALACHANDRAN

Identifying diclofenac as the sole cause of the catastrophic declines of populations of Gyps vultures across South Asia was a major step in the conservation of these Critically Endangered species (Image: White-rumped Vultures)

John Mallord is a Senior Conservation Scientist at the RSPB (BirdLife UK), leading the organization's research into Asia's vultures.

The availability of NSAIDs for veterinary use

It has been estimated that the onset of the decline in Gyps vulture populations occurred from around 1994 – this was also the year that diclofenac first became available for sale in India for veterinary use. Although its veterinary use was banned in 2006, it has been important to monitor its continued (illegal) availability for such use across vulture range countries. We have done this through overt and covert pharmacy surveys. Overt (or open) surveys involve a team of surveyors requesting a pharmacist to show all the NSAIDs being sold in a shop and noting down what was being offered. However, the problem with open surveys is that if a pharmacist is aware that it is illegal to supply diclofenac for veterinary use, he/she may be reluctant to admit to stocking it. Thus, one would get a biased picture of how common the drug was. The remedy has been to undertake covert (undercover) surveys, where a local man is employed to ask a pharmacist for a painkiller to treat his injured/sick cow. Sometimes, he would even provide a prescription for diclofenac. In 2012, when the surveys carried out by BNHS started, diclofenac was still being offered for sale in more than a third of pharmacies surveyed across India. And as late as 2017, the date of the most recent nationwide surveys, the drug was still widely available, accounting for

COURTESY: BIRD CONSERVATION NEPAL

Bird Conservation Nepal conducts regular monitoring and awareness programmes for pharmacies

10–46% of sales in the five regions surveyed in that year. Only in Assam, in 2016, was diclofenac not offered for sale in any pharmacy. More encouragingly, however, after the ban on large human-use vials in India, the proportion of diclofenac offered for sale in large vials halved compared to before the ban, and the majority of those sold were of old stock, rather than recently (and illegally) manufactured new products.

> Fortunately, the Governments of India, Pakistan, Nepal, and Bangladesh acted quickly by banning the veterinary use of diclofenac

The situation is better in Nepal. Recent surveys by Bird Conservation Nepal (BCN) of pharmacies across the country have shown that diclofenac has all but disappeared as a veterinary drug. These surveys have also made clear that meloxicam, the only known vulture-safe NSAID, has replaced diclofenac to become the unquestioned drug of choice for treating cattle in Nepal, it being offered in around 80–100% of pharmacies. However, just as the disappearance of diclofenac has been slower (and more uneven)

RAJAT BHARGAVA

RAJAT BHARGAVA

One is more likely to come across free-ranging dogs, crows, and Black Kite at carcass dumps that once attracted large numbers of vultures (Image: Eurasian Griffon)

in India, the same can also be said for the uptake of meloxicam. In 2016–2017, the proportion of pharmacies offering meloxicam varied between 10% (Haryana) and 77% (Assam).

Ascertaining the levels of drugs in cattle carcasses provides insights into the availability of different NSAIDs, and also helps to estimate the likely numbers of vultures that would be killed by a meal contaminated by diclofenac

While there is an understandable emphasis on the relative availability of diclofenac and meloxicam, pharmacy surveys also highlight the prevalence of a whole range of NSAIDs available for treating injured/sick cows. One of these, ketoprofen, is known to be toxic to vultures, and during our undercover surveys, it was found to be the most commonly offered drug in Bangladesh. Encouragingly, however, this drug has recently been banned, nationwide, by the Bangladeshi government. Another, aceclofenac, is quickly converted to diclofenac in cattle, and is therefore just as toxic to vultures. Some others (e.g. nimesulide, flunixin) have been linked to the deaths of both captive and wild vultures; in fact, recent safety testing of nimesulide has confirmed it as toxic as diclofenac to vultures. Whereas for at least one of the drugs, tolfenamic acid, safety testing has shown that it is another vulture-safe drug, only the second to be confirmed. Others (paracetamol, piroxicam) are of unknown toxicity.

The prevalence of NSAIDs in vulture food

The next step in the chain of NSAID prevalence from pharmacy to vulture is the birds' food supply. Ascertaining the levels of various drugs in cattle carcasses not only gives us another insight into the availability of different NSAIDs, but also helps us estimate the proportion of vultures that are likely to be killed by a meal that is contaminated by diclofenac. Livers are collected from dead animals, usually domesticated ungulates at carcass dumps run by local government corporations. These sites would once have attracted large numbers of vultures, but now you are more likely to come across free-ranging dogs, crows, and Black Kite *Milvus migrans* having their fill on the carcasses. These sites employ local skinners, who help us by removing the livers; we then take a few samples from each of the removed organs and store them ready for analysis. Once the samples have been treated, NSAID concentrations can be determined using a fancy (and expensive!) bit of kit in a process called liquid chromatography with electrospray ionization mass spectrometry (LC-ESI/MS).

Before the ban in 2006, diclofenac was found in around 10% of cattle carcasses across India. To put this into context, it has been estimated that less than 1% of cattle carcasses needed to be contaminated by lethal levels of diclofenac to account for the catastrophic declines experienced by vulture populations. Repeat sampling of cattle carcasses in 2009 revealed that the ban was having some effect. The prevalence of diclofenac had declined by half, the average concentration of the drug was also lower, and, importantly, the proportion of vultures likely to die from contaminated meat had also reduced to about a third of pre-ban levels. However, despite the ban, these findings showed that diclofenac prevalence was still at a level that would cause the mortality of many vultures, so it is imperative that we continue to monitor levels of the drug in the birds' food supply. It will also tell us what other drugs are being used by vets and livestock owners to treat their cattle, and alert us to whether any other vulture-toxic drugs are being used.

NSAIDs in vulture carcasses

When the population declines were at their peak, with millions of vultures dying, it was possible to find and analyse the carcasses of hundreds of dead birds. By doing this, the link between diclofenac and vulture disappearance was firmly established. It is still important to carry out a post-mortem on dead vultures to check for continued NSAID poisoning, but with populations at such a historic low, very few carcasses are found. Those that are found are often associated with a particular cause of death, e.g., a poisoned animal carcass, electrocution by powerlines, or collision along railway tracks. However, this doesn't give a true picture of the strength of the relative threats to vultures, as NSAID poisoning is often a 'silent killer', with affected birds often surviving for a couple of days, then dying well away from the treated carcass, and therefore harder to find.

RAJAT BHARGAVA

Findings show that diclofenac prevalence is still at a level that would cause the mortality of many vultures (Image: Eurasian Griffon)

An unbiased way to monitor bird mortality is to follow the movements of GPS-tagged individuals and, if they die, retrieve their carcasses to establish the cause of death. Coinciding with the first release of captive-reared vultures in Nepal in 2017, at Pithauli on the edge of Chitwan National Park, wild-caught birds were also fitted with GPS transmitters. Tagging has carried on until 2022, with a total of 99 birds tagged – 50 wild and 49 captive-released. These birds are monitored daily, their locations being recorded up to 14 times a day. While the birds that were reared and bred in captivity have tended to stay around the release area, where they continue to be provided with a safe source of food, the wild birds have ranged widely, many travelling over 200 km west from where they were caught.

Such monitoring is combined with a rapid response team, who follow up any suspicious lack of movement in a tagged bird by travelling to its last known location, in an attempt to confirm whether the bird is alive or dead. Vultures often do not move very much, especially if they have just eaten, so there have been many false alarms. In fact, on one occasion, a bird's lack of movement was found to be due to the bird sitting on a nest incubating an egg! So far, there have been no confirmed deaths from NSAID poisoning, suggesting that the work carried out by BCN, advocating for the removal of diclofenac from pharmacies and the promotion of the vulture-safe alternative meloxicam, has been successful. It is important now that such work be carried out in India, so that we can learn about the major threats to vultures in the most important country for these species.

Identification of other vulture-toxic NSAIDs and the search for safe alternatives – safety testing

How do we know that a drug is toxic, or safe, to vultures? The evidence for diclofenac's toxicity was initially based on the perfect correspondence between the presence of diclofenac residues in the blood of dead vultures and the classic symptom of NSAID poisoning, visceral gout. However, subsequently, the drug's toxicity to vultures was explicitly evaluated by experimental safety-testing, whereby a drug of unknown toxicity is fed to vultures under controlled conditions, either as an oral solution, or through being provided with contaminated buffalo meat. The birds are monitored over several days, or until they die, and checks are made of various chemical substances, especially uric acid, levels of which increase dramatically in the blood of birds that consume a toxic NSAID. As conservationists, these experiments present a moral quandary — to evaluate a drug's toxicity, we must accept the fact that safety testing will result in the death of some vultures. We take this ethical dilemma seriously, and take a number of measures to reduce the amount of suffering. Firstly, in initial experiments, doses of a NSAID are only given to two birds; if these birds die, then the experiment can be stopped and the drug declared toxic. Only if these birds survive, and the drug is likely safe to vultures, are more birds given the drug. Secondly, the initial testing is always carried out on species that is not categorised as Critically Endangered. These species are close Gyps relatives to those whose populations declined so catastrophically due to diclofenac, and which are also known to be susceptible to poisoning from that drug. Only after evidence from dozens of birds indicate that a drug is safe is the experiment extended to a small number of birds from a critically endangered species, to confirm that there is not something different about their physiology that makes them respond differently to the drug. Importantly, these birds are captive and unable to be released due to an unrelated injury, which is often the cause of their being kept in captivity in the first place. Finally, it is good to remember that diclofenac was the cause of death of tens of millions of vultures, and other NSAIDs could have an equally catastrophic effect. Therefore, we feel it is justified to sacrifice a tiny number of birds for the greater good of saving a far larger number of wild vultures, and potentially saving several species from extinction.

COURTESY: BIRD CONSERVATION NEPAL

BCN Team conducting vulture surveys in Nepal

SANJIV KHANNA

White-rumped Vulture

Conclusion

Recent surveys of vultures in India and Nepal have highlighted the importance of removing toxic NSAIDs from the environment. Analysis of road transect surveys carried out by BNHS across India suggest that the decline of White-rumped Vulture may have slowed or even stopped; however, Indian Vulture populations continue to decline, albeit at a slower rate than at the height of the vulture crisis. Meanwhile in Nepal, surveys by BCN have provided strong evidence that the population of White-rumped Vulture have started their recovery (and probably Slender-billed too – numbers are still too small to be statistically sure). The better performance of vultures in Nepal can be linked to the virtual disappearance of diclofenac from pharmacies, whereas in India, the drug is still widely sold for veterinary use, albeit in small human-use vials.

In addition to the fundamental importance of government bans on the veterinary use of diclofenac, part of the reason for the decline in the availability and use of diclofenac is the advocacy and education work carried out by BCN and BNHS, encouraging pharmacists to switch from this highly vulture-toxic drug to meloxicam. Much of this work is carried out in provisional Vulture Safe Zones (VSZs), areas of roughly 30,000 sq. km, centred on an established vulture colony or breeding centre. These zones will remain provisional until we can be sure they are genuinely safe for vultures. This would primarily entail that toxic NSAIDs are not available in pharmacies and, importantly, not accessible to the birds in their cattle carcass food. The importance of Vulture Safe Zones is heightened by the need to release captive-bred vultures into a safe environment. The VSZ in Nepal was declared safe in December 2021, the first in the world, based on the removal of diclofenac from the environment, high survival rates of wild GPS-tagged birds, and an increasing vulture population ■

Vulture Safe Zones of India

Text: **Paul Insua-Cao, Sachin P. Ranade, Rohan Shringarpure, S. Bharathidasan and Satya Prakash**

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National parks, nature reserves, wildlife sanctuaries — we are all familiar with their importance to safeguard the survival of many species, be they plants, animals, or even fungi, and to ensure the continued supply of essential natural services to humankind. These protected areas can be modest in size, like Keoladeo National Park at 28.73 sq. km, which provides a seasonal home for hundreds of thousands of migratory waterbirds. Or they may be vast, like Tadoba-Andhari Tiger Reserve which covers

ASHOK AGARWAL

Himalayan Griffon

MANDAR KULKARNI

Cattle carcass sampling

625.40 sq. km, needed to accommodate the vast ranges over which tigers roam. What characterizes these areas is that human activity is much reduced, allowing natural ecosystems, processes, and the wildlife within to thrive.

The protection of vultures raised a major dilemma in India. They had been found everywhere and had flourished, living harmoniously for millennia side by side with humans, providing an essential service by cleaning up carcasses of domestic cattle. They were an integral part of the human world. Then, unwittingly, the harmony was broken as diclofenac, a drug lethal for vultures, was introduced into this system. It became imperative that the human-impacted environment be cleared of diclofenac to save vultures and help return them to the harmonious co-existence of the past. By any measure, India is a large country, and although diclofenac had been banned, it was still being used illegally. Tackling this problem across the whole country has proved to be a huge undertaking.

The proposed solution was the concept of Vulture Safe Zones (VSZs). These are areas large enough for local vulture populations to thrive, but small enough for practical conservation management. These zones are based on the premise that normal human life is a part of such a landscape. The idea is to focus on a circular area roughly 100 km in diameter, so about 30,000 sq. km, centred on important nesting colonies of vultures. Of course, some vultures travel further than 100 km from their breeding colony, but a reasonable benchmark is needed to find and implement a practical solution. Within each VSZ, a team of conservationists works with the government, conducting a set of complementary activities to clean up the environment, eliminate hazardous substances and practices, and make it safe for the vulture populations to thrive again.

In 2011, the SAVE (Saving Asia's Vultures from Extinction) Technical Advisory Committee agreed that a VSZ can be confirmed (1) after two years of assessment, if (i) no diclofenac is found in pharmacies for veterinary use, and (ii) no diclofenac is found in a minimum of 800 cattle carcass liver samples; and (2) after 5 years of regular intensive

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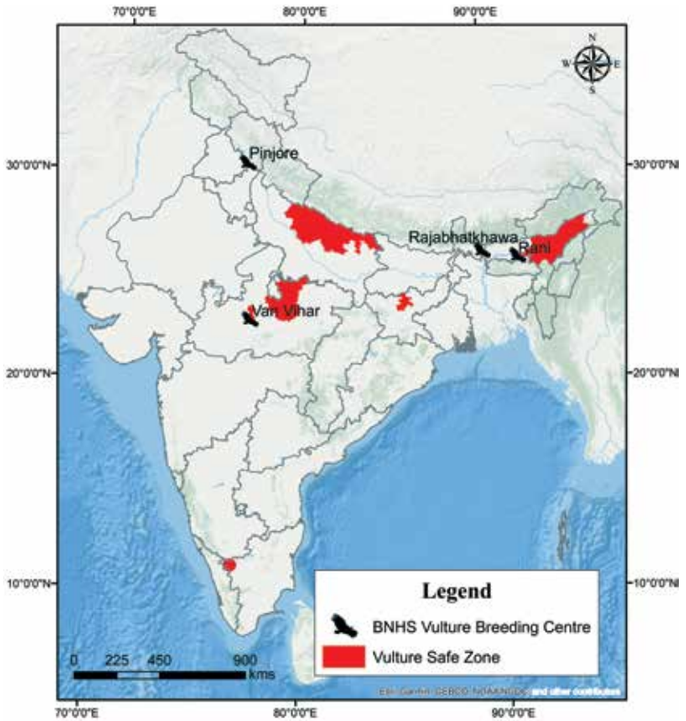
Satya Prakash is President of Neo Human Foundation & IBCN/ AWC State Coordinator-Jharkhand.

ROHAN SHRINGARPURE

Liver sample collection from cattle carcasses



Locations of provisional Vulture Safe Zones in India
(Map prepared by Rohan Bhagat)

monitoring, if (i) no diclofenac or visceral gout is found in dead vultures within the area, and (ii) vulture populations within the VSZ are either stable or increasing.

Until now, these criteria have not been met in any area, and so all the selected areas remain as provisional Vulture Safe Zones (pVSZs), and the work of cleaning the environment for vultures continues, so that eventually the birds can in turn clean the environment for the people living there.

So, what has this meant in practice in India? BNHS, in collaboration with state governments of Assam, Uttar Pradesh, and Madhya Pradesh, is working to establish three VSZs, followed more recently by two non-profit organizations, the Neo Human Foundation in Jharkhand and Arulagam in Tamil Nadu. This geographical spread across India means that once these areas effectively fulfill the criteria of Vulture Safe Zone in practice, they will provide strongholds for all three of India's Critically Endangered Gyps vultures. Further, the most recent Vulture Action Plan of the Indian government, aims to set up VSZs in every state of India. VSZs are the bedrock of vulture conservation and the main hope for the survival of vultures in India. Nevertheless, the mere designation of VSZs does not mean that the job is done. Continued monitoring will be needed to ensure that the designated areas still merit the title.

BNHS is working with State Forest Departments and receiving support from the UK-based Royal Society for the Protection of Birds (RSPB) to lead this pioneering work. In addition to three VSZs, BNHS is also establishing Vulture Release Areas (VRAs) close to Vulture Conservation Breeding Centres. The objective of these areas is to provide safe places for the eventual release of captive-bred vultures. The conditions in VRAs need to be the same as in VSZs, i.e. removal of diclofenac from the vultures' food sources across an area large enough to provide them with a safe home range.

VSZs need to be adapted to local circumstances, and to the capacity of those

implementing them. In each provisional Vulture Safe Zone, BNHS has a small team of three or four people based locally. In Madhya Pradesh and Uttar Pradesh, the VSZ work is led by the Chief Wildlife Warden and the Forest Department, and supported by the BNHS team. Working with state governments is of fundamental importance in all VSZs. Regular meetings are held with government officials, particularly from the Forest Department, Food and Drugs Administration, Animal Husbandry Department, District Administration, Education Department, and Public Relations Department. These meetings ensure that important messages about good livestock husbandry practices, which do not harm vultures, reach the grassroots level, and laws on the sale and use of veterinary drugs for livestock are understood and enforced.

The grassroots level, among local communities, is where the key work must be done. VSZ teams carry out awareness raising activities with livestock owners, veterinarians, and pharmacists, informing them of the perils of diclofenac, the law regarding its use and safe alternatives, good veterinary practices in general. The teams attempt to promote an appreciation of these magnificent and valuable creatures. This is done through print and electronic media, as well as in the form of hoardings and rallies on important days such as International Vulture Awareness Day, World Environment Day, Wildlife Week, Independence Day, and Republic Day.

In Madhya Pradesh, the pVSZ covers Tikamgarh, Bhopal, Damoh, Sagar, and Chhatarpur districts in the north-eastern part of the state, with important nesting sites for Indian and White-rumped Vultures known from the last three districts. Repeat vulture surveys are

> Vulture Safe Zones are areas large enough for local vulture populations to thrive, but small enough for practical conservation management

ROHAN SHRINGARPURE

Interaction with Dr Gowrishankar Shejwar,
the then Hon'ble Forest Minister of Madhya Pradesh

SATYA PRAKASH

Meeting with vets, and free distribution of the vulture-safe drug meloxicam

conducted across the state and pVSZ, following a standard method along roads, watching for vultures to estimate trends in their populations. BNHS follows a similar approach in Uttar Pradesh and Assam.

The team also identifies and regularly monitors the nesting colonies of both White-rumped and Indian vultures during the breeding season from October to June. Various stages of the nesting cycle, including pair formation and nest building, incubation, nestling and fledgling stages are monitored. At last count, there were 28 active nests

ROHAN SHRINGARPURE

Vulture rally during Republic Day in India

of the White-rumped and seven nests of Indian Vulture at the colonies. During the surveys, the teams also search for cattle carcass dumps. When they find a carcass, they record what may be feeding on it, be they dogs, vultures, or other animals. If the carcass is fresh, they take tissue samples, especially from the liver, which is a preferred food part for vultures and where diclofenac accumulates. The samples are processed in-house to extract in acetonitrile any drugs present, and the extracts are sent to a laboratory to analyse for the presence of any toxic drugs.

ROHAN SHRINGARPURE

VSZ team interacting with bone and hide collectors

Another means of monitoring the safety of the environment for vultures in a pVSZ is regular surveys of pharmacies, to know which veterinary drugs are more popularly sold, and therefore are being used more. These surveys are usually undercover, with surveyors posing as farmers requesting medication for their injured cattle. The surveys are conducted every six months and attempts are made to visit the same pharmacy during each survey, as far as possible. The latest survey, in March 2021, revealed that despite the ban, 27% of the surveyed pharmacies offered human-use formulations (largely tablets, but a few 1–3 ml ampoules) of diclofenac for cattle treatment, which is a cause of concern.

In Uttar Pradesh, the pVSZ is centred on Gonda and covers 16 districts, mostly along the

ROHAN SHRINGARPURE

Sensitization of pharmacists is essential to the success of the ban on diclofenac

border with Nepal in the Terai region. In principle, this pVSZ extends into Nepal where there are other VSZs being managed by Nepalese partners (see *Hopes are High: Collapse & Return of Vultures in Nepal* page 88). This necessitates transboundary cooperation and good communications across the border. As a direct result of public understanding of the vulture issue in Uttar Pradesh, in 2019, the State Forest Department successfully rehabilitated four White-rumped Vultures that had travelled from Nepal and were rescued at various locations of the state. With support from the VSZ team, the vultures were released and are now known to regularly travel between Nepal and India. Nesting sites for vultures in Uttar Pradesh have been identified in Dudhwa National Park, Katerniaghat Wildlife Sanctuary, and Suhelwa Wildlife Sanctuary, for Slender-billed and White-rumped Vultures.

> The focus of the Vulture Conservation Programme is removal from the environment of those veterinary drugs that are toxic to vultures

The drive Assam pVSZ is described in more detail in a separate article (see *Vulture Safe Zones in Assam* page 128), which gives a richer sense of the work carried out in a VSZ. It covers 14 districts straddling the Brahmaputra river, where there are important nesting sites in Sivasagar, Dibrugarh, Golaghat, and Lakhimpur districts for Slender-billed and White-rumped Vultures. Most importantly, the Assam pVSZ can be considered the strong-hold for Slender-billed Vulture, not just in India but globally.

In Tamil Nadu, another SAVE Partner is helping to set up a VSZ. Arulagam is a non-profit organization that was established in 2009 to protect vultures in the state. It works in three districts, namely Coimbatore, The Nilgiris, and Erode in the west of the state, bordering Karnataka and Kerala. The Nilgiris district contains an established nesting site, where much of their work is focused on the Moyar Valley pVSZ in the Nilgiri Biosphere Reserve. With limited resources, Arulagam focuses on

SATYA PRAKASH

Nesting White-rumped Vultures in Urwa Koderma, Jharkhand 2022

SANKARA NARAYANA

Red-headed Vulture

a smaller area of about 30 sq. km under the guidance of SAVE and the Tamil Nadu Forest Department. The area was chosen based on the breeding colonies of White-rumped and Indian Vultures, which at last count had 49 and 12 nests respectively; a nest of Red-headed Vulture was also recorded later.

Recent estimates suggest that more than 140 White-rumped, more than 30 Indian, and 12 Red-headed Vultures live in the Tamil Nadu VSZ landscape. There are about 165 villages located in and around the VSZ with approximately 1,736,000 inhabitants, predominantly of the Irula, Kurumba, and Toda tribes, who are pastoral communities with cattle rearing as one of their main occupations. Arulagam has used its limited resources to undertake broad, diverse, and enticing education campaigns to "rebrand" vultures to be seen as friends and benefactors of society. These campaigns draw from social surveys conducted among villagers, veterinarians, pharmacists, and government staff, and have uncovered negative perceptions about vultures among some groups. Arulagam has embraced all opportunities to promote a simple and consistent positive message about vultures across the Moyar Valley. Their innovative methods include a volleyball tournament; inviting the Air Force to make presentations for children, comparing vulture flight to aircraft aerodynamics; working through the Clean India Campaign; and planting trees. The list goes on, and more examples can be found in (see *Vulture Conservation Initiatives in the Moyar Valley Vulture Safe Zone, Tamil Nadu* page 138.)

In Jharkhand, the Neo-Human Foundation is working to establish a VSZ in Hazaribagh district, the only district in the state that still has a viable population of vultures. Only the White-rumped Vulture has been recorded nesting in this district in recent years, although Indian and Egyptian Vultures are also known to be resident. Surveys by the Neo-Human Foundation showed that diclofenac was an important issue and that lack of awareness of the value of vultures

PAUL INSUA-CAO

Indian Vulture nestling in Singoregarh, Madhya Pradesh

among the local population led to disturbance and loss of trees for breeding and roosting. Awareness programmes have been undertaken and meloxicam is distributed free of cost by the Forest Department to vets and paravets, to replace diclofenac. Vultures are now reported from other Jharkhand districts like Koderma, Ranchi, Khunti, and Chatra. It is a good sign to see them return to these areas.

Great progress has already been made in these pioneering pVSZs and there is a lot to be learnt from these initial steps. Recovery of populations of these long-lived and slow-breeding birds is the work of a lifetime, and rolling out VSZs across India will be vital to achieve this goal. The ban on diclofenac and reduction in its misuse is a step on the way, but diclofenac is not the only drug being sold for veterinary use. While some drugs like meloxicam are harmless to vultures and are being actively promoted, others are also toxic to vultures (see *Monitoring diclofenac & other NSAIDs impacting Gyps Vultures* page 106). There are other threats too, like deliberate poisoning of wildlife in some areas. The definition of a Vulture Safe Zone is currently being reviewed and refined, though the consensus is that in India, the focus still needs to be the removal from the environment of those veterinary drugs, especially diclofenac, which are toxic to vultures. ■

Creating a Vulture Safe Zone in Assam:
The road to recovery

Text: **Sachin P. Ranade**

Known to the world for its tea, and for its silk and oil resources, Assam is profusely blessed by Mother Nature. Geographically, Assam occupies a crucial position in north-east India, surrounded by six hill states (Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, and Meghalaya) and connected to the rest of India through West Bengal. Assam itself is also a hill state, but with large expanses of plains. These are the floodplains of the mighty Brahmaputra and Barak rivers, making the land fertile and favourable for human civilization for millennia. Humankind thriving alongside wildlife is yet another feature of Assam.

SACHIN P. RANADE

The floodplains of the mighty Brahmaputra and Barak rivers make the land fertile and favourable for paddy cultivation

Sachin P. Ranade is Sr Centre Manager & Asst Director, BNHS, Vulture Conservation Breeding Centres, West Bengal and Assam.

Being a wildlife enthusiast since childhood, it was my dream to see this wonderland full of wildlife. I got my first chance to visit Assam during the Nationwide Vulture Survey in May 2002. I started by road from Haryana, and after crossing Uttar Pradesh and Bihar on the fourth day, reached Siliguri in West Bengal. The geographical features start to change noticeably from Siliguri. From Srirampur, at the Bengal-Assam state border, one can enter the beautiful state of Assam. The landscape is dotted with small houses, fish ponds, areca nut plantations and bamboo thickets, with paddy fields on both sides of the road. The nationwide survey in 2002 was undertaken to record the vulture population in India. Therefore, while travelling by road and enjoying the beauty of the landscape, we were also counting vultures and their nests, whenever encountered. Fortunately, I could locate a few flocks of vultures in Assam. Documenting the availability of cattle carcasses for vultures was also on our job list. For the first time, I witnessed Slender-billed Vultures feeding along with Himalayan Griffons and White-rumped Vultures in the wild.

Currently, the Slender-billed Vulture is the most threatened species among the Gyps vultures. Earlier, it was known from Haryana in the west to Assam in the east, along the Himalayan foothills, especially north of the River Ganga. But after the vulture population crash in the 1990s (due to diclofenac, an NSAID painkiller used to treat cattle), their population declined drastically. Assam is now a stronghold for the remaining population of this species, along with a few places in north India and Nepal. Along with Slender-billed Vulture, Assam is home to two other resident Critically Endangered vultures, the White-rumped and the Red-headed. The state also harbours two migratory vultures – Himalayan Griffon and Cinereous Vulture.

Captive Breeding - a firm step in Conservation

Following a National Vulture Recovery Workshop in 2004, a decision was taken to set up at least three conservation breeding centres for Gyps vultures in India, in their natural range. Realizing the need for such a facility in north-eastern India, we established the Vulture Conservation Breeding Centre (VCBC) at Rani in Kamrup district in 2007, in collaboration with the Assam Forest Department. Rani VCBC soon became the base for our activities towards saving the vultures of this region. The objective

About 50 vultures have bred and fledged in the BNHS Vulture Conservation Breeding Centre in Assam over the last eight years

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The Slender-billed Vulture is the most threatened species among Gyps vultures

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Creating awareness among local stakeholders and children is an important objective in the Vulture Conservation Programme

of this VCBC was to keep 25 pairs each of White-rumped and Slender-billed vultures, breed them, and subsequently reintroduce them into the wild. This VCBC is on the way to successfully achieving its goal, as about 50 vultures have been bred and fledged here over the last eight years.

To carry out a captive breeding and reintroduction programme, many field-related activities are essential. Before the vultures are released back into nature, we must ensure that there are no man-made dangers in the release area, which must be safe for vultures. Thus, we initiated the formation of a Vulture Safe Zone. The first and foremost requirement of such a zone is that it must be free from diclofenac (and other dangers for vultures). The veterinary use of diclofenac was banned by the Government of India as early as 2006, following active lobbying by the BNHS. Yet, creating awareness about this decision among local stakeholders was much needed. It was necessary to raise awareness among forestry and other government officials and veterinarians, who are all equally important in ensuring enforcement of the law.

To take forward the Vulture Safe Zone concept, we selected a circular area of about 100 km radius, centred at Majuli as there was a small nesting colony of vultures. The rationale behind the size of this area is that vultures travel a distance of about 100 km in search of food. And, our objective is to make the area safe for vultures, especially from the dangerous diclofenac, through advocacy and awareness! The Vulture Safe Zone in Assam is spread across 14 districts which have suitable habitats for vultures, on the plains on either side of the Brahmaputra River. Historically, all 14 districts had resident vulture populations, but currently, vulture nesting colonies are found in only a few pockets within these districts.

Efforts at the grassroots level

White-rumped Vulture and Slender-billed Vulture are tree-nesters, and their nesting colonies in Assam are spread throughout the rural landscape. One of the prime vulture colonies that we are monitoring in Sivasagar district is spread over a few villages. Nests are located in the backyards and orchards of the villagers, usually in tall trees such as Devil's Tree, Red Silk Cotton or Simul, Kadamb, and large palms, and also in nearby reserve forest land. In such a scenario, the involvement of local people is vital to protect the birds.

Our team visits such areas to interact with the villagers, discuss related issues, and raise awareness and interest in vultures. The awareness meetings are held in schools, community halls, and even in temple premises, usually with screening of a documentary on why vultures are vanishing from their area, followed by a slide show about the need for vulture conservation. The meetings end with a question and answer session led by our team, where queries can be raised and misconceptions about the vultures are cleared. The commonest and funniest misconception is that vultures are being used to create a breed of poultry! It gives us satisfaction that we also do our bit in raising interest in science among young minds. The amazement in the eyes of children while watching the documentary, their pride in wearing a vulture-badge on their shirts, and their wonderful depictions of vultures in drawing competitions,

PAUL INSUA-CAO

Posters informing about the benefits of meloxicam (a vulture-safe drug) over diclofenac, (a vulture-toxic drug) are placed at strategic locations

PAUL INSUA-CAO

PAUL INSUA-CAO

Above: Vulture nests in backyards indicate that wildlife and humans can coexist. An adult White-rumped Vulture nest on a tree in the village (below)

of diclofenac in cattle. Meetings with veterinary practitioners also give us insights into the situation in the field. Many veterinarians willingly work as nodal persons for vulture conservation by promoting best veterinary practices; they also work to raise awareness among their own professional veterinary community. This plays an important role in saving our vultures from toxic drugs.

Another man-made disaster for vultures in Assam is the use of pesticides as poison baits. In the near absence of vultures, feral dogs now thrive on cattle carcasses and due to the abundant availability of this food, their populations have shot up. Dogs at carcass dumps have become ferocious, and there is an increasing incidence of attacks on domestic livestock and people. At times, cattle owners also suffer loss of cattle or goats from dog attacks, which results in an economic setback and deals an emotional blow to the owner. In retaliation, cattle owners often poison the carcass with pesticides like carbofurans and organophosphates, to kill the feral dogs. As the poisoned carcass is left out in open fields, it also attracts vultures, which many a time arrive even before the dogs, and feed on the poisoned carcass. Vultures are social birds and come in flocks to feed, hence many vultures are poisoned and killed in one instance. Poachers looking to hunt tiger or leopard poison their kills to use as bait, with similar consequences. These lethal chemicals are easily available to farmers and tea garden workers, for pest control in crop fields and gardens. It generates a great feeling of satisfaction in us when we successfully rescue and rehabilitate vultures, but the real challenge is that such incidents should not occur in the first place.

PAUL INSUA-CAO

Before captive-bred vultures are released back into nature, it is essential to ensure that there are no man-made dangers in the release area (Image: Slender-billed Vulture)

Vulture population on the path of recovery

We are receiving increasing public support for vulture conservation from our advocacy and awareness programmes, which is reassuring. Breeding success in the wild vulture colonies that we monitor has improved, from 50% in 2013 to about 70% in the 2018–19 breeding season. The results of pharmacy surveys are also encouraging. Diclofenac has been almost entirely removed from the market for veterinary use, within the Assam Vulture Safe Zone as well as the area around the Breeding Centre. Diclofenac has now been replaced by meloxicam (proven to be safe for vultures) as the most popular veterinary NSAID in Assam. We are confident that we will soon be able to start releasing our captive-bred vultures into the wild where they belong. We are also optimistic, that while working on this in situ programme to save vultures through concerted efforts in the Vulture Safe Zone and around the Breeding Centre, we will bring them back from the brink of extinction in Assam! ■

Creating Vulture Safe Zones in Madhya Pradesh and Uttar Pradesh

Text: **Rohan Shringarpure**

Madhya Pradesh is often called the Tiger State and the Leopard State of India. Now it is the Vulture State as well. The Forest Department and the people of Madhya Pradesh (M.P.) in general inherently care deeply about wildlife, and often go to great lengths to conserve it. This has also led to the State Forest Department being among the first few to initiate a Vulture Conservation Breeding Programme in India, with a centre established near Kerwa dam in Bhopal in 2011. The Centre was handed over to BNHS in 2014, under the umbrella of the Society's Vulture Conservation Breeding Programme. The objective of VCBC-Bhopal was conservation breeding of two Critically Endangered Gyps species, the Indian and White-rumped vultures. Currently, the Centre houses 60 vultures, including 41 Indian Vulture and 19 White-rumped Vulture. Till date, 21 nestlings have been bred at the Centre, including 15 of Indian Vulture and six of White-rumped Vulture.

ARINDAM ADITYA

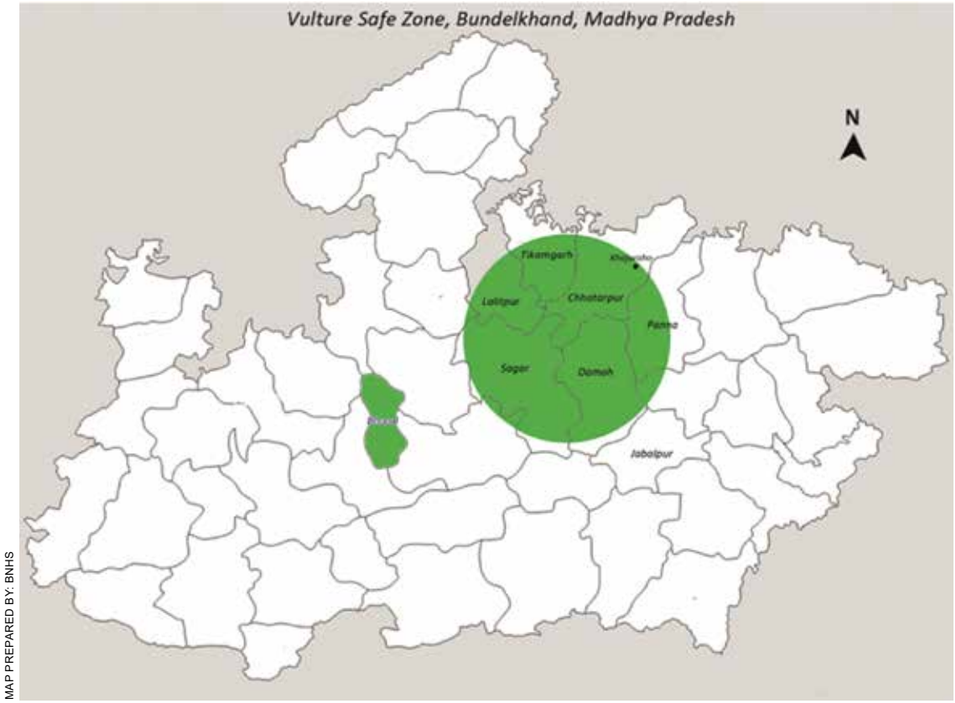
A pair of adult White-rumped Vultures with juvenile

Rohan Shringarpure has a doctorate in Biological Sciences. Currently, he is Centre Manager of VCBC-Bhopal and Project Coordinator for the BNHS VSZ Programme in M.P. and U.P.

Establishing pockets of Vulture Safe Zones (VSZ) throughout the country is one of the several objectives of the BNHS Vulture Conservation Breeding Programme. The overarching goal was to create VSZ in small, logistically feasible pockets (having a radius of 100 km around an existing vulture colony), which would eventually converge to make an entire state and even the country safe for vultures. The VSZ programme was conceptualized to not only help in the conservation of the extant wild populations of vultures, but also to create potential release sites for those bred at the Conservation Breeding Centres.

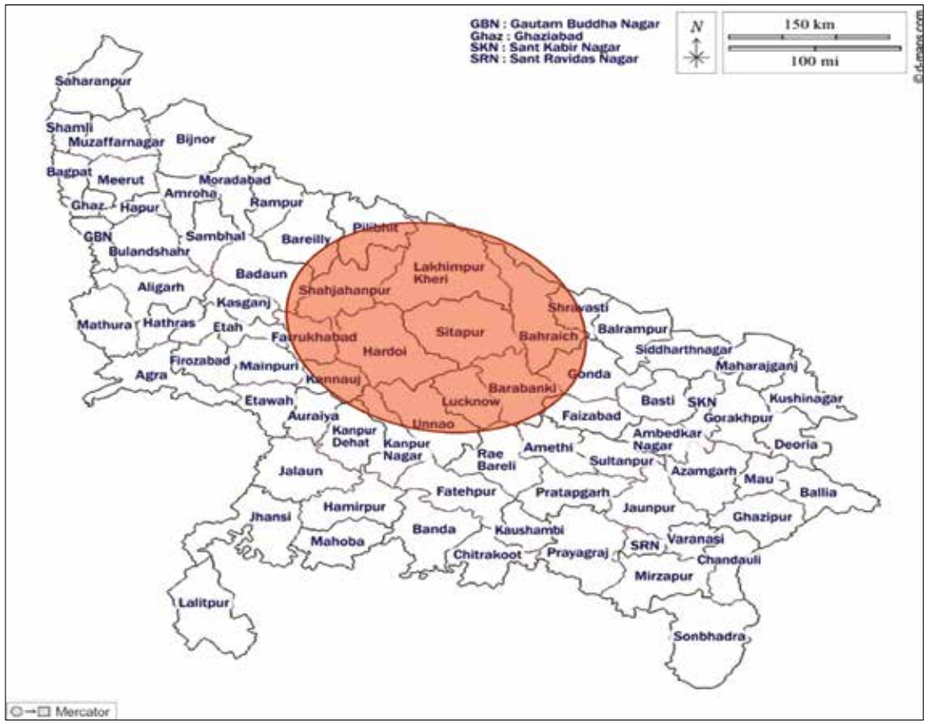
Establishing pockets of Vulture Safe Zones (VSZ) throughout the country is one of the several objectives of the BNHS Vulture Conservation Breeding Programme

One such area was identified in the Bundelkhand region of Madhya Pradesh, covering five districts – Sagar, Damoh, Tikamgarh, Chhatarpur, and Panna – around a nesting colony of White-rumped Vulture in Baxwaha, Chhatarpur district. The project is being jointly run by the Madhya Pradesh Forest Department and BNHS, with funding from the Royal Society for the Protection of Birds (RSPB), UK. A similar project is being carried out in 18 districts of the Terai region of Uttar Pradesh (U.P.), which is being jointly run by the U.P. Forest Department and BNHS, with funding from RSPB. The site was selected based on the following criteria:



MAP PREPARED BY: BNHS

The proposed Vulture Safe Zone (circled area) in Madhya Pradesh



MAP PREPARED BY: BNHS

The proposed Vulture Safe Zone (circled area) in Uttar Pradesh

i. The area was within the natural distribution range of two Critically Endangered Gyps species, the Indian Vulture and the White-rumped Vulture, which were target species of the project. For VSZ-U.P., the target species were White-rumped and Slender-billed vultures.
ii. The area had good habitat and there appeared to be sufficient food for vultures.
iii. The area had a local partner who could help the work at the grassroots level.
iv. The periphery of the VSZ had a vulture population, as well as protected areas.
v. The area did not appear to have any other threats to the vulture population, apart from diclofenac.

The project work broadly involves conservation actions by advocacy and awareness among stakeholder groups; rigorous monitoring to assess the effectiveness of the conservation actions being taken, by monitoring the vulture population, nesting success, prevalence of NSAIDs in cattle treatment, and availability of food for vultures.

Advocacy and Awareness

An in situ conservation programme requires the support of various stakeholder groups for success. Since the population of vultures was affected by the veterinary use of diclofenac, it was vital to sensitize the groups of people whose decisions could directly or indirectly revive the vulture population. Since 2015, the project personnel have conducted over 400 meetings with decision makers of various Government departments, including the Forest Department which, being the custodian of wildlife, implements the Wild Life (Protection) Act, 1972 and the Biological Diversity Act, 2006; the Food and Drugs Administration which implements the Drugs and Cosmetics Act, 1940 and has the power to ban or regulate the use of any drug; the

ROHAN SHRINGARPURE

Disseminating awareness on vulture conservation among various stakeholder groups using a vulture plaque

Animal Husbandry Department (the end-users of various veterinary drugs), and the District Administration that oversees the activities of all departments at the district level.

Following the restriction on the packaging size of human-use formulations of diclofenac to a maximum of 3 ml ampoules, interactions with the stakeholder departments have been mainly to apprise them of the current situation in their area, and request them to issue directives to their subordinates to contribute to vulture conservation by taking all the advised measures within their jurisdiction. Conservation messages from the decision makers were then conveyed to the field staff or grassroots level, by conducting awareness programmes to sensitize the field staff abovementioned, as well as cattle owners, untrained veterinarians, students, and the public. As the people of Madhya Pradesh have a leaning towards conservation, the message to conserve vultures was received positively, although there were a few sceptics.

Similar efforts have been made in U.P., with over 500 advocacy meetings since 2015 and over one lakh people from stakeholder groups sensitized through one-to-one and group awareness programmes. Recognizing that NSAIDs such as nimesulide, aceclofenac, and ketoprofen have been identified as toxic to

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Grassroots awareness programmes regarding vulture conservation

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Sensitization among school students regarding vulture conservation

vultures, the Drug Controller of Uttar Pradesh has written to the Drug Controller General of India, recommending a ban on the veterinary use of these drugs as well.

Status of vultures in Vulture Safe Zones

The vulture population in the region was monitored using three standard methods, road transects, total count, and nest count. The results of the surveys in VSZ-M.P. indicated that the vulture population was stable from 2017 onwards, after a slight decline from 2015 to 2017. Among the resident species, the Indian Vulture is the most abundant, followed by the White-rumped and Egyptian vultures, while the Red-headed Vulture is relatively rare. Vultures were recorded in all the transects, confirming their presence throughout the area. Moreover, three nesting colonies (two of White-rumped and one of Indian Vulture) were regularly monitored. There were 40 active nests of White-rumped Vulture and 19 of Indian Vulture in the colonies. Nesting success was 72.5% for White-rumped, which was good, and 63% for Indian Vulture, which was considered satisfactory. Nesting success is another indicator of the safety of the area for vultures. Moreover, surveys to determine food availability suggested that there was a regular and abundant supply of food for vultures, confirming the suitability of the habitat in these respects.

> A blanket ban on all vulture-toxic drugs is mandatory and this is now the focus of all advocacy meetings

Road transect surveys have been conducted in U.P. on a regular basis from 2019. Based on the surveys, the population of vultures in VSZ-U.P. is quite low. Among the resident species, Egyptian Vulture is the most abundant, followed by the White-rumped. Red-headed and Slender-billed vultures are rare. Although the population appears to be stable, more studies are required to confirm the trend, and to obtain a fair estimate of vulture numbers in the region.

Prevalence of vulture-toxic NSAIDs

A shortcoming of the provisional VSZ in M.P. is the continued availability of vulture-toxic NSAIDs for cattle treatment. The first undercover survey of pharmacies in 2015, to establish a baseline, indicated that more than 50% pharmacies were selling diclofenac for veterinary use. This prevalence decreased to 07% in 2019, but increased again to 14% in 2022. The good news is that diclofenac is no longer a drug of choice for cattle treatment, but the bad news is that nimesulide, another vulture-toxic drug, is quickly replacing it as the preferred drug. This leaves the vulture-safe NSAIDs meloxicam and the recently identified tolfenamic acid on the periphery, with only 12% and 1% of pharmacies selling the drugs, respectively. In VSZ-U.P., the prevalence of diclofenac decreased from nearly 50% in 2016 to 05% in 2022. However, the harmful nimesulide (39%), aceclofenac (20%), and untested piroxicam (21%) are quickly taking its place, which is a cause for concern.

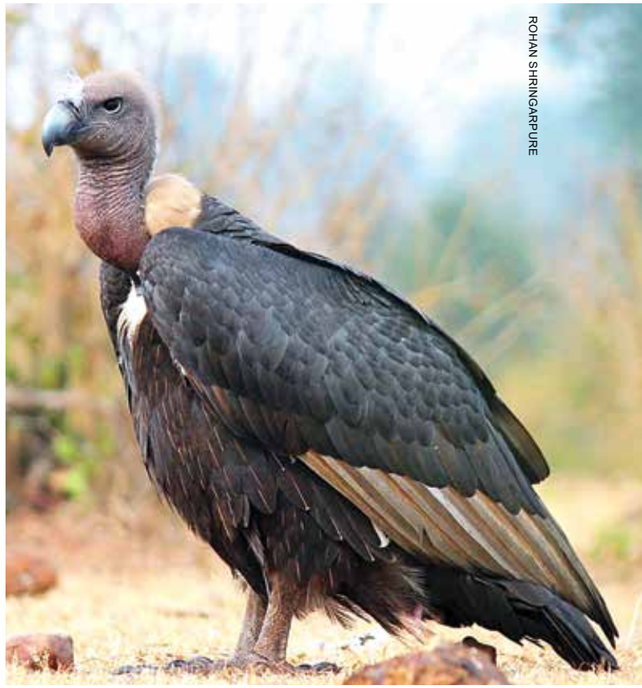
Therefore, a blanket ban on all vulture-toxic drugs, including aceclofenac, nimesulide, and ketoprofen, is mandatory and has been the focus of all recent advocacy meetings. Also, a strategy for the judicious use of all NSAIDs needs to be devised, with all NSAIDs being categorized into the Schedule X category, which will make it mandatory for pharmacists to retain a copy of the prescription before selling the drug.

ARINDAM ADITYA

A flock of vultures at Banda carcass dump, Sagar district, Madhya Pradesh

ROHAN SHRINGARPURE

An adult Indian Vulture



ROHAN SHRINGARPURE

An adult White-rumped Vulture

Reflections

A stable vulture population and good nesting success are indicators of the suitability of the habitat for vulture release, although the continued availability of vulture-toxic NSAIDs remains a cause for concern. It would be a worthwhile experiment to tag a few wild-caught and captive-bred vultures with PTTs (Platform Transmitter Terminals or satellite tag), then to release them and monitor their movements. This would facilitate quick retrieval of dead tagged birds to investigate the cause of mortality. If no mortalities are detected due to NSAID poisoning for two years, this would indicate the safety of the environment for vultures, and the area could be considered for the release of vultures bred at the Vulture Conservation Breeding Centres. ■

Creating a Vulture Safe Zone in West Bengal

Text & Photographs: **Soumya Sundar Chakraborty**

The second Vulture Conservation Breeding Centre (VCBC) of BNHS was established at Rajabhatkhawa, West Bengal, in 2006 in collaboration with the West Bengal Forest Department. The objective of the Centre was to release 100 pairs each of the three resident species of Gyps vultures – White-rumped Vulture *Gyps bengalensis*, Indian Vulture *Gyps indicus*, and Slender-billed Vulture *Gyps tenuirostris* – within 10 years of beginning vulture reintroductions into the wild. This aimed to contribute to the national plan of releasing 600 pairs of each of the three species into the wild.

Vulture Release and Reintroduction Zone in West Bengal extends to areas in Assam and Meghalaya, also Bhutan and Bangladesh

The Centre stands on a five-acre piece of land (protected by electric fencing as this is elephant country) of the West Bengal Forest Department in Rajabhatkhawa village, just outside Buxa Tiger Reserve and National Park. By 2019, the Centre had successfully bred over 70 nestlings of the three Gyps species. It currently houses 146 vultures (93 White-rumped, 35 Indian, and 18 Slender-billed). With the prevalence of diclofenac in cattle carcasses coming down in the landscape over the years due to the various programmes undertaken by the BNHS and government bodies, it is now time to initiate the planned reintroduction of vultures into the wild.

Vulture Reintroduction Zone

The vulture release and reintroduction zone for West Bengal is spread over an area of 30,000 sq. km (as is the case for all the vulture safe zones in India). An area of 100 km radius, centred around Rajabhatkhawa, West Bengal, was considered as the Vulture Release and Reintroduction Zone for the state. This zone encompasses the bordering areas of Bhutan in the north and Bangladesh in the south. Apart from the areas in West Bengal, it covers two other Indian states – the eastern part of Assam and parts of Meghalaya (see map). As vultures are known to travel over 100 km in a day in search of food, it is imperative to ensure that the area in a radius of 100 km is safe for vultures. It must contain enough food and safe habitat,

It is imperative that an area in a radius of 100 km must contain enough food and a safe habitat for the released birds

Reintroduced White-rumped Vulture with wing-tag no. P6 feeding at Fulbari Carcass Dump

Soumya Sundar Chakraborty is Centre Manager and Scientist "C" at VCBC-Rajabhatkhawa, West Bengal; he looks after the vulture release and reintroduction programme at the Centre.

White-rumped Vultures feeding at Fulbari Carcass Dump

so the released bird does not face such survival problems in the release and reintroduction zone. Hence, the following measures are being carried out in the designated area prior to and after releasing captive-bred vultures into the designated area.

a. **Presence of a stable free-ranging vulture population**: It is important to have a wild population of free-ranging Gyps vultures in the reintroduction zone, so that the captive-bred birds when released would join them, and increase their chances of survival in the wild. A stable or increasing population of free-ranging vultures also indicates the safety of the area. Hence, the wild population of vultures in the area is also being estimated by the VCBC team.

b. **Monitoring food and habitat availability**: Food is a basic survival need, so ensuring food availability is an important component in conserving vulture populations. Gyps vultures are obligate scavengers, and feed largely on the soft tissues and visceral organs of large domestic and wild ungulates. Hence, food availability in the release and reintroduction zone is being regularly monitored by the VCBC team. Another crucial aspect is habitat availability, so it is important to get an idea of the presence of good vulture habitat in the release areas.

c. **Monitoring threats from diclofenac and other such drugs**: Studies have shown that most of the vultures in India died due to diclofenac contamination in their principal food, i.e. cattle carcasses. The drug has been banned for veterinary use since 2006, but human-use formulations are still being illegally used to treat livestock. Not only diclofenac, but other drugs like nimesulide, aceclofenac, and ketoprofen have now proven to be toxic to vultures. Hence, the staff keeps a close watch on the use of these vulture toxic drugs in the reintroduction zone.

Other than these measures undertaken in the vulture reintroduction zone, the following programmes and activities were carried out:

Assessing other threats: It was important to identify other threats to vultures, like poisoning of cattle carcasses by villagers to kill rogue predators, which result in vultures becoming unintended victims. Such threats are being monitored by the VCBC team.

Conducting awareness programmes among stakeholders and local people: The Vulture Conservation Breeding Programme in West Bengal was not advertised much for the first 10 to 12 years since establishing the Centre, as it was an "off-display" facility, where general visitors could not be allowed. Instead, we made a dedicated team comprising biologists, veterinarians, and local assistants, who could visit places within the release zone and create awareness about vulture conservation among stakeholders (cattle owners, para-vets, gram panchayat members, chemists and druggists, forest guards, school and college students). Without the active participation of all the stakeholders, it would be next to impossible to make this programme successful. Awareness programmes, public meetings, rallies, street corner meetings, and various other gatherings were frequently organized to sensitize people in the release zone areas.

Support from government and other bodies: To seek support from different organizations and government agencies to make all these programmes successful, we approached several governmental and non-governmental agencies. We sought and received help in conducting awareness programmes from the Animal Resource Development Department, West Bengal; Himalayan Nature and Adventure Foundation, Siliguri; Paschim Banga Vigyan Mancha; and Bengal Chemists and Druggists Association, Alipurduar.

Rem oving misconceptions about vultures: Unfortunately, there are several misconceptions about vultures in our country, and most people do not regard them as friendly creatures. As a result, removing such misconceptions was difficult, especially in rural areas. To convince them of the importance of vultures and the impacts of the loss of vulture populations on society, constant work was required. By referencing Jatayu, the vulture who fought Ravana in the epic Ramayana, we were able to touch a cultural chord in the minds of our audience and woo them towards vulture conservation. After much perseverance, we persuaded the majority of the audience that vultures are crucial to human society and that they significantly contribute to maintaining a clean and healthy environment by halting the spread of pathogens.

Public meeting on vulture conservation at Siliguri

Meeting on vulture conservation with
Animal Resource Development Department

Captive-bred White-rumped Vulture fitted with PTT and wing-tag

Release of vultures into the wild

In December 2019, six rescued Himalayan Griffon were released from the pre-release aviary at 22nd mile in Buxa Tiger Reserve by Shri Rajib Banerjee, Hon'ble Forest Minister, Govt of West Bengal. All the released birds were fitted with orange patagial (wing) tags, and two were fitted with satellite transmitters (PTT, Platform Terminal Transmitter) of Geo Trak make to monitor their movements in the wild. State and national media covered this event. The message of the vulture release programme, as well as the prohibition of the use of the drug diclofenac in treating cattle, was disseminated through print and visual media, and through documentary movies, posters, booklets, and other forms of communication. The general public was asked to notify the Forest Department of any vulture sightings.

Within three months of release, one of the Himalayan Griffons was spotted at Fulbari Carcass Dump near Siliguri, which was around 100 km from the release site. One of the reintroduced Himalayan Griffon, which had a PTT, was seen in Phipso Wildlife Sanctuary of Bhutan within six months of release. We observed their behaviour in the wild for a year and were happy to observe that these birds could fly and soar and find their own food and water and none of them died because of NSAIDs poisoning. The experiment was successful and we were ready to release the captive-bred Critically Endangered White-rumped Vultures!

Results of releasing captive-bred White-rumped Vultures and Griffons

Ten Critically Endangered White-rumped Vultures and several rescued Griffon Vultures were released in the first few months of 2021, and some of the results are as follows:

- It has been more than 18 months since the release and no mortality has been recorded. The vultures' movements were monitored from the day they were released. All of them flew and soared regularly, frequently over Buxa Tiger Reserve and in adjoining areas of West Bengal and Assam. They would travel over 2–5 km, but would come to the pre-release aviary on every feeding day at the VCBC, where food was provisioned for them.
- Two White-rumped moved to neighbouring areas in the state of Assam in August 2021 and March 2022, and have joined a flock of free-ranging White-rumped that nest and roost near Dhubri and Guwahati. The other eight birds remained close to the pre-release aviary till January 30, 2022.
- On January 31, 2022, one White-rumped (P6) flew and crossed the international border and moved to Bhutan from Malbazar in West Bengal. On February 1, 2022, the bird came back to India and was sighted in Baikunthapur Wildlife Division of West Bengal. For the next seven days, it moved north and reached Ringking Pong Forest near Kalimpong, West Bengal. On February 9, 2022, the bird reached Fulbari carcass dump near Siliguri. For the next few days, the bird moved and fed at the carcass dump with other wild birds. On February 12, 2022, it moved to Teesta River near Sevok, and on the 13th, it came back near the release aviary. In 14 days, when the bird was away from the release aviary, it covered around 360 km.
- Except for one bird, all the rescued migratory Himalayan Griffons that were released in the first two months of 2021 possibly migrated back to their haunts, as they were not sighted in summer.

Reflections

We have been monitoring the released vultures for the last 18 months, and there has been no mortality so far. It is encouraging that no drug-related deaths have been reported so far, as this shows that the environment is relatively safe for vultures. However, there is no scope for complacency, as vulture-toxic drugs have not disappeared totally and unless sustained efforts are made, the use of these drugs could increase. Hence, active participation of all the stakeholders and policy makers in vulture conservation is extremely necessary to make the release programme successful. Let us hope to see increasing numbers of vultures soaring safely in the open sky above Rajabhatkhawa and its surrounds in the near future. ■

It is heartening that no drug-related vulture deaths have been reported for the last 18 months in West Bengal

A vulture awareness rally in Jalpaiguri

Vulture Conservation Initiatives in the Moyar Valley Vulture Safe Zone, Tamil Nadu

Text: **S. Bharathidasan**

In Tamil Nadu, Arulagam, a SAVE Partner, is engaged in setting up a Vulture Safe Zone (VSZ) for the state. Arulagam was established in 2002 to echo the voice of the voiceless, and protect threatened flora and fauna by involving targeted stakeholders through participatory action programmes.

In 2011, Arulagam initiated its vulture conservation work in three districts of Tamil Nadu, namely Coimbatore, The Nilgiris, and Erode with the support of the Bombay Natural History Society and Critical Ecosystem Partnership Fund. These districts are situated in the western part of the State, bordering Karnataka and Kerala. The Nilgiris district contains an established nesting site of vultures, and much of the work is focused on the Moyar Valley VSZ within the Nilgiri Biosphere Reserve. With its limited resources, Arulagam's work focuses on a small area of about 30 sq. km, under the guidance of the Tamil Nadu Forest Department and in partnership with SAVE (Saving Asia's Vultures from Extinction). The working area was chosen based on the breeding colonies of White-rumped Vulture and Indian Vulture, with a population of 49 and 12 nests (minimum count) respectively. Recent estimates suggest that more than 140 White-rumped Vultures, 30 Indian Vultures, and 12 Red-headed Vultures live in the landscape.

There are about 165 villages located in and around the VSZ, with approximately 17,36,000 inhabitants, predominantly of the Irular, Kurumbas, and Toda tribes, that are indigenous pastoral communities with cattle rearing as one of their main occupations.

Arulagam has used its limited resources to undertake broad, diverse, and appealing education campaigns to "rebrand" vultures to be seen as friends and benefactors of society. These campaigns draw from the social surveys conducted among diverse stakeholders, including farmers, herders, the common public, veterinarians, pharmacists, and government staff.

Vultures are often portrayed negatively by cartoonists and writers alike, who use them as metaphors for cunning, death, desolation, and so on. If looks are not the vultures' forte and they have bad press to boot, how could they make it to stardom? It was difficult to change such deeply ingrained attitudes, but not impossible. All that was needed was an image makeover for vultures, with a realistic positioning of their role in environmental services.

"When did you last see them?" was how "small talk" started with the elders. The people were engaged in discussions on what had happened to these birds and why they were disappearing. Once discussions got going, vital information on the declining population of vultures in the state (and the country) was gradually shared. A pamphlet on the importance of vultures and reasons for their decline, information about harmful and safer veterinary drugs was distributed.

Arulagam is a SAVE Partner engaged in setting up a Vulture Safe Zone (VSZ) in Tamil Nadu, India

RAJAT BHARGAVA

Arulagam initiated its vulture conservation work in three districts of Tamil Nadu in 2011

S. Bharathidasan is Secretary of Arulagam. He is the recipient of the 'Biodiversity Hotspot Hero' award from the Critical Ecosystem Partnership Fund. He is a Member of the State Wildlife Board, Government of Tamil Nadu.

Vulture Trophy – Volleyball Tournament

Youth in the Nilgiris love volleyball. Arulagam conducted a tournament called 'Vulture Trophy Volleyball Tournament' to convey the message on vulture conservation to the youth. During the tournament, the public announcement system was used to broadcast the message of vulture conservation and the ill effects of diclofenac, carcass poisoning, and forest fires. Interested youth were enrolled as "Vulture Guardians".

COURTESY: ARULAGAM

COURTESY: ARULAGAM

Commemorative Tree Plantation

Terminalia arjuna is a preferred nesting and roosting tree for vultures. To commemorate the 150th birth anniversary of the Father of the Nation, Mahatma Gandhi, a drive was initiated with the support of Tamil Nadu Forest Department, to plant 150 saplings of this tree.

Street Plays and Street Corner Meetings

Performing arts are an effective tool to convey messages to the public for the need to conserve vultures. Street plays were performed and pamphlets distributed to the public at street corners, cattle fairs, veterinary camps, festival gatherings, and other such events.

COURTESY: ARULAGAM

COURTESY: ARULAGAM

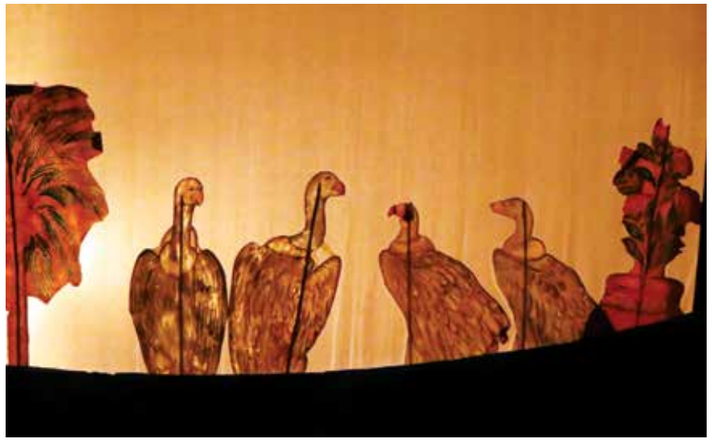
COURTESY: ARULAGAM

Selfie with a Vulture

A life-size cut-out of a vulture was installed at the Botanical Garden, Udhagamandalam for children to pose for a selfie with the bird. All the participants were urged to inform Arulagam of any sightings of the bird in their region.

Puppet Shows

Educational programmes on conservation awareness, using art as the medium, easily reach people. Puppet shows were conducted to convey the issues facing vultures. Such shows were not only performed in villages, but also at the CMS COP 13 meeting at Gandhinagar, Gujarat, with active support from SACON, Coimbatore.



COURTESY: ARULAGAM

COURTESY: ARULAGAM

Celebration of Vulture Awareness Day

The first Saturday of September each year is celebrated as International Vulture Awareness Day. A variety of activities are conducted for sensitizing the public on this occasion. One such event was a flash-mob formation of a vulture in flight by 600 students, which created a huge impact on the minds of students.

COURTESY: ARULAGAM

COURTESY: ARULAGAM

COURTESY: ARULAGAM

Reaching out to Children

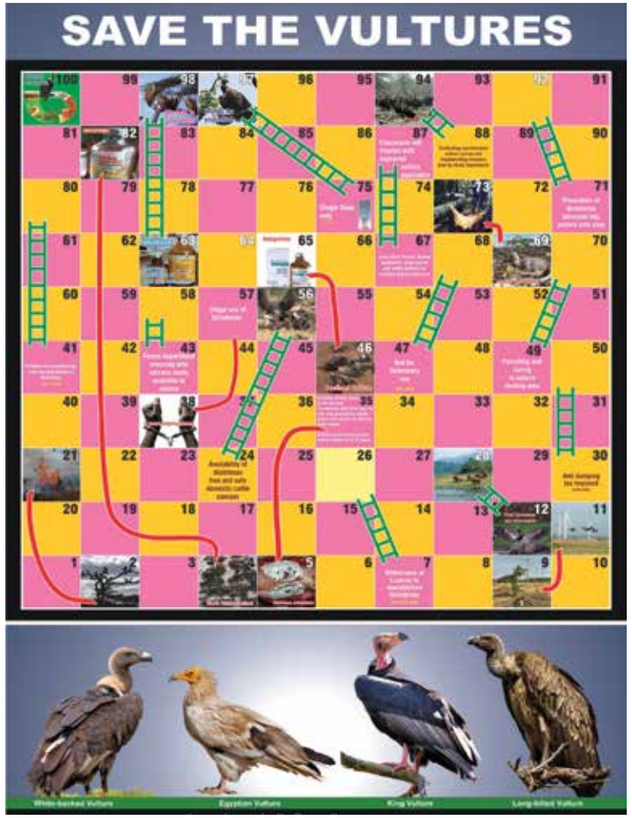
The Gyps Carnival was organized to portray the role that vultures play in cleaning animal carcasses and to draw attention to their unique adaptations such as keen eyesight, disease resistance, and enormous appetite. Arulagam sought the support of the Indian Air Force to address the children about the remarkable flight capabilities of the bird. Air Force NCC cadets were also invited to explain the process of flight with a model, and how aircraft were designed with inspiration from birds. More than 3,000 children across four age groups participated in an art competition in which they learnt about vultures by conservation artist Ragunath Krishna. Tattoo sessions with vulture drawings were also organized to attract the youth.

COURTESY: ARULAGAM

COURTESY: ARULAGAM

Motorbike Rally

A 500 km Motorbike Rally was conducted with the Tiruppur Information Technology Association (TITA), starting from Tiruppur and covering the three states of Tamil Nadu, Kerala, and Karnataka, to spread awareness on vulture conservation, and on the need to shun harmful veterinary drugs. Pamphlets were distributed and meetings conducted at important street junctions, as well as interactions with cattle owners. A vulture message put up on a display board on Arulagam's office jeep, also covered a distance of about 1,50,000 km by road.



COURTESY: ARULAGAM

Vultures & Ladders

The Snakes and Ladders board game was modified to incorporate the Do's and Don'ts of vulture conservation. Conservation messages were effectively communicated by this method. Snake images were avoided to discourage negative opinions on snakes.

Thus, Arulagam has embraced all opportunities to promote simple and consistent messages on vulture conservation to all stakeholders within their ambit, over a decade in the Moyar Valley Vulture Safe Zone. The 'Vulture' population are slowly laddering up. Thanks to the State Government for restricting Vulture harmful drugs 'ketoprofen', and 'flunixin' in the vulture safe zone area. But, still, we have to go a long way. ■

Vultures in Life & Death:
Sky Burials & Towers of Silence

Text: **Percy Erach Avari**

Vultures are amazing, enthralling, awe-inspiring birds; however, most of us have generally been scared and sometimes even a little intimidated by them. They captured our imagination right from childhood, when the *Jungle Book* vultures Buzzie, Flaps, Ziggy, and Dizzy guided and protected Mowgli from the terrible Shere Khan. And as we grew up, we were haunted by the gruesome accounts of vultures stripping human carcasses in mass graves in Khushwant Singh's TRAIN TO PAKISTAN. In Indian mythology, vultures find special mention, and everyone has heard about the noble vulture Jatayu, who sacrificed his own life at the hands of Ravana while attempting to protect Sita.

RAJAT BHARGAVA

The head and the long neck of vultures are featherless to facilitate effortless feeding by reaching into the carcass without soiling their feathers

Percy Erach Avari is working as Senior Manager - Marketing in the Animal Health Division of Himalaya Wellness Company. He is a vulture enthusiast and actively works for vulture conservation and advocacy.

Coming to the real world, the Gyps species of vultures are obligate scavengers, which means they do not kill for their sustenance. The feet of Gyps vultures are suited to walking, rather than hunting. They soar and glide with their broad wings to reach places, sometimes travelling up to 160 km in a single day in search of food. They have evolved to scavenge very efficiently; the head and the long neck are featherless to facilitate effortless feeding by reaching into carcasses, without soiling their feathers.

Vultures, as scavengers, have been performing a much-needed ecological function on the planet. We humans are aware and appreciate the interlinkages between the different species on Earth and their ecological roles as a whole. However, when we think of all creatures as a whole, we tend to exclude ourselves, *Homo sapiens*, from them. As humans, we are unable to recognize ourselves as inter-dependents in a multi-species world, and thus, we have a sense of 'human exceptionalism', which prevents us from seeing ourselves as part of nature and also as a possible food source for other creatures.

The act of consuming a human corpse by vultures is considered repulsive. Many people, especially in the West, have cited that "to be consumed by the vultures is the worst possible punishment for human misbehaviour". This is probably the case because consumption by vultures without following any rituals or rites is thought of as abandonment. There have been records of vultures being used as 'executioners' with the victims being laid on an execution rock in Bulgaria, Algeria, and South Africa. In India, vultures are also associated with impending death and are considered harbingers of bad luck. While we were trapping vultures in Assam, the owner of the lodge where we were put up said "If a vulture happened to sit on a rooftop of a house, they would break it down and build a new one, as it would signify that someone in the family would die."

> Vultures have adapted to a scavenging way of life with modifications in feet for walking and a slower metabolic rate to reduce the need for continuous feeding.

However, there are certain communities where the consumption of human corpses by vultures is considered a service. There are records from approximately 8,000 years ago, from Göbekli Tepe and Çatal Hüyük in Neolithic Anatolia, an archaeological site in south-central Turkey, of human bodies being fed to vultures.

COURTESY: BHAU DAJI LAD MUSEUM

An aerial view of the Tower of Silence in Mumbai

PERCY AVARI

A model of the Tower of Silence at Bhau Daji Lad Museum, Mumbai

Limestone figurines and murals at the site depict a series of vulture shrines, with vultures feeding on headless human figures. At the same site, there is also a painting that depicts a headless human form between two birds of prey, and a man with a sling, presumably warding off attack by the birds. In contrast, judging from a historical depiction of the Tibetan 'sky burial', it appears that the man is inviting the birds to the corpse. These figures might be considered to represent an ancient view that the high-flying carrion birds transported the flesh of the dead up to the heavens. (For more details, see VULTURE by Thom van Dooren). The use of vultures for disposal of the dead has been

PROF MA MING

To facilitate the complete consumption of the carcass, the body is often cut into pieces by a sky burial master (Image: Himalayan Griffon)

PROF MA MING

Vultures do not kill for sustenance, they look for dead animals to feed on

PROF MA MING

In Tibet, it is believed that *jhator*, which means "giving alms" to the birds is an act of generosity (Image: Himalayan Griffon)

predominantly recorded in two cultures, which still prevails, directly or indirectly, to this day – the Tibetan and Mongolian Buddhists, and the Zoroastrian community in India.

In Tibet, it is believed that the custom of *jhator* (which means giving alms to the birds) is an act of generosity. Other terms used for this way of disposal of the dead are *rir skyel* (which means to carry to the mountain), *phung-po bya gtor* (scattering the body to the birds), and *bya khyir ster-ba* (give to birds and dogs). One's standing in the social order decides the method of disposal of the corpse. While options like cremation and burial are permitted for the affluent, commoners have to resort to sky burials. The probable reason for the initiation of this ritual was the scarcity of wood for burning of corpses, and problems with burial, as the land is hard and rocky, frozen most of the time, and whatever land is arable is used for agriculture.

It is believed that if vultures do not consume even a part of the corpse, it is bad luck and would mean that the person was wicked. Thus, to facilitate the complete consumption of the carcass, the body is often cut into pieces by a

PROF MA MING

Big bones are broken to help the vultures consume the entire body (Image: Himalayan Griffon)

tokden ('sky burial master'); big bones are broken and sometimes even ground and mixed with blood or barley to help the vultures consume the entire body. The birds are sometimes attracted to the site by the *tokden* calling out to them, and sometimes even blowing a thigh-bone trumpet. The birds seen in Tibet are predominantly Himalayan Griffons, and there have been reports of sky burial being important for the

STUART GLASS

STUART GLASS

The use of vultures for disposal of their dead has been predominantly recorded among the Tibetan and Mongolian Buddhists, and the Zoroastrian community in India (Image: Himalayan Griffon)

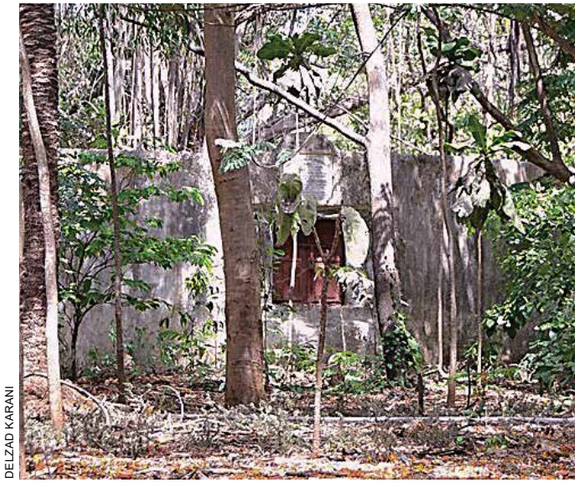
conservation of these vultures, along with other wildlife, especially in the Qinghai-Tibet Plateau.

In Mongolia, it is said that people do not talk about death as it is considered bad luck, and talking about it would attract more bad luck and misfortune to oneself and to the family. Mourning is also prohibited, due to the belief that mourning latches the spirit to the earth and prevents reincarnation. Mongolians have been known to practice sky burial, apart from cremation and burial. The people of Mongolia believe that only three types of animals can consume a corpse – vultures as birds of prey, dogs and wolves, and lastly maggots. Vultures are highest on the list and are considered heavenly birds. This is due to their ability to fly high, and because their food habits are comparable to those of the monks (who also do not kill living beings for food). Being consumed by vultures after death is considered a sign of good karma.

Gyps vultures in India have been an integral part of the last rites for followers of the Zoroastrian

IRAN K. MISTREE

Dakhma at Cham Yazd



DELZAD KARANI

Dakhma Wall

religion. The Zoroastrians of India, commonly known as Parsis, follow the religion preached by Prophet Zoroaster (Zarathustra). Zoroastrianism is a monotheistic religion and is centred in a dualistic cosmology of good and evil. One of the oldest religions in the world, it has a very important connection with nature, as has been observed in many other ancient religions. According to this religion, good (light) and evil (darkness) forces persist in the world. Once a person dies, the spirit or soul departs and the body is considered *naso* (impure). In Zoroastrianism, it is believed that all creations of *Ahura Mazda* (God), including the four elements of nature, namely earth, fire, water, and ether or air, are considered sacred and therefore pure. If an impure corpse is placed in any of these, they would be defiled. Hence, the funeral rites of the Zoroastrians are based on the process of *dokhimenishini*, which literally means exposing the corpse to the rays of the sun, and this has been practised for over 400 years in India. To facilitate the process of *dokhimenishini*, the corpse is placed in what are called Towers of Silence or *Dakhmas*. The *dakhma* is open from the top to allow sunlight to 'cleanse' the corpse, and also to allow access to aerial scavengers, mainly vultures. The vultures, which were in the past found in good populations around the Towers of Silence, would consume a corpse within a matter of hours. This was not only a service by the vultures to the Parsi community and the city as a whole, but also helped prevent the spread of contagious diseases.

Considered harbingers of death, vultures, on the contrary, are scavengers that protect the planet from the outbreak of diseases by efficiently disposing of the carcasses of dead animals

Even though vultures are not mentioned as being essential in the last rites of the Zoroastrian community, Gyps vultures have been serving the Parsi community for centuries. Since the decline in vulture numbers in the 1990s, the community has taken up alternative means to dispose of their dead, in line with their scriptures. However, the loss of these 'Masters of the Air' has affected the community to a great extent. There is a need to urge the community, well-known for its philanthropy, to work towards ensuring that these birds are back in the skies and help oversee their "journey to the next realm". ■

Ecological and Cultural Significance of Vultures

Text: **Nikita V. Prakash**

Until the early 1990s, India had an approximate population of four crore (40 million) vultures. However, their population crashed in the mid-90s as a result of their feeding on the remains of animals that were treated with diclofenac, a non-steroidal anti-inflammatory drug, and by 2007, their numbers in the wild had declined by 99.9%. In this context, I talk about the ecological and cultural significance of vultures in India.

Ecological significance of vultures

Vultures provide crucial ecosystem services, and with the crash in their numbers in India, the impacts are very evident, more so since, unlike in other countries, they were rather common birds in the Indian landscape, even in towns and cities, in the past. Carcasses rot in the absence of vultures, increasing the spread of dangerous diseases to humans. Besides, an abundance of food becomes available to free-ranging dogs, which has resulted in rapid increase in population of these opportunistic scavengers. These dogs are well-known disease reservoirs, especially of rabies, and the increase in their numbers may increase rates of infectious disease transmission to other species.

COURTESY: VCBC-PINJORE

White-rumped Vulture

Nikita V. Prakash is Scientist C with the BNHS Vulture Conservation Breeding Programme. She leads the captive breeding component of the Programme, and has raised over 300 nestlings of vultures.

VIBHU PRAKASH

Vultures provide crucial ecosystem services, the impacts of which are evident since their numbers declined

Vultures are successful and efficient scavengers, which survive by feeding on the flesh of dead animals. Unlike some birds, including raptors, which hunt as well as scavenge, vultures survive only by scavenging. This way of life is not easy, as they have to search far and wide for food. But vultures have successfully adapted to a scavenging way of life thanks to four important attributes:

- Vultures are social in nature. They live in flocks and help each other in all activities, including search for food. While soaring in the sky, vultures at all times look at each other, even as they scan the ground below for food. If they observe other scavengers or birds moving in a particular direction, they descend a little to inspect the area, and if they locate a carcass, they begin to fly in progressively tightening circles, homing in on the carcass. This behaviour alerts other individuals and triggers a cascading effect, with vultures from far and wide swooping down onto the carcass, reducing it to a heap of bones in no time. Such is the speed with which they clean carcasses that there isn't enough time for the carcass to rot and spread diseases.
- Vultures soar on hot air currents and travel long distances, over 100 km in a day, without spending much energy, in search of food. This is far more than the feeding grounds of terrestrial scavengers, which are limited by distance.
- Vultures feed fast because of the backwardly directed serrations on their long, muscular tongue. They can ingest the equivalent of 30–40% of their body weight at a time, and then go without food for days. No mammalian scavenger can eat more than 5% of its body weight at a time.
- Vultures have binocular vision. Their eyes are set wide apart, giving them a wider field of vision which helps them locate food easily while soaring in the sky.

Vulture Tales from the Ramayana

Tales of the vulture brothers Jatayu and Sampati are recited and enacted every Dussehra – a Hindu festival that celebrates the victory of good over evil. It was on this day that Rama killed Ravana, who had abducted Rama's wife, Sita, and held her captive in Lanka.

Though the Valmiki Ramayana does not mention the details of Dasharatha (Rama's father) and Jatayu's friendship, there are several accounts of it elsewhere. One such story relates how Jatayu helped Dasharatha when Ayodhya was reeling under a severe drought. Dasharatha was angered when he learnt that the drought was due to a curse of Shani, the god of planet Saturn. He took his chariot upwards to challenge Shani. Pleased with the efforts of the King for his people, Shani gazed on the chariot's wings but scorched them. Had he looked directly at the devout King, his gaze would have killed him. Jatayu came to the rescue, he grabbed the falling Dasharatha and flew back to Ayodhya with him. Jatayu extended this friendship to Rama, Lakshmana and Sita, whom he first met during their exile, south of the Dandakaranya forests. He assured them that their stay along the River Godavari would be under his care.

When Ravana takes away Sita by force and guile in a *pushpak vimaan*, his aerial chariot, Jatayu flies to her rescue and is fatally injured in his fight with Ravana. Rama and Lakshmana come searching for Sita and meet the injured Jatayu who has fallen to the ground. They learn from him that she was taken away by Ravana. Jatayu dies in Rama's arms.

Sampati, Jatayu's brother, also comes to the aid of Hanuman and Angad, the *vanara*-warriors, along with Jambavan, the bear-warrior, in their search for Sita. Sampati recounts how he and Jatayu would challenge each other's prowess and compete in flying higher. During one such challenge, the two brothers flew close to the sun, and Jatayu flew higher. When Sampati realized that his brother's wings could get scorched by the sun, he flew faster and higher with tremendous effort and spread his wings to cover his brother. In this attempt, both were injured, Sampati more than Jatayu. They fell to the ground at distant points and did not meet each other for the rest of their lives. Sampati learnt about Jatayu's valour and sacrifice, and of his death, from Hanuman and Angad. It was Sampati who told the *vanara*s where Sita was imprisoned, showing them the location of Lanka, the kingdom of Ravana.

COURTESY: RAJA RAVI VARMA

Jatayu struck down by Ravana

COURTESY: RAMANUJA DASAN

A bleeding Jatayu in the arms of Lord Rama

In another version, Sampati admits to Hanuman that it was his pride that made him fly closer to the sun; his wings were burnt, and thus came his fall. He then uses the power of his exceptional vulture eyesight to locate where Sita is held captive in the Ashoka Vatika, a grove of *Saraca asoka.*

Temples in India associated with Jatayu

COURTESY: KERALA TOURISM

The world's largest bird sculpture, which holds within it a rock theme park, pays tribute to the mythical bird Jatayu from the Indian epic Ramayana

In Kerala, it is believed that after his wings were chopped off by Ravana, Jatayu fell on the rocks in Chadayamangalam in present day Kollam district. Chadayamangalam is said to be derived from Jatayu-mangalam. Jatayu Earth's Center Nature Park in Chadayamangalam features a 61 m (200 ft) wide statue of Jatayu, possibly the world's largest bird sculpture.

In Andhra Pradesh, it is believed that Lepakshi is the place where Jatayu fell after being wounded by Ravana. Rama is said to have commanded the bird to rise, saying *Le Pakshi* (Telugu = Get up, bird!)

Vijayaraghava Perumal Temple in Thiruputkuzhi, Tamil Nadu, is associated with Jatayu, as the presiding deity, Vijayaraghava Perumal (a form of Rama), is believed to have performed the last rites of Jatayu here. The water body into which Jatayu fell is called Jatayu Teertham.

Thirupullabhoothangudi Temple in Pullabhoothangudi, Tamil Nadu, is also claimed to be the location of Jatayu's last rites.

In Tirunelveli district of Tamil Nadu, it is claimed that the last rites of Jatayu were performed at Arukankuzham by Rama. A vulture can be seen standing near the main deity Lakshmi Narayanan.

Sarv Tirth Jatayu Mandir in Taked Budruk in Igatpuri, Maharashtra is also believed to be the place where Jatayu breathed his last in Rama's arms.

Vultures in Indian culture

Vultures have been a part of cultures around the world for centuries. India too has a deep cultural connection with vultures. Jatayu, a vulture-warrior who fought with Ravana to rescue Sita, the daughter-in-law of his old friend King Dashrath, and Sampati, Jatayu's elder brother, play an important role in the epic Ramayana. The sacrifice and devotion of these vulture siblings for Lord Rama is held in high esteem in Hindu culture.

Sadly, the descendants of Jatayu and Sampati are under threat from modern-day demons: the toxic non-steroidal anti-inflammatory drugs diclofenac, aceclofenac, nimesulide, and ketoprofen. The intervention of Government authorities to effect a complete ban on these drugs in treating cattle is urgently required, to prevent the contamination of their food resources and thus save vultures from extinction. ■

The Last Song of the 'Punk' Vulture

Text: **Stoyan Nikolov**

This creamy white dwarf-vulture, with its impressive yellow mask and punky hairstyle, is called Egyptian not because of its geographical origin. Far in the past, it was so widespread – nesting even on the Giza pyramids and protected as a symbol of royalty – that it was immortalized in the shape of a hieroglyph and nicknamed Pharaoh's Chicken. Indeed, the Egyptian Vulture is distributed across the Old World, with three subspecies found on the Canary Islands, in the Indian subcontinent, and Africa-Eurasia, respectively. It is migratory in the northern part of its range, spending the winter in sub-Saharan Africa, and is known as a 'messenger of spring' in the Balkans, where its first sighting is considered a good omen.

IORDAN HRISTOV

Egyptian Vulture

Stoyan Nikolov is working at BSPB / BirdLife Bulgaria and managing international projects for the conservation of the Egyptian Vulture.

GREEN BALKANS

GREEN BALKANS

At work in the captive breeding programme of the Balkans Egyptian Vultures

These avian scavengers are monogamous, highly territorial, and in general always return to their natal areas. Male and female can be differentiated by the orange face of the male during the breeding season. Typically, they nest on a ledge, in a crevice or a suitable niche on cliffs, which become whitewashed by the excrement of many generations. It is this habit that gives rise to anecdotes of birds living for hundreds of years. Actually, under perfect living conditions, their lifespan is about 30–40 years. The female lay one or two eggs, which they incubate for about 42 days, but the breeding may fail due to disturbance, predation, bad weather conditions, or lack of parental experience, especially in newly formed pairs. Juveniles are dark brown and become mature in five to six years. In the European populations, the youngsters spend their first one to three years in Africa.

In its role as nature's cleaner, Egyptian Vulture often lives close to settlements and frequently patrols rubbish dumps. In contrast with the large vultures, it has a broad diet including livestock and poultry carcasses, also small animals, and even dung. It is one of the few birds known to use tools: when finding abandoned ostrich eggs, this vulture throws small stones at them until their shells break, and then eats the contents.

DIMITAR GRADINAROV

Egyptian Vulture's breeding habitat in the Balkans

TORSTEN PROHL

Egyptian Vultures at a carcass dump in Oman

ANASTASIOS BOUNAS

One of the anti-poison canine teams in the Balkans

But does the high IQ of this species, and its nomination as a sacred bird, guarantee its bright future? Unfortunately not. With a few local exceptions, the species is declining sharply throughout its range and currently is classified as globally Endangered. In the last 20–50 years, the population has dropped by 90% in India, and by 50% in Europe (including an 80% drop in the Balkans). The populations in Africa, Central Asia, and the Middle East also appear to have declined significantly.

Certainly, the primary 'serial killer' of this magnificent raptor through much of its range is unintentional poisoning. The Egyptian Vulture becomes an unintended victim of the poison baits targeting terrestrial predators that attack livestock. Unfortunately, this is a widespread illegal practice rooted in the human-carnivore conflict that has a terrible cascade of effects on the ecosystem. In Greece, the problem is so severe that it has led to inter-human conflict. Shepherds use poison to kill wolves, but often hunting dogs get poisoned instead. As revenge for the loss of their precious four-legged friends, hunters in turn poison shepherd dogs and thereby deprive herds of protection, which again causes livestock loss.

The story of Lazaros (one of the last Egyptian vultures in Greece) can give a rough idea of the magnitude of this threat. Lazaros and his partner were poisoned around their nest just after returning from Africa. Miraculously, Lazaros was rescued, tagged, and released, but his partner was not seen again. He did not form a new pair the same year, but became a celebrity. Thousands of people followed his migration online with the hope that he would start breeding upon his return. Indeed, in the next spring, Lazaros flew over 4,000 km in just two weeks to get back to his summer home, but was mortally poisoned this time.

Poison is also systematically used to control populations of stray dogs, which, apart from damaging wildlife and livestock, transmit diseases such as rabies to humans. Poisoned dogs are sometimes disposed of at rubbish dumps or other places accessible to vultures, and thus cause secondary poisoning. The devastation this bad practice causes can be illustrated by a case in North Macedonia where 60% of the population of Egyptian vultures was killed in a single event by consuming poisoned dogs, which had been left at a rubbish dump visited by these scavengers.

A less obvious form of poisoning is through many non-steroidal anti-inflammatory drugs (NSAIDs) used in veterinary medicine (most notably diclofenac), which are highly toxic to many vulture species (see *Monitoring diclofenac & other NSAIDs impacting Gyps Vultures* page 106). It is well-known now that vultures die by feeding on carcasses contaminated by NSAIDs.

The primary 'serial killer' of this magnificent raptor through much of its range is unintentional poisoning

This is most notable in South Asia, where several species are on the brink of extinction (see *The status of vultures in South & Southeast Asia* page 22). The Egyptian Vulture, unfortunately, is not an exception.

Mortality caused by energy infrastructure (electrocution with hazardous powerlines or collision with wind turbines) is another major threat that the species faces. In the semi-desert African areas where migratory Egyptian vultures winter, they often use electric poles for perches or roost sites, and are electrocuted easily. Mortality

VOLEN ARKUMAREV

VOLEN ARKUMAREV

Remains from electrocuted vulture in Ethiopia

CLOÉ POURCHIER

CLOÉ POURCHIER

Vulture parts sold at a fetish market in Niger

can be very high if the infrastructure is located at a migration bottleneck or congregation site. For instance, 30 km long powerlines in Sudan have caused the death of hundreds (or maybe thousands) of Egyptian vultures and many other birds since their establishment in the 1950s. Such a threat, even operating locally, is likely to impact population levels if it persists in the long term. Recently, other killer powerlines were identified in Ethiopia, where the largest wintering congregation (more than 1,600 individuals) of the species in Africa is present.

Egyptian vultures, like other soaring birds, are victims of illegal killing during their migration through the Middle East. When reaching the wintering grounds in Nigeria, Niger, or Chad, they can still be subject to direct persecution due to demand for traditional rituals and other belief-based uses. Consumers of vulture parts expect relief from a variety of physical or mental

COURTESY: EWNHS

Sensitization programme for local communities in Ethiopia

ailments, protection against the 'evil eye', a curse, or other black magic. They even expect success in life from consuming vulture parts, as they believe in absorbing the vultures' alleged abilities to see into the future. Because of intensive persecution, vultures in Nigeria have become very rare and the fetish market stalls are now supplied with vultures hunted in neighbouring countries. Paschalis was the only Egyptian Vulture, out of eight juveniles from the Balkans tagged with satellite transmitters in 2013, to successfully cross the Mediterranean Sea and reach Niger for wintering. A few months later, this sole survivor was killed by a traditional hunter and exported to Nigerian fetish markets to be sold in parts.

A telemetry study revealed that many young birds from the Balkans drown in the sea during their first migration. Egyptian vultures are usually gregarious when migrating and wintering, but with population scarcity, juveniles may fail to find experienced conspecifics to lead them, and try crossing the high seas driven only by their strong instinct to migrate south. As a soaring bird, the Egyptian Vulture uses thermals as lift to migrate without spending much energy. However, thermals are not available over the sea, and in most cases the juveniles are unprepared for non-stop active flight over long distances.

Overall, the status of the Egyptian Vulture is alarming, and the research and conservation community are united in helping this iconic bird. There are a few areas, like in Yemen and Oman, that seem like a paradise for this species. Spain is another good example, hosting the majority of the European population and developing some of the best conservation practices. A very successful story is the recovery of the sedentary Egyptian Vulture population on the Canary

Overall, the status of the Egyptian Vulture is alarming, and the research and conservation community are united in helping this iconic bird

COURTESY: PPNEA

Supplementary feeding station for Egyptian Vultures in Albania

Islands by mitigating the main mortality factor – electrocution from hazardous electric wires.

But how to deal with a migratory population flying over 10,000 km and crossing dozens of countries per year? Although this seems like Mission Impossible, an alliance of partner organizations from 12 countries have united in their common goal to save the Critically Endangered population of the Egyptian Vulture in the Balkans. In 2017, a Flyway Action Plan was adopted under the auspices of the Convention of the Migratory Species (CMS) as part of the Multi-species Action Plan to Conserve African-Eurasian Vultures. The same year, the trans-continental project 'Egyptian Vulture New LIFE' was started as one of the most challenging endeavours in the history of vulture conservation, as a flagship for the implementation of the Action Plan and with the support of the European Union. This project aims to achieve a substantial reduction of vulture mortality in the breeding grounds and along the flyway, as well as to boost population recovery through active management. To eliminate the risk of poisoning in the Balkans, national strategies are being developed, local management plans adopted, and governmental task forces established. Capacity of government authorities is being developed significantly

COURTESY: HOS

The Greek Students' Anti-poison Task Force

and amendments are being made to relevant legislation. Supplementary feeding sites and nest-guarding programmes are becoming established. Vigilant anti-poison canine teams are patrolling tirelessly in the most vulnerable areas to find and remove poison baits. Networks of caretakers are being set up to influence local perceptions and prevent accidental poisoning. Over 1,800 children in Greece are supporting this campaign by loudly raising their voices against the use of poison. A Regional Road Map to tackle the illegal killing of birds in the Middle East is under development. The traditional Hima (the concept of responsible hunting areas, their identification and management, promotion of responsible rural tourism in non-hunting season) reserves

COURTESY: BSPB

Screenshot from the live-streaming camera at a wild nest of Egyptian Vultures in Bulgaria

in Lebanon already provides 'stepping stones' for safe passage of migratory birds. Diclofenac (and other toxic veterinary drugs) is an issue in Saudi Arabia and Jordan, and the project team is digging deep into this problem to find solutions and hopes to learn from experiences in India and other South Asian countries.

The main challenge in the wintering grounds of Africa is to mitigate electrocution and collision risks in Ethiopia, which are growing together with the country's ambition to become an energy 'hub' for Eastern Africa with huge foreign investments in the sector. In the short term, hundreds of hazardous electric poles were identified for insulation in the core area of the wintering vultures, and a memorandum of understanding with the Ethiopian energy companies is in process to secure bird-safe designs of powerlines for the long term. Project partners in Nigeria and Niger are conducting environmental awareness raising and education, closely collaborating with local chiefs, hunters, and authorities to find alternatives by using plant products instead of vultures in traditional medicine.

A Balkan restocking programme to boost the population recovery has started with strong support of the European Endangered Species Programme under the European Association of Zoos and Aquaria, coordinated by Prague Zoo. A captive breeding pool is being established, and hacking, fostering, and delayed release techniques are being tested to identify the best approach for the restocking. Artificial nests in the wild are used in the first method [hacking], adoption by wild parents in the second one [fostering], while the third [delayed release] aims at eliminating mortality from drowning by releasing the birds after the first year, so that vultures have more time to be fit and mature enough before undertaking migration.

Apart from the International Vulture Awareness Day and World Migratory Bird Day celebrated in each project country, two flyway campaigns are being launched. 'Mile for the Egyptian Vulture' associates human efforts in marathon running with those of birds during

YANA NIKOLOVA

Fostering of captive-bred chick in wild nest

migration. So far, 38,000 people have taken part across seven countries. The 'Fly with the Vulture' campaign works through the main airports along the flyway, to inform people (20 million so far) about the alarming status of the species. Moreover, every year thousands of people from 150 countries follow the online streaming cameras installed in wild nests and in the restocking facilities in Bulgaria, as well as the movements of the tagged birds through the project website <www.LifeNeophron.eu>

Finally, is there still hope for the Egyptian Vulture? And who will usher in spring if the species becomes extinct? The answers should come from the heart and should not be the responsibility of only a handful of nature conservationists. ■

A Chronicle on Vulture Decline in South India

Text: **Ranjit Manakadan**

The Indian subcontinent is home to nine species of vultures, and most of these species, especially the resident Gyps species, have seen catastrophic declines since the early 1990s. Diclofenac, a non-steroidal anti-inflammatory drug used to treat cattle, is attributed to be the cause for this drastic decline. Over the decades, there have also been other factors such as loss of habitat in general, loss of nesting trees (tree-nesting vultures) or hillocks (cliff-nesting vultures), scarcity of wild or domestic carcasses, shooting the birds in airfields due to their threat to aircraft, and impacts arising from the human-population explosion and economic development in India. In this article, I touch upon my observations on vulture declines in some of the southern Indian states, these documented while working in various BNHS projects in these states.

RAJAT BHARGAVA

Vultures were rather uncommon in southern India (compared to the northern belt) even in the past (Image: White-rumped Vulture)

Ranjit Manakadan is a former biologist of BNHS, who also served on the Editorial Board of *JBNHS* and *Hornbill*.

Loss of habitat, loss of nesting trees or hillocks, scarcity of wild or domestic carcasses, shooting the birds in airfields due to their threat to aircraft are other factors resulting in decline of vulture populations

S. SIVAKUMAR

Kuzhalagar Temple at Point Calimere WLS, where a pair of Egyptian Vultures used to roost in the early 1980s

Tamil Nadu

The first vulture I got to see in my life was in December 1980, after a few days of being posted at Point Calimere Wildlife Sanctuary in Tamil Nadu. This sighting comprised a pair of Egyptian Vulture *Neophron percnopterus* sitting on a ledge of one of the *gopuram*s (temple towers) of the Kuzhaghar Temple at Kodiakkadu. I was told that this was their regular roost (and maybe nesting site), after they came back from their foraging trips in the surrounding areas. Other than for this species (this pair to be specific), there are no records of vultures in and around Point Calimere. Nor did I see vultures in my travels in the villages and towns in the landscape of the region, or in other parts of Tamil Nadu – except for the Egyptian Vulture on occasion. In the late 1980s, I was again posted in Point Calimere, and learnt that the pair at the Kuzhaghar Temple had disappeared.

As in the case of Point Calimere, there appears to be a disappearance or decline in Egyptian Vulture in other parts of Tamil Nadu. This has been 'inadvertently' documented for birds associated with Hindu temples. Besides the case in Point Calimere, the well-known case of decline pertains to the pair of vultures at the hill temple of Thirukalukundram near Chengalpattu. For 'centuries', as per the story, the birds would arrive every morning at a rock to partake on the sweet-rice offered by the presiding priest. This ritual came

K. MRUTYUMJAYA RAO

Vulture trap used by the vulture-eating community in Guntur and Prakasam districts, Andhra Pradesh (image from *Hornbill* [1994(4): 14–15]

SIDDU

Egyptian Vulture

to an end in 1994, with the sudden disappearance of the birds, which was considered a bad omen.

Maharashtra

After my six-month stint in Point Calimere, I was posted at Nannaj in Solapur district of Maharashtra to work on the Great Indian Bustard. Here too, as in Point Calimere WLS, vultures were more or less 'near absent', except for the occasional Egyptian Vulture. I had only two sightings of other vulture species during my four-year tenure. Each sighting comprised a flock of a few dozen birds, mostly the White-rumped Vulture *Gyps bengalensis* with a 'sprinkling' of the larger Indian Vulture *Gyps indicus*, these feeding on a cow carcass thrown at the outskirts of the village. I was told by the villagers that unless a cow/bullock died all of a sudden at night, carcasses would not normally be available for vultures since these would quickly be *halla*ed to end up in a butcher's shop in the Muslim dominated area in Solapur town.

Andhra Pradesh

In the mid 1980s and again during the early 1990s, I was based in Rollapadu Wildlife Sanctuary (RWS), working on the Great Indian Bustard Project and Grassland Ecology Project respectively. Except for the Egyptian Vulture, I had only a few stray sightings of White-rumped Vultures soaring in the sky during my stay in the Rollapadu area. Other than these sightings, I also had a fleeting sight of vultures being carried on the backs of a few men walking on the highway during a bus journey from Nandyal to Chennai. On enquiring from the *shikari* (hunting) community in the Rollapadu area, I was told that they were aware of a community in the Kadapa (= Cuddapah) area that ate vultures. Later, an account of a vulture-eating community in Guntur and Prakasam districts of Andhra Pradesh was published in *Hornbill* [1994(4): 14–15] by K. Mrutyumjaya Rao, the disappearance of vulture species in these areas being attributed to hunting.

RANJIT MANAKADAN

Moyar Valley and the adjoining areas of Nilgiris and Mudumalai are the last haunts of vultures in Tamil Nadu

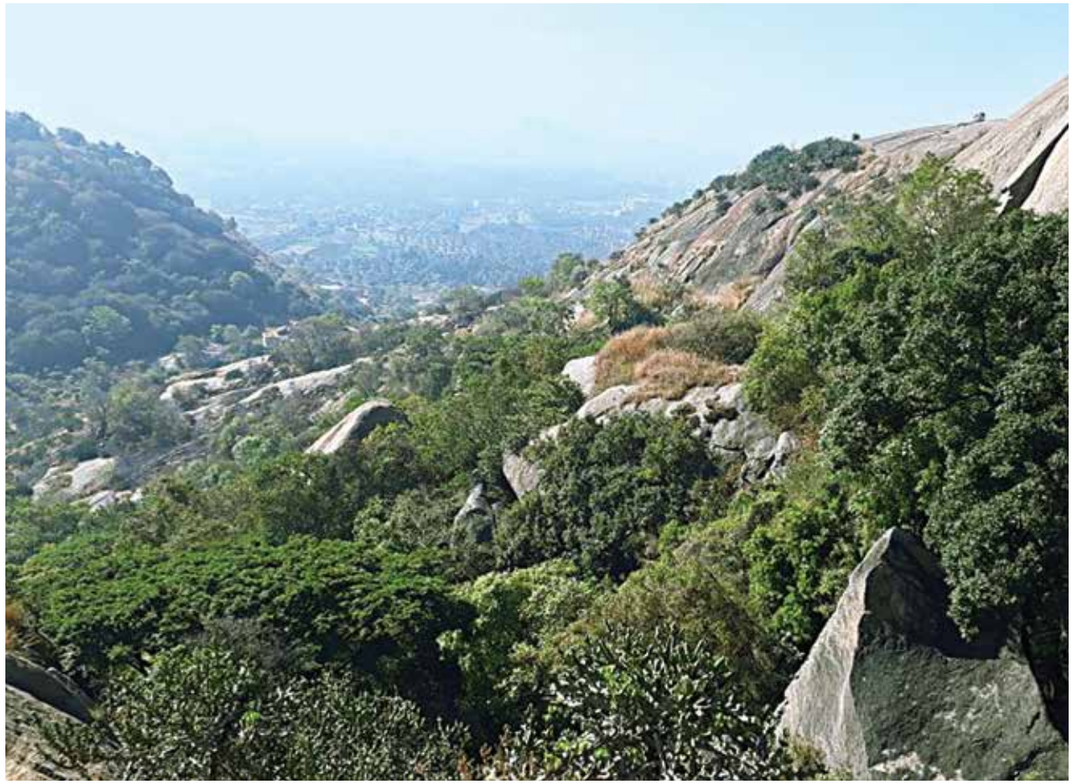
As in Tamil Nadu and in Maharashtra, one would not come across cattle carcasses, as beef finds a market for the large Muslim population of this region. And in the 1990s, cattle were being transported for sale in Kerala. Also, due to poverty and less sentiment towards cow slaughter, there was little hesitation in selling unproductive cattle to butchers, instead of allowing them to have natural deaths as in the olden days.

My next experience with vultures in Andhra Pradesh was in Sriharikota, the island largely falling in the state of Andhra Pradesh. The first BNHS bird survey undertaken in Sriharikota in 1977 by Sálim Ali and his team reported the occurrence of the White-rumped Vulture as "soaring over many parts of the island". During the BNHS Bird Migration Project in the 1980s, biologists located around 75–100 birds nesting in a stretch of tamarind trees in the central part of the island. During our study (2001 to 2003), the largest flock sighted comprised only 13 birds, while all the other scattered sightings were of 1–3 birds. Only one (unsuccessful) case of nesting was recorded in the earlier reported colony. A few birds were once seen feeding on a cow carcass at the edge of an island in Pulicat Lake. The birds totally disappeared from Sriharikota towards the end of 2003.

The only known 'significant' vulture population in Karnataka is in the Ramadevarabetta Vulture Sanctuary.

Back to Tamil Nadu

My last observation on vultures in south India was during a two week stay (in July, 2008) in Tengumarahada, which now falls under the Sathyamangalam Tiger Reserve (STR) of Tamil Nadu. The Moyar Valley and the adjoining areas of Nilgiri North Forest Division (NNFD) and Mudumalai Tiger Reserve (MTR) are more or less the last remaining refuge of vultures in Tamil



S. SWAMINATHAN

Ramadevarabetta Vulture Sanctuary in Karnataka

Nadu. I learnt that the food sources for vultures in the area were mainly from feral buffalo and gaur kills of tigers.

I kept a special lookout for vultures during my few field trips to parts of the area, but I did not have any sightings. A paper, published in the *Journal of Threatened Taxa* in 2016, provided figures of only four pairs of Indian Vulture breeding on rocky cliffs in both NNFD and MTR of Moyar Valley, and 36 pairs of White-rumped Vulture nesting on trees along the riparian habitat in NNFD and MTR.

> The presence of wild, feral, and domestic (assuming diclofenac-free) animals in this forest-dominated landscape (vis-à-vis solely livestock carcasses in a heavily human-impacted landscape) would be a plus point for vulture survival with regard to food availability

Karnataka and Kerala

I lack my own observations on the status of vultures in Karnataka and Kerala, but information available shows the situation to be equally dim in these two states.

Karnataka: The only known 'significant' vulture population in Karnataka is in the Ramadevarabetta Vulture Sanctuary. This sanctuary was established in 2012 to protect and help revive the population of Indian Vulture that had traditionally nested in the hills of Ramanagara. According to recent reports, there are only five Indian Vultures present now,

without any successful breeding. Apparently, the declaration of the sanctuary and protection to the habitat and birds has benefitted the Egyptian Vulture, which now number around 30–35 individuals.

Kerala: As per a CEPF-ATREE 2013–2014 report, the only surviving populations of vultures in Kerala are from Wayanad Wildlife Sanctuary. The report puts the estimate for the sanctuary at 12 breeding pairs of White-rumped Vulture and 5–8 individuals of Red-headed Vulture *Sarcogyps calvus*.

Reflections

My incidental records of vultures spanning almost four decades point to a decline in vultures in southern India from the 1990s. One good dataset comprises the fairly well-documented decline of White-rumped Vulture in Sriharikota. The only species that appears to be somewhat stable is the Egyptian Vulture. Its small size, solitary (or in pairs) nature, and the non-taxing food habits (carrion, offal, mammal dung, and small prey) could have played a part in its continued survival, unlike the other larger vultures with larger food and habitat requirements. For these reasons, Egyptian Vulture may still manage to survive over a large landscape – provided habitat and other conditions do not worsen for them.

The last remaining, and apparently still viable, populations of the larger species in southern India (not considering Maharashtra), occur in a landscape of protected areas at the borders of three states (Tamil Nadu, Kerala, and Karnataka) – Wayanad Wildlife Sanctuary, Mudumalai Tiger Reserve, Sathyamangalam Tiger Reserve, Bandipur National Park, and Rajiv Gandhi (Nagarhole) Wildlife Sanctuary.

Though a debate may arise on the issues of there being only one contiguous area remaining in the three southern states for the conservation of vultures, this concentration of vultures in one area also provides an opportunity for governments and forest departments to coordinate more easily and undertake focused efforts for vulture conservation. The presence of wild, feral, and domestic (assuming diclofenac-free) animals in this forest-dominated landscape (vis-à-vis solely livestock carcasses in a heavily human-impacted landscape) would be a plus point for vultures with regard to food availability. All these factors would make implementation of the concept of Vulture Safe Zone much easier. At the same time, since the overall population in the area is small, probably still at risk from many threats and could also be on the decline, a conservation breeding programme, as is being undertaken by the BNHS with the support of RSPB (Royal Society for the Protection of Birds) and MoEF&CC (Ministry of Environment, Forest and Climate Change) at a few sites in India, is critical and needs to be implemented urgently. ■

S. BALACHANDRAN

Red-headed Vulture

Homecoming of White-rumped Vultures in Assam

Text and Photographs: **Sachin P. Ranade**

It has been more than two decades since vultures almost vanished from the common man's environment in India. Twenty years have also passed since the BNHS's decision to start the Vulture Care Centre at Pinjore, which is now flourishing in its role as Vulture Conservation Breeding Centre (VCBC). In fact, there are now four dedicated VCBCs in India, and four governmental zoos working in the same direction, undertaking a conservation breeding programme for vultures. Our efforts to restore and save the wild populations are also in full swing through the development of Vulture Safe Zones.

Himalayan Griffon J29 sighted in the winter season following its rescue and release

Sachin P. Ranade is Sr Centre Manager & Asst Director, BNHS, Vulture Conservation Breeding Centres, West Bengal and Assam.

Hon'ble Forest Minister of Assam Pramila Rani Brahma at the release of a rescued vulture

Advocacy and public awareness programmes are being undertaken in the rural areas at nine sites in India, to save our critically endangered vulture species from extinction.

Among the four VCBCs, the Vulture Conservation Breeding Centre at Rani, established in 2007 at the outskirts of Guwahati in Assam, is dedicated for the White-rumped Vulture and Slender-billed Vulture. In this article, I have provided insights into the activities, other than its primary job of the captive breeding of vultures, undertaken by the Centre.

Role of VCBC in Advocacy and Awareness

Being the only facility to shelter and breed Critically Endangered vulture species in Assam, the Centre plays a valuable role in the training and education of frontline staff for nature conservation. Since its establishment, the Rani VCBC has been instrumental in training, on an average, seven to eight batches of frontline forest staff, 20 batches of schoolchildren, and 200 wildlife enthusiasts each year. The CCTV monitor in the vulture colony aviary plays a vital role in educating visitors about vultures, while they observe the daily activities of the birds such as feeding, bathing, roosting, and nesting. Documentaries on the need for vulture conservation and audio-visual presentations related to the maintenance of the breeding centre are shown to visitors. The Centre has also generated and printed brochures, posters, and other awareness material on vultures.

Rescue and Rehabilitation

With the Forest Department of Assam, the VCBC at Rani plays a vital role in rescuing vultures in distress. There have been a few instances of poisoning of vultures in the area. At every instance, the VCBC staff rushed to the spot and rescued the vultures, which comprised White-rumped Vultures, Slender-billed Vultures, Cinereous Vultures and Himalayan Griffons. Our specially trained veterinary staff treated and

> The BNHS VCBC in Assam plays a valuable role in the training and education of frontline staff for nature conservation

Three juvenile White-rumped Vultures at Rani, Assam in 2020

An adult White-rumped Vulture

took care of the vultures. Once recovered, the vultures were released into the wild. Till date we have saved and released more than 200 vultures.

Some of the released birds were marked with Darvic leg bands. These unplasticized PVC bands are engraved with an alphanumeric code, which can be read easily in the field with the help of binoculars/spotscopes. Banding/Ringing is a simple, low-cost, non-invasive way to mark a bird that may travel long distances. In a population of more than 10,000 Himalayan Griffons, marking a few vultures provides only a slim chance to relocate it. Yet, there was a rare moment that we witnessed of one of our rescued Himalayan Griffons. The bird (J29) — along with a few others — were released into the wild on May 3, 2017. The following season, in March, 2018, J29 was sighted again near the VCBC, feeding amidst a flock of Himalayan Griffons. That was the litmus test of successful rescue and rehabilitation of vultures for us.

New nesting of White-rumped Vulture in Rani

The rescued and released Himalayan Griffons visited the Centre and perched on a tall dead tree in the premises, tempting other wild Griffons to perch around. This assemblage of the migratory species slowly attracted the local resident vulture species from nearby areas. Even after the migratory Himalayan Griffons left the area, the White-rumped and Slender-billed vultures lingered around the Centre. The sight of the Slender-billed and White-rumped vultures in captivity has most likely raised their interest and assured them that the VCBC area was safe for them.

The winter of 2018 witnessed a wonderful event – a Slender-billed Vulture pair built their nest on a tree at a nearby hillock. Unfortunately, the attempt was futile, but the vulture flock became resident in the area. During the end of 2019, four White-rumped Vultures built nests on the tall trees around the VCBC. Towering Sal *Shorea robusta* – was one such tall trees selected for nesting. The nests were quite high up and concealed in the canopy, and moreover, the trees were difficult to approach because of the thick undergrowth below, with perennial streams and marshland encircling them. We monitored the nests with binoculars and a spotscope from a good distance. By the end of November 2019, all the pairs had successfully laid eggs – The parenting vultures' persistence in incubation throughout the chilly winter gave us some satisfying moments in January, when we saw the tiny whitish head of a nestling popping up from the nest, begging for food from its parent. Three nests had one nestling each, and these grew day by day. One fine morning, the birds fledged out; this thrilling sight gave us goose bumps. Although the fledglings could fly free, we were a bit worried till we saw that the parents followed and continued to feed the young ones.

> The nesting of vultures in the wild in the Rani area is a unique comeback for a species that suffered a drastic crash of 99.9% of its population in India

White-rumped Vulture with nestling

The nesting of vulture in the Rani area was a unique case of comeback of the White-rumped Vulture, a species that suffered a drastic crash of 99.9% of its population in India due to the veterinary drug diclofenac. Till then, a few vultures had been collected from Kamrup district in 2008–09 for the conservation breeding purpose in VCBC, but thereafter, the breeding and nesting records in the region were rare. The vultures having selected the area around the VCBC at Rani, Assam for their comeback is nothing less than Mother Earth's blessings to this project! ■

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When vultures watching your civilization begin dropping dead, it is time to pause and wonder.

– David Brower

DHRITIMAN MUKHERJEE

... AND WILL THERE BE NONE?

Humans, vulture is my name,

Same as the Jatayu of ancient mythological fame

I am a polarizing but an interesting creature,

And am certainly useful in cleaning up nature

I eat up the flesh of carrion,

sending pathogens into oblivion.

Unfortunate that my only source of food has turned into foe

Rendering single-handedly our population to levels catastrophically low

Is it our fault that we do not have the knack

Of identifying in our food, the presence of diclofenac?

My close ones have died an extremely painful death,

Our food is mercilessly taking away our last breath

And so my friends, please carefully pay attention to this fact,

It's time to come together and act.

Else the day is not far when we will forever be lost,

And nature along with the entire humanity will have to bear the cost.

Because our work on this planet will never be done,

And if we go, the ecological balance … well, there!

– Rohan Shringarpure

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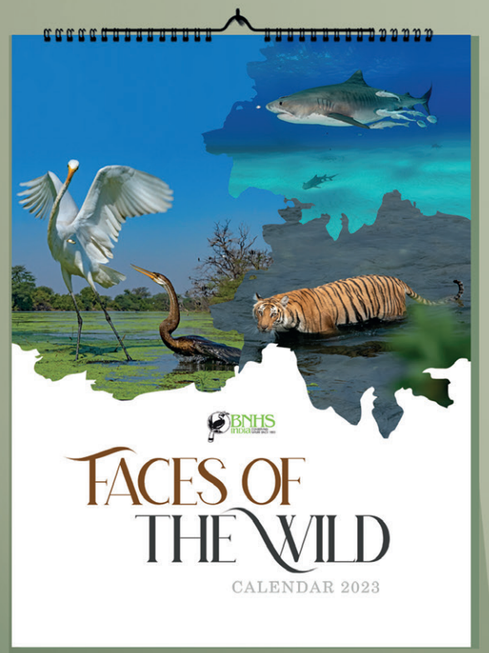

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