

On the decline of Oriental White-backed Vultures *Gyps bengalensis* in lowland Nepal

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INTRODUCTION

Eight species of vultures occur in Nepal of which two, *Gyps bengalensis* and *G. tenuirostris*, are listed as critically endangered in the IUCN's Red Data Book (BirdLife International 2000). Both these species, plus a third, *G. indicus*, have declined precipitously in India and Pakistan over the last decade (Virani *et al.* 2001; Gilbert *et al.* 2002; Prakash *et al.* 2003). *G. bengalensis* was the most common and widespread vulture species in lowland Nepal (Fleming *et al.* 1984; Inskipp & Inskipp 1991). Large flocks of vultures numbering >100 were a common occurrence at carcass dump sites in the Kathmandu Valley and protected areas in the lowlands, such as Royal Chitwan National Park, in the early 1990s (Rod Cassidy pers. comm.). Concerned that populations of these species may also have been affected in Nepal, it was felt that a study was required to urgently evaluate the status of *Gyps* vultures there in view of the vulture population decline in neighbouring countries. The aim of this study was to evaluate the status of Oriental White-backed Vultures *G. bengalensis* populations in lowland Nepal by measuring their breeding success and mortality over a three-year period. Information collected from this study would add to current knowledge on the species and be useful in the context of understanding the vulture population decline and discussing conservation interventions.

STUDY AREA AND METHODS

Populations of *G. bengalensis* have been studied since October 2000 at Koshi Tappu Wildlife Reserve (26°35' – 26°40'N/86°56' – 87°04'E; hereafter Koshi). The reserve lies on the flood plains of the Sapta-Koshi River in Sunsari, Saptari and Udaypur districts in eastern Nepal and is situated 5 km north of the Koshi barrage, on Nepal's southern border with Bihar State in

India. Koshi covers an area of 175 km² and is defined by the eastern and western embankments of the river. It consists of four main habitat types – Khair-Sissoo forest dominated by *Acacia catechu* and *Dalbergia sissoo*; a mixed tropical deciduous riverine forest comprising a variety of trees (*Bombax ceiba*, *A. catechu*, *Tamarix dioica*, *Trewia nudiflora*); grasslands; and a wetland vegetation that supports aquatic and marshy plants. The reserve is surrounded by human-inhabited villages and scattered mixed forests that have historically harboured breeding vultures (Badri Choudhary, pers. comm.). There is a series of water canals that are used for irrigation of wheat, rice and subsistence crops. Domestic livestock – mainly cattle and buffalos – are abundant. Prior to this study at Koshi in October 2000, a pilot vulture survey was conducted at Koshi and Royal Chitwan National Park from 4 to 13 May 2000 to assess the feasibility of conducting a full-fledged vulture study.

G. bengalensis and *G. tenuirostris* normally commence nest building by late October and, by early December, a large proportion of breeding birds are incubating (Inskipp & Inskipp 1991). In November 2000, the areas inside and immediately outside Koshi were searched intensively on foot and by vehicle for signs of vultures' nests and breeding activity. These areas included the Ramdhuni Forest and the areas adjacent to Koshi up to the Chatara Barrage. All occupied nests were recorded and marked using a hand-held Garmin GPS. A nest was considered "occupied" if it contained an egg, if a vulture was observed crouching low on the nest in the incubation position, if two adults were seen copulating on or next to a nest, or if an adult was seen arranging or bringing in nesting material to a nest. All marked nests were monitored on a periodic basis (at least twice a month). We followed Postupalsky's (1974) criteria of a minimum of two visits per nest per season to sufficiently determine breeding success. Any dead or moribund vultures found beneath or nearby marked nests were recorded. *Ad hoc* observations of numbers and age structure of flocks of vultures were also recorded. Where possible, freshly dead birds were autopsied to ascertain the presence of avian visceral gout, a condition associated with more than three-quarters of dead adult vultures located in Pakistan and India (Gilbert *et al.* 2002; Cunningham *et al.* 2003). To obtain an index of crude annual adult mortality, we divided the number of dead adults by the number of breeding adults (which was obtained by multiplying the number of observed occupied nests by two). We emphasize that the crude annual adult mortality is not a true annual mortality since we were unable to account for non-breeding adults and those birds that died away from their nests or dead birds that were scavenged.

RESULTS AND DISCUSSION

This study represents the first attempt to document the decline of *G. bengalensis* in lowland Nepal. We recorded a maximum of 150 *G. bengalensis*, two *G. himalayensis* and 18 *G. tenuirostris* during our first survey of Koshi in May 2000. At one cow carcass, 72 *G. bengalensis* were observed comprising 35 adults, 35 sub-adults and two juveniles. At the village of Ineruwa, on the outskirts of Koshi, we observed 22 *G. tenuirostris* in March 2001. There were two occupied nests of *G. tenuirostris* in Koshi of which one successfully raised

a chick in April 2001. No nests of *G. tenuirostris* have been located since then and sightings of this species have become rare with not more than two birds seen occasionally. Numbers of active nests of *G. bengalensis* at Koshi and the surrounding forests declined by 78.5% from October 2000 to May 2003 (65 nests in 2000-01, 13 nests in 2001-02, 14 nests in 2002-03). During the 2000-2001 breeding season, 19 out of 65 occupied nests (29.2%) successfully fledged chicks and 45 dead *G. bengalensis* comprising 34 adults, three sub-adults and eight nestlings, were recovered. Based on this, we calculated a crude annual adult mortality of 26.2%, which suggests that the population is in rapid decline (see Gilbert *et al.* 2002). During the 2001-2002 breeding season, nest searches in the western part of Koshi were limited due to problems with security and hence six nests located in the previous season in that area could not be monitored. Our breeding success was therefore underestimated at 15.4% and based on two successful nests out of thirteen. During the 2002-2003 breeding season, seven out of 14 occupied nests (50%) successfully raised chicks. Dead birds fresh enough for autopsy were rare, but in 2001 avian visceral gout was diagnosed in two out of three *G. bengalensis*. Both birds with avian visceral gout were adults while the non-gout bird was a fledgling. The cause of death of the fledgling was not determined. In 2003, the maximum number of *G. bengalensis* recorded in one day at Koshi was 22 birds. This reflected an 85.3% decline of the species since May 2000, when a maximum of 150 birds were seen in one day.

The population decline of *G. bengalensis* at Koshi is similar in magnitude to that recorded in India and Pakistan (Virani *et al.* 2002; Prakash *et al.* 2003). A 50% ratio of adult to immature *G. bengalensis* observed at Koshi in May 2000 and an increase in breeding success observed in 2003 suggests that even though the breeding population is rapidly declining, the species' ability to breed has either not been affected, or there may be an influx of sub-populations of immature vultures that would be difficult to detect without marked birds. Such movements may also offer a different perspective on what is going on in counts of flying birds.

The high number of dead adult *G. bengalensis* recovered and the fact that two out of three birds (both adults) had avian visceral gout suggests that the same mortality factor affecting the species in India and Pakistan is also negatively impacting on populations in Nepal. In their study of *G. bengalensis* in the Rampur Valley in Nepal conducted between October 2002 and May 2003, Baral *et al.* (2003) located 33 dead birds of which 30 were adults. This unusually high number of dead birds located out of a resident population of 86 birds further confirms the magnitude of the vulture mortality in Nepal.

In other parts of Nepal, various researchers have recorded declines in populations of *G. bengalensis*. For example, in Rupandehi District near Lumbini, maximum numbers of *G. bengalensis* observed in one day have decreased from 160 in July 2000 to 64 in March 2002 (Giri 2000, H.R. Baral in litt.). At Dhalkebar, 100 km west of Koshi, 25 *G. bengalensis* were seen at a carcass in January 2003 (Hathan Choudhary, pers. obs.). At Royal Bardia National Park, moderate numbers of *G. bengalensis* (range: 18 – 72 individuals) have been observed since 2001 although no data exist prior to that

period (Giri *et al.* 2003). At Royal Suklaphanta Wildlife Reserve in western Nepal, only four (30.8%) out of 13 occupied *G. bengalensis* nests produced fledglings (GC & Giri 2003). Numbers of *G. bengalensis* observed ranged from between 25 and 28 individuals in December 2002 to only four individuals observed in June 2003 (GC & Giri 2003).

Koshi is also an important wintering place for vulture populations in addition to breeding populations of *G. bengalensis*. In January 2002, 15 immature *G. himalayensis* were seen in one day. In the following year (2003), the maximum number of immature *G. himalayensis* recorded was 29 (January 2003) and 66 (February 2003). At Royal Chitwan National Park, 12 *G. bengalensis* were seen in February 2000 (Ghimire 2000) and none over a four-day period in May 2000. Six nests of *G. bengalensis* and a single nest of *G. tenuirostris* were recorded in the Nawalparasi District, west of Royal Chitwan National Park, during the 2001-02 breeding season, but their outcome was unknown. On 10 June 2002, a flock of 42 vultures was seen near Chitwan at the Jaldevi Community Forest, Devghat. The flock included 11 *G. bengalensis*, 22 *Neophron percnopterus*, two *Sarcogyps calvus* and seven *G. tenuirostris*.

Our data suggest that populations of *G. bengalensis* have declined catastrophically in lowland Nepal. At the time of writing this, compelling evidence that diclofenac, a non-steroidal anti-inflammatory drug, was presented at this conference by researchers from The Peregrine Fund as the primary cause of gout-associated vulture mortalities in Pakistan (Oaks *et al.* in press), the most likely route of contamination being through consumption of dead livestock treated with diclofenac prior to death (Oaks *et al.* in press). It is likely that the veterinary use of diclofenac may also be contributing towards high *G. bengalensis* mortalities and population declines in lowland Nepal although no data exist on the quantity used to treat livestock in the region. The extent and use of veterinary diclofenac in lowland Nepal urgently needs to be investigated.

Conservation of *G. bengalensis* and other *Gyps* species in Nepal depends on the Nepali government's commitment to prevent species extinction by controlling the primary cause of vulture mortalities. We therefore recommend that a workshop be held involving senior Nepali government officials and those conducting research on vultures, to discuss conservation priorities and implement actions to safeguard and restore populations of *Gyps* vultures in Nepal.

ACKNOWLEDGEMENTS

We are grateful to the Department of National Parks and Wildlife Conservation, Bird Conservation Nepal, Himalayan Nature and Koshi Camp for their support. Chitra Timsina, Badri Choudhry and Som GC provided valuable assistance in the field. This study was supported by The Peregrine Fund through grants obtained from the Betty and Gordon Moore Foundation, Disney Conservation Awards, U.N. Summit and Ivorybill Foundations. We also thank Todd Katzner, Mike McGrady and Carol Inskipp for valuable comments and suggestions on earlier drafts.

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