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Understanding the Efficacy of Diclofenac Use-ban and its Aftermath Effect on *Gyps* Vulture in Koshi Tappu Wildlife Reserve, Nepal

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ABSTRACT

Study on efficacy of Diclofenac ban and its aftermath effect on *Gyps* vulture status was conducted in Koshi Tappu Wildlife Reserve in Nepal. Nest survey of the *Gyps* vulture and questionnaire survey was carried out. *Gyps* vulture nest were not found in the area. However, a flock of soaring vultures was observed one morning. Use of diclofenac was found to be stopped suggesting *Gyps* vulture potential recovery in the area. *Gyps* vulture did not appear to be food limited given that the half of the people practice open disposal of carcass. Nonetheless, further study and monitoring of the *Gyps* vulture is warranted given the fact that there were not any nests of the vultures in the area.

Keywords: Vulture; Lowland; Decline; Diclofenac; Conservation.

1. Introduction

Vultures (*Gyps* species) are the largest flying raptors in Nepal with a crucial ecological role in the ecosystem via consumption of animal carcasses [9]. Once abundant throughout the Indian subcontinent, these *Gyps* species have declined from many parts of their former ranges [11]. Habitat destruction, food shortages, land use change appear to be the primary causal factors for the catastrophic decline of these raptors. Owing to the dramatic population decline, three *Gyps* species (Whiterumped, Indian *G. indicus* and Slender-billed Vultures *G. tenuirostris*) in the Indian subcontinent are threatened with extinction [13,17] and appear in the “Critically Endangered” category of IUCN [3]. Threaten to these species have been accrued more by the use of anti-inflammatory drug called Diclofenac in livestock and subsequent consumption of these animals after their death [15]. Diclofenac administration in the livestock and the aftermath negative impact of carcass consumption on *Gyps* population has been found true from the examination of dead bodies of birds in India and Nepal [15]. Vultures exposed to Diclofenac administered livestock carcasses die due to Diclofenac induced kidney failure with clinical signs of visceral gout [10,16].

Six resident (White-rumped vulture (WRV) *Gyps bengalensis*, Slender-billed vulture *Gyps tenuirostris*, Egyptian vulture *Neophron percnopterus*, Red-headed vulture *SarcoGyps calvus*, Himalayan griffon vulture *Gyps himalayensis* and Lammergeier vulture *Gypaetus barbatus* and two migratory (Cinereous vulture *Aegypius monachus* and Eurasian griffon vulture *Gyps fulvus*) vulture species have been recorded from Nepal [7]. Lowlands of Nepal are the potential distributional area of the *Gyps* vulture in Nepal. However, studies have shown a continuous decline of population [1, 17, 4] throughout their range in Nepal resulting to patchily distribution [8] with an increased risk of extirpation from the country. Diclofenac use along with habitat loss, scarcity of food, disease, pesticides, environmental contamination, poisoning, calcium deficiency, nest predators, hunting, and aircraft strikes have been attributed as the cause of decline [14, 18]. Owing to the widespread use of Diclofenac in livestock and the subsequent threats to the *Gyps* vulture; Government of Nepal, Department of Drug Administration (DDA) announced a ban on the manufacture and import of Diclofenac in Nepal in June 2006.

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Also, the government directed the use of Meloxicam that has been shown to be safe to the *Gyps* vulture [16]. However, efficacy of ban on Diclofenac use and status of *Gyps* vulture monitoring as a part of *Gyps* vulture conservation plan has not been conducted effectively in the country. Thus, the present study aims to document the efficacy of Government's drug ban and status of *Gyps* vulture in the buffer zone of Koshi Tappu Wildlife Reserve of Nepal.

2. Study Area

Koshi Tappu Wildlife Reserve (KTWR) (26°35' - 26°40'N, 86°56' - 87°04'E) lies on the flood plains of the Sapta Koshi River in Sunsari, Saptari and Udayapur districts in eastern Nepal and is situated 5 km north of the Koshi barrage, on Nepal's southern border with Bihar state in India. Characterized by subtropical monsoonal climate and defined by the eastern and western embankments of the river, it occupies an area of 175km². Altitude ranges from 75-81m and the reserve is subjected to annual flooding. Approximately 70% of the reserve's land area is covered in grasslands while riverine vegetation with *Acacia catechu*, *Dalbergia sisso* forest dominates the islands and edges of the reserve. It is also the largest heronry of Nepal and a total of 486 species of birds have been recorded from the reserve so far. Buffer zone of the reserve covers 173km² with majority of population depending on wetland resources for the livelihood.

3. Materials and Methods

The study was conducted during the last quarter of 2011. Area outside of the reserve was searched intensively on foot and vehicle for signs of nests and breeding activity of *Gyps* vulture. All occupied nests were recorded and marked using a hand held Garmin GPS. A nest was considered "occupied/active" if

- It contained an egg,
- A vulture was observed crouching low on the nest in the incubation position
- Two adults were seen copulating on or next to a nest

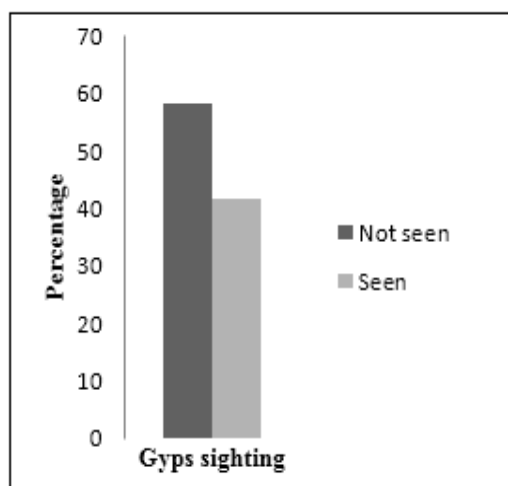


Fig 1: *Gyps* vulture sighting by local people

- An adult was seen arranging or bringing in nesting material to a nest.

Likewise, nesting tree as well as the vulture species; nest location in tree; fresh chick activity and signs of illness was recorded. Also, questionnaire survey was conducted to 90 respondents from randomly selected households. Respondents were asked about status of vulture population in the area, carcass disposal practice, and livestock holding size, and pesticide use in agriculture practice. Additionally, information on veterinary drug Diclofenac use was collected through informal talk to the shopkeepers and government officials. Almost all the veterinary shopkeepers of the buffer zone were interviewed.

4. Results

4.1 Nest counting

No vulture nests and vulture were seen in the buffer zone of the KTWR. However, about 18 vultures were seen soaring in the forest of Ramdhuni forests in one morning. Most of them were white rumped vulture (*G. indicus*) and very few were slender billed vulture (*G. tenuirostris*). As per the reserve people, those vultures presumably nested in the bombax species trees next to buffer zone area.

4.2 Questionnaire Survey

Respondents primarily consisted of farmers, nature guide of reserve, army personnel and the staff of the park involved in the patrolling activity of the park. Of the respondents, 58.33% had not seen the vulture while 41.66% had seen vultures for a year (Fig. 1). A flock of 5-10 vultures was the most common size observed. Vultures were mostly seen in the Haripur area and the bufferzone around the Simal Ghari. About 40% of the respondents left carcass in open place, while 53.33% buried them and 6.66% had the mixed practice (Fig. 2). Although not quantified, use of pesticides and chemical fertilizers was common practice among local farmers.

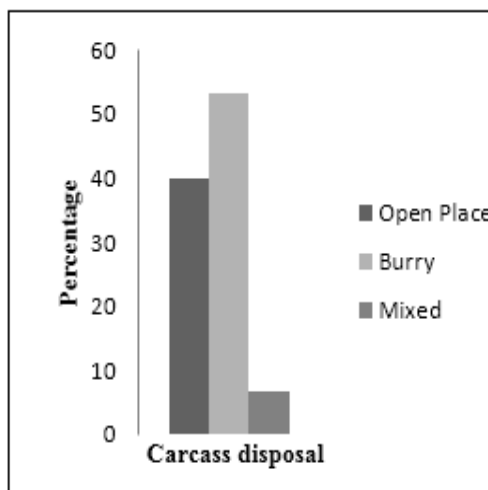


Fig 2: Carcass disposal method in the area

4.3 Diclofenac Survey

The respondents for the diclofenac survey were mostly the veterinary shopkeepers and the technicians. All the respondents were found to have knowledge about the negative effect of

diclofenac on *Gyps* vulture population. None of the respondents were found selling the diclofenac. They were found to use Meloxicam and Megaflam® (Nimesulide and Paracetamol) as an alternative to the diclofenac.

5. Discussion

High mortality rates and breeding failure has resulted to population crash of *Gyps* vulture in the Indian subcontinent which likely lead to extinction if the underlying causes are not addressed^[3]. No vulture nests were observed in the KTWR buffer area calling for the further intensive research in the area. It presumably signals the deteriorating condition of the *Gyps* vulture in the area. Our observation is in parallel to the *Gyps* vulture observation elsewhere in Nepal^[2, 4, 5, 6]. Literature suggests a very few nest sighting in many parts of the potential area of the country. This is presumably a reflection of widespread use of diclofenac in the country. It appears that the *Gyps* vulture population still needs some more generation to recover provided sufficient conservation. Besides, land use change and deforestation are the other potential threats. Although not quantified and incorporated in this study, felling of *Bombax* species (which are the potential nesting sites for *Gyps* vulture) is common and was observed during the field survey. However, observation of some soaring vultures in the area provides suggestive evidence that the area is suitable for the *Gyps* vulture and calls for immediate conservation plan.

Nepal being a Hindu country, cattle is not killed for beef and hence *Gyps* vultures do not appear to be food limited if the carcasses are provided to them in their habitat. About half of the people were found to practice open disposal of carcass. If certain areas could be set aside for carcass disposal, the practice could potentially increase providing more food to the vultures.

Ban on diclofenac was found to be very effective as reflected by almost total stoppage in the use and also the people's understanding about its untoward effect. This behavior could presumably help recover the vulture population in the future.

6. Conclusion

The present study found both the dark and bright side of the fate of the *Gyps* vulture in KTWR. Absence of nesting sites in the area suggests a population crash and probable extirpation, but observation of soaring vulture groups and ban of Diclofenac use provides a hook for potential recovery of population in the area. However, further monitoring research should be undertaken to get more insight on the fate of these raptors in Nepal.

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