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Are white-rumped vultures (*Gyps bengalensis*) scavengers or predators at a vulture safe feeding site of Nepal?

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Abstract. *Gautan R, Baral N, Sharma HP. 2022. Are white-rumped vultures (*Gyps bengalensis*) scavengers or predators at a vulture safe feeding site of Nepal?. Biodiversitas 23: 3808-3812.* Establishing safe feeding sites has been promoted as a strategy to conserve wild vultures following the population crash in South Asia due to the contamination of natural food by veterinary diclofenac. Several feeding sites have been established in the region, including Nepal and it is important to evaluate their effectiveness. One aspect that is not clear yet is whether such safe feeding sites change the behaviors of wild vultures in South Asia. Here, we report incidents of White-rumped Vultures *Gyps bengalensis* attacking live animals at the Vulture Safe Feeding Site in Ghachok village in central Nepal. Even though a carcass was available nearby to feed upon, three White-rumped Vultures attacked an adult cow and a calf at the feeding site. The vultures' attack served as an ancillary cause of the calf's death in this case. These two incidents of vultures' attacking live animals at the safe feeding site may allude to changing behaviors and cast doubt on their status of being classified as an obligate scavengers. The findings suggest alteration of vulture behaviors at the safe feeding site. Further research is needed to test the hypothesis of vulture behavior change.

Keywords: Behavior change, carcass, foraging, supplementary feeding, unproductive livestock

INTRODUCTION

All the 16 species of Old World Vultures, including White-rumped Vultures *Gyps bengalensis*, are considered to be obligate scavengers that feed upon dead animals only (Hunter et al. 2007). But some species of the New World Vultures, such as Black Vulture *Coragyps atratus* and Turkey Vulture *Cathartes aura* are considered facultative scavengers because they also prey upon other live animals for feeding (Toledo et al. 2013; Platt et al. 2021; Gula 2022). Not only the feeding behavior but also the food search strategy of these two groups of vultures is different: Old World Vultures find carcasses mainly through sight and the New World Vultures using both sight and smell to locate the carcasses (Houston 1974; Potier et al. 2019). The change from obligate scavenging feeding behavior to facultative is noticed in some of the Old World Vultures, including Cinereous Vulture *Aegypius monachus*, Bearded Vulture *Gypaetus barbatus*, Eurasian Griffon *G. fulvus*, and White-headed Vulture *Trigonoceps occipitalis* in their range states (Lowney 1999; Murn 2014; Duriez et al. 2019). Several factors might contribute to such behavioral changes, but a body of empirical research reports factors such as food scarcity, changes in livestock farming practices, and safe carcass disposal policy to be responsible for the behavioral change in vultures (Cortés-Avizanda et al. 2014; Margalida et al. 2017). The finding such as this highlights the need for regular monitoring of any conservation intervention to detect unintended consequences in a timely manner.

In response to the South-Asian vulture crisis leading to a more than 95% decrease in wild populations of three *Gyps* vultures due to the contamination of livestock carcasses by diclofenac (Oaks et al. 2004; Shultz et al. 2004), the vulture range state governments have adopted three major interventions for vulture conservation: (1) the ban on veterinary use of diclofenac; (2) initiation of captive breeding and release programs; (3) establishment of safe feeding sites. The Government of Nepal adopted the Vulture Conservation Action Plan in 2009 to avert the potential local extinction of wild vulture populations, incorporating all three major vulture conservation interventions. As per the action plan, one of the major conservation measures is to provide diclofenac and poison-free carcasses to wild vultures by establishing vulture-safe feeding sites and expanding the vulture-safe zones throughout the country (DNPWC 2015). The vulture safe zone is defined as the diclofenac and other vulture toxic non-steroidal anti-inflammatory drugs free area, which is declared to ensure the safe environment for vultures to feed and the initiative draws upon advocacy, monitoring and community involvement to make the program successful (Paudel 2013). Currently, the vulture safe feeding zone comprises 101,160 km^2 of the total land of 147,516 km^2 and covers 46 out of 77 administrative districts of Nepal (DNPWC 2015). Besides Nepal, this conservation approach is also implemented in India, Pakistan, and Bangladesh where vultures' distribution range overlaps (Mukherjee et al. 2014). The shortage of food for vultures in the wild due to changes in traditional farming and

livestock raising methods and carcasses disposal practices in Nepal lends further support for such conservation measures (Baral et al. 2005; Baral and Gautam 2007). So far, seven community-managed Vulture Safe Feeding Sites have been established in Nepal (DNPWC 2015). The concept of safe feeding sites was originally initiated in the 1960s in European and African countries to supply stable livestock carcasses in the wild to feed scavengers which became necessary due to legal restrictions on the open disposal of livestock carcasses (Bijleveld 1974). Although the merits and demerits of such safe feeding sites are hardly debated on rigorous scientific grounds, they have become one of the famous conservation tools for vulture conservation worldwide. This argument is supported by the increasing number of safe feeding sites throughout the world, for example, 143 active sites are recorded in South Africa only (Brink et al. 2020). At the safe feeding site, the food is constantly, consistently, and predictably available to vultures, which can prevent food shortage or routinely increase the frequency of food supply to the vultures (Kane et al. 2015; Fluhr et al. 2017).

A standard practice in these supplementary safe feeding sites is that they collect old, abandoned, unproductive and dying cattle in discounted prices or free of charge and feed them to vultures after their natural death. No in-depth research on the potential positive or negative impacts of safe feeding sites on the behaviors of wild vultures has been conducted in Nepal. Nonetheless, the safe feeding sites have attracted more vultures and the number of roosting and nesting vultures has increased near such safe feeding sites (DeCandido et al. 2012; Fluhr et al. 2017; Dhakal et al. 2022). Generally, wild vultures detect food by four mechanisms. Vultures find the food resources on their own without relying upon the activities of other individuals (Cortés-Avizanda et al. 2014). Vultures follow the scavengers, which are gathering in and around the carcass and find the food. Vultures observe the flight activities of other vultures and follow them when others dive fast towards a carcass after a short circle over it (Cortés-Avizanda et al. 2014). Vultures also find food by forming a chain of vultures flying towards or following the individual vultures which had previously visited the carcass site (Cortés-Avizanda et al. 2014; Rouviere and Ruxton 2022). These natural foraging behaviors of vultures might be altered by the establishment of safe feeding sites where vultures sit and wait for food rather than engage in active search in the wild (Zuberogoitia et al. 2013). The presence of safe feed sites leads to a decrease in the efforts of vultures to travel long distances to search for food or a reduction in the long wait time for food (Kane et al. 2015; Fluhr et al. 2017). Scholars and practitioners report that safe feeding sites might provide conditions favorable for vultures to attack live animals kept there. For example, one study claims that sometimes the food signal available in the feeding sites also motivates vultures to attack the live individuals (Black Vultures attack on calf; Toledo et al. 2013). In some instances, vultures are seen to attack non-aggressive, weak/small animals for feeding at such sites (Duriez et al. 2019). We also noticed similar unusual behavior of White-rumped Vulture at the Vulture Safe Feeding Site Ghachok, Kaski, Nepal. Therefore, we followed the White-rumped Vultures' activities at the safe feeding site to record whether there was any change in the behavior of wild White-rumped Vultures.

MATERIALS AND METHODS

Study area

The behavioral study of the White-rumped Vulture was carried out at the Vulture Safe Feeding Site Ghachok (28º06′N and 84º12′E), which lies within the Annapurna Conservation Area, Nepal. The Vulture Safe Feeding Site Ghachok is a community-based initiative started in 2010 to provide safe food for vultures by taking care of and letting the old and unproductive livestock to die naturally at the site. The safe feeding site, with an area of five hectares (50,000 m^2), is about 15 minutes walking distance from the human settlement on the west bank of the Seti River. The Vulture Safe Feeding Site is fenced by a large stone wall, and the area within in the periphery appears to be enough for stocked livestock to range freely. The management of the safe feeding site is partially supported by Machhapuchchhre Rural Municipality and Bird Conservation Nepal for feedstock to livestock, equipment, training and salary to staff. The villagers voluntarily supply old, abandoned and unproductive cattle to the Vulture Safe Feeding Site. Altogether 18 adult cows, an ox, and three calves were present at the site when the fieldwork was conducted. After livestock dies of natural death, they are skinned and the carcasses are left in the open for vultures to feed upon.

Seven species of vultures, namely Egyptian Vulture *Neophron percnopterus*, Himalayan Griffon *Gyps himalayensis*, Red-headed Vulture *Sarcogyps calvus*, Slender-billed Vulture *G. tenuirostris*, White-rumped Vulture *G. bengalensis* Cinerous Vulture *Aegypius monachus*, and Eurasian Griffon *G. fulvus* are recorded from the feeding site (Dhakal et al. 2022). We recorded five species (sans Cinerous Vulture and Eurasian Griffon) during the field visit. The White-rumped Vulture inhabits in tropical and subtropical regions of Nepal within the elevation of 1500 m above sea level (Grimmett et al. 2016). Its population is estimated to be 4000 to 6000 individuals in its range countries, including Bangladesh, Bhutan, Cambodia, India, Myanmar Nepal, Pakistan, and is categorized as a critically endangered species in the Red Databook by BirdLife International (2021). In Nepal, the population of White-rumped was estimated as 2000 individuals in the wild (DNPWC 2015). The White-rumped Vultures build nests and roost in colonies on tall trees near human settlements.

Methods

For the research purpose, the first author has been visiting the Vulture Safe Feeding Site Ghachok since February 2020 to count the number of vultures feeding at the safe feeding site and observe their feeding activities and other behaviors of the vultures. In our visit to the site on October 25, 2021, we observed unusual feeding behaviors

of vultures that cast doubts on them being obligate scavengers. To delve into the issue, we took detailed field notes, photos and videos in a systematic manner on October 25 and 26, 2021. Observations with naked eyes and binoculars (60×10) were made from 7:00 hr to 17:30 hr. We then analyzed the descriptions of the field notes and synthesized them into a coherent narrative to present the findings and develop hypotheses.

RESULTS AND DISCUSSION

On October 25, 2021 there was one dead cow at the safe feeding site. At 8:05 AM three White-rumped Vultures came near the cow carcass but did not attempt to feed on it at first, probably due to the presence of an employee who was cleaning the shed. Immediately the employee left the shed after cleaning, seven White-rumped Vultures and two Himalayan Griffons started feeding on the carcass from the anterior and posterior parts. Within 30 minutes, the number of vultures feeding on the carcass reached 10, with an additional White-rumped Vulture and two Himalayan Griffons. By 2:00 PM, there were 44 vultures in total feeding on the carcass (35 White-rumped Vultures; six Red-headed Vultures; two Himalayan Griffons; and one Slender-billed Vulture). As the number of vultures increased, aggressions between individuals while feeding also increased.

There was an adult cow (around 12 years old) resting in the cowshed, which was approximately three meters away from the carcass on which vultures were feasting. At 2:30 PM, a sub-adult White-rumped Vulture approached the adult cow and started to tug in the head's upper jaw region (Figure 1A). The adult cow moved its head sideways to discourage the vulture (Video 1). The vulture's persistence in pecking the upper jaw and eye seemed to annoy the adult cow. After two minutes, the adult cow moved away from the place. Based on this observation, we suspected that the vulture was attacking a live adult cow.

Because of these unusual activities of the White-rumped Vulture, we visited the same site the next day (October 26, 2021) with the intention of gathering further information. At 8:30 AM, the caretaker started skinning a cow carcass to make it ready for vultures to feed on. We observed 15 vultures (12 White-rumped Vultures and one each of Himalayan Griffon, Red-headed and Slender-billed Vulture) waiting for the food. It took almost 45 minutes for the caretaker to skin the carcass and by that time 24 White-rumped, three Red-headed and one Egyptian Vultures arrived at the safe feeding site to feed. The highest number of 54 vultures of five different species (38 White-rumped Vultures, seven Red-headed Vultures, four Slender-billed Vultures, 3 Egyptian Vultures and 2 Himalayan Griffons) was recorded at the cow carcass. They consumed the carcass within two and quarter hours (135 minutes). By 4.00 PM several vultures were seen soaring, basking or just resting on the ground and trees at the safe feeding site. We observed 13 individuals (nine White-rumped Vultures and four Himalayan Griffons) tugging with the remaining part of the carcass on the ground. Around that time, an adult White-rumped Vulture landed on the ground of the safe feeding site. Instead of moving towards the carcass remains, the adult vulture approached a frail calf that was lying on the ground nearby. The White-rumped Vulture started to peck the calf's body surface from head to tail at around 4:10 PM (Video 2). The calf seemed to lack the energy to fend away the vulture. When the calf moved the tail, the anal region was exposed to the vulture (Figure 1B).

At that moment, the White-rumped Vulture started to pull the anal sphincter muscles with a great jerk. Another sub-adult White-rumped Vulture joined and started to pull the calf's intestine. Then the adult WRV tugged the calf's eye. Another sub-adult White-rumped Vulture, joined the band at 4:20 PM to attack the calf, and it consumed the blood flowing from the calf's eye. When the calf reacted by shaking the heading and the body, the three White-rumped Vultures became alert and backed off to a safe distance. They raised their legs and spread wings towards the calf simultaneously. Because the calf could not stand, change its posture or walk, the vultures immediately attacked the calf, one vulture pulling its tongue and the other two working on anal sphincter muscles and eye. When the vultures consumed the calf's anal sphincter muscles, eyes, and tongue, the calf took its last breath at 4:25 PM. White-rumped Vultures' attack appeared to be an ancillary cause of the calf's death. Immediately after the calf's death, three more White-rumped Vultures joined and ate the dead body.

The staff of the Vulture Safe Feeding Site Ghachok also mentioned that there were a couple of incidents in the past in which White-rumped Vultures attacked immobile cattle. When we inquired other researchers and field assistants, they also reported a few incidents of White-rumped Vultures attacking live cattle elsewhere during winter.

Discussion

We have documented two incidents of White-rumped Vultures attacking live animals in the safe feeding station. These observations raise several questions regarding White-rumped Vultures' feeding behaviors. First, do the safe feeding sites alter the behaviors of White-rumped Vultures? Second, are White-rumped Vultures facultative or obligate scavengers? Third, how do White-rumped Vultures discriminate between dead vs frail animals? The answers to these questions help to interpret and explain the behaviors that we have documented. Among five species of vultures recorded at the site, only White-rumped Vultures being involved in the attack of live animals need further investigation. Is this due to their sheer number compared to other vulture species or just the change in their behaviors? The probability of finding food in the vulture-safe feeding sites is greater than finding carcasses in the natural habitats (Zuberogoitia et al. 2010; Fluhr et al. 2017). We wonder whether White-rumped Vultures' attack on live animals at the safe feeding site is prompted by habituation conditioned by the abundant supply of "easy" food. White-rumped Vultures are soft organ feeders and fall under the gulper feeding group of vultures (Linde-Medina et al. 2021).

A **B**

Figure 1. A. A White-rumped Vulture tried to tear soft part from live cow; B. White-rumped Vulture attacking a live calf at Vulture Safe Feeding Site Ghachok, Kaski, Nepal

What appeared to be a predatory behavior of White-rumped Vultures during this study is interesting and new to behavioral science. There might be various reasons for this behavior. They might be habituated to consuming soft organs from anal and mouth regions. That might be the reason of the first attempt from the face and anal region. White-rumped Vultures might be habituated to feeding on the carcasses at the safe feeding site. If the carcasses are not available at the safe feeding site, then they might be motivated to attack old, frail, immobile and dying animals. We suspect that a cow lying on the ground nearby the carcass might have provided false information on the cow's death to the vultures. In our case, the immobility of the calf might have served as a signal of the calf's death to vultures (Duriez et al. 2019). The presence of carcasses and cows lying on the same ground might provide false information on the death of an animal to the vultures. Vultures often take immobile eyes and ears and unshaken tails as indications of animals' death and appear to check these signs probably by body surface biting (Duriez et al. 2019). But, the White-rumped Vultures attacked the calf and cows even though they moved their body parts during the body surface biting in this case. Similar incidences are also recorded on Black Vultures, which attack cows and neonates in the calving sites in Brazil, but the attack is probably triggered by an opportunity to feed upon the fetal membrane and placenta present on the body of cows and neonates rather than killing them (Toledo et al. 2013). Or Black vultures might have been habituated for getting food during the parturition period at the calving sites and can attack to cows and calves while they are weak. White-rumped Vultures might attack old, frail and immobile animals in the wild, but the probability of recording and reporting such incidents is low, so we hardly know how the behavior we saw at the safe feeding site compares with vulture behavior in the wild in a similar situation. In the literature, some cases of obligate scavengers killing weak and diseased animals are reported. For instance, Black Vulture, Eurasian Griffon and Turkey Vulture prey upon the newly born defenseless and weak calf and sea lion pups (Toledo et al. 2013; Murn 2014). When vultures come in close contact with livestock and humans frequently at safe feeding sites, their behaviors might be altered due to limited home range size, movement and foraging abilities (Zuberogoitia et al. 2013; Cortés-Avizanda et al. 2016).

In conclusion, frequent interactions with the weak and old cattle in the safe feeding sites might prompt vultures to kill the animals before they die naturally. The predatory behavior as noticed in the White-rumped Vultures can raise questions to scientists and managers. More follow-up research is warranted to make a definite conclusion on whether the safe feeding sites alter the behaviors of wild White-rumped Vultures.

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