A short review on depicting major threats to Vultures in India

Pandey Shreya
Everain Global Services, Noida, Uttar Pradesh, India 20130.
E-mail: shreyapandey.2244@gmail.com

Introduction:

The health and well-being of communities depend greatly on the benefits rendered by natural ecosystem, which in turn rely on biodiversity (Bennett et al. 2015). The current unexpected extinction of species, on the other hand, jeopardises the foundations of ecosystem perseverance and associated services (Cardinale et al. 2012). Diurnal and nocturnal raptors are regularly used as ecological indicators due to their important roles in food web links (Buechley et al. 2019). Vultures serve an active role in the ecosystem by scavenging on animal carcasses (Ali & Ripley, 1968). They predominantly feed on rotting flesh and tear meat from carcasses before it decays, preventing the spread of disease that affects other mammals, including humans (Iqbal et al. 2011).

Image 1: A flock of White-rumped Vulture - Nature's remarkable scavenger. ***(Source: Down to Earth.org.in)***

There are nine vulture species in India, five of which are members of the genus Gyps (Prakash 1999). Residents include the Oriental White-rumped Vulture (OWRV) *Gyps bengalensis*, Long-billed Vulture (LBV) Gyps indicus, and Slender-billed Vulture (SBV) *Gyps tenuirostris*, while the other two, Eurasian Griffon *Gyps fulvus* and Himalayan Griffon

Gyps himalayensis, are primarily migratory species (Prakash et al. 2003).The three resident Gyps spp. in India have been identified as critically endangered by the IUCN. The red-headed vulture Sarcogyps calvus, also known as the Asian King Vulture, is a critically endangered species. The Egyptian vulture *Neophron percnopterus* is Endangered, while *Aegypiusmonachus* is Near Threatened. Due to food scarcity and habitat loss, vultures have dropped significantly in many parts of their former ranges (Pain et al. 2003). Since the early 1990s, the Indian subcontinent has seen a catastrophic decline in three Gyps species: White-rumped vulture (*Gyps bengalensis*), Indian vulture (*Gyps indicus*), and Slender-billed vulture (*Gyps tenuirostris*) (Prakash 1999; Prakash et al. 2003). (Bird Life International 2001). With the exception of the White-Rumped and Indian vulture, which are not found in the Trans-Himalaya and the Andaman and Nicobar Islands, all vulture species are found in nearly all geographical zones of the Indian subcontinent (Ali & Ripley, 1983). Vulture populations are most common in areas with permanent bodies of water, livestock and wildlife populations, and carcass disposal playing fields (Channgani 2010). They have also been spotted near safe nesting and roosting trees and cliffs, particularly in protected and undeveloped areas (Channgani 2005).

The most vultures are found in thorn forests, followed by dry deciduous, moist deciduous, and riverine forests (Samson 2016). Egyptian Vultures can be found in non-forested areas such as semi-arid and Gangetic eco-zones, where they feed on small animals, debris, or garbage dumps, as well as human and animal carcasses, ungulate faeces, and vegetable matter (Prakash &Nanjappa 1988; Jha, 2015). Vultures are nature's most efficient scavengers, consuming an adult cow carcass in minutes. Ali and Ripley (1983). Vultures are a unique functional guild among vertebrates, contributing significantly to ecosystem balance (Buechley&Sekercioglu 2016). Nonetheless, they are one of the most endangered species (Buechley&Sekercioglu 2016; O'Bryan et al. 2018). By efficiently consuming carrion, vultures help to control the spread of disease and facultative scavenger species that can cause human injury or death (Ogada et al. 2012). Vultures are also involved in waste disposal and nutrient cycling (e.g., Gangoso et al. 2013; Mole'on et al. 2014). Replacing these services could result in significant costs as well as increased greenhouse gas emissions, such as from carcass incineration (Morales-Reyes et al. 2017; O'Bryan et al. 2018).

Review of Literature:

Publish or Perish Software was used to search for relevant research papers about Vulture Conservation and Threats to Vultures in India. The search was done from 1965 to 2020, for a period of 55 years. The Keywords used were "Vultures", Threats to Vultures", "Gyps", "Diclofenac contamination", "poisoning". Out of the filtered 200 research papers, 45 papers were selected. The filtering was done using Prisma Method(Preferred Reporting Items for Systematic Reviews and Meta-Analyses).

Results:

Due to a lack of food and habitat destruction, vulture populations have declined from their former range (Pain et al. 2003). Their population in India was estimated to be around 40 million in the 1980s, and the decline observed by BNHS at Keoladeo National Park in the late 1990s was concerning. Gyps vultures are in danger of extinction due to the use of diclofenac in domesticated animals in India, Pakistan, and Nepal.

As a result, 95 percent of the vulture population has already declined, leaving only 60,000 vultures. In contrast to diclofenac use, the BNHS initiated a programme in 2003, and the Indian government decided in 2006 to restrict diclofenac manufacture, marketing, and use (Ganguly&Mukhopadhayay, 2013). Vulture populations are declining due to a number of factors. Human persecution and diclofenac poisoning, on the other hand, are among the causes of almost all vulture population declines (Ogada et al. 2012). The threats are discussed briefly below:

Diclofenac contamination: The primary cause of vulture population decline is diclofenac, a nonsteroidal anti-inflammatory drug (NSAID) (Green et al. 2004; Shultz et al. 2004; Oaks et al. 2006). Vultures are exposed to diclofenac after feeding on the carcasses of dead farm animals. In vultures, it causes kidney failure and death (Oaks et al. 2006). Diclofenac was responsible for 99 percent of Oriental, White-backed, Slender-billed, and Long-billed vulture mortality in Assam (Hussain 2015).

Habitat Loss: Vulture populations are declining as a result of habitat loss, food scarcity, and electrocution. Cutting down trees for agriculture, urbanisation, and firewood degrades habitat and threatens vulture nesting sites. Fire and grazing are also reducing safe roosting and nesting sites for vultures. The decrease in safer nesting sites reduces breeding success and raises the death rate (Purohit & Saran 2013).

Interference from traffic and other animals: Vulture breeding grounds, particularly those of *Gyps bengalensis*, are frequently found near roads. Vultures may feed on roads, making

them vulnerable to accidents caused by human activity and traffic. Another Cause that has been identified is the interaction of other animals with vultures and their nestlings, such as monkeys (Thakur & Narang 2012).

Infectious diseases: Post-mortem and histopathological examinations of 28 carcasses of Gyps bengalensis and Gyps indicus collected from across India revealed evidence supporting the infectious disease hypothesis. According to post-mortem examinations, many vultures had visceral or renal gout (Oaks et al. 2006).

Low Food Availability: Dead animals are the primary food source for many vulture species. Previously, animal carcasses were dumped in the open; however, this exercise is no longer practised in order to prevent disease transmission from the carcasses. As a result, a gradual decrease in food availability for vultures has been observed, which is a major threat to vultures and a contributing factor to the vulture population loss. Food availability has also decreased as a result of habitat loss and rapid urbanisation (Hussain 2015).

Environmental Contaminants: Contaminants are indeed a main cause of mortality in raptor and vulture communities. Insecticides and pesticides pollute the environment, and their accumulation in waterbodies serves as a potential source of contamination. Because of bio-magnification, these birds may incur significant losses (Hussain 2015).

Vultures are threatened by toxicants and other nutritional contaminants, direct persecution, collision with infrastructure and electrical hazards, disturbance, and habitat loss and fragmentation (Buechley& S ekercioglu 2016). Other threats include electrocution of birds on overhead power lines, which causes unnatural mortality (unpublished data from the Eskom-EWT Strategic Partnership's Central Incident Book).

The population of resident Gyps vultures on the Indian subcontinent plummeted during the 1990s. This was first reported in the media in 1996-97, and it was later documented by the Bombay Natural History Society (BNHS).

Between 1991 and 1993, the BNHS used a road transect method to conduct nationwide raptor surveys in many parts of India (Samant et al. 1995). The survey was repeated in 2000, and the results were shocking. OWRV and LBV populations decreased by more than 92 percent between 1991-1993 and 2000. (Prakash et al. 2003; 2005). Repeat surveys (in 2002 and 2003) revealed that between 2000 and 2003, the average annual decline rates for OWRV were 48% and 22% for LBV. Green and colleagues (2004). SBV and LBV were considered and counted as one species until the 2002 count, when SBV was discovered to account for less than 2% of the total of LBV and SBV (Green et al. 2004).

Discussions:

Vulture population declines and rapid urbanization are temporally linked events for vast human-use landscapes in South Asia and Africa (Botha et al. 2017; United Nations Department of Economic and Social Affairs- Population Division 2019).

Most of the literatures cited in this article were highlighting the issue of population decline of Vultures due to rapid urbanization and changes in land use pattern. The heavy uncontrolled utility of available natural resources by humans over the years has led to the decline in the overall habitat condition with a boom of environmental toxicants in the abiotic components resulting in an unbalanced ecosystem and this has ruptured the complex food web. The unsustainable practices along with the modernized commercial technological developments has forced the natural environmental factors to deteriorate which ultimately is responsible for affecting the entire biodiversity and species like Vultures.

In the Past Vultures were used to be commonly seen roaring high in the sky, but they are nowhere to be seen in the present. The limited available food and habitat resources in the urbanized landscape with increased linear infrastructure is the major cause for decline of Vultures in India. Industrial revolution in our country and urban development has affected the breeding ecology of Vultures by destroying their nesting sites for infrastructural development.

After identify them, I'm trying to count the total individual of Sociable Lapwing with help of binoculars and I observed total 18 individuals of them; They were primarily resting with little movement, although a few individuals were feeding occasionally. While observing the surrounding Habitat of the Sociable lapwing, I found 4 individuals of Red-wattledlapwing which are also foraging with the flock of Sociable lapwings; and 9 individuals of Cream-coloured courser *Cursorius cursor*and 8 individuals of Indian courser *Cursoriuscoromandelicus* are also observed nearby flock of sociable lapwings.

On January 25, 2021 while surveying near by the Shervowetland (Kachchh,Gujarat), At 1357 h, I observed 3 birds in flight. And I also heard the short call "*kyek*" by one individual during flight (Image 2).On February 02, 2021, at 1040 h, I observed a flock of 24 individuals in flight at different location(490 meters away from the earlier sighting at Bhirandiyara village).Later on February 06, 2021, at 0950 h again while surveying near plains of Bhirandiyara village, I found only 1 individual foraging in the plains with the folks of Greater short-toed larks *Calandrellabrachydactyla*(Image 3).

Collisions with and electrocution from energy infrastructure, human disturbance, habitat degradation, and a decrease in food availability are all significant threats to vultures (Botha et al. 2017

Birds devote significant time and energy to nest building and maintenance (Hansell 2000), so it is surprising that nesting biology has been overlooked as a research focus in comparison to other aspects of their breeding biology (Deeming & Reynolds 2015a) Biodiversity conservation in urbanizing landscapes thus necessitates multidisciplinary research (Nagendra et al. 2014).

Conservation of an efficient dynamic raptor like Vultures need high prioritization and ground-level approach with immense utilization of skills and both short-term and long-term planning.

Conclusion:

Vultures considered to be the supreme scavengers facing the risk of extinction. In order to restore our country's glory, we must make significant efforts at the local and national levels to provide suitable habitats for the species to adapt and exist as it did in the past. We need to provide suitable landscapes and habitat conditions for the raptors, for being able to co-exist with Humans. Proper steps have to be taken at the ground level to preserve the species habitat and its co-existence with Humans. Below are a few threat mitigation strategies that need to be reinforced for a

Conservation Implications for Vulture Conservation at Ground:

i. Removing the primary cause of vulture mortality, diclofenac
ii. Preventing diclofenac human formulation leakage into the veterinary sector
iii. Monitoring vulture conservation and recovery sites
iv. Establishing and expanding a vulture care and breeding centre
v. Preventing further mortality
vi. Raising awareness, particularly among veterinary formulation users.
vii. Tracking the implementation of the Action Plan.
viii. Ongoing assessment of ground conditions and local issues.

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Suggested citation:
Pandey S (2022). A short review on depicting major threats to Vultures in India. Prithivya, An Official Newsletter of WCB Research Foundation and WCB Research Lab. Vol 2(2) 24-33.