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The Perilous Plight of Vultures and Conservation Challenges in Southern Rajasthan

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Abstract: Vultures, critical components of the ecosystem as natural scavengers, are facing a severe crisis across the Indian subcontinent, with Southern Rajasthan being no exception. This paper explores the alarming decline of these critical scavengers, delving into the main culprits behind their vanishing numbers: the pervasive use of the veterinary drug diclofenac, widespread habitat loss, and other human-induced pressures in Southern Rajasthan. It further examines the current status of key vulture species in the region, assesses the effectiveness of existing conservation initiatives, and proposes future strategies for their recovery. The study emphasizes the urgent need for sustained efforts, including strict enforcement of drug bans, community engagement, and habitat restoration, to prevent the local extinction of these ecologically vital birds.

Keywords: *Vulture Decline, Southern Rajasthan, Diclofenac, Conservation, Gyps Species, Habitat Loss.*

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I. INTRODUCTION

Vultures often referred to as "nature's clean-up crew," play an indispensable role in maintaining ecosystem health [1]. By efficiently disposing of animal carcasses, they prevent the spread of diseases, reduce the proliferation of opportunistic scavengers like feral dogs and rats, and contribute to nutrient cycling [2]. Historically, the Indian subcontinent harboured robust populations of various vulture species, particularly the *Gyps* genus. However, since the 1990s, these populations have experienced an unprecedented and alarming decline, pushing several species to the brink of extinction [3]. Southern Rajasthan, with its semi-arid landscapes and significant livestock populations, was once a crucial habitat for numerous resident and migratory vultures. This region, however, has also witnessed a dramatic reduction in vulture numbers, mirroring the national trend. This paper aims to consolidate existing knowledge on the drivers of this decline in Southern Rajasthan and to highlight the on-going challenges and potential solutions for their conservation.

II. A HISTORICAL OVERVIEW OF VULTURE DECLINE IN INDIA

The precipitous decline of vulture populations in India was first observed and quantified in the mid-1980s, notably at Keoladeo National Park in Rajasthan, where the White-rumped Vulture (*Gyps bengalensis*) colony faced near extinction by 1999 [4]. Subsequent road transect surveys across northern India confirmed a widespread decline of over 92% in *Gyps* species by 2000 [3]. The initial cause of this rapid decline remained a mystery for several years, with early hypotheses including infectious diseases, pesticides, and heavy metals.

However, ground breaking research by Lindsay Oaks and his team at The Peregrine Fund in 2003 identified the non-steroidal anti-inflammatory drug (NSAID), diclofenac, as the primary culprit [5]. Diclofenac, commonly administered to livestock to treat pain and inflammation, proved to be highly toxic to vultures. Vultures ingesting even a small amount of diclofenac from the carcasses of treated cattle suffered acute kidney failure and visceral gout, leading to death [6]. Modeling studies revealed that even a tiny proportion (around 0.8-1%) of diclofenac-contaminated carcasses could cause significant population crashes [6].

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Following these findings, the veterinary use of diclofenac was banned in India in 2006, with Nepal and Pakistan following suit. Meloxicam, a vulture-safe NSAID, was promoted as a viable alternative [7]. Despite the ban, the illegal diversion of diclofenac for human use into the veterinary sector continued to pose a threat, leading to a further ban on multi-dose vials of diclofenac in 2015 [8].

III. VULTURE SPECIES AND CURRENT STATUS IN SOUTHERN RAJASTHAN

Southern Rajasthan is home to a variety of resident and migratory vulture species. Resident species include the Indian Vulture (*Gyps indicus*), White-rumped Vulture (*Gyps bengalensis*), Red-headed Vulture (*Sarcogyps calvus*), and Egyptian Vulture (*Neophron percnopterus*). Winter migratory species observed in the region include the Eurasian Griffon (*Gyps fulvus*), Himalayan Griffon (*Gyps himalayensis*), and Cinereous Vulture (*Aegypius monachus*) [9].

Studies in parts of Southern Rajasthan, such as Udaipur district, have highlighted the continued decline of the Indian Vulture, attributing it to factors beyond diclofenac, including disturbance at nesting sites, anthropogenic activities, mining in the Aravalli hills, road and railway construction, and tree cutting [10].

IV. THREATS TO VULTURES IN SOUTHERN RAJASTHAN

While diclofenac was the primary driver of the initial catastrophic decline, vultures in Southern Rajasthan continue to face a multitude of threats:

- Veterinary NSAIDs: Despite bans, illegal use and diversion of diclofenac and other vulture-toxic NSAIDs (like aceclofenac, ketoprofen, and nimesulide) persist, leading to continued poisoning [8].
- Habitat Loss and Degradation: Rapid urbanization, expansion of agricultural land, mining in the Aravalli hills, and infrastructure development (roads, railways, power lines) lead to the destruction and fragmentation of vital nesting and foraging habitats [11].
- Reduced Food Availability: Changes in livestock management practices, including the burial or proper disposal of carcasses due to disease concerns, have led to a significant reduction in the primary food source for vultures in open areas [12].
- Electrocution and Collision: Vultures are vulnerable to electrocution from high-voltage power lines and collisions with infrastructure like wind turbines [1].
- Human Disturbance: Disturbances at nesting sites due to human activities, including tourism, construction, and mining, can lead to nest abandonment and reduced breeding success [10].
- Prey Base Fluctuations: While less studied in Southern Rajasthan, a decline in the availability of wild ungulate carcasses can also impact vulture populations.
- Poisoning by Predators: In some areas, carcasses are intentionally poisoned by livestock owners to target rogue predators, inadvertently harming vultures.

V. CONSERVATION EFFORTS AND THEIR EFFECTIVENESS

Recognizing the dire situation, significant conservation efforts have been initiated at national and regional levels:

- Drug Bans and Monitoring: The ban on veterinary diclofenac in 2006 and later on multi-dose vials was a crucial step [13]. Continuous monitoring of drug availability and awareness campaigns for veterinarians and livestock owners is essential to ensure compliance.
- Vulture Conservation Breeding Centres: Ex-situ conservation through captive breeding programs has been established across India, with the aim of releasing birds back into the wild once the environment is free of diclofenac [14]. While Southern Rajasthan does not currently host a major breeding center, it benefits from national efforts.
- Vulture Safe Zones (VSZs): The concept of creating VSZs, areas free from vulture-toxic drugs, is being promoted. These zones involve intensive monitoring of drug use and promotion of safe alternatives like meloxicam. Jorbeer Conservation Reserve in Bikaner, while not in Southern Rajasthan, serves as an example of a crucial site for vulture conservation efforts, offering a safe haven and research opportunities [15].
- Community Involvement: Engaging local communities in conservation efforts is vital. The success story of Kekariya village in Bhilwara, Rajasthan, where community-led restoration of common lands led to the return of Indian Vultures, White-rumped Vultures, and Egyptian Vultures, demonstrates the power of local participation [16]. This includes awareness campaigns about the importance of vultures and the dangers of harmful drugs.
- Research and Monitoring: Ongoing research to monitor vulture populations, identify new threats, and assess the effectiveness of conservation interventions is crucial. Studies in Southern Rajasthan continue to provide valuable insights into breeding success rates and habitat utilization [10].

Despite these efforts, challenges remain. The continued illegal sale and use of banned NSAIDs, limited awareness among some rural communities, and the on-going pressures of habitat loss underscore the need for sustained and multi-faceted approaches. The "Action Plan for Vulture Conservation in India, 2020-2025" outlines key strategies, including preventing misuse of veterinary NSAIDs, promoting scientific carcass disposal, and expanding breeding programs [17].

VI. CONCLUSION AND RECOMMENDATIONS

The perilous plight of vultures in Southern Rajasthan mirrors the broader crisis across India. While the ban on diclofenac has slowed the rate of decline, the road to recovery is long and fraught with challenges. The ecological significance of vultures as natural sanitizers necessitates urgent and sustained conservation actions.

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Based on the current understanding, the following recommendations are crucial for the long-term survival of vultures in Southern Rajasthan:

- Strict Enforcement of NSAID Bans: Strengthen regulatory mechanisms and increase vigilance to prevent the illegal manufacture, sale, and diversion of diclofenac and other vulture-toxic NSAIDs for veterinary use. Regular pharmacy surveys are essential.
- Promotion of Vulture-Safe Drugs: Actively promote the use of meloxicam and other safe alternatives among veterinarians and livestock owners through awareness campaigns and incentives.
- Establishment and Management of Vulture Safe Zones: Identify potential Vulture Safe Zones in Southern Rajasthan, particularly around known roosting and nesting sites, and implement strict monitoring protocols to ensure a drug-free environment.
- Habitat Protection and Restoration: Protect existing nesting and roosting sites from anthropogenic disturbances, including mining, construction, and excessive human activity. Initiate habitat restoration efforts, including planting native tree species suitable for nesting and creating safe water sources.
- Scientific Carcass Management: Develop and implement guidelines for the scientific disposal of livestock carcasses, ensuring that vultures are not exposed to contaminated carrion. Explore the establishment of "vulture restaurants" in controlled environments where safe carcasses are provided.
- Community Engagement and Awareness: Launch extensive awareness campaigns targeting local communities, particularly livestock owners, veterinarians, and pharmacists, about the critical role of vultures and the dangers of harmful drugs. Emphasize the economic and health benefits of a thriving vulture population.
- Capacity Building: Train local forest department staff, NGOs, and volunteers in vulture monitoring techniques, rescue and rehabilitation of injured birds, and awareness generation.
- Further Research: Conduct more localized research to understand specific threats and population dynamics of different vulture species in Southern Rajasthan. This includes detailed studies on breeding success, foraging patterns, and the impact of localized disturbances.
- Integration with National Conservation Plans: Ensure that regional conservation efforts are well-integrated with the "Action Plan for Vulture Conservation in India," fostering synergy and maximizing impact.

By implementing these comprehensive strategies with strong governmental support, scientific backing, and active community participation, the majestic vultures of Southern Rajasthan can hopefully be pulled back from the brink of extinction, restoring their vital role in the region's ecological balance.

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