



Population Status and Habitat Preference of Vultures in Mudumalai Tiger Reserve, Tamil Nadu, Southern India

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Abstract

Vultures are nature's most successful scavengers, and they provide an array of ecological, economic and cultural services. There are nine species of vulture found in the Indian sub-continent, four of which are found in the Mudumalai Tiger Reserve viz. Egyptian Vulture *Neophron percnopterus*, Red-headed Vulture *Sarcogyps calvus*, White-rumped Vulture *Gyps bengalensis* and Long-billed Vulture *Gyps indicus*. During this study, a total of 120 (Mean SE 2.92± 0.96) individuals of four vulture species and two old nests were recorded, with the White-rumped Vulture *G. bengalensis* (n=98, 3.5±1.39) being the dominant species. Among the vegetation, Thorn Forest (n=75, 4.41±2.27) attracted the greatest number of vultures. Apparently, Mudumalai Tiger Reserve still provides a sufficient number of wild ungulates as food for vultures.

1. Introduction

Vultures are nature's most successful scavengers and provide an array of ecological, economic and cultural services (Moleon *et al.* 2014). Nine species of vulture are found in the Indian sub-continent (Ali & Ripley 1987), five of which are found in southern India viz. Egyptian Vulture *Neophron percnopterus*, Red-headed Vulture *Sarcogyps calvus*, White-rumped Vulture *Gyps bengalensis*, Long-billed Vulture *Gyps indicus* and Cinereous Vulture *Aegypius monachus* (Davidar 2007; Davidar & Davidar 2002; Ramakrishnan *et al.* 2010, 2012 & 2014; Samson *et al.* 2014, 2015; Sashikumar 2001; Shivanan d 2004; Subramanya & Naveen 2006).

The sudden decline of vultures in the Indian subcontinent in the last decade was attributed to disease, poisoning and reduction in food availability, although Diclofenac is now widely

regarded as the principal cause in India (Green *et al.* 2004 & 2007; Prakash *et al.* 2003; Shultz *et al.* 2004; Ramakrishnan *et al.* 2010; Swan *et al.* 2006). In view of the sharp decline, three species of *Gyps* vulture, namely Long-billed Vulture, White-rumped Vulture and Slender-billed Vulture *G. tenuirostris*, are now considered to be Critically Endangered (BirdLife International 2000). The Indian Government has also listed these three species in 'Schedule-I', and they are protected by the Indian Wildlife (Protection) Act, 1972. The populations of Egyptian Vulture and Red-headed Vulture have also declined rapidly (Cuthbert *et al.* 2006). The status of the Red-headed Vulture has deteriorated from Near Threatened (Birdlife International 2004) to Critically Endangered (BirdLife International 2007a), and that of the Egyptian Vulture has changed from Least Concern to Endangered (BirdLife International 2007b). Apart from their own threatened status, vultures are ecologically

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important in human-dominated areas as scavengers at primitive slaughterhouses and carcass dumps (Satheesan 1989; Mundy *et al.* 1992), and in natural areas as scavengers on animal carcasses of large mammals killed by carnivores (Houston 1974; Hunter *et al.* 2007; Majumder *et al.* 2009).

The present study aimed to assess the population status and habitat preference of vulture species in the Mudumalai Tiger Reserve, Southern India.

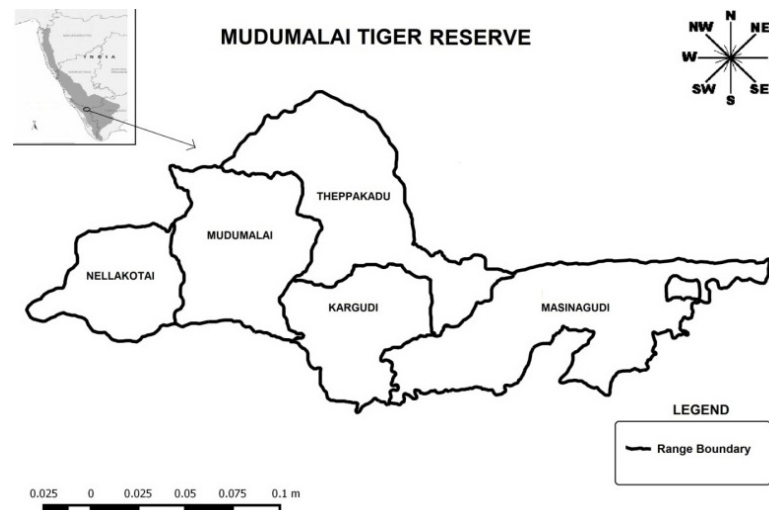


Fig. 1. Mudumalai Tiger Reserve with the range boundaries.

2. Materials and Methods

2.1. Study Area

Mudumalai Tiger Reserve (MTR) (11°32'–11°43'N, 76°22'–76°45'E) lies on the northern flank of the Nilgiri Mountain Range in the Western Ghats and is contiguous with Wayanad Wildlife Sanctuary (WWS) in the west, Bandipur Tiger Reserve (BTR) in the north and Nilgiri North Forest Division (NNFD) in the south. The MTR also forms part of the Nilgiri Biosphere Reserve (NBR). The area is renowned for its rich ecological diversity of flora and fauna. The total area of the MTR is 588.59 km² (core area 321 km²). According to Champion & Seth (1968), the vegetation types in Mudumalai are classified into Southern Tropical Dry Thorn Forest, Southern Tropical Dry Deciduous Forest, Southern Tropical Moist Deciduous Forest, Southern Tropical Semi Evergreen forest, Moist Bamboo Brakes and Riparian Forest.

2.2. Methodology

In Mudumalai Tiger Reserve, vultures were counted on road transects; tarred roads and metal roads are maintained by the Tamil Nadu Forest Department to provide easy access to the villages in the protected areas of MTR. Five major types of habitat were chosen, namely Thorn Forest (TF), Dry Deciduous Forest (DDF), Moist Deciduous Forest (MDF), Riverine Forest (RF), and Semi-evergreen

Forest (SF). Road transects were selected according to these habitat types. A total of 27 km of road transect were sampled on 10 occasions (n=270 km). The transects were driven between 08:00 and 17:00 local time at 20–30 km/h on 10 occasions from January to June in 2015. We also walked on elephant footpaths and alongside streams and rivers to search for vulture nests. When spotting vultures, the number of individuals, the activity of the birds and the major vegetation type in the surrounding area were noted. The geo-coordinates were recorded using a GPS handset for all vulture sightings during the survey period. These geo-coordinates were subsequently used for the preparation of maps using Quantum GIS Wien 2.8.2.

3. Results

A total of 120 individual vultures were recorded in Mudumalai Tiger Reserve in 41 sightings (Mean SE 2.92± 0.96), comprising four species *viz.* White-rumped (n=98, 3.5±1.39), Red-headed (n=14, 2.33±0.80), Egyptian (n=6, 1.25±0.25) and Long billed (n=2, 1±0) (Table 1). The maximum and minimum group size of each vulture species were as follows: White-rumped Vulture (max. 40, min. 1), Red-headed Vulture (max. 6, min. 1), Egyptian Vulture and Long-billed Vulture (max. 1, min.1). Two old and abandoned nesting areas were also identified.

Table 1. Counts of the four vulture species in MTR.

Vulture species	Total number of sightings	Total number of individuals sighted	Mean /SE
White-rumped Vulture <i>Gyps bengalensis</i>	28	98	3.5±1.39
Long-billed Vulture <i>Gyps indicus</i>	2	2	1±0
Red-headed Vulture <i>Sarcogyps calvus</i>	6	14	2.33±0.80
Egyptian Vulture <i>Neophron percnopterus</i>	5	6	1.25±0.25
Total	41	120	2.92±0.96

Table 2. Occurrence of the four vulture species in different vegetation types in MTR

Vegetation type	Total number of sightings	Total number of individuals sighted	Mean / SE
Thorn Forest	17	75	4.41±2.27
Dry Deciduous Forest	14	21	1.5±0.20
Moist Deciduous Forest	4	12	3±1.08
Riverine Forest	6	12	2±0.82
Semi-evergreen Forest	0	0	0
Total	41	120	

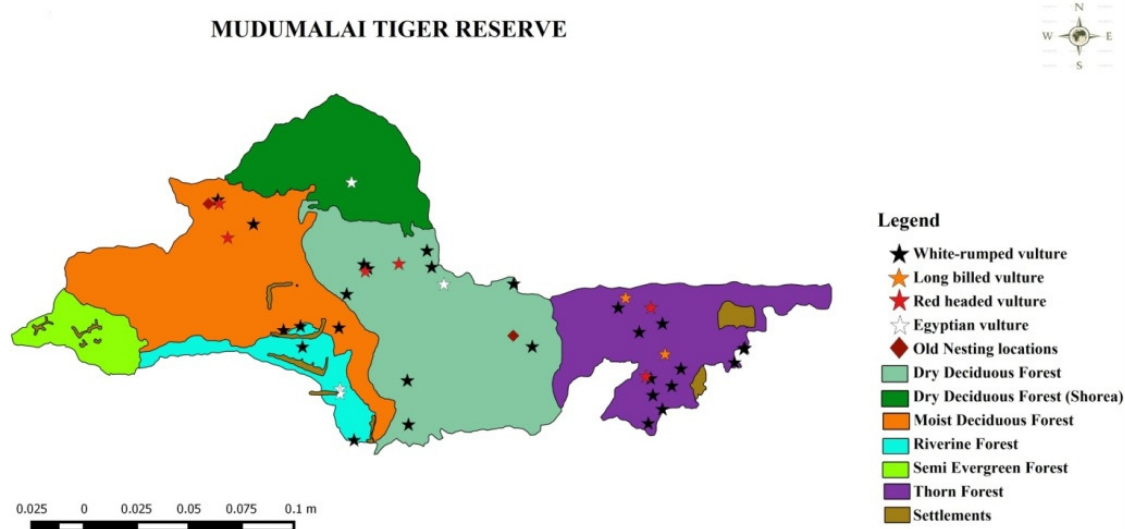


Fig. 2. Vulture sightings within different vegetation structures in Mudumalai Tiger Reserve.

As regards the occurrence of vultures within different vegetation structures in MTR, most vulture sightings were recorded in Thorn Forest (n=75 4.41±2.27), followed by Dry Deciduous Forest (n=21 1.5±0.20), Moist Deciduous Forest (n=12 3±1.08) and Riverine Forest (n=12 2±0.82) (Table 2). The maximum and minimum group sizes of vultures recorded in the different vegetation types were as follows: Thorn Forest (max. 40, min. 1), Moist Deciduous Forest and Riverine Forest (max. 6, min. 1), and Dry Deciduous Forest (max. 3, min. 1).



Fig. 3. White-rumped Vultures roosting on a dead tree in MTR.

4. Discussion

The distribution of vultures in MTR was scattered and it seems that the reserve was mostly used as a foraging site. Two old nesting areas were identified, but neither of these was currently being used by vultures. However, a few fresh nesting areas of vultures have been identified in areas adjoining MTR (Ramakrishnan *et al.* 2014; Samson *et al.* 2014). Earlier studies found only three species of vulture in MTR (Ramesh *et al.* 2011), but the Egyptian Vulture was also recorded in the present study. A similar study in Panna Tiger Reserve, Central India (Gurjar & Gawande 2011), found four species of vulture. These included the Himalayan Vulture *Gyps himalayensis*, but not the White-rumped Vulture.

A total of 14 individuals of the Red-headed Vulture were recorded during the present study. Six individuals were recorded in a single sighting, two individuals in three sightings and a single individual in two sightings. A similar finding was observed in the Sigur Plateau, an area adjoining MTR. Six Red headed Vultures were recorded at the carcass of a Spotted Deer killed by a tiger (Ramakrishnan *et al.* 2012). These observations suggest relationship between this predator and its prey in MTR. Red-headed Vultures are fresh carcass feeders in nature and the predator's presence indicates existence of their prey (Naoroji 2006; Chhangani 2007; Ramakrishnan *et al.* 2012).

Vultures were observed in all type of vegetation, but particularly Thorny Forest which attracted more vultures than other vegetation types (MDF, DDF, SF and RF). Vultures are aerial scavengers and will spot carcasses with their acute eyesight. Thus vegetation structure has an important influence on the vultures' ability to find carcasses. Brown (1985) established two hypotheses concerning vegetation structure and carcass finding by vulture species. In the first hypothesis, the increased vegetation density caused by bush encroachment decreases the likelihood of vultures locating a carcass, as they rely almost entirely on eyesight when foraging. In the second hypothesis, vultures, which are heavy birds adapted for soaring and unsuited for flapping flight in confined spaces, will not land at carcasses they have located if they do not

have sufficient space in which to take off again. This hypothesis was supported by Schultz (2007), who showed that Cape Vultures *Gyps coprotheres* in the Waterberg region of Namibia were unable to locate carcasses when the vegetation density was greater than 2,600 trees per ha. Land-use patterns influence raptor diversity and density (Herremans & Herremans-Tonnoeyr 2000). However, vultures have the highest density at the interface between protected and non-protected areas (Herremans & Herremans-Tonnoeyr 2000). In the present study also, vultures were seen most frequently on the periphery of the sanctuary near human settlements (Fig. 2). According to Prakash *et al.* (2007), although thousands of vultures may remain in India, they are now spread very thinly across a huge area. This is a dangerous situation for such social birds, which build nests and roost communally and rely on information gained from one another when searching for widely dispersed food sources.

Conclusion

The present study shows that the vegetation types in Mudumalai Tiger Reserve provide a good foraging area for vultures. Removal of invasive alien species such as *Lantana camara* and *Eupatorium spp.* is urgently warranted to ensure that carcass finding is facilitated in forested areas, especially dry deciduous forest. It is recommended that regular monitoring of vultures in the study area to assess habitat utilization is crucial for the preparation of a management plan to conserve the vultures in the reserve. The largest numbers of vultures were observed near the human settlements in the reserve where there is a serious threat from the use of Diclofenac. The use of Diclofenac in the villages around the reserve should be monitored as it has caused large-scale mortality in vultures in other regions of the country. The use of Diclofenac has already caused a 97% decline in *Gyps* vulture populations in India, and now, when the vultures are so few in number, even if only 10–15 vultures are killed by deliberate poisoning of carcasses or transmission lines, this could have a great impact on the population. Therefore, there is an urgent need to raise awareness among the local people living in areas surrounding vulture habitat.

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