
Population Status and Seasonal Distribution of Vultures in Mudumalai Tiger Reserve, Tamil Nadu, India.

S. Manigandan¹, P. Kannan¹, H. Byju², S. Bharathidasan³ & B. Ramakrishnan^{1*}

¹(Department of Zoology and Wildlife Biology, Government Arts College, Udthagamandalm, The Nilgiris, Tamil Nadu, India).

²(Independent Researcher, No. 35, Rakatchi Garden, Ganapathy P.O., Coimbatore, Tamil Nadu, India).

³(Arulagam, Ellappalayam (PO), Coimbatore, Tamil Nadu, India). (Corresponding author: Email – ramkiwildlife@gmail.com)

To Cite this Article

S. Manigandan, P. Kannan, H. Byju, S. Bharathidasan & B. Ramakrishnan* "Population Status and Seasonal Distribution of Vultures in Mudumalai Tiger Reserve, Tamil Nadu, India", *Journal of Science and Technology*, Vol. 06, Issue 04, July-August 2021, pp01-08

Article Info

Received: 11-06-2021

Revised: 25-06-2021

Accepted: 30-07-2021

Published: 14-07-2021

Abstract

The present study on the status of vultures in Mudumalai Tiger Reserve (MTR), Tamil Nadu has carried out by Road Transect Method from January to October 2018. A total of 1220 kilometers were covered through five road transects with varying distances. In total, 1602 vulture individuals (Mean & SE 80.01 ± 3.01) were sighted belonging to four species. Of which, the Critically endangered White-rumped Vulture *Gyps bengalensis* (n=1405, 70.25 ± 2.75) was the dominant species, followed by Long-billed Vulture *Gyps indicus*, Red-headed Vulture *Sarcogyps calvus*, and Egyptian Vulture *Neophron percnopterus*. Among the seasons, more vulture individuals were encountered during the summer count (Anova $C^2=6.92$, $df=2$, $p=0.037$) in the study area.

Keywords: Mudumalai Tiger Reserve, Vulture Population, Road Transect Method

1. Introduction

Indian Subcontinent is home to a wide range of flora and fauna owing it is to a varied range of climatic, topographic, and vegetation structures. Out of 1224 bird species recorded from the subcontinent, 79 are threatened and 8 are reported as critical and in instant danger of extinction. Among the threatened birds, vultures, especially *Gyps* species facing drastic population collapse in the country (Prakash, et al 2001). *Gyps* vultures in the Indian subcontinent and Southeast Asia have declined catastrophically during the last few decades and the current populations of various vulture species are estimated to be less than 5% of the original. Vultures play a vital role in environmental health by scavenging meat from carcasses. Being a scavenger in habit vultures averts the spread of dangerous diseases such as anthrax and rabies (Prakash *et al.*, 2003), which could cause havoc to wild animals, livestock, and human. Therefore, vultures play an imperative role in the terrestrial ecosystem as a scavenger. In Southern India, there are four resident species namely, White-rumped (*Gyps bengalensis*), Long-billed (*Gyps indicus*), Redheaded (*Sarcogyps calvus*), Egyptian (*Neophron percnopterus*), and three migrants namely, Himalayan Griffon (*Gyps himalayensis*), Eurasian Griffon (*Gyps fulvus*), and Cinereous vultures

(*Aegyptusmonachus*) were recorded. The Tamil Nadu part of the Nilgiri Biosphere Reserve (5540 sq. km), has been reported six species of vultures (Ramakrishnan et al.2010, 2014; Venkitachalam and Senthilnathan, 2016; Samson et al. 2019). They are mainly dependent on wild carcasses (90%) as their diet (Ramakrishnan et al. 2010). The Indian Government has also listed these four species White-rumped (*Gyps bengalensis*), Long-billed (*Gyps indicus*), Slender-billed (*Gyps tenuirostris*), and Red-headed (*Sarcogyps calvus*) in 'Schedule-I', and they are protected by the Indian Wildlife (Protection) Act, 1972. The status of the Red-headed Vulture has deteriorated from Near Threatened (Birdlife International 2001) to Critically Endangered. Vultures have also declined in many parts of their former distribution ranges owing to food shortages and loss of habitat (Painetal, 2003). The present study aimed to assess the present population status of vulture species in the Mudumalai Tiger Reserve, Southern India.

2. Materials and Methods

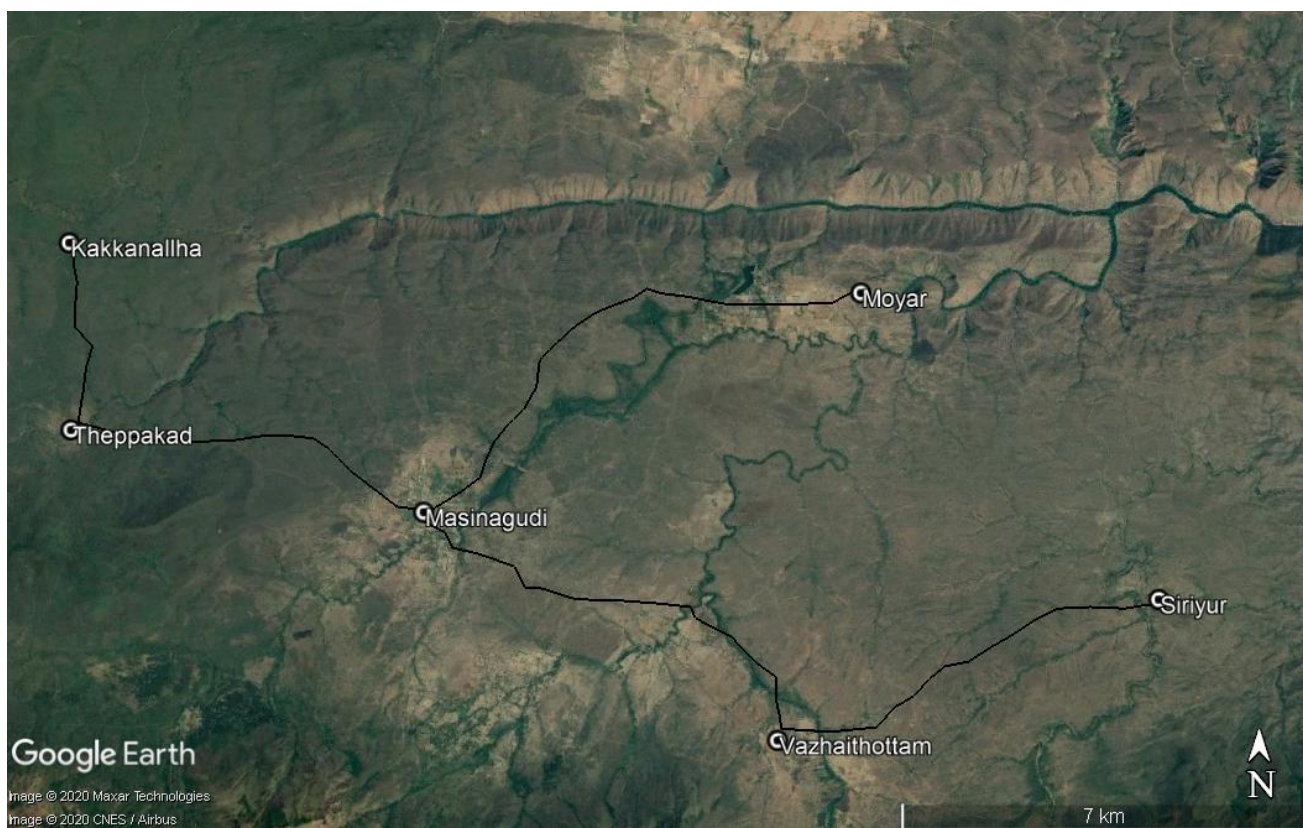
2.1. Study Area

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 Buffer zone of MTR 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 alone 321 km²). According to Champion & Seth (1968), the vegetation types in MTR 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. Road transect method

Opportunistic sightings of vultures were recorded between January to October 2018 in (MTR). The tarred roads and metal roads are selected as transects for the vulture survey (Map 1). A total of 1220 km was surveyed in the length of 61 km of road transects by 20 replications during the study period. The road transects were driven by a four-wheel vehicle between 08:00 and 17:00 local time at 20-30 km/h on each visit. On each vulture(s) sighting, the size of the flock, and the activity of the birds were recorded (Image 1-4). The observation was done with the help of a binocular (8*42). The geo-coordinates were recorded using a GPS and the same geo-coordinates were used for the preparation of maps using Arc GIS on Google Earth. The encounter rate of all vultures-sightings was categorized into different seasons viz. Monsoon (August-October), Post Monsoon (January - March), and Summer (April- July) and the same were analyzed statistically using Kruskal-Wallis and Anova.

Map 1. Road Transect Lines selected for vulture survey in the Mudumalai Tiger Reserve



- Transect Line 1- Sيريور to Vazhathottam(26 Km)
- Transect Line 2- Vazhathottam to Masinagudi (10 Km)
- Transect Line 3 – Masinagudi to Moyer(10 Km)
- Transect Line 4- Masinagudi to Theppakad (10 Km)
- Transect Line 5- Theppakad to Kakkanallha (5 Km)

RESULTS

Table 1. Population status of vultures in the MTR

Month	Number of visits (once in Fortnight)	The total number of vultures sighted.				Total
		White-rumped	Long-billed	Red-headed	Egyptian	
January	1 half	66	8	1	-	75
	2 half	58	5	2	-	65
February	1 half	66	8	1	-	75
	2 half	40	5	2	-	47
March	1 half	55	7	4	-	66
	2 half	56	3	4	-	63
April	1 half	66	5	4	-	75
	2 half	58	6	4	1	69

May	1 half	71	5	3	1	80
	2 half	65	3	5	1	74
June	1 half	84	7	2	-	93
	2 half	78	8	5	-	91
July	1 half	77	8	4	-	89
	2 half	73	5	7	-	85
August	1 half	85	7	6	-	98
	2 half	80	4	5	-	89
September	1 half	81	7	7	1	96
	2 half	89	3	2	1	95
October	1 half	80	5	2	1	89
	2 half	77	7	4	-	88
Total		1405	116	74	6	1602
ER		1.15	0.09	0.06	0.004	1.31
Means, Standard error		70.25±2.75	5.8±0.38	3.7±0.40	1±0	80.01±3.01

A total of 1602 (M±SE 80.01±3.01) individuals belonged to all four species of vultures were recorded in the 1220 Km road transect survey with an encounter rate of 1.31 individuals/Km in the MTR between January and October 2018. Among the four species White-rumped vultures were recorded maximum in numbers (n=1405; 70.25±2.75) with an encounter rate of 1.15 individuals/Km followed by Long-billed vulture (n=116; 5.8±0.38 ER= 0.09), and Red-headed Vulture (n=74; 3.7±0.4 ER=0.06). The Egyptian vulture count recorded the lowest throughout the survey (n=4; 1±0 ER=0.004) (Table 1).

Table 2. Season wise population status (Encounter Rate) of vultures in MTR

Parameter	Season	White-backed vulture		Long-billed vulture		Redheaded vulture		Egyptian Vulture	
		Mean	SE	Mean	SE	Mean	SE	Mean	SE
Encounter Rate(/km)	Monsoon (August, September & October)	1.16	0.034	0.08	0.002	0.06	0.008	0.01	0
	Post-Monsoon (January, February & March)	0.92	0.044	0.86	0.003	0.03	0.013	-	-
	Summer (April, May, June & July)	1.33	0.067	0.09	0.012	0.06	0.014	0.01	0

	Kruskal-Wallis Anova	C ² =6.92,df=2, p=0.037	C ² =5.42,df=2, p=0.049	C ² =2.96,df=2, p=0.21	Nil
--	-----------------------------	---------------------------------------	---------------------------------------	--------------------------------------	-----

The Encounter Rate (ER) results showed remarkable variations in vulture numbers between seasons in MTR. The ER of White-rumped Vulture was higher in Summer (1.33±0.067) followed by Monsoon (1.16 ±0.034) and Post Monsoon (0.92±0.044) season. On the contrary, the long-billed vulture's ER (0.09 ±0.012) was lowest during the Summer and Monsoon seasons (0.08±0.002) when compared to Post Monsoon (0.86±0.003) seasons. Redheaded vulture's ER was higher in Summer (0.06±0.014) and Monsoon (0.06±0.008) than Post Monsoon (0.03±0.013) season and the ER of Egyptian Vulture was unable to estimate for due to insufficient sightings for analysis.

The flock size of the three dominant vulture species was significantly higher in the Sigur plateau of MTR. Though there is a variation in the mean encounter rate of White-rumped Vulture compared to the other two species, it was statistically significant (C²=6.92,df=2, p>0.037). Although the flock size of the long-billed vulture was very low, the mean encounter rate (C²=5.42,df=2,p>0.049) was significant. On the contrary, the encounter rate of the Red-headed vulture (C²=2.96,df=2,p>0.21) was not significant statistically (Table 2).

Discussion

The distribution of vultures in Mudumalai Tiger Reserve was sprinkled and it appears that the MTR is being used as a foraging and nesting site of vultures. Ramakrishnan et al., (2010) and Samson et al (2014) identified the nesting habitat of a White-rumped vulture. The present study recorded that there was a fluctuation in all vulture species numbers concerning seasons. Earlier studies by Venkitachalam and Senthilnathan(2016) in the Nilgiris north forest Division (Part of the present buffer zone of MTR), it was recorded that the white-rumped vulture population was highest (0.92 +_0.17) in the post-monsoon period. In the present study, the ER of White-rumped Vulture was higher in Summer (1.33±0.067). Similarly, the Indian Vulture sightings were relatively higher during the monsoon period when compared to post-monsoon and summer (Venkitachalam and Senthilnathan (2016). In the present study, the long-billed vulture's ER(0.09 ± 0.012) was highest during the Summer period when compared to Monsoon and post-monsoon (0.09±0.012) seasons. So this shows that there is a clear seasonal variation of the White-rumped Vulture population along with the ER. The dominant species observed were white-rumped vulture, followed by long-billed vulture and Red-headed vulture. The same trend was recorded by the earlier studies (Venkitachalam and Senthilnathan (2016). However, vultures have the highest density at the interface between protected and non-protected areas (Herremans&Herremans-Tonnoeyr 2000) the present study corroborates with the above study because of the frequency of vulture sightings was on the periphery of the tiger reserve near human settlements.

The present study found that there was a seasonal variation among the vulture numbers as well as an encounter rate of four species. The White-rumped Vulture encounter rate was higher during the Summer (1.33±0.034) and monsoon(1.16 ±0.067) period. The long-billed vulture encounter rate (0.86 ±0.003) was highest during the post-monsoon period. The red-headed vulture encounter rate was higher in Summer (0.06±0.014) and

Monsoon (0.06 ± 0.008) and very few sightings of the Egyptian vulture in monsoon and summer seasons. During the monsoon season, the foraging time is limited due to uncertain thermal production and relatively low temperature. Meanwhile, during summer the extended daylight hours available and continuous thermal lift formation helps the vultures to forage. In the summer season, foraging of the vulture population was seen in high numbers. In general, the summer season happens to be after the breeding, (Venkitachalam and Senthilnathan 2016; Sashikumar, and C. Vishnudas 2018; Rajkumar 2018; Samson and Ramakrishnan 2020). Hence the maximum number of vulture individuals sightings recorded can be related to the search for food for the newly hatched chicks.

In this study, 74 Redheaded Vulture individuals were recorded. Seven individuals of Red-headed vulture were recorded in a single sighting. Ramakrishnan et al., (2012) recorded six individuals in a single sighting from the MTR at the carcass of an Indian Guar killed by a tiger. These observations suggested a strong relationship between a predator and its prey in MTR. Redheaded vultures are fresh carcass feeders in nature and the predator's presence indicates the existence of their prey (Naoroji 2006; Chhangani 2007; Ramakrishnan *et al.* 2012 & Samson et al. 2016) According to Prakash *et al.* (2007), although thousands of vultures may live in India, they are now extending very sparsely across a vast area. This is a very difficult state of affairs for such social birds, which do communal nesting construction and roosting and rely on information to expand from one another when searching for extensively dispersed food sources. The food supply available to any large scavenging animal came largely from the carcasses of ungulates and these were widely dispersed earlier. The present study envisaged that the numbers of vultures are slowly picking up in numbers mainly because of food availability as the contiguous tract of vulture habitats in the Nilgiri Biosphere Reserve that has been declared as "Tiger Reserves", and thus ensured large ungulates' carcass food availability. The present study highlights the need for continuous monitoring of the vulture population in MTR for long-term conservation efforts.

Acknowledgments

We thank the Tamil Nadu Forest Department for providing us the necessary permission to conduct the field study and also the staff of MTR who accompanied us during the field study.

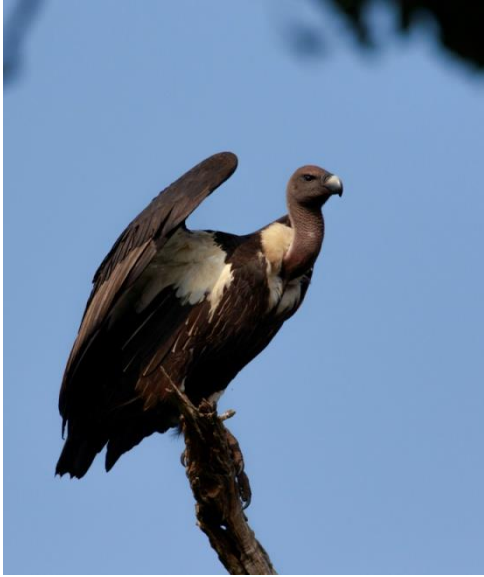


Image 1 White- Rumped Vulture



Image 2 Long billed Vulture



Image 3 Red headed Vulture



Image 4 Roosting of Vultures

References.

- 1) BirdLife International ., *Threatened Birds of Asia: The BirdLife International Red Data Book*. Birdlife International, Cambridge, U.K, (2001), 30-38pp.
- 2) Chhangani, A .K., Sightings and nesting sites of Red-headed Vulture *Sarcogyps calvus* in Rajasthan, India. *Indian Birds* 3(6): (2007) , 218–221.
- 3) Herremans M , Herremans-Tonnoeyr D., Land use and the conservation status of raptors in Botswana. *Biological Conservation*, 94: (2000) 31–41.
- 4) Naoroji R., *Birds of Prey of the Indian subcontinent*. Om book international. (2006), 220-288.
- 5) Pain DJ., Cunningham AA, Donald FP., Duckworth WJ., Haoston CD., Katzner T., Parry J., Poole C., Prakesh V., .Round P & R.Timmins.Causeandeffectsof temporospatialdeclinesof *Gyps* vultures in Asia. *Conservation Biology* 17(3) (2003) 661-671.
- 6) Prakash V., Status and distribution of vultures in India with special reference to the population crash in *GYP*S species (2001), Pp: 4-6
- 7) Prakash, V., Pain DJ., Cunningham AA., Donald PF., Prakash N, Verma A., Gargi R., Sivakumar S. & AR Rahmani ., The catastrophic collapse of Indian White-backed *Gyps bengalensis* and Long-billed *Gyps indicus* Vulture populations. *Biological Conservation*, (2003) 109: 381–390.
- 8) Prakash V., RE .Green, DJ Pain, SP. Ranade., Saravanan S., Prakash N., Venkitachalam, R., Rahmani AR & A.A.Cunningham., Recent changes in populations of resident gyps vultures in India. *Journal of the Bombay Natural History Society*, 104(2) (2007). 129–135.
- 9) Ramakrishnan B., Kannan P., Samson A., Ramkumar K., & S. Ramasubramaniyan ., Nesting of White-rumped vulture (*Gyps bengalensis*) in the Segur Plateau of The Nilgiri North Forest Division. *Indian Forester*, 140(10) (2014) 1014–1018.
- 10) Ramakrishnan B., Ramasubramanian S., & A. Samson ., The occurrence of Red-headed vulture in Segur plateau, Tamil Nadu. *Current Science*, 102(6) (2012) 832.
- 11) Ramakrishnan B., Ramasubramanian S., Saravanan M., & C. Arivazhagan ., Is Diclofenac the only culprit for the declining population of *Gyps* Vultures in the Moyar Valley. *Current Science*, 99(12) (2010) 1645–1646.
- 12) Samson A., Ramakrishnan B., Renuka S., & S. Ramasubramanian ., An emerging threat for the Egyptian vulture population in Chamundi Hill Reserve Forest, Mysore, and Karnataka. *Newsletter for Birdwatchers*, 50 (2014) 16–17.
- 13) Samson A., Ramakrishnan B., Veeramani A., & P Ravi ., Population Status and Habitat Preference of Vultures in Mudumalai Tiger Reserve, Tamil Nadu, Southern India. *Podoces*, (2016) 11(1): 7–12
- 14) Sashikumar C & CK Vishnudas ., Status of vultures in Kerala, Securing Vulture Population in Southern India (SVPSI) (2018). 40-43
- 15) Rajkumar D., Status Of Vultures In Bandipur Tiger Reserve Securing Vulture Population in Southern India (SVPSI) (2018) 63-68
- 16) Samson A., Ramakrishnan B., Selvan V., & S. Manigandan ., Cinereous Vulture *Aegypius monachus* in Mudumalai Tiger Reserve, Western Ghats, and it's status in southern India. *Indian Birds.*, 15 (2019) 93-94.
- 17) Samson A., & B. Ramakrishnan ., The Critically Endangered White-rumped Vulture *Gyps bengalensis* in Sigur Plateau, Western Ghats, India: Population, breeding ecology, and threats, 26 September 2020 | Vol. 12 | No. 13 | Pages: 16752–16763.
- 18) Venkitachalam R., & S. Senthilnathan., Status and population of vultures in Moyar Valley, southern India. *Journal of Threatened Taxa.*, 8: (2016) 8358-8364.
