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Demography, Nesting and Breeding Success of Red Headed Vulture (*Sarcogyps Calvus*) In Thar Desert of Rajasthan, India

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ABSTRACT:

Great Indian Thar desert have favorites habitat for vultures. Red headed Vulture is a solitary vulture mainly feeding on the carcasses of a variety of animal. Repetitive surveys were taken in to accomplish the objective to know the population and breeding habits of the vulture species in Thar Desert of Rajasthan. With its striking, simple, red head and jet-black body, the red-headed vulture is distinctive among vulture species. Present study suggests marked increase in population of red headed vulture in study area. During the present investigation, nests were seen mostly on the canopy of *Prosopis cineraria* (Khejri) trees. The breeding success is evaluated 75%, thus there is positive hope for increase in the population of this critically endangered species, although continuous conservation efforts are demanded.

KEYWORDS: Red headed Vulture, Thar Desert, Nesting.

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INTRODUCTION:

Since 1990's various research reports suggest that the vulture population showing a drastic declination in India^{1,2,3,4,5}. Red headed vultures are highly sensitive to the environmental fluctuations⁶. Reports indicate that it was widespread and generally abundant throughout Indian Subcontinent, but it has undergone an immense population and range decline in recent decades^{7,8,9}. Recent reports indicates that in India the species started undergoing a sharp decline (41% per year) in about 1999, and declined by 91% between the early 1990s and 2003^{10,11}. The IUCN Red list has listed this animal in "Critically endangered" category¹². Red-headed Vultures are very distinct with their remarkable red head and jet black body; also white thigh-patches and ruff. They have unique lappets on red head¹³. There is no morphological difference in males and females¹⁴ except that males have white iris while females have dark brown. They are 76-86 cm medium sized vultures but possess an impressive wingspan of over 2 m and juveniles having dark eyes and more mottled dark brown plumage¹². It can be seen open country usually away from human habitation such as barren field, semi-arid and arid deserts, deciduous forest, foothills and river valley, grasslands usually below 2,500 m¹⁵. Nesting has been recorded in tall trees like *Prosopis cineraria*, *Acacia nilotica*, *Acacia tortalis*, *Anogeissus pendula*, *Prosopis juliflora*, *Tecomella undulata* and *Azadirachta indica*. It occurs at lesser density than Gyps vultures mainly due to its territorial behaviour¹⁴. On comparing to other vulture species at feeding sites, red headed vultures are relatively timid and solitary bird and often found in breeding pairs¹¹. Besides Thar desert of Rajasthan is hub of four resident vulture species as Red-headed Vulture (*Sarcogyps calvus*), Long-billed Vulture (*Gyps indicus*), White-rumped Vulture (*Gyps bengalensis*), and Egyptian Vulture (*Neophron percnopterus*) and Three migratory species namely Cinereous Vulture (*Aegyptius monachus*), Eurasian Griffon (*Gyps fulvus*), Himalayan Griffon (*Gyps himalayensis*),^{16, 17,18,19, 20}. The Goal of this study to find out the information about the demography and nesting biology of Red headed vulture in Thar Desert of Rajasthan, India.

MATERIAL AND METHODS:

Thar Desert of Rajasthan covers 12 district of Rajasthan namely Barmer, Bikaner, Churu, Ganganagar, Hanumangarh, Jaisalmer, Jhunjhunun, Jodhpur, Jalor, Nagaur, Pali and Sikar. Geographic extent is 24°37' to 30°10'48" north latitude and 69°29' to 76°05'33" east longitude. During present investigation Red headed vultures were located in four district of Thar Desert namely Barmer, Jaisalmer, Bikaner and Jodhpur (Map 1). The study area consists mainly of semi-arid and arid desert topography with dry condition. The climate is characterized by low rainfall with unpredictable distribution, extremes of daily and annual temperatures, low humidity and high wind velocity. In study area the maximum daily temperatures varies between 40°C to 45°C in summer

months. Occasionally, it rises to 49°C. The minimum temperatures may fall close to 0°C in the night at some places of Barmer and Jaisalmer during winter months.

Map 1: Red headed vulture reporting site study area in Rajasthan state.



The count of birds was conducted for two years in different seasons from November 2016 to April 2018. Repetitive surveys were carried out in the nesting and breeding season (March to June) and rest of the year were surveyed seasonally in each district. Any structure made or the place used by vulture for laying their eggs and sheltering their young regardless of whether eggs are laid in the nest in a given year or in any year were designated as nest. Each nest was also monitored periodically to find out the breeding success.

Nests were categorized as 'occupied' if no eggs were laid but there was evidence of some nest building activity and 'active' which had eggs. The nest from which a chick fledged is termed as productive nest^{21, 22}. The breeding success was calculated in percentage using following formula

$$\text{Breeding success} = \frac{\text{Productive nest}}{\text{Active nest}} \times 100.$$

During present investigation, Olympus 8-16 X 40 binoculars and Canon 70D SLR with 100 - 400mm lenses, digital hygrometer and a hand held GPS Montana-680 Garmin unit were used to record and identify species and age class. Careful observation of potential vulture nesting habitat

were made. Nesting vulture was thoroughly searched for by scanning potential cliffs and nesting trees in open areas.

RESULTS:

Population Estimates:

Population census was performed for the period of November 2016 to April 2018 in study area to assess the population of red headed vultures. Red headed vulture relies on carrion of domestic livestock, thus majority of observations were made during the feeding on carcasses of domestic livestock's. During present investigation total ± 204 individuals of red headed vultures were recorded in four districts of Rajasthan.

Nest Type:

Structure built by birds for protecting and raising their off-springs are termed as nests. During the breeding season (December to March), each vulture pair builds a nest at the top of a large tree or, in open areas where large trees are absent, on the top of a bush. The large, flat nest is constructed from sticks and lined, towards the centre, with leaves and dry grass. A single egg is laid, with both parents sharing the incubation duties. After ± 45 days the chick hatches. We recorded 88 Red headed vulture nests in different districts, and those were monitored periodically to determine breeding success (Table 1). Out of 88 nests, 51 were not having egg or chick and were designated as occupied. Thirty seven nests were having egg and designated as active nest out of which in twenty eight chick fledged were termed as productive nest (Graph 2).

Image 1: a. Red headed vulture, b and c. Red headed vulture at nesting sites, d and e. Nest of Red headed vulture at the top of Khejri tree, f. Nest with egg on a Keekar tree.



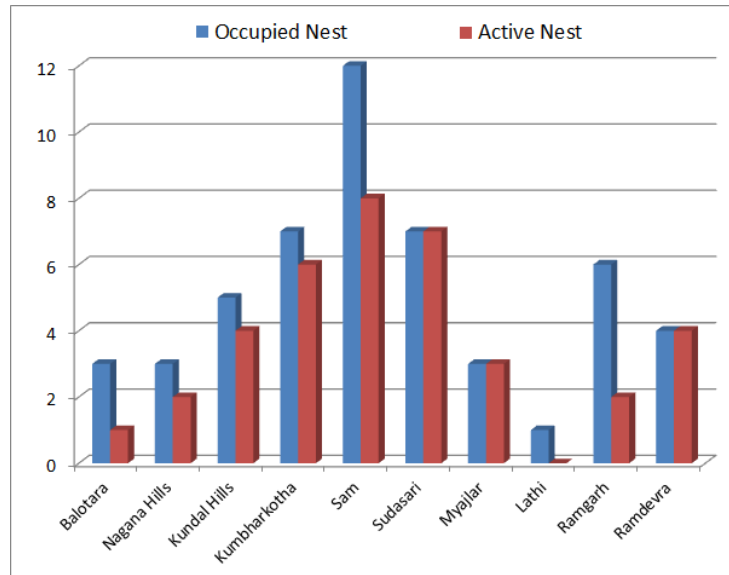
Maximum occupied nest were seen in Sam area followed by Kumbharkotha and Sudasari. Same region also have high number active nest as well as productive nest (Image 1). Almost 100 percentage productive nests were observed in Sam, Kumbharkotha, Sudasari and Nagana Hills. Conversion of active to productive nest is least in Ramgarh and Ramdevra region. Overall, 75% nest

having egg successfully hatched into chicks. Thus, conversion of active nest to productive next is satisfactory (Table 1, Graph 1).

Table 1: Status of Vultures in different sites of Study area

S.R.	Location of Nest	Occupied Nest	Active Nest	Productive Nest
1.	Balotara	3	1	0
2.	Nagana Hills	3	2	2
3.	Kundal Hills	5	4	2
4.	Kumbharkotha	7	6	6
5.	Sam	12	8	8
6.	Sudasari	7	7	7
7.	Myajlar	3	3	1
8.	Lathi	1	0	0
9.	Ramgarh	6	2	1
10.	Ramdevra	4	4	1
Total		51	37	28

Graph 1: Status of occupied and active nest of red headed vulture at different study sites.



Breeding Success:

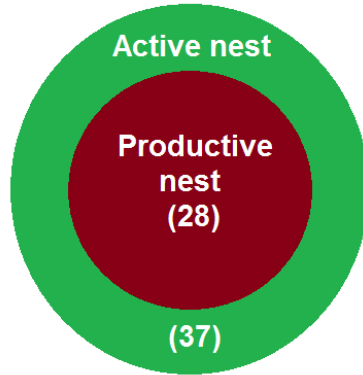
The breeding success of critically endangered vulture species is important for their conservation. The breeding success can be enhanced by making nest at safe sites, investment in parental care and access to food. In study area, almost two-third of active nest yields healthy viable offspring. The observed breeding success was around 75.6%.

Nesting Site:

The vegetation of study area includes few patchy grasses, spiny scrubby jungle to a dry deciduous forest type consisting of *Acacia arabica*, *Acacia leucophloea*, *Acacia senegal*, *Prosopis juliflora*, *Prosopis cineraria*, *Euphorbia nerrifolia*, *Capparis decidua*, *Zizyphus nummularia* etc. However, floristic composition varies considerably with certain species indicating a distinct affinity with the habitat. Vultures are known to inhabit tall trees in forests, smaller trees in open areas, rocky

cliffs, old monuments and the countryside. Most of the Redheaded Vultures nests were observed in and around the area which are safe and protected. The Red headed vulture prefers to make nest on *Prosopis cineraria* (Khejri) trees probably due to more canopy and high availability in study area (Image 1). Out of 88 nests recorded, 16 were on rocky cliffs, and 60 were on Khejri trees and 13 on Acacia (Keekar) tree. The majority of nests which were set up on Khejri tree were at the top and center of canopy while only four were in mid branches.

Graph 2: Proportion of productive nest out of active nest for red headed vulture in study area.



DISCUSSION:

On the extensive debate on vulture conservation and population declination, we have attempted a study on nesting and breeding success of the critically endangered Red headed vulture in a very challenging climatic condition at the Great Indian Thar Desert of Rajasthan. Great Indian Thar desert have been a preferred habitat for vultures in India. Total seven species can be seen in this region, namely- the Red headed vulture, Cinereous vulture, Egyptian vulture, Eurasian griffon, Himalayan griffon, Long-billed vulture and White-backed vulture. Of these, the red headed vulture is residents and breed in this region^{16,19}.

As nesting sites and demography depends on the vulture population size²³ so we also estimated total population of red headed vulture in the study area. Earlier studies¹¹ suggest that population of red headed vulture are lesser than 100 but, present investigation finds the number is far higher than that reported earlier. We suggest the reason for this increase in count, is the regular availability of food in form of garbage dumps as well as protection of study area by government agencies. As a result more vultures have been attracted from surrounding regions, thereby increasing the count. Similar increasing population trends have been observed in other species of vulture also, but the increase in population of red headed vulture is the lowest. The reason may be attributed due to its solitary and territorial habits

Vultures are highly sensitive to the environmental changes⁶. The major reasons for vulture population decline are scarcity of food vultures and massive habitat loss¹⁷. Use of anti-inflammatory

drug Diclophenac in cattle and other animals is also responsible for lethal renal failure in vulture after feeding those treated carcasses^{24,25}. Competitors like Crows, Ibises, Egrets, Eagles, Dogs, jackals, foxes are somehow also disturb the vultures in feeding practices²⁶. A consequence of various zoonotic diseases like rabies and bubonic plague by the dogs and rats are suggested as cause for declination of the vulture species¹⁷. Beside these, electrocution and trichobezoar are some most recent cause identified in the declination of vultures^{27,28}.

Availability of nesting sites is very important for red headed vultures. Their total population and breeding success depends primarily on the availability of nesting sites (Newton 1979). Numerous threats as mining and deforestation resulted in decline of the long lasting nesting sited of vultures in Thar Desert⁸. This has resulted the enormous decrease in nest building sites and breeding success²⁹. During present investigation, total 88 different sites were seen to have nest of red-headed vulture. The most utilized sites for nest building were Sam, Kundal Hills, Kumbharkotha, Sudasari and Ramgarh. All these sites are located in core area of Thar Desert. This region has limited vegetation and resource availability but limited human encroachment. The most of nest were built on top of Khejri tree, although occasionally they were also seen at rocky cliffs. During the present investigation almost 60% of nests were active while the breeding success was 75%. The high breeding success and occupancy of majority of nest are positive indication of increase in population of this raptor. Although situation is very disastrous, since the population is still very low and therefore demands immediate conservational efforts to conserve the areas that provide suitable nesting sites for thus species so that we can save the few that are still remaining.

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