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# STATUS, DISTRIBUTION AND RECENT CHANGES IN POPULATIONS OF CRITICALLY ENDANGERED GYPS INDICUS AND ENDANGERED NEOPHRON PERCNOPTERUS VULTURE SPECIES IN GWALIOR DISTRICT

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**Abstract**

*Vultures, the most efficient carrion feeders play an important ecological role,but their number is declining at a very fast rate. The study on the status of vultures in Gwalior district was carried out in 2019 which revealed the presence of only two species of vultures, long billed vulture (Gyps indicus) and Egyptian vulture (Neophron percnopterus) in the study areas. A total of 29 individuals were recorded during the study period among which Gyps indicus was abundant in number. As per various study reports there has been a drastic decline in the population of vultures from the past 10-15 years due to many anthropogenic activities, veterinary use of diclofenac (DF), shortage of food and habitat loss. Therefore proper management and conservation measures should be taken to save these natural carrion consumers. This study is aimed at knowing the status and distribution of vulture population in Gwalior district which could enhance the contingent study, valuation will help in establishing the possible reasons for their decline and in turn will boost the steps for their conservation.*

*Keywords:* ***Gyps indicus, Neophron percnopterus, Carrion, Diclofenac, Ecological, Anthropogenic, Biodiversity***

## 1. INTRODUCTION

The affiliation between biological diversity and ecosystem purpose has been a subject of decades of rigorous experimental investigation, and lies at the heart of key perceptions in ecology and conservation biology. The diminution in the species richness leads to the loss of ecosystem function and in certain ecosystems functionality is maintained by a few profuse species. Vultures feed on discarded dead animals, which makes them an essential component of the ecosystem. They also play a significant cultural role in the southern Asia (parts of Nepal, Tibet, and India) as they consume human cadavers which are left in the open during ritual sky burials (Singh, 1999; Goi, 2009; Liu et al, 2013). The decrease in the Indian sub-continent has eliminated a major scavenger population, with effects on other scavenging species and the incidence of putrefying carcasses, both of which are associated with disease risks for wildlife, live-stock and human (GOI, 2006). There are 23 species of vultures present in the world, India has 9 species of vultures in the wild (Ali and Ripley., 1987).White backed vulture, Slender billed vulture, Long billed vulture, Egyptian vulture, Red headed vulture, Indian griffon vulture, Himalayan griffon, Cinereous vulture, and Beaded vulture (GOI, 2006).Vultures are known to inhabit tall trees in forests, small trees in open areas, rocky cliffs, old monuments and aside (Thompson et al., 1990; Liberatori and Penteriani, 2001; 2005; Monoderm and Garcelon, 2005; Thakur and Narang, 2012; Harris, 2013; Haenn et al., 2014).Except griffons and Lammergeier, all Asian vultures are in threatened or near threatened categories (IUCN Red List, 2011).Vultures are known to colonize wooded as well as open habitats with agriculture and tree cover (Robinson 1994; Donazer et al., 2002). The Egyptian vulture is long

lived species which is classified as endangered because of rapid population declines in India and Nepal (Cuthbert et al., 2006).

## 2. MATERIALS AND METHODS

### 2.1 Study Site

The current study was carried out in the Gwalior district situated in the northern part of Madhya Pradesh that lies between latitudes $25^0$ 34' N and $26^0$ 21' N and longitudes $77^0$ 40' E and $78^0$ 54' E and an average elevation of 197 meters (646 feet). The Gwalior is as historical city of Madhya Pradesh which is allied to rest of the country by roads and railways.

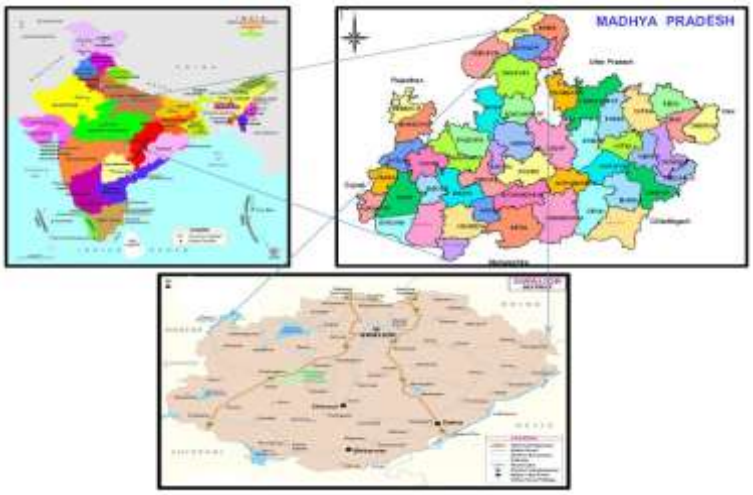


**Fig. 1:** Map represents study area

The study sites were Gopanchal Pahadi, Changa Shah Darga, Muldas Baba Ki Gufa (sanjay Nagar). All these sites are situated in different directions of Gwalior within 14-kilometer radius (Fig. 2).

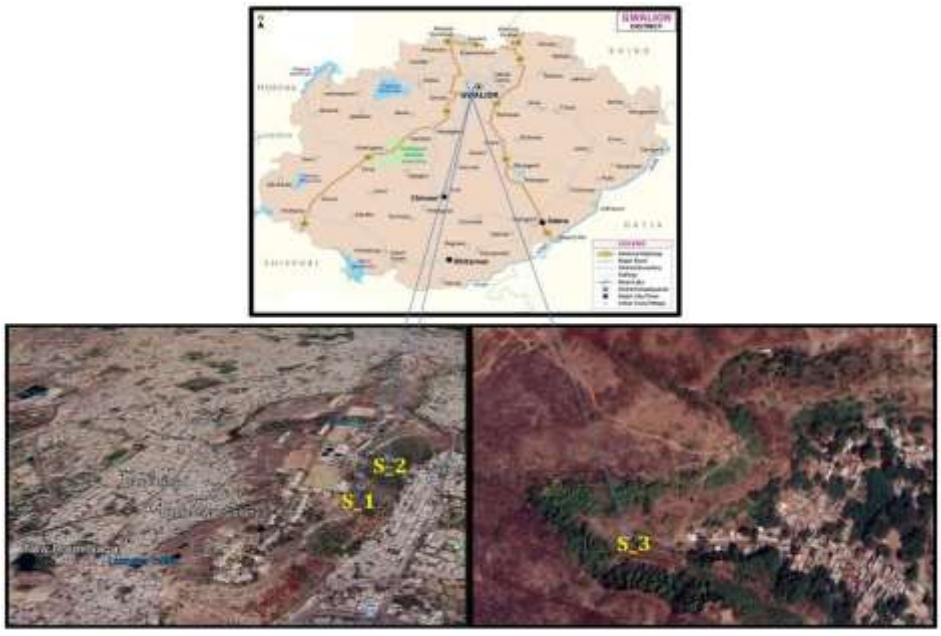


Figure 2: Study sites at different locations in the study area

**Table 1. List of study sites with their GPS Location.**

| S. No | Name of the study site | GPS Location |
|---|---|---|
| 1 | Gopanchalpahadi | 26°12'5" N 78°10'21" E |
| 2 | Changa Shah Darga | 26°13'24" N 78°10'15" E |
| 3 | Mule das Gufa (sanjaynagar) | 26°12'4" N 78°7'56"E |

**2.2 Study site 1:**

Gopanchal pahadi lies on the eastern slopes of Fort, a famous historical place located in Gwalior district of Madhya Pradesh. Its Geographic Positioning System is 26° 12'5"N latitude and its longitude is 78° 10'21"E. This site carries the rock crevices and cliffs which the vultures use as their nesting sites. Human activities were also observed at this site, people come here early in the morning for morning walk, exercise visited nature lovers and for worship purposes.

**2.3 Study site 2:**

Changa shah dargah is also situated in the outskirts of eastern mountainous slopes of the Gwalior fort. The area is named after the honour of the shrine Changa Shah Data. The people visit this site on daily basis and bring with them the various food items to feed the poor and beggars. The waste food materials are thrown and dumped on the nearby site upon which the vultures feed. The site is lies in between latitude 26°13'24" N and longitude 78°10'15" E.

**2.4 Study site 3:**

Mule das baba Ki Gufa is located in the Sanjay nagar Gwalior lies on 26°12' 34″ N latitude to 78° 7' 56″E longitude and it has an evaluation of 314.86m. Area of this village is contaminated by municipal waste were scavenging birds such as house crows, Kites and feral do can be commonly seen. It is about 14 kilometers away from the main city center Gwalior. Study area is mainly populated by plant species such as prosopis (Prosopis cineraria)Neem (Azadirachtaindica), chesrol and kardahi (Anogeissus acuminate-floraofinda).

**2.5 Identification of scavenging bird species:**

The scavenging bird species were identified using books of Ali (1996); Grimmit*et al.*, (2011). The English, and scientific names of the birds were taken from Ali (1996**).** Identification of different bird species of vultures is carried out on the bases of color pattern of the body, upper and under wing color pattern, pattern, length of bill, plumage orientation and shape, rump, head and neck regions colors. Feathers of scarf are longer, more lanceolate or spiky and less fluffy then that of the adult, while adult birds have larger, more rounded flight and tail downy in appearance.

**2.6 Counting of birds:**

There are principally two types of procedure which are most commonly used in bird surveying, line transects and point transects. The latter is often termed as point counts. Both are based on recording birds along a pre-defined route within a pre-defined survey unit. Line and point transect are mostly preferred survey methods' here point transect method have been used because scavenging birds are found in groups or in pairs. Point transect method was used to obtain species frequency and birds frequency. In this method at pre-defined spots, allow the birds to settle, and then record all the birds seen or heard for a prearranged time ranging at different dissipations from 4 to16 minutes standing at a fixed point. The point was distributed at random at the study sites so as to denote all types of habitat elements of that area.

**2.7 Instruments**

Binocular (Nikon Action 8 X40): Binocular is an instrument which is used by the wildlife researchers in order to see the far-flung animals or birds to get close up look from a distance,

limiting the chance of disturbing them. Global Position System (GPS Gramin 60): Global Positioning System is an electronic instrument which is generally enables the acquisition of detailed location information any were in the world and it does not require frequent visits which reduces in field tracking time of an animal by biologist. GPS receiver is attached to the collar of an animal which receives signals from three or more satellites, and records the time, date, and location of the animal at programmed intervals. Digital Camera (Nikon d-60 10x optical zoom and 12 mega pixel): Camera is used to capture images of wild creatures in the wild with as little human interference as possible. This method has been used in variety of ecological research including studies of nest ecology, detection of rare species, extinction of population size and species richness as well as researchers on habitat use of various wild fauna.

## 3. RESULTS

Field work was carried out to count total number of vulture's and its species in the Gwalior district of Madhya Pradesh from January 2019 to June 2019 (n=6). During this period of time one count per month was regularly done at the study sites. The study sites for counting the vultures were three which included GopanchalPahadi, Changa Shah dargah and Mule das baba Ki Gufa (sanjaynagar). The total number of vultures sighted varied from month to month which ranged from 11 to 29. However, the maximum number of individual vultures was recorded in the month of June in which 30 vultures were sighted in total which included both adults and juveniles. All these recorded vultures belong to two species *viz*. Egyptian vulture (Neophron percnopterus) and long billed vulture (Gyps indicus). The numbers of long billed vultures sighted were more than the Egyptian vulture. The former outnumbered the later during all the counts that were done in pertinent to the study. In the Month of June, out of 29 vultures recorded, 27 were found to belong billed vultures and only 02 belonged to Egyptian vulture.

The main threat with the Egyptian vultures at the study site 3$^{rd}$ is human interference and deforestation; it is the main pressure on the Egyptian vultures at this site. Both of these two species of the vultures are the native species of the Gwalior district. They move out in search of food in the morning time and returns back to their nesting places in the evening but during the breeding season which starts from October to May and June. One individual bird (female) spends most of the time at the nest site for the protection of their eggs.The fluctuations which have been seen in the number of individuals of long billed vulture are because of cold season in the month of January and February. The first and second field work was carried out in early morning in the month January and February. Less number of individuals were seen to be come out from their nests. Certain nests of these vultures have also seen during the field work and mostly each nest was occupied by a pair of vultures. It indicates that vultures live in pairs. From the study it was also observed that vultures provide excellent parental care. From the time of egg laying till the juvenile start their first flight, one of the two parents are always seen in the nest.

The third and the fourth field work were carried out in the month of March and April at 2 Pm.At that time an increase in the number of vulture count was identified. Certain individual vultures from the nest were seen to going faraway flying into the air. It was observed that one individual vulture (female) is necessary for the preservation and protection of their eggs.The fifth and the final field work was carried out in the month of May and June in which seven juveniles were seen at the nesting sites in the rocky cliff. The status of breeding population of long billed vultures in and around the study sites is good and safe. From such results it was observed that the study sites GopanChalPahadi and Changa shah Darga are safe habitat for the long-billed vulture. Both these two sites are free from anthropogenic pressure. Resident species have reproduced here due to the availability of food and good habitat. From the above results it is clear that evening time is better for the recording of vultures. They cover a long of distance in search of carcass during the day period.

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Egyptian vulture (Neophronpercnopterus) Long billed vulture (Gyps indicus)

Long billed vulture (Gyps indicus)

| S. No. | Common Name | Genus | Species | IUCN Status |
|---|---|---|---|---|
| **1.** | Long Billed Vulture | Gyps | *G. Indicus* | Critically Endangered |
| **2.** | Egyptian Vulture | Neophron | *N. Percnopterus* | Endangered |

**Field work data collected from January 2019 up to June 2019.**

| Month | Number of individuals | | | No. of species |
|---|---|---|---|---|
| | Site1 | Site 2 | Site 3 | |
| **January** | 01 (LBV) | 08 (LBV) | 02 (EGV) | 02 |
| **February** | O2 (LBV) | 08 (LBV) | 02 (EGV) | 02 |
| **March** | 04 (LBV) | 14 (LBV) | 02 (EGV) | 02 |
| **April** | 04 (LBV) | 14 (LBV) | 02 (EGV) | 02 |
| **May** | 08 (LBV) | 18 (LBV) | 02 (EGV) | 02 |
| **June** | 09 (LBV) | 18 (LBV) | 02 (EGV) | 02 |

**Down (between the samples observed during study duration)**

| S. No. | | SITE 1 | SITE 2 | SITE 3 |
|---|---|---|---|---|
| 1 | **SE** | 1.432946 | 2.013289 | 0 |
| 2 | **SD** | 3.204164 | 4.501851 | 0 |
| 3 | **MEAN** | 4.666667 | 13.333333 | 2 |
| 4 | **MEDIAN** | 4 | 14 | 2 |
| 5 | **VARIANCE** | 10.266667 | 20.266667 | 0 |
| 6 | **TOTAL** | 6 | 6 | 6 |

**Across (between different sites during the study)**

| S. No. | Month | SITE 1 | SITE 2 | SITE 3 |
|---|---|---|---|---|
| | | SE | SD | Mean |
| **1.** | **Jan** | 2.677063 | 3.785939 | 3.666667 |
| **2.** | **Feb** | 2.44949 | 3.464102 | 4 |
| **3.** | **Mar** | 4.546061 | 6.429101 | 6.666667 |
| **4.** | **Apr** | 4.546061 | 6.429101 | 6.666667 |
| **5.** | **May** | 5.715476 | 8.082904 | 9.333333 |
| **6.** | **Jun** | 5.671567 | 8.020806 | 9.666667 |

Maximum numbers of vultures were recorded at the Changa Shah Darga then at study site GopanChal Pahadi, and minimum of vultures were recorded at study site Mule Das Gufa. Fig. (a)

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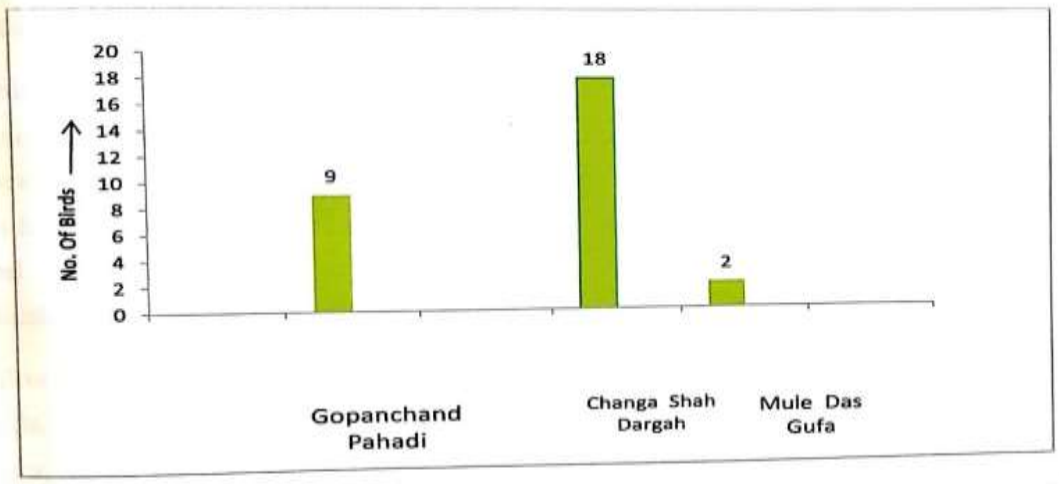
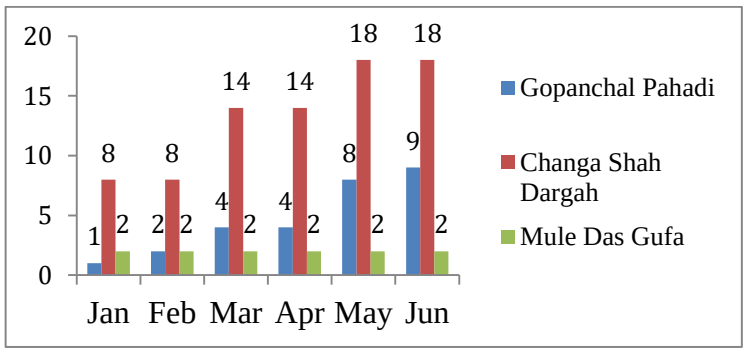



**Field work data collection represented bar graphically from January 2019 to June 2019. Minimum numbers of vultures were recorded in the month of January and maximum numbers of the vultures were recorded in the month of June including juveniles. Fig (b)**




### 3.1 Habitat evaluation of vultures

Vultures are known to colonize wooded as well as open habitats with agriculture and tree cover that is vultures inhabit tall trees in forests, trees in open monuments and in agricultural fields. Two species of the vultures such as long billed vulture (Gyps indicus) and Egyptian vulture (Neophronpercnopterus) recorded in the Gwalior district at the study sites such as Go -Panchal Pahadi, change shah darga, and at MuledasGufa (Sanjay nagar) are the native species of this area and they reproduce here due to the availability of food through-out the year. Long billed vulture is of large size and long robust neck and is cliff nesting species and Egyptian vulture is different as compared to other species of the vulture species. It is a smaller bird with naked head and without long scrawny. Both these two species are present in the rocky cliffs at all three study sites. They possess their nests in the same rock. Seven nests also been recorded at these study sites. Inspite of this at each nest a pair of vultures and their juveniles' haves also recorded during the study period, from this observation it means vultures do not live individually but they live in pairs and in every pair, one is male partner and another one is female partner.

### 3.2 Management and conservation measures for vultures

Supervision and conservation measures are given as below.

- Complete disuse of the diclofenac is one of the most significant steps for the vulture population and hence for ecological balance. Further the spread of the diseases such as tuberculosis, anthrax, brucellosis, foot and mouth diseases will decrease in human beings and in livestock.
- Advancement of efficient carcass disposal systems is also necessary.
- Formation of more safe zones.
- Protecting breeding sites, which continue to be destroyed for real estate, industry, organization, and other development projects.
- Education campaigns such as distributing posters and street theatres in local languages highlighting the importance of vultures and the threats, they face should be conducted to inform the general public. Such programs enhance the awareness of the people to the wide range of vulture.
- Another impotent strategy is to educate livestock owners, farmers and veterinary personal on the negative effects of diclofenac and on the proper disposal of contaminated carcasses.
- It is also essential to educate livestock holders, farmers and veterinary personal will help to secure healthy food for vultures.
- Vultures breeding centre should be established in Madhya Pradesh state in order to increase the vulture population.
- Collaboration of the Ministry, Forest and Climate change is also necessary for the regaining population of vultures in the Indian sub-continent.
- Introduction of feral dogs into the breeding centres should be prohibited.

## 4. DISCUSSION

From time long-established, vultures have been soundlessly finalizing a very important test in the cycle of nature as its finest scavenger. They feed on the carcasses of dead animals, helping diminishing the chance of carcass tolerated diseases outbreaks. A survey across 18 protected areas revealed that there were 40 million of the vultures in the Indian subcontinent in between 1991-1992 (Bindra. P.S.2018). unfortunately, their number get reduced and reached near to extinction. They have been considered as one of the most endangered bird species. This is the fastest decline of any bird species ever reported in the world. The causes of their decline were habitat destruction, shortage of food, anthropogenic pressure, natural calamities and use of pesticides in the agricultural fields. But the most and remarkable cause was the use of diclofenac to treat the livestock has actually ended up poisonings the vultures causing the kidney failure and gout and finally death. This has not only resulted in lesser sighting of this glorious bird in our skies, but has also endangered health and cleanliness in the country side and causes unnatural changes in the natural food chain. Vultures are a critical link in the ecosystem and in their absence, population of other scavengers such as feral dogs and rats is rising. This can increase the incidence of dangerous and potentially fatal diseases such as rabies (Bindra.P.S 2018).

Vultures play a significant role in the ecosystem as scavengers. Their speedy efficient disposal of bodies does not allow deadly bacteria to develop and spread. High body temperatures and strong stomach acids allow vultures to ingest carrion infected by bacteria such as anthrax without any ill effects. The drastic decline of vultures created a vacuum and millions of carcasses left rooting, increasing the probability of spread of diseases such as tuberculosis, anthrax, brucellosis, foot and mouth diseases. Nine species of the vultures are recorded in the India, Long Billed Vulture, Red Headed Vulture, White Rumped Vulture, Egyptian Vulture, and Beaded Vulture, Himalayan griffon Vulture, Cinerous Vulture, Slender Billed Vulture and Indian griffon vulture. Diclofenac mainly effects three of the five species of the genus gyps, long billed vulture, white rumped vulture and slender billed vulture (Ali and Ripley 1987).

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The Eurasian Griffon gyps fulvous and Himalayan Gyps Himalayans's, white impacted, were spread the massive decline. These species are migratory; many breeds in the upper Himalayas and central Asia where the use of such drug is rare, explained Prakash. The king vulture and the cinerous vulture have tougher beaks, and feed on the hide and tough meat and tendons, and possibly did not fall victim of diclofenac (Bindra P.S 2018). Results show that Gwalior district still harbors a small but stable population of nature's scavengers. Population limitation can be caused by a number of different things such as habitat loss, shortage of food, anthropogenic pressure, competitors, predators, harsh weather. Field work was carried out to count total number of vulture's and its species in the Gwalior district of Madhya Pradesh from January 2019 to June 2019 (n=6). During this period of time one count per month was regularly done at the study sites. The study sites for counting the vultures were three which included GopanchalPahadi, Changa shah dargah and Mule das baba Ki Gufa (sanjaynagar). The total number of vultures sighted varied from month to month which ranged from 11 to 27. However, the maximum number of individual vultures was recorded in the month of June in which 29 vultures were sighted in total which included both adults and juveniles. All these recorded vultures belong to two species *viz*. Egyptian vulture (Neophronpercnopterus) and long billed vulture (Gyps indicus). Both these two species were recorded during the field survey in the Northern Madhya Pradesh in Kuno wildlife sanctuary Sheopur (Taigor 2009).

The numbers of long billed vultures sighted were more than the Egyptian vulture. The former outstripped the advanced through all the counts that were done in apposite to the study. In the Month of June, out of 29 vultures logged, 27 were found to be long billed vultures and only 02 belonged to Egyptian vulture. The main threat with the Egyptian vultures at the study site 3$^{rd}$ is human intrusion and deforestation; it is the main compression on the Egyptian vultures at this site. Both of these two species of the vultures are the native species of the Gwalior district. During the field inspection the juveniles have recognized in the month of May and June and it was observed that in these two months the chicks have come out from their eggs. From the reports it is said that female birds of long billed vulture species give one single egg in eight months. Then from the above observations this period starts from October up to May, June. The breeding season for long billed vultures is from October to May/June (Naoroji 2007). Maximum number of vultures were seen on sunny warm days. They were active when temperature raises up because of thermal air currents, which are formed when air is heated up by warm surface of the earth as the sun gains in the morning. Less number of vultures have been recorded at the morning time in the month of January and February. The first field work was carried out on 12 January 2019 with the department of forest and wildlife of district Gwalior Madhya Pradesh.

During the field work the long-billed vulture was only sighted in the rocky cliff it means the species is a cliff -nesting species. The long-billed vulture, can easily distinguished from the Slender billed vulture by the former's relatively large size and long robust neck, is a cliff- nesting species (Naoroji 2007). Inspite of this it was observed that species of long billed vulture do not live solitary but at every nest a pair of vultures have been recorded and their juvenile in the month of May and June. Certain nests of these vultures have also seen during the field work and mostly each nest was occupied by a pair of vultures. It indicates that vultures live in pairs. From the study it was also observed that vultures provide excellent parental care. From the time of egg laying till the juvenile start their first flight, one of the two parents are always seen in the nest. Both of these two species of the vultures i.e. Long -billed vulture and Egyptian vultures are the native species of the Gwalior district of Madhya Pradesh. Mostly both these two species are the carrion feeders, but none of them was seen feeding on carcass during the field survey due to the shortage of carcass but on municipal waste around the study site of Changa shah darga along with feral dogs (Canisfamiliaris) and house crows (Carvussplendens). Here it could be notified that both these species are not only carrion feeders but they can feed on municipal dumps/or feeding around the slaughter houses.

During the passage of field wok, it has been proved that cold weather conditions are not favorable for vulture species. As the average temperature of January and February in Gwalior district is 14 to $16^0$ c. It has been also observed that during the field work which was carried out in January and February the vultures recorded in lazy position. From the above observation it can be concluded that most of the vulture species prefer to live in nests. It was suggested that some vulture species had a tendency to choose dead trees, Babool or gum Arabic Accacianilotica, P rosopisCineria for roosting (Ceballos and Donazasr 1990, Khatri 2013) which was confirmed I in the present study.

## 5. SUMMARY

Vulture the most successful scavenging birds which play an important role in the environment by clearing the carcass of animals and also prevent the transmission of the diseases which could affect the other animals as well as humans. They were ubiquitous seen in both cities and country side perched on trees, electric poles, house tops etc. But unfortunately, their number plummeting near to extinction due to various reasons such as habitat destruction, shortage of food, anthropogenic pressure. But the most remarkable cause was the veterinary use of diclofenac in order to treat the ill animals. Three species of the vultures were mostly affected by the carcass containing the presence of diclofenac Long bi
lled vulture, White rumped vulture, and Slender billed vulture.

For their conservation and to know the final status of the vulture species and their population across the Indian sub-continent various institutes and university students have did research in the various states. Another help to repopulate the population of vultures in India was from famous NGO i.e. Bombay Natural History Society and Haryana Forest Department, to establish Jatayu Conservation Breeding Centre in Pinafore which is the battleship of eight such breeding centers in India. A total of 162 vultures of all three effected vulture species such as long billed vulture, slender billed vulture, and white rumped vulture have been breed and raised in captivity. I also carried out the work on the same topic in Gwalior district of state Madhya Pradesh.

Field work was carried out to count total number of vulture's and its species in the Gwalior district of Madhya Pradesh from January 2019 to June 2019 (n=6). During this period of time one count per month was regularly done at the study sites. The study sites for counting the vultures were three which included GopanchalPahadi, Changa shah dargah and Mule das baba Ki Gufa (sanjaynagar). The total number of vultures sighted varied from month to month which ranged from 11 to 29. However, the maximum number of individual vultures was recorded in the month of June in which 29 vultures were sighted in total which included both adults and juveniles. All these recorded vultures belong to two species *viz*. Egyptian vulture (Neophronpercnopterus) and long billed vulture (Gyps indicus).

The numbers of long billed vultures sighted were more than the Egyptian vulture. The former outnumbered the later during all the counts that were done in pertinent to the study. In the Month of June, out of 29 vultures recorded, 27 were found to be long billed vultures and only 02 individuals of Egyptian vulture. The main threat with the Egyptian vultures at the study site $3^{rd}$ is human interference and deforestation; it is the main pressure on the Egyptian vultures at this site. Both of these two species of the vultures are the native species of the Gwalior district. They move out in search of food in the morning time and returns back to their nesting places in the evening but during the breeding season which starts from October to May and June. One individual bird (female) spends most of the time at the nest site for the protection of their eggs. The fluctuations which have been seen during the month of January and February in the number of individuals of long billed vulture are because of cold season in the month of January and February. The first and second field work was carried out in early morning in the month January and February. Less number of individuals were seen to be come out from their nests. Certain nests of these vultures have also seen during the field work and mostly each nest was occupied by a pair of vultures. It

indicates that vultures live in pairs. From the study it was also observed that vultures provide excellent parental care. From the time of egg laying till the juvenile start their first flight, one of the two parents is always seen in the nest. The third and the fourth field work were carried out in the month of March and April at 2 Pm. At that time an increase in the number of vulture count was identified. Certain individual vultures from the nest were seen to going faraway flying into the air. It was observed that one individual vulture (female) is necessary for the preservation and protection of their eggs. The fifth and the final field work were done in the month of May and '9' June at evening periods in which juveniles were also recorded at the nesting sites in the rocky cliff. The status of breeding population of long billed vultures in and around the study sites is good and safe. From such results it was observed that the study sites GopanchalPahadi and Changa shah darga are safe habitat for the long-billed vulture. Both these two sites are free from anthropogenic pressure. Resident species have reproduced here due to the availability of food and good habitat

Two species of the vultures such as long billed vulture (Gyps indicus) and Egyptian vulture (Neophronpercnopterus) recorded in the Gwalior district at the study sites such as Go -Panchal pahadi, change shah darga, and at MuledasGufa (Sanjay nagar) are the native species of this area and they reproduce here due to the availability of food through-out the year. Long billed vulture is of large size and long robust neck and is cliff nesting species and Egyptian vulture is different as compared to other species of the vulture species. It is a smaller bird with naked head and without long scrawny. Both these two species are present in the rocky cliffs at all three study sites. They possess their nests in the same rock. Seven nests also been recorded at these study sites. Inspite of this at each nest a pair of vultures and their juveniles' haves also recorded during the study period, from this observation it means vultures do not live individually but they live in pairs and in every pair, one is male partner and another one is female partner. It is obligatory to preserve and achieve them in order to keep the ecological balance in the steady state. Supervision and conservation measures are given as below. Complete disuse of the diclofenac is one of the most significant steps for the vulture population and hence for ecological balance. Further the spread of the diseases such as tuberculosis, anthrax, brucellosis, foot and mouth diseases will decrease in human beings and in livestock.

- ✓ Advancement of resourceful carcass disposal systems is also obligatory.
- ✓ Formation of more safe zones.
- ✓ Protecting breeding sites, which continue to be destroyed for real estate, industry, organization, and other development projects.
- ✓ Education movements such as allotting posters and street theatres in local languages highlighting the reputation of vultures and the threats, they face should be conducted to inform the general public. Such programs boost the awareness of the people to the wide range of vulture.
- ✓ Another impotent strategy is to educate livestock owners, farmers and veterinary personal on the negative effects of diclofenac and on the proper disposal of contaminated carcasses.
- ✓ It is also essential to educate livestock holders, farmers and veterinary personal will help to secure healthy food for vultures.
- ✓ Vultures breeding centre should be made in Madhya Pradesh in order to increase the vulture population.
- ✓ Collaboration of the Ministry, Forest and Climate change is also necessary for the regaining population of vultures in India.
- ✓ Introduction of feral dogs should be prohibited in the breeding centres in order to prevent to conflict.

## 6. CONCLUSION

Vultures play a crucial role on this mother planet, by tearing the meat of dead animals and thereby helping in clearing the environment from rotten meat of dead animals and the disposal of

dead bodies, as per religious practices of the parsi community. Vultures are the primary consumers carrion in India and elsewhere. Removal of major scavenger from the ecosystem will affect the equilibrium between populations of other scavenging species and /or result in putrefying carcass causing of infectious diseases outbreaks such as rabies, brucellosis, Anthrax, and tuberculosis.

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