Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

Journal of Entomology and Zoology Studies

**E-ISSN: 2320-7078**
**P-ISSN: 2349-6800**
JEZS 2018; 6(5): 747-751

Received: 21-07-2018
Accepted: 23-08-2018

**AK Kataria**
Principal Investigator, Centre for Excellence for Use of Space-Based Technology in Animal Science, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

**N Kataria**
Professor, Head, Department of Veterinary Physiology, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

**RK Pareek**
Project Associate, Centre for Excellence for Use of Space-Based Technology in Animal Science, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

**Akriti**
Project Associate, Centre for Excellence for Use of Space-Based Technology in Animal Science, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

**Diwakar**
Project Associate, Centre for Studies on Wildlife Management and Health, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

**Sunita Choudhary**
Assistant Proessor, Department of Veterinary Microbiology, Arawali Veterinary College (Affiliated with Rajasthan University of Veterinary and Animal Sciences, Bikaner), N.H.-52, Jaipur road, V.P.O.-Bajor, Sikar, Rajasthan, India

**RN Kumawat**
Deputy Conservator of Forest (Wildlife), Bikaner, Rajasthan, India

**Correspondence**
**AK Kataria**
Principal Investigator, Centre for Excellence for Use of Space-Based Technology in Animal Science, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

# Effect of temperature humidity index on migration of Himalayan griffon (*Gyps himalayensis*) at Jorbeer conservation reserve, Bikaner, India

**AK Kataria, N Kataria, RK Pareek, Akriti, Diwakar, Sunita Choudhary and RN Kumawat**

**Abstract**
The present exploration appraised the effect of temperature humidity index on migration of Himalayan griffon (*Gyps himalayensis*) at Jorbeer Conservation Reserve, Bikaner, Rajasthan, India (JCRBRI) during a period from May 2015 to April 2018. The population of griffons was recorded along with environmental temperature and humidity on 1st and 15th day of every month from May 2015 to March 2016, and 1st, 10th and 20th day of every month from April 2016 to April 2018. The Himalayan Griffon established their presence from the month of November 2015 in the duration of 2015-16, October 2016 in the duration of 2016-17 and October 2017 in the duration of 2017-18. It was observed that in each year of study, birds marked their disappearance from May to September in absolute terms. In year 2015-16, a maximum number of 60 Himalayan Griffons was observed on February 15, 2016. In year 2016-17, a maximum number of 30 birds was observed in the months of January and February, 2017. In year 2017-18, a maximum number of 120 birds was observed on 10th December and 20th December 2017, 1st January and 10th January 2018. During the disappearance period (from May 2015 to October 2015) of birds, the $THI_{max}$ values oscillated between 80.66 and 86.89. The period (from November 2015 to March 2016) when birds were observed in the reserve, the $THI_{max}$ values were either 77.03 or lower. The result of present endeavour exhibited precedent of wintering for Himalayan griffon at the JCRBRI.

**Keywords:** Himalayan griffon, Jorbeer conservation reserve, Bikaner, Rajasthan, India, temperature humidity index

## Introduction
Himalayan Griffon (*Gyps himalayensis*) is a large sized raptor and known to be a precipice builder. Many vultures are creating their place in vulnerable category owing to sombre decline in their number. Currently the status of Himalayan Griffon has been regarded as "Near Threatened" [1]. Vultures are known to play an important role in the upholding and preservation of ecosystem. The placement of vultures in the ecosystem enjoys the category of scavengers by disposing of the carcasses and other organic wastes thereby contributing in the safeguard the animal and human health. Besides immense contribution of vultures, the worrying issue is decline in their number. Temperature and humidity are important cogs of environment which can thump upon profoundly on migratory efficiency [2]. Birds travelling larger distances are stumbled upon with several types of spatial information. Research by scientific community is lucidly reflecting changes in the environment developing in the manner that biological systems are gradually intruded in a downbeat way resulting in ecological inequity and stress to dwellers [3, 4]. Trip of birds is the time-honoured event alongside an indisputable passage escorted by reproductive and environmental issues. Commonly, birds move from areas of smallest keeps and provisions to regions of rising possessions [2]. Migration behaviour of the bird insinuates wintering in arid areas and Jorbeer, Bikaner, Rajasthan, India marks a distinctive habitat for these birds gratifying the requirements of the birds for their cosy stay. The migration precedent denotes movement of the birds starting in the months of October and November. Observations recorded in the field conditions are important to bring into evidence more vultures to pore over members of the species. Elements related with pre-migration and post-migration can manoeuvre the pattern of migration of birds. Temporal scrutiny can help in emphasizing spatiotemporal database for appraising increase or diminution in numbers for making sound imminent stratagem about conservation centres [5].

It has been acclaimed that more number of migratory birds divulge a superior landscape for biodiversity and ecosystem overhauls. Vagrants devise journeys to and from their breeding and halting areas each year in huge numbers. Corroboration and figuring out the migration of birds is imperative from technical reasons. Awareness of buoyancy of migrants towards unkind environments has become a burning issue among scientific community globally. This information can also play a role towards justification of the course of migrating birds. Frank distinction in a time frame from one period to another is a way to put together the data and to collect consequential relation amid variable components [6]. Scientists are working hard to explore the impact of abiotic stressors in the arid tracts on mammals [7, 8], however, there is scarcity of research on these aspects on migratory birds especially Himalayan griffon. Hence, the present investigation was launched to observe the effect of temperature humidity index on migration of Himalayan Griffon (*Gyps himalayensis*) at Jorbeer conservation reserve, Bikaner, India (JCRBRI).

## Materials and methods

Jorbeer Conservation Reserve, Bikaner (Rajasthan, India) is comprised of 56.46 km2 sited south east to Bikaner at a distance of 12 Km with a geographical position of 20'3° north latitude and 73'5° east longitudes at height of 234.84m mean sea level. Bikaner is a district positioned in the northwest of the state of Rajasthan in north part of India.

To determine effect of temperature humidity index (THI) on Himalayan Griffon migration, surveillance was done over a period of 36 months commencing from May 2015 to April 2018 for analysis. The distribution of the period was from May 2015 to April 2016; May 2017 to April 2017 and from May 2017 to April 2018. The population influx/outflux was evidenced by visual methods on 1st and 15th day of each month from May 2015 to March 2016 and on 1st, 10th and 20th day of each month from April 2016 to April 2018. The environmental correlates were also recorded correspondingly by employing portable instrument (Atmospheric Data Centre Pro, Brunton, USA) for the computation of temperature humidity index (THI) values [9].

## Result and discussion

Population of Himalayan Griffon at JCRBRI from May 2015 to April 2018 is depicted in fig1. The Himalayan Griffon established their presence from the month of November 2015 in the duration of 2015-16, October 2016 in the duration of 2016-17 and October 2017 in the duration of 2017-18. It was observed that in each year of study, birds marked their disappearance from May to September in absolute terms. The month of October reflected variable picture of appearance of the birds at the reserve. In year 2015-16, a maximum number of 60 Himalayan Griffons was observed on February 15, 2016. In year 2016-17, a maximum number of 30 birds was observed in the months of January and February, 2017. In year 2017-18, a maximum number of 120 birds was observed on 10th December and 20th December 2017, and 1st January and 10th January 2018. Himalayan Griffon (%) with average temperature-humidity index (THI) values from May 2015 to April 2018 is depicted in figures 2, 3 and 4. During the disappearance period (from May 2015 to October 2015) of birds, the $THI_{max}$ values oscillated between 80.66 and 86.89. The period (from November 2015 to March 2016) when birds were observed at the reserve, the $THI_{max}$ values were either 77.03 or lower. Fig. 5 depicts changes in per cent population of Himalayan griffon during the study period with corresponding variations in the THI values. In each year, fall in THI values was associated with rise in bird population. Fig 6. reveals average monthly Himalayan griffon population from 2015-2018 with average maximum temperature humidity index ($THI_{Max.}$) values at JCRBRI.

In the first year of study, from November 2015 to April 2016, the variation in the average monthly per cent population of Himalayan Griffon was from 5.5 to 26.25%. In the second year of study, from October 2016 to April 2017, the variation in the average monthly per cent population of Himalayan griffon was from 7.77 to 100%. In the third year of study, from October 2017 to April 2018, the variation in the average monthly per cent population of Himalayan Griffon was from 1.88 to 97.22%.

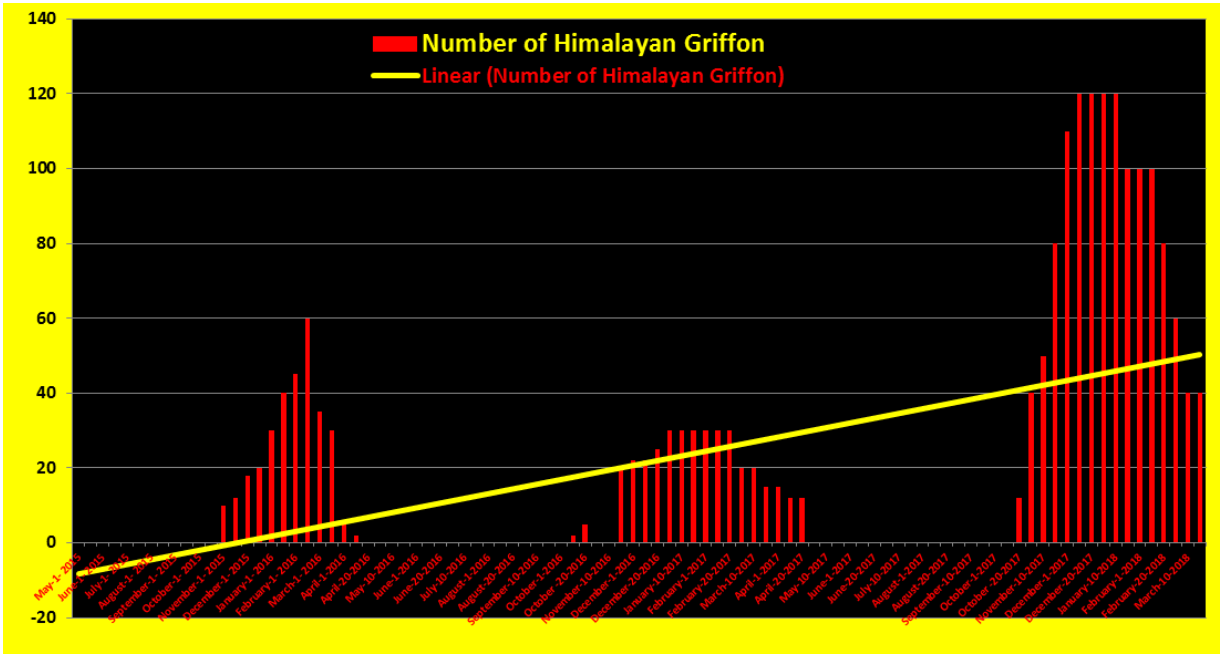


**Fig 1:** Number of Himlayan Griffon at Jorbeer Conservation Reserve, Bikaner, Rajasthan, India

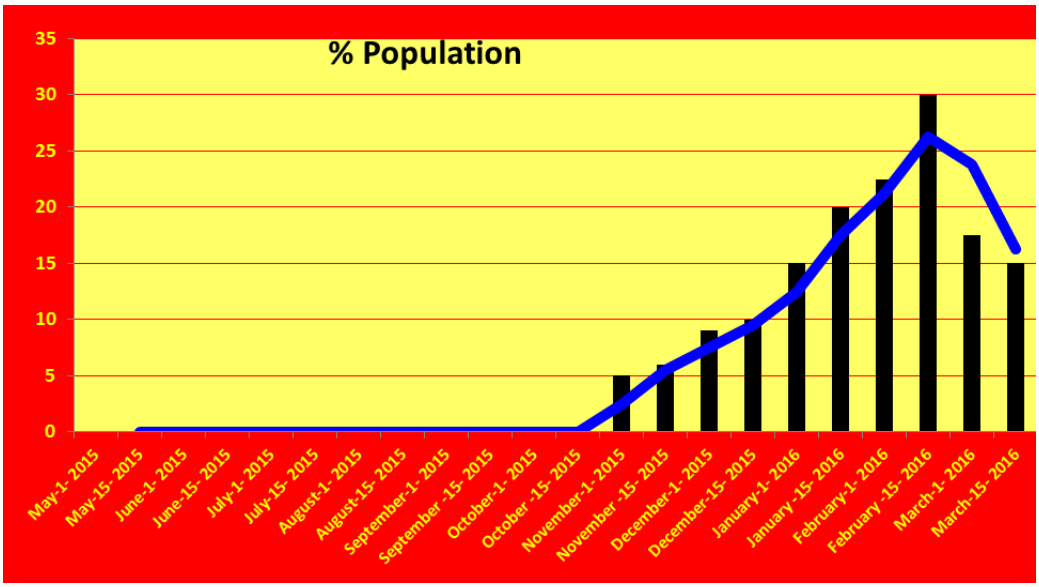


**Fig 2:** Per cent population and migration pattern of Himlayan Griffon during year 2015-16 at Jorbeer Conservation Reserve, Bikaner, Rajasthan, India

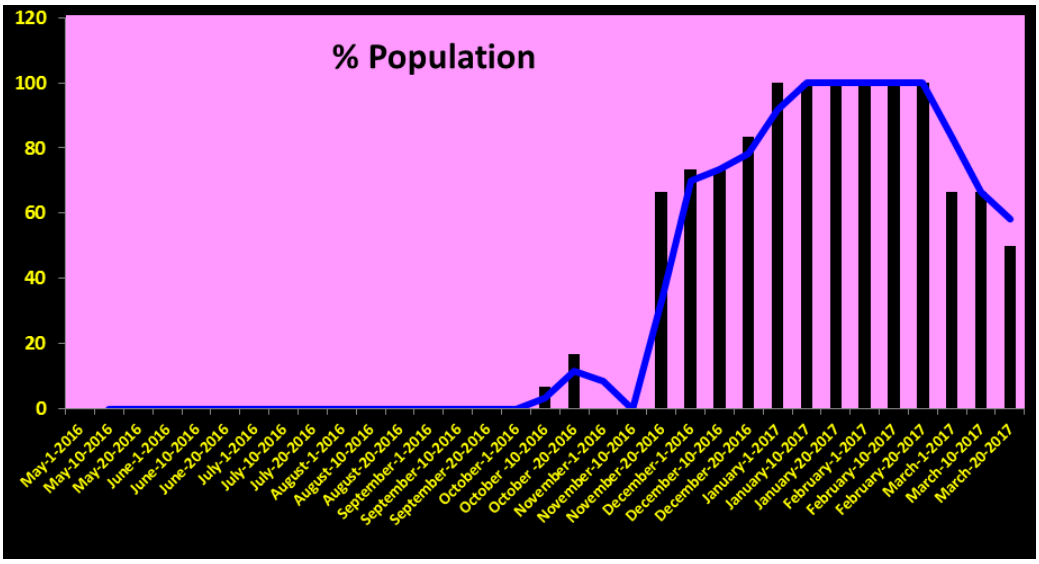


**Fig 3:** Per cent population and migration pattern of Himlayan Griffon during year 2016-17 at Jorbeer Conservation Reserve, Bikaner, Rajasthan, India

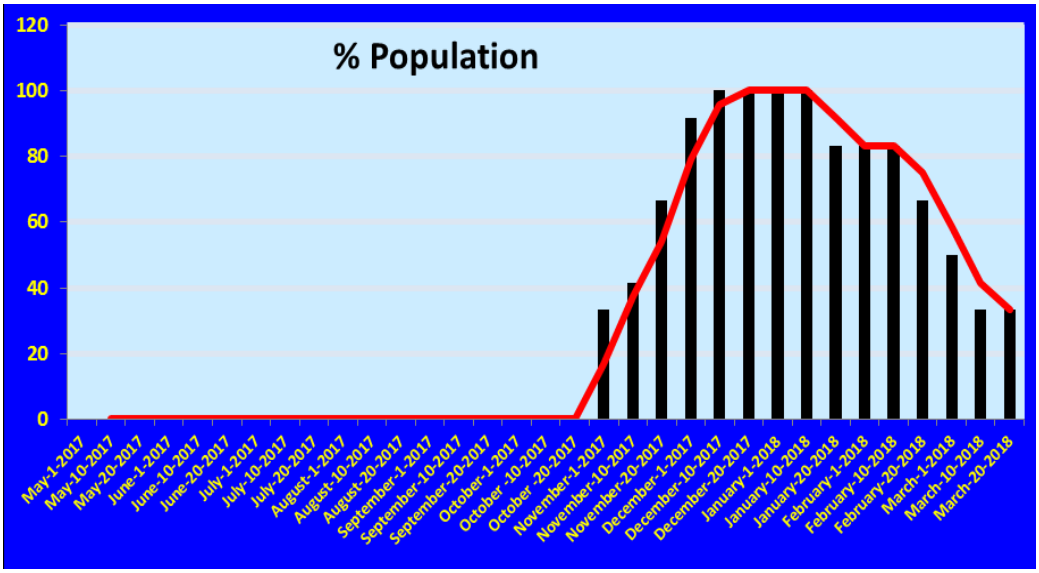


**Fig 4:** Per cent population and migration pattern of Himlayan Griffon during year 2017-18 at Jorbeer Conservation Reserve, Bikaner, Rajasthan, India

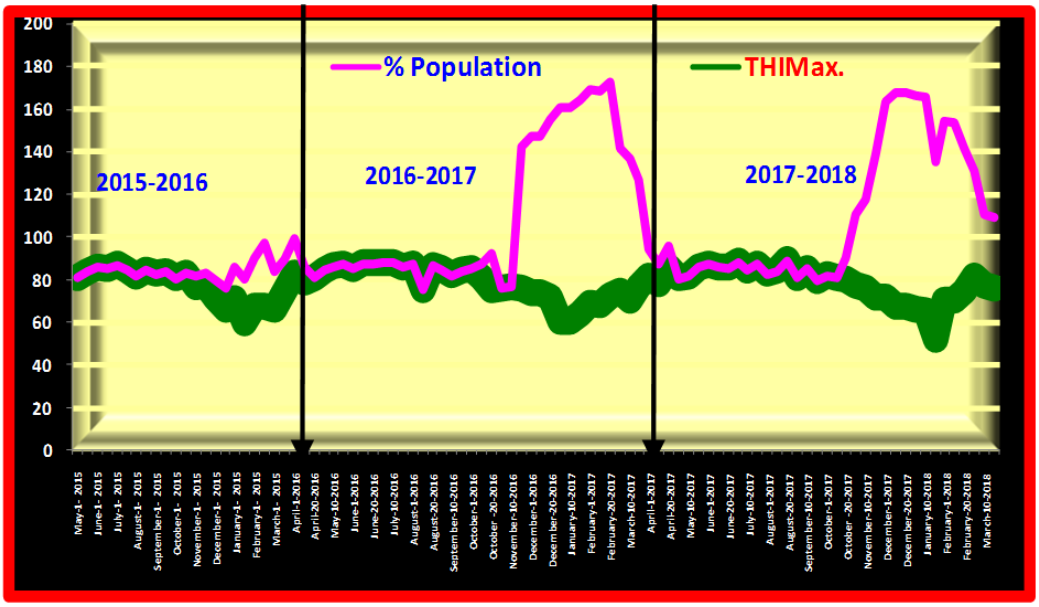


**Fig 5:** Himlayan Griffon (% Population) versus maximum temperature humidity index ($THI_{Max.}$) values at Jorbeer Conservation Reserve, Bikaner, Rajasthan, India from May 2015 to April 2018

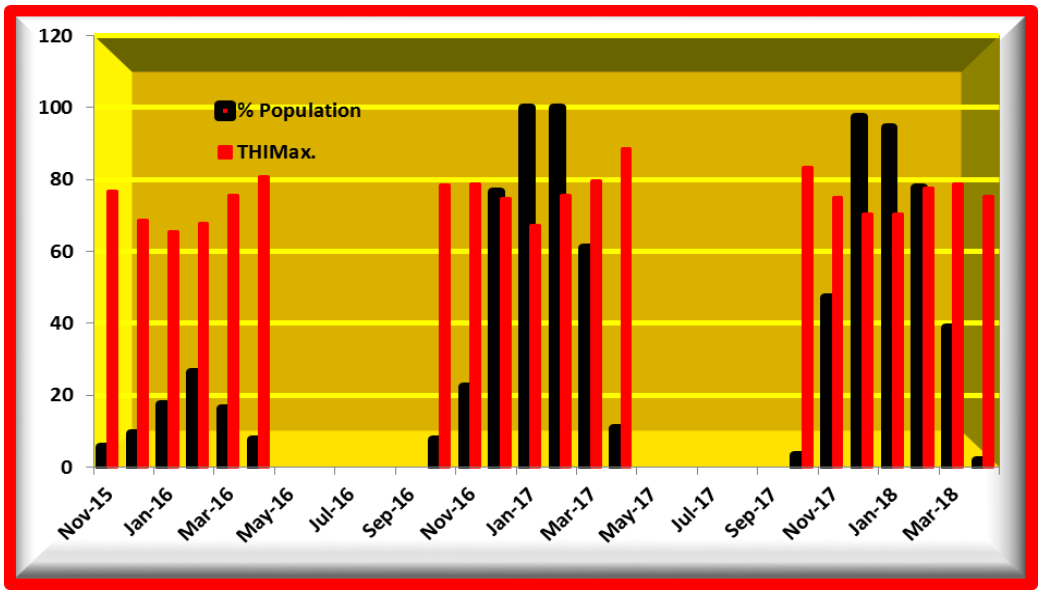


**Fig 6:** Average monthly Himalayan Griffon population from 2015-2018 with average maximum temperature humidity index ($THI_{Max.}$) values at Jorbeer Conservation Reserve, Bikaner, Rajasthan, India

Maximum number of Himalayan griffons were observed during the third period of study (2017 to 2018) on 10th December, 2017; 20th December, 2017; 1st January, 2018 and 10th January, 2018. The corresponding $THI_{Max}$. Values were 67.33, 67.33, 65.97 and 65.69, respectively. An overall picture of the presence of birds with corresponding $THI_{Max}$. values was appraised which was based on the maximum number of birds landed at the JCRBRI and then computing per cent of birds reached at JCRBRI during the period of three years. It was inferred that above 60% of birds preferred to stay at JCRBRI when $THI_{Max}$. Value was 74.71 or less than that. This showed the pattern of wintering at JCRBRI.

Doctrinaire monitoring of the number of birds and correlation with the environmental correlates can chip in critically in the conservation tactics of these birds. The variation in number can be undoubtedly appraised by counting the number of members in a flock. Usually score during months of March and April mark a reduction in the number revealing return of the birds to their breeding regions. Keeping the testimony of bird population during the process of migration have been used to support the itinerary of migrating population. Calculating inconsistency in a time-series from one epoch to the next is a way to make the data and to locate consequential correlations among irregular numbers. Visual methodology recommends listed information of birds at migratory places [10]. Researchers are giving serious thoughts to explore the doable potential perils to these bird which may encompass unreceptive environment or hunting.

The observations attained in the present exploration can be precious in devising easy stratum of Himalayan griffon during stay period. Ambient obstacles shroud important anguish over multiplication of birds in numbers, fortitude and prospective breeding managements.

## Conclusion

The date wise viewing of Himalayan griffon and the harmonized testimonials of environmental correlates can be employed for screening Himalayan griffon migration in the

region that may have remarkable impingement to assess migrant population. Migration time of Himalayan griffon vacillation conceivably due to environmental exposure threshold or other clandestine factors associated with the physiological reactions and ease of access of food. An overall picture of the presence of birds with corresponding $THI_{Max}$. values was appraised which was based on the maximum number of birds landed at the JCRBRI and then computing per cent of birds reached at JCRBRI during the period of three years. It was inferred that above 60% of birds preferred to stay at JCRBRI when $THI_{Max}$. Value was 74.71 or less than that. This showed the pattern of wintering at JCRBRI.

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