



## **Study of behavior of long-billed vulture after the death of juvenile in surrounding areas of Udaipur, Rajasthan**

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### **Abstract**

In long-billed vulture death of juvenile caused by various reason like; shortage of water and food, inbreeding due to small population, parasitic infection, high environmental temperature. Raptor success breeding rate and population size directly related to availability of nesting habitats & low level of pesticide pollution. In early morning vulture are physically and sexually low active but preening was more common activities carry out, followed by adults body movements, body and beak screeching. Where foraging, matting, sun basking, singing, nest constructions are almost absent. These time both adults movements at near old nest site was maximum as compare to other time of day. Late morning and early afternoon time: vultures was more time spend in thermoregulation as compare to other time of day followed by adults leave breeding colonies, re-mating and generally almost all activities performed by adults. In afternoon time; flying activity was more commonly performed and other activities in decreasing order- preening, allo-preening behavior and body and beak scratching in maximum time as compare to other day of day. Sunbathing, foraging, re-matting activity are not commonly seen in these time. In evening time adults are more sexually active (re-matting) sound produce before matting followed by foraging behavior and scat release were maximum as compared to other time of day and almost perform in some fraction of all activities. Allo-preening behavior was general shown in adults before mating and post-matting time, they are absent in early hours of morning. Threat of the vulture population decline is due to shortage of food and water, loss of breeding habitat, splitting of stone, unsuccessful hatching, calcium deficiency and various infectious diseases; responsible for vulture mortality.

**Keywords:** juvenile, genetic variation, beak scratching, Allo-preening behavior, calcium deficiency, vulture mortality

### **Introduction**

The south Asian vulture population has been declined first reported at Keoladeo National park, Rajasthan during mid 1980s to mid 1990s (Prakash, 1999) <sup>[14]</sup>. Seven species of vulture are resident in South Asia, and three of these, white-rumped, Slender-billed, Red-headed vulture are also resident in South-East Asia. These species were historically highly abundant in South Asia, as religious and cultural practices ensured a plentiful food supply of livestock caracasses (Houston 1985). Indian subcontinent have nine species of vulture (Ali and Reply, 1987), out of nine four species White-rumped vulture (*Gyps bengalensis*), long-billed vulture (*Gypus indicus*), red headed vulture (*Sarcogypus calvus*), slender billed vulture (*Gyps tenuirostris*) are listed in critically endangered species, other species are categorized into Egyptian vulture, Himalayan vulture, bearded vulture, cinoceros vulture, Eurasian griffon vulture are endangered according to International Union for Conservation of Nature Red data book (IUCN, 2017) <sup>[2]</sup>.

All vulture species play important role in our ecosystem and very beneficial scavenging birds, mainly feed upon livestock animal and other vertebrates. All vultures species population declined due to-loss of habitat, reduction in breeding sites, contagious disease, broad and largely used of veterinary diclofenac drugs, polluted environment, reduction of food availability and over exploitation & degradation of forest area and rocky cliffs(Prakash, 1999; <sup>[14]</sup> Asian vulture recovery workshop,2004; Chhangani, 2005) <sup>[5]</sup>. In Indian culture raptor always have a particular position as gaduda

usually the mount "vahanam" of the lord vishnu. They were also mentioned in the great Hindu epic Ramayana as jatayu and sampathi which were mainly the vulture and have high significant ecological, sociological and cultural value in India. They help in scavenging animal carcass and help in environmental cleaning. In raptor group, vultures are the one of distinct group which feed only on dead carcass and primary consumer of dead animals. All raptor have hooked beak, sharp talons, binocular vision and high hearing power, broad body size, different body shaped, they all characters build up for speed and well organizing hunter. Birds have various mechanisms for its survival and fight against pathogens. In these mechanism long included morphological adaptations, anti- parasitic mechanism and response through immune system of body (Clyton DH, Moore J 1997; Clyton *et al.*, 2010; Owen *et al.*, 2010) <sup>[13]</sup>.

Seven day continuous observation of adult parents behavior after neo-natal death, recorded all activities performed by those day.

### **Study areas**

Aravalli hill range also spelled Aravalli mountain system of northern India running northeasterly 560 kilometer through Rajasthan state. Our study area was located near Kalaishpuri village 35 kilometer away from Udaipur city. The study site was situated between Latitude N24°45.39" & longitude 73°43.062'E. The Most of vulture species are territorial and generally distributed in big area (Fuller and Mosher, 1981). There have been numerous number of long-billed vulture nest & other species were present in Aravalli area. These

sites are approximate 750 meter long and straight rocky cliffs, site hold small number population of long-billed vulture and Egyptian vulture.

**Materials and Methods**

Both adults, died juvenile and surrounding areas activities were monitored by the observers and the photograph were captured by Canon D-60, 150-500 sigma lens, Nikon Coolpix P900 and Nikon 8X40 binocular from the distance of 700 meter so that the individuals could be studied and recorded without disturbing them. The study area had five long billed vulture active nests, twelve adults individual, four long-billed juvenile and three nests of Egyptian vulture, six adults individual were present. Observation were taken from 24/3/2018 to 31/3/2018 at regular observation at 06:00 am to 06:00pm, activities were recorded by photograph and video recording of adults activity in hour basis. Adult activities were divided into three hours interval 6.00- 9.00 am, 9.01-12.00 pm, 12.01- 3.00 pm, and 3.01 - 6.00 pm. We were also observed neo-natal death whole seven days.

**Result and Discussion-**

Long billed vulture juvenile death had many reasons like-shortage of food, high temperature, parasitic infection, inbreeding and direct exposure of sunlight. Every month 4-5 carcasses were seen in surrounding areas, with no vulture were consuming the carcasses, high number of feral dogs was seen which where feeding on carcass and they also disturb vultures feeding. Raptors are among those species of birds whose number and breeding success depends upon the availability of nesting habitats (Newton, 1979) [11]. The reduction of roosting places and nesting habitat are main causes of population declination. The shortage of good nesting sites also reduces breeding success. The vultures are

large birds, having weight about 4-5 kg and hence need big strong trees and large rock cliffs of successful breeding. There are excessive mining in Aravalli hills, shortage of food and anthropogenic activities are responsible for declination of long-billed vulture population and its breeding habitat. The raptor populations are dramatically decline due to pesticide and insecticide concentration accumulation in tropic level (Ratcliff, 1967 [16]; Hickey and Anderson, 1968 [9]; Hickey 1969) [10]. Persistent high fat soluble and noxious products like- organo-chlorine pesticides are responsible for declining bird’s population (Prakash, V. 1989) [15]. Predatory animal and scavenger animals are the on top of the food chain and are among most influenced species (Newton, 1984) [12]. Small concentrations of organo-chlorines in body of birds have long lasting effects to disrupt breeding. (Newton, 1984) [12]. Some studies suggest that the population declining in vulture by toxicant and pesticide accumulate in body, leads to death of juvenile and adults. No studies have been carried out on the genetic diversity among *Gyps* species in India (Prakash, V. 1989) [15]. Populations declining are also linked with low level of genetic diversity. In raptor group population number and breeding success is also influenced by various disease. Various sign indicates by birds suffering from pesticide poisoning are aggressiveness, decrease in reproductive behavior, lack of alertness, poor egg incubation and decrement in territorial behavior.

Percentage of specific activity performed by adult long-billed parents =

$$\frac{\text{number of particular activity performed by long-billed vulture parents}}{\text{Total activity performed by long-billed vulture during study periods}} \times 100$$

**Table 1:** Showing various activities performed by long-billed vulture during different time interval and percentage of specific activity and total activities

Various activity performed by long-billed vulture	Activity	% activity 6.00-9.00	% activity 9.01-12.00	% activity 12.01-3.00	% Activity 3.01-6.00	% Total specific activity performed by adult
Both adult sitting away from old nest	Basaon	21.36	5.23	3.24	5.51	7.74
Foraging	Fr	0	3.14	4.32	4.72	3.22
Preening	Pr	29.05	11.51	15.67	17.32	17.25
Walking on rock	Wor	5.12	2.61	3.24	2.36	3.22
Both adult body movements	Babn	19.65	6.28	8.64	8.66	10
Both adult fly	Baf	3.41	4.71	11.89	3.93	6.45
One/ Two parents Return to old nest	O/t pron	6.83	6.8	3.78	2.36	5
Both adult construct new nest at new location By collecting wooden stick	Bacnnlbcws	0	3.14	8.1	5.51	4.51
Adult beak scratch on rock	Absr	5.12	2.09	7.56	4.72	4.83
One adult sitting at new nest location and one adult fly	Oasnlaof	9.4	18.84	3.24	11.02	10.8
Sunbathing behavior perform	Sbp	0	9.42	7.02	3.93	5.8
Both adult are leave breeding sites	Baabs	0	5.75	4.86	2.36	3.7
Both adult returns on new nest site	Barnns	0	8.37	3.78	6.29	5
Allopreening behavior performed	Apbp	0	4.188	8.1	5.51	4.83
Scat release	Sr	0	1.57	1.08	3.93	1.61
Sound produce	Sp	0	4.71	3.24	5.51	3.54
Re-mating performed	Rmp	0	1.57	2.16	6.29	2.41

Note- BASAON- Both adult sitting away from nest, FR-Foraging, WOR- Walking on rock, BABN- Both adult body movement, BAF- Both adult fly, O/T PRON- One/ Two parents return to old nest, BACNNLBCWS- Both adult construct new nest at new location by collecting wooden Stick, ABSR- Adult beak scratch on rock, OASNNLAOAF-

one adult sitting new nest location and one adult fly, SBP- Sunbathing behavior performed, BAABS- Both adult are leaves breeding sites, BARNNS-Both adult returns on new nest site, APBP- Allo-preening behavior performed, SR- Scat release, SP- Sound produce, RMP- Re-matting attempted, LBV- Long-billed vulture.

**Table 2:** Relationship between Activities percentage and different time intervals

Activities percentage Range	6.00am-9.00am	9.01am-12.00pm	12.01pm-3.00pm	3.01pm-6.00pm	Total range percentage activity
Very common (20%-30%)	11.76%	0	0	0	2.94%
Common (15%-20%)	5.88%	0	5.88%	5.88%	4.48%
Less common (10%-15%)	0	5.80%	5.88%	5.88%	4.48%
Least common (5%-10%)	23.52%	41.17%	29.41%	41.17%	33.82%
Rarely performed (0%-5%)	64.70%	52.94%	58.82%	47.05%	54.41%

### 1. Percentage of total specific activity performed by long-billed vulture

The analysis of Total percentage of specific/ particular activity performed by adult long-billed vulture were the most common activity PR (17.25%) followed by OASNNLAOAF (10.8%), BABN (10%), BASAON (7.74%), BAF (6.45%), SBP (5.8%), O/T PRON and BARNNS(5%), APBP and ABSR (4.83%), BACNNLBCWS (4.51%), BAABS(3.7%), SP(3.54%), FR and WOR (3.22%), RMP(2.4%) and SR(1.61%) showing in (Table 1 and figure 2).

### 2. Percentage of particular activity performed by long-billed vulture between 6.00am-9.00am-

The maximum activity performed in morning time by long-billed vulture were PR (29.05%), and followed by (21.36%), BABN (19.45%), Oasnnlaoaf(9.4%), WOR and ABSR (5.12%) and minimum activity were recorded BAF(3.41%), other activities were absent(Figure1). In morning duration sunbathing behavior, Allopreening behavior, matting attempt, sound producing activity, scat releasing activity are completely absent during study periods and both adult do not leave breeding site in early morning hours(Table 1 and figure 1).

### 3. Percentage of particular activity performed by long-billed vulture between 9.01am-12.00pm

The maximum activity performed by long-billed vulture were OASNNLAOAF(18.84%) and followed by PR (11.51%), SBP(9.42%), BARNNS (8.37%), O/T RON(6.8%), BABN (6.28%), BAABS (5.75%), BASAON (5.23%), BAF and SP(4.71%), FR and BACNNLBCWS (3.14%), WOR(2.61%), ABSR(2.09%) and minimum activity was reported RMP(1.57%) (Table 1 and figure 1).

### 4. Percentage of particular activity performed by long-billed vulture between 12.01Pm-3.00pm-

These times maximum activity performed by long-billed vulture was preening(PR) (15.67%) and other activity BAF(11.89%), BABN(8.64%), BACNNLBCWS and APBP (8.1%), ABSR (7.56%),SBP(7.02%), BAABS(4.86%), FR(4.32%), BARNNS(3.78%), BASAON, OASNNLAOAF and SP(3.24%), RMP (2.16%) and minimum activity was performed SP(1.08%)(Table 1 and figure 1).

### 5. Percentage of particular activity performed by long-billed vulture between 3.01pm-6.00pm

These times maximum activity performed by long-billed vulture again preening activity, Preening activity are more common in long-billed vulture in any time duration of day. Activity percentage were recorded PR (17.32%), OASNNLAOAF (11.02%), BABN (8.66%), BARNNS and RMP (6.29%), BASAON, BACNNLBCWS and SP (5.51%), FR and ABSR (4.72%), BAF, SBP and SR (3.93%) and minimum activity showed WOR, O/T RON and BAABS (2.36%). During evening time adults were not

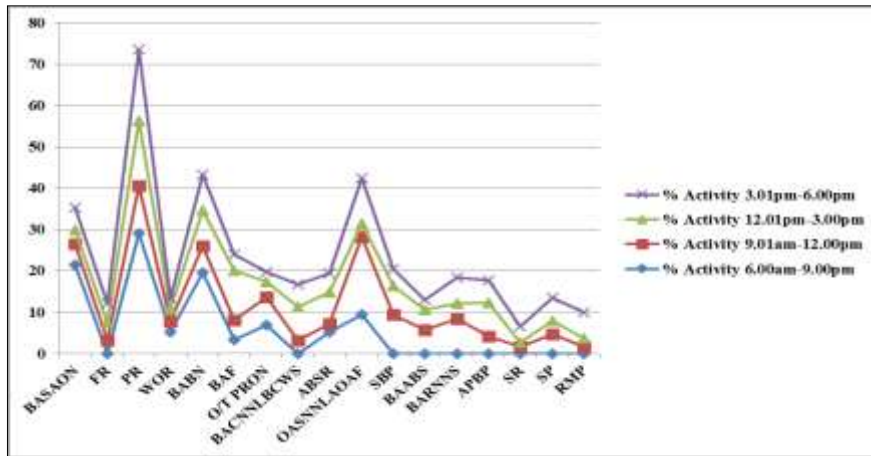
leave breeding sites, performed preening, all-preening behavior and also report mating attempt by adults (Table 1 and Figure 1).

### 6. Relationship between range of activities and percentage of activities performed by long-billed vulture in different time interval

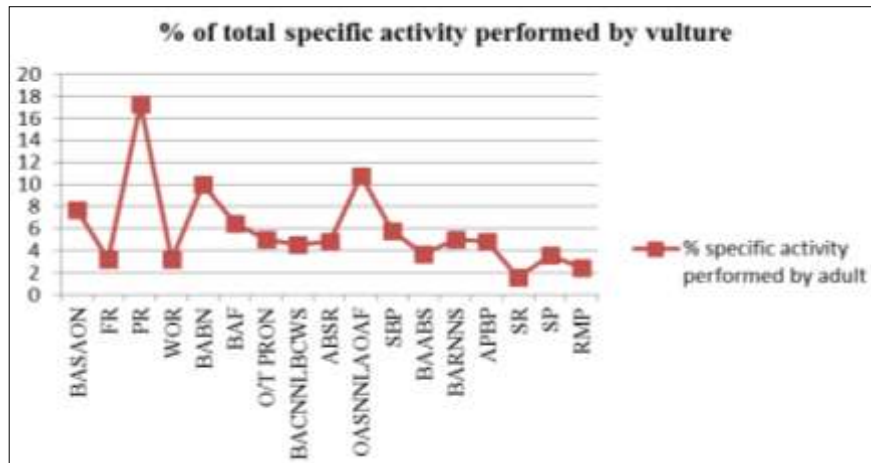
- A. 06.00-9.00am:** In early hours of morning very common activities were recorded (PR) and (BASAON) 11.76% percentage; where common activities (BABN) (5.88%); less common (0%); least common WOR,O/T PRON, ABSR, OASNNLAOAF (23.52%)and rarely performed means other activities were not performed by long-billed vulture in morning hours(Table2 and figure3).
- B. 09.01-12.00pm:** In these hours very common and less common activity was not performed by long-billed vulture, common activities were (PR) and (OASNNLAOAF) (5.88%); least common activities BASAON, BABN,O/T PRON, SBP,BABS,BARNNS (23.52%)and rarely performed activities observed in maximum percentage FR, WOR, BAF, BANCNNLBCWS, ABSR, APBP, SR, SP, RMP (64.70%)(Table 2 and figure 3) .
- C. 12.01- 03.00pm:** In these time environmental temperature raise, when long-billed vulture was perform almost activity including sunbathing, preening, leave breeding colonies, areal display behavior, foraging and also observed matting/copulation behavior. Afternoon time very common was absent, common (PR) and less common (BAF) activities are equal in percentage value (5.88%); least common (BABN,BACNNLBCWS, ABSR, SBP) (29.41%); rarely performed activity (BASAON, FR, WOR, O/T PRON, OASNNLAOAF, BAABS, BARNNS, SR, SP,RMP) (58.82%)(Table 2 and figure 3).
- D. 03.01-06.00pm:** In late afternoon and evening time long-billed vulture was more sexually active, because number of matting attempted was found in maximum number and more frequently compare to other time interval. Range of activities; very common was absent, common (PR) and less common (OASANNLAOAF) (5.88%), least common (BASAON, BABN, BACNNLBCWS, BARNNS, APBP, SP, RMP) (41.17%) and rarely performed activity (FR, WOR, BAF, O/T RON,ABSR, SBP, BAABS,SR) was reported (47.05%)(Table 3 and figure 3).
- E. Total range activity percent performed by long-billed vulture:** Very common activity was (2.94%), common and less common (4.48%), least common activity (33.82%), and rarely performed activity (54.41%) (Table 2 and figure 4). The presence of allopreening was also related with an increased to bonding between two partners in breeding seasons. However, there was not strong evidence for an association between allopreening and sexual fitness within seasons or time spent together outside the

breeding season (Brooke 1985 [4]; Villa *et al.*) Allopreening behavior we were also observed after post-neonatal death, they are performed by adult's long-billed vulture in pre- matting time as well as post-matting time; they were increase the matting attempt in vulture. Other aspect of allopreening, the removal of

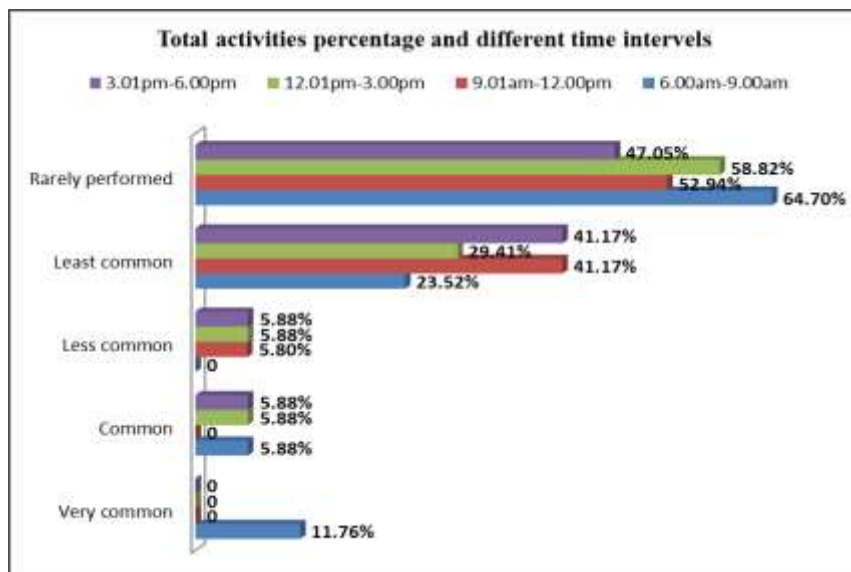
ectozoons, provided long term fitness benefit by maintaining the health of both individuals in species and monogamous paring (Black1996). These studies also suggest the daily fluctuation of activities according to their different time intervals in day time.



**Fig 1:** Percent of various activity performed by long-billed vulture in different time interval



**Fig 2:** Percent of total specific activity performed by long-billed vulture during study periods



**Fig 3:** showing relationship between activities percentage range and time interval by performing by long-billed vulture

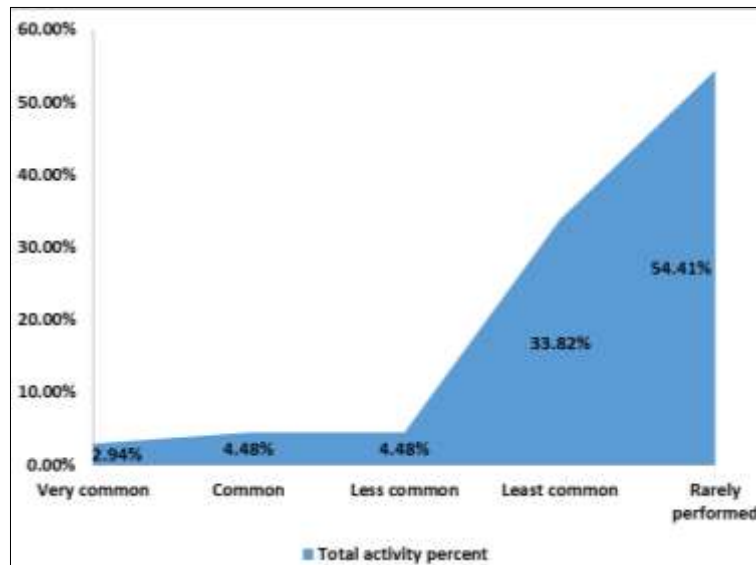


Fig 4: Showing total activities percentage by long billed vulture during study periods

**Recommendations for saving long-billed vulture**

The population of long-billed vulture has declined because of juvenile mortality, shortage of food, loss of breeding habitat and failed to egg incubation development. Population of other vulture species facing same problem in present time. The following step taken for save vulture population- Analyzed property of carcass tissue and toxicity in different region of county. Avoid human settlements,

infrastructure development and rail and road line near breeding colonies of vulture. Vultures are sensitive to human disturbance, so prohibited anthropogenic movement, illegal mining in breeding areas, vulture feeding sites or vulture restaurant established where long-billed vulture breeding colonies are present. Detail study of genetic diversity and threats analyze for vulture and continuous organized vulture awareness and conservation programs.



Fig 5



Fig 6



Fig 7



Fig 8



Fig 9



Fig 10



Fig 11



Fig 12



Fig 13



Fig 15

### References

1. Ali S, Ripley R. Compact handbook of the birds of India and Pakistan. Oxford University press, Delhi, 1987, 296-314.
2. Bird Life International Gyps indicus. The IUCN Red List of Threatened Species, 2017. e. T22729731A117875047. <http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T22729731A117875047.en>.
3. Black JM. Partnership in birds: the study of monogamy. Oxford (UK): Oxford University Press, 1996.
4. Brooke M de L. The effect of allopreening on tick burdens of molting Eudyptid penguins. Auk. 1985; 102:893-835.
5. Chhangani AK. Population ecology of Vultures in the western Rajasthan, India. Indian forester. 2005; 131:1373-1382.
6. Clayton DH, Koop JAH, Harbison CW, Moyer BB, Bush SE. How birds combat ectoparasites. Open Ornith. J. 2010; 3:41-71. (doi:10.2174/1874453201003010041).
7. Clayton DH, Moore J (eds.) Host –parasite evolution: general principles and avian models. Oxford University Press, 1997.
8. Henery CJ. Birds of prey. DDT. & Tussock Moths in Pacific Northwest. Trans. N. Amer. Wild. & Nat. Res. Conf. 1977; 42: 397-411.
9. Hickey JJ, Anderson DW. Chlorinated hydrocarbon and eggshell changes in raptorial and fish eating birds. Science. 1968; 162: 271-23.
10. Hickey JJ. Peregrine Falcon Populations. Their biology and decline. Uni. Wisconsin Press. Madison. Milwaukee and Landon, 1969.
11. Newton I. Population ecology of raptors. Poyser, London, 1979.
12. Newton I. Effects of Organochlorine pesticides on Birds. In: Proceeding of the second symposium on African predatory birds. Eds. Mendelsohn J. M. and C. W. Sapsford. Southern African Ornithological Society, Durban Natural History Society Museum, Natal, 1984.
13. Owen JP, Nelson AC, Clayton DH. Ecological immunology of bird-ectoparasite systems. Trends Parasitol. 2010; 26:530-539. (Doi: 10.1016/j.pt.2010.06.05).
14. Prakash V. Status of Vulture in Keoladeo National Park, Bharatpur, Rajasthan, with special reference to population crash in Gypus species. Journal of Bombay

- Nat. Hist. Soc. 1999; 96:365-368.
15. Prakash V. The General Ecology of raptors in Keoladeo National Park, Bharatpur, Rajasthan. Ph.D. Thesis. Bombay Natural History Society. Bombay University, Bombay, 1989.
  16. Ratcliff, Da. Decrease in eggshell weight in certain birds of prey. *Nature*. 1967; 215:208-210.
  17. Villa SM, Goodman GB, Ruff Js, Clayton DH. Does allopreening control avian ectoparasites. 2016; 54:170-177.