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PROMISING TREND OF IN SITU BREEDING OF ORIENTAL WHITE-RUMPED VULTURE *Gyps bengalensis* IN RAIGAD DISTRICT, MAHARASHTRA, INDIA: CONSERVATION IMPLICATIONS FOR RE-INTRODUCTION OF EX SITU POPULATIONS

Satish Pande¹, Preamsagar Mestri², Prashant Deshpande³, Amol Warange⁴ & Anil Mahabal⁵

^{1,3,5}Ela Foundation, C-9, Bhosale Park, Sahakarnagar-2, Pune, Maharashtra 411009, India

²'Gulmohor Colony', Near Chavdar Tale, Mahad, Raigad District, Maharashtra 402301, India

⁴Plot No. 50/A, Sahakarvinda Soc., R.P. Nagar, Kothrud, Pune, Maharashtra 411038, India

¹pande.satish@gmail.com (corresponding author), ²preamsagarm@gmail.com, ³detaman@gmail.com, ⁵mahabal.anil@gmail.com

Abstract: The population of *Gyps* vultures crashed at an alarming rate in India, from 85% since 1985–86 to 0% in 1997–99. There are sporadic records of sightings, wild breeding and captive breeding of *Gyps* and *Neophron* Vultures from 2005 to 2010 from various parts of India. We noticed continued, uninterrupted successful nesting of Oriental White-rumped Vultures *Gyps bengalensis* in their natural habitats in Raigad District, Maharashtra from 2004 to 2011. Their breeding population steadily increased from 10 pairs in 2004–2005 to 22 pairs in 2010–2011 and the nesting success steadily increased from 30% in 2004–2005 to 70% in 2010–2011. We feel that the naturally breeding populations are a must for successful re-introduction of the juvenile captive-bred vultures in the wild, and both in situ and ex situ breeding of vultures should be coordinated till the vulture population increases to an acceptable level and stabilizes in the Indian subcontinent. Identification of natural active nest sites is the foremost requirement for safeguarding the breeding of the Oriental White-rumped Vultures in private land by winning peoples' participation.

Keywords: Captive breeding, conservation implications, *Gyps bengalensis*, in situ breeding, Oriental White-rumped Vulture, re-introduction, wild populations.

Out of the nine species of vultures recorded from India (Ali & Ripley 1968), the Critically Endangered (BirdLife International 2012) Oriental White-rumped Vulture *Gyps bengalensis* and the Long-billed Vulture *Gyps indicus*, have declined by more than 95% throughout India

(Prakash et al. 2003, 2007; Green et al. 2004; Shultz et al. 2004; Naoroji 2007; Richard et al. 2011). The causes appear to be multi-factorial such as drugs like Diclofenac and Ketoprofen, scarcity of food, habitat loss, pesticide poisoning, and infections (Cunningham et al. 2003; Shultz et al. 2004; Poharkar et al. 2009; Pande et al. 2011). The nesting success of the Oriental White-rumped Vultures dropped from 82% in 1985–86 to 0% during 1997–99 in Keoladeo National Park, Bharatpur, Rajasthan (Prakash 1999). Though there are several reports of sightings of *Gyps* and *Neophron* vultures from various states in India (Iyer 2005; Pimplapure 2005; Bharos & Bharos 2010), there are only sporadic records of the successful nesting of *Gyps* vultures in their natural habitats (Devakar & Visavadia 2005; Kasambe et al. 2005; Gomathi 2006; Kamble 2011). Breeding of *Gyps* species in captivity has also been reported recently (Lahkar et al. 2010). While the vulture population crashed at an alarming rate in India, we noticed continued, uninterrupted successful nesting of Oriental White-rumped Vultures in their natural habitats in Raigad District, Maharashtra from 2004 to 2011. The breeding population of the vultures steadily increased from 10 pairs in 2004–2005 to 22 pairs

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in 2010–2011. Similarly the nesting success steadily increased from 30% in 2004–2005 to 70% in 2010–2011. We feel that the naturally breeding populations are a must for successful re-introduction of the juvenile captive-bred vultures in the wild, and both in situ and ex situ breeding of vultures should be coordinated till the vulture population increases to an acceptable level and stabilizes in the Indian subcontinent.

Methods

All observations of vultures were made during their breeding season (October–April) and later in each of the years from 2004 till 2011. Observations of the Oriental White-rumped Vulture were made at six independent breeding sites, at the foothills of the northern Western Ghats, two each in Mhasala Taluka (18°06'N & 73°08'E), Mangao Taluka (18°17'N & 73°17'E), and from the coastal region in Shriwardhan (18°08'N & 73°14'E) Taluka, in Raigad District, Maharashtra. The habitat of the first two sites is semi-evergreen type of forest while the last locality is coconut plantation near human habitation in the coastal region. All the localities were private lands outside protected areas. Weekly visits were made at all the sites and observations were made about the breeding behavior of adults, appearance of chicks in the nest and the feeding of the chicks in the nest and during the branching period by adults. For observing the nesting success we noted the number of young fledged from each nest in the entire study area. We also looked for nest occupation or abandonment. For those nests that were on the trees on the hill slopes, we made observations from a high vantage point with the help of binoculars. For other nests on the coastal region that were on the plains, observations were made by climbing on neighboring trees. All observations were made from a distance of about 25–40 m from the nest.

Results

We regularly observed some vultures in the study area from 2004 to 2011. All sites of the Oriental White-rumped Vulture were about 30–40 km from each other, encompassing an area of approximately 2025 km². In the year 2004–2005 six active breeding sites were recorded. Subsequently in 2005–2006 onwards till 2010–2011, only three sites remained active, one in each taluka.

The breeding season commenced in the third week of October; Ali & Ripley (1968) mention that nesting begins in November. In various sites, all the nests of the Oriental White-rumped Vulture were observed only on trees in the semi-evergreen forest. Only one active nest was seen on each tree. In one case two nests were seen on one tree but only one was active. The vultures used nine trees species for nesting, Mango *Mangifera indica*, Coconut *Cocos nucifera*, Arjuna *Terminalia cuneata*, Behada *Terminalia bellirica*, Devil Tree *Alstonia scholaris*, Beach Mahogany *Calophyllum inophyllum*, False Hemp Tree *Tetramelis nudiflora*, Indian Tulip Tree *Thespesia populnea* and Fishtail Palm *Caryota urens*, most located on private land. The average height of the trees on which the nests were built was 27 m (n=15; range 20–43 m). The average height of the nest from the ground was 21.2 m (n=15; range 15–35 m). However, in Anjarale, Murud and Deobag villages in coastal Maharashtra, seven breeding pairs were observed only on *Cocos nucifera* (Kamble 2011).

The number of nests in our study ranged from 11 in 2004–2005 to 25 in 2010–2011, of which, the total active nests ranged from 10 to 22 (Table 1). Further the locality-wise nest count during the study period is shown in Table 2. The maximum number of nests in one site, in Mhasala Taluka in 2010–2011 was 16 nests. The species is known to breed in colonies and also scavenges in flocks (Hume & Oates 1889–1890). During our observations in 2009–2010, in three nests in Mhasala Taluka, incubation was abandoned and no young fledged and the cause was not

Table 1. The population of Oriental White-rumped Vultures *Gyps bengalensis* from the year 2004 to 2011 in Raigad District, Maharashtra. It shows breeding adults, non-breeding birds and newly fledged birds, with total numbers of nests and active nests. * Non-breeders include sub-adults and adults.

	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11
Total nests	11	14	15	20	23	25	25
Total active nests	10	12	15	16	19	22	22
Breeding adults	20	24	30	32	38	44	44
Non-breeders*	10	11	5	10	11	12	12
Young fledged	03	03	05	09	13	14	16
Nesting success	30%	25%	33.3%	56.3%	68.4%	63.6%	69.5%

Table 2. Locality-wise and year-wise nest count during the study period.

Locality/Year	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11
Mangao	0	0	2	2	4	6	5
Mhasala	2	6	6	11	12	15	16
Shriwardhan	9	8	7	7	7	4	4
Total Nests	11	14	15	20	23	25	25

determined. Similarly, in Mhasala Taluka, the Changeable Hawk-Eagle *Spizaetus cirrhatus* attacked a nest of the vultures once in each year in February 2010 and 2011, when a chick was present in the nest. This eagle nested about 200m from the nest site of the vulture only during these two years. The plundered nest was subsequently abandoned. Ali & Ripley (1968) documented that this species lays only one egg per clutch (we assumed that only one egg was laid per active nest, because we could not ascertain the contents of the nests placed in trees at considerable heights). Nests were reused and new nests were also built during the study period.

Our observation showed that the eggs were laid between 18 October and the first week of December in each year during the study period. The exact duration of incubation and dates of hatching could not be ascertained. However, our observations reveal that the incubation period is at least 40 days. The chicks were first seen in the various nests between the end of November and the fourth week of January during the study period. The chicks fledged during February and early April. Branching period (when the young perch outside the nest on adjacent branches) was up to 45 days from fledging. This is probably the first record of the nestling and branching periods for this species. Feeding of the young by adults outside the nests, but in the same respective locality, was observed up to two years from the time of fledging. We identified the young based on plumage characteristics. Our observations revealed that nesting success (percent young fledged from active nests) increased from 30% in 2004–2005 to 69% in 2008–2009. It declined in 2009–2010 to 64% for unknown reasons, but again increased to 70% in 2010–2011 (Table 1). The breeding population of vultures in 2004–2005 was 10 pairs and increased to 22 pairs in 2010–2011. Although some vultures were regularly seen at the site throughout the year, there were some periods when no vulture was seen at the site for up to three days at a stretch.

Conservation Implications

Identification of natural active nest sites is the foremost requirement for safeguarding the breeding of the Oriental White-rumped Vultures in the future. Protecting such nest sites and conserving the existing nest trees on private lands cannot be effectively achieved without winning peoples' participation. The vulture population throughout India appears to be currently stabilizing with the substitution of toxic Diclofenac with Meloxicam (Richard et al. 2011). At present, successful attempts are also being made to breed the *Gyps* vultures in captive breeding programs (Lahkar et al. 2010). It is vital to note that naturally breeding populations are a must for successful re-introduction of the captive bred vultures in the wild; thereby, captive bred populations will get an opportunity to mingle with wild populations and learn the essentials of survival from their wild kin. Wild flocks of vultures are necessary to ensure the effective naturalization, long term survival and genetic stability of captive bred populations. Considering the present situation of declining vulture populations in India, both in situ and ex situ breeding of vultures should be coordinated till the vulture population increases to an acceptable level and stabilizes in the Indian subcontinent. The conservation importance of natural populations of various species of raptors is evident by the use of such nests for the successful re-introduction of orphaned or captive bred raptors in the wild in various parts of the world, where such chicks have been successfully fostered in the nests of their wild breeding counterparts (Wiemeyer 1981; Gonzalez et al. 1986; Rymon 1990 & Pande et al. 2004).

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