

- Short communication

Diurnal activity pattern of white-rumped vulture, *Gyps bengalensis* (Gmelin, 1788) in captivity during breeding season at Bangladesh National Zoo, Dhaka

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Vultures are scavenging birds of prey, play key role as a natural cleaner. Stomach acid of this bird is exceptionally corrosive, allowing them to safely digest carcasses infected with *Botullinum* toxin, hog cholera and anthrax bacteria that would be lethal to other scavengers and humans thus play important role in control of these diseases. Population of the white-rumped vulture *Gyps bengalensis* (Gmelin, 1788) and other resident species of *Gyps* vulture has declined very rapidly since the mid 1990s across the Subcontinent (Prakash *et al.*, 2007; Gilbert *et al.*, 2006). It is scientifically proven that the use of diclofenac (a nonsteroidal anti-inflammatory drug) in animals especially in cattle has led to massive mortality and a sharp decline in vulture population. Perhaps no other bird species in the world has suffered a more rapid decline than the vultures of South Asia. The bird is now critically endangered (IUCN, 2014) and facing high risk of extinction. Vulture populations in the wild are precariously small because of the low natural reproductive capacity and long duration of immaturity of vultures (even under the favorable conditions, the shortest period in which a wild vulture population can double in size is about ten years) and will remain vulnerable to adverse events until numbers have increased substantially (SAVE, 2014). The rate of the recent population decline was much more rapid than the most rapid possible rate of increase, with the population of the species most strongly affected by diclofenac halving every year (SAVE, 2014). If the rate of decline cannot be arrested, the species may disappear altogether from the Subcontinent in the next few years (Khan, 2013).

With this speed and uncertainty in mind, the precaution of taking viable numbers of this species into captivity (i.e., establishing a full-scale conservation breeding programme for future reintroduction once diclofenac had been removed) was agreed in 2004 as a key element of the Recovery Plan (IUCN, 2012; MoEF, 2006; ISARPW, 2004). The loss of tens of millions of vultures over the last decade has had major ecological consequences across the Subcontinent that pose a potential threat to human health (Swan *et al.*, 2006).

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In current situation there is serious threat to spread of these communicable diseases to livestock and humans. Thus, it is wise to conserve vultures for human benefits. Bangladesh is considering the development of a vulture conservation breeding centre (SAVE, 2014). In this context, there is a need to understand the in-depth scientific knowledge for better management and conservation of this species.

The proper scientific knowledge on activity pattern in breeding season is the first and foremost priority for management and conservation of a wildlife species. Quantifying animal activities can identify factors that influence animal behavior (Relyea *et al.*, 1994). Several studies on behavioral ecology of *Gyps* vulture were conducted in the Subcontinent. The available literature on the diurnal activity pattern of white-rumped vulture in Bangladesh is rare and imprecise. The present study was designed to know the diurnal activity pattern of white-rumped vulture in breeding season in captivity which may be useful in management practices of this species in both captivity and wild.

The study was conducted at Bangladesh National Zoo, Dhaka (23° 48' 43.69" N 90° 20' 40.32" E), situated in Mirpur about 16 km northwest from Dhaka city centre. Topographically, the Zoo area is more or less plain land with loamy and sandy soils (Ahmed *et al.*, 2013). Rainfall and temperature patterns delimit the annual cycle into three distinct periods: hot and humid summer from March to May, monsoon from June to October, and cool and dry winter from November to February (Ahmad, 1968). The study birds were kept in an enclosure (11.5×5.5×6.5m approx.), consists of concrete wall, iron bars and metal mesh. It contained feed trough, freshwater tank artificial nests, perches, shade and shelter. Every day 1-1.5 kg red meat (cow) was supplied by Zoo keeper around 10.00-11.00am. The experimental birds were observed for 10 days from November 2015 to April 2016. During the intensive study, the diurnal activities were recorded at two minutes interval by using scan sampling method as described by Altmann (1974) and Martin & Bateson (1993). Data were collected from 4 adult white-rumped vultures. The behaviour of one individual during the scan was recorded as one observation. The different activities were grouped into ten major categories *viz.*, feeding, roosting, sleeping, walking, performing breeding activity, flying, preening, wing flapping, chasing and bathing. Special activity of vulture, which was missed in the scan sampling, was recorded as *ad libitum*. Activities were quantified by counting the number of events (frequency or rate measures). The frequency distribution was compared by χ^2 -test. Graphical representation was prepared by using MS-Excel software (Ver. 2007).

The observation (n= 4787) showed that in captivity the white-rumped vulture spent most of time of their activity budget in roosting (56.34%) followed by preening (10.59%), walking (8.69%), performing breeding activity (6.79%), wing flapping (6.66%), flying (4.26%), feeding (3.03%), chasing (2.27%), sleeping (1.25%) and bathing (0.12%) (Fig.1). Chi-square analysis revealed, diurnal activities were varied significantly across the ten categories ($\chi^2= 11902.861$, df= 9, $\alpha= 5\%$, $p> 0.05$). The highest observation (n=1698) was collected in November and lowest (n=199) was in March. Time spent in all activities showed a wide variation in different months and also in different hours of the day. Gunawan (2005) reported differences in the daily activities in captive White-bellied

Sea Eagles *Haliaeetus leucogaster*. They started their diurnal activities at about 8.00-8.30am, when the light intensity increased and stopped before sunset. Flying from perches to ground, walking and wing flapping were very usual in morning sunlight. Prakash *et al.* (2012) reported that generally they did not attempt to fly until the day warms up.

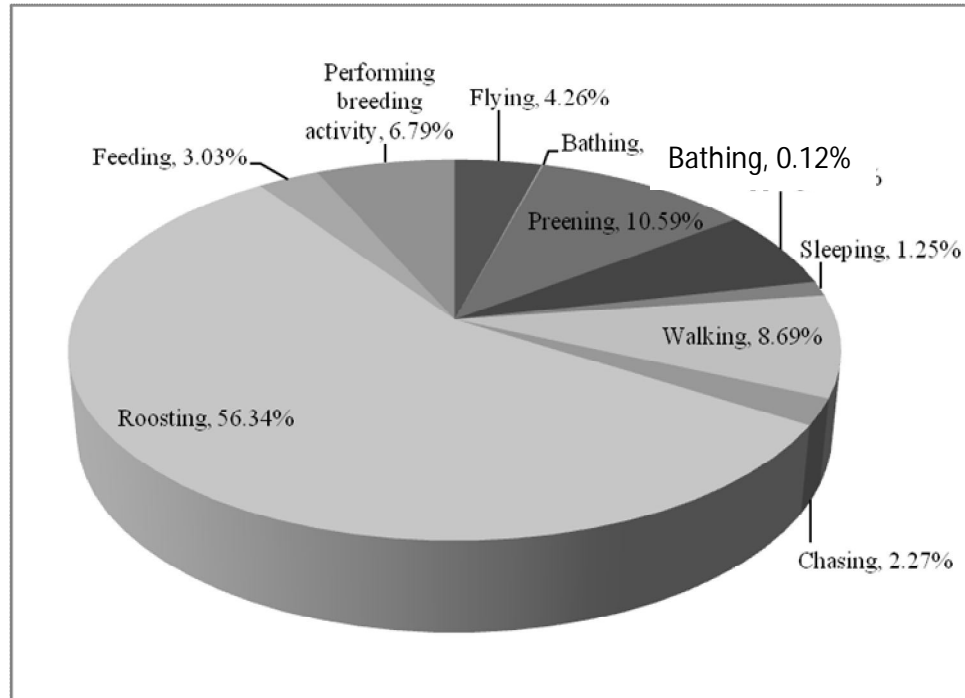


Fig.1. Percentage of time spent in different activities by white-rumped vulture in captivity at Bangladesh National Zoo, Dhaka

There are many factors that affect activity patterns of animals such as climatic difference, cycles of light and dark, phases of the moon, biological cycles, temperature cycles, regular feeding bouts and predation risk (Lehndal, 2008; Kamler *et al.*, 2007). The activity budget is mainly constrained by digestion time rather than searching time (Owen-smith & Novellie, 1982; Belovsky, 1978). In the present study, we observed that white-rumped vulture remained inactive (i.e., roosting and sleeping) over half (57.59%) of its time of activity budget in captivity. The finding is supported by Lehndal (2008), who reported most animals divide their time into two fundamentally different behavioral states: activity and rest. Moreover, in captivity food is available during the course of the day and there is no predator pressure thus spend most of their time in resting; and Prakash *et al.* (2012) noted due to their large size, vultures need to conserve energy and avoid demanding activities. Like the largest carnivores, *Gyps* vultures conserve energy by remaining inactive whilst digesting their relatively large meal. Neck drooping posture was sighted during sleeping. Feeding activity was related to food supply by the Zoo authority. Vultures were observed to take small amount of fresh supplied food and avoided taking

stale food. Sometimes, they did not take any supplied food in the whole day. In healthy vultures sufficient food can be taken into the crop at one meal to last several days (Prokash *et al.*, 2012). They spent only 3.03%, (n= 145) of its active time in feeding. Paired dominant vulture chased away the others just after food supply. Birds chase and bite one another during food taking (Prakash *et al.*, 2012). The highest feeding activity (n=68) was recorded in January. Usually, during breeding season female takes extra food and the majority of breeding activities were recorded between November and January.

The study was also aimed to investigate the breeding success of white-rumped vulture in captivity at Bangladesh National Zoo, Dhaka. White-rumped vulture bred from October to April (Baral *et al.*, 2005); therefore, observation was carried out during the breeding season. The majority of breeding activities (n=294) were recorded from November to January. The vultures were sighted on sitting and roosting (n=88) together which was the probable sign of courtship displays (Prakash *et al.*, 2012). The pair was also involved in nest building activities and observed to collect branches of tree from the ground and rearranged nesting materials. The paired vulture were observed in copulation (n=16). During mating male bit on the neck of female and the female produced harsh sound. Most *Gyps* vultures generally make a low creaking/grating/hissing type of noise during copulation (Prokash *et al.*, 2012). The paired vultures used to sit (n=40) in the artificial nest. Sometimes displaced other by bite to take over the nest. During the observation period, we did not record any egg. Further intensive study could find the exact reason of failure of egg laying subsequently breeding success of white-rumped vulture at Bangladesh National Zoo, Dhaka.

Agonistic interactions were also noticed, although white-rumped vulture lives in group peacefully. The paired individual chased away (n=109) by biting with harsh sound or expanding the wings move forward if any other individual approached to interact breeding pair. Sometimes, their forelimbs were also used to flee away others. One individual was observed with injured neck. Vultures can be susceptible to disturbance during the breeding season and can injure themselves in enclosures if disturbance is not kept to a reasonable, manageable (Prakash *et al.*, 2012). White-rumped vultures did not get scared of human presence and remained undisturbed during the study period. The present study can be useful for understanding the behavioral activities of white-rumped vulture which may provide more appropriate management practice both in wild and captivity. We suggest more intensive studies (such as, comparison of behavioral patterns between captive and wild population) are greatly needed to provide a sound basis for understanding the activity patterns of the species or proper captive management of zoo animals.

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