

Study of vultures in Western Lowland of Nepal

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By:

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Background

Nepal has exceptionally rich bird diversity because of its position between the meeting point of two large zoogeographical realms (The Palearctic and Oriental) and the great variation in altitude, topography and hence the vegetation and microenvironments. A total of 857 bird species have been recorded in Nepal (BCN 2002) which covers an area of 1,47,181 Sq. Km. It has been noted that nearly 650 bird species breed within the country and as many as 130 species are considered as threatened species (Inskipp and Inskipp 1991, Baral et al. 1996). Nepal holds as many as 29 globally threatened species (BirdLife International 2000). Nine species are feared already extinct from the country because of habitat loss, hunting, trapping poisoning, pesticides, food/prey shortage (Baral et al. 1996). Only nine species of birds have been kept in protected bird list in the National Parks and Wildlife Conservation Act, 1973 of the HMG, Nepal. More or less upto date information has been known and well documented about the general bird distribution, species richness and overall status of birds especially that of protected areas (Inskipp and Inskipp 1989, Baral and Upadhyay 1998, Baral 2000, Karki and Thapa 2001).

Much has been known about the general bird distribution and species richness in Nepal (Inskipp and Inskipp 1991). Similarly, some globally threatened species, as categorized by BirdLife International 2000, have been well studied by the following scholars: Bengal Florican *Houbaropsis bengalensis* (Inskipp and Inskipp 1983, Pokharel and Dhakal 1998, Tamang and Baral 2000, Timilsina *et al.* 2000), Sarus Crane *Grus antigone* (Suwal 1999), Swamp Francolin *Francolinus gularis* (Baral 1998a, Dahal 2000), Lesser Adjutant *Leptoptilos javanicus* (Pokharel, 1998), Hodgson's Bushchat (Baral 1998b). This has greatly helped for the avian conservation and research within Nepal.

Unfortunately so far no study on vultures has been conducted in Nepal before 2000 besides general records of their numbers. Vultures are the largest flying birds in Nepal and are closely associated with human kinds in different ways. They are the most efficient scavenger of the nature and help to maintain the clean sanitation. Therefore, they prevent the outbreak of epidemics and reduce the foul odor by cleaning the carcasses before they purify and thereby help to keep sound environment around us (Giri and Baral, 2001).

The White-rumped Vulture (*Gyps bengalensis*), resident of below 1000 m. and recorded upto 1800 m. in Summer, has been the most common and wide spread vulture of lowland Nepal (Fleming *et. al.*, 1984, Inskip and Inskipp, 1991). It is found west from Pakistan (Baluchistan), east through Assam and Manipur, South from Kashmir and along the Himalayas including Nepal, through the Peninsular to Kanyakumari (Ali and Ripley, 1987). Long billed Vulture complex (*Gyps indica indicus* and *Gyps indica tenuirostris*) has been well studied and now suggestion is to treat former two subspecies as full biological species (Rasmussen and Parry, 2000). The Slender-billed vulture (*Gyps indica tenuirostris*) is believed to occur in Nepal (Inskipp and Inskipp, 1991). The Cliff vulture, *Gyps indicus*, may occur in Nepal but there is no confirmed record yet (Giri and Baral, 2001).

Decline in vultures have been noticed for ten or more years in Southeast Asia and India (Thiollay, 2000). Pesticides are known to affect bird population in a slowly and gradually (Satheesan, 1999a). The White-rumped Vulture was "resident and wide spread" in Thai-Malay Peninsula previously become "local and sparse" now (Wells, 1999). However since 1997, the White-rumped Vulture have been deserting at alarming rate in parts of northern India and lowland Nepal (Risebrough, 1999, Rahmani 1999, Prakash, 1999).

Significant population declines of vultures may have gone unnoticed for many years simply because they were so abundant. In Keolado National Park of India, the numbers of active

nests of White-rumped Vulture have decline to 353, 150, 25, 20 and none in the year 1987/88, 1996/97, 1998/99 and 1999/2000 respectively. A total of 265 dead White-rumped and 29 Slender-billed vultures were recorded in 1999 only. In 1987 to 1999, a total of 96% of White-rumped and 97% of Long billed Vulture population declined in Keolado only (Prakash 1999).

Slender-billed?

Vultures have been declining in many parts of Nepal especially the White-rumped and long-billed. It was reported that they had breed in Kathmandu Valley as recent as 1950s (Inskipp and Inskipp 1991). On average of 30 – 40 White-rumped Vultures were regularly noted in Kathmandu valley in 1980 to 1982 (Inskipp 1980, 81, 82). Only a few (3 in Feb. 1991 and 2 in Feb.1993) number of White-rumped Vultures were recorded in Kathmandu valley (Baral 1991, 1993b). A bird survey in Gokarna landfill site Kathmandu in 1996 recorded no any vulture species (Giri 1996, Panthi 1996). Almost no records of these birds came from Kathmandu valley during last four years. Very small number of white-rumped and Long billed Vultures were recorded in Chitwan and Bardia National Parks in 2001 in comparison to 1982 and these two species are almost entirely absent in eastern and central Nepal in 2001 (Inskipp and Inskipp 2001). No any vultures nest has been recorded from Chitwan National Park since last five years, once a major breeding strong hold of White-rumped Vultures previously, except few flying individuals.

The large number of vultures (38 White-rumped Vultures and 13 long billed vulture and 12 Eurasian griffons (*Gyps fulvus*) recorded at Suklaphanta on April 23, 2001. It is a far higher number than all of the vultures found else where on our visit of Nepal in 2001, and a significantly higher total in one flock than has been recorded by other observe in the last year (Inskipp and Inskipp, 2001).

Vulture population in Koshi area also sharply decreased last year in comparison to last few years (Giri and Baral 2001). Sixty-one vulture nests of last decreased to twelve this year. Out of these sixty-one and twelve nests of 2001 and 2002 only nineteen and two nests were fledged the chicks respectively. A total of forty-six dead vultures were recorded last years while only three were recorded this year. Thus there is massive decline of White-rumped Vulture in Koshi area this year in comparison to last year.

Geography and bio-diversity of the reserve

Location

Royal Suklaphanta Wildlife Reserve is located in the Far-Western Terai, on the southwest edge of Nepal in an elevation of 176 m from see level. It covers an area of 305 Sq. km. and lies between 80°25'E and 28°35'N. It protects last remaining herd of Swamp Deer (*Cervus duvaucelli*) along with Royal Bengal Tiger (*Panthera tigris*), Wild Elephant (*Elephus maximus*) and other important wildlives. The reserve and its surrounding areas are comprised of flood plains of various river system, like the Mahakali, Bahuni, Radha Syali and Chaudhar with hill wash and alluvial deposits (Baral, 1998b).

Geography

The Suklaphanta offers a variety of new experiences with its diverse interior and abundant geological features, flora, fauna and other components. Forests, streams and rivers, lakes and several large phantas (grasslands) like, Singpur Phanta, Barkaula Phanta, Radhapur Phanta, Jhilmila, Mangalsera, Malumela, SuklaPhanta etc comprise the good habitat of the reserve. Amongthem Suklaphanta is the largest one and regarded as core habitat of Swamp Deer

(Currently more than 2500 individuals) for which the reserve is named.

Vegetation and habitat diversity

Basically, following major types of habitats have been found in Royal Suklaphanta Wildlife Reserve.

- (a) Sal dominated forests which covers the major forest areas of the reserve.
- (b) Mixed forests which covers an average of 20% of total forest area and found different tree species in mixed distribution pattern like *Shorea sobusta*, *Terminalia tomentosa*, *Syzygium cuminii*, *Plerocarpus marsupium*.
- (c) Riverine forests of Sissoo, Khair and other broad-leaved tree species which extends an average area of 20% of the total forest area and runs along the riversides.
- (d) Wetlands/Marsh areas which dominated by marsh/aquatic vegetation along with tall grasses around like *Phragmites karka*, *Saccharum munj* etc. Ranital, Sikautal, Salghandital and other river sites serve as wetland habitat for many birds, mammals, herpetofauna and other wildlife.
- (e) Grassland/Phanta areas the main feature of the RSWR is the occurrence of several large open field of grasses known as phanta and cover the major area of the reserve. The dominant grass species found in phanta are *Saccharum spontaneum*, *Saccharum munj*, *Imperata cylindrica*, *Vertiverica zizanioides*, *Pragmites kalk*, *Heteropogon contortus* etc. *Bombax ceiba*, *Albezzia procera*, *Ficus religiosa*, *Bueia frondosa* are the major tree species growing along the periphery of the phantas, which provide good nesting habitat for the vultures.

Other important flora found in the reserve are *Trewia nudiflora*, *Terminalia chebula*, *Schima wallichii*, *Anthocephalus cadampa*, *Adina cardifolia*, *ficus glomerata*, *Dillenia pentagyna*, *Aegle marmelos*, *Phyllanthus emblica*, *Lagerstromia parviflora*, *Codrela tooma*, *Butia monosparma*, *Dalbergia sissoo*, *Mallotus phillipinensis*, *Bauhinia vahlii*, *Terminalia belarica*, *Albezzia procera*, *Ficus religiosa*, *Calotropis procera*, *Dalbergia latifolia*, *Ficus lacor*.

Bahunia vahlii, *Vitis latifolia*, *Dioscorea deltoidea*, *Wendlandia puberula* etc. are the main vines found in the reserve (Velde, 1997).

Faunal diversity

Royal Suklaphanta Wildlife Reserve serves as a home for many endangered, rare and common species. It harbors good number of Wild Elephant, Rhinoceros (*Rhinoceros unicornis*), Royal Bengal Tiger, Leopard (*Panthera pardus*), Swamp, Blue bull (*Boselaphus tragocamelus*), Barking Deer (*Muntiacus muntjak*), Langur (*Presbytis entellus*), Pangolin (*Manis crassicaudata*), Python (*Python molurus*), Crocodile (*Crocodylus palustris*), and other many common Wildlife (DNPWC, 2000).

A total of 372 bird species has been recorded in this relatively small reserve (Baral and Inskipp *in prep.*). This reserve is especially important for grassland birds. In addition to supporting the country's most important population of Bengal Floricans, (Inskipp and Inskipp, 1983), it hosts good population of three globally threatened grassland species, Bristled Grassbird and Finn's Weaver (*Ploceus megarhynchus*) and Hodgson's Bushchat (*Saxicola insignis*). The latter is a regular winter visitor (Baral 1998b). Other grassland specialties notably Bright-apped Cisticola (*Cisticola exilis*), Rufous-rumped grassbird (*Graminicola bengalensis*) are fairly common and there is a small population of Jerdon's Bushchat (*Saxicola jerdoni*) (Inskipp and Inskipp, 2001). Besides these, it has White-rumped

Vulture, Slender-billed Vulture, Lesser Florican (*Sypheotides indica*), Swamp Francolin (Inskipp and Inskipp 1991). Oriental Pied Hornbill (*Anthracoceros coronatus*), Grass Owl (*Tyto capensis*), Striated Grassbird (*Megalurus palustris*), Pallas's Fish Eagle (*Haliaeetus leucoryphus*), Sarus Crane and many other important globally threatened avifauna are also the inhabitant of the reserve (Baral and Inskipp *in prep.*).

Climate

The reserve is under the tropical climate with more than 90% annual precipitation in monsoon season (June – September). The reserve has three seasons, the winter, spring and monsoon. The winter season starts in October and lasts in early March during which the weather is dry, the temperature decreased minimum of 7°C in January. The spring begins in March and lasts in June. April and May is the hottest months in which the temperature warm upto 37.49°C. The monsoon usually begins with early July to the end of September. The mean annual rainfall of last ten years was 1844 mm. and maximum rainfall (2446 mm) was recorded in 1998.

Mean data of temperature and rainfall of the year 1991 to 2000

| Year | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|--------------------------------|--------------|--------------|---------------|--------------|--------------|---------------|--------------|--------------|------|----------------|
| Mean Maximum Temperature | 31.5 | 31.0 | 30.3 | 30.9 | 30.2 | 29.8 | - | 30.0 | 30.7 | 29.6 |
| Mean Minimum Temperature | 16.1 | 16.5 | 16.9 | 16.7 | 17.2 | 17.2 | - | - | 17.4 | 17.2 |
| Rainfall – Annual Total in mm. | 1565 | 1257 | 1964 | 1617 | 2135 | 1643 | 1626 | 2446 | - | 2342.6 |
| Maximum in month | 136/ July | 154/ Aug. | 142/ Sept. | 112/ July | 190/ Aug. | 111/ Sept. | 118/ Aug. | 139/ Aug. | - | 158.8/ Aug. |

Source: Yearbooks of Department of Hydrology and Meteorology, Babar Mahal, Kathmandu.

Objectives

The main aims of this study were to assess the population of White-rumped and Slender-billed Vultures, to estimate the food availability, to quantify the mortality rate and breeding success in western lowland, Suklaphanta Wildlife Reserve, Nepal. Therefore, the data collection sheets were designed to answer at least the following points –

- (a) Breeding success of both the vulture species.
- (b) Food/ carcasses availability.
- (c) Number of dead vultures / mortality.
- (d) Estimated population of White rumped and Slender-billed Vultures.

Materials and methods

A preliminary survey was thoroughly made throughout the reserve except the proposed buffer zone and currently extended area. The preliminary survey was made especially in those areas where many vulture nests and vulture movements were abundant in previous year. Other possible sites were also surveyed thoroughly if there were suitable habitat. Pipariya, Barkaula Suklaphanta, Radhapur Jhilmila Singapur, Ranital, Babatal, Siwarital Mangalsera, Malumela areas were the localities of carefully surveyed. Besides these, forests with tall trees were also thoroughly watched. The western part, which is the borderline of Nepal and India, was thoroughly surveyed. All possible important habitats were searched for vultures and their nests.

The nest trees were identified, permanently marked and nest number was given to minimize the risk of data inter mixing. All nests were regularly monitored in every month and it was made possible by trained field assistants. Nest was recorded till mid-May. Number of and successful nests were noted. Well-planned data sheets were used to collect the data.

The Phantas were visited on foot to find the carcasses. Carcass types, conditions, number of vulture were also recorded properly. Not only the different sites of reserve, nearby villages were also surveyed in every field visit and data on carcasses were taken in the assistance of local people. But the interior part of the large phantas like, Suklaphanta was left due to security problems from wildlife.

Regular visits below the nesting trees and roosting colonies were made in every field trip. The ground below the nesting/roosting colonies carefully searched. The species and age classes of dead vultures were noted and either permanently marked or removed to minimized the chances of repetition in subsequent count.

A telescope and a pair of binoculars were used for distinct visualization. Field book by Grimmett et al. 2000, Birds of Nepal was used to identify the individual vulture species. Birds were counted at regular intervals at different study sites to quantify overall numbers. Main focus was given to White-rumped and Slender-billed Vultures in population counting. A total of four visit, each of at list four to five days, were made in every two months by researchers and whole days (06.00 to 17.00 hours) were spent in the field.

Besides this, a pilot survey of vulture in Royal Bardia National Park and Khairapur area where a survey was made last year also completed. Vultures seen on the way Chitwan to Bardia and Mahendranagar also recorded and nest status of possible nests located along the road site were monitored in every visit.

Results

Distribution of nests on different tree species is shown in table 1 and figure 1 below. A total of 15 nests (79%) were built on Silk-Cotton tree (*Bombax cieba*) three (16%) on Pipal (*Ficus religiosa*) and one (5%) on Karma (*Adina cordifolia*) trees. Only one Pipal tree contained double nests and both are abandoned. Excluding this, all other nests were located singles (table 1 and figure 1).

All nests were not recorded during the beginning of the study. During the first visit, birds were making their nests and a total of 9 nests were (5 White-rumped, 3 Slender-billed and 1 unknown) recorded. Rest of all (19 nests) was found in January. A total of 8 nests were active with parents sitting on the nest out of these. Out of these 19 nests, 9 belonged to White-rumped, 7 Slender-billed and 3 unknown from the beginning. The number of vacant nests increased from late January to afterward unexpectedly may be due to increased rate of nest abandonment like in Koshi (Giri and Baral 2001)(Fig.2).

Although a large area was searched, nest concentrations were found mainly to the western border line of the reserve between Pillar no.23 to 27, in the southwest border marginal line (Nepal and India) of the largest grassland, Suklaphanta. A total of 15 nests were located in this site. Only 2 nests in Jhilmila, 1 in Bahunikhola and 1 in Singhpur were recorded. Out of these nineteen nests, only three nests (2 white-rumped and 1 Slender-billed) were able to fledge their chicks. Other nests were deserted at various stages of nest building and incubation (Table-2).

A total of 38 different types of carcasses were recorded in and around the study area in different seasons of the study period. Of these, 18 were Swamp Deer, 5 Spotted Deer, 9 cows and 6 buffaloes. Twenty-three carcasses were found within the reserve while 15 carcasses of domestic animals found in the human settled areas adjoining the reserve either in opened form or slightly covered with soil. Some properly dumped animals were not counted because they did not serve as food material of vultures. Most of Deer carcasses were found in open grassland while some were in the near by forest strips. Only a few carcasses were found in fresh and partially consumed state, rest all were completely eaten and only the skeletons were left. Most of Deer were killed by Tiger and consumed by vultures latter on the left amount. The highest number of Deer carcasses, as many as 12 out of 18, were recorded in Suklaphanta, 3 in Barkaula and rest three in different localities of the reserves (see Table -3 and Figure-3).

A total of seven dead vultures were recorded during the study period in different nesting localities. Out of these, five were white rumped (three adult, 1 sub-adult and 1 juvenile) and two adult Slender-billed Vultures. Only a dead vulture was found with full body while others were either fully or partially consumed. Identification of fully consumed vultures was made possible due to the remains of wings. The number of dead vulture could be more if all the Phantas were thoroughly surveyed which was not possible during this study due to tall grasses, interference of Wild Elephants and more due to security problems (Table.4).

The frequency of activity and movement of the vultures were high in late morning to early evening during the nest building period. As many as 28 adults, 5 sub-adults and 4 juveniles of White-rumped on Jan.2nd in two different flocks and 15 adults, 4 sub-adults and 3 juveniles of Slender-billed Vultures on Jan 4th in different three flocks were recorded in different localities of Sukla Phanta in 2002. It was clear, sunny and warm day. This was the highest number of vultures recorded during the study period. Number of vulture crashed sharply in the last of May while it was moderate in March. Slender-billed Vulture was recorded higher in western lowland in comparison to eastern lowland, The number of White-rumped Vulture have been recorded higher in number than Slender-billed Vulture in Suklaphanta. Besides these, Red-headed Vulture (*Syrcoyps calvus*), Eurasian Griffon Vulture (*Gyps fulvus*), Egyptian Vulture (*Neophron perchopterus*), Himalayan Griffon Vulture (*Gyps himalayansis*) were also noted in the study period. No any Cinereous Vulture (*Aegypius monachus*) was observed in the reserve during the study period. However, the main focus was given to White-rumped and Slender-billed Vultures than others.

A normal head-drooping behaviour was also noted in some vultures after the commencement of March and May however it was not seemed significant with respect to number and degree.

Vulture numbers on the away Narayangarh (Chitwan) to Mahendranagar (Kanchanpur) were counted. Bardhghat, Hardiyachapi, Devdaha Murgiya, Emilia, Chandrauta, Hattisar Khola, Karri Community Forestry, Sunbal and Panchanagar Bhulaha were the areas from where vultures of different species were recorded. Sunbal is an area in which more than 65 vulture individuals were flying in clear sunny afternoon of January. That was the maximum number of vultures recorded on the way throughout the study period. It was not possible to identify all of them because of high-speed of bus and long distance but majority were White-rumped. Besides these, two active nests of White-rumped with incubating parents (one on Sal tree, *Shorea robusta* and other on karma tree, *Adina cordifolia*) were searched in Panchanagar, Nawalparasi. Likewise one active nest with incubating parent of White-rumped Vulture in Chandrauta Kapilbastu (on Sissoo tree, *Dalbergia sissoo*) and four active nests with incubating parents of White-rumped Vultures (all on Sal tree) were seen in Lalmatiya area of Dang district. All those nests were able to fledge their chicks successfully. Thus Sunbal – Chisapani – Bardhghat area of Nawalparasi district, Emilia–Chandrauta, areas of Kapilbastu

district, Lalmatiya – Murgiya Masauria, Hattisar stream, Chyaukhola areas of Dang district hold vultures in moderate numbers.

A pilot survey of Royal Bardia National Park and Khaire...

... survey of Royal Bardia National Park and Khairapur area for vulture was made this year in January. Same type of survey in the same localities was carried out last year in May also (Giri and Chaudhary 2001).

A total of ten nests (1 Slender-billed and 9 unknown) were recorded in Royal Bardia National Park last year which decreased to only three (2 Slender-billed and 1 White-rumped) this year. As many as 11 nests of White-rumped vultures and a total of 40 White-rumped Vulture were seen in Nayabeli, Bardia (Amrit Karki pers. comm. 2002) which site was not actually surveyed last year. Only one Slender-billed Vulture nest with a nearly fledging chick was recorded in Khairapur last year. The same area was thoroughly surveyed this year also and recorded 8 nest (6 White-rumped and 2 unknown). A total of 13 Slender-billed vultures were recorded in Khairapur last year but only 6 were seen this year.

Group discussions with villagers, local leaders, schoolteachers and students were organized in Jhilmila and Radhapur primary School. Discussion was focused on status of vulture in the past and present, possible causes of their crash, significant role of vulture to maintain healthy environment and public role for their conservation. Many suggestions, with strong comments to the concerned authority, were put ahead and finally made agree for the conservation of vulture.

J.B. Giri has written three articles on the alarming state of vultures for Gorkhapatra National Nepali Daily, Munal (quarterly Nepali newsletter of Bird Conservation Nepal) and The Himalayan Times, national daily (English Version). These articles will be able to highlight conservation issues and create/promote conservation awareness amongst general public.

Discussions

Interestingly, large number of vulture nests were built in southwest corner of Suklaphanta which harbors the largest herd (more than 2500 individual) of Swamp Deer. This may be partly because of the accessible food availability, wide grazing and chopping area for deer, easy availability of water hole. Again many mature Silk-Cotton trees along the periphery of the phanta may provide suitable habitat for nesting and perching the bird. Vulture normally prefers nesting site at the edges of forests, open grassland or lone silk cotton tree and lightly wooded old forests. Saj tree (*Terminalia tomentosa*) was in the top and Silk-cotton tree was in second position of priority list for nesting purpose in Koshi (Giri and Baral, 2001). In contrast to that, Silk-cotton trees came in top position in Suklaphanta. It may be due to easily availability of tall and mature Silk cotton and fewer mature Saj trees in and around the reserve. Silk-cotton tree is seen to be the most commonly used tree for vulture nest. Besides these, they are known to use a variety of trees like Sissoo (*Dalbergia sissoo*), Mango (*Mangifera indica*), Pipal (*Ficus religiosa*), and Banyan (*Ficus bengalensis*) for nesting (Ali and Ripley, 1987).

There is a high rate of nest abandonment. Of the 19 nests, only three became successful to fledge the chicks and remaining sixteen nests were abandoned before egg laying. No any dead chick was seen on the nests. Out of three successful nests, two were White-rumped and one Slender-billed Vultures. This is a frightening situation considering how sporadically they roamed and bred in the past. No clear causes have been traced for the high rate of nest abandon. Exactly the same situation is there in Koshi-area (Giri and Baral, 2001). The rate of nest abandonment accelerated from late January and afterward in Suklaphanta like in Koshi. Only one chick of Slender-billed Vulture fledged this year in Suklaphanta is a surprising and unexpected result considering their actual population size in the area.

At Suklaphanta, there is no indication of food shortage. Comparatively greater number of carcasses was found inside the reserve than outside. Majority of carcasses belonged to Swamp Deer followed by Cow, Buffalo and others. This may be due to high population of Swamp Deer. Maximum number of carcasses was recorded in Suklaphanta, which reflects the prime habitat of Deer species. There was least possibility on feeding the cattle carcasses by vulture disposed in nearby area of the reserve due to high human traffic and other disturbances. Most of the cattle carcasses may be far from their vicinity because people usually buried them. Therefore it was seemed that reserve was the main feeding station of vultures in Sukla Phanta as the Koshi tappu Wildlife reserve served (Giri and Baral, 2001). Higher number of carcass was recorded in the reserve even though there was high density of voracious carnivores like Royal Bengal Tiger, Common Leopard (*Panthera pardus*), Jackal (*Canes aureus*) etc. who consume the dead body very much. The number of carcasses may account more than this because it was not possible to search all phantas thoroughly due to their large area, tall grasses and interference of much Wildlife including Tigers, Wild Elephant's etc. Number of carcasses recorded in Koshi area is higher (Giri and Baral, 2001) than in Suklaphanta might be due to the absence of large predators like Tiger, Leopard in Koshi, high number of cattle permanently grazing inside the reserve and because of more intensive surveys.

A total of 7 dead vultures (5 White-rumped and 2 Slender-billed) were recorded inside the reserve during the study period. All the dead vultures, except one, were completely consumed as in Koshi (Giri and Baral, 2001). But the morality rate is lower in Suklaphanta in comparison to Koshi where a total of 46 dead vultures were recorded. The lower number of dead vultures in Suklaphanta might be due to rapid consumption by carnivore scavengers and probably died far away from the nesting sites where the observer might not reached. Again it was not possible to visit all site thoroughly due to some constraint during the study period. If all the areas of the reserve have been thoroughly searched this number might have been raised to some extent.

A clear sign of head drooping was observed only after the commencement of late spring and summer, even though very few vultures were noted in May. There was no any significant association between orientation of the sun and crop characters with the head drooping as in Koshi (Giri and Baral, 2001). It seems that head drooping behaviour to some extent may be a normal behaviour however excessive head drooping can not be explained as a normal behaviour the vultures.

Population of vultures (both species) is still good in Suklaphanta to some extent. As many as 37 White-rumped and 22 Slender-billed vultures indifferent groups were recorded in different two days. But their number decreased r after the commencement of Spring and Summer as in Koshi.

Another largest flock (more than 65) of vulture was noted in Sunball, Kapilbastu and Devdaha, Nawalparasi district where more than 15 individual (not identified) in a block. Many other reports clearly indicated that decline of vulture population in comparision to past years. Population of White-rumped and Slender-billed vultures is still good in Royal Bardia National Park and Khairapur area (about 30-km southeast from the Head Quarter of Bardia National Park). This area looked very good habitat for vulture with many mature Silk-Cotton trees, open grassland, nearby villages, high number of cattle etc. This place had a large number of cattle (500⁺) grazing, an important food item for vultures when they are dead (Giri and Chaudhary, 2001).

Vulture population continues to decline all over Nepal. The alarming rate of vulture decline is noted in Koshi, where more than 120 individuals were estimated last year while only a few numbers of vultures recorded this year. Shortage of food and fear of attack or perdition have

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Table 1 Distribution of nests in different localities and tree species at Suklaphanta in 2002.

| Area | Tree species | | |
|-------------|--------------|-------|-------|
| | Silk-Cotton | Pipal | Karma |
| Suklaphanta | 11 | 3 | 1 |
| Bahuninala | 1 | 0 | 0 |
| Jhilmila | 2 | 0 | 0 |
| Singapur | 1 | 0 | 0 |
| Total | 15 | 3 | 1 |

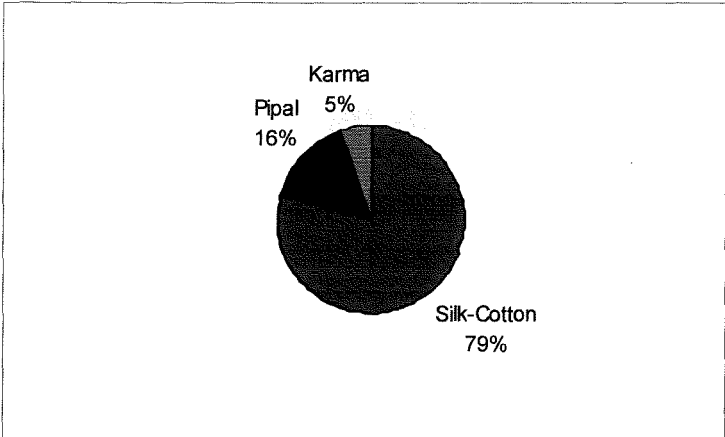


Fig.1 Distribution of nests in different tree species.

Table 2 Distribution of vultures nests in different localities and their coordinators at Suklaphanta in 2002.

| Nest N. | Localities | Vulture species | Tree species | Final result | Coordinators | |
|---------|-------------|-----------------|--------------|--------------|--------------|------------|
| | | | | | Latitude | Longitude |
| 1 | Suklaphanta | WRV | Silk-Cotton | Success | 28°49'24"N | 80°09'10"E |
| 2 | Suklaphanta | WRV | Silk-Cotton | Abandon | 28°49'27"N | 80°09'06"E |
| 3 | Suklaphanta | WRV | Silk-Cotton | Abandon | 28°49'10"N | 80°08'38"E |
| 4 | Suklaphanta | SBV | Silk-Cotton | Abandon | 28°48'43"N | 80°08'30"E |
| 5 | Suklaphanta | WRV | Pipal | Abandon | 28°48'38"N | 80°08'40"E |
| 6 | Suklaphanta | SBV | Pipal | Abandon | 28°48'38"N | 80°08'40"E |
| 7 | Suklaphanta | Unknown | Silk-Cotton | Abandon | 28°48'33"N | 80°08'46"E |
| 8 | Suklaphanta | Unknown | Pipal | Abandon | 28°48'29"N | 80°08'40"E |
| 9 | Suklaphanta | WRV | Silk-Cotton | Abandon | 28°48'11"N | 80°08'59"E |
| 10 | Suklaphanta | WRV | Silk-Cotton | Abandon | 28°48'06"N | 80°09'06"E |
| 11 | Suklaphanta | WRV | Silk-Cotton | Abandon | 28°48'00"N | 80°09'17"E |
| 12 | Suklaphanta | SBV | Karma | Success | 28°47'33"N | 80°09'38"E |
| 13 | Bahuninala | Unknown | Silk-Cotton | Abandon | 80°46'53"N | 80°12'50"E |
| 14 | Jhilmila | SBV | Silk-Cotton | Abandon | 28°47'33"N | 80°13'11"E |
| 15 | Jhilmila | SBV | Silk-Cotton | Abandon | 28°47'33"N | 80°13'19"E |
| 16 | Singapur | WBV | Silk-Cotton | Success | 28°47'48"N | 80°14'00"E |
| 17 | Suklaphanta | WRV | Silk-Cotton | Abandon | 28°48'40"N | 80°08'44"E |
| 18 | Suklaphanta | SBV | Silk-Cotton | Abandon | 28°48'40"N | 80°08'45"E |
| 19 | Suklaphanta | WRV | Silk-Cotton | Abandon | 28°48'54"N | 80°08'14"E |

WRV – White-rumped Vulture, SBR – Slender-billed Vulture

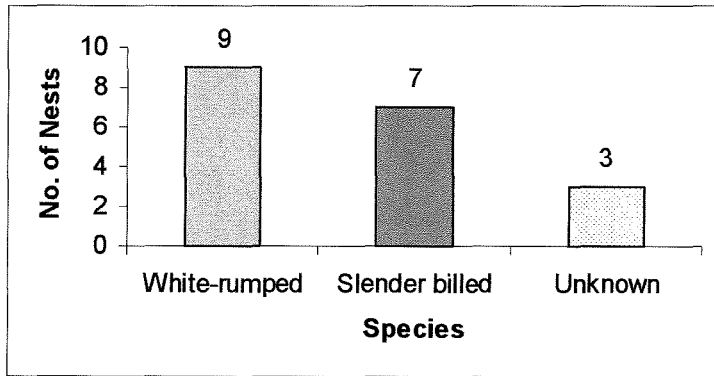


Fig. 2 Number of nests of different Vultures recorded at Suklaphanta in 2002.

Table 3 No. of carcasses recorded in different localities of Sukliphanta in 2002

| Localities | Carcasses type | | | |
|--------------|----------------|--------------|-----|---------|
| | Swamp Deer | Spotted Deer | Cow | Buffalo |
| Sukilaphanta | 12 | 3 | 0 | 0 |
| Barkaula | 3 | 0 | 0 | 0 |
| Singapur | 1 | 1 | 0 | 0 |
| Jhilmila | 2 | 0 | 4 | 3 |
| Radhapur | 0 | 1 | 5 | 3 |
| Total | 18 | 5 | 9 | 6 |

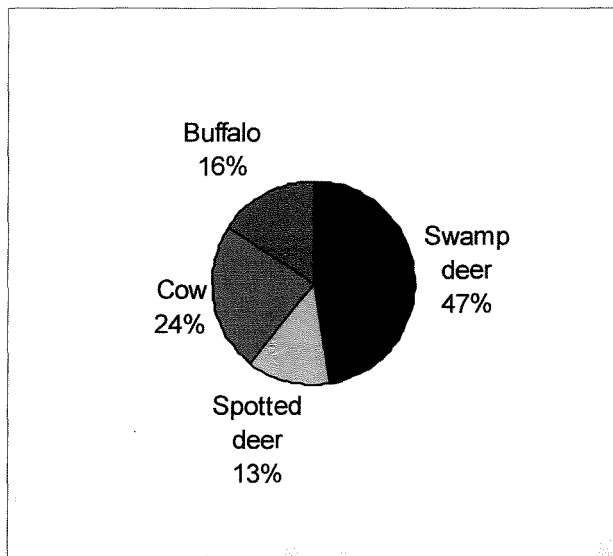


Fig. 3 Total no. of different carcass species found at Sukla Phanta.

Table 4 Dead vultures recorded in different localities of Suklaphanta in 2002

| Localities | Species | |
|--------------|--------------|----------------|
| | White-rumped | Slender-billed |
| Sukilaphanta | 3 | 1 |
| Barkaula | 1 | 0 |
| Jhilmila | 1 | 0 |
| Radhapur | 0 | 1 |
| Total | 5 | 2 |

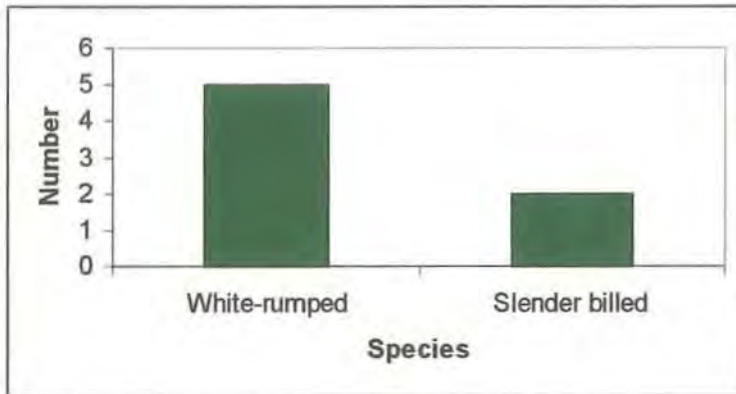


Fig.4 Dead vultures recorded in Sukla Phanta.

Table 5. Number of vulture and their nests recorded in different localities of Royal Bardia National Park and Khairapur Area in 2001/2002.

| Species | Kauraha Phanta | | Bagaura Phanta | | Khairapur | | Bhurigaun | |
|-------------------------------------|----------------|------|----------------|------|-----------|------|-----------|------|
| | 2001 | 2002 | 2001 | 2002 | 2001 | 2002 | 2001 | 2002 |
| No. of White-rumped vulture | 0 | 2 | 2 | 7 | 15 | 20 | 1 | 3 |
| No. of Slender-billed vulture | 10 | 8 | 0 | 8 | 13 | 6 | 0 | 0 |
| No. of Red head vulture | 2 | 0 | 7 | 4 | 0 | 0 | 0 | 0 |
| No. of Egyptian vulture | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| No. of WRV nests | 0 | 1 | 0 | | 0 | 6 | 0 | 0 |
| No. of Slender-billed vulture nests | 1 | 1 | 0 | 1 | 1 | | 0 | 0 |
| Unknown nests | 5 | 0 | 4 | 0 | 0 | 2 | 0 | 0 |