

## Acknowledgements

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(2007) Survey of Birds of Prey in  
Upper Mustang, Nepal

in the area where local people performed sky burial through making human corpse into many pieces.

Since 1998, totaling 5083.3 liter and 2.11 metric ton of pesticide had been distributed to increase the agricultural production, where as 4 local retail shops are providing medicine for the livestock in the Mustang district though the effect of such practices was not covered on the study.

Special symbiotic relationships between the culture and birds have been found in the area. Every part of the Lammergeir used as homeopathy medicine by local doctor called Amchi. After hanging the head of Golden Eagle on the main door and by keeping the feather of Owl in house it is believed that evil is unable to rich inside the home. Himalayan Griffon (*Gyps himalayensis*), took part in funeral rites activities in which human corpse were offered by making it into many small pieces.

In order to conserve these birds species, it is recommended to monitor transect and nests, prepare data base, conduct awareness program to local people, build up the capabilities of conservation education teachers, control on wildlife hunting, test of Diclofenac in Griffon, increase the pray species are few to mention.

# Introduction

## 1.1 Birds of prey

Among the best-known birds are the birds of prey. Some, including hawks, eagles, and falcons, are active during the daytime. Others, notably owls, are nocturnal or active at night. Birds of prey have hooked beaks, strong talons or claws on their feet, and keen eyesight and hearing. The larger hawks and eagles prey on small mammals, such as rodents and other vertebrates. Some birds of prey, such as the osprey and many eagles, eat fish. Falcons eat mainly insects, and owls, depending on the species, have diets ranging from insects to fish and mammals. Scavengers that feed on dead animals are also considered birds of prey. These include relatives of eagles called Old World vultures, which live in Eurasia and Africa, and the condors and vultures of North and South America. Birds of prey, such as hawks and eagles, are able to see extremely small details, such as tiny rodents viewed from high in the air (Encyclopedia 2002).

Himalayan Griffon, Golden Eagle, Common Kestrel, Owl, Black Kite are some of the birds of prey found in the Upper Mustang.

## 1.2 Study area

Upper Mustang with an area of 2667 m<sup>2</sup>, covers the northern half of Mustang district (Ale, 2002). Upper Mustang area is still decreed by the traditional Monarchy system. Annapurna Conservation Area (ACA) was gazetted in 1992 and it covers 56 Village Development Committees (VDCs) from five districts. Upper Mustang is the northern part of Mustang district extended up to the Tibet autonomous region of China and ultimately up to the Europe. It consists of 7 VDC (Chuksang, Ghemi, Charang, Lomanthang, Chosyar, Chunup and Surkahang) (Map 1) and containing 33 Buddhist settlements with 6096 populations. On the basis of topographical features, bioclimatic condition & floristic composition, the ACA has been divided into 7 Phyto-geographical region (KMTNC /BCDP, 1994). The upper Mustang Area (i.e. Upper Kaligandaki valley) belongs to the arid, trans-Himalayan zone. The area is known to be extremely rich in flora and fauna due to steppe habitat. Trans-Himalayan zone receives an average rainfall of 132 mm. per annum (average of 1988-1992 in Jomsom). This area is drainage by Kaligandaki river containing numerous tributaries. The people of Upper Mustang practice a combination of livestock farming; agriculture and winter trade. This unique marginal land (Map 2). lies between the east and west Himalayan; Tibetan Plateau and Himalayan range. The Upper Mustang Biodiversity Conservation Project (UMBCP) is undertaken By KMTNC/ACAP through UNDP/GEF to restore its ecology and economy through the high altitude biodiversity.

## 1.3 Background and justification

Altogether 79 species of "Birds of prey" (9.2%) has been recorded from Nepal out of 861 bird species. As far known record, habitats of Mustang support for 18 birds of prey (22.78%). Study carried out from 15 July to 5 August 2004 was able to identify 7 species of birds of prey from the area. The annotated checklist suggests the occurrence of 133 species found in upper Mustang jurisdiction (Suwal 2003, Shah 2001, Kazi 1977, Kazi 1978). It has been found to be significant area for avifauna. The Kaligandaki valley is a migration pathway for birds moving for north to south and south to north. About 40 migratory species have been recorded from lower Mustang area including Demoiselle Crane (*Grus virgu*). In addition to this a larger number of birds of prey totaling 8000 individuals of about 20 species have been observed at

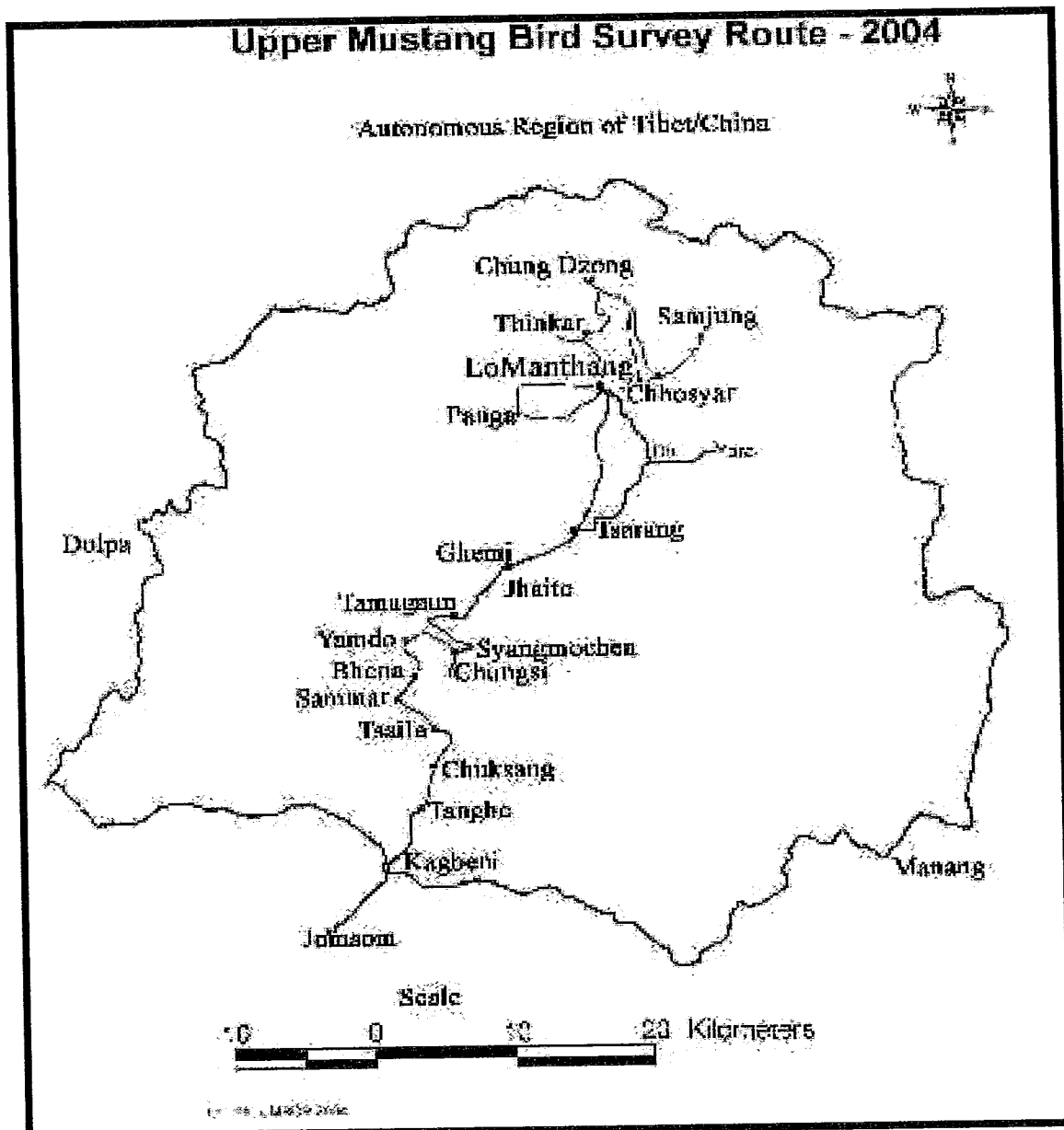
Dhampus area (Inskipp and Inskipp, 2001). Probably they crossed the Kaligandaki corridor. After the establishment of ACAP three scientific studies have been carried out in this area (Shah 2001, Shah 2002, Suwal 2003) and during these study period several birds of prey have been recorded.

The major 'Birds of prey' found in the areas are Himalayan Griffon (*Gyps himalayensis*), Golden Eagle (*Aquila chrysaetos*), Lammergeier (*Gypaetus barbatus*) etc. Only single study have analyzed on densities and their minimum population in the area (Acharya, 2002). However, their status and distribution in Mustang is still unknown. Birds of prey lie on the tertiary level of food chain. Through the conservation of these key species we could manage all the biodiversity found in Upper Mustang.

Special cultural relation has been found between human and 'Birds of prey' in the area. Only a few nest of Himalayan Griffon were observed in Ghemi and Chhosyar area with few numbers of populations. Only a limited study on vulture has been conducted in Nepal (Giri and Baral, 2001). Vulture has been almost disappeared from the Royal Chitwan National Park, the world heritage site (Giri and Baral, 2001).

Lack of proper information is the barrier for the conservation of all the 'Birds of prey' species in Nepal. Although a number of birds of prey (Specially Vulture) are declining nationally as well as globally, their population still believed to be healthy in Mustang, However, detail information on them in relation to Mustang is lacking.

Through the various support Bird Conservation Nepal has been conducting Vulture research in lowland but limited in high altitude. Their result shows that White rumped Vulture and Himalayan Griffon are declining in Nepal. Scientists are suspecting that if the disease theory is true then the disease might have already spread to Himalayan species and there might be population decline. So we required the baseline information for the future monitoring program. Therefore their detail study and monitoring are very much necessary.



Map no.1 Survey route of birds of prey

## Objectives and scope

### 2.1 Objectives

#### 2.1.1 Main objective

To find out the distribution and status of birds of prey in Upper Mustang

#### 2.1.2 Specific objectives

- To find out the nesting place of birds of prey focusing on vulture.
- To list out Ethno-ornithological prospective of birds of prey.
- To find out the distribution of birds of prey.
- To find out the densities of birds of prey in relation to transects.

### 2.2 Scope

The Entire Trans-Himalayan area provides appropriate residential and migratory space for the 'Birds of prey', especially Vulture. But the particular upper Mustang area has been chosen for the study. Upper Mustang with an area of 2667 Sq.km. covers the northern half of Mustang district. To get the detail data, required minimum four transects crossing the north south (Two) and east west (Two), However the Ghara, Tangya and Dhey village of Surkhang Village Development Committee area were not touched during the study. Team applied transect count in the three transects instead of Four.

Birds of prey occupied the tertiary level in the food chain and also termed as indicator species. Their occurrences in a place indicate the healthy ecosystem. Vulture and Lammergeier represent the healthy Himalayan ecosystem. These key species will be important when they are culturally related with human kind. Least study about birds of prey always creates for difficulty in undertaking the conservation measures. Due to this reason study of birds of prey has been chosen in the Upper Mustang.

The old and big deciduous tree species, which support the nesting in a lower belt, are declining day-by-day, resulting decreasing in the nesting, however without any big tree now Vultures are leaving in the area. Various study on White-rumped Vulture shows that the population is declining in Nepal as well as in South Asia. The possible reason estimated is the pesticide and bacterial infection. Recent experiment shows that Diclofenac is the major factor for the decrease of White rumped Vulture. By realizing the probability of same case for other Birds of Prey, their densities in each transect, nesting status, species diversity, has been collected. All the information computed on simple computer modeling system i.e. Microsoft Excel.

All the data were collected on the basis of form developed by the Asian Vulture Crisis Project with few amendments. Transect and vantage counts were made to identify and to know the overall status of 'Birds of prey' in Upper Mustang.

Area of each Transect could be estimated through GIS but simple multiplying of length and breadth has been used. Length of transect was calculated through the GPS. In transect, breadth was suppose to be 500 meter left and right side of transect.

Transect should cover 5 km per day, which vary with 3-26 km due to duration, high altitude, residential location, time and climatic condition.

Bird density were calculated on the transect basis. Available data are able to describes bird density within transect only because there is a possibility of recounting of a single number within the total transect. We couldn't forget that there is also a possibility of not repeating.

Vultures that are enjoying in carcass supposed to be come from all transect sighted in upper Mustang. 62 Himalayan Griffon seen during the baiting and other HG observed near carcass were not included in density count. Ethno-ornithological relationship has been described on the basis of informal discussion and my own experience getting from four year.

Adverse weather condition such as rain has hampered the bird observation many times during the field survey. The swollen river and steep terrain and high altitude are also other reasons for the limitations of the study.

Each species should include in literature review section but due to few literatures, Griffon and Eagle were incorporated. This is because of limited study on them in case of Nepal.

## Methodology

### 3.1 Transect count

Birds of prey was surveyed in transect, which was used as path by the local people. Minimum length of transects covered 3 Kilometers per day, which varied depending upon the settlement, altitude, climate etc. Birds 500 m on either side of transect were counted. Three transects i.e., north south (Jomsom to Nichung, approximately 89 km) and east west (Lomanthang to Samjung and Lomanthang to Yara; approximately 18 and 17 km respectively) was drawn and observed. Transect were followed as surveyed by the previous team (Acharya, 2002) to make it comparable. All the birds of prey found in transect were recorded; however birds of prey found in the carcass were discarded.

### 3.2 Baiting

Traditional place where the people launched funeral activities was chosen for the baiting. Dhokyno of Lomanthang, have been used by the local people for such activities. All the procedure was similar as they performed for the human only the bait was female goat. Local lama and local people were hired to carry out the activities in the area. All type of local authorities was informed before carried out the baiting.

### 3.3 Observation

Nesting sites were identified on the basis of local experience, vantage observation and previous study reports. Nesting sites detail was taken by using the formats prepared by Asian Vulture Crisis Project 2001/2002 with few revisions (Appendix 1). Formats were filled on the basis of sheet abbreviation (Appendix 2).

### 3.4 Nest observation

About 400 km<sup>2</sup> areas were scan for the identification of nest. Vantage observations were also made for it and nest information was recorded (Appendix 3) Local people have good knowledge on the nesting place and their behavioral status in the area. According to the local information, area below from the Chungshi cave and above from the Kaligandaki river (near Chaile) are the best nesting site of birds of prey but the team did not visited the sites due to difficulty in crossing the river.

### 3.5 Total count

Black Kite have nest on the tree of Populus. There was at least one old tree of Populus in the village which is not cut due to its religious value. Newly established village did not have such big tree. All the trees were observed and total populations of Black Kite were calculated. Team did not visit four villages out of thirty three settlements. Due to its Chicks raring time pair found around the tree, which made easy to count them and identify their nest in the area.

### 3.6 General observation

Identification of bird is made possible with the help of binocular (10x40) and telescope. A book on the birds of Nepal (Grimmet *et al.*, 2002) is referred for field identification. Bird observation period was considered from 8 AM to 6 PM.



### 3.7 Participatory rural appraisal

Discussions with key informants were conducted to determine the threats, ecologically important site and ethnological relationship with birds. Informal discussion was conducted in various places to solicit local community support and to create conservation among the local population. Discussions were fruitful for the identification of nest and their ethno-ornithological relationship.

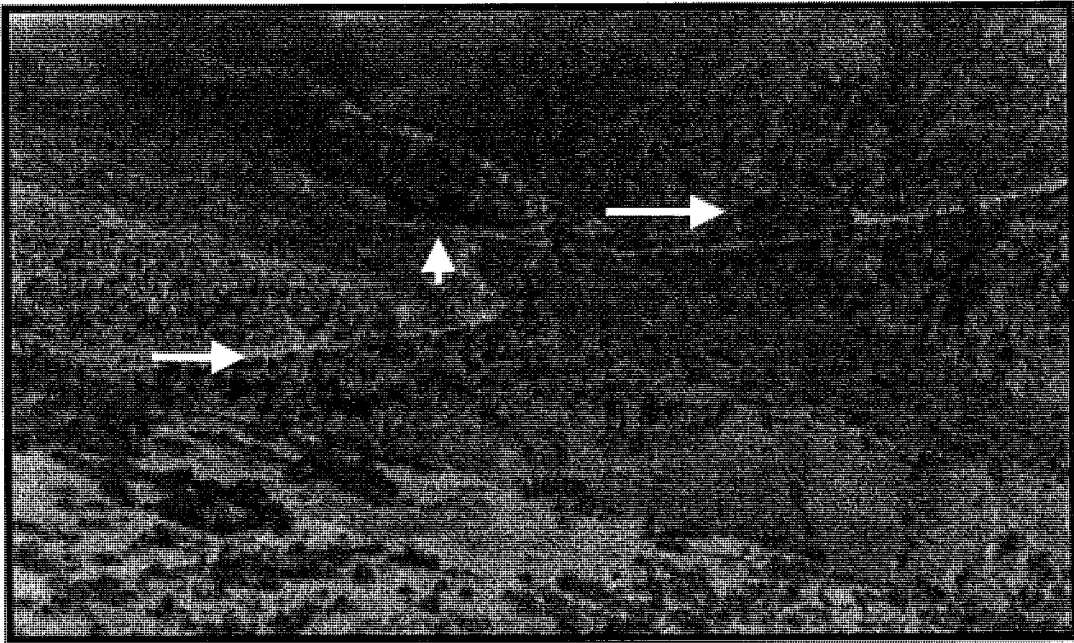


Plate 2: Existing routes were used as Transect Survey

### 3.8 Assumption for the study

Data were collected and analyzed on the basis of following assumption (Colin, 1998). The survey team sets last three assumptions.

- Birds are exactly on the route and are all detected.
- Birds don't move before detection.
- Distance is measured accurately.
- Individual birds are counted only one.
- Individual birds are detected independently.
- Transects are representatively placed with respect to bird species and density.
- Transects are straight line from starting to ending points.
- Birds are counted in all transect shared any carcass found in Upper Mustang.
- Fresh feces in the nest support at least one pair of birds of prey.

### 3.9 Data analysis

#### 3.9.1 Descriptive statistics

The descriptive analysis was done to represent the collected data for the further interpretation. Pooled mean, standard deviation and the variance were preferred to represent the overall status of the species in the area. As we know that the sampling sizes were not equal so that in initial phase all the sample size were converted into the same size on the basis of data

obtained during the survey. All sampling plot were converted into the 1 km<sup>2</sup> plot after than data were analysis.

$$\bar{x} = \frac{x_1 + x_2 + \dots + x_{20}}{N}$$

$$\sigma = \sqrt{\frac{(x - \bar{x})^2}{N}}$$

$\bar{x}$  = mean of the sample

$\sigma$  = Standard deviation

$n$  = Number of sample

### 3.9.2 Detection rate or encounter rate

Detection rate or encounter rate of birds of prey was calculated by summing the total number of recorded bird in transect and then divided by the total number of survey day.

$$\text{Entire detection rate} = \frac{\sum x}{\text{sample size(20 days)}}$$

### 3.9.3 Nest observation

Most of the nesting sites were surveyed and recoded data. In case of Black kite total number were counted and found most of the nest occupied by the chicks. There were lots of Himalayan Griffon nest found unoccupied by themselves. Team tried to observe them before they soar to the sky for their usual habit but this was not possible in all nests. Nests which were occupied by the chicks, found male and female both in the nest. But other nest which were not occupied by the chicks but have fresh feces were supposed that this nest support at least for two Himalayan Griffon. On the basis of such nest total number of Himalayan Griffon were extrapolated. This is not the exact population of HG in the area because team was unable to search the entire site where they could occur.

### 3.9.4 Baiting

Local goat was used as bait for the HG so that we could count the number of HG found in the area. The area which is selected for baiting was also used by local people incase of funeral activities. The process and step were similar as they performed during the funeral time. All the local authority were informed and requested for the baiting because it was related with the culture. Numbers of HG were recorded during the baiting process. Data were not analyzed because of insufficient sample number (? Under consultation).

### 3.9.5 Carcass observation

Data related to the carcass were not incorporated in the transect data. Team visited the entire site where carcasses were found but team was late in all places. Team visited the entire site but carcass was completely in the verge of finished by vulture. Observation of carcass depends on the luck of the team.

## Results and discussions

### 4.1 General status

Checklist suggests the occurrence of 18 'Birds of prey' (Table no-1) found in upper Mustang. Majority of birds were breeding resident (72.22%) followed by Individual records 11.11%, summer 11.11% and passage migrants 5.56%. The survey team was able to observe 7 birds of prey in the study area. Majority of birds were breeding resident (85.71%) and followed by summer visitor (14.29%).

In 20 days out of 22days (Appendix-4), birds were observed from 8 AM to 5.30 PM in three main transect. Transects were Kagbeni to Chosyar, Lomanthang to Samjung and Lomanthang to Dhi. Altogether 235 Himalayan Griffon, 49 Lammergeir, 44 Black Kite, 11 Common Kestrel, 1 Common Buzzard, 14 Golden Eagle and 1 Northern Goshawk was observed (Table 2). Maximum number of observation within one day were 62 Himalayan Griffon, 8 Lammergeir, 6 Black Kite, 2 Common Kestrel, 1 Common Buzzard, 2 Golden Eagle and 1 Northern Goshawk (Table 2).

Most abundant species was Himalayan Griffon and rare were Common Buzzard and Northern Goshawk, Occasional species was Golden Eagle. (Table 3).

Table –3 Observation statuses of birds

Observation status (relative frequency in parenthesis) and representative species	Number of species (percentage in parenthesis)	
<b>Rare (.01 -.24)</b> Common Buzzard and Northern Goshawk	2	28.57%
<b>Occasional(.25-.45)</b> Golden Eagle	1	14.29%
<b>Fairly Common (.46 - .65)</b> Common Kestrel, Black Kite and Lammergeir	3	42.85%
<b>Common (.66 - .9)</b>	0	0 %
<b>Abundant (.9+)</b> Himalayan Griffon	1	14.29%
<b>Total</b>	<b>7</b>	<b>100%</b>

### 4.2 Nest status

Several species nests were observed during the survey. The nesting habitat includes from the sheer cliff edges of Himalayan Griffon to tree nest of Black kite. Total 62 caves nesting of Himalayan Griffon, 13 tree nest of Black kite, 8 cliff nest of Lammergeir and 4 cliff nest of Golden Eagle were observed. Altogether 43.68% nests were found occupied themselves.

Out of 62 nest of HG, 33(53.23%) nest were unoccupied, 24 nest were occupied (12.9%), 17 nest were unoccupied but having fresh feces and 4(6.45%) were roosting site. The caves and cliff edges of Chungsi Gompa, Ghemi, Gharphu, Chosyar were important nesting locations of Himalayan Griffon. Several pairs with juveniles were observed during the study period.

The sacred grove of Tsarang, Tsaille, Lomanthang, Chhosyar, Nenyol and several other villages are regular nesting sites of Black Kites. Altogether 13 nesting site of BK were found and one found unoccupied by themselves. Untouched *Populus ciliate* tree were providing best nesting site for the BK. The entire occupied nesting sites were found single chicks in each nest and they are ready to flight. Lammergeier nest were found in inaccessible location of the cliffy area. Total of 8 nesting sites were identified and 2 found occupied by themselves and 2 were suspected. Altogether 4 nesting site of Golden Eagle were found and 3 were unoccupied but have fresh feces (Figure 1).

Locals reported that Kaligandaki Gorge north of Chaile is the best place of nesting for birds of prey. This information needs further confirmation.

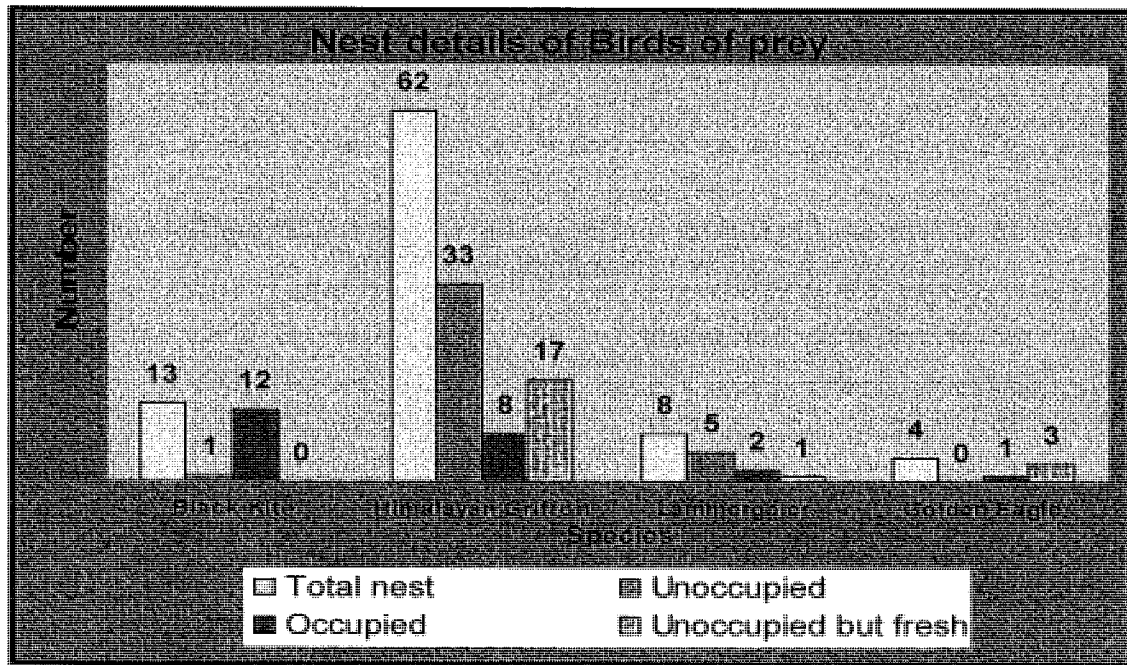


Figure 1: Nest details of birds of prey

#### 4.3 Densities

Average detection (encounter) of each species found per square kilometer was 0.26 Himalayan Griffon, 0.07 Lammergeier, 0.02 Common Kestrel and 0.02 Golden Eagle. The population density ranges between 0.08 to 0.44 for Himalayan Griffon, 0.02 to 0.12 for Lammergeier, 0.01 to 0.03 for Common Kestrel and 0.00 to 0.03 for Golden Eagle per square kilometer at 95% confidence limit.

Highest density of each species found per square kilometer were, 1.40 Himalayan Griffon in Jhaite area, 0.49 Lammergeier in Ghemi area, 0.09 Common Kestrel in Ghemi and 0.11 Golden Eagle in Jhaite.

#### 4.4 Population

Total of 58 Himalayan Griffon were found within the study area. This data were extrapolated through the multiplying 3 to occupied nest and 2 to unoccupied nest but having fresh feces. Nest best population is best option for the monitoring process in the future but required detail study in different season. Occupied nest were found with male female and chicks in all sites.

Sacred tree of Populus supports for the 12 breeding pair of Black kite and 12 chicks were living in the area. Altogether 36 black kite found in the study area which represent 90 % of the total potential site for the Black kite. This is based on the settlement and Populus tree because Black Kite were never been recorded in other places in the study site.

#### 4.5 Carcass observation

A total of 3 different types of carcass were noted. Of these, two were mule and one is house cat. Mules were recorded in the pasture land and main route while cat was recorded the in abandoned palace near Thingar. All sites were affected by the human traffic. They all are near to finished, so numbers of HG were counted in minimum number.

**Table Detail of carcass**

Type of carcass	Habitat	State of carcass	Vulture at carcass	Human traffic	Other scavenger	GPS
Mule	Pature near Jahite	Trace amount of bone and head	8	Moderate	Red Fox	N 29 <sup>0</sup> 11'55.6" E 083 <sup>0</sup> 50'30.3"
Cat	Near Thigar	Fresh	8	High	No	N 29 <sup>0</sup> 11'47.1" E 083 <sup>0</sup> 56'43.5"
Mule	Syangbo chen	One day old	12	High	-	<i>Per. Comm.</i> Madhu Chetri

#### 4.6 Baiting

Mustang is popular for its sky burial culture and HG is the major component of such traditional activities. Data were collected only from the Lomanthang area however there were 33 settlements in the area and all adopted such ritual performance. The area where native people performed such activities was chosen for the baiting of livestock to count the number of Birds of prey. Female goat was bait in the area and processes were followed as followed by local people. All the authorities were informed prior to carry out the activities because it is totally related with the culture. Entire process was completed within the period of one hours and total 62 Himalayan Griffon and 2 Golden Eagle immediately react. Golden Eagle were not come to the bait however all HG were visited at least the site even most of them did not get a piece of meat.

**Table Details of bait**

Name	Type of bait	Sex	HG	GE	Date	Remarks
Chyang Angmo Gurung	Human	Female	54	2	Feb, 2004	Data collected by piece maker of corpse
Dhinduk Gurung	Human	Male	65	2	Oct, 2003	“ “
Nutuk Gurung	Human	Male	58	-	Feb, 2004	“ “
	Goat	Female	62	2	2 <sup>nd</sup> July, 2004	N 29 <sup>0</sup> 10'57.6"(3733m.) E 083 <sup>0</sup> 58'17.3"

#### 4.7 Bird Depredation

Golden Eagle is the most destroyers in the area which, grab small baby of Sheep and Goat. Almost all sheep herder were affected by the Golden Eagle. Team was unable to collect all the

data related to the depredation in the area. In Thingar within the period of one year Golden Eagle killed 5 and in Namgyal, it kills 3 baby Sheep. Local people have reported Golden Eagle killed 2-7 babies of sheep in each village in the study area. In Samjung village of Upper mustang Out of five top ranking predators compared, Golden Eagle falls in third rank category (Chetri, 2004)

#### 4.8 Hunting and Snaring

Local people have reported depredation through the Himalayan Marmot (*Marmota bobak*). For the diminution of such depredation Mountain Resources Management Group (MRMG) has encouraged local people to kill them. Due to the political conflict in the country lots of outsiders found in the Mustang. They were involved in killing such mammals, Chukkar partridge, and other prey species. Such activities have direct effect on the Golden Eagle. The economic conditions of the some local people have sharply increased during the last one decade period which is not possible through the simple economic activities. About 10 house hold made their huge building in the capital city. Team was suspected few high level personnel were involved in hunting and became mediator to send wildlife part from the lower Mustang to Tibet. Team confirmed the illegal trades of Yarsa Gunpa to Tibet which they bought from the Manang.

#### 4.9 Pesticide

In Mustang district, use of pesticide started from 1998 and till now. Diesel oil Dimethoate, Ravistin, Zink phosphitezon and Dithane -45 has been distributed in the area by District Agriculture Development Centre. Altogether 5083.3 liter and 2.11 metric ton of pesticide distributed in the Mustang district. There were 4 shops which provide the medicine for the livestock. In the name of agriculture production MRMG has been distributing pesticide. They were found unaware about the effect of such pesticide which ultimately related birds of prey through the prey species. In addition to this District Livestock Development Service, Jomsom and three shops have been distributing livestock medicine i.e. Albendazole, berenil, Gentamicine pencilin etc.

#### Use of pesticide in Mustang District

Name of the pesticide	Year	Liquid (liter.)	Powder (Metric ton)	Remarks
Diesel oil Dimethoate Ravistin Zink phosphitezon Dithane -45	1998	1500	0.72	In Mustang use of pesticide started from 1998.
	1999	540	0.46	
	2000	765	0.34	
	2001	839.3	0.29	
	2002	540	0.05	
	2003	899	0.25	
	Total	5083.3	2.11	

#### Supplier of livestock medicine in Mustang

Supplier	Address	Annual transaction	Type of medicine
Jomsom Aggre-vate	Jomsom	20000	Albendazole, berenil, Gentamicine pencilin
Syang Medicin shop	Syang	18000	
Kobhang Medicine shop	Kobhang	15000	
District livestock service centre	Jomsom		

#### 4.10 Ethno-ornithological relationship

People still believe and widely practiced a dead Lammergeier corpse and intestine are used as an effective medicine for diarrhea treatment. Every part of the Lammergeier used as homeopathy medicine by local Doctor named as Amchi. Any body if first get the chicks of Lammergeier (People thought that Lammergeier gives the small dogs instead of chicks), he became the prosperous personality in the area. People thought that if they took the chicks (dog in their language) from the nest than that dog will provide him everything which they offered. Feces of Lammergeier were used as medicine to make good vocal. Lammergeier is supposed to be the god in the study area. All the part of the Lammergeier only used by the Amchi, after the the extraction of toxic found in the part. Amchi which used the part of animal for treatment process mostly found in the Tibet area.

After hanging the head of Golden eagles on the main door and by keeping the feather of Owl in house it is believed that evil is unable to rich inside the home. People thought that the Golden Eagle made their nest with expensive ornamental gold but they were unable to find out the nest. A toe on each foot was used for caring of hair especially by women but now it is rarely found.

There is a significant relationship between the social culture and vulture in Upper Mustang. Himalayan Griffon (*Gyps himalayensis*), take part in such ritual performance. When a local person dies, The Lama, who is only the special cultural leader and the respected person of the area decides how to carry out funerals- rites. A few specific castes like Bista usually burn the dead body but the major cast of the area that is Mustangi Gurung which constituents' more than 90% population chops down the dead body in many piece and offer to vulture. Lama calls the vulture by praying and blowing his trumpet. If vultures do not visit the corpse it is believed that the person had committed some sorts of sin during his lifetime (Sharma, 2003). When the vulture finish entire corpse by eating them it is said that they take bath in river before flying away. Same tradition can also be seen in the working caste like Biswokarma. Such tradition funeral-rites are prohibited in agricultural harvesting season but the body is cut into many pieces and thrown into a river. Thus instead of birds of prey the dead body is offered to aquatic life like fishes and insects. Therefore vultures keep the local environment neat and clean. It is also believed that vulture also take the soul of that person in the heaven.

Bone of the Himalayan Griffon was used to make the flute and it is believed that it gives melody sound. Common Kestrel is unloved bird of the area. In Chuksang VDC they performed great celebration named as "Shi". In such celebration they prey with god not to make them as Common Kestrel in next era.

## 5.0 Discussion

Locally Black Kite, Lammergeir and Himalayan Griffon fall under the common category, Common Buzzard fall under the fairly common and Golden Eagle and Northern Goshawk under the uncommon (Grimmet *et al*, 2002) category. The only common species found in Upper Mustang is Himalayan Griffon and rare are Common Buzzard and Northern Goshawk. Golden Eagle was found occasional and common Kestrel, Black Kite and Lammergeir found fairly common. Status is based on the basis of their sighting frequency however there is not any detail scientific backup. On the basis of densities of birds of prey in the area Himalayan Griffon is also the common for the area and followed by the Lammergeir, Black Kite and Golden Eagle respectively. Hari Sharan Nepali' Kazi' had found White-rumped Vulture in 1977, which is now in critical condition in South Asia. White-rumped vulture is also seen in lower Mustang during the survey of Cheer Pheasant (2004) in Kunjo Village Development committee.

Permanent nesting site of Lammergeir and Himalayan Griffon has been observed in cliff edge and abandoned cave at Chojung and Ghemi respectively (Sharma, 2002). The cave and cliff edge of Chungsi Gonpa, Ghemi, Garphu, are very important location for Himalayan Griffon. The sacred grooves of Tsarang, Tsaille, Lomanthang, Chosyar, Nhenul and several other villages are regular nesting site of Black kite. Local reported the Golden eagle nest on the cliff below the Ghilling village but it needs to be confirmed. Team reported the nest of Golden Eagle in 4 sites but 3 of them were unoccupied and one may be the roosting site. The nest of Common Kestrel has been reported in between the Lomanthang and Samjung by the biodiversity assessment team (Shah,2001).Team (2001) also reported the nest of Golden Eagle in the Chojung area but at that movement it was not identify and supposed to be the nest of Lammergeir. But during this period Nest of lammergeir were also reported with Chicks and just started to flight. Abandoned cave was found in most of the village and Birds found near the settlement help us to conclude that Vulture as well as others birds of prey are closely associated with human kind in this area. Good vantage for vulture provided by the abandoned cave is also damaging by wind erosion. In Chaile and Kimling area Lammergeir leave their nest due to the sliding of site and move to unknown area. Upper Mustang area is facing the massive wind erosion problem and it is found some nests are being destroyed by continuous wind heat. As in low and midland of Nepal due to the absence of good vantage tree (i.e. Simal) number of vulture is declining.

Most of the nests of Himalayan Griffon were found near to the settlement probably due the cultural attachment and the abandoned cave found only near to settlement area. Himalayan Griffon enjoy with the sky burial practices is only the strong reason that could be made good place for them.

Interestingly, large numbers of Vulture nests were built outside the Koshi Tappu reserve. This may be partly because the reserve doesn't have many matured trees inside (Giri and Baral, 2001). Vultures know to use a variety of trees for nesting, i.e. Sisso *Dalbergia sissoo*, Mango *Mangifera indica*, Peepul *Ficus religiosa*, *Ficus bengalensis* (Ali and Ripley, 1987). Mustang doesn't have any such big and deciduous trees however the permanent structure i.e. caves, cliff made possible to become residential area for Vulture (Plate 2). During study period total 43.68% percent nest were found unoccupied by the birds of prey. In case of HG total 53.23% nest were found unoccupied. Number of HG in the nesting site decreased from 75-100% in some area of the Upper Mustang (Figure 2) .What a number of Vulture raise their chicks successfully could be answered only after the detailed study.



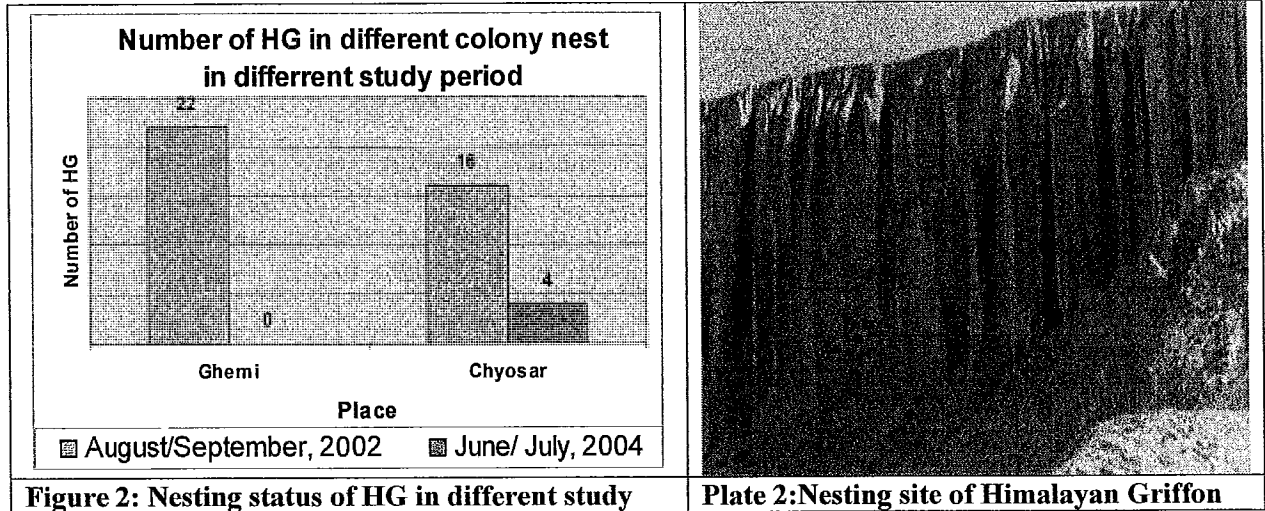


Figure 2: Nesting status of HG in different study

Plate 2: Nesting site of Himalayan Griffon

Altogether 234 Vulture comprising 9 Himalayan Griffon and one Eurasian Griffon with in the 1460-kilometer road transect survey in east and west high way (Baral *et. al.*, 2002) in low land of Nepal. In Mustang survey covers the total length about 200-kilometer and found 235Himalayan Griffon, 49 Lammergeir, 44 Black Kite, 11 Common Kestrel, 1 Common Buzzard, 14 Golden Eagle and 1 Northern Goshawk were observed. On the basis of Baiting we conclude that at least 62 HG found in the Upper Mustang. The result obtained by Mustang survey clearly shows that numbers of Vulture are higher than the plain area but lower than the previous record in the same area (figure 3).

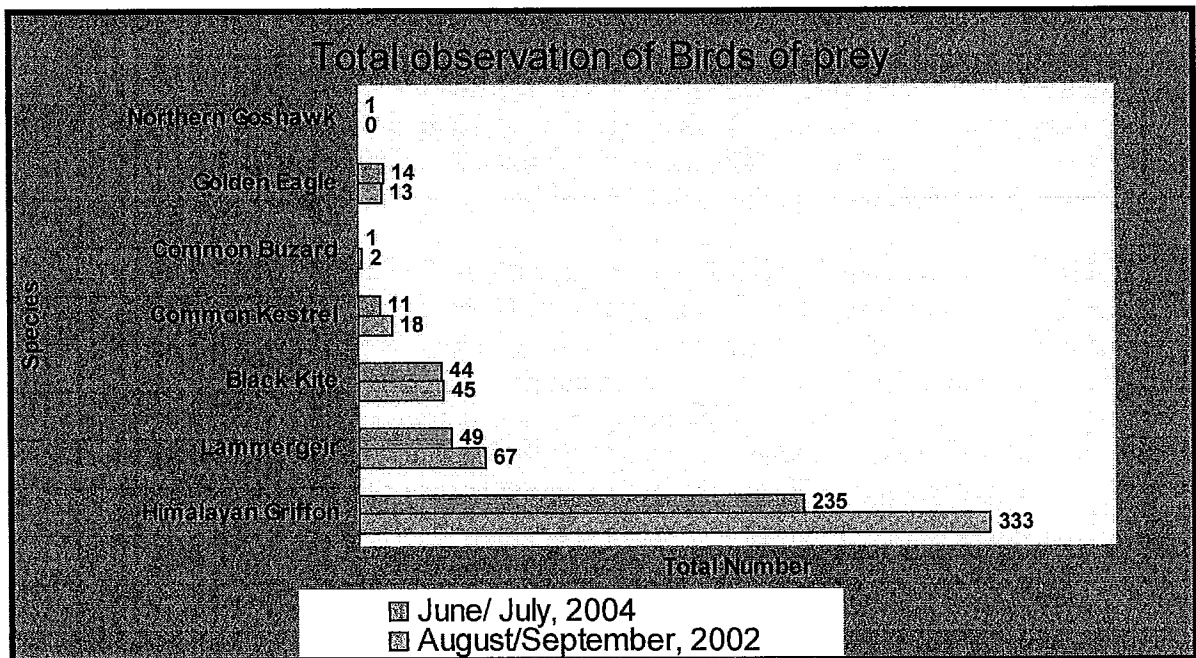


Figure 3: Different in total observation in separate study

It has been calculated that individual Lammergeir cover as much as 700 km in one day. Highest density of Lammergeir found in Ethiopia is (1 pairs/ 100km<sup>2</sup>). No meaningful figures for Asia range, where specie's patchy distributed must cover at least 3.5 million km<sup>2</sup>, estimated suggest the 1 pairs/ 600km<sup>2</sup> (Lees and Christie, 2001). Upper Mustang provided densities crossing this limitation by 40 times more. Total 0.07 Lammergeir/km<sup>2</sup> were found in Upper Mustang. Due to the repetition count densities might became highest. If the all nest of

Lammergeir supposed to be the occupied than it becomes 16 pair/200 km<sup>2</sup> in the study site only.

Golden Eagle diminished by late 20<sup>th</sup> century; limiting factor being food supply and conservation of favorable habitat (Thiollay, 1994). Due to the absence of their population estimation data, it is difficult to compare. However above-mentioned limitation might not be true in case of Nepal. Altogether, 0.02 Golden Eagles were found in a square kilometer in the study area.

According to D.B. Chaudhari's personal observation on 12<sup>th</sup> November 2002 at Nawalparasi, there were 19 White-rumped Vulture, 2 Red-headed Vulture, 1 Eurasian Griffon, 5 Egyptian Vulture, 5 Slender Billed Vulture, 2 Himalayan Griffon and 3 Cinereous Vulture feeding on the water Buffalo calf carcass. Recently Cheer Study team from the ACAP also reported the roosting site occupied by the Lammergeir, HG and White rumped Vulture in the lower Mustang area one by one in duration of three days (N28°37'19", E 083°39'18.2" Sarkhyo of Kunjo VDC). It clearly states that sharing the same carcass and roosting site increases possibly of transmitting disease, ecto-parasites and poison. As we know that White rumped Vulture are declining due to the use of antibiotic (Diclofenac) mainly in livestock. Food chain effect was found in the White-rumped Vulture. It is encouraging to know that Upper Mustang is relatively a pesticide free zone of Nepal. The road from Tibet and Baglung may provide easy access to bring pesticide to Upper Mustang. It would have negative impact on insects and threats of contamination to the insectivores and carnivores, which may eventually kill the carrion feeders i.e. Griffon, Eagles etc. This situation shouldn't be underestimated (Suwal, 2003). Due to the higher spatial habitat of birds of prey they roam lower Mustang and probably to other area. The lower Mustang is not free from the pesticide even in Upper Mustang in the name of agricultural production NRMG was using pesticide. But there is good news that after the interruption of ACAP they are trying to give up such activities. According to the District Livestock Development Office trace amount of pesticide have been distributing in the Upper Mustang from the initial stage of Pesticide distribution.

There is a significant relationship between vulture and local culture. Birds of prey enjoy corps, which is the regular and sustainable food for those species. To know about different ecological parameter of vulture in the area is necessary as it is related to local culture as well as ecological balance. The vulture still remains a little studied bird throughout its distribution range in Nepal. (Acharya, 2003). During study it is found that 2-6 People die yearly in each VDC which is the sustainable food mainly for HG because other birds of prey did not visit the site or people did not give any option to take the human corpse. It is believed that the soul of human only can be delivered by the HG. Every part of Lammergeir is used for traditional medicine and psychological treatment. People found to searching the feces of lammergeir in a single incident near to the Samjung. Common Kestrel and Crow are the hated bird of the area.

All the local guns were collected by the district administration office so hunting is not major problem as before however local people has reported on illegal hunting through rope trap in the lower part of the Mustang. (Acharya and Thapa 2003). Wildlife depredation creating people wildlife conflict in the area, total \$54861 loosed in 1999(annual data) in Kaligandaki valley within the Annapurna area. It was found that mammals and birds are both responsible for the depredation. Total 13.73% depredation found in the lower Kaligandaki valley from the bird (Acharya 1999). Army arrested illegal trader of cats in Jomsom (common leopard and leopard cat) with 22 nos. of pelts who tried to supply them to Tibet via Lomanthang (Thapa 2003). This area is suffering from the hunting and snaring from the time of immemorial. Not only professional hunter threats the area, small primary level student and teachers from the

outside also involve for killing Galliformes in the area. After the interruption of ACAP the trend is decreasing but not stopped.

## Recommendations

### 6.1 Monitoring and prepare data base

#### 6.1.1 Baiting

Until and unless, we couldn't prepare the baseline data, our effort towards the conservation will not fruitful. Yearly, at least 3 sites (Lomatnghan, Yara and Chuksang) should be chosen for baiting of livestock for the counting of HG.

#### 6.1.2 Transect

The roots which were used during the couple of survey should be used for the counting of different birds of prey. It will provide us the general idea (Figure 4) whether the species is decreasing or not. It required about 25 days for the monitoring of birds of prey.

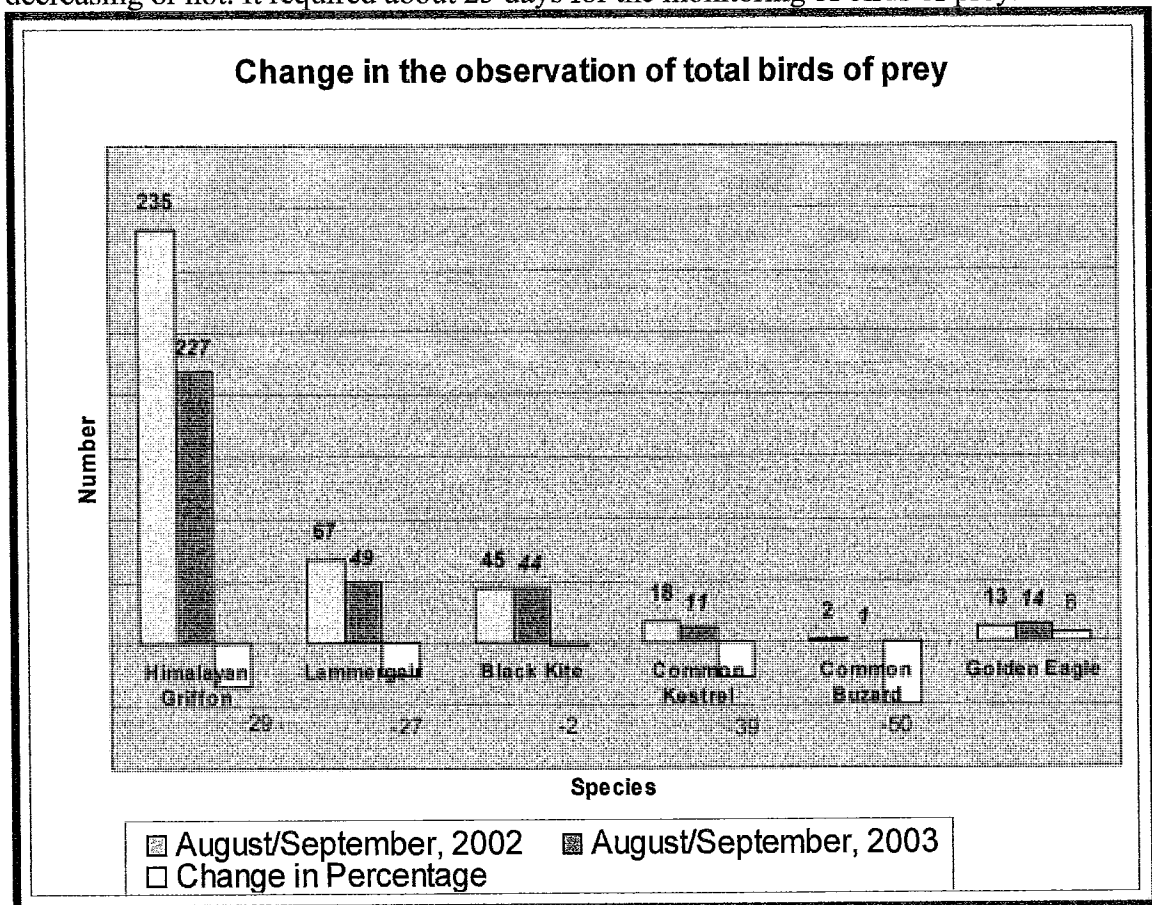


Figure 4: Change in the observation of birds

#### 6.1.3 Nest base monitoring

Most reliable monitoring method should be applied in the area after the detail inventory on the nest. Such nest will help in the future for determined the ecological study of the specific species in the area.

### 6.2 Trained to local human corpse piece maker

Local people easily identified the birds of prey and they know their local Name. Data could be gathered through those people who made human corpse into many pieces. Instead of such work minimal amount should be given to those individuals. This data recording process can be started after giving simple training to corpse piece maker. In such case Conservation Management committee could be used as a coordinator.

### **6.3 Awareness**

Although people were not involved directly killing the birds of prey in the area and obviously not anywhere in Nepal. But the prey species were threats by villagers and outsider. Many people from the out side were now concentrated in the area in search of work. They killed the birds, small mammals, which are directly related with the food of birds of prey. Catapult became the common weapons for them. Some teacher of Chosyar and Chunup VDC were found in hunting of Galliform species. From few years ago ACAP is involving in the data base preparation of biodiversity in the area. Its extension program and monitoring mechanism should be implemented properly through out the area. During such program ACAP should incorporate Lama, the respected person of the area, in many ways i.e. motivation, tour, training, awarding etc.

### **6.4 Strength the CE teacher**

ACAP has been launching its conservation education (CE) program through the CE teacher. Teacher has the same responsibilities as ACAP is being performed in the area because ACAP is providing additional incentive for them. Those teacher represents each VDC so that they should be motivated at least stop the illegal hunting by teacher. The Conservation Booklet provided by ACAP and His Majesty Government of Nepal is unable to incorporate to deal about biodiversity especially about bird. So the Booklet should be revised for the sake of birds.

### **6.5 Immediate control on wildlife hunting**

Immediately ACAP should conduct meeting with the CAMC and informed them about the hunting status in their village through the outsider. Outsider should punish so that they may not repeat the same nature in future. During such visit ACAP should informed the villagers about the ultimate goal of the ACAP.

### **6.6 Testing of Diclofenac in Griffon**

It has been proved that the reason for the decline of White rumped Vulture is Diclofenac (chemical used in common pain killers and anti inflammatory drugs for cattle and even people). The same situation for the HG is not recorded at all. Due to its common roost and sharing of Carcass some have think it has already been transferred. At least ACAP should test some HG whether affected by such incident or not. HG can be trapped by bating easily in the area. But the local permission is required before start work.

### **6.7 Increase the prey species**

Birds of prey occupied tertiary level in food chain and all the food in terms of energy transferred from Producer and primary consumer. To increase the productivity, availability of moisture in the area has high value. Small pond, Open irrigation canal, promote grasses, increase the number of demonstration plots, plantation, etc are small program with long-term positive impact.

### **6.8 Information sharing**

Some important site for birds of prey should be made accessible through the information i.e. Sign posting, brochure preparation, placement of CAMC notice board.

## Conclusion

Research, monitoring and the conservation effort on ornithological aspect is lesser in Nepal with respect to other biodiversity component. Within the aviary, birds of prey falls on the least study group of birds. Birds of prey occupy the tertiary level in food chain and their presence or absence both indicates the status of ecosystem in the area.

Number of the birds of prey decreased in many aspects as transect total count, nesting number, number found in the carcass site. Study team (2002) found 110 number of Himalayan Griffon on carcass but these numbers even not found in the baiting site (2004). Total Observation number found to be decreased by 2-50%. Nesting site of Himalayan Griffon in Ghemi was found unoccupied though it provided space for 22 HG in last study period (2002). Obtained information suggest us for the immediate workout on birds of prey, otherwise it will be late as a result we are facing the drastically decline of the White rumped Vulture in low land of Nepal.

There is a symbiotic relationship between the vulture and culture of Upper Mustang. We have not sufficient data to show that the birds of prey are absolute in good position in Upper Mustang. On the basis of few international literatures, we can conclude that the number of Himalayan Griffon and Lammergeir is higher in Upper Mustang. But, they are fewer than the survey carried out 2 years ago.

Especially the area above Chhuksang and Chungshi area should be considered for the launching of various programs. Detail study is required for the sustainable conservation and monitoring program. Program should be focused on ex-situ and in-situ conservation i.e. Awareness program on different level on wider area (formal and informal education, publication), habitat improvement (maintain the moisture, afforestation, pasture improvement,), maintaining the organic farming, conservation of buffer species (Crete small pond, stop the hunting), establishment of monitoring (with the help of local corpse piece maker) unit in the area. Transect based observation, nest based population count and testing of Himalayan Griffon for Diclofenac are recommended.

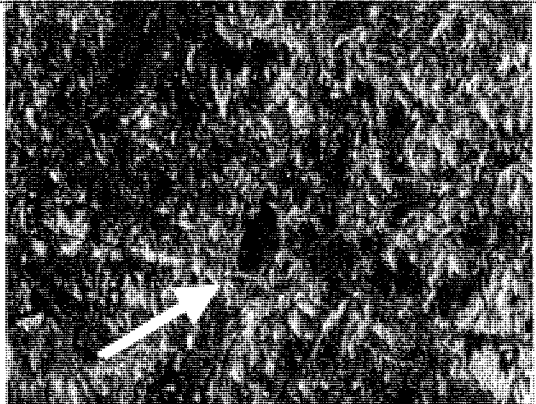



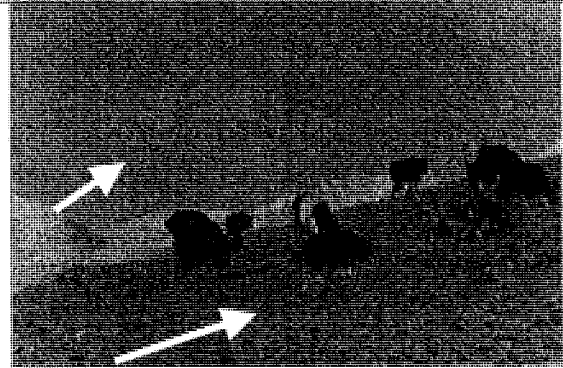
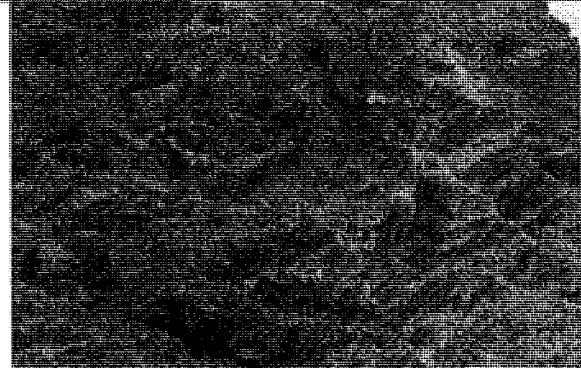


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**Plates**

	
<b>Plate 3: BK on nest with chicks</b>	<b>Plate 4: Nest of Golden Eagle on cliff</b>
	
<b>Plate 5: Observation of Nest near Yara</b>	<b>Plate 6: Use of D-45 in lower Mustang in potato field</b>
	
<b>Plate 7: Livestock grazing on pasture</b>	<b>Plate 8: Nest of Lammergeir on cliff</b>
	
<b>Plate 9: Himalayan Griffon on Bait</b>	<b>Plate 10: Cliff near Chungsi, hot spot for Birds of prey</b>

**Table 1: Upper Mustang annotated bird of prey checklist 2002**

Common name	Scientific name	Kazi 77	Kazi 78	Shah '01	Suwal '02	Acharya, 2004	Status	CITES
<b>ACCIPITRIDAE</b>								
BLACK KITE	<i>Milvus migrans</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BR	
LAMMERGEIER	<i>Gypaetus barbatus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BR	
WHITE-RUMPED VULTURE	<i>Gyps bengalensis</i>	<input type="checkbox"/>					IR	
HIMALAYAN GRIFFON	<i>Gyps himalayensis</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BR	
EURASIAN GRIFFON	<i>Gyps fulvus</i>			<input type="checkbox"/>	<input type="checkbox"/>		BR	
HEN HARRIER	<i>Circus cyaneus</i>			<input type="checkbox"/>			PV	
NORTHERN GOSHAWK	<i>Accipiter gentilis</i>	<input type="checkbox"/>				<input type="checkbox"/>	BR	
EURASIAN SPARROW-HAWK	<i>Accipiter nisus</i>				<input type="checkbox"/>		BR	
COMMON BUZZARD	<i>Buteo buteo</i>				<input type="checkbox"/>	<input type="checkbox"/>	SV	II
UPLAND BUZZARD	<i>Buteo hemilasius</i>		<input type="checkbox"/>				SV	II
BLACK EAGLE	<i>Ictinaetus malayensis</i>	<input type="checkbox"/>					BR	
GOLDEN EAGLE	<i>Aquila chrysaetos</i>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	BR	II
BOOTED EAGLE	<i>Hieraaetus pennatus</i>				<input type="checkbox"/>		BR	
<b>FALCONIDAE</b>								
COMMON KESTREL	<i>Falco tinnunculus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BR	
EURASIAN HOBBY	<i>Falco subbuteo</i>	<input type="checkbox"/>			<input type="checkbox"/>		BR	
MERLIN	<i>Falco columbarius</i>	<input type="checkbox"/>					IR?	
<b>STRIGIDAE</b>								
TAWNY OWL	<i>Strix aluco</i>	<input type="checkbox"/>					BR	
LITTLE OWL	<i>Athene noctua</i>		<input type="checkbox"/>		<input type="checkbox"/>		BR	

## Legend:

- BR Breeding resident  
SV Summer visitor  
PV Passage visit  
IR Individual record  
WV Winter visitor  
GT Globally threatened  
BLI Bird life international

- Appendix II includes those species, which, although not necessarily threatened with extinction now, may become so if the trade of these species is not subject to strict regulation. This category includes 'look alike' species, whose exploitation is in need of control because of similarity in appearance to Appendix I species.

**Table 2: Detail about birds of prey**

Detail about Birds of Prey1									
Day	Place	HG	L	BK	CK	GE	CB	NG	Transect length
1	Jomsom-Kagbeni	0	0	0	0	0	0	0	10
2	Kag -Chuksam	2	3	1	0	0	0	0	9.29
3	Chuksam-Samar	1	6	4	0	0	0	0	5.9
4	Samar-Syanboche	24	2	0	1	2	1	0	4.83
5	Sya-Chunksi-Jhaite	25	3	0	0	2	0	0	4.22
6	Jhaite-Ghemi	29	8	0	2	1	0	0	4.72
7	Ghemi-Charang	19	3	5	2	0	0	0	6.61
8	Charang to Marang and Back	1	4	5	1	0	0	0	7.9
9	Char.-Lomanthang	1	0	0	1	0	0	0	10.2
10	Lomanathang	10	2	2	1	1	0	0	4
11	Lomanthang-Thingar	8	0	2	0	0	0	0	3.2
12	Thingar-Chunjung	16	1	4	1	1	0	1	5.81
13	Chu-Chosyar-Lom	10	3	5	0	0	0	0	9.2
14	Lomanthang (rest)	0	0	0	0	0	0	0	0
15	Lomanthang to Dhi	5	4	5	0	1	0	0	14.3
16	Dhi to Lomanthang	2	0	6	0	0	0	0	14.8
17	Lomanthang to Samjung and back	4	4	1	1	0	0	0	17.8
18	Lomanthang(bating)	62	0	0	0	2	0	0	0
19	Lomanthang to Dhakmar	1	0	0	1	2	0	0	14
20	Dhakmar to Syangbochen	4	3	2	0	0	0	0	10.3
21	Syangbochen to Chaile	9	3	1	1	2	0	0	17
22	Chaile-Jomsom	2	0	1	1	0	0	0	26
<b>23</b>	<b>Total for the trip</b>	<b>235</b>	<b>49</b>	<b>44</b>	<b>11</b>	<b>14</b>	<b>1</b>	<b>1</b>	
	Frequency of sighting (Day)	20	14	14	11	9	1	1	
	<b>Relative frequency</b>	<b>0.91</b>	<b>0.64</b>	<b>0.64</b>	<b>0.50</b>	<b>0.41</b>	<b>0.05</b>	<b>0.05</b>	
	<b>Area (sq.km)</b>	200	200	200	200	200	200	200	200
	Density/sq.km	1.18	0.25	0.22	0.06	0.07	0.01	0.01	
	No. of days in the field	21	21	21	21	21	21	21	
	Maximum in a day	62	8	6	2	2	1	1	

**Appendix-1 Data collection sheet***General description of birds of prey*

Date	Species	Number	Place/location	GPS	Habitat	Activity	Temperature

*General description of Nest*

Place Location	GPS	Aspect	Nearest settlement	Colony of nest	Species	Habitat	Ht. From the Ground (m.)