

**ROLES OF GHACHOWK VULTURE RESTAURANT AND SANITARY
LANDFILL SITE FOR VULTURES CONSERVATION IN KASKI
DISTRICT, NEPAL**



Entry 58
M.Sc. Zoo Dept. Ecology.....
Signature *Anand*.....
Date: 2076-10-29.....
2020-02-12

Sharmila Sigdel

T.U. Registration No: 5-2-48-2205-2012

T.U. Examination Roll No: 449/073

Batch: 2073/74

A thesis submitted in partial fulfillment of the
requirements for the award of the degree of Master of
Science in Zoology with special paper Ecology & Environment

Submitted to

Central Department of Zoology
Institute of Science and Technology
Tribhuvan University
Kirtipur, Kathmandu

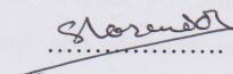
Nepal

July, 2020

DECLARATION

I hereby declare that the work presented in this thesis entitled “**ROLES OF GHACHOWK VULTURE RESTAURANT AND SANITARY LANDFILL SITE FOR VULTURES CONSERVATION IN KASKI DISTRICT, NEPAL**” has been done by myself, and has not been submitted elsewhere for the award of any degree. All sources of information have been specifically acknowledged by reference to the author(s) or institution(s).

Date: 2076-10-29



Sharmila Sigdel

Roll No: 449/073



त्रिभुवन विश्वविद्यालय
TRIBHUVAN UNIVERSITY

प्राणी शास्त्र केन्द्रीय विभाग

CENTRAL DEPARTMENT OF ZOOLOGY

कीर्तिपुर, काठमाडौं, नेपाल।
Kirtipur, Kathmandu, Nepal.



०१-४३३१८९६

01-4331896

Email: info@cdztu.edu.np

URL: www.cdztu.edu.np

पत्र संख्या :-

च.नं. Ref.No.:-



RECOMMENDATIONS

This is to recommend that the thesis entitled “**ROLES OF GHACHOWK VULTURE RESTAURANT AND SANITARY LANDFILL SITE FOR VULTURES CONSERVATION IN KASKI DISTRICT, NEPAL**” has been carried out by Ms. Sharmila Sigdel for the partial fulfillment of Master’s Degree of Science in Zoology with special paper Ecology and Environment. This is her original work and has been carried out under my supervision. To the best of my knowledge, this thesis work has not been submitted for any other degree in any institutions.

Date: 31/07/2020

Supervisor

Dr. Bishnu Prasad Bhattarai

Asst. Professor

Central Department of Zoology

Tribhuvan University

Kirtipur, Kathmandu, Nepal



Bird Conservation Nepal

नेपाल पंखी संरक्षण संघ

Government Regd. Charity No. 77/049/050, Social Welfare Council Affiliation No. 5130, Pan No. 301136877

पंखी संरक्षण कार्यक्रम
CENTRAL DEPARTMENT OF ZOOLOGY
संरक्षण विभाग
नेपाल पंखी संरक्षण संघ

RECOMMENDATION

This is to recommend that the thesis entitled "ROLES OF GHACHOWK VULTURE RESTAURANT AND SANITARY LANDFILL SITE FOR VULTURES CONSERVATION IN KASKI DISTRICT, NEPAL" has been carried out by Ms. Sharmila Sigdel for the partial fulfillment of Master's Degree of Science in Zoology with special paper Ecology & Environment. This is her original work and has been carried out under my supervision. To the best of my knowledge, this thesis work has not been submitted for any other degree in any institutions.

Date: 5-October 2020

Co-Supervisor

Mr. Krishna Prasad Bhusal

Vulture Conservation Program Officer



giving
nature
a home



त्रिभुवन विश्वविद्यालय
TRIBHUVAN UNIVERSITY



०१-४३३१८९६
01-4331896

Email: info@cdztu.edu.np

URL: www.cdztu.edu.np

प्राणी शास्त्र केन्द्रीय विभाग
CENTRAL DEPARTMENT OF ZOOLOGY

कीर्तिपुर, काठमाडौं, नेपाल।
Kirtipur, Kathmandu, Nepal.

पत्र संख्या :-

च.नं. Ref.No.:-



LETTER OF APPROVAL

On the recommendation of supervisor "Dr. Bishnu Prasad Bhattarai" this thesis submitted by Mrs. Sharmila Sigdel entitled "**ROLES OF GHACHOWK VULTURE RESTAURANT AND SANITARY LANDFILL SITE FOR VULTURES CONSERVATION IN KASKI DISTRICT, NEPAL**" is approved for the examination.

Date: २०७६-१०-२९

Prof. Dr. Tej Bahadur Thapa
Head of Department
Central Department of Zoology
Tribhuvan University
Kirtipur, Kathmandu, Nepal



त्रिभुवन विश्वविद्यालय
TRIBHUVAN UNIVERSITY



०१-४३३९८९६

01-4331896

Email: info@cdztu.edu.np

URL: www.cdztu.edu.np

प्राणी शास्त्र केन्द्रीय विभाग
CENTRAL DEPARTMENT OF ZOOLOGY

कीर्तिपुर, काठमाडौं, नेपाल ।
Kirtipur, Kathmandu, Nepal.

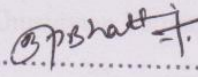
पत्र संख्या :-

च.नं. Ref.No.:-

CERTIFICATE OF ACCEPTANCE

This thesis work submitted by Ms. Sharmila Sigdel entitled “**ROLES OF GHACHOWK VULTURE RESTAURANT AND SANITARY LANDFILL SITE FOR VULTURES CONSERVATION IN KASKI DISTRICT, NEPAL**” has been accepted as a partial fulfillment for the requirements of Master’s Degree of Science in Zoology with special paper Ecology and Environment.

EVALUATION COMMITTEE

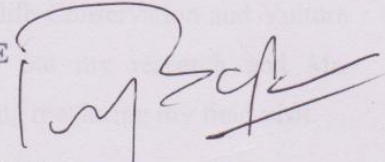

.....

Supervisor
Dr. Bishnu Prasad Bhattarai
Asst. Professor
Central Department of Zoology
Tribhuvan University
Kirtipur, Kathmandu, Nepal

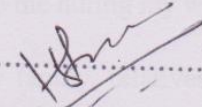

.....

External Examiner
Dr. Man Kumar Dhamala
Associate Professor
Central Department of Environmental Science
Tribhuvan University
Kirtipur, Kathmandu, Nepal

Date of Examination: 31/07/2020


.....

Head of Department
Prof. Dr. Tej Bahadur Thapa
Central Department of Zoology
Tribhuvan University
Kirtipur, Kathmandu, Nepal


.....

Internal Examiner
Dr. Hari Prasad Sharma
Associate Professor
Central Department of Zoology
Tribhuvan University
Kirtipur, Kathmandu, Nepal

ACKNOWLEDGEMENTS

It is a great pleasure to acknowledge my deepest thanks and gratitude to Dr. Bishnu Prasad Bhattarai, Assistant Professor, Central Department of Zoology for his kind supervision. It is a great honour to work under his supervision. My appreciation goes to Prof. Dr. Tej Bahadur Thapa, Head of Central Department of Zoology for his kind support.

I am extremely grateful and indebted to my co-supervisor Mr. Krishna Prasad Bhusal, Vulture Conservation Programme Officer, Bird Conservation Nepal (BCN) for his suggestion before and during my study.

I would like to thank Bird Conservation Nepal (BCN), Royal Society for the Protection of Birds (RSPB), UK and Darwin Initiative, UK providing Jatayu Scholarship, for my research work.

I would like to thank Department of National Parks and Wildlife Conservation and Vulture Restaurant, Ghachowk for giving me permission to carry out my research and Mr. Khusimaan Tamang, Care taker of Vulture Restaurant for helping me during my field visit.

I am thankful to all the community people of Machhapuchhre Rural Municipality-3, Ghachowk, Kaski and Pokhara Metropolitan-14, Baachhibuduwaa who provided their valuable time in collection of data.

I would also like to thanks to my husband Mr. Baman Chalise for helping me during my field work as well as in completing my dissertation. I am thankful to my friends Anita Poudel, Deepa Pun, Samikchhya Sapkota and other classmates who help me during my work.

At last, but not the least, I would like to acknowledge to my family, relatives and all the helping hands for their kind co-operation and encouragement which help me in completion of this research work.

Sharmila Sigdel

T.U. Reg. No: 5-2-48-2205-2012

T.U. Examination Roll No: 449/073

CONTENTS

DECLARATION	i
RECOMMENDATION	ii
LETTER OF APPROVAL	iv
CERTIFICATE OF ACCEPTANCE	v
ACKNOWLEDGEMENTS	vi
CONTENTS	vii
LIST OF TABLES	ix
LIST OF FIGURES	ix
LIST OF ANNEXES	ix
LIST OF ABBREVIATIONS	x
ABSTRACT	xi
1. INTRODUCTION	1
1.1 General Background	1
1.1.1 Status of Vulture in Nepal	1
1.1.2 General characteristics of different Vulture	2
1.1.2.1 Himalayan Vulture	2
1.1.2.2 Egyptian Vulture	2
1.1.2.3 Bearded Vulture	3
1.1.2.4 Red-headed Vulture	3
1.1.2.5 White-rumped Vulture	3
1.1.2.6 Slender-billed Vulture	4
1.1.2.7 Griffon Vulture	4
1.1.2.8 Cinereous Vulture	4
1.1.2.9 Long-billed vulture	4
1.1.2 Threats to Vulture	5
1.1.3 Conservation practices	5
1.2 Objectives	6
1.2.1 General objective	6
1.2.2 Specific objectives	6

1.3 Significance of the study	6
2. LITERATURE REVIEW	8
3. MATERIALS AND METHODS	11
3.1 Study area	11
3.2 Materials	12
3.3 Methods	12
3.3.1 Direct observation method	12
3.3.2 Collection of roosting preference data	13
3.3.4 Estimation of tree stands variables	14
3.3.5 Breeding success of the Vulture	14
3.3.6 Questionnaire survey/Interactions:	14
3.4 Data Analysis	14
3.4.1 Estimation of Population size	15
3.3.2 Threats and people's attitudes	15
4. RESULTS	16
4.1 Population estimation	16
4.2 Population composition	17
4.3 Roosting preference	18
4.4 Questionnaire survey	19
4.4.1 Demography of the respondents	19
4.4.2 Domestic animals description and carcass disposal Mechanism	20
4.4.3 Attitude of respondents	21
4.4.4 Threats to vultures	26
5. DISCUSSION	27
5.1 Population status of vultures	27
5.2 Roosting preference	28
5.3 Threats and attitude of respondent towards vulture	29
6. CONCLUSION AND RECOMMENDATIONS	31
7. REFERENCES	32

LIST OF TABLES

Table 1: List of variables used for collecting habitat preference data	13
Table 2: Numbers of vulture species in the study area (GVR)	16
Table 3: Numbers of vulture species in the study area (SLS)	17
Table 4: Population composition of vulture species in GVR	17
Table 5: Population composition of vulture species in SLS	18
Table 6: Habitat used by different vulture	19
Table 7: Demography of the respondents	20
Table 8: Respondent's view towards vultures in GVR	22
Table 9: Respondent's view towards vultures in SLFS	23
Table 10: Attitude of respondents	24
Table 11: Significance of the parameters with the respondent's attitude towards vulture in GVR	25
Table 12: Significance of the parameters with the respondent's attitude towards vulture in SLFS	25

LIST OF FIGURES

Figure 1: Map showing the study area with land covers type	12
Figure 2: Respondent's view on carcass disposal mechanism	21
Figure 3: Respondent's views about the cause of death of vulture	26

LIST OF ANNEXES

Annex 1: Photographs of the field work	38
Annex 2: Nest monitoring Form	41
Annex 3: Observation form for vultures	42
Annex 4: Household survey	43

LIST OF ABBREVIATIONS

BCN-Bird Conservation Nepal

CR- Critically Endangered

CV- Cinereous Vulture

DBH- Diameter at breast height

DNPWC- Department of National Parks and Wildlife Conservation

EN-Endangered

EV-Egyptian Vulture

GPS- Geographic Positioning System

GIS- Geographical Information System

GVR- Ghachowk Vulture Restaurant

HV-Himalayan Vulture

IUCN- International Union for Conservation of Nature

IVI- Important Value Index

NSAIDs- Non-Steroidal Anti-Inflammatory Drugs

NT- Near Threatened

RHV- Red-headed Vulture

SBV- Slender-billed Vulture

SLS- Sanitary Landfill Site

VR- Vulture Restaurant

WRV- White-rumped Vulture

ABSTRACT

This study was focused on the roles of Vulture Restaurant and Sanitary Landfill Site for vulture conservation. This study was also focused on the present status of vultures, roosting preference, people's perception and present threats to the vultures. The study was based on the direct observation method using birding routed and visiting roosting and nesting sites. Questionnaire survey was done to identify people's perception towards vultures. The study was mainly concentrated in and around the Ghachowk Vulture Restaurant (GVR) and Sanitary Landfill Site (SLS) in Kaski District. Altogether 202 individuals of six species of vultures were recorded in GVR. The most abundant (n=104) was Himalayan Vulture and the least was Egyptian Vulture (n=2). Other species of vultures, White-rumped Vulture (n=67), Red-headed Vulture (n=11), Slender-billed Vulture (n=10), and Cinereous Vulture (8) were also observed. Likewise, a total of 204 individuals of five species of vultures were recorded in SLS. The most abundant (n=164) was EV and the least was RHV (n=6). Other species of vultures, WRV (n=16), SBV (n=10), and CV (n=8) were also observed. One nest of SBV was recorded nearer to the SLS. Large number of Juvenile population of WRV was seen in GVR. Likewise, different age class of Egyptian Vulture was seen frequently in SLS. The more preferred tree species for roosting and nesting were *Bombax ceiba* and *Alnus nepalensis*. Five related questions were taken and combined these questions to form a single attitude scale. Overall 84% and 80% showed positive attitude towards vulture in GVR and in SLF respectively. This study showed that age and ethnicity in GVR, and Occupation in SLS were the determinant factors for the people's attitude towards vultures. Respondents from GVR said that electrocution and disease were the major threats to the vultures and respondents from SLF said that electrocution and poisoning were the major threats to the vultures. Therefore, for the successful vulture conservation programme it should include creation of a long term survival environment for vultures with involvement of the people in all of its range areas along with its ecological aspects.

1. INTRODUCTION

1.1 General Background

Vultures are the primary consumer of carrion of avian family Accipitridae and order Falconiformes which provide a vital ecosystem service by cleaning the environment of animal carcasses (Mundy et al. 1992). A particular characteristic of many vultures is bald head and neck. This is because a feathered head would become spattered with blood and other fluids and thus will be difficult to keep clean. Physiologically the bare skin areas in Griffon vultures play an important role in thermo-regulation (Ward et al. 2008). Vultures consume carcasses of both domesticated and wild animals; thereby, cleaning the environment (Thakur et al. 2012). They are regarded as a sweeper of nature that sweeps the rubbish every day (Ming et al. 2013). Vultures remove the ungulates dead and decayed bodies rapidly and efficiently thus cleanse the environment (Pain et al. 2003). Vultures putrefy the environment by cleaning up the dead and decay animals that may have direct threat to the public health with direct or indirect infection by providing the potential breeding ground for the pathogenic bacteria (Prakash et al. 2003). They also have an important cultural role in the consumption of human dead bodies in the form of sky burials within Nepal and Tibet (Acharya et al. 2009; Ming et al. 2013).

1.1.1 Status of Vulture in Nepal

There are 23 species of vultures distributed worldwide (including condors), among which the majority (16 species) occur in the Old World and within the Family Accipitridae, while the remaining seven species belong the New World Cathartidae Family (Ogada and Keesing 2010). Nine species of vultures of family Accipitridae are found in Indian sub-continent (Subedi and Decandido 2013). Nepal bears all these nine species. Out of the nine species, White-rumped Vulture (*Gyps bengalensis*), Slender-billed Vulture (*Gyps tenuirostris*), Himalayan Vulture (*Gyps himalayensis*), Red-headed Vulture (*Sarcogyps calvus*), Egyptian Vulture (*Neophron percnopterus*) and Bearded Vulture (*Gypaetus barbatus*) are resident vultures whereas Eurasian Griffon (*Gyps fulvus*) and Cinereous Vulture (*Aegypius monachus*) are winter visitors (BCN and DNPWC 2016). The Long-billed Vulture (*Gyps*

indicus) has been recently found to occur in Nepal which was previously considered to be endemic to India and Pakistan (Subedi and DeCandido et al. 2013).

Five species of vultures are included in threatened category by IUCN. Among which White-rumped Vulture, Slender-billed Vulture, Red-headed Vulture and Long-billed Vultures are in Critically Endangered and Egyptian Vulture is in Endangered category (Birdlife International 2017).

The biological maturity of vultures to breed varies, however *Gyps* vultures start to breed at the age of five to seven years. They form monogamous pairs and both the sexes share the incubation and care of the hatchlings. Nests are generally built on trees or cliffs and are colonial in some species (SAVRW 2004). Nests can be used year after year. Both birds participate in nest construction with often one bringing sticks and the other doing the building (Mundy et. al 1992). They produce one egg during each subsequent breeding season. Annual survival rates of large raptors are typically high (Mendelssohn & Leshem 1983).

1.1.2 General characteristics of different Vulture

1.1.2.1 Himalayan Vulture

Himalayan Vulture is larger than Griffon Vulture, with broader body and slightly longer tail. Its body is pale buffish, contrasting strongly with dark flight feathers and tail, and ruff is buffish. Juvenile has brown feathered ruff, with bill and cere initially black, dark brown body and upperwing-coverts boldly and prominently streaked buff (Grimmett et al. 2016). It is the heaviest breeding vulture in Nepal which resembles Griffon Vulture but more pale white to sandy buff, larger and wider with yellowish beak. Young bird dark and streaked differs from other young Griffons by large size, higher altitude and associated adults. It produces grunts, screeches gooses, like clamor and hisses sounds (Shrestha 2001). The breeding season is chiefly January to March or April. Nest is large rough and untidy pad of sticks and rubbish placed on the ledge of a cliff, often inaccessible (Grimmett et al. 2016).

1.1.2.2 Egyptian Vulture

It is a small vulture with long, pointed wings, small pointed head and wedge-shaped tail. Adults are mainly dirty white, with bare yellowish face and black flight feathers. Juvenile is blackish-brown with bare grey face (Grimmett et al. 2016). The nesting season is February to April and both parents incubate the eggs and feed the chicks until they fledge at the age of 70 to 85 days. Egyptian vultures become sexually mature at four to five years of age and are known to live for up to 37 years in captivity. The number of egg is two and hatch after about 42 days. The second chick may hatch after an interval of 3 to 5 days or more (Bhusal 2011).

1.1.2.3 Bearded Vulture

It has long and narrow pointed wings, and large wedge-shaped tail. Adult has pale head with black mask and beard, grayish-black upperparts, and cream or rufous-orange under parts contrasting with black under wing-coverts. Juvenile has blackish head and neck, and grey-brown underparts (Grimmett et al. 2016). It is the only member of the genus *Gypaetus*. The diet of Lammergeir mainly consists of bone remains from the wild and domestic ungulates (Margalida et al. 2007).

1.1.2.4 Red-headed Vulture

Its length is 76-86 cm. Bulky vulture with medium-sized body, body is black with bare red head, neck and legs; also white thigh-patches. Juveniles have paler more mottled plumage (BirdLife International 2020). Juvenile browner with white down on head; pinkish head and feet, white patch on upper thighs, and whitish undertail-coverts are best features (Grimmett et al. 2016). Usually they are alone or in pairs. Frequently feeds on carcasses of animals overlooked by other large vultures.

1.1.2.5 White-rumped Vulture

White-rumped vulture is medium-sized, dark vulture of length of 75-85 cm with blackish plumage, silvery panel on upper surface of head and neck, and short, heavy, mostly silver bill of adult. Juveniles are dark brown with streaked underparts and underwing-coverts, dark rump and back, whitish head and neck, and all dark bills. Juvenile similar in colour to juvenile Himalayan Vulture, but smaller and less heavily built, with narrower wings and

shorter tail. They roost communally at traditional sites in groves. They build platform for nest of sticks and twigs, in top of large tree (BirdLife International 2020; Grimmett et al. 2016).

1.1.2.6 Slender-billed Vulture

They are local resident for Nepal. The length of Slender-billed Vulture is 80-95 cm; bill, head, neck and body more slender than in Griffon. Adult has dark bill and cere with pale culmen, lacks any down on black head and neck, and has dirty white ruff that is rather small and ragged. An upperpart is colder grey-brown, and has white thighs. In flight, from below, prominent white thighs, trailing edge to wing appears rounded and pinched-in at body, undertail-coverts appear dark and in flight feet reach tip of tail. Juvenile is similar to adult. Juvenile has mainly dark bill, some white down on head and neck, and pale streaking on underparts (Grimmett et al. 2016).

1.1.2.7 Griffon Vulture

They are mainly a passage migrant, but a rare winter visitor in small number. Key features of adult are yellowish bill with blackish cere, whitish head and neck, fluffy white ruff, rufescent-buff upperparts, and thighs with prominent pale streaking. Immature Griffon is richer rufous-brown on upperparts and upperwing coverts (Grimmett et al. 2016). Griffon Vulture nest is not recorded in Nepal as it is a winter visitor and passage migrant (DNPWC 2015; Inskipp et al. 2016).

1.1.2.8 Cinereous Vulture

Cinereous Vulture length is 98-107cm; large, broad-winged vulture, short tail is slightly wedge-shaped. Adult are dark brown in colour. It is the largest Old World vultures. Adult blackish-brown with paler brown ruff; may show paler band on greater underwing. Juvenile is blacker and more uniform than adult (BirdLife International 2020; Grimmett et al. 2016). Cinereous Vulture nest is not recorded in Nepal till date as it is a winter visitor and passage migrant (DNPWC 2015; Inskipp et al. 2016).

1.1.2.9 Long-billed vulture

Key features of adult are sandy-brown body with upperwing-coverts (Griffon is more rufescent). Head is blackish and neck with sparse white down on hindneck. They are much smaller and less heavily built than Himalayan, with darker head and neck, white ruff and dark legs and feet (Grimmett et al. 2016). Long-billed Vulture nest is not recorded in Nepal till date as it is a passage migrant (DNPWC 2015; Inskipp et al. 2016).

1.1.3 Threats to Vulture

The Anti-inflammatory Veterinary drug diclofenac used to treat domestic livestock has been identified as the cause of mortality in past years (Oaks et al. 2004; Swan et al. 2006; Gilbert et al. 2006).

Human disturbance, habitat destruction, food scarcity and wild fire are found as main threats for Vultures (Gautam and Baral 2013). Including these, others like electrocution, deforestation and the burrowing practice for the disposal of dead livestock are the cause for the declining of the *Gyps* species (Shah 2016). The disappearance of vultures from Asia is linked with the demise of wild ungulates (Clements et al. 2013). People in upper Mustang and lower Mustang believe that Bearded Vulture intestines make an effective treatment for diarrhea and that anyone who takes chicks from the nest of a vulture becomes more prosperous lead to decline in vulture species (Acharya et al. 2010; Giri 2013).

1.1.4 Conservation practices

To conserve vultures a Vulture conservation and breeding center was established in Chitwan National Park in 2008. Likewise seven community managed Vulture safe sites were established in Nawalparasi, Rupendehi, Dang, Kailali, Kaski and Sunsari districts between 2007 and 2013 (DNPWC 2015). Ghachowk Vulture Restaurant is one of them in Kaski district. Within vulture safe zones, dead cattles are placed at designated dining place where vultures come to feed, is known as vulture restaurants. Many of Nepal's Vulture Restaurants are called Jatayu Restaurants, after the vulture god, Jatayu, from the Hindu religion. For Hindu followers, cows are regarded as sacred animals. In Nepal, killing a cow is punishable by law. Thus, when cattle become old and unproductive, they are often a burden

to farmers. At a cow rescue centre attached to the restaurant they collect such cattle and provide good care until their natural death. As a result, they can also ensure that the food that these cattle provide to vultures is diclofenac free (BCN 2012). The government of Bangladesh declared two Vultures Safe Zone (VSZ) on 2014 intending to conserve the vultures (Alam et al. 2015). VSZ is a pioneering approach in conserving the Critically Endangered Gyps vulture populations of South Asia. Currently, SAVE partners and associates are establishing 12 VSZ along India, Bangladesh, Nepal and Pakistan for the conservation of these species in their natural habitat (Mukherje et al. 2014).

The Government of Nepal banned the production and use of veterinary diclofenac in 2006. In 2009 the Vulture Conservation Action Plan for Nepal (2009-13) was prepared. At present the revised Vulture Conservation Action Plan for Nepal (2015-19) is being implemented (DNPWC 2015).

1.2 Objectives

1.2.1 General objective

The main aim of this research is to determine the roles of Ghachowk Vulture Restaurant and Sanitary Landfill Site for vultures conservation in Kaski District, Nepal.

1.2.2 Specific objectives

- To determine the species diversity and population composition of vultures in Ghachowk Vulture Restaurant and in Sanitary Landfill Site.
- To determine the roosting preference of vultures in both the study sites.
- To explore the conservation threats and people's perception towards vultures.

1.3 Significance of the study

Vultures have been declined on grate number throughout the world as well as in Nepal. In recent years main threat to vulture (diclofenac) has been banned in Nepal. However, vulture population has not recovered to its original size. Reasons behind this may be attributed to insufficient food availability to vulture and habitat loss. Moreover, several researches that have been undertaken after the massive decline in vulture

population have indicated the social aspect as an additional factor in vulture conservation.

This study helps to find out the present status of vultures in Kaski district .It gives the idea about the role of Vulture Restaurant as well as landfill site for vulture conservation. This research has tried to explore the habitat requirements of the vultures. In many societies, vultures are seen as bad signal but actually they have great role to clean environment and also an important role in ecosystem services. This research studies also assess attitude of local people towards vulture conservation. Similarly, it makes people aware about the extinction of vultures and understands the ecological and environmental value of vultures and how livestock are used for the feeding.

Finally, these outputs would be very crucial to the scientific communities and the group of conservationists for the betterment of approaches towards sustainable vulture conservation.

2. LITERATURE REVIEW

2.1 Diversity and population composition

The absolute population of the critically endangered vultures; WRV, SBV and RHV were 44, 21 and 18 respectively in Dang Deukhuri valley. Other four species of vulture's i.e. Egyptian vulture (*Neophron percnopterus*), Himalayan griffon vulture (*Gyps himalayensis*), Cinereous vulture (*Aegypius monachus*) and Eurasian griffon vulture (*Gyps fulvus*) were also found during the study period. The maximum numbers of 33 Egyptian vultures were recorded in December, 2009 (Shrestha and Devkota 2011).

Based on the Jack-knife technique, the total estimated population of Red-headed Vultures was 24 and the observed maximum was 19. For Egyptian Vulture, the estimated population was 241 and the observed maximum was 217. The breeding success of Egyptian Vulture was 62.5% for nine nests however they did not find any Red-headed Vulture nests in the middle mountain region of central west Nepal covering Arghakhanchi, Kaski, Palpa, Salyan and Pyuthan districts (Subedi and DeCandido 2014). Red-headed Vultures were recorded in four districts (except Salyan).

Population survey in Upper Mustang area was done from 6 to 24 August 2014 with total 96 Himalayan Vulture (65 Adults, 12 Sub-adults and 19 Juveniles) and 13 Bearded Vulture (8 Adults, 3 Sub-adults and 2 Juveniles) were recorded. Population of Bearded Vultures remains same while that of Himalayan Vulture were recorded less than that of last year (BCN 2015).

Karki et al. (2019) observed 18 individual of Himalayan Griffon and six individuals of Bearded Vulture from five different sites of Sankhuwasabha district, eastern Nepal; vulture nest were not observed.

Three road surveys were conducted following the fixed route using vehicle and 141 identifiable individuals of four different vulture species were recorded; eight individuals of Red-headed Vulture, 27 Egyptian Vulture, 18 Bearded Vulture and 88 Himalayan Griffon from Salyan district, Nepal (Ghimire et al. 2019).

2.2 Roosting preference

Baral (2004) found that, vultures more prefer the habitat with combination of outskirts of village, dumping site, tall and strong silk-cotton trees and enough sources of water.

The nesting habitat assessment of the White-rumped Vulture suggested that *Bombax ceiba* was a preferred tree species for nest building. It was found that the height of the tree was an important characteristic for nesting rather than its diameter. Similarly, the height of the tree was dependent on the distance from the forest edge. Likewise, the nests were found along the water sources and nearer to the human settlement and farmland which indicate that water is the vital component for the nesting site selection and they are tolerant to human disturbance (Shrestha 2014).

Bearded Vulture preferred for landscape patches with greater food availability. However, their models also indicated selection patterns that are probably a response to the higher altitudes and sheer reliefs of the Annapurna massif, such as avoidance of the steepest slopes and selection of cliffs facing south and west for nest-sites. They did not detect an impact of human activities on the distribution of nests or territories. However, the Annapurna massif is experiencing development of infrastructures (e.g. road construction) (Subedi et al. 2018).

2.3 People's perception and threats

Shrestha and Devkota (2011) concluded that, major threat to vultures was diclofenac contamination of livestock carcasses and other threats were habitat destruction, disturbance and hunting, lack of awareness, food shortage, poisoning and pesticide use from Dang Deukhuri foothill forests and west Rapti wetlands.

The study of Kambale (2011) in the Konkan Coast of India found that major threats for the nesting population of vultures in the study area include the nest destruction by coconut farmers due to inadequate or lack compensation. People in the region have started burying or burning cattle carcass to keep their villages clean which had resulted diminishing food sources for vultures. Coconut farmers strongly believe that their crop yield drastically comes down when vultures start using their palm for nesting. Therefore, they have started destroying the nest at beginning themselves.

KC and Timilsina (2013) surveyed that conservation attitude towards vultures is influenced by various socioeconomic characteristics. More than half of respondents who rear livestock (53.82%) dump livestock carcasses in the open fields. Ethnicity, age, education, status, gender, livestock unit and involvement in conservation activities are the most significant predictors for the positive attitudes towards vulture conservation. Those who are young, male, educated, involved in organizations and do not rear livestock are most likely to support vulture conservation. Peoples also shows negative perception about vultures that vulture drooping cause their animal sick and sometimes human also.

The study of Phuyal et al. (2016) in the Eastern Mid-Hills of Nepal reported that vulture population from Nepal has also undergone rapid decline that mostly associated with humans, people's attitude which can have direct effect and also by low awareness among people about its ecological importance. Due to negative perception on vultures, human activities such as carcass poisoning pose threats to vultures are reported. So for sustainable conservation, local attitudes and behavior should be considered along with ecological aspects of vultures.

In Southern India, there are five species of vultures successfully thriving unlike Northern Indian population. Still, there are many conservation threats such as livestock grazing, bamboo cutting, non-timber forest product collection, honey collection, pilgrims threat, and deliberate poisoning threatening the population (Samson et al. 2018).

Perceptions were not homogenous and that the perceived importance of the Egyptian vulture differed between stakeholders in the Bardenas Reales, northern Spain. Study found that the knowledge of the presence and endangered status of the Egyptian vulture in the Protected Area is higher for hunters than other local residents and visitors. Furthermore, they also observed that hunters and livestock keepers assessed the importance of the Egyptian vulture as a provider of ecosystem services more often than other local residents and tourists (Avizanda et al. 2018).

3. MATERIALS AND METHODS

3.1 Study area

The study was carried out in two place of Kaski district. One was in Ghachowk vulture restaurant in Machhapuchhre Rural Municipality-3 Kaski district, in the Annapurna Conservation Area. It lies on the geographical coordinates 28.334576N, 83.937987E. The Ghachowk vulture restaurant, established during 2010, is located in a river valley in the foothills of the Himalayas about 15 km northeast of Pokhara. Another one was in Sanitary Land fill Site in Pokhara Metropolitan-14, Baachhibuduwaa, kaski Nepal. It lies on the geographical coordinates 28.09562N 84.00332E, Northeast from Dobilla Pokhara. The altitude of Kaski district ranges from 450m the lowest land to 8091m the highest point in the Himalayan range. Study was conducted from 600m to 1200m above sea level.

Both the area has humid subtropical monsoon climate. These sites are on the bank of Seti River. These sites are characterized by presence of grassland, agricultural field water body and forest. Subtropical climatic zone are characterized by the presence of vegetation like *Schima wallichii*, *Castanopsis indica*, *Alnus nepalensis*, etc. Around the Vulture Restaurant vegetation like *Alnus nepalensis*, *Bombax ceiba*, *Castanopsis indica* were found. Other birds like, *Hieraaetus fasciatus* and Red-billed Blue Magpie *Urocissa erythrorhyncha*, Bonelli's Eagle, small egrets, White-throated Kingfisher, etc. was also found.

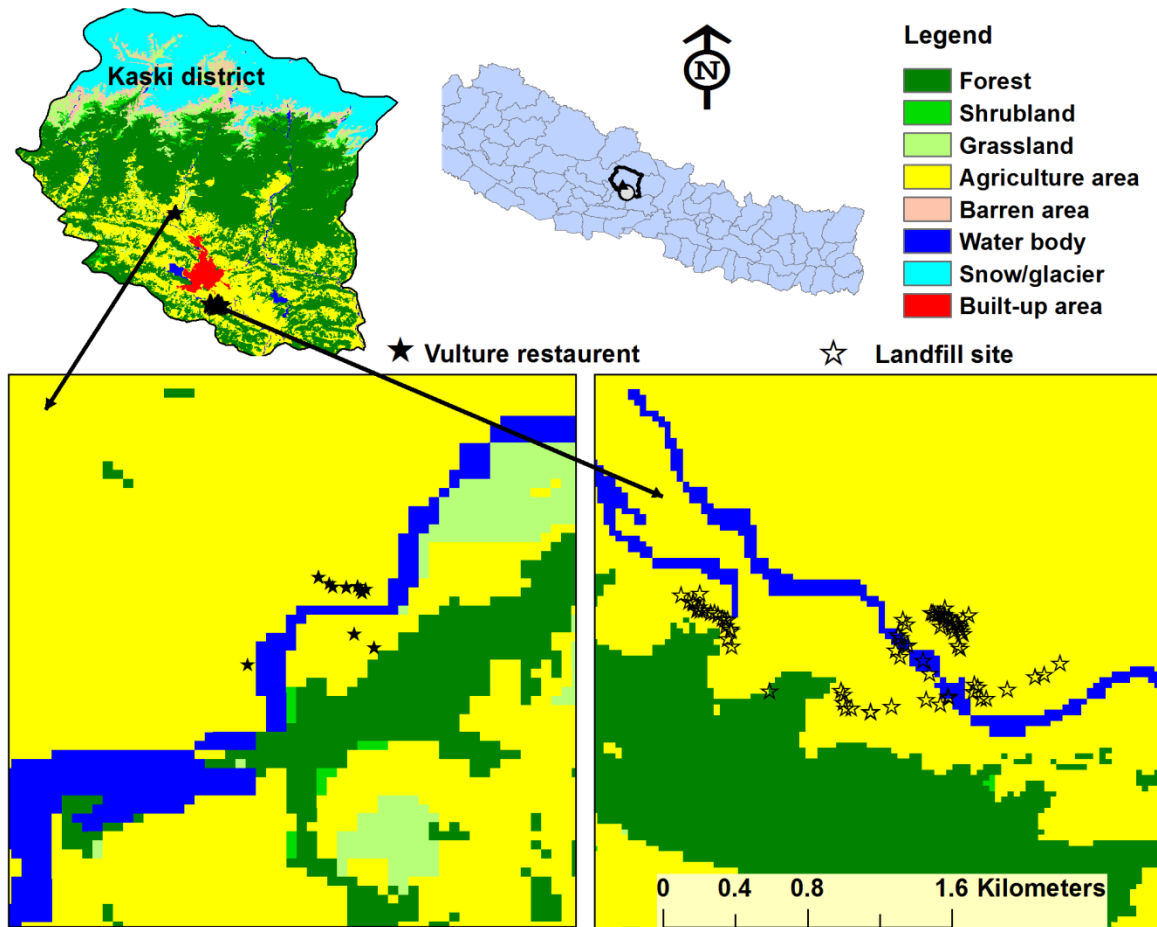


Figure 1: Map showing the study area with land covers type.

3.2 Materials

Camera (Nikon D3200), Binocular 10x42, GPS Garmin 64s, DBH tape, Birds of Nepal Book, Notebooks and Pencil.

3.3 Methods

The method used to meet the objectives included the collection of primary information from the field.

3.3.1 Direct observation method

The number of individuals of vultures were explored by direct observation method using transects, birding routes and visiting roosting and nesting sites in both the study area. Four

birding routes were selected for each site in four geographical directions (East, West, North and South) within 1 km. All the roosting and nesting sites were monitored early in the morning (7am to 11am). The data were collected from October 2018 to June 2019. The study sites were visited five times in the month of October, January and June. The identification of vultures was done by using binocular, camera and reference book.

3.3.2 Collection of roosting preference data

After the location of active nest site and roosting sites, different variables describing the habitat characteristics were measured. Within the four birding routes in each sites plot was made in each and every 100m within 1km. Only the non-flying individuals which were seated in any place were listed. The List of the variables that were considered in the study is presented below.

Table 1: List of variables used for collecting habitat preference data

Variables	Description
GPS location	
Habitat type	Tree, Rocky area, Barren land, Agricultural land
Tree name	Name of tree where vultures nest and roost
Tree DBH	Diameter at breast height of the nesting and roosting tree
Tree HT	Height of nesting and roosting tree
Position of Roost	Tree top/middle/branch/ground
Distance to LFS/VR	
Distance to water resources	Distance to the nearest river
Distance to settlement	Distance to the nearest inhabited building
Distance to road	Distance to the nearest forest road
Presence of Carcass	Presence of dead livestock at study sites

3.3.3 Estimation of tree stands variables

All the trees stand variables were estimated in field at the nesting and roosting site. DBH tape was used to estimate the DBH of the trees that contained the nest of the vulture and where they roost. Similarly, clinometer was used to estimate the tree height and nest height of these trees.

3.3.4 Breeding success of the Vulture

An active nest is the one in which egg has been laid and a nest from which a chick fledged is termed as successful or productive nest (Postupalsky 1974). To access the breeding success of Vultures, firstly nests were located in first field visit i.e. in breeding season (November-December) and nesting success was observed in second field visit i.e. in post breeding season (March- April). Breeding success of Vultures was determined by using following formula:

$$\text{Breeding Success} = \frac{\text{Productive nest}}{\text{Active nest}} \times 100$$

3.3.5 Questionnaire survey/Interactions:

Structured questionnaires were prepared for questionnaire survey. Questionnaire survey was done for the local people to acquire their knowledge on the vulture to know the diversity, abundance, threats and people's attitude in that area. Personal interview was done at the local level with the local people. Questionnaire survey was conducted to a sample of 100 (50 in each site) randomly selected households in two sites within 2 km that covers more than 10% of the total households.

3.4 Data Analysis

The collected data were analyzed through Microsoft Excel and Statistical Package PAST version 3.25. ArcGIS 10.4 software was used to draw the study area map.

3.4.1 Estimation of Population size

The Jackknife Techniques (Rodgers 1991) was followed to estimate a population size. This method assumes that with repeated counts theoretically there is the probability of counting all the animals in the area at one time. This method requires at least five repeated absolute counts and uses the difference between the highest count n_k and the second highest count n_{k-1} , to calculate Population size (N).

The estimated total number, $N=2n_k-(n_k-1)$

3.3.2 Threats and people's attitudes

The attitudes of local people towards vulture were measured using five related questions and combined these questions to form a single attitude scale. Each answer was graded with a number and summed response for each question as negative (1), positive (3) and neutral (2). Based on these numbers, I considered the respondents scoring greater than 10 as having positive attitude, those less than 10 as having negative attitude and those respondents scoring 10 as having neutral attitude (Phuyal et al. 2016). The association between two variables was tested using chi-square test with the 95% confidence level.

4. RESULTS

4.1 Population estimation

During the study period, a total of 202 individuals of six species of vultures were recorded in Ghachowk Vulture Restaurant (GVR). The most abundant (n=104) was Himalayan Vulture and the least was Egyptian Vulture (n=2). Other species of vultures, White-rumped Vulture (n=67), Red-headed Vulture (n=11), Slender-billed Vulture (n=10), and Cinereous Vulture (8) were also observed during this study.

Table 2: Numbers of vulture species in the study area (GVR)

Species Name	First Maximum (n_k)	Second maximum (n_{k-1})	Estimated population $N=2n_k-(n_k-1)$	Conservation status (IUCN 2018)
White-rumped Vulture(WRV)	59	51	67	CR
Egyptian Vulture(EV)	1	0	2	EN
Slender-billed Vulture(SBV)	6	2	10	CR
Himalayan Vulture(HV)	95	86	104	NT
Cinereous Vulture(CV)	7	6	8	NT
Red-headed Vulture(RHV)	9	7	11	CR
Total	177	152	202	

A total of 204 individuals of five species of vultures were recorded in Sanitary Landfill Site (SLS). The most abundant (n=164) was Egyptian Vulture and the least was Red-headed Vulture (n=6). Other species of vultures, White-rumped Vulture (n=16), Slender-billed Vulture (n=10), and Cinereous Vulture (n=8) were also observed during this study.

Table 3: Numbers of vulture species in the study area (SLS)

Species Name	First Maximum (n_k)	Second maximum (n_{k-1})	Estimated population $N=2n_k-(n_{k-1})$	Conservation status(IUCN 2018)
WRV	9	2	16	CR
EV	146	128	164	EN
SBV	6	2	10	CR
CV	5	2	8	NT
RHV	4	2	6	CR
Total	170	136	204	

4.2 Population composition

Vultures are generally sexually mature in the age of four to five years. Their breeding season starts from November to April. For the age class category, large number of juvenile population of WRV was seen in both the breeding ($n=35$) and post-breeding (26) season in GVR. The juvenile of CV ($n=7$) was seen. They are the winter migrant to our country. Likewise different population composition was observed in RHV. In the sub-adult category, EV ($n=1$) and RHV ($n=2$) were observed.

Table 4: Population composition of vulture species in GVR

Species Name	Breeding Season				Post Breeding Season			
	Adult	Sub-Adult	Juvenile	Total	Adult	Sub-Adult	Juvenile	Total
White-rumped Vulture	16		35	51	33		26	59
Egyptian Vulture						1		1
Slender-billed Vulture	6			6	2			2
Himalayan Vulture	95			95	13			13
Cinereous Vulture			7	7				
Red-headed Vulture	6	1		7	7	2		9
Total	123	1	42	166	55	3	26	84

In Sanitary Landfill Site, the more abundant species was Egyptian Vulture. Species diversity was comparatively less in SLS compared to VR. Large number of population was seen in breeding season. Different age class category was observed in Egyptian Vulture; adult (n=108), Sub-adult (n=22) and Juvenile (n=16) in breeding season, and adult (n=47), sub-adult (n=12), and juvenile (n=8) in post breeding season. One juvenile of SBV was recorded which was hatched within the study period. Five Juvenile population of CV was also observed in SLFS.

Table 5: Population composition of vulture species in SLS

Species Name	Breeding Season				Post Breeding Season			
	Adult	Sub-adult	Juvenile	Total	Adult	Sub-adult	Juvenile	Total
White-rumped Vulture	2			2	7	2		9
Egyptian Vulture	108	22	16	146	47	12	8	67
Slender-billed Vulture	2			2	4	1	1	6
Cinereous Vulture			5	5				
Red-headed Vulture	1			1	3	1		4
Total	113	22	21	156	61	16	9	86

4.3 Roosting preference

One active nest of Slender-billed Vulture was observed in the southern part of SLS (800m far), which was built on Simal (*Bombax ceiba*) tree. The breeding success of Vulture was 100%. The distance between the nests and nearest water source was found to be 400m. The tree that was used by the vulture for nesting had the DBH of 2.34m, height 18.37m and nest height 13.8m. The land use type used by the vulture is shown in table 6.

Table 6: Habitats used by different vulture

Place	Land use type	Name of species					
		HV	WRV	RHV	SBV	CV	EV
GVR	Rocky Area	17	8	1	2		
	Forest	29	32	6			1
	Barren land	42	19	2	3	7	
	Agricultural land	7			1		
LFS	Forest		5		3	5	98
	River bank			1	1		8
	Barren land						14
	Grassland		4	3	2		10
	Rocky Area						16

The analysis of the roosting trees was done to identify their characteristics in terms of their DBH, height of the tree. Mostly preferred tree species were *Bombax ceiba* and *Alnus nepalensis*. The trees that were used by the vultures for roosting had the maximum DBH of 2.04m and minimum was found to be 1.02m in and around Ghachowk Vulture Restaurant and the maximum DBH of 2.34m and minimum was found to be 1.08m in and around Sanitary Landfill Site. The maximum height of the tree in which the vulture were roost was found to be 18.8m and the minimum height was 7.2m in GVR and 14.6m maximum and 7.3 minimum in SLS.

4.4 Questionnaire survey

4.4.1 Demography of the respondents

Among the total 50 respondents from the Ghachowk Vulture Restaurant, 46% were male and 54% were female. The age of the respondents were ranged from 21 to 87 years. The highest percentage of respondents were from 40 to 60 years (56%) followed by 20 to 40 years (24%) and 60 to above (20%).

Likewise, out of 50 respondents from the Sanitary Land Fill Site, 44% were male and 56% were female. The age of the respondents were ranged from 20 to 78 years. The highest

percentage of respondents were from 40 to 60 years (44%) followed by 20 to 40 years (34%) and 60 to above (22%). The demography of the respondent's is shown in Table.

Table7: Demography of the respondents

Socio-economic Parameters		GVR	SLFS
		Percentage	Percentage
Ethnicity	Brahmin/Chettri	72	24
	Magar/Gurung/Tamang	20	70
	Others	8	6
Sex	Male	46	44
	Female	54	56
Age	20-40	24	34
	40-60	56	44
	60-Above	20	22
Education	Illiterate	38	50
	0 to 10	40	44
	10 to above	22	6
Occupation	Agriculture	50	36
	Job	22	4
	Own business	6	12
	Labourers		4
	Others(Retired, unemployed, housewife and students)	22	44

4.4.2 Domestic animals description and carcass disposal Mechanism

In GVR, 92% of the respondents reared domestic animals. Within past five years, among reared livestock 52% have lost their domestic animals. The carcass was dumped in different places. Altogether 92% of the carcasses were buried while 3% throw to the river and only 6% gave it to the Vulture Restaurant. Sixty-eight percentage of the respondents reared domestic animals in around SLFS. Within past five years, among reared livestock 74% have lost their

domestic animals. The carcass was dumped in different places. Altogether 72% of the carcasses were buried while 24% throw to the river and only 4% gave it to the landfill site.

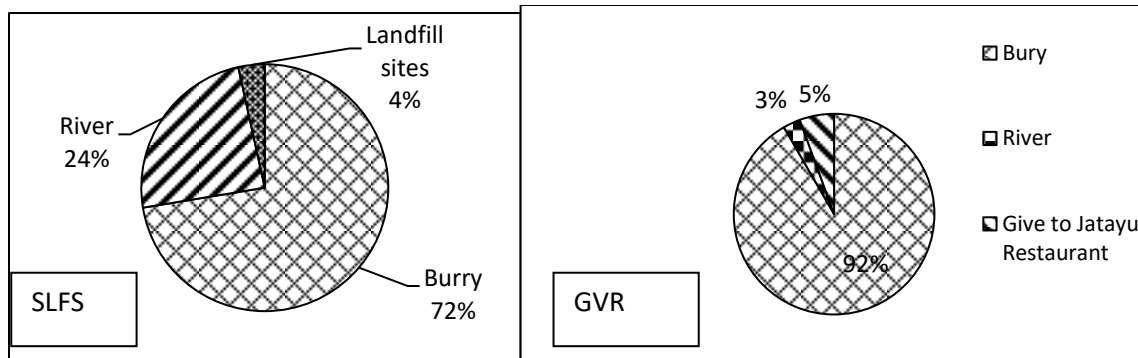


Figure 2: Respondent's view on carcass disposal mechanism.

Ninety-eight percentages of the reared domestic animals were checked up by veterinary doctor in Ghachowk. People were not aware about what the veterinary doctor used as a medicine for domestic animals. Among the total respondents only 12% of the respondents were heard about the Diclofenac, majority of the respondents (88%) were unknown. Likewise, only 22% of the respondents were heard about the Meloxicam, majority of the respondents (78%) were unknown.

In SLFS, ninety-seven percentages of the reared domestic animals were checked up by veterinary doctor. Among the total respondents only 2% of the respondents were heard about the Diclofenac, majority of the respondents (98%) were unknown. Likewise, only 2% of the respondents were heard about the Meloxicam, majority of the respondents (98%) were unknown.

4.4.3 Attitude of respondents

All respondents were known about vulture in both study area. They have seen vultures in their area. The respondents had different views regarding the increasing and decreasing the population, benefits of vultures, harms of vultures and how can we conserve the vulture in our locality (Table 8 and 9). Among the 39 respondents from GVR and 25 respondents from SLS who said that vulture population was increasing; the main reason to increase the population of vulture was Jatayu Restaurant (82%) in GVR, and habitat conservation (35%)

and Landfill site (35%) in SLS. The respondents who said that vulture population was decreasing (n=4 in GVR and n=9 in SLS), the main reasons behind that were food scarcity and deforestation. Respondents viewed regarding the benefits of vultures (n=39 in GVR and n=38 in SLS) from two site said that, the main benefits of vultures was it consumes carcass of animals. The reason behind to say vultures are harmful were; they pollute the farmland by defecation and they are dirty birds. Among the respondents who said that vultures should be conserve (n=40 in GVR and n=41 in SLS), the main method was habitat conservation effort.

Table 8: Respondent’s view towards vultures in GVR

Reason as perceived by respondents		Percentage
Increasing reason	Jatayu Restaurant	82
	Carcass Amount	14
	Habitat conservation	4
Decreasing reason	Food scarcity	50
	Killed for Ethno-medicine	25
	Unknown	25
Benefits of vultures	Consume carcass of animal's	58
	Keep environment clean	40
	All(Consume carcass of animal's, stop spread of disease, keep environment clean, decrease our workloads	2
Harms of vultures	Pollute ours farms by defecation	50
	They are dirty birds	50
Methods to conserve	Increasing conservation awareness	10
	Through community participation	4
	Habitat conservation effort	34
	Increase food availability	30
	Removal of Diclofenac use	4
	Don't know	18

Table 9: Respondent's view towards vultures in SLFS

Reason as perceived by respondents		Percentage
Increasing reason	Awareness program	6
	Carcass Amount	24
	Habitat conservation	35
	Landfill sites	35
Decreasing reason	Food scarcity	25
	Electrocution	12.5
	Deforestation	37.5
	Killed for Ethno-medicine	12.5
	Food poison	12.5
Benefits of vultures	Consume carcass of animal's	66
	Keep environment clean	32
	All(consume carcass of animal's, stop spread of disease, keep environment clean, decrease our workload)	2
Harms of vultures	Pollute farms by defecation	100
Methods to conserve	Increasing conservation awareness	4
	Habitat conservation effort	36
	Increase food availability	29
	Removal disease from vulture	1
	Don't know	30

The attitude of the respondent's towards vulture was measured using five related questions (question numbers 13, 16, 19, 22 and 23 in Appendix 4). Similar type of result was seen in two sites (Table 10).

Table 10: Attitude of respondents

Parameters of attitude		GVR	SLFS
		Percentage	Percentage
Vultures are bad sign	Yes	8	6
	No	64	52
	No idea	28	42
Vultures are declining in this area	Yes	8	18
	No	78	50
	No idea	14	32
Vultures are beneficial to humans	Yes	78	76
	No	2	2
	No idea	20	22
Vultures have an Important role in the environment	Yes	80	74
	No	2	2
	No idea	18	24
Vultures should be conserved	Yes	80	82
	No	6	6
	No idea	14	12

The attitude of the respondent's towards vultures was influenced by age ($\chi^2=12.31$, $p=0.015$ $df=4$) and ethnicity ($\chi^2=10.337$, $p=0.035$, $df=4$) in the Ghachowk area. Respondents with increasing age were less favorable towards vultures. Respondent's attitude towards vultures was not associated to respondent's gender, education and occupation. But in the SLS area occupation was the one of the parameter which was associated to the respondent's attitude ($\chi^2=23.63$, $p=0.0026$, $df=4$) and other parameters; gender, age education and ethnicity were not associated.

Table 11: Significance of the parameters with the respondent's attitude towards vulture in GVR

Parameter	χ^2 value	P value	d. f.	Interpretation
Gender	0.061	0.9697	2	Respondent's attitude towards vulture was not associated to respondent's gender
Age	12.31	0.015	4	Respondents with increasing age were less favorable attitudes
Education	6.774	0.148	4	Respondent's attitude towards vulture was not associated to their education
Ethnicity	10.337	0.035	4	The ethnicity of the respondent's was associated with respondent's attitude
Occupation	4.822	0.5667	6	The occupation of the respondents did not determine their attitude

Table 12: Significance of the parameters with the respondent's attitude towards vulture in SLFS

Parameter	χ^2 value	P value	d. f.	Interpretation
Gender	6.27	0.434	2	Respondent's attitude towards vulture was not associated to respondent's gender
Age	3.556	0.469	4	Respondent's attitude towards vulture was not associated to respondent's age
Education	6.152	0.188	4	Respondent's attitude towards vulture was not associated to their education
Ethnicity	3.616	0.46	4	The ethnicity of the respondent's did not determine their attitude
Occupation	23.63	0.0026	8	Respondent's attitude towards vulture was associated to their occupation

4.4.4 Threats to vultures

Fourteen percentages of the respondents said that they were encountered with dead vultures (n=14) and 86% of the respondent said that they didn't seen any dead vultures in Ghachowk. From the personal communication with the local people, the probable threats to the vulture were determine. Out of them, 29% of them found electrocution as cause of death of vultures. Similarly, 14% people reported disease was the another cause of death and 57% didn't know about the cause for the death of vultures. Higher percentages of the respondents didn't know about the cause of death because they didn't have knowledge about other cause like Diclofenac, disease, human persecution and food scarcity.

Twenty-four percentages of the respondents said that they were encountered with dead vultures (n=13) and 76% of the respondent said that they didn't seen any dead vulture in SLS. Out of them, 39% of them found electrocution as cause of death of vulture. Similarly, 15% people reported poisoning was the cause of it and 46% didn't know about the cause for the death of vultures in SLS.

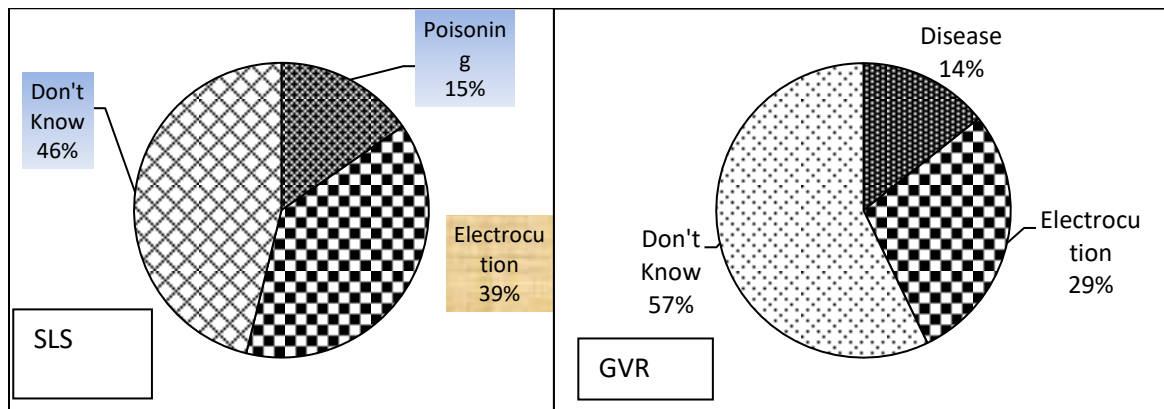


Figure 3: Respondent's views about the cause of death of vulture

5. DISCUSSION

5.1 Population status of vultures

During this study all together 202 individuals of six species were recorded from GVR and 204 individuals of five species were recorded from SLS. The last official record of Ghachowk vulture Restaurant in 2015 showed that there were 89 individuals of six species of vulture recorded from the vulture restaurant. It shows that Vulture Restaurant plays an important role to increase the population of vultures. In this study, the more abundant species was Himalayan Vulture in GVR and Egyptian Vulture in SLS. The less abundant species was Egyptian Vulture in GVR and Red-headed Vulture in SLS. Himalayan Vulture was seen abundant in GVR; this may be due to the study period. The study was conducted during the winter season. In winter season, Himalayan Vulture move from high land to low land. Highland species were most common (Decandido et al. 2012), including up to 50 Himalayan Griffons (*G. himalayensis*), White-rumped and Redheaded vultures, although a few slender billed and one Cinereous vulture (*Aegypius monachus*) were seen as well. Egyptian vultures were seen in significant number in Sanitary Landfill Site. It can be attributed to Egyptian Vultures is an opportunist and can feed on a huge range of food that it encounters and also due to proximity of dumping sites from nesting sites and roosting sites from Phedipatan of Nirmalpokharai and other part of Kaski district. Baral and Gautam (2007) also found Egyptian Vultures were the most abundant in Pokhara followed by White-rumped Vultures and Slender-billed Vultures. Similar study was done by (Parajuli 2013). Three species of vulture were recorded in dumping site of Pokhara. In his study, the more abundant vulture species was Egyptian Vulture and the least was Slender-billed Vulture. However, all six species of vultures were seen in GVR.

Sah et al. (2017) recorded three Red-headed Vultures at Anbu Khairini. Out of this, two was adults and one was sub-adult. The total population of this vulture is less than 500 in Nepal. Also the red-headed vulture is mostly found with White-rumped vulture.

In this study only one active nest of SBV was observed with the breeding success 100%. Study by (Bhusal et al. 2019) showed that Slender-billed Vulture uses open country mixed with some wooded patches to forage, feed, roost and nest. The elevation of nesting location

of Slender-billed Vulture ranges from 180 to 785 m above the sea level. All nests were in the tree at an average height of 30 m above the ground level. The breeding success was 50%. The overall breeding success of White-rumped Vulture in Nepal is reported 75.54% (BCN 2016) which also includes the study site also. However, the breeding success of the species in the Khaireni community forest of Palpa was found to be 94.12% by (Ghimire et al. 2019).

5.2 Roosting preference

This study shows that vultures mostly prefer tallest *Bombax ceiba* tree for the roosting in SLS and more prefers for *Alnus nepalensis* as well as *Bombax ceiba* in GVR. This may be due to the *Bombax ceiba* density was high in the southern part of sanitary landfill site and this is the most preferred tree species for vulture. Only one active nest of Slender-billed vulture was observed during this study in the southern part of Sanitary Landfill site. This nest was nearer to the water resource as well as nearer to the road. We could clearly see the human disturbance nearer to the nest but it could not affect the vulture. Although, during questionnaire survey, people informed the presence of Egyptian Vulture and the White-rumped Vulture nest in the study area one year back. This may be due to the human disturbance. We can clearly observe the disturbance in the area where nest were present in last year. Similar result was seen in the study of (Shrestha 2014) which showed that the nesting habitat assessment of the White-rumped Vulture suggested that *Bombax ceiba* was a preferred tree species for nest building. It was found that the height of the tree was an important characteristic for nesting rather than its diameter. The nests were found along the water sources and nearer to the human settlement and farmland which indicate that water was the vital component for the nesting site selection and they were tolerant to human disturbance. Only one nest was observed, so couldn't analyze the preferred habitat for vulture in this study. Dumre (2019) observed that, the habitat preference of WRV species were higher in tallest *Bombax ceiba* forest similar to my study. *Bombax ceiba* and *Clerodendron spp.* were the most dominant species of trees and shrubs in khaireni community forest (Ghimire et al. 2019). The vultures nesting preference was strongly correlated with the highest IVI of *Bombax cebia* in that area and it was due to the availability of large *Bombax ceiba* tree for nesting and roosting.

5.3 Threats and attitude of respondent towards vulture

In Nepalese society, vultures are generally considered as an unattractive bird and symbol of bad luck (Baral et al. 2007); attitudes are influenced by physical and behavioural characteristics of the species. Ethnicity, age, education, gender, occupation etc. are the significant factors that govern conservation attitudes (Baral and Gautam 2007). Establishment of Vulture Safe Feeding Site in Kaski is playing an important role for the conservation of vultures. It also helps to provide the public awareness on the need of conservation of vulture as well as it provides diclofenac free safe food for vulture. In both the study sites, most of the peoples were known about vulture. I found that 84% of the respondents had positive attitude, 8% had neutral attitude and 8% had negative attitude towards vulture in Gachowk area. Likewise, 80% had positive, 10% had negative and 10% had neutral attitude towards vulture in SLS area. This results support to the result of (Phuyal et al. 2016). The sudden decline of vultures during 1990s and their disappearance may have increased the unfamiliarity with a number of people and may have created the neutral and negative attitude towards vultures. Weaker attitudes towards vulture and its conservation can become a barrier to successful conservation programmes as people with neutral (or weaker) attitudes are less likely to care about the species or be indifferent to change their attitudes (as in the case of the wolf in Sweden Ericsson & Heberlain 2003). If we do not consider the neutral attitude, it can turn to negative attitude due to the unattractiveness and carcass eating behaviour of the vultures. The respondent's attitude towards vulture was not associated with gender, education and occupation in GVR and gender, age, education and ethnicity in SLS which is different than other study. KC and Timilsina (2013) revealed a highly positive attitude among those people who obtained higher secondary and college level education. Furthermore, that study has found positive attitude among younger and male respondents

. Young are well aware of the vulture decline as they had good access to education and aware of the benefits of vulture to the ecosystem and human health. Peoples from lower caste and livestock producers typically are less interest for vulture conservation. Study in Nawalparasi District by (Dumre 2019) showed that, 89% of respondents show positive response towards vulture conservation while remaining shows negative attitude towards vulture conservation.

The carcass was dumped in different places. Among the dead body, 92% of the carcasses were buried, while 3% throw to the river and only 6% gave it to the Vulture Restaurant. Likewise, 72% of the carcasses were buried while 24% throw to the river and only 4% gave it to the landfill site. Results were not found on the favour of vulture in this study. Similar result was found in Chitwan-Annapurna Landscape (Thapa 2016). Seventy-three percentages of the people burry their livestock while only 27% of people either throw carcass in open place (river and Vulture safe feeding site). The reported carcasses burial practice in my study is apparently higher than the other study like, 60% in Baitadi (Karmacharya 2011) and 22% in Rampur by (Baral and Gautam 2007). Besides carcass burying activity, vultures have become victim of deliberate or unintentional poisoning of carcasses not only in Nepal but also more widely; in Canary Island (Donazar et al. 2002), in Spain (Hernandez and Margalida 2009). Informal discussion with the respondents showed that they were quite negative with the Vulture restaurant because of the bad fouling of the carcass nearer to the VR.

Respondents from GVR said that electrocution and disease were the major threats to the vultures and respondents from SLF said that electrocution and poisoning were the major threats to the vultures in my study. Ogada et al. (2015) found major decline due to poisoning (61%), medicinal use (29%) and electrocution (9%). The major threats in Chitwan-Annapurna Landscape were food scarcity, Diclofenac use, electrocution, killed for medicine and deforestation (Shah 2016).

6. CONCLUSION AND RECOMMENDATIONS

Six species of vultures (White-rumped Vulture, Himalayan Vulture, Red-headed Vulture, Slender-billed Vulture, Egyptian Vulture and Cinereous Vulture) were recorded in GVR and five species (White-rumped Vulture, Red-headed Vulture, Slender-billed Vulture, Egyptian Vulture and Cinereous Vulture) were recorded from SLS. Among these species Himalayan Vulture is the more dominant one in GVR and Egyptian Vulture is the more dominant in SLS. This study concluded that Ghachowk Vulture Restaurant as well as Sanitary Landfill Site helps to maintain the diversity as well as population of vultures in Kaski District. One active nest of Slender-billed Vulture was recorded nearer to the SLS. Large number of juvenile population of Egyptian Vulture was seen in SLF which indicates that there may be presence of nest nearer to the SLS. Electrocution was seen as the major cause of population decline in both the sites. The rates of decline of *Gyps* vultures have been slowed down to some degree by different programme but they are susceptible to any threats. This study concluded that the overall attitudes of people towards vulture were good. The attitude's of people towards species is influenced by their appearance as well as their behavior and various socioeconomic characteristics; therefore, for the successful vulture conservation programme it should include creation of a long term survival environment for vultures with involvement of the people in all of its range areas along with its ecological aspects.

Based on this research, recommendation for the further research and conservation of vulture are as follow;

- For the regular food supply, local people should be encouraged to dump the diclofenac and disease free carcasses in safe place (VR and SLS). So, awareness activities should be done.
- Nearer to the SLF, cow rescue center is present. They burry the carcasses, when cattle die. Burrying practice of Diclofenac free livestock should be discouraged.
- Regular monitoring of the sites to identify probable nesting sites should be done from local level to government level.

7. REFERENCES

- Acharya, R., Cultibert, R., Baral, H.S. and Chaudhary, A. 2010. Rapid decline of the Bearded Vulture *Gypaetus barbatus* in Upper Mustang, Nepal. *Forktail* **26**: 117-120.
- Alam, A.B.M.S. 2015. White-rumped Vulture (*Gyps bengalensis*) Conservation in Bangladesh: Establishment of Toxic Drug Free Vulture Safe Zones (VSZ) and Monitoring of the population Trend project Quarterly Progress Report (October-December, 2015). IUCN, Bangladesh.
- Avizanda, A.C., Lopez, M. B., Ceballos, O. and Pereira, M.H. 2018. Stakeholders perceptions of the endangered Egyptian vulture: Insights for conservation. *Biological Conservation* **218**:173-180.
- Baral, H.S. 2004. Conservation status of white-rumped vulture in Lumbini. M.Sc. Thesis. Central Department of Zoology, Tribhuvan University, Kathmandu, Nepal.
- Baral, N., R. Gautam, N. Timilsina and M.G. Bhat 2007. Conservation implications of contingent valuation of Critically Endangered White-rumped Vulture *Gyps bengalensis* in South Asia. *International Journal of Biodiversity Science and Management* **3**(3): 145–156.
- Baral, N. and Gautam, R. 2007. Ecological Studies on Three Endangered Vulture Species in the Pokhara Valley, Nepal. A final report submitted to the Peregrine Fund World Center for Birds of Prey, USA.
- Baral, N. and Gautam, R. 2007. Socio-economic perspectives on the conservation of Critically Endangered vultures in South Asia: an empirical study from Nepal. *Bird Conservation International* **17**: 131-139.
- BCN and DNPWC 2016. Birds of Nepal: An official Checklist, Kathmandu, Nepal.
- BCN 2016. Annual Report 2015/16. Bird Conservation Nepal, Lazimpat, Kathmandu, Nepal.
- BCN 2012. Community-managed vulture restaurants. Bird Conservation Nepal, Lazimpat, Kathmandu, Nepal.
- Bhusal, K.P. 2011. Population status and breeding success of Himalayan griffon, Egyptian vulture and Lammergeier in Gherabhir, Arghakhanchi, Nepal. M.Sc. Thesis. Central Department of Zoology, Tribhuvan University, Kathmandu, Nepal.

- Bhusal, K.P. 2018. Vulture Safe Zone: a landscape level approach to save the threatened vultures in Nepal. *Friends of Nature, The Himalayan Naturalist* **1**(1): 25-26.
- Bhusal, K. P., Chaudhary, I.P., Dangaura, H. L., Rana, D.B. and Joshi, A.B. 2019. Nesting of Critically Endangered Slender-billed Vulture *Gyps tenuirostris* more than decade in Nepal. *Vulture Bulletin* **8**: 25-27.
- BirdLife International 2017. The IUCN Red List of Threatened Species 2017:e.T22729460A117367614. <http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T22729460A117367614.en>. Downloaded on 16 August 2019.
- BCN 2015. Annual Report 2014/2015. Bird Conservation Nepal.
- BirdLife International 2020. IUCN Red List for birds. Downloaded from <http://www.birdlife.org> on 01/10/2020.
- Clements, T., Gilbert, M., Rainey, H.J., Cuthbert, R., Eames, J.C., Bunnat, P., et al. 2013. Vultures in Cambodia: population, threats and conservation. *Bird Conservation International* **23**:7-24.
- Decandido, R., Subedi, T. and Allen, D. 2012. Jatayu: the vulture restaurants of Nepal. *Birding ASIA* **17**: 49–56.
- DNPWC 2015. Vulture Conservation Action Plan for Nepal (2015—2019). Department of National Parks and Wildlife Conservation, Ministry of Forests and Soil Conservation, Government of Nepal, Kathmandu.
- Donazar, J.A., Palacios, C.J., Gangoso, L., Ceballos, O., Gonzalez, M.J. and Hiraldo, F. 2002. Conservation status and limiting factors in the endangered population of Egyptian Vulture (*Neophron percnopterus*) in the Canary Islands. *Biological Conservation* **107**(1): 89–97.
- Dumre, K. 2019. Vanishing vultures and human society: A case study on impact of vulture restaurant on environment and vultures in Nawalparasi District, Nepal. M.Sc. Thesis. Central Department of Zoology, Tribhuvan University, Kathmandu, Nepal.
- Ericsson, G. and Heberlein, T.A. 2003. Attitudes of hunters, locals, and the general public in Sweden now that the wolves are back. *Biological conservation* **111**(2): 149–159.
- Gautam, R. and Baral, H.S. 2013. Population trends and breeding success of three endangered vulture species in Pokhara valley, Kaski, Nepal. *Ibisbill* **2**: 46-54.

- Ghimire, B., Acharya, R., Sivakumar, K., Biswas, S. and Dorj, C. 2019. Nesting Characteristics and Habitat Preferences of Critically Endangered White-rumped Vulture *Gyps bengalensis* in Rampur IBA, Palpa, Nepal. *Vulture Bulletin* **8**: 20-24.
- Ghimire, S., Bhusal, K.P., Bhattarai, S. and Pandeya P. 2019. Status and Distribution of Accipitridae Vultures in Salyan District, Nepal. *Vulture Bulletin* **9**: 10-13.
- Gilbert, M., Watson, R.T., Virani, M.Z., Oaks, J.L., Ahmed, S., Chaudhry, M.J.I., et al. 2006. Rapid population declines and mortality clusters in three Oriental White-backed Vulture *Gyps bengalensis* colonies in Pakistan due to diclofenac poisoning. *Oryx* **40**: 388-399.
- Giri, J.B. 2013. Population of Lammergeier (*Gypaetus barbatus*) in lower Mustang, Nepal. *Ibisbill* **2**: 121-125.
- Grimmett, R., Inskipp, C., Inskipp, T. and Baral, H.S. 2016. *Birds of Nepal*. Bloomsbury Publishing India Pvt Ltd, New Delhi, 106 p.
- Hernández, M. and Margalida, A. 2009. Poison-related mortality effects in the endangered Egyptian Vulture (*Neophron percnopterus*) population in Spain. *European Journal of Wildlife Research* **55**(4): 415–423.
- Inskipp, C., Baral, H.S., Phuyal, S., Bhatt, T.R., Khatiwada, M., Inskipp, T. et al. 2016. The status of Nepal's Birds: The national red list series. Zoological Society of London, UK.
- Kambale, A.A. 2011. A Study on Breeding Behavior of Oriental White-Backed Vulture (*Gyps bengalensis*) in Anjarle & Deobag, Maharashtra. M.Sc.Thesis. Wildlife Institute of India, Saurashtra University, Rajkot, India.
- Karki, P., Bhattarai, B.P. and Bhusal, K.P. 2019. Status and Distribution of Vultures in Sankhuwasabha District, Eastern Nepal. *Nepal. Vulture Bulletin* **9**: 14-17.
- Karmacharya, D.K. 2011. Population status, breeding success and conservation approaches of vultures with special reference to Himalayan Griffon (*Gyps himalayensis* Hume, 1969) in Khodpe, Baitadi, Nepal. M. Sc. Thesis. Central Department of Zoology, Tribhuvan University, Kathmandu, Nepal.
- KC, S. and Timilsina, Y.P. 2013. Factors Affecting Peoples' Participation on Vulture Conservation from Kaski district of Nepal. *Conservation Science* **1**: 19-26.
- Margalida, A., Manosa, S., Bertran, J. and Garcia, D. 2007. Biases in studying the diet of the Bearded Vulture. *Journal of Wildlife Management* **71**: 1621–1625.

- Ming, M., Caiwujiap, D., Guohua, X., Jiap, S., Xumao, Z., Aizijiang, M., et al. 2013. Why are juvenile Himalayan Vultures *Gyps himalayensis* in the Xinjiang Tien Shan still at the nest in October? *Birding ASIA* **20**: 84-89.
- Mukherjee, A., Galligan, H.T., Prakash, V., Paudel, K., Khan, U., Prakash, S., et al. 2014. Vulture Safe Zones to save *Gyps* Vultures in South Asia. *Mistnet* **15**(3).
- Mundy, P., Butchart, D., Ledger, J. and Piper, S. 1992. *The Vultures of Africa*. Academic Press, London.
- Mendelssohn, H. and Leshem, Y. 1983. Observations on reproduction and growth of old world vultures. Report of the international South Asian Vulture Recovery Plan Workshop.
- Oaks, J.L., Gilbert, M., Virani, M.Z., Watson, R.T., Meteyer, C.U., Rideout, B.A., et al. 2004. Diclofenac residues as the cause of population decline of vultures in Pakistan. *Nature* **427**: 630-633.
- Ogada, D. L. and Keesing, F. 2010. Decline of raptors over three year period in Laikipia, central Kenya. *Journal of Raptors Research* **44**: 43-49.
- Ogada, D.L., Shaw, P., Beyers, R.L., Buji, R., Murn, C., Thiollaya, J.M. et al. 2015. Another Continental Vulture Crisis: Africa's Vultures Collapsing toward Extinction. *Conservation Letters* **0**(0): 1-9.
- Pain, D. J., Bowden, C. G. R., Cunningham, A. A., Cuthbert, R., Das, D., Gilbert, M., et al. 2008. The race to prevent the extinction of South Asian vultures. *Bird Conservation International* **18**: 30–48.
- Pain, D. J., Cunningham, A.A., Donald, P.F., Duckworth, J.W., Houston, D.C., Katzner, T. et al. 2003. Causes and effects of temporalspatial declines of *Gyps* vultures in Asia. *Conservation Biology* **17**(3): 661-671.
- Parajuli, S. 2013. Feeding behavior and potential threats to vultures due to aircrafts in Pokhara valley. B.Sc. Thesis. Institute of Forestry, Tribhuvan University, Pokhara, Nepal.
- Phuyal, S., Ghimire, H.R., Shah, K.B., and Baral, H.S. 2016. Vultures and people: Local perceptions of a low-density vulture population in the eastern mid-hills of Nepal. *Journal of Threatened Taxa*. **8**(14): 9597–9609.

- Potupalsky, S. 1974. Raptor Reproductive Success: Some problems with Methods, Criteria and Terminology. Raptor Research Report, Management of Raptors, Proceedings of the Conference on raptor Conservation Techniques. In: Hamerstrom, F.N, Jr., Harell, B.E. & Olendorff, R.r (eds), Fort Collins: 22-24.
- Prakash, V., Pain, D.J., Cunningham, A.A., Donald, P.F., Prakash, N., Verma, A. et al. 2003. Catastrophic collapse of Indian white-backed *Gyps bengalensis* and Long-billed *Gyps indicus* vulture populations. *Biological Conservation* **109**(3): 381-390.
- Sah, A.K., Baniya, C. B., Baral, H.S. and Mandal, R.A. 2017. Population Status and Diurnal Behaviour of the Red-Headed Vulture (*Sarcogyps calvus*) in Anbu Khaireni, Tanahu, Nepal. *International Journal of Research Studies in Zoology* **3**: 56-65.
- Samson, A., Ramakrishnan, B., Kannan, G., Veeramani, A. and Ramasubramanian, S. 2018. Conservation Threats on Critically Endangered *Gyps* Vultures in the Tamil Nadu Part of the Nilgiri Biosphere Reserve, Southern India. Springer.
- Shah, G. 2016. Distribution of vulture species and their nesting sites in Chitwan-Annapurna Landscape (CHAL), Nepal. M.Sc. Thesis. Central Department of Zoology, Tribhuvan University, Kritipur, Nepal.
- Shrestha, B.P. and Devkota, B.P. 2011. Status of Critically Endangered Vultures in Dang Deukhuri Foothill Forests and West Rapti Wetlands. *The Initiation* **4**: 28-34.
- Shrestha, S. 2014. Nesting preference of White-rumped Vulture (*Gyps bengalensis* gmelin, 1788) and conservation perspective of Jatayu restaurant of Nawalparasi district. M.Sc. Thesis. Department of Environment Science Khwopa College, Tribhuvan University Dekocha, Bhaktapur, Nepal.
- Shrestha, T.K. 2001. Birds of Nepal: Field Ecology, Natural history and Conservation (vol. 2), 537-538 p.
- Subedi, T.R. and Decandido, R. 2013. Indian Vultures *Gyps indicus*: first record for Nepal. *Birding Asia* **19**:115-116.
- Subedi, T.R. and DeCandido, R. 2014. Population and breeding success of Red-headed Vulture *Sarcogyps calvus* and Egyptian Vulture *Neophron percnopterus* in central west Nepal. *African Journals Online* **67**(2).

- Subedi, T.R., Anadon, J.S., Baral H.S., Virani, M.Z., and Sah, S.A.M. 2018. Breeding habitat and nest-site selection of Bearded Vulture *Gypaetus barbatus* in the Annapurna Himalaya Range of Nepal. *International journal of avian science*.
- Swan, G., Naidoo, V., Cuthbert, R., Green, R.E., Pain, D.J.et al. 2006. Removing the threat of diclofenac to Critically Endangered Asian Vultures. *PLoS Biology* **4**(3):e66.
- Thakur, M.L., Kataria, R.C. and Chauhan, K. 2012. Population decline of vultures and their conservation: scenario in India and Himanchal Pradesh. *International Journal of Science and Nature* **3**(2): 241-250.
- Thapa, V. 2016. Food access and threats to vultures in Chitwan-Annapurna Landscape, Nepal. M.Sc. Thesis. Central Department of Zoology, Tribhuvan University, Kritipur, Nepal.
- Ward, J., McCafferty, D.J., Houston, D.C. and Ruxton, G.D. 2008. Why do vulture have bald heads? The role of postural adjustment and bare skin areas in thermoregulation. *Journal of Thermal Biology* **33**: 168-173.

Annex 1: Photographs of the field work



Red-headed Vulture



Egyptian Vulture



White-rumped Vulture



Himalayan Vulture



Cinereous Vulture



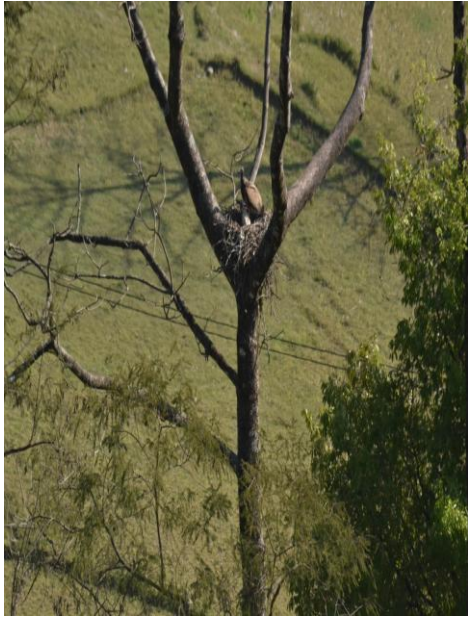
Slender-billed Vulture



Vultures at GVR



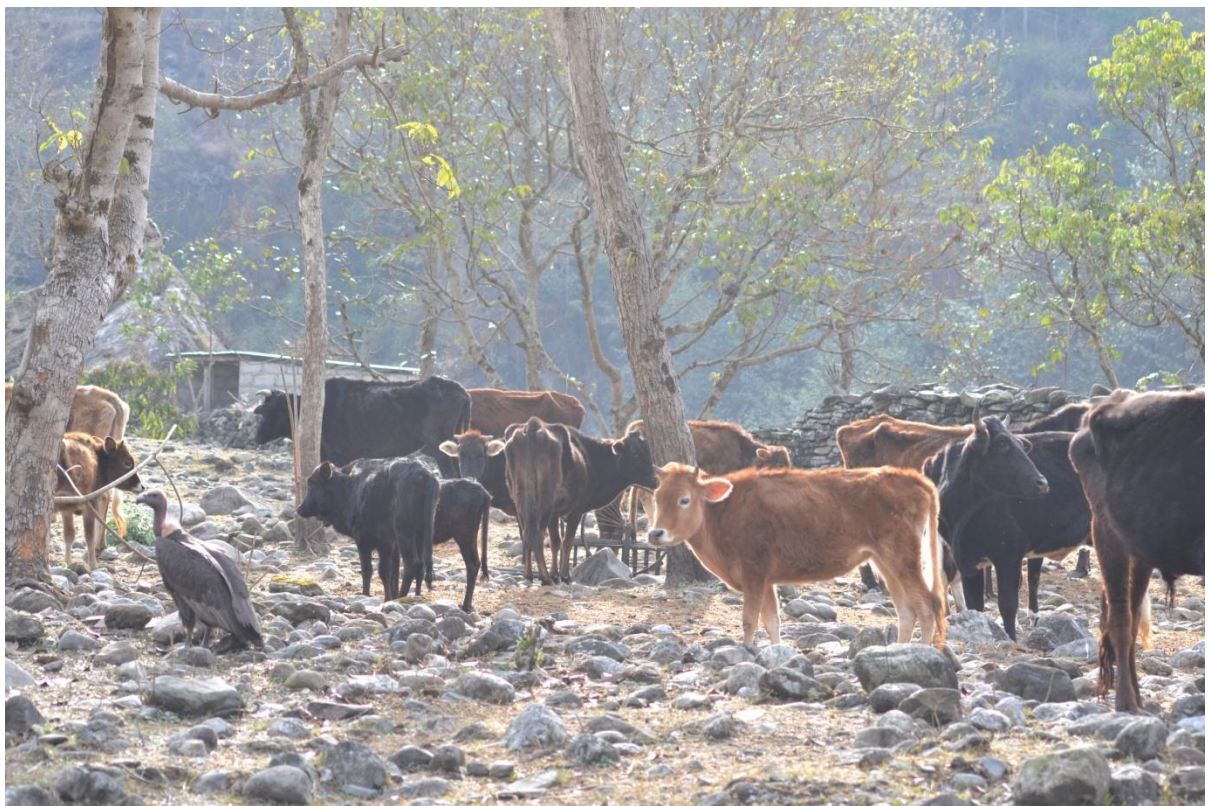
Egyptian Vulture at SLS



Nest of SBV with chick



Carcass at GVR



Cow in “cow rescue center” with Vulture

Annex 2: Nest monitoring Form

Nest No: _____ Observer: _____ Other wildlife encountered at survey: _____
 GPS Location: _____
 Species: _____ Address: _____
 _____ Nest _____
 Location :- _____ Height: _____ Associated Tree species:- _____
 _____ Nesting _____
 Nesting tree species: _____ on: _____
 Height of Tree (by Abney's Altitude: _____
 level): _____

S N	Date	Time	Active Nest	Fledgling in Nest	Weather	Visibility	Remarks
1							
2							
3							
4							
5							
6							
7							
8							
9							

Annex 3: Observation form for vultures

Date:

Location:

GPS location:

Observer:

Time of starting for feeding:

S.N.	Species name	Number			Total	Remarks
		Adult	Sub-adult	Juvenile		
1						
2						
3						
4						
5						
6						

Time of ending for feeding:

Other animals in carcass:

Status of carcasses after feeding:

1. Whole remaining
2. Half remaining
3. Quarter remaining
4. Little remaining
5. Only bone

Annex 4: Household survey

Questionnaire for Local People

Your participation for this survey is voluntarily. You will neither be rewarded not be penalized for not answering the question. The survey is for people’s perception and threat’s towards the vulture. This questionnaire is only for academic purpose only. Your name and other information regarding your identity will be kept confidential.

Questionnaire Code No:

Name of Respondent:

Age:

Date:

Occupation:

Education:

Address:

Gps Location:

1. Do you have livestock at your home?

- a. Yes b. No

2. How many livestock do you have?

- a. Cow b. Buffalo.....
- c. Goat..... d. Others.....

3. Within 5 years, have your livestock died?

- a. Yes b. No

If yes how many livestock have died?

4. If livestock die, what will you does?

- a. Burry b. Sell c. Self consume
- d. Throw e. Give it to Jatayu Restaurant
- f. If other, please specify

5. When your livestock become sick, will you check- up by veterinary doctor?

- a. Yes b. No

If yes, will you give medicine to them?

.....

6. Do you know about Diclofenac?

- a. Yes b. No

7. Do you know about Meloxicam?

- a. Yes b. No

8. Do you know about vultures?

- a. Yes b. No

9. Have you seen vultures in your area?

- a. Yes b. No

10. Have you seen dead vultures in recent year?

- a. Yes b. No

11. If yes, how many?

- a. 1-3 b. 4-8 c. 8-15 d.15+

12. What could be the cause of death?

- a. Poisoning b. Disease c. Food scarcity
d. Diclofenac e. Electrocution f. Others.....

13. Is there any change in vulture number compared to past?

- a. Increasing b. Decreasing C. No idea

14. If increasing, what could be the reason?

- a. Awareness programmes
- b. Jatayu restaurant
- c. Carcass amount
- d. Habitat conservation
- e. Banning the use of Diclofenac
- f. Don't know
- g. If others.....

15. If decreasing what could be the reason?

- a. Diclofenac
- b. Food scarcity
- c. Electrocutation
- d. Deforestation
- e. Killed for Ethno-medicine
- f. Unknown
- g. Others.....

16. Do you think vultures are of bad sign?

- a. Yes
- b. No
- c. No idea

17. Have you ever killed vulture?

- a. yes
- b. No

If yes, why or for what purpose you killed?

.....

18. Have you ever used the vulture parts as medicine?

- a. Yes
- b. No

If yes, for what purpose?

.....

19. Are vultures beneficial or harmful?

- a. Beneficial
- b. Harmful
- c. Both
- d. Neither
- e. Don't know

20. If beneficial, what could be the benefits of having vultures?

- a. Consume carcass of animal's
- b. Stop spread of disease
- c. keep environment clean
- c. Decrease our burder/ workload by disposing carcass
- e. Others

21.If harmful, what harms could vulture cause?

- a. Eats our livestock(chicken/goat kids)
- b. Cause ill luck by landing on our homes
- c. Pollute ours farms by defecation
- d. They are dirty birds
- e. Others....

22. Do you believe the vultures have important role in the environment?

- a. Yes
- b. No
- c. No idea

If yes, what type of role?

.....

23. Do you think vultures should be conserved?

- a. Yes
- b. No
- c. Neutral

If yes or no why?.....

24. How can we conserve vulture in this locality?

- 1. Increasing conservation awareness participation
- 2. Through community
- 3. Habitat conservation effort
- 4. Increase food availability
- 5. Removal of Diclofenac use
- 6. Don't know.....