Conservation Science
Translating Knowledge into Actions

Factors Affecting Peoples' Participation on Vulture Conservation from Kaski district of Nepal

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Summary

Aim This paper explores the social factors affecting local peoples' participation in the vulture conservation.

Location Kaski, Nepal.

Materials and Methods This study examines attitude of local people towards vulture conservation using a questionnaire survey of 130 households drawn randomly from the two vicinities of the vulture colonies.

Key findings The results show that 77.4% of respondents rear an average of 2.97 livestock unit (LSU) per household. 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.

Conservation implications Conservation education is a key for vulture conservation.

Keywords attitudes, carcass, colony, favorable, diclofenac, vulture conservation

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Introduction

The population of the three species of vultures (white-rumped, slender-billed and long-billed vulture) in the wild has declined drastically over the past decades. In India, population of white rumped vulture has declined by more than 99.9 % and long-billed and slender-billed have declined by 96.8 % during the past two decades (Prakash et al. 2007, Virani et al. 2002). The average annual rate of decline in India was 44%, 16%, and 16% for white-rumped, slender-billed and long-billed vulture respectively, while this rate is even higher in Nepal (40%) (GoN/MoFSC 2009, Prakash 1999, Prakash et al. 2007). These studies reveal that a rapid population decline of vulture is common throughout in its home range. Birdlife International (2007) lists four vulture species: white-rumped vulture (*Gyps bengalensis*), long-billed vulture (*G. indicus*), red-headed vulture (*Sarcogyps calvus*) and slender-billed vulture (*G. tenuirostris)*, as critically endangered (CR).

Wildlife biologists have recently discovered that diclofenac, a widely used painkiller and anti-inflammatory drug, administered to livestock and humans is the main reason for mass mortality of vultures (Green et al. 2004, Anderson et al. 2005, Oaks et al. 2007). Consequently, there have been initiatives to (1) ban on the use of veterinary diclofenac, (2) captive breeding and release of vultures, and (3) identification of alternatives of vulture-safe drug (www.vulturerescue.org). These actions though paid very little attention to social and human related issues although they are equally important for successful species conservation plan (Myers 1979, Stephan 1980 and 1985, Carlton 1986). For example, the endangerment of most of Hawaii's endemic avifauna is attributed to the social forces (Berger 1981). The same is true for vulture in Nepal (Baral and Virani 2004). Therefore, it is a necessity to assess the relationship between human society and these close-to-extinction species.

Attitude is the psychological tendency of an individual to evaluate an entity (person, place or thing) with a certain degree of favor or disfavor (Ajzen and Fishbein 2005). In wildlife conservation, a positive attitude towards a protected area or wildlife is likely to be linked to pro-conservation behaviors (Holmes 2003). A basic assumption or hypothesis of this research is that the problem of endangered species' conservation is primarily a socioeconomic distortion evolving to a variety of attitudes, social and economic forces. Assessment of public views and knowledge on wildlife often permits the development of pertinent and effective public relation campaigns designed to develop support and to enable people in order to make more rational and intelligent decisions (Mehta and Heinen 2001, Ite 1996).

This study aims to reveal various social and perceptual factors contributing to the contemporary vulture conservation problem. The findings of this research will provide an additional understanding of the underlying problems and perhaps lead to concrete suggestions of more effective strategies for mitigating their impact on vulture conservation.

Materials and Methods

Study area

This study is carried out in periphery of two vulture colonies in Kaski district (**Figure 1**). Kaski district (28° 06'–28° 36' N—83° 40'– 84 ° 12' E) occupies a total area of 2017 km^2. The total human population of the district is 380527 (189 per km^2) consisting 184995 males and 195532 females (CBS 2002). There are 85075 households with an average household (HH) size of 4.47 persons. The literacy rate of the district is 71%, which is higher than the national literacy rate (54%). The major ethnic groups include Gurung, Brahmin, Chhetri, Magar, and Newar.

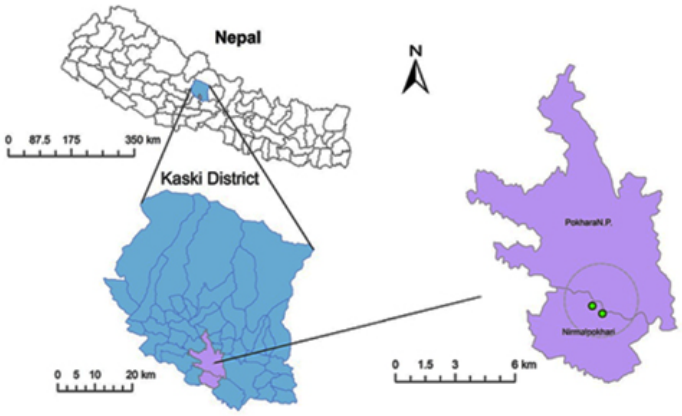

Figure 1: Map showing the study area (source: DDC Kaski)

Data collection

The study area is divided into three sites based on the political-administrative zone (ward number 5 of Nirmalpokhari Village Development Committee and ward number 17 and 18 of Pokhara municipality). People living within 2 km periphery from the vulture colonies were selected randomly for questionnaire survey. Altogether 130 respondents (mostly head of each household) were interviewed using a semi-structured questionnaire. A key informant survey with teachers, farmers and members of local institutions such as Community Forest User Groups (CFUGs), youth clubs and women groups was carried out whereas applicable. Each questionnaire consisted of five general parts: (1) demographic and social factors, ethno-religious background, households' characteristics (gender, age and occupation), education (illiterate, and literate), (2) economic factors such as land-holdings, alternative sources of income, annual cash income, animal husbandry (livestock-holdings, animal diseases, veterinary services and carcass disposal practices), (3) natural resources use, (4) participation in conservation programs and benefits from conservation (memberships, personal benefits, income generating activities and saving-credit program); (5) awareness about plight of vultures and attitudes towards vulture conservation. After the completion of the survey, the questionnaires were again cross-checked and edited in the field to avoid the discrepancies and data inconsistencies.

Data analysis

The respondents' attitudes towards vultures were measured in a Likert scale of agree to disagree (1-3) as shown in **Table 1** (Babbie 1995). Attitudes toward vulture conservation were tested by 15 variables (**Table 1**). Data were analyzed using the Statistical Package for the Social Sciences (SPSS) Version 11.5. The internal consistency of the scales was measured by the reliability coefficient, Cronbach's alpha (Cronbach 1951), which ranges from 0 to 1. The larger the value, the greater the reliability of the scale. The logistic regression was used for examining the relationship between the response and set of predictors (variables). Logistic regression is a multivariate technique which assumes nonlinearity and is used to predict a binary dependent variable from a set of independent variables (Bishop 1975). Following the convention of logistic regression, each attitude scale was dichotomized into a dummy (indicator) variable by using the median score of the scale. For example, a respondent was assigned a value 1 if he/she held a more favorable attitude and 0 if otherwise (i.e., less or no favorable attitude).

All independent, demographic variables were also re-coded as dummy variables. For example, the respondent was coded 1 and 0 as follows: 1 if male and 0 if female, 1 if younger (≥ 39 years) and 0 if not (median age of sample population is 38 years), 1 if illiterate and 0 if not, 1 if rear livestock and 0 if not, and 1 if they are participating in conservation projects and benefited from them and 0 if not. The original 'ethnicity' variables (i.e. Brahmin, Chhetri, Gurung, Magar and others) were reassigned into two dummy variables (ethnic and non-ethnic). For multivariate analysis non-ethnic caste formed a reference category for other ethnic and lower caste two dummy variables. Bivariate analysis Chi-square test was used to identify the significant factors associated with conservation attitude. The logistic regression was used for examining the relationship between the response and set of predictors. The result was then expressed in terms of odds ratios for the simplicity of explanation.

To assess which of the socioeconomic variables influence the conservation attitudes of people, we first summed the scores of the above fifteen questions to create a vulture conservation attitude scale. Cronbach's alpha on this scale was 0.77. The average scale score (on a 45 - point scale) for the conservation attitude scale was 31.99. The scale of conservation attitudes was dichotomized into two categories for further analysis.

Results

Socio-economic attributes

Among the respondents, 59% were male and 41% were female. The age of the respondents ranged from 18 to 80 years, with a median age of 38 years. The majority of respondents (51%) belonged to the middle age class and was equally followed by younger (25%) and older age classes (24%). The average family size was 6 . Sixty percent of the respondents belonged to non-ethnic groups (Bhramin/Chhetri/Thakuri), 23 % were ethnic (Gurung /Magar) and 17% from other caste. Thirty-one percent of the respondents were illiterate, while 11% had completed primary school, 23% had graduated from high school and 35% had attended college. From the total households within the study area 12.27% was categorized as poor, and the remaining 16.04%, 19.81% and 51.89% was categorized as comfortable, well off and rich respectively. Firewood was the most important source of fuel energy for 67.4% of households. About 22% of the respondents use biogas for cooking and heating purposes whereas 11.2% of the respondents use electricity and others use firewood.

Only a small number of the respondents (21.7%, n = 94) was self-reliant from subsistence agriculture and animal husbandry. Of those who were not self-sufficient (67.9%), people had to depend on alternative income sources on an average of 7.51 months (SD = 2.561, n = 72) for livelihood. Livestock rearing is an integral part of subsistence agriculture, and animals are kept for milk, meat, and manure. Among the respondents 77.4% reared livestock with an average of 2.97 LSU per household. Within the past five years, 44.3% (n = 82) of households lost livestock due to diseases. Out of 47 households that lost livestock to diseases, 44.47% had treated their livestock with the help of veterinary practitioner. Diclofenac may have been administered to livestock whenever veterinary personnel attended and the situation demanded it. Diclofenac is mainly used in treatment of inflammation and pain in livestocks. More than half (55.3%, n = 33) of households lost livestock in the absence of veterinary practitioner. When domestic animals die, 52.42% of households dump the carcasses in open fields while 37.80% bury them and 9.75% call a tanner to skin the carcasses. The practice of carcasses disposal differed significantly with the mode of animal death (DF. = 3, Pearson chi square = 23.48, $P < 0.0001$) (**Table 3**). When animals die due to diseases, 57% of the respondents bury the carcasses and if the death is natural, they prefer to dump the whole carcass in open fields.

Conservation attitudes

Overall attitude of respondents for vulture conservation was towards neutral as the average of the total weighted mean (2.10) showed (average total weighted mean of Likert scale is 2). The scores of the 15 questions were summed to produce an overall scale score on attitudes towards vultures and the results show that 30.2% of the respondents possess highly favorable attitude, 37.7% showed favorable attitude and the rest 32.1% showed unfavorable attitude towards vulture conservation. The majority (80.2%) of the respondents were aware of vanishing vulture populations, however 61.32% of respondents did not agree with the fact that there had been mass mortality of vultures in the recent years. A significantly larger percentage (83.2%) of respondents opined that there had been no increase in the number of carcasses. The majority of the people (88.68%) claimed that they had not persecuted vultures. Although vultures are not scared animal for local people, they consider them as beneficial creatures to

Table 1: Overall attitude of people toward vulture

SN	Statements	Response (%)			
		Agree	Neutral	Disagree	WM
1	Vultures are declining in your area	80.2	3.77	16.03	2.64
2	In recent years there has been mass mortality of vulture population.	27.36	1.32	71.32	1.56
3	There are more carcasses than before	2.83	14.15	83.02	1.20
4	People kill vultures	9.43	1.89	88.68	1.22
5	It is important to set aside a place for animals to live in.	75.47	0.94	23.58	2.52
6	It is important to educate people about vulture conservation.	72.64	0.943	26.42	2.46
7	We should conserve vultures for future generation to see.	66.04	5.66	28.3	2.38
8	People have high regards for vultures due to religious reasons.	24.53	33.019	42.45	1.82
9	Vultures are beneficial to humans.	72.64	0.943	26.42	2.46
10	The forests around your village have decreased in recent years.	56.6	20.75	22.64	2.34
11	Chemical fertilizers and pesticides may cause vulture decline.	16.98	56.6	26.42	1.91
12	It would be better not to have community forests.	14.15	12.26	73.58	2.59*
13	There are more feral dogs now than ten years ago	41.51	16.98	41.51	2.00
14	Diclofenac or veterinary medicine may cause vulture death.	35.85	42.45	21.7	2.14
15	Deforestation/food scarcity may cause vulture death.	80.19	5.66	14.15	2.66
	Average of total weighted mean				2.10

Table 2: Relation between socioeconomic factors and conservation attitudes

Factors	Category	UF(%)	F(%)	WM	χ^2	df	p
Ethnicity	Brahmin	47.83	52.17	1.52	135.75	4	0.000**
	Chetri/ Thakuri	22.22	77.78	1.77			
	Gurung/Magar	62.5	37.5	1.37			
	Newar	25	75	1.75			
	Occupational	92.85	7.15	1.07			
Gender	Male	44.45	55.55	1.55	6.76	1	0.009*
	Female	62.79	37.21	1.37			
Age	Young(18 -35)	22.23	77.77	1.77	74.92	2	0.000**
	Middle(35 -55)	52.73	47.27	1.47			
	Old(>55)	83.34	16.66	1.16			
Education	Illiterate(<1 year)	90.91	9.09	1.09	185.5	3	0.000**
	Primary(1 -5 years)	83.34	16.66	1.16			
	Secondary(5 -10 years)	54.17	45.83	1.45			
	College (>10 years)	5.41	94.59	1.94			
Livestock holding	Yes	69.3	40.7	1.25	3.53	1	0.06
	No	55.5	54.5	1.55			
Resource Dependency	Dependent	50.8	49.2	1.57	0.01	1	0.91
	Not dependent	51.6	48.4	1.49			
Participation and benefit	Yes	31.25	68.75	1.68	26.8	1	0.000**
	No	67.85	32.15	1.32			

** =P<0.001, *= P<0.05. UF= Unfavorable, F= Favorable, WM = Weighted mean, χ^2 =Chi - square.

humanities (72.64 %). People were aware of declining forest cover in their surroundings, so they were in favor of community forestry (WM = 2.59).

Respondents disagreed with the statement that "use of chemical fertilizers and pesticides cause vulture decline" (WM = 1.91). The response of the respondents towards the population trend of feral dog was neutral (WM = 2). More than 80% of the respondents living in Pokhara municipality agreed that the population of feral dogs had increased while the respondents of Nirmalpokhari VDC disagreed with this statement.

Respondents agree with the statement that "deforestation and food scarcity may cause vulture decline" (WM = 2.66) and their response was toward neutral (WM = 2.14) for the statement "diclofenac or veterinary medicine cause vulture decline". Only 35.85% of the respondents were aware of diclofenac and that it is responsible for catastrophic declines of vulture population (**Table 1**).

Factors affecting people's attitude towards vulture conservation

There was a substantial but statistically insignificant number (52.8%) of respondents with favorable attitude toward vulture conservation. The dichotomized scale was used to test the significant predictors of conservation attitude.

A significant proportion of non-ethnic group had a favorable attitude towards vulture conservation whereas ethnic groups were not in favor of vulture conservation (**Table 2**). Male respondents showed a favorable attitude (55.55%) while female were not in favor (62.79%) of conserving vultures. A significantly larger percentage (77.7%) of younger respondents was in favor of vultures while middle and old aged respondents showed unfavorable attitude (52.73% and 83.34% respectively). Almost all (94.5%) of the respondents who have college level education possess favorable attitudes as compared to illiterate respondents (9.09%). Likewise, respondents who participated in INGOs, NGOs, and community-based organizations have favorable attitudes (68.7%) towards vulture conservation.

For multivariate analysis, a logistic regression model has been used. Those variables which were statically significant in chi-square test were selected for multivariate analysis. Odds ratios were calculated from logistic models of people's attitude towards vulture conservation by selecting background characteristics such as higher caste, male, younger, illiterate, livestock holders and respondents who participated in conservation programs and benefited from conservation (**Table 3**). People from indigenous caste were 1.2 times more favorable towards vulture conservation as compared to the lower caste and upper caste people. Female, older people and people who had not participated in conservation programs had less favorable attitude towards vulture conservation than male, young individual and those who had participated in conservation programs respectively. Similarly, literate people were 3.5 times more likely in favor of vulture conservation than illiterate and those people who did not rear livestock were1.2 times more likely towards vulture conservation than those who owned livestock.

Table 3: Relation between socioeconomic factors and conservation attitudes

Variable	B	SE	Wald	P	OR
Ethnicity1 (Indigenous)	1.16	0.63	7.33	0.07	1.2
Ethnicity2 (Lower)	-2.65	1.08	9.35	0.01*	0.03
Gender (Female)	-0.74	0.40	3.40	0.06	0.56
Age (Older)	-1.74	0.52	11.33	0.00**	0.03
Education(Literate)	2.25	0.68	10.79	0.00**	3.5
Livestock holding(No)	0.53	0.47	1.28	0.09	1.2
Resource dependency(Not)	1.15	0.56	1.3	0.75	-
Participation and benefits(No)	2.07	0.66	9.81	0.00**	0.2

(n=130). B=Logistic regression coefficient, SE= Standard error, Wald= Wald statistic, OR= Odd ratio,** =P<0.001 and * = P<0.05

Discussion

Socioeconomic surveys which were carried out at Rampur valley indicated that age, education, willingness to pay and bid amount are significant for conservation attitude (Baral and Gautam 2004). This research also demonstrates similar results to the Rampur survey but also shows that ethnicity, age, education, gender, livestock holding, participation and benefits were significant factors that govern conservation attitudes. There was a higher proportion of male respondents than the female respondents which is mainly due to the fact that the household head in Nepalese society are usually men. The literacy rate of people in this area is very close to the national literacy rate (CBS 2011). However, there is significant variation among different ethnicities. The illiteracy rate among the non-ethnic groups was higher than ethnic groups. None of the respondents from disadvantaged groups (e.g., lower caste) had achieved college level education. That fact denotes that an environmental education program for such people is imperative to draw their attention towards conservation. Education can affect conservation attitudes, usually for the high degree of positive attitudes (Banko 1979, Heinen 1993, Heinen 1998, Emtage 2004).

Socioeconomic status, as measured by education, represents a primary factor that affects the attitude towards vulture conservation. Data obtained in this study have revealed a highly positive attitude among those people who obtained higher secondary and college level education. Furthermore, this 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. These results suggest that these demographic groups would be inclined to express a strong affection towards vultures' protection. Peoples from lower caste and livestock producers typically are less interest for vulture conservation. This might be due to few educated people among low caste communities. Besides, people who are involved in NGOs and INGOs have a more favorable attitude towards vulture conservation.

Subsistence agriculture and livestock rearing are the mainstay occupation of people in the study area. A significantly larger number of households reared livestock with an average of about three individuals per household. There was a significant difference between resource dependency and LSU (livestock unit) as respondents increased demand of resource with increase in LSU. People usually have low productive type of livestock as compared to the productive ones. When livestock was infected with diseases, people usually called a veterinary doctor to treat them, who usually prescribed diclofenac as pain killer. Respondents (slightly less than a half) claimed that there was contamination of diclofenac in the carcasses. The practice of carcasses disposal differed significantly with mode of animal death. Local people usually buried the carcasses that died of diseases while they prefer to throw them in open fields in the case of natural death. However, this study found that more than half of the diseased carcasses (usually contaminated with diclofenac) were buried but the remaining others (about half) were dumped in open fields where they were available to vultures. Less than a half of the respondents were aware of diclofenac as a harmful medicine for vultures which is used to treat cattle. The practice of calling a tanner to skin a carcass or for consumption of meat depends upon the nature of death, type of animal, and also highly depends on the occupational caste of the respondents who would choose such practice.

In this study, local people have moderate level of conservation attitudes towards vulture conservation. People believed that the vultures are highly beneficial creatures to human societies because of the ecosystem services provided by vultures in making a clean and healthy environment by consuming carcasses. However, people did not have high regards to vultures on cultural grounds. People were also aware of dwindling population of vultures, however, do not readily accept the fact that there has been mass mortality of vulture population in the recent years.

An informal discussion with the respondents showed that they were quite negative with the vultures nesting in trees within their farmlands. In that occasion, people perceived vultures as pest because of their smell and the impact of vultures' droppings on their livestock and farm. To get rid of vulture colonies nearby human settlements, people prune the branches that hold vultures' nests. All the respondents who participated in this survey were from Phedi Patan colony which is a very important colony in terms of vulture population and also a very vulnerable colony (Baral and Gautam 2007) making the protection of their habitat very crucial.

Another discussion was made with Youth Club members in the study area. These youths need to be mobilized in conservation endeavourers considering their potentiality and enthusiasm in conservation. Youth Clubs can be a good and efficient local level institution that can sensitize their communities. Discussion with CFUGs members revealed that there was no program and plan regarding vulture conservation. Public support for community forestry is likewise not directly linked with vulture conservation. Community forest user groups were logging kapok trees, which are the main roosting and nesting sites for vultures. Last year, 60 mature kapok trees in the study area were logged to support a community building and increase fund. According to the governing body of CFUG, they were allowed to cut down only mature trees under the supervision of District Forest Office (DFO) of Kaski. Therefore, if such activities are not controlled properly, the vulture population in these areas will be declined in near future.

Conclusion and Conservation Implications

The study concluded that the overall attitudes of people towards vulture conservation are fairly good. The rarity of vultures and particularly their critically endangered status, contribute to a feeling of sympathy and support for their conservation. Ethnicity, age, education, gender, livestock holding, participation and benefits were significant predictors of conservation attitudes. The educated people showed a highly favorable attitude towards vulture conservation. These groups of people were well aware of the extinction of vultures and understand the ecological and environmental value of vulture species. Livestock holders and resource dependent people do not show comparatively a favorable attitude due to the negative impact of vulture drooping nearby their settlements. It can be deduced from these results that rural and resource-dependent groups, particularly livestock producers, would be inclined to endorse attitudes of exploitation and subordination of vulture for the sake of enhancing various human interests and practical needs. The present research also concludes that conservation attitude is influenced by various socioeconomic characteristics, therefore, for the successful implementation of endangered species' management programs, a wildlife manager must follow the integrated conservation approach with a clear understanding of human's interaction with the environment and its effects on target species.

In this study area a small number of respondents were well aware of the ecological services provided by vulture species and their population decline. Therefore, intensive education and awareness campaign should be launched with the main aim of targeting occupational and ethnic groups because

they play a significant role in carcasses management. Considering the potentiality and enthusiasm of the youths in the study area they should be mobilized in a conservation endeavor. Youth clubs can be a good and efficient local level institution that can sensitize their community (Ite 1996). One of the issues found during the research was the negative effect of vulture drooping to human settlements. Research should be done regarding the cause and effect of vulture droppings because people thought that vulture drooping cause their animal sick and some time humans also, if it comes in contact with the body or if the livestock eat the forage that is in contact with vultures' drooping. This research noted that various socioeconomic factors (e.g., caste, gender, age, education, livestock holding, participation and benefits) have significant influence on conservation attitudes. Such findings can also form the milestone basis for the implementation of conservation programs in the community, with a more effective conservation of vulture colonies in other sites as well.

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Biography

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