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Cover: Indian Grey Wolf *Canis lupus pallipes* and Smooth-coated Otter *Lutrogale perspicillata* sharing the territory in Chambal basin. Digital art on Procreate by Aakanksha Komanduri.



Knowledge and attitude towards wild carnivores among university students: a study from Kargil Trans-Himalaya, India

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Abstract: Several studies have reflected that the success of wildlife conservation approaches and efforts are determined by local people's knowledge and attitude toward the target wildlife species. It is critical to have a favourable attitude of the local communities towards wildlife for implementing successful conservation efforts that involve public participation. We conducted this study in Kargil Trans-Himalaya, India to understand the knowledge and attitude of local undergraduate and postgraduate students towards wildlife in general, and wild carnivores in particular. To achieve the objectives of this study, an online semi-structured questionnaire was drafted and distributed among student residents of Kargil pursuing their higher education degrees from Kargil and other parts of India. We received a total of 385 responses, and 362 were considered fit for the study. The total knowledge score for the respondents ranged from 3–12 out of 12, with a mean score of 9.68 ± 1.565 . With the overall attitude score ranging from 4–12 out of 12, and a mean score of 10.19 ± 1.417 , students in higher education from Kargil possess a favourable attitude towards the wildlife of the region. The Spearman's correlation between knowledge and attitude score was weak, $r_s = 0.255$, $p < .001$, $N = 362$. The knowledge and attitudes of local students towards wild carnivore species should be considered for effective long-term conservation efforts. This could be accomplished by timely sustainable conservation education and awareness initiatives. Although this study tries to explore an important factor to be considered in wildlife conservation efforts from a less explored region in the trans-Himalaya, future studies can intensively look into the factors that influence the formation of social attitudes toward wildlife.

Keywords: Biodiversity, cold desert, conservation, environmental awareness, Himalayan Brown Bear, Ladakh, perception, Snow Leopard, social attitudes, wildlife.

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Author contributions: IA—conceptualization, methodology, field investigation, data collection, data analysis, project coordination, writing - original, and preparation of manuscript. RJY—supervision, conceptual guidance, methodology review, interpretation of results, critical review and editing of the manuscript.

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INTRODUCTION

Humans have been sharing space with wildlife and competing with them for natural resources throughout history. As the human population is expanding at a rapid pace, demand for natural resources is also increasing, which has resulted in inflated competition for resources and intensified pressure on wildlife (Woodroffe 2000; Conover 2002). As anthropogenic activities expanding across the world, biodiversity suffers a direct loss, and there is a decline in human well-being (Dickman & Hazzah 2016). The exponential increase in the human population has led to an increase in human-wildlife conflicts throughout the world (Woodroffe 2000; Conover 2002). The degradation and fragmentation of wildlife habitats through intensive human use have brought wildlife and humans closer than ever before. Attacks by large predators on humans and their livestock, as well as agricultural damage by large herbivores, have always occurred, but have gained increased attention in recent decades (Inskip & Zimmermann 2009). These occurrences have led to misconceptions and unfavourable notions/emotions about the behaviour of non-charismatic carnivores and large herbivore species in rural areas where people share land and resources with such species (Marchini & Macdonald 2012; Dickman et al. 2014; Castillo-Huitrón et al. 2020).

In the case of emotions and attitudes towards a wild carnivore, physical traits of animal species, as well as human-created “personalities”, have elicited a wide range of emotions (Kellert et al. 1996; Kruuk 2002; Prokop & Randler 2018; Castillo-Huitrón et al. 2020). Large charismatic creatures that have historically been viewed as dangerous, yet intelligent, elicit emotions that can lead to protective acts, as has been the case with Lions *Panthera leo*, Tigers *Panthera tigris*, Leopards *Panthera pardus*, Snow Leopards *Panthera uncia*, and different species of Bears *Ursus* spp. (Marchini & Macdonald 2012; Dickman et al. 2014). Knowledge of the behaviour of culturally significant species develops better in rural communities where people are in contact with wildlife regularly than in other locations (Castillo-Huitrón et al. 2020). This allows the anthropomorphising of particular animals, which enhances dread and rejection toward them by labelling them “shy”, “noxious”, and “monstrous” among other descriptors (Lescureux & Linnell 2010; Castillo-Huitrón et al. 2020). Furthermore, if the existence of an animal causes members of a community to suffer economic losses, their main perspective will be negative, resulting in resentment that may lead to fatal management (Naughton-Treves 1997).

The environmental ethics of the Abrahamic monotheistic faiths—Judaism, Christianity, and Islam, are all based on the concept of stewardship, which implies human responsibility for the preservation of nature (Bhagwat et al. 2011). Further, religions evolved in Asia (Buddhism, Jainism, Hinduism, Taoism, and Sikhism) place a high value on the holiness of nature and its animals, and principles that might elicit environmental awareness and action (Bhagwat et al. 2011). Moral ideals are both derived from and legitimized by religion/faith and they can play a significant role in addressing today’s global environmental issues (McLeod & Palmer 2015). Religion can assist in developing compassion towards an animal/creature, which is the primary ethics of all the faiths but sometimes not valued on an individual level (McLeod & Palmer 2015).

Community knowledge, engagement, and the impact of conservation measures depend on public attitudes toward conservation. Assessing local people’s perspectives can reveal how they will act, whether they will comply with wildlife protection rules, how they will respond to wildlife-related economic losses, and how eager they are to cohabit with wildlife (Megaze et al. 2017). Local community knowledge is regarded as an important component in the expression of feelings toward animals (Castillo-Huitrón et al. 2020). Moreover, local knowledge and emotional ties with animals can be an important factor in identifying strategies to promote environmental awareness (Bowen-Jones & Entwistle 2002).

Individuals’ emotional responses to animals are influenced by a variety of factors, including their gender, age, cultural & natural settings, and perceived sensitivity to each species (Johansson et al. 2012). Significant disparities in fear of wildlife species have been discovered among persons with various levels of education; those with higher educational levels are frequently less fearful of wild animals than those with lower educational levels (Røskaft et al. 2003). Understanding the attitude and perception of local people towards wildlife and conservation approaches is necessary to improve favourable human-wildlife interactions (Shrestha & Alavalapati 2006; Vodouhê 2010; Mir et al. 2015; Ciocănea et al. 2016) and how the future of wildlife conservation is shaped (Adams & Hutton 2007; Røskaft et al. 2007; Barua et al. 2013; Lyamuya et al. 2014). In addition, local communities’ views and attitudes toward wildlife are essential in resolving conflict problems, which put a negative toll on both the local communities living adjacent to wildlife habitat and on the wildlife species (Naughton-Treves &

Treves 2005). Further, individuals with higher education are likely to have more opportunities to learn about the environment and, in particular, wild animals, which may help individuals realize the ecological advantages given by noncharismatic species reducing their unfavourable preconceptions and beliefs about them (Castillo-Huitrón et al. 2020). Given that values evolve at a youth age (Schwartz 2006), understanding how the younger generation understands and perceives wildlife is critical. These values eventually impact attitude and behaviour related to wildlife and human-wildlife interactions. There is not a single study from Kargil District, India addressing the awareness of wildlife among university students and how they perceive wildlife species. Hence, this study was aimed to fill the gap and targeted respondents studying at the university level to explore and assess their knowledge and attitude towards wildlife of the region in general, and wild carnivores in particular. Although ecological research has expanded in Kargil in recent years, there remains a gap in understanding the social dimensions of wildlife conservation, particularly the attitudes and knowledge of local youth. To assist in implementing concrete, successful, and sustainable conservation efforts in the region, it was felt necessary to conduct this study with the specific objectives: (1) to understand the knowledge and attitude towards wildlife among students from Kargil; (2) to identify the factors and associations, if any, between various respondent categories and knowledge and attitude scores and variables within; and (3) to examine if there is any relationship between knowledge of students and their attitude towards wildlife. Based on the objectives, we hypothesized that: (1) higher knowledge scores are positively associated with more favourable attitude towards wildlife; (2) knowledge and attitude scores significantly vary by demographic variables such as education level, subject background, faith, and gender.

MATERIALS AND METHODS

Study area

Administratively, Kargil is divided into 15 community development (CD) blocks (District Statistics & Evaluation Officer Kargil 2020). But with demographic insights and data available according to the past demarcation of nine CD blocks of the district, we adapted and utilized the data according to the nine CD blocks of the study area (Census of India 2011; District Statistics & Evaluation Officer Kargil 2020) (Image 1).

Kargil is one of the two districts in the newly formed

Union Territory of Ladakh, India. Before 2019, it was a district in the former state of Jammu & Kashmir. Often referred to as 'cold desert' in the scientific community, Kargil has a unique floral and faunal assemblage (Pfister 2004), with cold and temperate climatic characteristics. Kargil is home to some of the important and endangered wild carnivore and ungulate species such as Snow Leopard, Himalayan Brown Bear *Ursus arctos isabellinus*, Wolf *Canis lupus*, Fox *Vulpes vulpes*, Pallas's Cat *Otocolobus manul*, Asiatic Ibex *Capra ibex sibirica*, and Ladakh Urial *Ovis vignei* (Pfister 2004). Livestock rearing and sustenance agricultural practices are the main traditional livelihood practices in this region (Barthwal & Mathur 2012). Particularly, in Kargil and Zaskar region, livestock rearing is one of the most important sources of income for agro-pastoral communities (Maheshwari 2016; Maheshwari & Sathyakumar 2020). With a total human population of 140,802 (Census of India 2011) and a geographical area of 14,036 km², Kargil is one of the least densely populated districts in India. The human population is distributed along the glacial streams and the three main river valleys (Suru, Drass, and Wakha), which form important tributaries of the Indus river. The majority of the human population in Kargil belongs to the tribal community of the Purigpa and Balti people of Tibetan descent mixed with the Dard, Mon, and other Aryan people (Gellner 2013).

Education in Kargil has undergone a transition phase since the beginning of the 21st century. Until 1998, 95% of Ladakhi (Kargil and Leh district) students failed to complete their high school exams (10th class, as per the education system of India) every year (SECMOL 2022). This reflects that modern education is very new to the region. However, some major steps have been taken by the then state of Jammu & Kashmir, and the government of India to boost the education quality in the region. To improve and provide accessible higher education to the people of the region, the former state of Jammu & Kashmir established the Degree College Kargil by Order No: 138-HE of 1995 dated 31 March 1995 (District Statistics & Evaluation Officer Kargil 2020). The College was founded on 29 June 1995, and the operation of this district's top seat of higher education learning marked the beginning of a new era in the educational development of Kargil's steep, under-developed, and sensitive border region (District Statistics & Evaluation Officer Kargil 2020). The University of Ladakh, established in 2019, is the sole Trans-Himalayan institute of higher learning and research in the Union Territory of Ladakh (University of Ladakh 2020). Both Leh and Kargil are home to the University's administrative offices. The university has

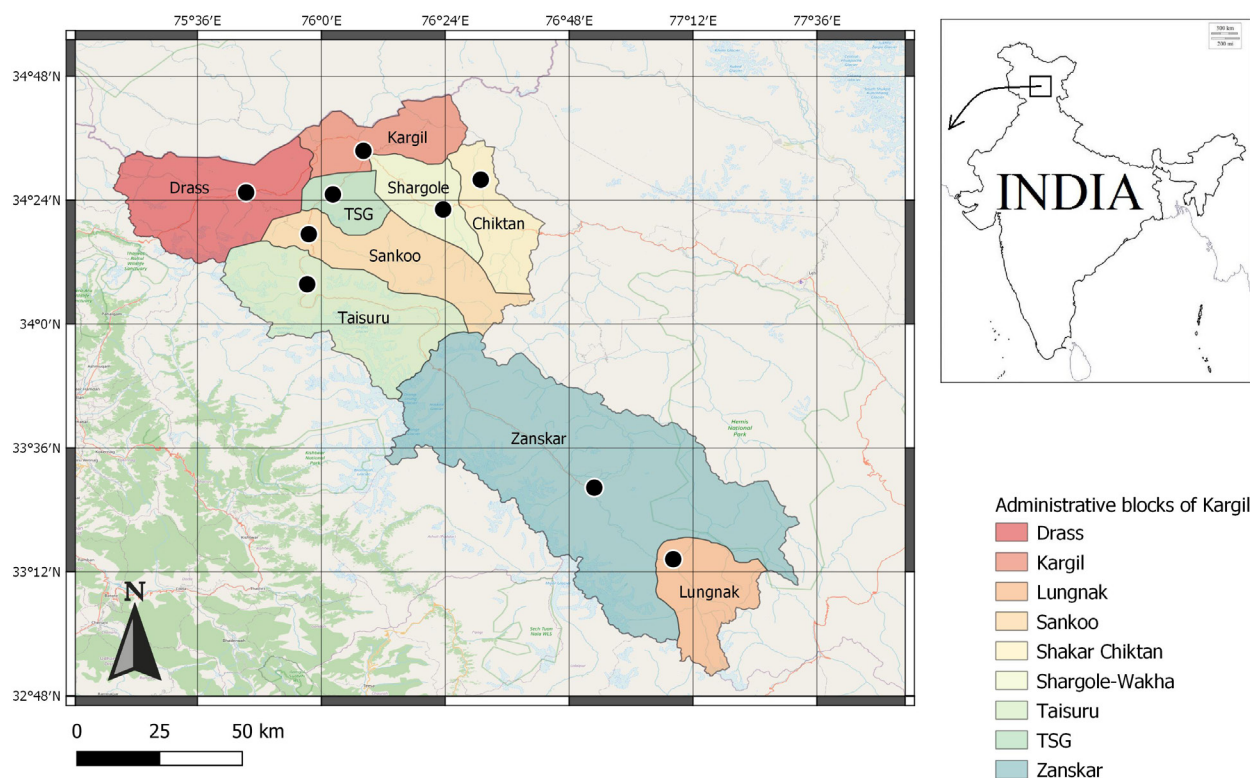


Image 1. Administrative boundary of Kargil District with the demarcation of nine CD blocks boundary and their headquarters.

campuses in both Leh and Kargil, as well as six constituent colleges. In August 2021, to ensure quality education and higher educational requirements for people residing in Ladakh, a bill was passed in the Indian parliament to establish a central university in the Union Territory of Ladakh (The Hindu 2021). Besides the efforts to improve the quality of education, from an early age, many pupils are admitted to renowned Indian colleges to prepare for and participate in competitive postsecondary education (Smith & Gergan 2015). Likewise in the case of Kargil, to pursue quality education students frequently travel to bigger cities like Jammu, Srinagar, Delhi, Chandigarh, and Mumbai.

Kargil has been disregarded in terms of intense wildlife studies and follow-up conservation efforts since it was an armed conflict zone in the late 1990s and early 2000s (Maheshwari 2016). Although human-wildlife interaction is not unique to Kargil, people in this region are particularly vulnerable owing to the high level of reliance on livestock, limited agriculture season, and pasture lands, which restricts conflict mitigation strategies. Understanding human-wildlife interactions require an understanding of how the local communities living adjacent to wild carnivore species' habitat perceive and respond toward the species (Woodroffe 2005).

METHODS

Online survey

Nonprobability convenience sampling was adopted for the application of an online survey. The inclusion criteria were students resident of Kargil, aged 18 years or above, and pursuing graduation or higher degree education in Kargil and other parts of India. A preliminary version of the questionnaire was distributed among 40 respondents (mostly students in higher education) to adapt the questions and improve the clarity of the language. The final set of the questionnaire was distributed among the students through executive members of various student organizations in Kargil and other parts of India, emails (colleges and universities), media outlets, and virtual platforms (WhatsApp, Facebook, and Instagram) from 8 November 2021 to 8 December 2021. This is a random technique that ensures the representativeness and equity of the sample (Boso et al. 2021).

The first page detailed the information and purpose of the study. The name, e-mail address, and other contact information of the responsible researcher were available on this page if the respondents needed more information and clarity on the purpose of the study.

This section also highlighted the ethical measures in place to protect the participants' integrity, anonymity, and well-being. The page ended with the consent of the respondent to participate in the study with a 'Yes' or 'No' response. The participants were allowed to proceed further to the completion of the full survey only upon their consent to participate in the research.

Questionnaire design

An online questionnaire form was drafted using the Google Form survey sheet. The questionnaire was divided into three sections. Being one of the three official languages of Kargil (Kargil District - Wikipedia 2021), and a compulsory subject at primary, middle, high, and higher secondary school education levels across Kargil, English was adopted as the medium of language for the questionnaire. We decided to exclude the responses that stated English was not a subject at their higher secondary education level and also, where the respondents stated difficulty in understanding the questionnaire.

Section one of the questionnaire obtained the socio-demographic information (gender, faith, age, CD block of residence, level of education, current place of study, subjects at higher secondary level, environmental science in higher secondary) of the respondents. The section also explored whether the respondent studied English as a subject at their school level to understand the clarity of the questionnaire.

Section two explored the knowledge score of the respondents through 12 sets of questions or statements about the wildlife of Kargil. This section included questions with 'Yes' or 'No' responses or text space to identify wild carnivore species of the region. The pictures of the mammal species that were included to be identified by the respondents were a Red Fox, a Himalayan Brown Bear, a Snow Leopard, and a Wolf. The correct answer to each knowledge question was given a score of '1' and '0' for incorrect responses. Hence the overall knowledge score of the respondent was accumulated to a maximum of 12.

Section three examined the attitude scores of the respondents. This section consists of 12 statements/questions intended to assess the attitude of the respondents towards the wildlife of the region. A favourable response/attitude towards wildlife was scored '1' and a negative response was scored '0'. Hence, the accumulated maximum attitude score for a respondent summed up to 12.

A question was included to find out whether the questionnaire was intelligible to the respondents. One

open-ended question was also included in the last section of the questionnaire to explore their experience, further comments on the wildlife of the region, and scope for future studies.

The questionnaire was validated through a pilot test involving 20 students from Kargil in higher education, who matched the inclusion criteria. This pretesting was aimed to assess clarity, language comprehensibility, and content relevance. Based on their feedback, questions were simplified that were hard to understand. While reliability coefficients were not calculated, internal consistency was promoted through clearly defined binary scoring (0 = incorrect/unfavourable, 1 = correct/favourable).

The knowledge section of the questionnaire entirely composed of fact-based questions. Each item was scored as correct (1) or incorrect (0), based on factual accuracy.

Statistical analysis

A one-sample Shapiro-Wilk test was performed to assess the normality of the data. Square root and log transformation were performed on non-normally distributed data to obtain normality. None of the variables satisfied the normality criterion after log and square root transformations. Hence, nonparametric tests were used to guarantee that the findings were reliable.

The Chi-square test (Pearson chi-square, Fisher exact test, likelihood ratio) was used to assess any association between two categorical variables. We used the Kruskal-Wallis test to compare the knowledge and attitude score with more than two independent categories of socio-demographic variables. The Mann-Whitney U test was performed to compare the attitude and knowledge score with two independent paired sociodemographic categories. To evaluate the relationship between the total knowledge and attitude score, we performed a Spearman's correlation test (ρ). All the data handling and statistical analysis were performed in Microsoft® Excel and SPSS® 27.

A limitation of this study lies in non-probability convenience sampling approach. The sole use of digital distribution channel may have led to selection bias as those without internet may have left out of the sample. Hence, the findings should be interpreted cautiously.

RESULTS

In total, we received 385 responses. Nine respondents did not consent to participate in the study. A total of 14

additional responses were removed from the final data list. These were the responses that indicated difficulty in understanding the questionnaire ($n = 6$) and the responses where English was not one of the subjects at their higher secondary education level ($n = 8$). Hence, a total of 362 responses were considered fit for the final data analysis. The age of the participants ranged between 18 and 33 years with a mean of 23.10 years ± 3.368 . The detailed demographic information of the respondents is shown in Table 1.

Knowledge score

The total knowledge score for the respondents ranged 3–12, with a mean score of 9.68 ± 1.565 . The accurate responses (in percentage) for the knowledge statement by the respondents are detailed in Table 2.

Identification of species

Identification of different wild carnivore species and their association with various categories of respondents are laid out in Table 3. Fox was correctly identified by 331 respondents. However, it was confused for Wolf *Canis lupus* and common dog *Canis familiaris* by 8.65% ($n = 31$) of the total respondents. The chi-square test of independence was performed to assess the relationship between various demographic categories of the respondents and the identification of the species. There was a significant relationship between the identification of fox and the students who studied environmental science at the higher secondary school level $\chi^2 (1, 362) = 3.949$, $p = 0.047$. Students who had environmental science as one of their subjects at higher education level were able to identify the fox more accurately (93.26%) as compared to students without an environmental science background (86.32%).

Bear was the easiest species to be identified by respondents, with 356 (98.3%) respondents correctly identifying the species. It should be noted here that we also considered the responses as accurate, where the Brown Bear was also responded as 'bear' by the participants but excluded responses with Polar Bear *Ursus maritimus*. Six respondents were not able to identify the brown bear correctly, confusing it for the polar bear.

The Snow Leopard was the least identified species by the respondents. It was correctly identified by 255 (70.4%) of the total 362 respondents. The Snow Leopard was confused by the respondents for the common cat *Felis catus*, Cheetah *Acinonyx jubatus*, Tiger, and other cat species in terms of identification. There was a significant relationship between gender and identification of Snow

Leopard, $\chi^2 (2, 362) = 11.128$, $p = 0.004$, with male respondents identifying the species more accurately (75.71%) as compared to female counterparts (58.77%). Three-hundred-and-thirteen of the total 362 respondents were able to identify the wolf correctly. However, 13.5% ($n = 49$) confused it for the common dog, fox, and Jackal *Canis aureus*.

Knowledge score and various factors

The Kruskal-Wallis test revealed a non-significant difference, $H(2) = 3.885$, $p = 0.143$, in the total knowledge score across three gender categories. However, the distribution of the total knowledge score was significantly different, $H(3) = 12.724$, $P = 0.005$, across four categories of faith (Islam, mean rank = 185.45; Buddhism, mean rank = 178.93; Bon-chhos, mean rank = 68.35; prefer not to say, mean rank = 183.64). The distribution of total knowledge scores was significantly different, $H(3) = 10.626$, $P = 0.014$ across the different levels of education (graduation, mean rank = 175.05; masters, mean rank = 194.25; PhD, mean rank = 236.82; others higher than 10+2, mean rank = 163.71). The distribution of total knowledge score was not the same, $H(3) = 10.120$, $P = 0.018$, across the categories of academic subjects of the respondents at the higher secondary education level (Science, mean rank = 191.73; arts & humanities, mean rank = 159.65; commerce, mean rank = 140.20; others, mean rank = 192.85).

To evaluate the difference in knowledge scores among students who studied environmental science as a subject in their higher secondary education level, a non-parametric Mann Whitney U test was performed. Effect size (r) statistic, was calculated using the below formula:

Where Z is the Z statistic from the Mann-Whitney U test, and N is the number of cases. The test revealed a significant difference in knowledge scores among students who studied environmental science as a subject at their higher secondary school level (median = 10, $n = 267$) and students who did not study environmental science at their higher secondary school (median = 9, $n = 95$), $U = 9978.000$, $z = -3.159$, $p = 0.002$, $r = 0.166$.

Attitude score of the respondents

The overall attitude score for the respondents ranged from 4–12, with a mean score of 10.19 ± 1.417 . In general, students in higher education possessed a favourable attitude towards the wildlife of the region (Table 4).

A significant difference, $H(3) = 20.286$, $p = <0.001$, was observed in the distribution of total attitude score across various categories of faith of the respondents

Table 1. Socio-demographic profile of the respondents to questionnaire about wildlife in Kargil region (N = 362).

		Frequency	Percent (%)
Gender	Male	247	68.2
	Female	114	31.5
	Prefer not to say	1	0.3
Faith	Islam	307	84.8
	Buddhism	38	10.5
	Bon-chhos	10	2.8
	Prefer not to say	7	1.9
Current education level	Graduation	181	50.0
	Masters	91	25.1
	PhD	22	6.1
	Others (higher than 10+2)	68	18.8
Resident (Block)	Kargil	123	34.0
	Zaskar	15	4.1
	Shakar-Chiktan	30	8.3
	Sankoo	68	18.8
	Drass	35	9.7
	Taisuru	30	8.3
	Cha/Lungnak	4	1.1
	Shargole	33	9.1
	TSG	24	6.6
Current place of study	Kargil	158	43.6
	Leh	17	4.7
	Srinagar	22	6.1
	Jammu	59	16.3
	Delhi	38	10.5
	Chandigarh	32	8.8
	Dehradun	5	1.4
	Others (outside Kargil)	31	8.6
Subject in higher secondary (10+2)	Science	252	69.6
	Arts & Humanities	78	21.5
	Commerce	22	6.1
	Others	10	2.8
Environmental Science as a subject in higher secondary	No	95	26.2
	Yes	267	73.8

(Islam, mean rank = 183.09; Buddhism; mean rank = 201.36, Bon-chhos, mean rank = 47.50; prefer not to say, n = 195.43). The distribution of the total attitude score of the respondents was not the same, $H(3) = 17.006$, $p < 0.001$, across four categories of the current level of education (graduation, mean rank = 177.80; masters, mean rank = 189.30; PhD, mean rank = 254.45; others

Table 2. Students' response to knowledge statement/questions.

Question/Statement	Accurate response (%)
Identification of regional wildlife species (fox)	91.4
Identification of regional wildlife species (bear)	98.3
Identification of regional wildlife species (Snow Leopard)	70.4
Identification of regional wildlife species (wolf)	86.5
Kargil has unique and rich biodiversity, due to its special geographic characteristics	91.2
There are many protected areas for wildlife in Kargil	57.7
Wolves are omnivorous animals?	67.1
Kargil (Ladakh) is sometimes referred to as a 'cold desert' in the scientific community	90.6
Each wild carnivore plays an important role in the 'food web'	95.0
The scientific name of the fox is (<i>Vulpes vulpes</i> or <i>Canis lupus</i>)	75.7
The largest carnivore species of Kargil is (the Brown Bear or Snow Leopard)	66.3
Tigers (<i>Panthera tigris</i>) are also found in Kargil	77.9

(higher than 10+2, n = 157.32). The distribution of overall attitude score was significantly not uniform, $H(3) = 5.523$, $p = 0.037$, across categories of respondents' subjects of study (Science, n = 252; arts/humanities, n = 78; commerce, n = 22; others, n = 10). Further, the Kruskal-Wallis test of the independent sample reflected that the distribution of the total attitude score was significantly different, $H(7) = 22.547$, $p = 0.002$, in the categories of the current place of study (Kargil, mean rank = 168.76; Leh, mean rank = 195.00; Srinagar, mean rank = 214.43; Jammu, mean rank = 166.95; Delhi, mean rank = 236.05; Chandigarh, mean rank = 201.36; Dehradun, n = 201.90; others, mean rank = 152.71). Mann Whitney U test revealed a non-significant difference in the total attitude score among students who studied environmental science as a subject in their higher secondary school level (median = 11, n = 267) and students who did not study environmental science in their higher secondary school level (median = 11, n = 95), $U = 11466.000$, $z = -1.476$, $p = 0.140$. The effect size ($r = 0.077$) of the difference was negligible/very small (Cohen 1988).

Relationship between knowledge score and attitude score

A nonparametric correlation test (Spearman's rho) was performed to explore any relationship between the total knowledge score and the attitude score. Spearman's correlation of knowledge score and attitude score was moderately positive and statistically significant, $r_s = 0.255$, $p < 0.001$, $N = 362$. This correlation though weak, reflected that the increase in knowledge of the wildlife of

the region increases the favourable attitude of students in higher education towards wildlife.

DISCUSSIONS

Although several studies have indicated that females are more afraid of wild animals and have a negative attitude toward them than males (Costello 1982; Klrkpatrick 1984; Kellert & Berry 1987; Arrindell 2000), this study revealed that there was no significant difference in the attitude of university students from Kargil towards wildlife across different gender categories. Although females are more afraid of wild animals, they, on the other hand, place a higher value on wildlife as objects of affection and are more concerned about wildlife exploitation (Kellert & Berry 1987).

The study also revealed that the distribution of the knowledge score was not the same across the different levels of education of the respondents. The knowledge score increased with an increasing level of education. These findings are consistent with the findings of previous researchers who determined that education plays a significant role in influencing knowledge (Fiallo & Jacobson 1995; Pyrovetsi & Daoutopoulos 1997; Gillingham & Lee 1999; Barthwal & Mathur 2012).

The attitude of students towards wildlife

The study also revealed that the distribution of the total attitude score was not the same across categories of the subject of the education of the respondents at the higher secondary education level, students with an educational background with arts and science possess a more favourable attitude than those of commerce and other streams. This could be due to fact that students with arts and science as their main subject have an option for choosing environmental science as a subject in their higher secondary school education level.

The study also informed that the increase in knowledge of the wildlife of the region increases the favourable attitude of students in higher education towards it. This, on some level, confirms past studies that reveal education and awareness can improve attitude and tolerance for wild carnivores (Woodroffe 2005), which may further assist in translating knowledge into positive behavioural changes within the student population and further. Another reason could be, living in close proximity to native species improves awareness of their ecology and behaviour, enabling the development of improved management techniques and responses to them (Røskaft et al. 2003).

The significant correlation, though weak ($r_s = 0.255$, $p < 0.001$) suggests that knowledge may be an important factor that instils a favourable attitudes in humans, but in context to this study it is not the only predictor. This finding also align with existing literature that identifies the importance of other psychosocial variables, such as emotional association with the surroundings, cultural identity, perceived personal risk, or moral values, in determining conservation attitudes (Johansson et al. 2012; Castillo-Huitrón et al. 2020). Another possibility is that individuals' preexisting attitudes affect their acquisition and interpretation of knowledge, instead of the other way around (Khan et al. 2022). Besides, the study did not used any multivariate regression methods to control for potential influencing variables such as gender, education level, or subject background, etc. These variables can be examined in a regression model in future studies to better understand the independent effects of these variables in attitude formation.

In other parts of the Himalaya, such as Suryawanshi et al. (2014) in Himachal Pradesh and Bhatia et al. (2017) in Ladakh, it was found that people with higher education tend to have more positive attitudes toward large carnivores. In those settings, however, direct experiences of livestock loss or perceived risks often moderated those attitudes. In contrast, in our study, students from Kargil living in or outside of Kargil, may have less firsthand experience of human-wildlife interactions, which may partially explain the overall favourable attitudes despite moderate knowledge levels.

There can also be a significant cultural and religious worldview. The majority of respondents in this study identified with Islamic faith, where the concept of stewardship encourages respect for all forms of life, including wild animals. Likewise, Buddhist principles of non-violence (Ahimsa) in neighboring regions like Zaskar may contribute to conservation-positive attitudes. Furthermore, as Kargil is a geopolitically sensitive and historically underserved border region, wildlife may be viewed less as a threat and more as a symbol of regional identity and ecological uniqueness.

The statistical analyses shows some variation in knowledge scores across religious groups, but this needs to interpreted cautiously. Religious identity alone is unlikely to have any effect on factual ecological knowledge. Rather, these differences may be indicative of larger socio-cultural factors, such as access to education, geographic concentration, and community values & interest on the environment. These pathways could be explored further in future studies more explicitly through qualitative or ethnographic approaches.

Table 3. Association between categories of respondents and identification of species.

Respondent categories	Variables	Fox					Bear					Snow Leopard					Wolf				
		Ci (%)	li (%)	Asso.	df	Sig. (p value)	Ci (%)	li (%)	Asso.	df	Sig. (p value)	Ci (%)	li (%)	Asso.	df	Sig. (p value)	Ci (%)	li (%)	Asso.	df	Sig. (p value)
Gender	Male	92.31	7.69				98.38	1.62				75.7	24.3				87.04	12.96			
	Female	90.35	9.65	5.328* (G ²)	2	0.07	98.25	1.75	0.042 (G ²)	2	0.979	58.78	41.22	11.128 (G ²)	2	0.004	85.09	14.91	0.542 (G ²)	2	0.762
	Prefer not to say	0	100				100	0				100	0				100	0			
Faith	Islam	91.86	8.14				98.7	1.3				71.66	28.34				85.99	14.01			
	Buddhism	92.11	7.89	5.128 (G ²)	3	0.163	100	0	6.183 (G ²)	3	0.103	71.05	28.95	12.023 (G ²)*	3	0.007	89.47	10.53	0.492 (G ²)	3	0.921
	Bos-chhoss	70	30				90	10				20	80				90	10			
Block resident	Prefer not to say	100	0				85.72	14.28				87.5	12.5				85.72	14.28			
	Kargil	90.24	9.76				98.38	1.62				65.04	34.96				85.37	14.63			
	Zanskar	93.34	6.66				100	0				60	40				80	20			
	Shakar-Chiktan	96.67	3.33				100	0				73.34	26.66				83.34	16.66			
	Sankoo	92.65	7.35	8.139 (G ²)	8	0.42	97.06	2.94	4.759 (G ²)	8	0.783	73.53	26.47	5.911 (G ²)	8	0.657	85.3	14.7	17.458 (G ²)*	8	0.026
	Drass	85.72	14.28				97.14	2.86				80	20				74.29	25.71			
	Talsuru	83.34	16.66				96.67	3.33				76.67	23.33				100	0			
	Lungnak	100	0				100	0				50	50				100	0			
	Shargole	96.97	3.03				100	0				72.73	27.27				90.91	9.09			
	TSG	87.38	12.62				100	0				70.84	29.16				95.84	4.16			
Current education level	Graduation	93.37	6.63				99.45	0.55				71.27	28.73				90.06	9.94			
	Masters	91.21	8.79	2.364 (G ²)	3	0.5	97.71	2.29	4.288 (G ²)	3	0.232	67.04	32.96	6.623 (G ²)	3	0.085	85.72	14.28	10.534 (G ²)*	3	0.015
	PhD	86.37	13.63				100	0				90.91	9.09				95.46	4.54			
	Other	88.24	11.76				97.06	2.94				66.18	33.82				75	25			
Current place of Study	Kargil	92.41	7.59				99.37	0.63				62.66	37.34				82.09	17.91			
	Leh	94.12	5.88				100	0				64.71	35.29				78.58	21.42			
	Srinagar	81.82	18.18				100	0				77.28	22.72				84.21	15.79			
	Jammu	89.83	10.17	4.078 (G ²)	7	0.771	98.31	1.69	5.436 (G ²)	7	0.607	64.41	35.59	21.189 (G ²)*	7	0.003	90.74	9.26	3.699 (G ²)	7	0.814
	Delhi	89.47	10.53				94.74	5.26				86.84	13.16				81.25	18.75			
	Chandigarh	93.75	6.25				96.875	3.125				78.13	21.87				85.72	14.28			
	Dehradun	100	0				100	0				100	0				100	0			
Subject in Higher Secondary	Others	93.55	6.45				96.77	3.23				87.1	12.9				85.19	14.81			
	Science	92.46	7.54				98.41	1.59				72.23	27.77				88.1	11.9			
	Arts	89.74	10.26	4.433 (G2)	3	0.218	97.44	2.56	1.415 (G ²)	3	0.702	64.11	35.89	4.552 (G ²)	3	0.208	80.77	19.23	2.660 (G ²)	3	0.447
	Commerce	81.82	18.18				100	0				63.64	36.36				86.37	13.63			
EVSin 10+2	Others	100	0				100	0				90	10				90	10			
	Yes	86.32	13.68		1	0.053 (P)	96.84	3.16		1	0.188 (P)	72.63	27.37	0.297 (x2)	1	0.586	82.11	17.89	2.091 (x2)	1	0.148
	No	93.26	6.74				98.88	1.12				69.66	30.34				88.02	11.98			

G²—Likelihood ratio | P—Fisher exact | X²—Pearson chi-square | EVS—Environmental science as a subject | *—significant at 0.05 | Ci—Correct identification | li—Incorrect identification | Asso.—Association.

Table 4. Students' response to attitude statement/questions.

Question/ Statement	Favourable response (%)
Do you think there should be more emphasis on the wildlife-related curriculum/subjects in schools?	92.5
There should be more protected areas in Kargil to conserve and protect biodiversity?	90.3
Local people living in areas adjacent to wild carnivores should be educated and aware about wild carnivores?	88.7
Wild carnivores should be protected even if it incurs a loss of some livestock	82.9
Would you be interested or thrilled to see a snow-leopard in wild?	91.2
It is Important to protect wild carnivores of Kargil	75.4
I feel relieved and comforted when there are efforts to protect the wildlife of Kargil	94.2
Conservation of the wild carnivores is necessary for human survival	91.7
Curriculum/subjects focusing on local and global wildlife should be included in school education	95.5
In geographically challenging regions, like Kargil, the wise use of natural resources is necessary	96.7
Every student especially in higher education must have good basic knowledge of the wildlife of his/her region	90.9
We should respect and strive to protect all living beings, including wild carnivores as an integral part of the ecosystem	95.0

CONCLUSIONS

Students from Kargil in higher education possessed good knowledge and information of their local wild carnivores and have a favourable attitude towards them; 78.3% of the respondent studied environmental science at their higher secondary education level, this shows students' interest in understanding and exploring more about the natural environment. Several studies (Kellert 1985; Røskaft et al. 2007; Suryawanshi et al. 2014; Bhatia et al 2017) have revealed that people with higher levels of education and awareness have higher levels of tolerance towards wild carnivores, and other non-charismatic species. Considering knowledge as an important component of human emotions (Castillo-Huitrón et al. 2020), we recommend that the perception and emotions of wild carnivores among local students can be improved by organizing regular awareness campaigns and programs in schools and higher education institutions across Kargil. This approach can also assist in shaping the need to translate knowledge into positive behaviour change of local communities towards wildlife.

Studies had also indicated that education and awareness can improve attitude and tolerance for wild carnivores (Woodroffe 2005), however, educating people who have a negative attitude about large carnivores due

to a lack of interest in knowing more about them might be challenging (Bath & Majic 2001; Kaczensky 2003). Better direct experiences, such as understanding the importance of species in tourism and their aesthetic values, can help alleviate fear and promote favourable attitudes toward wildlife (de Pinho et al. 2014). Implementing proper livestock compensation schemes by considering the tangible and intangible cost of livestock loss (e.g., loss of sleep due to worry) by the local communities, setting up proper livestock insurance programs, and promoting eco-tourism could be some of the positive steps in reducing poor attitudes and perceptions towards wildlife and can also serve as initial steps in enhancing their interest in knowing more about species of the region.

The study also reflected that students with environmental science as a subject at their higher secondary education level possess more knowledge about the wildlife of the region. Although environmental sciences, as a subject is taught at a higher secondary school level across Kargil within science and arts stream as an optional subject, we recommend prioritizing the subject at a higher secondary school level to promote knowledge and awareness of wildlife of the region in specific and Environment as a general.

The findings of this study carry important conservation implications. The weak correlation between knowledge and attitudes suggests that awareness campaigns should not focus solely on factual knowledge but also engage with local values, emotions, and lived experiences. Conservation programs targeting youth in Kargil and similar trans-Himalayan landscapes should be designed to reinforce positive perceptions, integrate traditional ecological knowledge, and build platforms for direct and empathetic engagement with wildlife. Additionally, religious and community leaders can be strategic allies in shaping conservation messaging that resonates with local belief systems.

Future research could intensively look into the factors that influence the formation of social attitudes toward wildlife.

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