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Perception of Local Communities towards Mitigation of Human Wildlife Conflict in Haridwar

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Abstract: *Human-wildlife conflicts are frequently observed in areas surrounding national parks and wildlife sanctuaries, often resulting in adverse consequences including property damage, injuries to humans and livestock, and, in some cases, the loss of human or animal life. The Haridwar Forest Division is one such region that has been significantly affected by these conflicts. This study investigates the influence of gender on the perceptions of local communities regarding negative human-wildlife interactions. A total of 300 respondents (160 women and 140 men) were interviewed to assess the extent to which gender influences perceptions of conflict and preferences for mitigation strategies. The findings indicate that gender does not statistically affect perceptions related to conflict frequency or the direct impact on humans. However, moderate gender-based differences were observed in perceptions concerning the causes of conflict, the perceived effectiveness of mitigation measures, and the effect of wildlife. These findings suggest that gender plays a nuanced role in shaping attitudes toward human-wildlife conflict. It is essential to incorporate gender-sensitive approaches to enhance the inclusivity and effectiveness of community-based mitigation efforts. The study recommends developing targeted strategies to actively involve women in conflict mitigation initiatives and raise awareness about methods for preventing and minimizing such conflicts.*
Keywords: *Gender Perceptions; Conflict Mitigation; Community Attitudes; Wildlife Management; Conservation Conflicts*

INTRODUCTION

Human-wildlife conflict is a complex and multifaceted issue that requires a comprehensive understanding and analysis. It arises from the intersection of human and wildlife habitats, leading to conflicts over resources, land use, and safety (Arlidge et al., 2018; Mekonen, 2020; Patana et al., 2018). Globally, the current status of human-wildlife conflict (HWC) reflects an ongoing and pervasive challenge, with incidents occurring across diverse ecosystems and regions (Nyhus, 2016; Seoraj-Pillai & Pillay, 2017; Sharma et al., 2021; Xu et al., 2020). Research indicates a concerning trend of increasing conflicts between humans and wildlife driven by factors such as habitat fragmentation, expanding human populations, and climate change-induced habitat alterations(Redpath et al., 2015). In regions like Africa and Asia, where biodiversity hotspots coincide with densely populated areas, conflicts with large predators, such as lions, elephants, and tigers, are particularly prevalent(Dickman, 2010; Inskip & Zimmermann, 2009). These conflicts often result in significant economic losses for communities reliant on agriculture and livestock, as well as threats to human safety and wildlife conservation goals. Moreover, the intensification of agriculture and infrastructure development further exacerbates habitat loss and HWC by encroaching on wildlife habitats and reducing available resources for both humans and wildlife (Ripple et al., 2019). Addressing the current status of HWC requires interdisciplinary approaches that integrate ecological, social, and economic perspectives to develop sustainable mitigation strategies that safeguard both human livelihoods and biodiversity conservation efforts.

In India, human-wildlife conflict (HWC) represents a significant and escalating challenge, particularly in regions where human settlements overlap with critical wildlife habitats (Athreya et al., 2013; Manral et al., 2016). In Himachal Pradesh, encounters with leopards, particularly livestock depredation, are common (Dhee et al., 2019). These conflicts often lead to retaliatory killings of wildlife, further endangering their populations. As agricultural expansion continues, HWC increasingly occurs at the

interface of farmlands and wildlife habitats (Anand & Radhakrishna, 2017). This conflict not only affects farmer's livelihoods but also raises concerns about food security. With rapid urbanization, wildlife is increasingly encountering humans in urban and peri-urban areas (Sharma et al., 2021). Leopards adapting to urban environments, like in Mumbai, highlight this growing concern (Sharma et al., 2021). These encounters can lead to fear and panic among residents and pose risks to both human and animal safety.

Human-wildlife conflict in Uttarakhand is a pressing issue, particularly near protected areas such as Rajaji National Park, where a high level of anthropogenic and developmental activities, including encroachment of human settlements, has led to a reduction in wildlife habitats and increased encounters with species like elephants (Joshi & Singh, 2007). These encounters often result in crop raiding, property damage, and occasionally, human casualties, posing significant risks to both local livelihoods and conservation efforts. Mitigation strategies have included creating wildlife corridors, habitat restoration, and community conservation initiatives; however, persisting challenges underscore the need for ongoing research and adaptive management approaches. Notably, local attitudes toward conflict resolution can vary significantly with gender, literacy status, and economic status, demanding context-specific approaches that consider the diverse perspectives within affected communities (Meena et al., 2021; Ogra, 2009; Zimmermann et al., 2020)

Gender roles and power dynamics play a pivotal role in determining the distribution of labour, decision-making processes, and access to resources within communities living in HWC hotspots (Fonjong, 2008). A study on human-wildlife conflict in the area near Rajaji National Park, India found that local attitudes differed among subgroups based on gender, literacy, and wealth(Ogra & Badola, 2008). Gender emerged as a significant factor, with women being less likely to support compensation and less willing to participate in cooperative management institutions, instead preferring local village leadership. This suggests the importance of addressing gender differences in attitudes towards human-wildlife conflict and highlights the need to incorporate gender-responsive approaches in conservation and mitigation efforts to ensuring that the concerns and perspectives of all individuals are taken into account (Ogra, 2009). By the current study we intended re-examine the current ground situation to suggest suitable outreach and awareness activities to ensure inclusive approach of conservation and mitigation strategies being implemented in the region.

MATERIAL AND METHODS

The present study was conducted in the Haridwar Forest Division and Rajaji Tiger Reserve, situated within the Haridwar district of Uttarakhand. The total geographical area of study is approximately 372 Km^2. Haridwar district is situated within the Gangetic plains biogeographic zone, in the upper Gangetic Plains province at 316 meters above sea level. It experiences a moderately subtropical and humid climate. Temperatures rise from 29.1°C in March to 39.2°C in May, then decrease with the monsoon in mid-June. Winter temperatures range from 6.1°C to 10.5°C, and the annual rainfall is approximately 1200 mm. Primary land use types include urban, agricultural, forest, and barren land.(Pathak et al., 2020; Rodgers et al., 2002).

The 20 villages were strategically selected from two prominent conflict hotspots within the region (Joshi & Singh, 2007; Rani et al., 2024). These hotspots are located in the Motichoor range of Rajaji Tiger Reserve and two ranges of Haridwar Forest Division, namely Laksar Range and Haridwar Range (Table 1). Data collection was carried out between September 27 and October 10, 2018, by a team of eleven researchers and volunteers. A mixed-methods approach was employed, incorporating both in-depth interviews and structured questionnaires to assess local perceptions and attitudes toward human-wildlife conflict. Participants were selected using purposive sampling to ensure diverse representation across gender and geographic locations within the study area. The sample included farmers, local villagers, youth, and key informants from village council members, village heads, Self-Help Groups, and Village Forest Committees. Respondents were identified through snowball sampling and direct engagement using door-to-door surveys, as suggested by the method outlined by Ogra (Ogra, 2009). A structured questionnaire

comprising both open-ended and closed-ended items was developed to facilitate systematic data collection. Responses to the closed-ended items were recorded using a Likert scale ranging from 1 to 10, allowing for a nuanced assessment of participant's perceptions and attitudes. Five distinct types of Likert scales were employed, each tailored to the specific nature of the corresponding question. The design and categorization of these scales are detailed in Table 2. Data analysis was conducted using IBM SPSS Statistics software (Version 27), which is widely used and have acceptance in social science research and its ability to handle both descriptive and inferential statistical analyses. We selected Pearson's Chi-Square test to address the primary research question of whether gender influences perceptions of human-wildlife conflict. The Chi-Square test was sued to determine whether any observed differences in perceptions between genders were statistically significant or merely due to chance. Recognizing that statistical significance does not necessarily equate to practical significance, Cramer's V test was employed to further evaluate the strength of any significant associations revealed by the Chi-Square test. This combined approach of employing descriptive statistics, Chi-Square tests for association, and Cramer's V for quantifying the strength of association ensured a robust and thorough analysis of the data.

RESULTS

A total of 300 respondents with a mean age of 41.05 ±0.77 years, comprising of 160 women (mean age, 40.36 years) and 140 men (mean age of 41.84 years) took part in the study from 20 villages. The literacy rate among women in the villages is 50.2% and 60.5% is the rate of literacy among the male members. Gender-wise, 40.6 % of the population is represented by females, and about 59.4 % are male in the project villages. Farming and labour work have been the primary source of income with monthly average household income of about INR 8990/-. The average landholding size is 6.6 acres, and the land holding varies from 0.3 acre to 41 acres in these villages, with Wheat, Paddy, and Sugarcane as the main crops. The descriptive analysis of the data using case summaries method revealed marginal differences in the responses received from males and females. The human-wildlife conflict in the study area is perceived to be frequent and increasing, with both men and women largely agreeing on this trend. The primary causes of HWC are attributed to factors such as reduced food and water availability in forests, the presence of preferred crops near human settlements, and habitat destruction. Mitigation measures such as electric fences and awareness programs are considered to be in need of developing or improvement in their efficacy, while translocation is viewed similarly. HWC leads to increased fear among people, restricts their movement, and negatively impacts wildlife by disrupting their movement patterns and causing habitat loss due to encroachment. Detailed results can be seen in the table 3.

Chi-square analyses revealed statistically significant associations ($p < 0.05$) between gender and perceptions about human-wildlife conflict. These differences encompass beliefs regarding the causes of HWC, such as inadequate protection measures by villagers and a lack of understanding of animal behavior, as well as the impact of HWC on animal movement and the perceived effectiveness of fencing as a mitigation strategy. Cramer's V values suggest these associations are weak to moderate ($V = 0.240$-0.261). Detailed results are present in the table 4.

DISCUSSION AND RECOMMENDATIONS

The study focused on the assessing the existing perceptions of the local community regarding HWC mitigation measures and sought to understand the key elements to be integrated in implementing awareness and communication measures directed at them. The study highlighted that the commonly perceived driver of conflict is a scarcity of food and water due to the reduced natural habitat of wild animals. The responses received from men and women were marginally different (Table 3). Both women and men expressed that the frequency of the conflict has increased over the year and the occurrence of conflict very frequent. The perception on the efficacy of the mitigation measures showed men (6.5) perceived electric fencing as an effective measure while women (5.8) found it less effective. This difference

of 0.7 can be attributed the gender-defined roles undertaken by women such as collection of firewood and Non-Timber Forest Products (NTFPs). During the interviews, women participants shared that due to erecting of electric fence or other physical barriers intended to restrict wild animal movement, their accessibility to forest gets reduced. This increases their labour in collecting these essential products for their livelihood. The correlation analysis also revealed that the response to this statement was moderately associated with the gender of the respondents (table 3).As per the earlier study (Ogra, 2009), similar responded expressed their dependence on forest for fuelwood, fodder, cattle grazing areas, water, fibres, thatch grass, and toilet. But since 2009, the toilet coverage in the region has increased due to the government initiatives (Swachh Bharat Mission : Ministry of Housing and Urban Affairs, Goverment of India, n.d.), the toilet coverage was found out to be 96.2% in the villages. The use of firewood was confirmed by 9.3% of the respondents and this effect may be due to the government scheme (*PMUY : About*, n.d.) related to cooking gas. Raising awareness on the wild animals among public and children was also identified as a suitable measure to reduce the accidental encounters with wild animals. In response to the impact of conflict on humans, respondents agreed that due to conflict, their nighttime movement is decreased, and they experienced a constant fear of being attacked by wild animals. They also decided that there are negative impacts of conflict on wild animals such as reduced movement due to presence of humans and loss of habitat due to encroachment of wildlife habitat. Similarly, Community perception of conflict species can vary significantly based on location and occupation. For example, a study in Pauri Garhwal found that an equal proportion of people held positive and negative views towards leopards, while in North Bengal, a majority were positive (Naha et al., 2019). However, occupation played a role, as 65% of tea estate workers in North Bengal and 70% of agriculturists in Pauri disliked leopards (Naha et al., 2018). This indicates that human-leopard conflict is influenced by socio-economic factors and livelihood dependencies (Naha et al., 2020). On the question "What are the causes of Human-Wildlife Conflict in your area?", the correlation analysis revealed that the gender of respondents is moderately associated with responses lack of awareness and improper protection measures by the villagers. Similarly, the response to the statement "Movement of wild animals gets affected due to presence of humans/human settlements" was also moderately associated with the gender of the respondents. During interviews, the respondents also confirmed that the use of mitigation measures that are wildlife-friendly is important. They also acknowledged that the human population increase is leading to encroachment of the wildlife habitat and wildlife species like elephant, tiger and leopards have existed outside the protected area for many generations. Since the toleration of the local community is high, a harmonious coexistence approach for conflict mitigation can be implemented in the region to ensure sharing of landscape by humans and wildlife. The study also considered the communication preferences of the women respondents for developing effective outreach strategies to engage with them. Panchayat office and Anganwadi centres and village meetings was suggested as the most preferred information area for women. Women preferred to receive information via Friends/relatives, mobiles, and local newspaper. The Sarpanch and Anganwadi workers were identified as the most reliable communication sources in the village with low trust on forest officials. Therefore, it is recommended that the awareness and engagement programs on reducing human wildlife conflict should be held at the periodical *Gram Sabhas* (village meetings) in close cooperation with the local *panchayat* (village council). The awareness posters can be placed at the panchayat offices and Anganwadi to increase their visibility to women. Multimedia awareness content can be circulated through collaboration with local newspapers and mobile-friendly formats.

CONCLUSION

The active participation of local communities is crucial for effectively mitigating human-wildlife conflict. Consequently, their involvement in the planning and implementation of mitigation strategies is of critical importance. To ensure an inclusive approach, particular attention must be paid to the specific challenges and needs faced by women within these communities. The present study underscores both the convergences and divergences in perceptions between women and men. For instance, a mitigation

measure perceived as effective by men may, in practice, have unintended adverse effects on women. These findings underscore the necessity for forest department officials to adopt contextually appropriate and gender-sensitive methods of engagement with local populations. Effective communication strategies that acknowledge and respond to gendered experiences are vital to fostering community trust and cooperation. Additionally, the study reaffirms the socio-economic dependence of local communities on forest resources and advocates for a framework that promotes harmonious coexistence between humans and wildlife as a sustainable long-term solution to conflict.

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List Table

Table 1: Name of villages where interviews took place

S No	Block	Gram Panchayat	Village Name
1.	Bahadrabad	Pherupur Ramkhera	Chandpur
2.	Doiwala	Thakurpur	Thakurpur
3.	Doiwala	Khand Raiwala	Khand Gaon 1
4.	Doiwala	Haripur Kalan	Haripur Kalan
5.	Bahadrabad	Ajitpur	Ajitpur
6.	Bahadrabad	Katarpur Alipur	Katarpur
7.	Doiwala	Raiwala	Raiwala
8.	Haridwar	Rani Majra	Rani Majra
9.	Haridwar	Sherpur	Sherpur
10.	Bahadrabad	Nurpur Panjanhedi	Panjanhedi
11.	Bahadrabad	Under Nigam Consideration	Jagjeetpur
12.	Doiwala	Haripur Kalan	Motichur Nai Basti
13.	Bahadrabad	Katarpur Alipur	Jiyapota
14.	Bahadrabad	Nurpur Panjanhedi	Missarpur
15.	Doiwala	Gohrimafi	Gohrimafi (Tehri Farm)
16.	Doiwala	Prateet Nagar	Vedic Nagar
17.	Doiwala	Khand Raiwala	Khand Gaon 2
18.	Bahadrabad	Bishanpur Kundi	Bishanpur
19.	Doiwala	Sahabnagar	Sahabnagar

20.	Doiwala	Prateet Nagar	Prateet Nagar

Table 2 : Distinct types of Likert scales

Scale (1 -10)	For Agreement or disagreement on statements	Increased or Decreased	Frequency of conflicts incidents	Effectiveness
1	Very Strongly Disagree	Decreased	Not Sure	Ineffective
2	Strongly Disagree		Never	
3	Moderately Disagree		Once	
4	Slightly Disagree		Very Rarely	Developing/ Needs improvement
5	Neither Agree nor Disagree		Rarely	
6	Slightly Agree		Occasionally	
7	Agree		Frequently	Effective
8	Moderately Agree		Very Frequently	
9	Strongly Agree		Usually	Very Effective
10	Very Strongly Agree	Increased	Always	

Table 3: Gender segregated results of descriptive analysis of the data

S. N	Responses	Women	Men	Total
1.	**Perceived Causes of human wildlife conflict in your area**			
a)	Less food in forest area result in wild animals to move to human habitation	8.56 Strongly Agree	8.34 Moderately Agree	8.46 Moderately Agree
b)	Water scarcity in forest results	7.53 Moderately Agree	7.26 Agree	7.40 Agree
c)	Easy availability of preferred crops to wild animals	6.73 Agree	7.02 Agree	6.86 Agree
d)	Natural habitat (e.g. Forest) destruction	6.54 Agree	7.06 Agree	6.78 Agree
e)	Animals come into conflict with us because we have occupied their spaces and used up their resources	5.66 Slightly Agree	6.10 Slightly Agree	5.87 Slightly Agree
2.	**Frequency of the Human Wildlife Conflict Incidents**	8.80 Usually	8.76 Usually	8.78 Usually
3.	**Human wildlife conflicts incidents increased or decreased recently**	8.61 Increased	8.83 Increased	8.71 Increased
4.	**Perception efficacy of Mitigation measures**			
a)	Protecting villages/farms/ houses using an electric fence	5.8 Developing/ Needs improvement	6.5 Effective	6.1 Developing/ Needs improvement
b)	Making people and children aware of the behaviour of wild animals	5.1 Developing/ Needs improvement	5.1 Developing/ Needs improvement	5.1 Developing/ Needs improvement
c)	Translocation of problem animals to some other areas	4.9 Developing/ Needs improvement	4.8 Developing/ Needs improvement	4.8 Developing/ Needs improvement
5.	**Impact on humans**			
a)	People are afraid to go out in the night	6.22 Slightly Agree	6.29 Slightly Agree	6.25 Slightly Agree

b)	Always in fear of being attacked by the wild animals	5.60 Slightly Agree	5.66 Slightly Agree	5.63 Slightly Agree
6.	**Impact on Wild animals**			
a)	Movement of wild animals gets affected due to presence of humans/human settlements	5.91 Slightly Agree	6.19 Slightly Agree	6.04 Slightly Agree
b)	Loss of habitat for wild animals due to increased encroachment in wildlife habitats (e.g. Forest)	5.78 Slightly Agree	5.91 Slightly Agree	5.84 Slightly Agree

Table 4: Results of Pearson Chi-square and Cramer's V

S. N	Questions (Q) and Responses (R)	Pearson Chi-Square			Cramer's V	
		Value	df	Asymptotic Significance	Value	Approximate Significance
1.	Q: What are the causes of Human Wildlife Conflict in your area? R: Improper and inefficient protection measures by the villagers for people and livestock result in human-wildlife conflict	20.458a	9	0.015	.261	.015
2.	Q: What are the causes of Human Wildlife Conflict in your area? R: Lack of understanding on wild animal behaviour by villagers result in human-wildlife conflict	20.243a	9	0.016	.260	.016
3.	Q: What in your opinion might have been the impact of such conflict on the wild animals? R: Movement of wild animals gets affected due to presence of humans/human settlements	17.716a	9	0.039	.243	.039
4.	Q. How do you rate the effectiveness of Mitigation Measures to reduce the impact of Human Wildlife Conflict? R: Creating fences around protected zones to prevent wild animals from coming to human habitation	17.320a	9	0.044	.240	.044

LIST OF FIGURE

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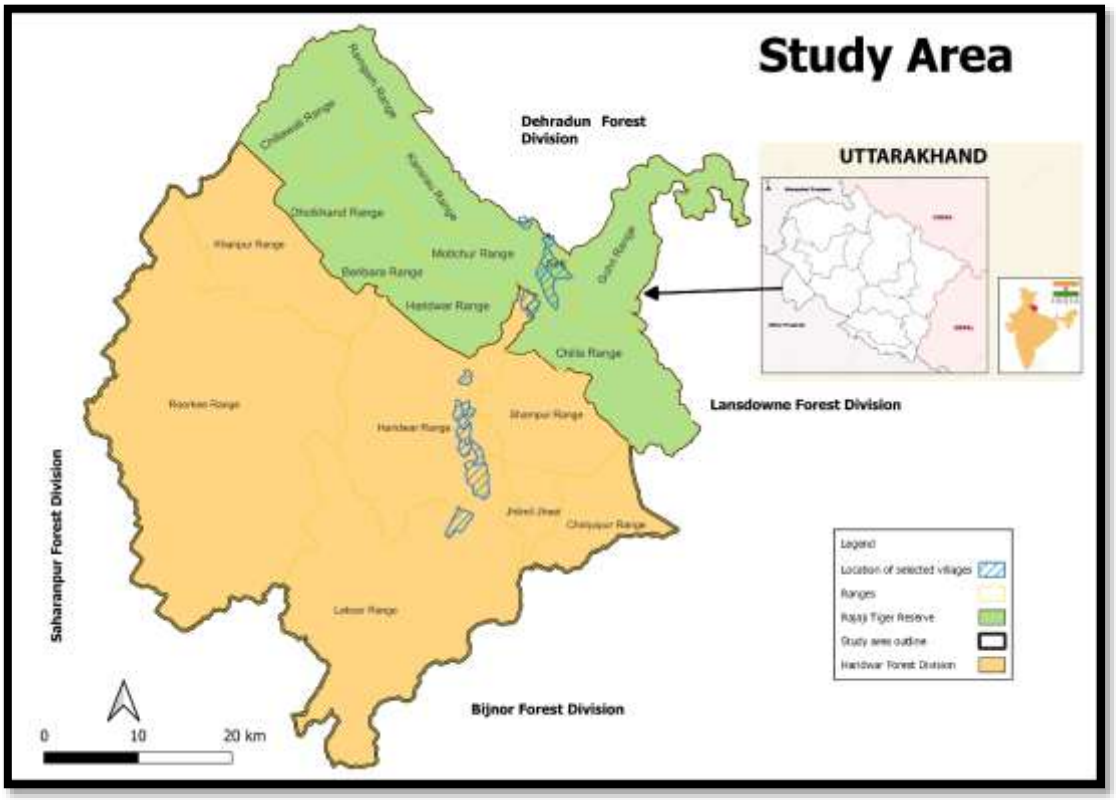

Figure 1: Map showing study area and location of villages.