

RESEARCH ARTICLE

Who welcomes the bear: Evidence for a disconnect between attitudes and acceptability of killing brown bears

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Abstract

1. Acceptability of large carnivores is influenced by socio-psychological factors and is crucial to coexistence. When large carnivores cause real or perceived threats such as damage to local economy or safety, people may engage in lethal control. However, in the presence of legal protection for the species and associated penalties, lethal retaliation can diminish or happen elusively. Therefore, it is helpful for managers to understand people's attitudes and acceptability associated with support for killing large carnivores in conflict situations and the demographics of those involved in lethal retaliation.
2. We interviewed 390 respondents living in 26 villages in northern Iran, where communities are largely dependent on agriculture and livestock for their livelihood and conflicts with brown bears (*Ursus arctos*) are common. Our goal was to assess the acceptability of killing bears in four different scenarios, from low-intensity to high-intensity interaction.
3. The results showed that although respondents generally had a slightly positive attitude towards bears, those with negative attitudes were associated with higher acceptability of killing bears. The mean acceptability of killing bears increased as human–bear interaction intensified. Younger, less educated and female respondents were more supportive of killing bears, while respondents with an alternative source of income were less accepting of killing them.
4. We provide five recommendations to foster coexistence, including leveraging positive attitudes through strategies like building advocacy networks, promoting inclusive outreach programmes, particularly for female and younger respondents. Also, we recommend emergency conflict mitigation teams take immediate action for conflict mitigation in areas with higher acceptance of killing bears to prevent retaliatory behaviour. Furthermore, providing an alternative source of income and focusing on preventive methods and effective strategies are recommended.

KEYWORDS

attitudes, coexistence, human–wildlife conflict, lethal retaliation, mixed effect models, Potential for Conflict Index₂, *Ursus arctos*

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1 | INTRODUCTION

Human–wildlife conflict occurs when the behaviour and needs of wildlife cause real or perceived negative impacts on wildlife conservation and human interests, and engender disputes among groups of people (Redpath et al., 2013, 2015; Zimmermann et al., 2020). To mitigate human–wildlife conflict, promoting coexistence has become a key focus (Carter & Linnell, 2016, 2023; Lute & Carter, 2020; Pooley et al., 2022). Coexistence is defined as a stable state where humans and wildlife adapt to living together in shared environments, with interactions managed to ensure wildlife survival, social acceptance and acceptable risk levels (Carter & Linnell, 2016).

A characteristic of coexistence is that negative interactions between humans and wildlife are either absent, minimal or tolerable, ensuring that they do not negatively impact each other substantially (Carter & Linnell, 2016; Glikman et al., 2021; Morehouse & Boyce, 2017). However, certain human characteristics such as negative attitudes towards wildlife and negative wildlife impacts such as causing economic damage can greatly reduce people's acceptability of coexistence (Dickman, 2010). Consequently, affected people may consider lethal control as a tool to resolve the conflict (Jacobs et al., 2014; Kleiven et al., 2004; Marchini & Macdonald, 2012). Therefore, if the acceptability of lethal control is high and its roots are not addressed, efforts to promote coexistence are likely to fail.

To be able to achieve coexistence, a thorough socio-psychological understanding of the lived realities of people living alongside wildlife is needed to understand their behaviour and why they behave the way they do (Teel et al., 2015). For example, people's attitudes towards wildlife are an important aspect of human behaviour as they are determined based on various factors, such as social experiences (Dickman, 2010; Manfredo & Dayer, 2004). Given the central role of attitudes in determining behaviour, they have been the focus of many studies (Wallen & Landon, 2020). Attitudes are defined as an evaluation of a topic that can be positive or negative (Bright & Manfredo, 1996; Fishbein & Ajzen, 2010). That topic can be any aspect of an individual's life, such as an animal, a behaviour or a person (Fishbein & Ajzen, 2010). Attitudes can also be translated into specific behavioural intentions such as killing an animal (Bruskotter & Wilson, 2013, but see Heberlein, 2012). Another psychological process is acceptability, where people compare and judge the perceived reality with alternative options and choose between the current option and the alternative one (Bruskotter et al., 2009).

In this study, we aimed to understand the acceptability of killing a large carnivore across a set of four conflict scenarios at different levels of intensity. Additionally, we sought to explore the local people's attitudes towards lethal control in conflict situations with such a carnivore. In our case study, we focused on brown bears (*Ursus arctos*) in northern Iran, where there are high-density populations of bears (Farhadinia & Valizadegan, 2015; Mohammadi et al., 2021; Moqanaki et al., 2018). We specifically focused on Golestan

province as it has been identified as a major hotspot of brown bear mortality in Iran (Nayeri, Mohammadi, Hysen, et al., 2022). Brown bears in Iran are widely associated with agricultural damage and occasionally depredation of livestock (Khosravi et al., 2023; Madadi et al., 2023; Nayeri, Mohammadi, Zedrosser, et al., 2022). Although the species is legally protected and killing bears is prohibited by law, local communities do not completely rule out lethal control in the absence of compensation programmes and law enforcement (Nayeri, Mohammadi, Hysen, et al., 2022). The absence of governmental support can lead locals to feel compelled to manage the risks posed by bears, occasionally resorting to lethal means in a discreet manner (Parchizadeh & Belant, 2021).

We first evaluated how the acceptability of killing bears varies with different levels of human–bear interactions by exposing respondents to hypothetical conflict scenarios. We also evaluated the acceptability of killing bears among different attitudes using Potential for Conflict Index₂ (PCI₂) to measure consensus regarding the acceptability of killing bears (Vaske et al., 2010). We then quantified the association between demographic and socioeconomic factors of respondents and their level of acceptability of killing bears. We had three hypotheses:

H1. Mean acceptability and consensus of killing bears are positively associated with the levels of human–bear interaction.

H2. Mean acceptability and consensus of killing bears are positively associated with negative attitudes.

H3. Wealth in the form of more resources (i.e. a higher number of livestock and beehives) and an alternative source of income are associated with the higher acceptance towards bears, making people less likely to accept killing them.

These hypotheses explore the interplay between human–bear interactions, attitude types and socioeconomic factors in shaping acceptance of killing bears, a topic that has not been explored in the region. By understanding these dynamics, we can develop targeted conservation strategies that account for diverse perspectives on bears and their management, fostering better coexistence between humans and bears.

2 | MATERIALS AND METHODS

2.1 | Study area

With an area of 20,438 km² in northern Iran, Golestan province neighbours the Caspian Sea and international borders with Turkmenistan (Figure 1). This province is home to a great diversity of potentially conflicting mammals, such as the brown bear,

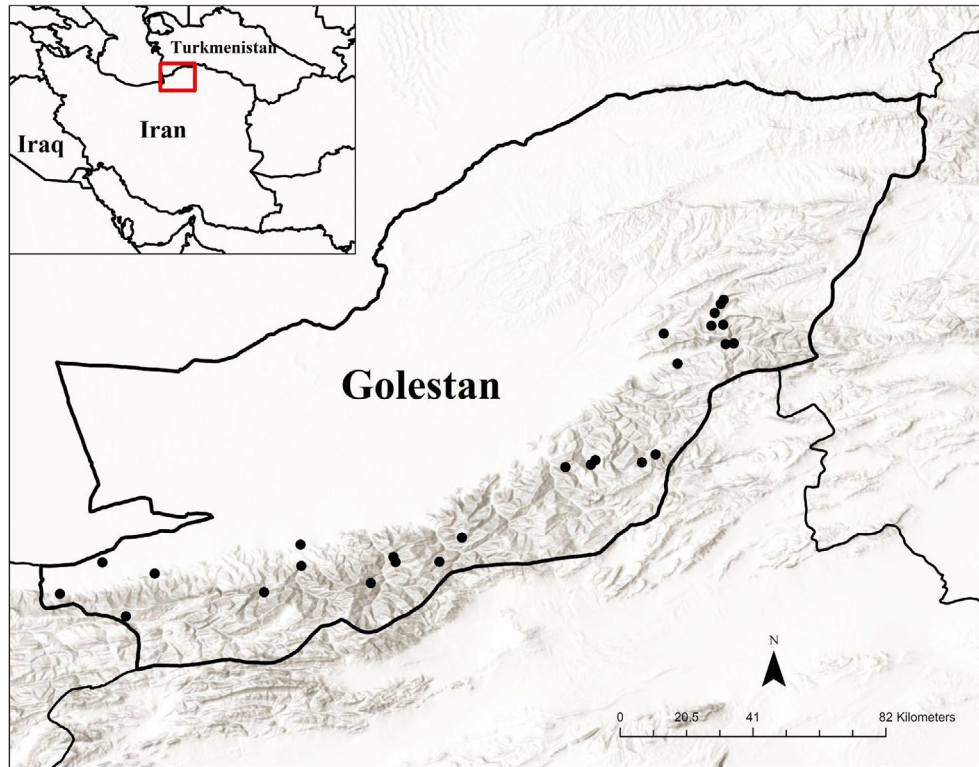


FIGURE 1 Location of sampled villages (n=26) along Alborz Mountains in Golestan province, north-eastern Iran.

Persian leopard (*Panthera pardus tulliana*), grey wolf (*Canis lupus*) and wild boar (*Sus scrofa*), which are all legally protected and broadly distributed across the province (Rastgoo et al., 2021; Soofi et al., 2022).

The forests are dominated by chestnut-leaved oak (*Quercus castaneifolia*), hornbeam (*Carpinus betulus*) and ferns, transitioning into arid steppes in the eastern part of the province where juniper (*Juniperus excelsa*) and wormwood (*Artemisia* spp.) scrublands replace trees and dominate the landscape (Akhani, 1998, 2023). Most forested mountains of the province are inhabited by brown bears (Mohammadi et al., 2021). A total of six protected areas cover ~2000km² of the Golestan province area. These areas have been protected under different titles, such as Golestan National Park, which is the oldest national park in the country (Darvishsefat, 2006).

Golestan province is inhabited by ~1,868,000 residents, mainly of Turkmen and Mazani ethnicities, yet other ethnicities live there as well (Khorozyan et al., 2015). While Farsi as the national language is widely spoken, many residents also speak their local dialects. Rural people, which consist of ~871,000 of the population, mainly rely on animal husbandry (cattle, sheep and goat) and crop farming as their main source of income (Golestan Census, 2019; Soofi et al., 2022). Other sources of income include apiculture and horticulture. In Iran, livestock grazing typically occurs in open areas where livestock roam freely, sometimes accompanied by a herder and herding dogs. This practice differs from many other countries where livestock are often raised on farms. In Iran, farming usually focuses on growing grains (e.g. white rice) and does not include livestock (Soofi et al., 2022). Additionally, livestock grazing

sometimes occurs illegally along the edges of protected areas, such as Golestan National Park (Khorozyan et al., 2017).

2.2 | Questionnaire survey

A self-administered questionnaire was designed to evaluate the attitudes of respondents towards bears and the acceptability of killing them. Respondents were asked to evaluate the extent to which they agreed or disagreed with killing a bear under four different scenarios (Table S1) (Doney et al., 2020; Engel et al., 2017):

- A Bear track seen near their home.
- B Bear is seen near their home.
- C Bear causes damage to their resources (e.g. orchards, livestock or beehives).
- D Bear attacks the respondent or his/her family.

Responses were originally coded on a 5-point Likert scale from strongly disagree (-2) to strongly agree (+2). However, responses were recorded for the subsequent analyses due to their negative nature to strongly agree (-2), to strongly disagree (+2).

Attitudes towards bears were assessed through evaluating four statements (Table S1):

1. Bears are an integral part of the forest.
2. Even if I never see bears, it is personally important that they exist in the region.

3. Bears are a threat to humans.
4. Bears cause economic losses.

Similarly, we coded the responses on a 5-point Likert scale: strongly disagree (−2) to strongly agree (+2) for Items 1 and 2. Due to their difference from Items 1 and 2 and their negative nature, we recoded Items 3 and 4 as strongly agree (−2) to strongly disagree (+2) for the subsequent analysis.

We also asked about respondents' demographic and socioeconomic information using eight questions, including (1) age; (2) education (from illiterate to graduate levels); (3) gender; (4) family size; (5) source of income dependency (farming, orchard, livestock, beehives); (6) alternative source of income; (7) livestock/beehives number; and (8) personal experience (damage/attack caused by a bear). Responses for Item 5 were coded as nothing (0%) to very high (76%–100%) (Table S1).

A total of 390 respondents (age > 18) were interviewed in July 2021. We randomly selected respondents in 26 villages of Golestan province with confirmed presence of human–bear conflict (Figure 1; Table S2). We determined sample size using Cochran formula (Cochran, 2007; Equation 1).

$$N = \frac{Z^2 p(1-p)}{e^2} \quad (1)$$

In this formula, Z refers to the Z statistic for a given level of confidence, p denotes the expected proportion or prevalence, and e represents the precision or margin of error. We used a margin of error of $e=0.5$, and we selected the expected proportion based on the population of Golestan province.

First and second author (RR, DN) conducted face-to-face interviews with a trained research assistant. As there was a lack of reliable population data for the villages, we opted to limit our survey to an equal number of respondents per village. Most villages had substantial nuclear family populations, impacting our sampling process, as we interviewed only one family member (usually the head of the family, unless they were not home). To ensure consistency across villages, we randomly selected 15 individuals from each village for our study. Local research permits were obtained from the Iranian Department of Environment, and all respondents gave oral consent before being interviewed. Similar to other studies in rural regions of Iran, oral consent was chosen over written consent due to limited formal education within these communities. Prior to obtaining consent, the study's purpose and potential benefits were explained to respondents. They were also assured of confidentiality and anonymity to ensure informed consent and voluntary participation. The oral consent was then documented in the study records. The ethical clearance was acquired from the University of Jiroft under code 130/249.

2.3 | Potential for Conflict Index₂ (PCI₂)

We calculated the Potential for Conflict Index₂ (PCI₂) to assess how the acceptability of killing bears differs with different levels of human–bear interaction and among different attitudes of respondents

(Vaske et al., 2010). We used PCI₂ to display the mean acceptability score of killing bears in each scenario (centre of the circle), the degree of consensus regarding acceptability (size of the circle), and if the distribution is positively or negatively skewed (location of the bubble compared with the X-axis as the neutral point, Heneghan & Morse, 2019). The PCI₂ value is calculated based on the average distance between respondents on a preference scale related to the maximum potential distance on that same scale, ranging from 0 to 1 (Vaske et al., 2010). For example, when all responses are on the same point of a scale, the PCI₂ score will be 0; meaning that there is minimum potential for conflict. In contrast, when responses are evenly divided between the two most extreme ends of the scale, it will yield a PCI₂ value of 1, equal to the maximum potential for conflict.

2.4 | Statistical analysis

We calculated Cronbach's alpha (α) for questions to estimate the reliability of the attitudes and acceptability items using IBM SPSS V. 23.0 (Bland & Altman, 1997; Cronbach, 1951). Then we calculated Pearson's correlation between attitudes and acceptability questions. If two questions were correlated ($r>0.7$), the one with less relevance to our research objectives was removed from further analyses (Tables S3 and S4). We used the Asymptotic one-sample Kolmogorov–Smirnov test for assessing normality between questions. To test the difference between mean acceptability of killing bears across scenarios, we used the paired t -test. Also, to compare mean acceptability of killing bears among different attitudes (from negative to positive) across scenarios, we utilized analysis of variance (ANOVA) and Tukey post hoc test.

To unravel the associates of acceptability of killing bears, we fitted cumulative linear mixed models with a Poisson error distribution (Bolker et al., 2009). Response variables included responses to each scenario about whether killing bears would be acceptable or unacceptable. Since Scenario A (bear tracks seen) and Scenario B (bear seen) were correlated, we only retained Scenario B (Table S3). We developed 11 models for each scenario and in total 33 models with varying explanatory variables depending on our hypotheses, such as demographic factors and personal experience (Table S5). All continuous predictors were standardized using the scale function to constrain their mean to be zero and enable us to have a more accurate interpretation. We used predictor variables as fixed factors, and village identity as a random effect in all models. Given that our response variables were on a Likert scale, to build our models, we developed a cumulative link mixed model with the `clmm` function with Laplace approximation for maximum likelihood using the 'ordinal' package in R (Christensen, 2015).

We used the Akaike information criterion after correction for a small sample size (AICc) for model selection (Burnham & Anderson, 2004). We used package `AICcmodavg` to assess model weights (Mazerolle, 2020). Model weights are interpreted as the probability of the best model for the observed data, given the list of candidate models (Bolker, 2008). We selected and interpreted the best candidate models using $\Delta AICc < 2$ (Burnham & Anderson, 2004) (Table 1; Table S5). We primarily relied on

TABLE 1 Parameters of the top cumulative linear mixed models for acceptability of killing brown bears (response variable) across three scenarios (B–D) in Golestan province, northern Iran.

Model number	Model	ΔAICc	WAICc	K
Scenario B (Bear seen)				
1	Acceptability ~ Age + Gender + Education + Alternative Income + Family Size	0.00	0.50	11
2	Acceptability ~ Age + Gender + Education	1.59	0.23	9
Scenario C (Bear damage)				
1	Acceptability ~ Age + Gender + Education	0.00	0.62	9
Scenario D (Bear attack)				
1	Acceptability ~ Age + Gender + Education	0.00	0.47	9
2	Acceptability ~ Age + Gender + Education + Alternative Income + Family Size	0.30	0.41	11

Note: 'AICc' is the Akaike information criterion corrected for small sample sizes, 'ΔAICc' denotes the delta Akaike information criterion, 'WAICc' indicates the AIC weight, and 'K' denotes the number of parameters.

each candidate model's weights for interpreting them. We considered a variable significant if it had a *p*-value of less than 0.05. We conducted all our analyses using R statistical software (R Core Team, 2018). All descriptive analyses are provided with standard deviation.

3 | RESULTS

We interviewed 390 respondents from 26 villages in Golestan province with a sex ratio of eight males: two females. The mean age of the respondents was 43.1 (SD=18–88). Most respondents had low or no formal education (56.9%), while a minority of 12.3% had high education (university level). The family size was on average 4.22 ± 1.61.

The primary source of income for respondents (those who reported high and very high reliance) was farm (26.7%) and livestock (12.1%), while orchard (4.4%) and beehive (3.3%) were less frequent (Table S1). Most respondents had no livestock (58.1%) or beehives (86%). Moreover, 43.7% of respondents had an alternative source of income besides the traditional activities mentioned above. Most respondents practised small scale farming and livestock breeding; for example, only 11.1% had more than 50 livestock, and 14% had more than 50 beehives (Table S1). Cronbach's alpha showed that questions measuring acceptability ($\alpha=0.8$) and attitudes ($\alpha=0.7$) had an acceptable reliability ($\alpha \geq 0.7$), supporting their internal consistency (Table S6). None of the items were correlated with each other except Scenario A and Scenario B of acceptability items (Tables S3 and S4).

3.1 | Consensus and acceptability of killing bears across scenarios

There was a significant variability in the mean acceptability of killing bears between all scenarios (Table S7). For example, there was a significant difference between the mean acceptability of Scenario A (bear tracks seen) and Scenario D (bear attack) ($t = -23.72, p < 0.01$).

In Scenarios A and B (bear seen) respondents disagreed with killing bears respectively ($M = -0.88 \pm 0.73, M = -0.67 \pm 0.88$). There was also disagreement in Scenario C (bear damage), but it leaned towards neutral ($M = -0.28 \pm 1.05$). Whereas in Scenario D, respondents agreed with killing bears ($M = 0.42 \pm 1.09$). Overall, the mean acceptability of killing bears was positively associated with levels of human–bear interaction from the first scenario to the last, supporting the first part of our first hypothesis (mean acceptability of killing bears are positively associated with the levels of human–bear interaction).

Similarly, the PCI_2 values, which indicate the potential for conflict (with higher values showing a greater potential for conflict), varied significantly between different scenarios (see Figure 2). As the conflict intensified from the first to the last scenario, consensus decreased. In Scenario D, the consensus surpassed the neutral line (0) (Figure 2), which did not support the second part of our first hypothesis (consensus of killing bears are positively associated with the levels of human–bear interaction).

3.2 | Consensus and acceptability of killing bears across attitudes

Respondents generally had a slightly positive attitude towards bears ($M = 0.21 \pm 0.83$; Figure 3). However, individuals with negative attitudes were more likely to accept killing bears in all scenarios compared to those with neutral or positive attitudes ($p < 0.01$), confirming the initial component of our second hypothesis (mean acceptability of killing bears are positively associated with negative attitudes; see Table 2; Figure 4).

For respondents with neutral or positive attitudes, there was high agreement against killing bears in Scenarios A (bear tracks seen, PCI_2 range = 0.06–0.07) and B (bear seen, PCI_2 range = 0.1–0.2). However, in Scenarios C (bear causing damage, PCI_2 range = 0.25–0.34) and D (bear attack, PCI_2 range = 0.22–0.38), opinions were more divided, with lower consensus (Figure 4).

On the contrary, respondents with negative attitudes showed less agreement but a higher acceptance of bear killing in Scenarios

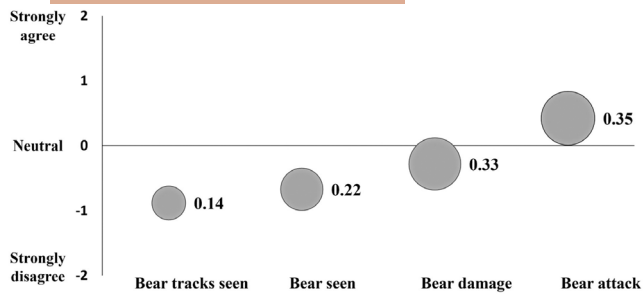


FIGURE 2 PCI_2 results for acceptability of killing brown bears across four scenarios in Golestan province, Iran. The size of the circle commensurate to the degree of potential for conflict; the larger the circle, the higher the potential for conflict and vice versa. The Y-axis is the rating scale used in the survey, and the centre of the circle is the mean score for each scenario presented on the X-axis.

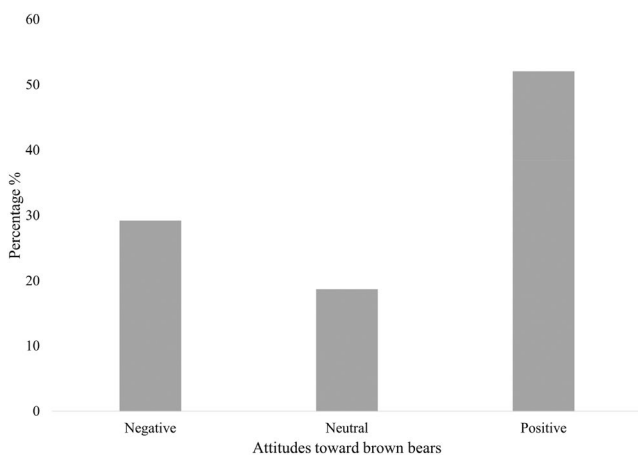


FIGURE 3 Bar chart displaying the distribution of attitudes percentages towards brown bears in Golestan province, Iran.

A ($PCI_2=0.26$) and B ($PCI_2=0.31$), compared to those with neutral or positive attitudes (PCI_2 ranges: 0.06–0.26 for A and 0.1–0.31 for B). In Scenario C, those with negative attitudes also had less consensus ($PCI_2=0.34$) and were more accepting of bear killing than their neutral or positive counterparts (PCI_2 range=0.25–0.34). In Scenario D, respondents with negative attitudes showed higher consensus and greater acceptance of bear killing ($PCI_2=0.22$) compared to those with neutral or positive attitudes (PCI_2 range=0.22–0.38; Figure 4). This means that the second part of our second hypothesis (consensus of killing bears are positively associated with negative attitudes) was mostly rejected, except for Scenario D, where there was a positive association between negative attitudes and consensus on killing bears.

3.3 | Factors influencing the acceptability of killing bears

Gender, education and age were included in all of our top models. In Scenario B, our top model showed a significant decrease in

TABLE 2 Results of one-way ANOVA test among different attitudes towards brown bears across four scenarios in Golestan province, northern Iran.

Scenario	<i>M</i>			<i>p</i>
	Negative	Neutral	Positive	
Scenario A (Bear tracks seen)	-0.52	-0.92	-1.08	<0.01
Scenario B (Bear seen)	-0.19	-0.59	-0.97	<0.01
Scenario C (Bear damage)	0.31	-0.41	-0.55	<0.01
Scenario D (Bear attack)	0.82	0.47	0.18	<0.01

Note: Mean attitude refers to the rescaled mean of attitude items.

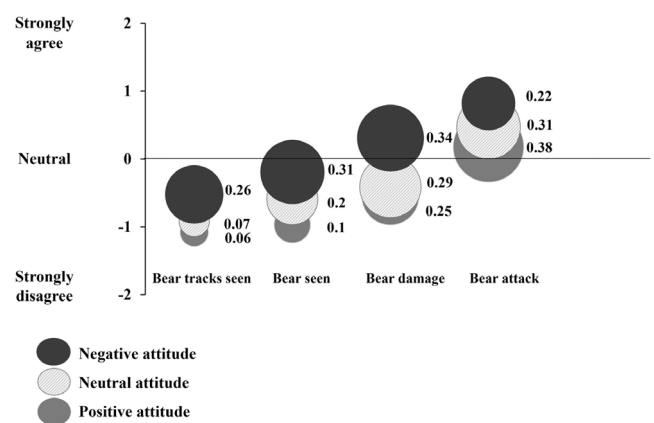


FIGURE 4 PCI_2 acceptability of killing bears among different attitudes across four scenarios in Golestan province, northern Iran. Each circle depicts a scenario and the size of each circle shows the degree of potential for conflict; the bigger the circle, the higher the potential for conflict.

the acceptability of killing bears with higher education ($Z=-0.30$, $p<0.05$). Similarly, female respondents showed significantly higher acceptability of killing bears ($Z=1.05$, $p<0.01$). Younger respondents tended to be more accepting of killing bears ($Z=-0.34$, $p<0.05$). Lastly, respondents with an alternative source of income were less accepting of killing bears ($Z=-0.51$, $p<0.05$; Table 3), aligning with the second part of our third hypothesis (an alternative source of income is associated with the higher acceptance towards bears, making people less likely to accept killing them).

We did not find any support for the first part of our third hypothesis as the number of livestock and beehives did not contribute significantly to the model (wealth in the form of more resources (i.e. a higher number of livestock and beehives) is associated with the higher acceptance towards bears, making people less likely to accept killing them). In Scenario C, our top model indicated a decline in the acceptability of killing bears with higher education ($Z=-0.30$, $p<0.01$), with no other variables being significant (Table 3). In Scenario D, our model also showed a decrease in the acceptability of killing bears with higher education ($Z=-0.24$, $p<0.05$). Younger respondents were significantly

TABLE 3 Beta coefficients of the top cumulative linear mixed models for acceptability of killing brown bears (response variable) across three scenarios (B–D) in Golestan province, Iran.

	Estimate (SD)	SD	Z	p
Scenario B (Bear seen)				
Age	-0.34	0.15	2.24	0.02
Gender	1.05	0.36	2.86	0.00
Education	-0.30	0.07	3.83	0.00
Alternative income	-0.51	0.25	2.01	0.04
Family size	0.12	0.11	1.07	0.28
Scenario C (Bear damage)				
Age	-0.22	0.12	-1.73	0.08
Gender	0.11	0.26	0.43	0.66
Education	-0.30	0.07	-4.33	<0.01
Scenario D (Bear attack)				
Age	-0.54	0.13	4.04	<0.01
Gender	0.34	0.31	1.11	0.26
Education	-0.24	0.07	3.43	0.00
Alternative income	-0.42	0.22	1.88	0.05
Family size	-0.09	0.11	0.85	0.39

more accepting of killing bears ($Z = -0.54, p < 0.05$). Lastly, respondents with an alternative source of income were less accepting of killing bears ($Z = -0.42, p < 0.05$), while gender and family size were not considered significant variables (Table 3).

4 | DISCUSSION

Our findings revealed that respondents generally held positive attitudes towards bears and deemed killing them unacceptable (Figure 3). Notably, there was varied consensus regarding bear killings across conflict scenarios and attitudes, illustrating the complexity of lethal control as a solution among locals. Demographic and socioeconomic factors also significantly impacted the acceptability of killing bears. Younger individuals, those with lower levels of education, and women were more likely to accept bear killings. Conversely, people with alternative sources of income tended to oppose killing bears. Our study serves as a preliminary study of demographic and socioeconomic differences in acceptance of killing bears, highlighting the need for more comprehensive research to gain an understanding of human–bear coexistence.

4.1 | The (missing) link between attitudes and acceptability

Although attitudes play an important role in understanding human behaviour (Bruskotter & Wilson, 2013; Schuman & Johnson, 1976), doubts about the strength of the connection between attitudes and

behaviour persist, as there are cases where this connection is weak (Wicker, 1969). For instance, positive attitudes towards bears do not uniformly translate into direct support for specific bear management policies or actions, highlighting the intricate link between attitudes and acceptability in shaping coexistence (Morzillo & Needham, 2015). This intricacy was observed in China, where links between attitudes and killing bears were weak (Liu et al., 2011). Another study also identified a nuanced relationship between attitudes and acceptability, showing that positive attitudes towards bears do not necessarily mean supporting the current bear expansion policy (Kaczynsky et al., 2004). For attitudes to predict behaviour, they must focus on performing a specific action in a particular context, rather than a general attitude towards a broader topic (Ajzen & Fishbein, 1973; Glasman & Albarracín, 2006). This pattern aligns with our study, suggesting that acceptance of bears is conditioned on the extent of interactions. When bears cause remarkable damage or pose a threat, the necessity for more aggressive management, including lethal control, becomes more acceptable despite an overall positive attitude towards the species. This intricacy between attitudes and acceptability is shaped by various factors that influence coexistence, including decisions regarding controversial actions such as killing (Brenner & Metcalf, 2020; Nayeri, Rastgoo, et al., 2025).

Furthermore, the misalignment of acceptability of killing and attitudes can also be explained through the concept of impact dependency, which explains that support for lethal control methods is context-specific and varies based on the perceived impact of predation on essential resources (Decker et al., 2006). A study found that support for lethal control of bears and wolves was highest when predation directly affected residents' access to crucial resources for food (Decker et al., 2006). Additionally, another study revealed that while landowners generally had positive attitudes towards beavers, their acceptance of lethal control increased with the severity of the impacts caused by them (Morzillo & Needham, 2015). This suggests that people are more likely to endorse lethal control when they perceive a great threat to their livelihood. As the perceived impact on human needs decreases, so does the support for lethal control.

Finally, this contradiction between favourable attitudes towards bears and the acceptability of killing them can be better understood through the concept of relational values. Relational values, which focus on the meaningful relationships between humans and nature, suggest that people's interactions with nature are shaped by a web of interconnected values and responsibilities (Chan et al., 2016; Himes et al., 2024; Unks et al., 2021). For instance, individuals may care for and value bears as part of their cultural heritage but also see them as threats, making their killing acceptable in some situations (Hughes et al., 2020). This duality reflects the multifaceted nature of human–wildlife relationships, where cultural identity and well-being can coexist with the need for self-protection (Chan et al., 2016; Gould et al., 2019; Klain et al., 2017). Similarly, studies found that cultural traditions, such as the religious and cultural significance associated with certain species, can sometimes promote coexistence between people and wildlife (Anand & Radhakrishna, 2020; Nayeri, Sardari, et al., 2025; Talukdar & Gupta, 2018). However, cultural values and

traditions may vary in countries, among certain cultures and within certain species (Jacobs et al., 2022). In some contexts, these values are being challenged by increasing human–wildlife conflict, further worsening conflicts and shifting attitudes towards wildlife (Hughes et al., 2020; Manfredo et al., 2020; Thinley & Lassoie, 2013). To develop effective conservation strategies, further explorations beyond socio-psychological and socioeconomic factors are needed to unravel these complexities and address the diverse factors that contribute to this inconsistency.

4.2 | Determinants of acceptability of killing bears

Demographic and socioeconomic factors play a key role in determining the acceptability of killing large carnivores, which can influence the potential for coexistence (Babgir et al., 2017; Engel et al., 2017). In line with our findings, higher levels of education are usually correlated with a more positive attitude and lower acceptability of killing, reflected in other studies (Hariohay et al., 2018; Kleiven et al., 2004; Røskaft et al., 2003).

We also observed gender disparity in bear killing acceptance, skewed towards females. This could possibly be influenced by factors such as fear, a known factor in attitudes towards carnivores, and higher perceived risks of potential attacks compared with men (Carter & Allendorf, 2016; Redmore et al., 2020; Røskaft et al., 2003). Women face greater challenges and hidden costs in conflicts, including increased work and indirect harm through gendered divisions of labour (Barua et al., 2013; Doubleday, 2020; Ogra, 2008). Cultural norms and societal expectations often overlook these challenges, as women's risky activities, like collecting water and firewood, are seen as sacrifices for their families (Ogra, 2008). Such expectations increase women's vulnerability to wildlife, which can contribute to the development of negative attitudes towards them (Doubleday, 2020; Massé et al., 2021). Additionally, less education and fewer experiences with wildlife further contribute to negative attitudes among women (Carter & Allendorf, 2016).

Our study area's gender roles, with men in outdoor occupations and women in indoor and occasionally farming, detached them from natural areas but not from its costs. This conflict context highlights complex local gender dynamics, intertwining cultural expectations and experiences (Massé et al., 2021). However, further research is needed to explore how differences across diverse cultural and political contexts shape people's coexistence with wildlife (Pooley et al., 2017).

Younger respondents exhibited higher acceptance of killing bears, a deviation from patterns seen elsewhere (Chynoweth et al., 2016; Røskaft et al., 2003; Vaske & Sponarski, 2021). This could stem from generational challenges, with younger generations favouring urbanized lifestyles and reduced involvement in nature-based activities due to economic and social changes (Fletcher & Toncheva, 2021). Conversely, older generations are deeply connected to nature through traditional activities such as farming and raising livestock, viewing nature as a crucial part of their cultural

identity (Lescureux & Linnell, 2013). These differing priorities between older traditions and younger ambitions contribute to a complex dynamic, influencing attitudes towards bears. Lastly, respondents with alternative sources of income were less accepting of killing bears. Economic conditions play a key role in shaping people's attitudes towards coexisting with large carnivores (Babgir et al., 2017; Farhadinia et al., 2017). When people rely on limited resources that are at risk of human–wildlife conflict, their acceptance for carnivores is low (Dickman, 2010). In regions like our study area, where people are heavily dependent on agriculture and livestock, the situation is similar, primarily due to perceived and real threats posed to livestock and humans that overshadow potential benefits of coexistence (Goodale et al., 2015; Kumar et al., 2017).

The most economically vulnerable members of the community bear the costs of coexisting with wildlife (Braczkowski et al., 2023). These communities face difficulties protecting their livelihoods due to regulations that prohibit any damage to species involved in conflicts, with no compensation scheme available in the area. To promote coexistence, there is a need to recognize the inherent trade-offs, whether between biodiversity and development or conflicting interests among different community groups (Adams, 2015). Therefore, stakeholders should emphasize inclusive and equitable conservation strategies that address both ecological concerns and the well-being of economically disadvantaged populations (Bruskotter et al., 2022; Martinez-Alier, 2014).

Lastly, coexistence with bears in Golestan province can be an achievable and practical outcome. However, to achieve it, more studies should be conducted on effective conflict mitigation strategies that reduce the costs and increase people's acceptance and support for coexistence. This can help reinforce the idea that human–wildlife interactions do not always lead to conflict (Culos et al., 2025; Glikman et al., 2023; Nyhus, 2016; Ouvrier et al., 2025).

4.3 | Areas for further exploration

Human–wildlife conflict and coexistence are multifaceted phenomena, and therefore, there is a need for an interdisciplinary approach that integrates perspectives through collaboration across various disciplines (Dickman, 2010; Marchini, 2014; St John et al., 2010). That being said, our study was faced with limitations such as limited data on village populations, limited access to female respondents due to taboos and social norms, and limitations of exploring other influential factors due to limited time and budget. Taking a cue from the importance of other influential factors, future research and conservation efforts could consider these factors when designing interventions aimed at promoting coexistence with wildlife. Specifically, exploring concepts such as care and stewardship could provide insights for fostering positive attitudes towards wildlife (Chan et al., 2018; Pratson et al., 2023). Understanding factors such as risk perception and emotion is also crucial, as emotions like fear can shape perception of wildlife risks, leading to behaviours that reduce threats to safety or livelihoods (Kahler & Gore, 2015; Wieczorek Hudenko, 2012).

Additionally, when perceived risk is high and trust in authorities is low, people may show lower acceptance of bears and engage in illegal activities such as wildlife killing (Siemer et al., 2023; Toncheva & Fletcher, 2021; Wald et al., 2019). Furthermore, we acknowledge that our theoretical framework focusing on attitudes and acceptability represents just one perspective among many for understanding human behaviour. Future research should adopt a holistic approach that combines insights from various theories and metatheories, each providing unique perspectives on the causes of human action (Davis et al., 2015; Eyster et al., 2022). Despite the limitations, our study adds to the human dimensions' literature by shedding light on the factors affecting acceptability of killing bears in a lesser studied area and inferring management recommendations based on our results to enhance coexistence.

4.4 | Management implications

Based on our results, we provide five conservation and management recommendations to improve the coexistence of rural people and brown bears:

1. Given that a high proportion of respondents hold favourable attitudes towards bears, several management recommendations can be made. Firstly, building a strong network of advocates for bear conservation, particularly those with positive attitudes, can help spread awareness (Can et al., 2014; Krofel et al., 2020). Additionally, sharing success stories of human–bear coexistence through various media can inspire and motivate others (Can et al., 2014; Krofel et al., 2020; Lamar et al., 2024). Finally, conducting a thorough analysis of the underlying reasons behind these favourable attitudes will allow for more targeted and effective future initiatives that further support coexistence.
2. Conservation efforts should go beyond ecological considerations and actively address the social and gender dimensions of human–bear conflicts in policies and programmes to promote coexistence. Inclusive outreach programmes are required to target rural communities within bear habitats, particularly female and younger respondents who generally showed a more negative attitude towards bears. While it may be challenging to suggest that women take on direct decision-making roles given cultural and gender disparities, it is crucial to address their well-being and educate them in effective handling of conflict situations (Carter & Allendorf, 2016; Doubleday, 2020; Ogra, 2008). The objective is to equip them with skills to coexist with bears rather than altering the entire society's attitudes or blaming them. Education is crucial, but it is not a panacea to solve conflict (Dietsch et al., 2017).
3. Higher acceptance of killing bears among people with negative attitudes implies that there is a high chance that lethal retaliation is quickly and widely accepted among local people in serious conflict situations. Therefore, if mitigation efforts are affected by bureaucratic delays, they might happen when people have already

illegally killed the conflict bears. Accordingly, it is crucial to establish emergency conflict mitigation teams in conflict-prone areas to facilitate coexistence. These teams should be highly trained, equipped to act fast and capable of implementing a range of adaptive strategies, such as verbal de-escalation techniques and safe physical restraint methods to manage severe conflict situations before they escalate to lethal retaliation against wildlife (Nayeri, Arianejad, & Rastgoo, 2022).

4. Our study showed that an alternative source of income is associated with lower acceptability of killing bears. Therefore, providing alternative income opportunities such as ecotourism can encourage coexistence, as far as a fair distribution of revenues occurs (Ghoddousi et al., 2018). However, promoting ecotourism warrants thoughtful consideration (Stronza et al., 2019; Toncheva & Fletcher, 2021). Apart from tourism, exploring initiatives that assist traditional resource users in diversifying their income sources is crucial. This could include developing sustainable practices in agriculture, agroforestry or promoting handicrafts, aligning with the unique skills and preferences of the communities.
5. To enhance acceptance towards bears and foster coexistence, it is recommended to focus firstly on prevention rather than solution. Assessing the efficacy of current traditional coping methods and their perceived effectiveness is important (e.g. Khorozyan & Waltert, 2020). This involves promoting practices for timely crop harvesting, establishing community-based monitoring programmes and testing effective solutions in the absence of technological advancements that can enhance the efficacy of bear management efforts (Goodale et al., 2015).

AUTHOR CONTRIBUTIONS

Reyhane Rastgoo and Danial Nayeri conceived the idea for the project, conducted data collection and carried out the formal analysis; Reyhane Rastgoo, Danial Nayeri, Alireza Mohammadi and Alistair J. Bath designed the survey; Reyhane Rastgoo curated the data; Reyhane Rastgoo, Danial Nayeri and Mohammad S. Farhadinia developed the methodology and led the writing of the original draft; Reyhane Rastgoo, Danial Nayeri, Mohammad S. Farhadinia, Alireza Mohammadi and Alistair J. Bath contributed to reviewing and editing the manuscript. All authors reviewed drafts and approved manuscripts for submission.

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The authors declare no competing interests.

DATA AVAILABILITY STATEMENT

All relevant material associated with this article is available in the supplementary material file. For ethical and confidentiality reasons, the data supporting this study cannot be made publicly available.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Table S1. Descriptive statistics (percentage) for the items used in this study (sample size, $n=390$) in Golestan province, Iran. Items are codified according to the instruments section (see text for details).

Table S2. Surveyed villages with their associated counties, and their sample sizes in Golestan province, Iran.

Table S3. Pearson's correlation coefficients between acceptability items (scenario A–D) used as our response variables in cumulative linear mixed models in Golestan province, Iran.

Table S4. Pearson's correlation between attitudes items (Q1–4) used in this study in Golestan province, Iran.

Table S5. Parameters of cumulative linear mixed models for acceptability of killing brown bears (response variable) in Golestan province, Iran.

Table S6. Cronbach's alpha results with their mean, variance, and standard deviation for acceptability of killing brown bears and attitudes toward them in Golestan province, Iran.

Table S7. Paired t-test results for mean acceptability of killing brown bears across scenarios in Golestan province, Iran.

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