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CONTRIBUTED PAPER

Emotions and perceptions predict local communities' attitudes toward the conservation of large carnivores

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Abstract

Understanding local communities' emotions and attitudes toward large carnivores is crucial for promoting coexistence, yet few studies have examined how emotions and perceptions shape these attitudes. We conducted interviews with 292 rural residents living in 30 villages around Golestan National Park, northeastern Iran. With Bayesian ordinal regression models, we assessed how fear, happiness and pride, damage experiences, perceived ecotourism benefits, and perceived population status influence local communities' attitudes toward the conservation of leopard, wolf, and brown bear. We found that happiness and pride, along with the perception that carnivores provide ecotourism benefits, substantially influenced attitudes. This pattern was consistent across species, with generally high support for the conservation of all three species. Respondents expressed fear of leopards and bears, and the perception of declining populations increased support for their conservation. In contrast, perceiving a high wolf population was associated with reduced positive attitudes. Furthermore, direct experiences of carnivore-related damage (e.g., livestock losses and crop damage) were linked to general dislike of all three species, further diminishing positive attitudes. These findings highlight the importance of emotions such as fear, happiness and pride, as well as perceptions of population status, ecotourism benefits, and damage in shaping human–carnivore interactions. Addressing these factors, particularly by mitigating fear of carnivores, in decision-making processes could help offset the costs of living alongside these animals, thereby enhancing positive attitudes and promoting coexistence with large carnivores.

KEYWORDS

affect, fear, human-dimensions, large predators

1 | INTRODUCTION

We are living in an era of unprecedented biodiversity loss, largely driven by the expansion of human activities (Young et al., 2005). However, conservation success ultimately depends on the behavior of local communities who live and work in the landscapes. While conserving biodiversity and its species is a priority for some social groups (e.g., conservationists), for many, the primary concerns are food security, livelihood, or societal needs. These contrasting interests increasingly lead to conflicts between conservation goals and other human interests and have been formally defined as "Struggles that emerge when the presence or behaviour of wildlife poses actual or perceived, direct and recurring threats to human interests or needs, leading to disagreements between groups of people and negative impacts on local communities and or wildlife" (International Union for Conservation of Nature and Natural Resources Species Survival Commission Human-Wildlife Conflict Task Force [IUCN SSC HWCTF], 2020). A common form of human–wildlife conflict (hereafter referred to as human–wildlife interaction) occurs when large carnivores (e.g., leopard, wolf, and brown bear) prey on livestock or threaten human life (Redpath et al., 2015; Treves & Bruskotter, 2014). In response to livestock losses, livestock owners may kill or injure problem carnivores (Badola et al., 2021; Soofi, Qashqaei, et al., 2022; Zimmermann et al., 2020). Such incidents continue to pose significant challenges to conservation efforts (Khorozyan et al., 2020; Nyhus et al., 2005; Treves & Bruskotter, 2014). It is therefore crucial to mitigate their negative impacts on human livelihoods, well-being, and conservation objectives (Redpath et al., 2013). These situations typically arise when coexistence programs aimed at reducing negative interactions between humans and carnivores while ensuring the persistence of self-sustaining large carnivore populations in human-dominated landscapes (Chapron & López-Bao, 2016), such as compensation schemes, are either absent or ineffective (Babrgir et al., 2017; Morehouse et al., 2020). Many studies have focused on technical fixes for these human–carnivore interactions (Khorozyan & Waltert, 2019). However, humans are not only financially rational beings; other socio-psychological factors, such as emotions (e.g., fear of predators), can also influence their attitudes, defined as the tendency to evaluate an object, concept, or action as positive or negative, and their behavior (Ajzen & Fishbein, 2000; St. John et al., 2010). The social context of human–wildlife interaction is often shaped by emotions, thoughts, and ultimately, human behavior (Castillo-Huitrón et al., 2020). While focusing solely on attitudes is insufficient for managing negative interactions, as it does not provide holistic solutions (Heberlein, 2012), the human dimensions of human–wildlife interaction, including values, beliefs, and particularly emotions, have received inadequate attention (Arbieu et al., 2024). This aspect is often overlooked in conservation decision-making because these factors have been mistakenly regarded as obstacles to effective management (Arbieu et al., 2024; Larson et al., 2016; Nelson et al., 2016). Evaluating how local communities' emotions, beliefs, and behaviors are influenced by their actual and perceived interactions with wildlife (e.g., fear of being attacked by predators) within their living spaces can help wildlife managers and conservationists better understand and enhance local communities' tolerance of wildlife. Here, tolerance is defined as the ability and inclination of individuals to absorb the extra potential or actual costs of living with wildlife (Kansky et al., 2016; Manfredo & Dayer, 2004). In this context, a recent study by Castillo-Huitrón et al. (2020) found that the conservation status of many wildlife species is closely tied to human emotions, with mental reactions such as fear, experience, happiness, and love influencing residents' attitudes and potentially shaping tolerance toward predators (Hobson et al., 2023). This underscores the relevance of emotions in emerging conservation management strategies (Frank et al., 2019; Jacobs & Vaske, 2019). Evaluating the emotions of local communities who share the landscape with large carnivores can thus enhance our understanding of human–carnivore interactions and help identify effective ways to garner support for conservation efforts (Ehrhart et al., 2022; Jacobs, 2012; Mech and Boitani, 2003).

Furthermore, emotions such as dislike and fear of predators can be shaped by socio-psychological factors, including perceptions (e.g., perceived population abundance), beliefs, and negative experiences (e.g., livestock predation by leopards and wolves, crop damage by bears) with large carnivores (Castillo-Huitrón et al., 2020; Jacobsen et al., 2021; Moures-Nouri et al., 2023). Emotions and cognitions may vary among individuals or social groups, leading to differences in behavior (Treves & Santiago-Ávila, 2020). While large carnivores such as wolves, bears, and leopards can cause damage to property or pose threats to human life, potentially triggering anger and fear, these animals may also evoke positive emotions such as happiness due to their values (e.g., economic, cultural or pride-related) for local communities (Castillo-Huitrón et al., 2020; Eriksson et al., 2015; Soofi et al., 2019). It is therefore crucial to assess how socio-psychological factors influence local community's attitudes toward large carnivores, especially in contexts where compensation schemes are absent or limited (Kansky et al., 2016; Redpath et al., 2017). Understanding how emotions and beliefs (i.e., what individuals consider true about a person, object, or action) influence

attitudes toward coexisting with large carnivores can offer practical pathways for conservation and inform decision-making processes (Arbieu et al., 2024; Treves & Santiago-Ávila, 2020). Coexistence refers to the sustainable sharing of landscapes and natural resources between humans and wildlife, requiring cooperation and agreement among different groups to effectively manage human–wildlife interactions (International Union for Conservation of Nature and Natural Resources [IUCN], 2023). However, research on the human dimensions of human–carnivore interactions remains limited, particularly in areas where local communities coexist with multiple large mammalian carnivores and may hold varying attitudes and interactions toward each species (Arbieu et al., 2024; Cheng et al., 2024).

Here, we focus on three iconic large mammalian carnivore species in Iran's first biosphere reserve, Golestan National Park, including the Persian leopard (*Panthera pardus saxicolor* Pocock, 1927, synonym *P. p. tulliana* Valenciennes, 1856), the brown bear (*Ursus arctos* Linnaeus, 1758), and the gray wolf (*Canis lupus* Linnaeus, 1758). The Persian leopard is classified as an endangered subspecies on the IUCN Red List (Ghoddousi & Khorozyan, 2023), and recent IUCN assessments reported a declining trend in global leopard populations (Soofi, Qashqaei, et al., 2022; Stein et al., 2025). Negative interactions between humans and large predators in Iran's protected areas and beyond have been frequently documented (Babrgir et al., 2017; Ghoddousi et al., 2020; Khorozyan et al., 2020; Meinecke et al., 2018; Soofi et al., 2019). These interactions are primarily due to livestock predation and, less commonly, threats to human life (Behdarvand & Kaboli, 2015). Consequently, these carnivores are often illegally killed or persecuted in retaliation (Nayeri et al., 2022; Soofi, Qashqaei, et al., 2022). For example, over the past decade, an average of 30 leopards has been illegally killed annually across Iran, largely through shootings, persecution, precautionary killings, and road accidents. A similar pattern has been observed for brown bears, with an increasing trend in mortality due to these human-related factors (Nayeri et al., 2022). In this study, we examined how socio-psychological factors such as emotions (e.g., fear, happiness and pride), perceived population status, direct experiences of carnivore-related damage (e.g., livestock losses and crop damage), and the perceived benefits of these species for ecotourism interact with socio-economic factors (e.g., income) to shape local community attitudes toward large carnivores in Golestan National Park. Using face-to-face interviews with residents around the park, we tested the following three hypotheses:

1. Local communities' attitudes toward the conservation of large mammalian carnivores (i.e., Persian leopard, gray wolf, and brown bear) around Golestan National Park, Iran, will be negatively influenced by their experiences of damage caused by these species and by the fear they evoke, with the intensity of perceived fear varying across species.
2. The perceived population status of carnivores (i.e., increasing or decreasing) in rural areas around Golestan National Park will have varying effects on local tolerance toward these species. Specifically, a higher perceived leopard population trend is expected to increase positive attitudes toward leopards, while it may negatively reduce positive attitudes toward wolves and bears.
3. Emotions such as happiness and pride, along with perceived benefits from the presence of large carnivores (e.g., ecotourism opportunities) will positively increase local communities' support for the conservation of these species.

2 | METHODS

2.1 | Study area

We conducted our study in Iran's premier biosphere reserve, Golestan National Park, designated in 1957 (Zehzad et al., 2002). The park is positioned in Golestan Province, northeastern Iran, where the Hyrcanian temperate and relict forests meet with steppe vegetation and semi-arid habitats (Figure 1). Covering 91,895 hectares, the park spans an elevation gradient ranging from 450 to 2411 m (Akhani, 2023). Golestan National Park hosts several native large carnivores and herbivores, including the globally endangered Persian leopard, gray wolf, brown bear, urial (*Ovis vignei* Blyth, 1841), bezoar goat (*Capra aegagrus* Erxleben, 1777), red deer (*Cervus elaphus maral* Ogilby, 1840), and roe deer (*Capreolus capreolus* Linnaeus, 1758) (Ghoddousi et al., 2019; Soofi et al., 2017). Surrounding villages are inhabited by diverse local communities comprising several social groups. The northern and northwestern areas are predominantly Turkmen, while southern and southeastern villages are mainly home to Turks, Kurds, Fars, Baluch, and Sistani communities. Agriculture, livestock husbandry, horticulture, and ecotourism are the primary economic activities in the region (Ghoddousi et al., 2017).

2.2 | Study design

We selected villages located near the park that are likely to be more affected by large carnivores. Specifically, we focused on the villages within a 5 km buffer zone from

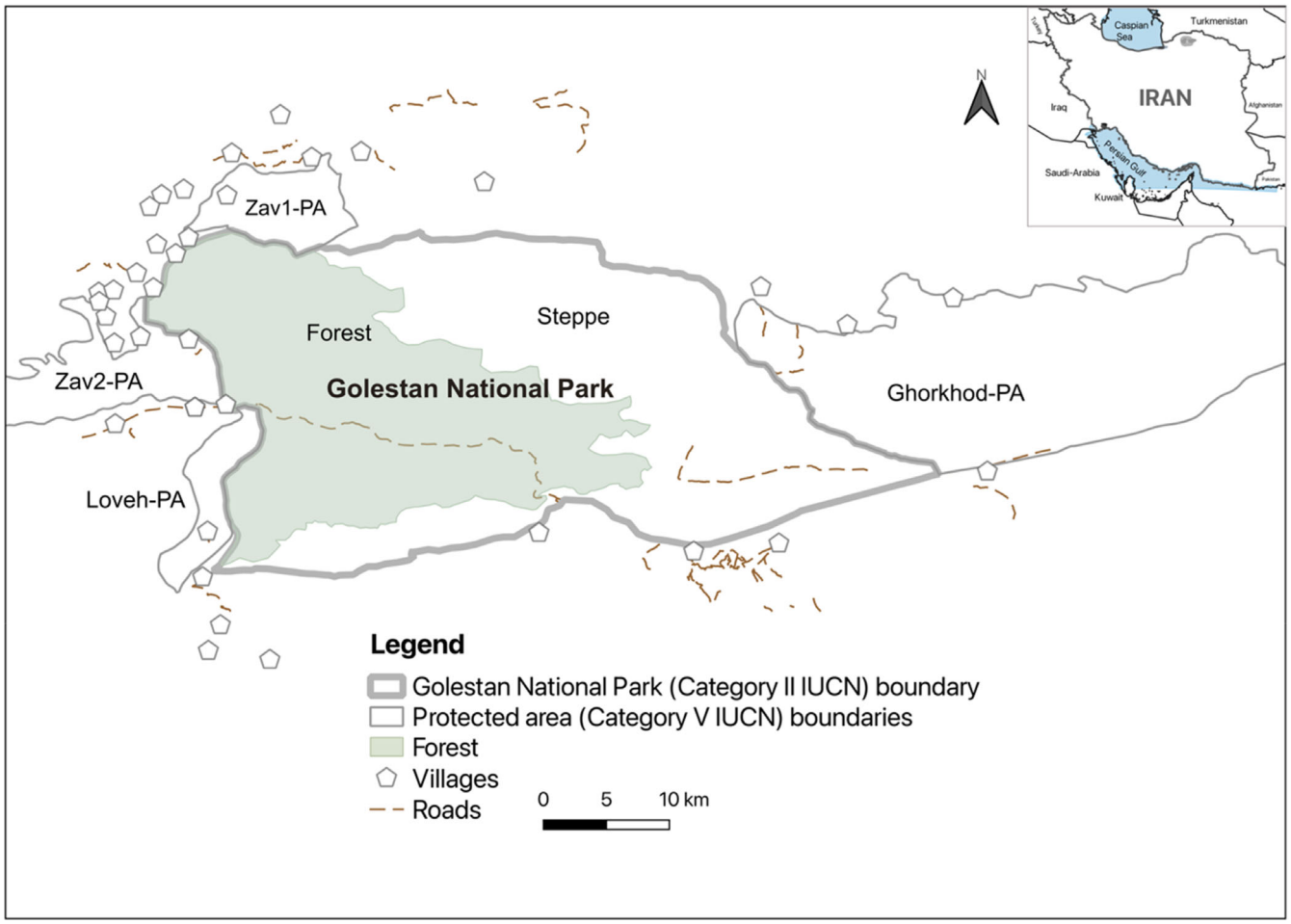

FIGURE 1 Map of the study area showing Golestan National Park and the surrounding villages where interview surveys were conducted. The map also highlights the park's two dominant vegetation communities: forest and steppe. IUCN denotes the International Union for Nature Conservation.

the park boundary, as previous studies have indicated that the range of large carnivores often extends up to 5 km from their home ranges (Ghoddousi et al., 2020).

2.3 | Measures

We conducted structured face-to-face interviews using a questionnaire with Likert-scale items from April to November 2022. The respondents included residents of 30 villages around Golestan National Park representing diverse occupations such as livestock and crop farmers, beekeepers, teachers, freelancers, and others (unspecified). Our survey team consisted of two experienced local Iranian researchers. While Farsi is the official language of Iran and familiar to all participants, 71% of the interviews ($n = 210$) were conducted in the Turkman language, and 29% ($n = 82$) in Farsi.

Prior to the main interviews, we conducted a pilot study on a subset of the population ($n = 15$) in the studied villages. This allowed us to assess the suitability of the questionnaire and estimate the duration of the interviews (Young et al., 2018). With the assistance of experienced park rangers and the research team, respondents were informed either by phone or in person about the study objectives. We emphasized that "participation was entirely voluntary, anonymized, and used solely for scientific purposes." A brief statement in the questionnaire informed respondents of their right to stop the interview or decline to answer further questions at any point without any consequences. This study was conducted under a permit (ethical clearance letter no. 355135-81947/2022) issued by the Iranian Department of Environment.

2.4 | Data collection

Park rangers and our research team played a key role in introducing the study to community members, including

households and village leaders. With informed consent, interviews were conducted in participants' homes. We assessed how emotions and perceptions influence the local community's attitudes toward each carnivore species around Golestan National Park. Specifically, the response variable was measured by asking: "*when you think about each large carnivore species, do you feel that these carnivores should be protected (not be killed) regardless of the threats they may pose such as attacks on livestock and people*?" To characterize respondents' emotional reactions, we used a 5-point Likert-type scale ranging from strongly disagree (1) to strongly agree (5) (León-Mantero et al., 2020).

The questionnaire was structured around several dimensions as predictor variables, including social demographic (e.g., age, sex, culture, and ethnicity), emotions (e.g., fear of carnivores, happiness and pride), cognition (e.g., perceived population trend of the target species, increasing, decreasing, and stable), and perceived benefits of large carnivores for ecotourism (White et al., 2005). These measures were applied for the three focal species: Persian leopard, gray wolf, and brown bear (Supporting Information S1).

2.5 | Statistical analyses

To examine our hypotheses, we ran the Bayesian ordinal regression models (probit link) for each carnivore species separately. Models were fitted using the "brms" R package (Bürkner, 2017) in Stan (Stan Development Team, 2025) via R version 4.2.3 (R Core Team, 2022). This modeling approach is increasingly applied in sociology, psychology, and ecology (Bürkner, 2017; Bürkner & Vuorre, 2019) and assumes the latent variable (i.e., the error term, ε) is normally distributed (Bürkner, 2017). In ordinal models, the intercept varies across levels of the grouping factor (e.g., ethnicity), resulting in multiple intercepts known as thresholds, including the grouping factor. Accordingly, we included ethnic groups as a random intercept to account for variability among different ethnic groups (Bürkner & Vuorre, 2019). We used a weakly informative normal prior (mean $\mu = 0$, standard deviation $\sigma^2 = 5$). For the group-level intercept (1|ethnic), we specified Student_t priors ($\nu = 3$, $\mu = 0$, $\sigma^2 = 2.5$) (Bürkner, 2017). Posterior distributions were sampled using the Markov-Chain Monte Carlo (MCMC) algorithm with 6000 iterations, including a 3000-iteration warmup, across parallel chains (Bürkner & Vuorre, 2019). Models were first run with a single covariate (linear effect) (Table 1), and additional covariates were subsequently added. This procedure was conducted separately for each carnivore species. Model ranking was performed using leave-one-out cross-validation (LOO-CV; Vehtari et al., 2017). Coefficients were considered to have a substantial effect when their credible interval (CrI) did not cross zero and marginally substantial and non-substantial otherwise (Benjamin et al., 2018; Soofi et al., 2024). Finally, model fit was evaluated using posterior predictive checks (Bürkner & Vuorre, 2019).

2.6 | Post hoc analyses

We first ran a Kruskal–Wallis test to assess overall differences in attitudes among cultural groups, which was significant. To examine pairwise differences in attitude scores between cultural groups, we conducted Dunn's test with "Holm" correction to account for unbalanced sample sizes (Dinno, 2017).

3 | RESULTS

Overall, we interviewed 292 individuals (48 women and 244 men, 121 households) across five age groups (range = 18–60 years) in 30 villages around Golestan National Park. Participants were from various educational backgrounds (i.e., illiterate = 55, primary school = 112, elementary school = 94, and academic = 31) with different cultural groups (Turkmen = 210, Fars = 58, Kurd = 13, Turk = 6, and Baluch = 5). Interviews lasted 30–40 min. Support for carnivores' conservation varied by species (Figure 2). Strong support was highest for leopards (37.3% strongly agree, 47.3% agree). Bears received 46.2% agreement, with 7.2% opposing. Wolves had the most opposition (20.2% disagree) and the lowest strong support (17.8% strongly agree), though the majority still supported their protection (Table S1). Approximately 56.5% of respondents reported experiencing property damage (e.g., loss of livestock and crop damages) from large carnivores, while 43.5% had no such experience. Respondents reported the most damage from wolves (90% agree and strongly agree) and bears (77%), and the least from leopards (56%). Leopards were seen as most beneficial for ecotourism (66% agree/strongly agree) and generated the highest happiness and pride (77%), while fear was moderate for all species (30%–35% agree/strongly agree), showing mixed but informative perceptions (Figure 2). Most respondents perceived leopard (38%) populations as declining, while perceptions of bear (23%) and wolf (39.4%) populations were mixed, with a large proportion indicating "don't know" (Figure 3).

Posterior predictive checks indicated that observed data fell within the simulated values of the models (Figures S1, S5, and S6). Overall, we ran 15 Bayesian

TABLE 1 Comparison of the three best-fitting Bayesian cumulative ("probit") ordinal models for the brown bear, Persian leopard, and gray wolf. elpd_diff is the difference in expected log pointwise predictive density (ELPD) between two models, with se_diff indicating its standard error. elpd_loo is the ELPD estimated using leave-one-out cross-validation (LOO-CV), and se_elpd_loo gives its standard error. p_loo measures the difference between elpd_loo and the non-cross-validated log posterior predictive density with se_p_loo as its standard error. looic is the leave-one-out information criterion, derived from elpd_loo and adjusted for model complexity, and se_looic reports its standard error.

Species	Models	elpd_diff	se_diff	elpd_loo	se_elpd_loo	p_loo	se_p_loo	looic	se_looic
Persian leopard	m14	0.0	0.0	−269.6	14.8	13.2	1.9	539.3	29.7
	m13	−4.9	3.6	−274.5	14.5	11.7	1.6	549.1	29.0
	m12	−6.7	4.4	−276.4	14.9	11.8	1.8	552.8	29.8
Gray wolf	m14	0.0	0.0	−364.4	13.8	15.8	2.6	728.9	27.6
	m13	−0.3	2.7	−364.8	13.5	13.9	2.1	729.6	26.9
	m12	−0.4	2.6	−364.8	13.6	13.9	2.2	729.6	27.1
Brown bear	m14	0.0	0.0	270.0	14.9	13.5	1.9	539.9	29.7
	m12	−2.5	3.3	−272.5	15.1	12.6	1.8	545.0	30.2
	m13	−5.4	3.8	−275.4	14.6	13.2	1.8	550.8	29.2

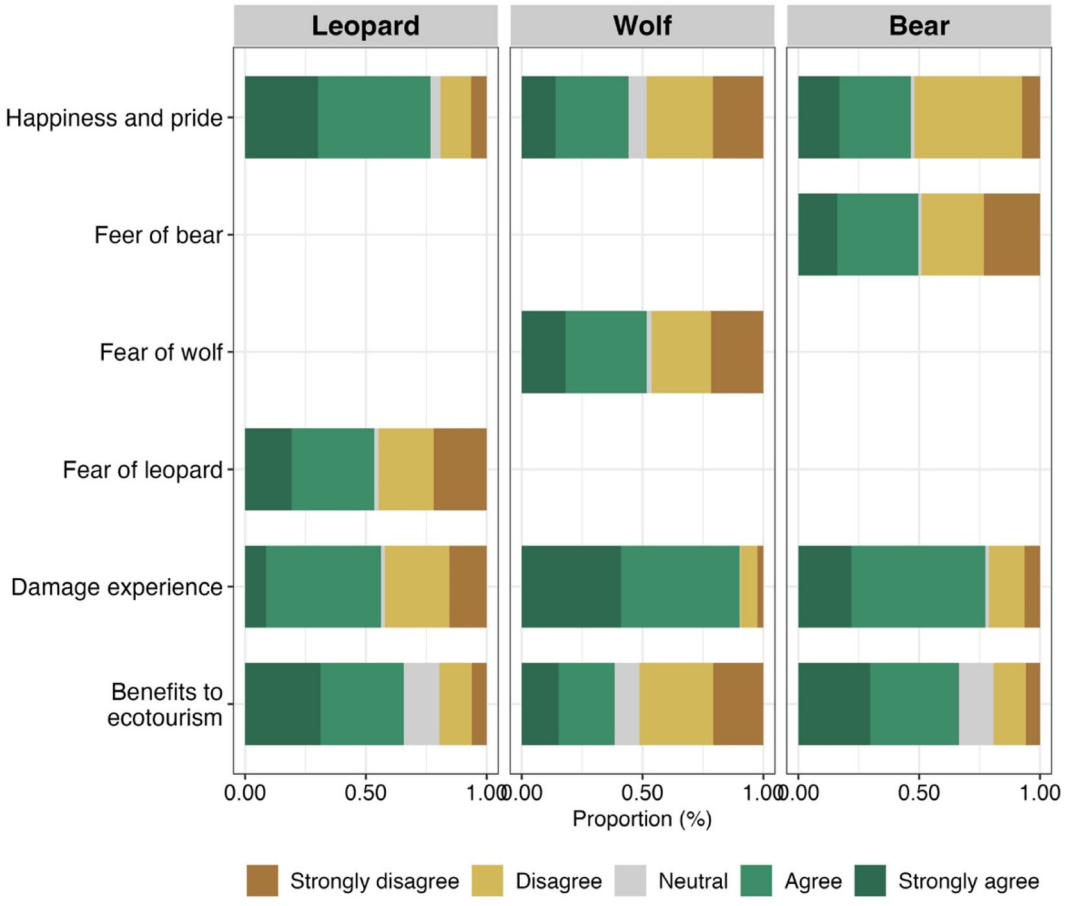

FIGURE 2 Percentage (*x*-axis) of responses to each question (*y*-axis, Likert-type scale) regarding local communities' attitudes toward supporting large carnivores (i.e., Persian leopard, gray wolf and brown bear) and preventing their illegal killing.

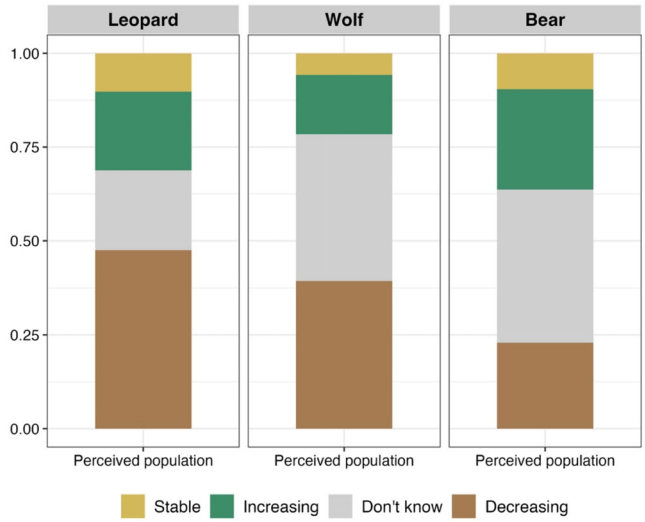

FIGURE 3 Perceived trends of large carnivore population abundances (Persian leopard, gray wolf, and brow bear) in Golestan National Park.

ordinal regression models for gray wolves, 14 models for the Persian leopards, and 13 models for the brown bears.

3.1 | Persian leopard

Our results indicated that the feeling of happiness and pride (Figure 1) had a substantial positive effect on attitudes toward leopard protection ($\beta = .54$, CrI = 0.36 to 0.70) (Figure 4a; Table 2). The belief that leopards benefit ecotourism also substantially and positively influenced support for their conservation ($\beta = .24$, CrI = 0.08 to 0.41) (Figure 4a; Table 2). Perceiving the leopard population as abundant was also associated with greater support for protecting them from illegal killing ($\beta = .14$, CrI = 0.00 to 0.27) (Figure 4a; Table 2). Fear of leopards had a negative but less substantial effect on attitudes ($\beta = -.14$, CrI = −0.31 to 0.01). In contrast, direct experiences of damage caused by leopards showed a substantial negative effect on support for conservation and opposition to illegal killings ($\beta = -.27$, CrI = −0.43 to −0.12) (Figure 4a; Table 2).

3.2 | Gray wolf

In the wolf model, feelings of happiness and pride (Figure 1) about the presence of wolves have a substantial positive effect on attitudes ($\beta = .57$, CrI = 0.40 to 0.73) (Figure 4b, Table 3). This suggests that such emotions are likely to increase tolerance toward wolves. Support for wolf conservation was negatively influenced by perceptions that wolves cause damage to human property or pose risks to human life ($\beta = -.15$, CrI = −0.30 to −0.01) (Figure 4b). Perceived wolf population status had a negative but less substantial effect ($\beta = -.10$, CrI = −0.23 to 0.03), while fear had a positive but non-substantial effect ($\beta = .02$, CrI = −0.11 to 0.15). Viewing wolves as economically valuable for ecotourism substantially and positively influenced attitudes toward them ($\beta = .20$, CrI = 0.04 to 0.35) (Figure 4b, Table 3).

3.3 | Brown bear

In the brown bear model, feelings of happiness and pride (Figure 2) about the presence of bears had a substantial and positive effect on attitudes ($\beta = .53$, CrI = 0.37 to 0.70) (Figure 4c, Table 4). Perception that the bears are beneficial to ecotourism also had a substantial and positive effect ($\beta = .24$, CrI = 0.08 to 0.41). Perceived bear population status was positively associated with attitudes ($\beta = .14$, CrI = 0.01 to 0.27) (Figure 4c, Table 4). Conversely, experiencing damage from bears, such as crop damage, beehive destruction, or livestock losses, had a substantial negative effect ($\beta = -.27$, CrI = −0.46 to −0.17) (Figure 4c, Table 4). Fear of bears had a negative but less substantial effect ($\beta = -.14$, CrI = −0.29 to 0.01), suggesting that fear may lower tolerance toward them.

Post-hoc analyses revealed significant differences in attitude scores among cultural groups ($\chi^2 = 15.63$, df = 4, $p = .004$). Fars held significantly more positive attitudes toward carnivore protection than Kurds ($Z = 3.55$, $p = .004$), while Kurds' attitudes were significantly lower than those of Turkmen ($Z = -2.79$, $p = .047$) (Figure 4d). Other pairwise comparisons were not significant.

4 | DISCUSSION

Understanding emotions such as fear, happiness and pride, as well as the attitudes of local communities who live alongside large carnivores, is crucial for promoting coexistence and informing conservation decisions (Ashish et al., 2022; Castillo-Huitrón et al., 2024). However, studies on the social-psychological context of human–carnivore interactions remain limited (Arbieu et al., 2024). Our findings provide valuable insights into these interactions and highlight the relative roles of such factors in shaping local communities' attitudes toward the conservation of large carnivores. The results supported our first hypothesis: fear of large carnivores can reduce the positive attitudes of local communities in

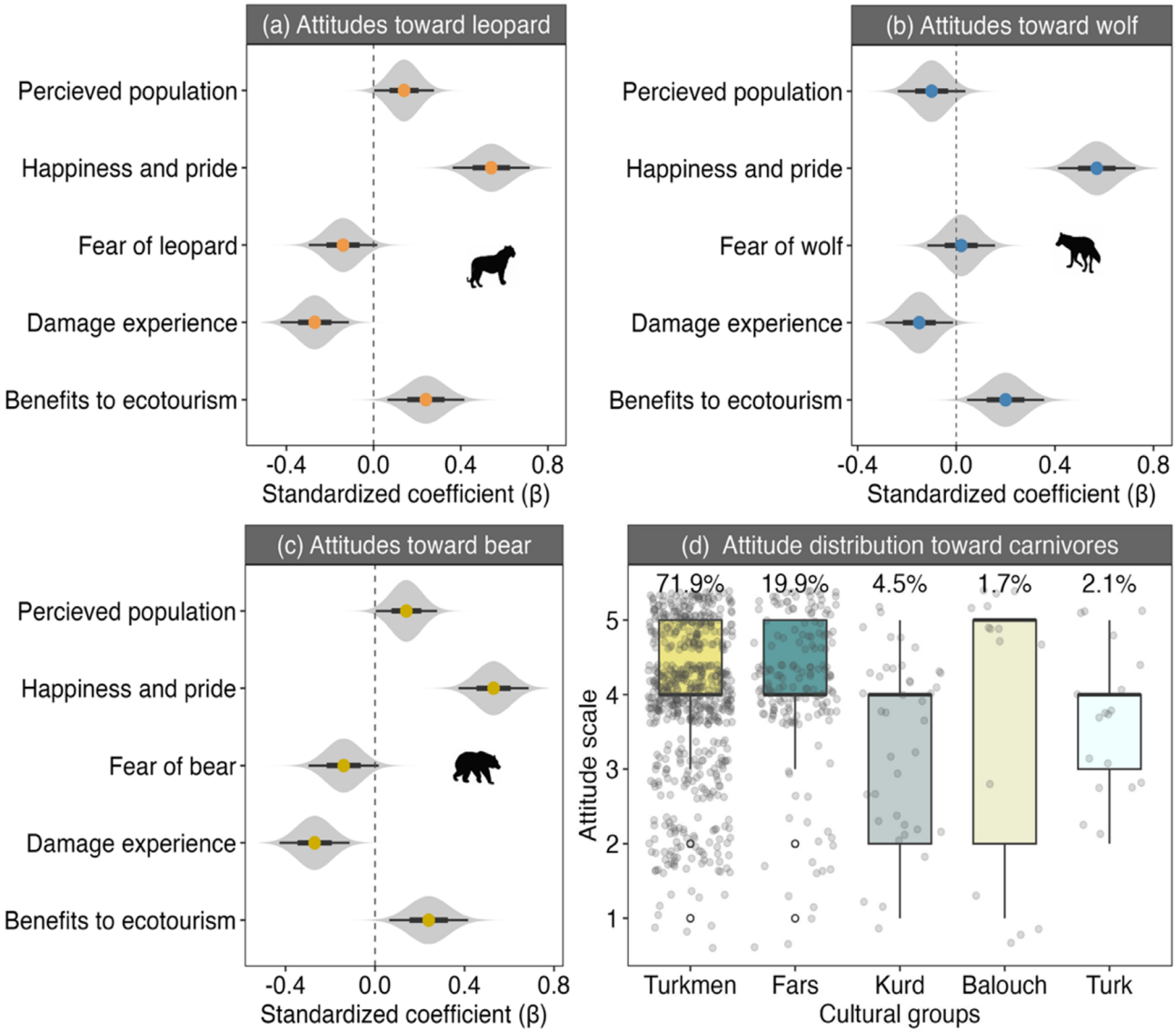

FIGURE 4 Posterior distributions of coefficients from the Bayesian ordinal regression models of local community's attitudes toward Persian leopards (a), gray wolves (b) and brown bears (c) in Golestan National Park, northeastern Iran. Posterior means are shown as orange, blue and yellow dots, with 95% Bayesian credible interval represented by dark line. Coefficients are classified as "substantial" if the credible interval does not cross 0, less substantial if it slightly crosses 0 and non-substantial if it crosses 0. Panel (d) illustrates a boxplot of attitudes toward large carnivore (leopard, wolf, and bear) protection across cultural groups. Transparent gray circles indicate individual respondents, percentages indicate the proportion of sample, and solid-line circles outliers.

Iran's oldest biosphere reserve. Respondents reported feeling fearful of leopards, bears, and wolves; however, the magnitude of fear toward wolves was negligible. Fear is an important component of human emotions and can have contrasting effects on communities' willingness to support wildlife conservation (Prokop et al., 2024). Notably, fear of large carnivores is typically self-reported, which may differ from actual fear levels. Johansson et al. (2016) argued that self-reported fear only reflects a fraction of the real emotional experience. In Golestan National Park, leopard and bear attacks on humans occasionally occur, but no wolf attacks have been reported (Iranian Department of Environment). However, occasional wolf attacks on humans, mainly children, were reported in western Iran (Behdarvand et al., 2014). These findings are consistent with earlier research showing that in areas where large carnivores coexist with humans, fear plays a key role in shaping tolerance levels and can hinder support for conservation measures (Prugh et al., 2023). Studies on human emotions toward wildlife hazards support this, highlighting that deeply rooted fear and anxiety are crucial factors driving dislike of large carnivores (Castillo-Huitrón et al., 2020). For example, several studies have shown that fear of grizzly bears can

TABLE 2 Summary of the best-fitting Bayesian cumulative regression model assessing local community attitudes toward Persian leopard conservation in Golestan National Park, northeastern Iran. CrI denotes the 95% credible interval, SD is the standard deviation, and Rhat is the Gelman–Rubin convergence diagnostic.

	Estimate	SD	Lower 95% CrI	Upper 95% CrI	Rhat	Bulk_ESS	Tail_ESS
Intercept [1]	−3.59	0.49	−4.63	−2.73	1.00	2383	2561
Intercept [2]	−2.35	0.39	−3.19	−1.66	1.00	2446	2373
Intercept [3]	−1.59	0.38	−2.42	−0.90	1.00	2485	2324
Intercept [4]	0.28	0.37	−0.54	0.92	1.00	2468	2261
Feeling of happiness and pride	0.54	0.09	0.36	0.70	1.00	3092	2946
Feeling fear of leopard	−0.14	0.08	−0.31	0.01	1.00	2705	2945
Beneficial to ecotourism	0.24	0.09	0.08	0.41	1.00	2927	2741
Perceived leopard population status	0.14	0.07	0.00	0.27	1.00	3070	2720
Direct experience of leopard damage	−0.27	0.08	−0.43	−0.12	1.00	3086	2722

Bulk_ESS: effective sample size for the bulk (main part) of the posterior distribution. Tail_ESS: effective sample size for the tails of the posterior distribution.

TABLE 3 Summary of the best-fitting Bayesian cumulative regression model for assessing local community attitudes toward gray wolf conservation in Golestan National Park, Iran. CrI denotes the 95% credible interval, SD is the standard deviation, and Rhat is the Gelman–Rubin convergence diagnostic.

	Estimate	SD	Lower 95% CrI	Upper 95% CrI	Rhat	Bulk_ESS	Tail_ESS
Intercept [1]	−1.40	0.79	−2.94	0.27	1.00	2192	2375
Intercept [2]	−0.20	0.78	−1.76	1.40	1.00	2185	2417
Intercept [3]	0.31	0.75	−1.24	1.93	1.00	2209	2425
Intercept [4]	1.84	0.78	0.29	3.35	1.00	2188	2627
Feeling of happiness and pride	0.57	0.08	0.40	0.73	1.00	2925	2722
Feeling fear of gray wolf	0.02	0.07	−0.11	0.15	1.00	2767	2411
Beneficial to ecotourism	0.20	0.08	0.04	0.35	1.00	2752	2752
Perceived wolf population status	−0.10	0.07	−0.23	0.03	1.00	2826	2548
Direct experience of wolf damage	−0.15	0.07	−0.30	−0.01	1.00	3075	2528

Bulk_ESS: effective sample size for the bulk (main part) of the posterior distribution. Tail_ESS: effective sample size for the tails of the posterior distribution.

TABLE 4 Summary of the best-fitting Bayesian cumulative regression model assessing local community attitudes toward brown bear conservation in Golestan National Park, Iran. CrI denotes the 95% credible interval, SD is the standard deviation and Rhat is the Gelman–Rubin convergence diagnostic.

	Estimate	SD	Lower 95% CrI	Upper 95% CrI	Rhat	Bulk_ESS	Tail_ESS
Intercept [1]	−3.57	0.51	−4.57	−2.72	1.00	2421	2339
Intercept [2]	−2.34	0.41	−3.23	−1.70	1.00	2711	2606
Intercept [3]	−1.58	0.40	−2.47	−0.96	1.00	2711	2723
Intercept [4]	0.29	0.39	−0.61	0.91	1.00	2768	2753
Feeling of happiness and pride	0.53	0.08	0.37	0.70	1.00	2909	2776
Feeling fear of brown bear	−0.14	0.08	−0.29	0.01	1.00	2941	2829
Beneficial to ecotourism	0.24	0.09	0.08	0.41	1.00	2809	2964
Perceived population status	0.14	0.07	0.01	0.27	1.00	2675	2684
Direct experience of bear damage	−0.27	0.08	−0.46	−0.17	1.00	2961	2753

Bulk_ESS: effective sample size for the bulk (main part) of the posterior distribution. Tail_ESS: effective sample size for the tails of the posterior distribution.

reduce coexistence levels among those experiencing this emotion (Balčiauskas et al., 2020). It has been suggested that fear should not be addressed in isolation, but rather considered alongside a broader set of emotions (Castillo-Huitrón et al., 2020).

Our results further supported our second hypothesis: local community's perceptions of large carnivore population trends (i.e., stable, declining, or increasing) can influence their support for carnivore conservation. Specifically, when community members believed that a species population was declining, such as the Persian leopard, they were more likely to support conservation measures. In contrast, perceptions of an increasing population, as in the case of wolves, were associated with more negative attitudes toward conservation. These findings highlight the importance of effective communication strategies, including the dissemination of accurate information and initiatives to increase ecological knowledge.

Providing reliable data on population abundance could help communities better understand the realities of human–carnivore interactions, particularly, high-risk areas. Previous studies have shown local knowledge about large carnivores is linked to more positive attitudes, highlighting the importance of awareness in fostering human–carnivore coexistence (Gebo et al., 2022). Similarly, Glikman et al. (2012) found that knowledge can moderate the relationship between beliefs and emotions in shaping support for management actions involving wolves and bears in Italy. In their study, residents with greater knowledge about wolves held more positive attitudes toward them, further highlighting the value of enhancing community understanding in conservation efforts.

Therefore, conservation practitioners and policymakers should consider incorporating information on population trends and status into their outreach efforts to strengthen public support for large carnivores' conservation in the region. Additionally, we found that direct experiences of property loss due to predators led to a dislike of all three studied species, which in turn reduced positive attitudes. Previous research has shown that people who perceive carnivores as problematic often oppose their conservation, with livestock predation being a key major driver of these attitudes (Bhatia et al., 2021). Treves (2009) noted that "*wildlife values are believed to take shape early in life and change slowly*," therefore, direct experiences rarely alter basic values (Bruskotter et al., 2007). However, such experiences can shift attitudes or tolerance toward carnivores and influence behavior (Heberlein, 2012). For example, households affected by carnivore damage may retaliate against problematic individuals, particularly where mitigation measures such as compensation schemes are absent (Khorozyan et al., 2020). Although the public might hold more positive views of large carnivores than those most directly affected, negative interactions remain a major source of tension in our study area (Soofi et al., 2019; Soofi, Soufi, et al., 2022). Wolves were most often implicated in predation on sheep and goats, whereas leopards were reported to kill mainly cattle, leading to widespread retaliatory killings. In contrast, bears were primarily associated with crop and orchard damage (e.g., sunflowers and wheat) and beehive destruction (Nayeri et al., 2022). Affected households often bear the brunt of these costs while receiving few of the associated benefits (Babrgir et al., 2017; Manfredo et al., 2009). In the absence of compensation schemes, problem carnivores may be killed in reprisal (Babrgir et al., 2017). To mitigate such risks, it is essential to implement effective preventive measures, including damage mitigation strategies, community engagement, and habitat management. One potential approach could be the establishment of collaborative management systems with local communities, as highlighted in the recent "First Range State Meeting for the Persian Leopard" report (UN Environment Programme [UNEP]-CMS, 2022).

For instance, community-based compensation schemes can support those affected by large carnivores and foster positive attitudes toward them (Li et al., 2022). Additionally, Khorozyan et al. (2020) developed studded leather collar to protect freely grazing cattle from leopard attacks in northern Iran. A recent study in Golestan National Park suggested that, on average, four trained livestock-guarding dogs per herd can prevent wolf attacks and reduce leopard predation on livestock (Soofi, Soufi, et al., 2022). However, such measures are currently unavailable or not implemented in the study area. Implementing these strategies could not only lower the risk of retaliatory killings but also help shift the negative attitudes and perceptions toward carnivores, thereby facilitating human–carnivore coexistence (Guadagno et al., 2023).

Furthermore, our results reveal that feeling happiness and pride (third hypothesis) about the presence of large carnivores was strongly and positively associated with support for their conservation regardless of potential threats. Respondents who were happy and proud of leopards in their area were more likely to support leopard conservation. These findings align with previous studies showing that positive emotions driven by coexistence with large carnivores can foster favorable attitudes and strengthen human–carnivore relationships (Castillo-Huitrón et al., 2024). Similarly, Dheer et al. (2021) found in Tanzania that the acceptance of management strategies by Maasai pastoralists was influenced by the joy and cultural significance of large carnivores. Our results also indicate that community members perceive large

carnivores as contributing positively to ecotourism, suggesting that they recognize potential economic benefits despite associated risks. Ecotourism can promote conservation by offering potential economic incentives to local communities, thereby encouraging support for protecting natural resources, including large carnivores (Hatma Indra Jaya et al., 2024). Benefit-sharing mechanisms are crucial in securing community support, as the acceptance of benefits significantly impacts conservation outcomes (Kegamba et al., 2023). However, benefits are not equally distributed among all community members, and a single benefit may not sufficiently incentivize conservation for everyone (Spiteri & Nepalz, 2006). In practice, economic gains from carnivores, such as through ecotourism, often reach only a fraction of the community and may not compensate for the costs of coexistence, such as livestock predation (Abbott & Whitford, 2001; Manfredo et al., 2009). Together, these findings highlight the importance of engaging local communities in conservation initiatives and ensuring that strategies such as ecotourism deliver inclusive benefits to both the local community and large carnivores.

A potential caveat to our study is the influence of situational social conformity bias, where individuals may align their responses with perceived community norms or expectations (Gonzalez et al., 2024). However, this is unlikely to have introduced systematic bias, as we assessed these effects during the pilot study. Another limitation is the underrepresentation of women (16%) in our sample. Cultural and logistical challenges constrained our ability to interview more women, whose perspectives on human–carnivore interactions and conservation strategies may differ from those of men. Including women is crucial for developing effective and equitable conservation solutions.

5 | CONCLUSIONS

Conserving large carnivores requires addressing emotions (e.g., fear, happiness and pride) and perceptions, as these factors substantially influence local communities' attitudes. Our findings indicate that rural residents around Golestan National Park generally recognized the ecotourism benefits of carnivores. Kurds expressed fewer positive views than Turkmens, although this may partly reflect unbalanced sampling, as Turkmens are the dominant population around the park. Leopards and bears elicited fear but were perceived as having declining populations, which positively influenced support for their conservation. In contrast, wolves were perceived as increasing in numbers, leading to reduced support. To strengthen support for carnivore conservation, it is essential to address underlying social–psychological factors shaping attitudes. Our study offers two key practical implications: (1) fostering positive emotions—happiness and pride were the strongest predictors of supportive attitudes. Initiatives such as ecotourism programs that involve local communities, such as guided carnivore monitoring, can instill pride, enhance appreciation, and shift attitudes from fear to respect and admiration. (2) Addressing fear of large carnivores—strategies such as predator-proof livestock corrals, studded protective collars (Khorozyan et al., 2020), and trained guard animals (Soofi, Soufi, et al., 2022) can reduce negative interactions. Financial incentives or compensation programs for affected livestock owners can further improve acceptance by minimizing economic losses. These measures not only mitigate damage and compensate affected households but also dispel fears, highlight the ecological importance of large carnivores, and promote coexistence. Considering such social–psychological and practical factors in conservation decision-making can offset, at least partially, the costs of living alongside large carnivores, fostering positive relationships and garnering stronger support for their conservation.

AUTHOR CONTRIBUTIONS

ZEM, MS, and SM conceived the study. ZEM collected the data. MS conducted the statistical analyses. SM acquired funding, and SM, HMK, and MS supervised the project. ZEM wrote the first draft of the manuscript, and MS led the statistical analyses and writing of the manuscript. All authors contributed critically to reviewing and editing the final version.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest.

DATA AVAILABILITY STATEMENT

We will provide data in online platforms.

ETHICS STATEMENT

This study was conducted in accordance with the ethical standards of Gorgan University of Agricultural Sciences and Natural Resources and the Iranian Department of Environment (permit number 355135-81947/2022). Prior to the interview, all respondents were informed about the objectives of the study, assured of the confidentiality and anonymity of their responses, and provided informed consent. Participation was entirely voluntary, and no personal identifiers were collected.

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SUPPORTING INFORMATION

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

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