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Application of the integrated threat theory to conservation law enforcement

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Abstract

Interactions between law enforcement agents in conservation (e.g., rangers) and illegal resource users (e.g., illegal hunters) can be violent and sometimes fatal, which negatively affects conservation efforts and people's well-being. Models from social psychology, such as integrated threat theory (ITT) (intergroup interactions shape intergroup emotions, prejudices and perceived threats leading to hostile attitudes or behaviors between groups), are useful in addressing such interactions. Conservation approaches relying mainly on law enforcement have never been investigated using this framework. Using a structured questionnaire, we collected data from 282 rangers in protected and unprotected areas ($n = 50$) in northern Iran. We applied Bayesian structural equation modeling in an assessment of rangers' affective attitudes (i.e., emotions or feelings that shape attitudes toward a person or object) toward illegal hunters in an ITT framework. Rangers' positive perceptions of illegal hunters were negatively associated with intergroup anxiety (emotional response to fear) and negative stereotypes about a hunter's personality, which mediated the relationship between negative contact and affective attitudes. This suggests that negative contact, such

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as verbal abuse, may lead rangers to perceive illegal hunters as arrogant or cruel, which likely forms a basis for perceived threats. Rangers' positive contact with illegal hunters, such as playing or working together, likely lowered their perceived realistic threats (i.e., fear of property damage). Perceived realistic threats of rangers were positively associated with negative contacts (e.g., physical harm). The associations we identified suggest that relationships based on positive interactions between rangers and illegal hunters can reduce fear and prejudice. Thus, we suggest that rangers and hunters be provided with safe spaces to have positive interactions, which may help lower tension and develop cooperative conservation mechanisms.

KEYWORDS
behavior change, intergroup anxiety, negative stereotypes, protected areas, rangers

INTRODUCTION

Protected areas (PAs) are a cornerstone of conservation that preserve wildlife habitats and often contribute positively to the livelihoods of local communities (Schulze et al., 2018). The last agreement of the parties of the CBD (Convention of Biological Diversity) on the Kunming–Montreal Global Biodiversity Framework outlines that governments have committed to expanding PAs and other effective area-based conservation measures to 30% of the world's surface by 2030 (Target 3). More specifically, it notes that "biodiversity should be conserved through effectively and equitably managed PAs" and that PAs must "recognize and respect the rights of indigenous peoples and local communities" (CBD, 2022).

Nevertheless, overexploitation of wildlife (e.g., illegal hunting) in PAs remains a pressing global concern (Bennett, 2016; Challender & MacMillan, 2014). Many PAs heavily rely on law enforcement regulations to counter the rapid rise in illegal hunting (Ripple et al., 2016) that require compliance with rules of behavior, but the existence of rules does not guarantee compliance (Keane et al., 2008). Protected areas rangers are law enforcement agents and have a wide variety of roles, such as monitoring of environmental noncompliant behavior of rule breakers (e.g., illegal hunters [participants in unlawful harvesting of wildlife]). They are also responsible for wildlife monitoring, guiding visitors, and responding to human–wildlife conflicts (Moreto, 2016). Patrol data collected by rangers and their role in conservation law enforcement have been crucial in mapping illegal wildlife activities, quantifying threats to biodiversity, and optimizing patrol efforts (Critchlow et al., 2015; Ghoddousi et al., 2022; Moore et al., 2017; Soofi, Qashqaei, Mousavi, et al., 2022; Soofi, Qashqaei, Trei, et al., 2022). However, conservation can benefit from understanding rangers' relationships with community members (Rizzolo et al., 2021).

The pressure of illegal hunting in the PAs of Asia and Africa has shifted the focus of many rangers mainly toward monitoring noncompliance and undertaking armed forms of conservation (Duffy et al., 2019), but their activities often collide with the interests of local people (Moreto, 2016). For instance, rangers might capture illegal hunters from the communities where they live or police, which can create tensions between ranges and hunters and between rangers and their friends, neighbors, and families (Pienkowski et al., 2022). These negative interactions between rangers and illegal resource users can result in injuries or death of either party (Gaynor et al., 2016). Such interactions are complex and damage conservation outcomes and the well-being of the people involved (Redpath et al., 2015). Therefore, it is critical to understand how individual rangers perceive illegal resource users, considering that rangers are the key figures for conservation and their behavior can positively influence the illegal resource users' responses to law enforcement measures and local community attitudes toward PAs in general (Keane et al., 2008; Moreto et al., 2017; Rizzolo et al., 2021).

Despite this, rangers' attitudes toward illegal hunters have rarely been investigated in biodiversity conservation, and the possibility that this knowledge could be used to reduce tension between rangers and illegal hunters has not been explored (Moreto & Charlton, 2019). This scarcity of relevant literature exists despite more than 150 rangers losing their lives in protecting biodiversity and PAs yearly due to interactions with illegal hunters (The World Bank, 2023).

Understanding rangers' perception of illegal hunters is an important step in reducing negative interactions (Cusack et al., 2020). Such insights enable conservation authorities to empower rangers with the best law enforcement practices (Moreto et al., 2017). Understanding the dynamics of these relationships can also benefit cooperative conservation mechanisms, such as participatory wildlife monitoring (Dolrenry et al., 2016; Wilfred et al., 2019).

Models from social psychology can improve understanding of rangers' perceptions of illegal hunters in enforcement encounters and of how these perceptions may fuel hostile situations. One such model is the integrated threat theory (ITT) proposed by Stephan and Stephan (2000). The ITT offers insights into the assessment of the perceptions of one group's members toward outgroup's members. The ITT assumes 4 sources of threats that ingroups perceive from outgroups (González et al., 2008; Stephan, 2014; Stephan & Stephan, 2000; Stephan et al., 1999): intergroup anxiety, which refers to the affective or emotional response of ingroups to outgroups; realistic threat, which indicates the perceived threats to the ingroups' welfare, such as experiencing economic and physical harm or insecurity from the members of the outgroup; symbolic threat, which denotes the perceived variations in ingroup morals, values, beliefs, and attitudes toward the outgroup members; and negative stereotypes, which refers to

negative expectations of the ingroup members relative to the personalities of members of the outgroup.

Stephan and Stephan (2000) added "contact" as a variable and linked it to the 4 components of the ITT model to assess prejudice between groups. The intergroup contact theory (also known as the intergroup contact hypothesis) formulated by Allport (1954) argues that interpersonal contact between members from different groups can improve attitudes toward outgroups. As an example of such positive contacts, rangers and illegal hunters can get involved with conservation authorities in collaborative conservation efforts, such as wildlife monitoring projects (Dolrenry et al., 2016). Such positive interactions can alleviate intergroup anxiety and negative stereotypes (Pettigrew, 1998) and thus reduce tensions and negative emotions between them. Pettigrew (1997) note that positive contact might reduce intergroup prejudice only if the 4 conditions of the intergroup contact theory (Figure 2) (Allport, 1954) are considered: equal status between groups, common goals (e.g., conserving natural heritage), no competition, and no authority sanction for having contact between groups (e.g., if rangers were sanctioned for having contact with illegal hunters). In positive interactions between ingroup and outgroup contacts, individuals of both parties perceive equal status and thus are motivated toward intergroup cooperation and common goals (Allport, 1954; Pettigrew, 1998).

Multiple studies in various social psychology disciplines have examined the role of intergroup contact as a predictor of threat or affective attitudes within the ITT model and in various social contexts. For example, Stephan and Stephan (2000) assessed the attitudes of people living in the United States toward immigrant groups with the ITT model. They found that opposition to immigration is related to perceived realistic threats, such as threats to the physical well-being of the group or loss of economic resources, but differences in values and negative stereotypes are equally important. The ITT has also been used to examine women's attitudes toward men (Stephan et al., 2000), intercultural attitudes between US and Mexican citizens (Stephan et al., 2000), and attitudes of White residents of the United States toward African Americans (Aberson & Gaffney, 2008). Furthermore, González et al. (2008) investigated Dutch adolescent prejudice toward Muslim minorities and reported that stereotypes and symbolic threats, but not realistic threats, predict prejudice toward Muslims. Likewise, Çakal et al. (2016) used ITT to examine whether realistic and symbolic threats predict collective action tendencies among Kurds and Turks in the Middle East. They found that groups may not always have distinct psychologies about collective actions, and incorporating perceived threats as a predictor of collective actions can inform understanding of the tendencies of the groups. They also noted that intergroup contact has an indirect negative effect on collective action and a positive effect on outgroup evaluations. Finally, Krüppel et al. (2021) used ITT to understand the extremist behaviors of sociopolitical groups toward immigrants in Germany and reported that feeling threatened is related to hostile attitudes and stereotypes against immigrants (Krüppel et al., 2021).

Boin et al. (2021) suggest that intergroup contact is an effective strategy for reducing prejudice. Even if some of the information is not positive, the process at least reduces prejudice toward the personalities and behaviors of members of the outgroups. For example, contact between Catholics and Protestants in Northern Ireland has been related to improved Catholic attitudes toward Protestants (Turner et al., 2013). Boin et al. (2021) highlight that intergroup contact can facilitate the adjustment of group-based norms, such as shared beliefs and views about wildlife management. They suggest that intergroup contact can be one of the most effective ways to overcome intergroup tensions, prejudice, and conflict.

In the context of intergroup interactions, affective attitudes can be measured as evaluative and emotionally fraught reactions toward outgroups that cause hostility (Stephan et al., 1999). Such emotional evaluations signify perceived threat and prejudice toward outgroups (e.g., González et al., 2008; Renström et al., 2022; Stephan et al., 1999).

Although the theoretical and practical insights of ITT and intergroup contact theory in solving, reducing, and preventing various negative interactions have been well elaborated (Allport, 1954; Boin et al., 2021; Çakal et al., 2016; Pettigrew, 1998; Ramiah & Hewstone et al., 2013; Redpath et al., 2015; Stephan, 2014; Stephan & Stephan, 2000), to date there has been no attempt to apply these theories to conservation law enforcement. We applied the ITT model to conservation law enforcement in Iran as a case study.

Despite increasing law enforcement efforts in Iran, thousands of animals are illegally killed across PAs yearly, partly due to the worsening economic situation (Soofi, Qashqaei, Trei, et al., 2022). In Iran, illegal hunting incurs a fine and imprisonment. In response to the high rate of unlawful harvesting of wildlife, in 2015, the Iranian Department of Environment stopped issuing hunting licenses and, subsequently (in July 2019), increased the penalty rates for illegal hunting by ~20–50%, depending on the action. Seemingly, the changes in legislation and increase in wildlife-crime-related punishments have not only led to a substantial increase in the illegal killing of large mammals (Soofi, Qashqaei, Mousavi, et al., 2022; Soofi, Qashqaei, Trei, et al., 2022), but also to increased armed and violent clashes between rangers and illegal hunters. Using the biodiverse PAs of the Hyrcanian forests in northern Iran as a case study (Figure 1), we designed a questionnaire based on the ITT and intergroup contact theory framework to evaluate rangers' affective attitudes toward illegal hunters.

We hypothesized that intergroup anxiety (i.e., feeling apprehensive, worried, anxious, awkward, threatened), negative stereotypes (i.e., negative expectation about an outgroup, e.g., brutal, cruel, immoral, arrogant), realistic threat (i.e., subjective representation of threats, e.g., job security, property, life, family), and symbolic threat (incompatibility of values, norms) would mediate the relationship between negative and positive contacts and affective attitudes of rangers toward illegal hunters (Figure 2). Finally, we expected positive contacts to have the opposite set of associations with affective attitudes (Figure 2).

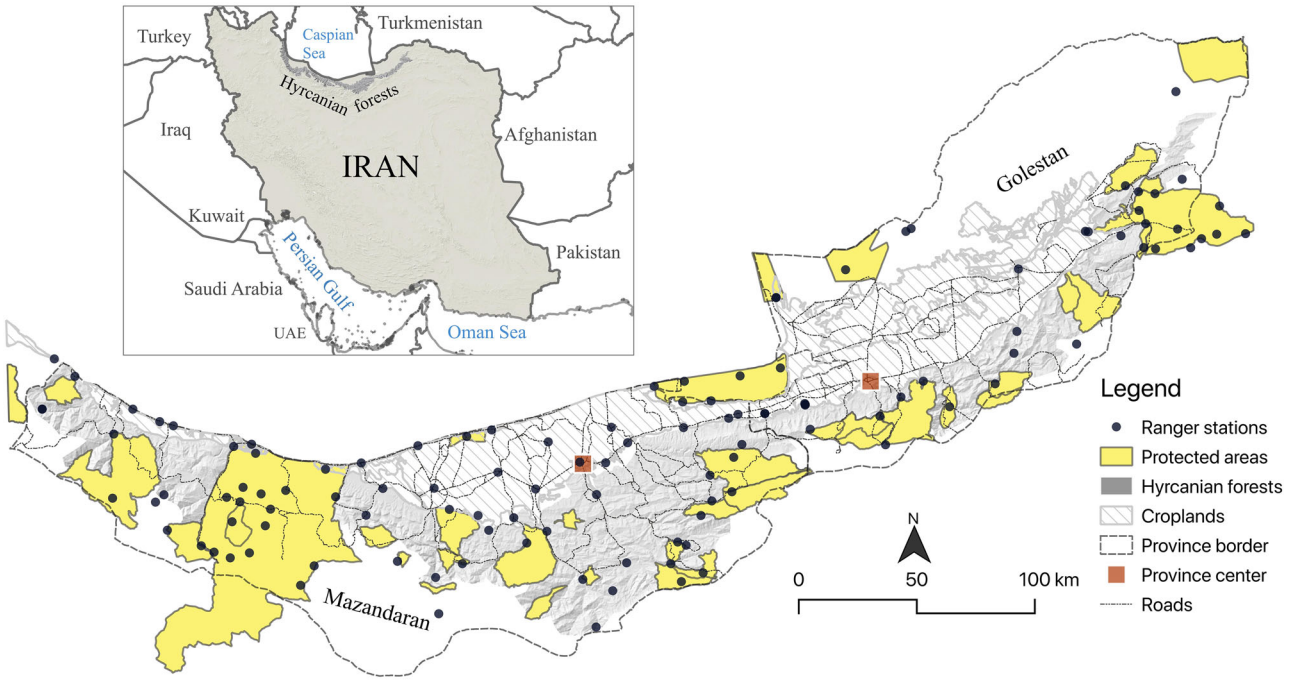

FIGURE 1 Study area in the Hyrcanian forests of northern Iran (Mazandaran and Golestan provinces) and locations of protected-area ranger stations, protected areas, and land-cover types (province center, province border).

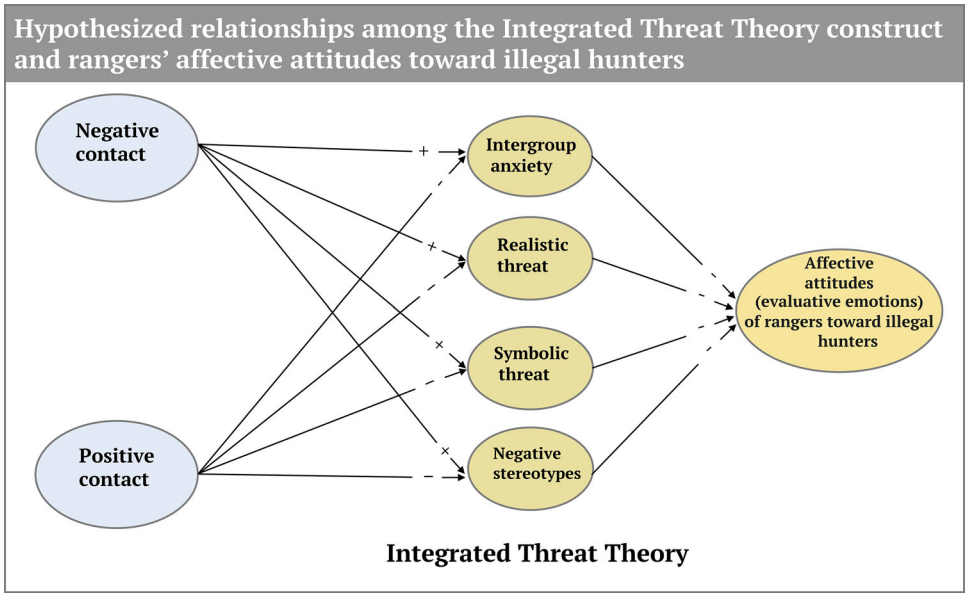

FIGURE 2 Hypothesized relationships among sociopsychological constructs of the integrated threat theory (ITT) (+ and –, hypothesized direction of relationship).

METHODS

Study area

The Hyrcanian forests of northern Iran host a unique set of biodiversity and ecoregions in southwest Asia. It covers an area of 18,000 km^2, extending from the Talysh Mountains in Azerbaijan to northeastern Iran (Figure 1) and harbors a diverse community of large mammals, such as the Persian leopard (*Panthera pardus tulliana*), brown bear (*Ursus arctos*), gray wolf (*Canis lupus*), Caspian red deer (*Cervus elaphus maral*), roe deer (*Capreolus capreolus*), and wild boar (*Sus scrofa*) (Soofi et al., 2018). It is one of the world's last extensive temperate primeval forests (Müller et al., 2017) and a UNESCO World Heritage Site (UNESCO, 2019). These forests are characterized by native communities of plant species, such as chestnut-leaved oak (*Quercus castaneifolia*),

oriental beech (*Fagus orientalis*), Caucasian wingnut (*Pterocarya fraxinifolia*), common hornbeam (*Carpinus betulus*), Persian ironwood (*Parrotia persica*), Caspian poplar (*Populus caspica*), Caspian locust (*Gleditsia caspica*), and Caucasian elm (*Zelkova carpinifolia*), with an understory dominated by boxwood (*Buxus hyrcana*), butcher's broom (*Ruscus hyrcanus*), and a variety of ferns (Akhani et al., 2010). Our study area encompassed 3 national parks, 4 wildlife refuges, 16 International Union for the Conservation of Nature (IUCN) category V areas, 2 natural monuments, 18 no-hunting areas (NHA) (unclassified by the IUCN category), and 7 unprotected areas in Golestan and Mazandaran provinces (Soofi et al., 2018). It also holds 120 offices of the Iranian Department of Environment and ranger stations (91 ranger stations, 363 rangers). The human population in these 2 provinces was approximately 5,152,401 in 2016 (www.amar.org.ir).

Despite biodiversity conservation and law enforcement in the region, the area faces numerous challenges, including intense illegal hunting and inadeqaute wildlife law enforcement measures (Ghoddousi et al., 2019; Sardari et al., 2022; Soofi, Qashqaei, Mousavi et al., 2022). In Iran, the regulation of hunting began in 1956 with the establishment of the Iranian Game Council, which was renamed in 1974 the Department of Environment (DoE) (Firouz, 2005). The first networks of PAs were formed at that time, and the number of PAs in Iran has grown steadily since then. PAs now cover >11.6% of the country's land surface (DoE, www.doe.ir). PA rangers in Iran are assigned to ranger stations and are responsible for monitoring wildlife and law enforcement patrols. All rangers are male and Iranian and are trained in wildlife ecology, management, and law enforcement (DoE, www.doe.ir).

A rise in unemployment rates (Soofi, Qashqaei, Trei, et al., 2022), lack of acceptance of conservation law enforcement by local communities, and insufficient resourcing of the DoE (Ghoddousi et al., 2019) have resulted in the widespread illegal hunting across Iran's PAs (Soofi, Qashqaei, Trei, et al., 2022). Illegal hunting is conducted by local Iranian hunters, who primarily target ungulates (e.g., bezoar goat, wild sheep, and red deer) (Ghoddousi et al., 2019; Soofi, Qashqaei, Trei, et al., 2022). Hunting is mainly for subsistence, but it is also motivated by the wild meat market, pleasure, tradition, and reprisals against park staff (Ashayeri & Newing 2012; Ghoddousi et al., 2019). However, the illegal killing of an animal in Iran is prohibited and is subject to a fine and imprisonment (DoE, www.doe.ir).

Aquaculture, livestock and crop farming, horticulture, industry, hunting, and tourism are the main activities in the region. The 2 provinces (Figure 1) have experienced over 12% of Iran's reported illegal ungulate killing events over recent decades (Soofi, Qashqaei, Trei, et al., 2022).

Participants and data collection

We collected data with self-administered structured questionnaires from rangers in the ranger stations across protected and unprotected areas (n = 50) in the 2 provinces in February–March 2021. The time at which the questionnaire was administered and the locations (ranger stations) where it was administered were coordinated with the provincial offices of the DoE. Rangers were informed via phone by the park heads. A team of 2–3 Iranian researchers administrated the paper surveys, which were completed by the rangers. The research team provided additional information or clarifications if requested by respondents.

We informed the managers and rangers of every PA about our study objectives and explained that their participation in this survey was entirely voluntary, anonymized, and solely used for scientific (not political) purposes. The respondents were informed about their right to stop completing the questionnaire and to decline to answer further questions for any reason without consequence. The research was undertaken under a permit and human ethical clearance letter issued by the Iranian Department of Environment (number 98/170/39717).

We conducted a pilot study on a subset of the ranger population (n = 20) after ethical clearance (Young et al., 2018) to refine the survey. Interviews were conducted by a team of 2 trained researchers, and we communicated with rangers in local languages if it was essential (Mazandarani, Turkmeni, Farsi, Turki, Sistani, and Baluchi). However, our structured questionnaire was in Persian, the official language of Iran, with which all participants were familiar. The study questionnaire is in Appendix S1.

Psychological scales

The psychological constructs (Table 1) we applied were measured using scales adapted from the ITT literature (see, e.g., Riek et al., 2006) and translated into Persian. Whenever necessary, new items were developed or adapted to the sociocultural context of the study area. Rangers' negative and positive contacts with illegal hunters were assessed using 6 and 7 items, respectively, based on Stephan et al. (2002), González et al. (2008), and Pettigrew et al. (2010). These items reflected a range of common interactions that may occur between rangers and illegal hunters. Rangers were asked to indicate the frequency of their interactions with illegal hunters on a 5-point scale ranging from *never* (0) to *frequently* (4). Furthermore, we evaluated the indirect or total effects of negative and positive contact on affective attitudes toward illegal hunters.

We assessed intergroup anxiety based on 5 items (i.e., apprehensive, worried, awkward, anxious, and threatened) adopted from Stephan and Stephan (1985). We asked rangers about their feelings when interacting with illegal hunters in their day-to-day lives. Responses were measured on a 5-point scale ranging from *not at all* (0) to *very much* (4). We further measured realistic threats by asking rangers to what extent they think hunters are a threat to their job security, park facilities and property, family, personal property, life, and safety. We measured symbolic threat constructs. For example, we asked rangers whether they agreed or disagreed with the statement that "illegal hunters deteriorate the country's natural heritage." We used items developed for the context of the study based on our conceptualization of Stephan et al. (1999), Stephan et al. (2002), and Stephan and Stephan (2000). Responses were recorded on a 5-point scale ranging from *strongly disagree* (0) to *strongly agree* (4).

TABLE 1 Item wording, descriptive statistics, factor loadings, and reliability coefficients.

Construct, question, response	Mean	SD	Factor loading[a]	Cronbach's α	McDonald's ω
Positive contact[b]				0.79	0.82
In your community and day-to-day life, how frequently do you engage in the following activities with illegal hunters?					
Being invited to their home	0.59	0.81	0.64		
Inviting them to my home	0.15	0.46	0.46		
Played or worked together	0.34	0.63	0.62		
Had friendly conversations with	1.42	1.06	0.73		
Participated together in community meetings or ceremonies	1.24	1.03	0.62		
Cooperated with them in community activities or ceremonies	1.09	1.02	0.64		
Negative contact[b]				0.88	0.88
In your community and day-to-day life, how frequently do you experience the following situations by illegal hunters?					
Being insulted (yourself or your family)	1.72	1.21	0.72		
Being discriminated against (yourself or your family)	1.05	1.15	0.73		
Being harassed (yourself or your family)	0.74	0.97	0.79		
Being verbally abused (yourself or your family)	1.32	1.15	0.81		
Being threatened (death, physical harm, …) (yourself or your family)	1.46	1.24	0.79		
Being physically harmed (yourself or your family)	0.62	1.02	0.54		
Incurring damage to your property	0.59	0.98	0.64		
Intergroup anxiety[c]				0.87	0.88
In your day-to-day life in your community, when you interact with illegal hunters, to what extent do you experience each of the following feelings?					
Apprehensive	0.87	1.13	0.84		
Worried	1.18	1.22	0.81		
Awkward	0.85	1.15	0.65		
Anxious	1.02	1.12	0.86		
Threatened	1.15	1.14	0.70		
Realistic threat[d]				0.88	0.88
To what extent, do you think that illegal hunters are a threat to?					
Your job security	2.18	1.25	0.61		
Park's facilities and property	2.78	1.00	0.49		
Your family	1.86	1.13	0.88		
Your personal property	2.10	1.13	0.85		
Your life and safety	2.47	1.12	0.77		
Your family's day-to-day life in the community	1.99	1.11	0.85		
Symbolic threat[d]				0.85	0.85
To what extent, do you agree or disagree with the following statements?					
Illegal hunters deteriorate the country's natural heritage	3.14	1.06	0.73		
Illegal hunters undermine our values and moral principles	2.84	1.07	0.75		
Illegal hunters threaten our society's rules and norms	3.01	0.92	0.86		
Illegal hunters break the God's commands and our religious rules	2.44	1.13	0.63		
Illegal hunters destroy future generations' natural assets	3.41	0.86	0.71		

(Continues)

TABLE 1 (Continued)

Construct, question, response	Mean	SD	Factor loading[a]	Cronbach's α	McDonald's ω
Negative stereotypes[c]				0.86	0.86
To what extent, do you think the following characteristics describe illegal hunters?					
Not conscientious	2.38	1.26	0.81		
Arrogant	2.53	1.06	0.78		
Immoral	2.38	1.07	0.75		
Cruel	2.61	1.10	0.65		
Brutal	1.88	1.26	0.66		
Affective attitudes toward illegal hunters[b]				0.67	0.72
When you think of illegal hunters, to what extent do you experience each of the following feelings?					
Hostility (reversed[f])	3.14	1.17	0.67		
Disdain (reversed[f])	3.33	1.09	0.51		
Hatred (reversed[f])	2.87	1.40	0.81		
Rejection (reversed[f])	2.91	1.30	Removed[g]		

[a]Medians estimated from Bayesian posterior distributions.
[b]Measured on a scale from *never* (0) to *frequently* (5).
[c]Measured on a scale from *not at all* (0) to *very much* (5).
[d]Measured on a scale from *strongly disagree* (0) to *strongly agree* (4).
[e]Measured on a scale from *no, absolutely not* (0) to *yes, certainly* (5).
[f]Item reverse coded in the analysis to reflect positive affective attitudes toward illegal hunters.
[g]Item removed from analyses due to its low factor loading.

To measure the negative stereotypes of rangers toward illegal hunters, we adopted the approach used in González et al. (2008), where they examined the stereotypes projected by Dutch adolescents onto Muslim minorities living in the Netherlands. The authors measured stereotypic personality traits of participants, such as being hostile, dishonest, arrogant, unintelligent, and violent. We substituted these adjectives with 5 traits used to describe illegal hunters' personalities in the study area (i.e., not conscientious, arrogant, immoral, cruel, and brutal). Rangers were asked to indicate the extent to which they thought these traits describe illegal hunters on a 5-point Likert scale ranging from *not at all* (0) to *very much* (4).

Finally, affective attitudes toward illegal hunters were assessed with 4 negative feelings (i.e., hostility, disdain, hatred, and rejection) adopted from Stephan et al. (1999). Rangers were asked to indicate the extent to which they felt these emotions when thinking about illegal hunters on a 5-point scale ranging from *not at all* (0) to *very much* (4). Before analyses, affective attitude statements were reverse-coded such that high values indicated positive affective attitudes (Table 1).

Statistical analyses

To test our hypotheses, we applied the 2-step procedure in structural equation models (SEMs) (Anderson & Gerbing et al., 1988). In the first step, we tested the measurement model with confirmatory factor analysis (CFA). We assessed the internal consistency (i.e., reliability) of the measures with Cronbach's alpha and McDonald's omega for each construct; values >0.7 were of acceptable reliability (Hayes & Coutts, 2020; Ursachi et al., 2015). In the second step, after establishing a satisfactory measurement model, we removed the correlations between latent variables in the measurement model and added the hypothesized relationships between latent variables to test the full latent structural model (Appendix S2).

We used the Bayesian estimator with the Gibbs sampler algorithm for Markov chain Monte Carlo (MCMC) to obtain reliable SEM estimates (Muthén & Asparouhov, 2012; Scheines et al., 1999). The Bayesian approach is a reliable estimation method for SEMs with small sample sizes and data with nonnormality (Ulitzsch et al., 2021). A Bayesian SEM involves incorporating prior information and uncertainty into the model to obtain posterior distributions of the parameters through iterative computations, such as MCMC, where parameter values are randomly sampled from the posterior distribution, allowing for inference on the model parameters and model fit assessment (Lee et al., 2007). By iterating through a sequence of parameters, latent variables, and missing observations, the Gibbs sampler generates a posterior distribution based on observed data and prior specifications for the parameters, which can be constructed once convergence is achieved (Scheines et al., 1999). Mplus automatically discards the first half of the samples as burn-in (Asparouhov & Muthén, 2010). We did not use thinning (Link & Eaton, 2011). We visually assessed the trace plots for the convergence of the 2 MCMC chains (Song & Lee, 2012). We used uninformative priors because there was no reliable

previous research on the specific relationships and the context of our study to identify informative priors.

In the Bayesian estimation approach we used, Bayesian credible interval (CrI) denotes a probability statement about the true value being estimated, namely, it has an α% chance of being in the interval. Credible intervals are occasionally referred to as probability intervals. This designation as a probability interval contrasts with the frequentist statistics' confidence intervals. It represents the estimated range within which the true unknown value might exist with a specific likelihood, such as $\alpha = 90\%$ or $\alpha = 95\%$ (Dunn & Shultis, 2022; Hespanhol et al., 2019). Thus, in testing our hypotheses with Bayesian statistics, we considered substantial evidence to reject our null hypothesis if the credible interval at the 95% level did not cover zero and was in the expected direction. We also report an effect as less supported by the evidence if the 90% CrI excluded zero (Kruschke, 2021). We evaluated the goodness of fit of our models based on the recommendations of Asparouhov and Muthén (2021) for SEM models with Bayesian estimation. The model assessment criteria included root mean square error of approximation (RMSEA) $\leq$0.06 and comparative fit index (CFI) and Tucker–Lewis index (TLI) $\geq$0.95. Less than 1.1% of values were missing in the data, and Little's test provided no evidence for rejecting the MCAR assumption ($\chi^2 = 1{,}134.966$, df = 1120, $p = 0.371$) (Little, 1988). The SEMs were run in Mplus 8.8 (Muthén & Muthén, 2022), and SPSS 26 (IBM) and R version 4.2.2 (R Core Team, 2023) were used for mapping and other statistical analyses.

RESULTS

Participants' characteristics

Of the total of 363 rangers employed across the 2 study provinces during the time the data were collected, 302 (83%) participated in our surveys. Surveys of 20 rangers were considered pilot surveys and were excluded from the analyses (n = 282). The mean age of respondents was 41.0 (SD 8.2) years. On average, respondents had 13.8 years of work experience (SD 8.7). A total of 24.8% of respondents (n = 70) had a high school diploma, 13.1% (n = 37) had an associate degree, 25.5% (n = 72) had a master's degree, one respondent had a PhD, and the rest (3.2%, n = 10) had no higher education. All respondents were male, and 67% of the rangers were from Golestan and Mazandaran provinces, whereas only 33% were from other provinces. Finally, 63% of the rangers responded that they had cooperated with illegal hunters in community activities or ceremonies, and 59% had participated in community meetings with them.

Measurement model

We used 50,000 iterations to estimate the measurement models. The potential scale reduction factor (PSR) dropped below the 1.05 recommended value and remained steadily low after about 25,000 iterations. Fit indices suggested a good fit of the measurement model (CFI = 0.957, 90% CrI 0.950 to 0.962; TLI = 0.952, 90% CrI 0.946 to 0.959; RMSEA = 0.035, 90% CrI 0.032 to 0.037). Cronbach's alpha and McDonald's omega values for the multiple-item scales were generally >0.67 and >0.72, respectively (Table 1). One item (rejection) was removed from the final measurement model because of its low factor loading. All other factor loadings were above the 0.40 threshold and were statistically significant (Kline, 2016) (Table 1).

Structural model

Similar to the measurement model, we used 50,000 iterations to estimate the model parameters. PSR dropped below the 1.05 recommended value and remained steadily low after about 10,500 iterations. The hypothesized structural model fitted the data well (CFI = 0.956, 90% CrI 0.950 to 0.962; TLI = 0.952, 90% CrI 0.945 to 0.958; RMSEA = 0.035, 90% CrI 0.032 to 0.037) and explained 30% of the variance in respondents' affective attitudes toward illegal hunters (Figure 3). Our results provide some evidence that negative contact had a positive effect on symbolic threats; however, the relationship was statistically less substantial ($\gamma = 0.13$, 95% CrI −0.01 to 0.26, 90% CrI 0.01 to 0.24). Additionally, there was no substantial evidence in support of positive contact's inverse effect on symbolic threat ($\gamma = -0.02$, 95% CrI −0.17 to 0.13, 90% CrI −0.14 to 0.11).

Moreover, negative contact was positively associated with intergroup anxiety (γ = 0.38, 95% CrI 0.26 to 0.49), and the association between positive contact and intergroup anxiety was not substantially supported by the evidence (γ = −0.01, 95% CrI −0.15 to 0.13, 90% CrI −0.13 to 0.10). The indirect effect, thus the total effect, of positive contact on affective attitudes was not substantially supported by the evidence ($\beta = 0.07$, 95% CrI −0.02 to 0.15, 90% CrI −0.00 to 0.13). The indirect effect, thus the total effect, of negative contact on affective attitudes toward illegal hunters was negative and substantially supported ($\beta = -0.24$, 95% CrI −0.34 to −0.14).

Affective attitudes toward illegal hunters were negatively related to intergroup anxiety (β = −0.24, 95% CrI −0.37 to −0.10) and negative stereotypes about illegal hunters' personalities ($\beta = -0.38$, 95% CrI −0.52 to −0.23). More specifically, both intergroup anxiety ($\beta = -0.09$, 95% CrI −0.15 to −0.03) and negative stereotypes ($\beta = -0.07$, 95% CrI −0.14 to −0.02) mediated the relationship between negative contact and affective attitudes. The expected associations between realistic and symbolic threats and affective attitudes toward illegal hunters were not statistically substantial (β = −0.11, 95% CrI −0.27 to 0.04, 90% CrI −0.24 to 0.02 and β = −0.09, 95% CrI −0.24 to 0.08, 90% CrI −0.22 to 0.05, respectively) (Figure 3). Realistic threat was negatively associated with positive contact (γ = −0.17, 95% CrI −0.29 to −0.04) and positively related to negative contact (γ = 0.53, 95% CrI 0.43 to 0.63). Negative stereotypes had a positive relationship with negative contact ($\gamma = 0.20$, 95% CrI 0.07 to 0.34), and its relationship with positive contact was not statistically substantial ($\gamma = -0.12$, 95% CrI −0.26 to 0.03, 90% CrI −0.24 to 0.00).

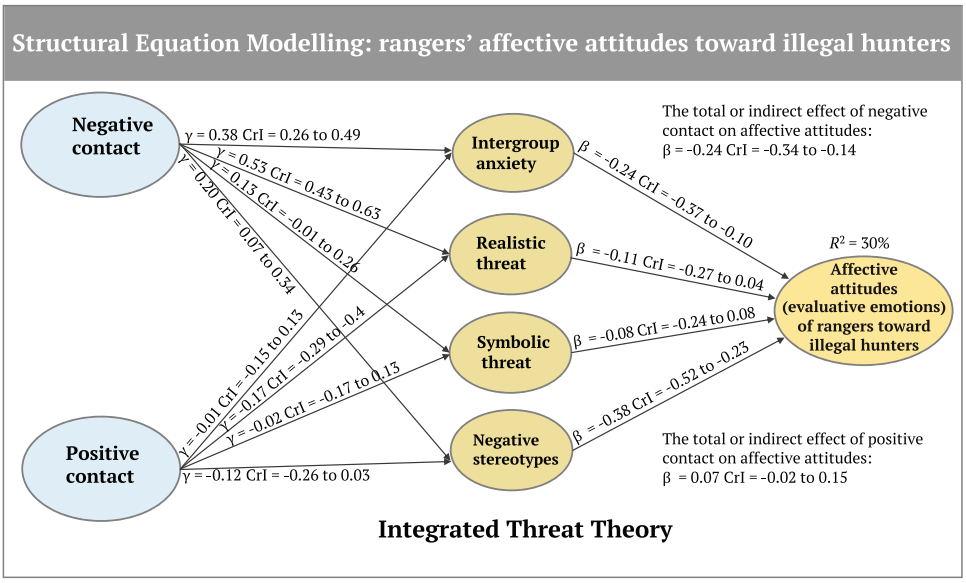

FIGURE 3 Bayesian structural equation modeling results of 282 rangers' attitudes toward illegal hunters across protected areas in the Hyrcanian forests, Iran (β and γ, posterior median standardized estimates; CrI, Bayesian credible intervals of the coefficient; R^2, explained variance; dotted lines, indirect effects). The relationships are substantially supported by the model estimates if their 95% CrIs do not include zero.

DISCUSSION

Our results showed that emotional or affective attitudes of rangers toward illegal hunters were negatively influenced by the degree of fear or anxiety and negative stereotypes about hunters' personalities. These negative emotional attitudes were mediated by frequent negative contact experiences, such as physical harm or verbal abuse, that rangers had with illegal hunters in their daily lives. This appears to represent an instance in which negative contact could indirectly influence emotional attitudes. Our findings further showed partial evidence (90% CrI) that negative contact of rangers with illegal hunters positively increased their perceived symbolic threats. Positive contact of rangers with illegal hunters had a very minor effect on perceived symbolic threats, but its effect was less substantial (90% CrI). Moreover, perceived symbolic threats and perceived realistic threats were negatively related to the affective attitudes of rangers toward illegal hunters; however, these relationships were partially supported by the evidence.

Our findings suggest that rangers' perceptions of realistic threats posed by illegal hunters were reduced when they had positive contact experiences, such as being invited to their homes, playing or working together, and cooperating in community meetings or ceremonies. In contrast, perceived realistic threats of rangers increased with negative contact, such as experiencing insults, discrimination, harassment, verbal abuse, incurring of damage to property, and physical harm. The latter suggests that the more positive contact the rangers have with illegal hunters, the less they would perceive being threatened by them. Earlier evidence suggests that contact—direct and indirect cross-group friendship—among groups under common goals (e.g., nature conservation) can counteract prejudice and intergroup anxiety. This contact needs to occur under conditions of equal status, with no competition and no sanctioning by authorities of the interaction (Allport, 1954; Paolini et al., 2004; Stephan, 2014; Turner et al., 2008; Wright et al., 1997). This kind of contact may diminish the negative perceptions about personality and behavior. Positive interactions between rangers and illegal hunters can foster intergroup relations and achieve conservation goals while maintaining peace and justice through equal status, reducing perceived threats (Blumberg, 2015).

Aberson and Gaffney (2008) note that making contact, even negative, can reduce prejudice and intergroup anxiety. Our data revealed that the majority (63%) of rangers reported cooperating with illegal hunters in community activities or ceremonies, and 59% participated in community meetings with illegal hunters. This strong tendency among rangers for positive contact with illegal hunters suggests that suitable conditions are in place, at least from the rangers' side, to develop cooperative conservation mechanisms. Since rangers often act as key figures in conservation, their role has the capacity to positively influence rule breakers' responses to conservation (Rizzolo et al., 2021).

A potential mechanism to reduce conflict between rangers and other interest groups is to develop comanagement arrangements, such as the presence of a formal and operative co-management body representing all stakeholder groups (de Pourcq et al., 2015). Adopting alternative conservation models that reduce the reliance on enforcement by government authorities may reduce tension between conservation authorities and illegal hunters (Lele et al., 2010).

Our results indicated that increased negative contact of rangers with illegal hunters positively influenced negative stereotypes, intergroup anxiety, and the realistic threat response. Rangers' negative stereotypes and intergroup anxiety were associated with threats experienced from negative contact (e.g.,

being insulted or threatened) with illegal hunters. Thus, reducing prejudice and modifying emotions require an active, goal-oriented effort to establish more positive contact between rangers and illegal hunters within community-based conservation interventions. A plausible reason rangers tended to interact less frequently with illegal hunters (e.g., only 10% of rangers had invited illegal hunters to their homes, but 28% were invited by illegal hunters to their homes) is that rangers appeared apprehensive or worried about doing so. Such avoidance is likely associated with a set of perceived personality traits and negative attitudes about illegal hunters due to negative experiences. For example, some rangers perceived illegal hunters as having stereotypic personalities, such as being arrogant, immoral, cruel, and brutal. These perceived negative personalities can stimulate subjective threats, which, ultimately, could lead rangers to have feelings of disdain or hatred toward illegal hunters (González et al., 2008). Stereotyping from one social group toward another can generate and reinforce disparities (Bertrand & Duflo, 2017; Jenkins et al., 2017).

Militarization of rangers fails to enhance rangers' safety; instead, it harms their reputation and psychological well-being and generates or strengthens negative perceptions of rangers, eroding the level of trust among local communities (Belhekar et al., 2020; Duffy et al., 2019). Maintaining positive relationships requires investment in ranger training and education, including ensuring that there is adequate training in ethical standards and codes of conduct. Such training and education require institutional support (Appleton et al., 2021; Stephan, 2014). In Iran, rangers are mainly trained in law enforcement, wildlife monitoring, patrol techniques, basic wildlife ecology, and conservation and management of PAs. Besides this training, we propose that rangers be trained in sociopsychology principles, such as implicit biases training, which influences individuals' judgments and behavior when a situation is ambiguous (Spencer et al., 2016). For example, when evidence about a wildlife crime event is insufficient, it may drive rangers to rely on prejudice and stereotypes when attempting to resolve uncertain situations. Therefore, developing ways of responding to anxiety, fear, anger, hostility, and other harmful attitudes and relevant communication skills (e.g., control over the expression of prejudice and stereotyping [Stephan, 2014]) under stressful and ambiguous situations is important for effective law enforcement at the level of the individual ranger.

Our results provide insights into how tensions between rangers and conservation rule breakers could be reduced. Our results are likely to be highly applicable across the Global South because Iran has law enforcement practices similar to many countries in the Middle East, Asia, and Africa. On average, 2.8 rangers die annually throughout Iran (www.doe.ir), which represents 2% of global ranger deaths (The World Bank, 2023). Our results suggest that providing safe spaces for rangers and illegal hunters to have positive interactions could help reduce conflict and lead to the development of cooperative conservation mechanisms. Engaging rangers and illegal hunters in cooperative conservation interventions can be challenging. Rangers' decisions to (or not to) cooperate with illegal hunters in wildlife management are fundamentally shaped by individual motivations (e.g., financial) and social norms, beliefs, values, or perceived risks related to cooperating with illegal hunters (St. John et al., 2015). Interventions such as joint herbivore or carnivore monitoring or patrolling (Dolrenry et al., 2016; Ghoddousi et al., 2019) offer opportunities for establishing positive contact between groups. Nevertheless, interventions alone are unlikely to be sufficient to reduce negative interactions because historical, sociopolitical, and legal dimensions also affect trust building between groups (Redpath et al., 2015). Therefore, motivating rangers and illegal hunters to interact and engage in conflict management processes could be challenging.

An important caveat to our study is that we examined only perceptions of rangers toward illegal hunters and thus lacked the equivalent information on perceptions of illegal hunters toward rangers. However, our results captured a set of perceived threat mechanisms linking information from one side of the interaction to another side.

Negative emotional states can lead to not only physical injuries and death, but also to fear that enforcement encounters might affect mental health and well-being (Belhekar et al., 2020). The ITT has been proven to explain conflicts in various social contexts around the world and has been applied in the design of interventions to reconcile them (reviewed by Ramiah & Hewstone [2013], and case studies are in González et al. [2008] for the Netherlands and in Çakal et al. [2016] for Turkey). The rich literature on the ITT and contact theory highlights its importance in understanding and reducing tensions among various social groups. Our study, for the first time, introduces this theory to conservation scholars and practitioners. We do not contend that intergroup contact is a panacea for reducing tensions; however, evidence suggests that contact generally does not exacerbate negative relations. Instead, it plays a positive role if the specific conditions of the intergroup contact theory, such as equal status, no competition, and no authority sanctions, are present (Allport, 1954). Our study shows how ITT and intergroup contact theory can be applied to conservation law enforcement. Conservation authorities can utilize such frameworks to devise communication strategies and conservation interventions to decrease tensions between rule breakers and conservation law enforcement.

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REFERENCES

Aberson, C. L., & Gaffney, A. M. (2008). An integrated threat model of explicit and implicit attitudes. *European Journal of Social Psychology*, *39*, 808–830.

Akhani, H., Djamali, M., Ghorbanalizadeh, A., & Ramezani, E. R. (2010). Plant biodiversity of Hyrcanian relict forests, N Iran: An overview of the flora, vegetation, palaeoecology and conservation. *Pakistan Journal of Botany*, *42*, 231–258.

Allport, G. W. (1954). *The nature of prejudice*. Reading, MA: Addison Wesley.

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, *103*, 411–423.

Appleton, M. R., Cary-Elwes, J., Fritze, C., Galliers, C., Long, B., Lowton, M., McCallum, J., Singh, R., & Stanciu, E. (2021). What will it take to professionalize rangers? *Parks Stewardship Forum*, *37*(1), 174–184.

Ashayeri, S., & Newing, H. (2012). Meat, markets, pleasure, and revenge: Multiple motivations for hunting in Bamu National Park, Fars Province, Iran. *Parks*, *18*(1), 125–133.

Asparouhov, T., & Muthén, B. (2010). *Bayesian analysis using Mplus: Technical implementation*. Muthén & Muthén. https://www.statmodel.com/download/Bayes3.pdf

Asparouhov, T., & Muthén, B. (2021). Advances in Bayesian model fit evaluation for structural equation models. *Structural Equation Modeling: A Multidisciplinary Journal*, *28*, 1–14.

Belhekar, V., Paranjpye, P., Bhatkhande, A., & Chavan, R. (2020). Guarding the guardians: Understanding the psychological well-being of forest guards in Indian tiger reserves. *Biodiversity*, *21*, 83–89.

Bennett, N. J. (2016). Using perceptions as evidence to improve conservation and environmental management. *Conservation Biology*, *30*, 582–592.

Bertrand, M., & Duflo, E. (2017). Field experiments on discrimination. In A. Banerjee & E. Duflo (Eds.), *Handbook of economic field experiments* (pp. 309–393). North Holland.

Blumberg, H. (2015). The relevance of psychology to conservation conflicts. In S. Redpath, R. Gutiérrez, K. Wood, & J. Young (Eds.), *Conflicts in conservation: Navigating towards solutions (Ecological reviews)* (pp. 122–136). Cambridge University Press.

Boin, J., Rupar, M., Graf, S., Neji, S., Spiegler, O., & Swart, H. (2021). The generalization of intergroup contact effects: Emerging research, policy relevance, and future directions. *Journal of Social Issues*, *77*, 105–131.

Çakal, H., Hewstone, M., Güler, M., & Heath, A. (2016). Predicting support for collective action in the conflict between Turks and Kurds: Perceived threats as a mediator of intergroup contact and social identity. *Group Processes & Intergroup Relations*, *19*, 732–752.

Challender, D. W. S., & MacMillan, D. C. (2014). Poaching is more than an enforcement problem. *Conservation Letters*, *7*, 484–494.

Convention on Biological Diversity (CBD). (2022). *Draft decision for the fifteenth meeting of the conference of the parties to the convention on biological diversity*. https://www.cbd.int/doc/c/c9de/d8ef/7225d7bb822f39ad3426c52b/cop-15-02-en.pdf

Critchlow, R., Plumptre, A. J., Driciru, M., Rwetsiba, A., Stokes, E. J., Tumwesigye, C., Wanyama, F., & Beale, C. M. (2015). Spatiotemporal trends of illegal activities from ranger-collected data in a Ugandan national park. *Conservation Biology*, *29*(5), 1458–1470. Portico. https://doi.org/10.1111/cobi.12538

Cusack, J. J., Bradfer-Lawrence, T., Baynham-Herd, Z., Castelló y Tickell, S., Duporge, I., Hegre, H., Moreno Zárate, L., Naude, V., Nijhawan, S., Wilson, J., Zambrano Cortes, D. G., & Bunnefeld, N. (2020). Measuring the intensity of conflicts in conservation. *Conservation Letters*, *14*(3), Article e12783.

De Pourcq, K., Thomas, E., Arts, B., Vranckx, A., Léon-Sicard, T., & Van Damme, P. (2015). Conflict in protected areas: Who says co-management does not work? *PLoS ONE*, *10*(12), Article e0144943.

Dolrenry, S., Hazzah, L., & Frank, L. G. (2016). Conservation and monitoring of a persecuted African lion population by Maasai warrior. *Conservation Biology*, *30*, 467–475.

Duffy, R., Masséa, F., Smidt, E., Marijnen, E., Büscherc, B., Verweijen, J., Ramutsindela, M., Simlaie, T., Joannya, L., & Lunstrumf, E. (2019). Why we must question the militarisation of conservation. *Biological Conservation*, *232*, 66–73.

Dunn, W. L., & Shultis, J. K. (2022). Markov chain Monte Carlo. In W. L. Dunn & J. K. Shultis (Eds.), *Exploring Monte Carlo methods* (2nd ed., pp. 189–254). Elsevier.

Firouz, E. (2005). *The complete fauna of Iran*. I. B. Tauris.

Gaynor, K. M., Fiorella, K. J., Gregory, G. H., Kurz, D. J., Seto, K. L., Withey, L. S., & Brashares, J. S. (2016). War and wildlife: Linking armed conflict to conservation. *Frontiers in Ecology and the Environment*, *14*, 533–542.

Ghoddousi, A., Soofi, M., Hamidi, A. K., Ashayeri, S., Egli, L., Ghoddousi, S., Speicher, J., Khorozyan, I., Kiabi, B. H., & Waltert, M. (2019). The decline of ungulate populations in Iranian protected areas calls for urgent action against poaching. *Oryx*, *53*, 151–158.

Ghoddousi, A., Van Cayzeele, C., Negahdar, P., Soofi, M., Kh Hamidi, A., Bleyhl, B., Fandos, G., Khorozyan, I., Waltert, M., & Kuemmerle, T. (2022). Understanding spatial patterns of poaching pressure using ranger logbook data to optimize future patrolling strategies. *Ecological Applications*, *32*(5). Portico. https://doi.org/10.1002/eap.2601

Global Conservation. (2018). *Over one thousand park rangers die in 10 years protecting our parks and wildlife*. https://globalconservation.org/news/over-one-thousand-park-rangers-die-10-years-protecting-our-parks/

González, K. V., Verkuyten, M., Weesie, J., & Poppe, E. (2008). Prejudice towards Muslims in the Netherlands: Testing integrated threat theory. *The British Journal of Social Psychology*, *47*, 667–685.

Hayes, A. F., & & Coutts, J. J. (2020). Use omega rather than Cronbach's alpha for estimating reliability. But…. *Communication Methods and Measures*, *14*, 1–24.

Hespanhol, L., Vallio, C. S., Costa, L. M., & Saragiotto, B. T. (2019). Understanding and interpreting confidence and credible intervals around effect estimates. *Brazilian Journal of Physical Therapy*, *23*, 290–301.

Jenkins, A. C., Karashchuk, P., Zhue, L., & Hsua, M. (2017). Predicting human behavior toward members of different social groups. *Proceedings of the National Academy of Sciences of the United States of America*, *115*, 9696–9701.

Keane, A., Jones, J. P. G., Edwards-Jones, G., & Milner-Gulland, E. J. (2008). The sleeping policeman: understanding issues of enforcement and compliance in conservation. *Animal Conservation*, *11*(2), 75–82. Portico. https://doi.org/10.1111/j.1469-1795.2008.00170.x

Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). The Guilford Press.

Krüppel, J., Yoon, D., Fieg, K., Sharma, P., & Mokros, A. (2021). On the relationship between right-wing attitudes, conspiracy beliefs, and intergroup threat: Introducing an indirect measure for intergroup threat. *Journal of Theoretical Psychology*, *5*, 354–365.

Kruschke, J. K. (2021). Bayesian analysis reporting guidelines. *Nature Human Behaviour*, *5*, 1282–1291.

Lee, S. Y. (2007). *Structural equation modeling: A Bayesian approach*. Wiley.

Lele, S., Wilshusen, P., Brockington, D., Seidler, R., & Bawa, K. (2010). Beyond exclusion: Alternative approaches to biodiversity conservation in the developing tropics. *Current Opinion in Environmental Sustainability*, *2*, 94–100.

Link, W. A., & Eaton, M. J. (2011). On thinning of chains in MCMC. *Methods in Ecology and Evolution*, *3*(1), 112–115. Portico. https://doi.org/10.1111/j.2041-210x.2011.00131.x

Little, R. J. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American statistical Association*, *83*, 1198–1202.

Moore, J. F., Mulindahabi, F., Masozera, M. K., Nichols, J. D., Hines, J. E., Turikunkiko, E., & Oli, M. K. (2017). Are ranger patrols effective in reducing poaching-related threats within protected areas? *Journal of Applied Ecology*, *55*(1), 99–107. Portico. https://doi.org/10.1111/1365-2664.12965

Moreto, W. D. (2016). Occupational stress among law enforcement rangers: Insights from Uganda. *Oryx*, *50*, 646–654.

Moreto, W. D., Brunson, R. K., & Braga, A. A. (2017). 'Anything we do, we have to include the communities': Law enforcement rangers' attitudes towards

and experiences of community–ranger relations in wildlife protected areas in Uganda. *The British Journal of Criminology*, *57*, 924–944.

Moreto, W. D., & Charlton, R. (2019). Rangers can't be with every elephant: Assessing rangers' perceptions of a community, problem solving policing model for protected areas. *Oryx*, *55*, 89–98.

Müller, J., Sagheb-Talebi, K., & Thorn, S. (2017). Protect Iran's ancient forest from logging. *Science*, *355*(6328), 919–919. https://doi.org/10.1126/science.aam8810

Muthén, B., & Asparouhov, T. (2012). Bayesian structural equation modeling: A more flexible representation of substantive theory. *Psychological Methods*, *17*, 313–335.

Muthén, L. K., & Muthén, B. O. (2022). *Mplus user's guide (version 8.8)*. Muthén and Muthén.

Paolini, S., Hewstone, M., Cairns, E., & Voci, A. (2004). Effects of direct and indirect cross-group friendships on judgments of Catholics and Protestants in Northern Ireland: The mediating role of an anxiety-reduction mechanism. *Personality and Social Psychology Bulletin*, *30*, 770–786.

Pettigrew, T. F. (1997). Generalized Intergroup Contact Effects on Prejudice. *Personality and Social Psychology Bulletin*, *23*(2), 173–185. https://doi.org/10.1177/0146167297232006

Pettigrew, T. F. (1998). Intergroup contact theory. *Annual Review Psychology*, *49*, 65–85.

Pettigrew, T. F., Wagner, U., & Christ, O. (2010). Population ratios and prejudice: Modelling both contact and threat effects. *Journal of Ethnic and Migration Studies*, *36*, 635–650.

Pienkowski, T., Kean, A., Castello y Tickell, S., de Lange, E., Hazenbosch, M., Khanyari, M., Arlidge, W., Baranyi, G., Brittain, S., Kapoor, V., Mohan, V., Papworth, S., Ravi, R., Smit, I., & Millner-Gulland, E. J. (2022). Protecting those who protect nature by supporting conservationists' mental well-being. Preprint. Research Square. https://doi.org/10.21203/rs.3.rs-1132018/v1

Ramiah, A. A., & Hewstone, M. (2013). Intergroup contact as a tool for reducing, resolving, and preventing intergroup conflict evidence, limitations, and potential. *American Psychologist*, *68*, 527–542.

Redpath, S., Gutiérrez, R., Wood, K., & Young, J. (2015). *Conflicts in conservation: Navigating towards solutions*. Cambridge University Press.

Renström, E. A., Bäck, H., & Carroll, R. (2022). Protecting the ingroup? Authoritarianism, immigration attitudes, and affective polarization. *Frontiers in Political Science*, *4*, Article 919236.

Riek, B. M., Mania, E. W., & Gaertner, S. L. (2006). Intergroup threat and outgroup attitudes: A meta-analytic review. *Personality and Social Psychology Review: An Official Journal of the Society for Personality and Social Psychology*, *10*, 336–353.

Ripple, W. J., Abernethy, K., Betts, M. G., Chapron, G., Dirzo, R., Galetti, M., Levi, T., Lindsey, P. A., Macdonald, D. W., Machovina, B., Newsome, T. M., Peres, C. A., Wallach, A. D., Wolf, C., & Young, H. (2016). Bushmeat hunting and extinction risk to the world's mammals. *Royal Society Open Science*, *3*, Article 160498.

Rizzolo, J. B., Gore, M. L., Long, B., Trung, C. T., Kempinski, J., Rawson, B., Huyen, H. T., & Viollaz, J. (2021). Protected area rangers as cultural brokers? Implications for wildlife crime prevention in Viet Nam. *Frontiers in Conservation Science*, *2*, Article 698731.

R Core Team. (2023). *R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing*, Vienna, Austria. https://www.R-project.org/

Sardari, P., Felfelian, F., Mohammadi, A., Nayeri, D., & Davis, E. O. (2022). Evidence on the role of social media in the illegal trade of Iranian wildlife. *Conservation Science and Practice*, *4*(7). Portico. https://doi.org/10.1111/csp2.12725

Scheines, R., Hoijtink, H., & Boomsma, A. (1999). Bayesian estimation and testing of structural equation models. *Psychometrika*, *64*, 37–52.

Schulze, K., Knights, K., Coad, L., Geldmann, J., Leverington, F., Eassom, A., Marr, M., Butchart, S. M., Hockings, M., & Burgess, N. D. (2018). An assessment of threats to terrestrial protected areas. *Conservation Letters*, *11*(3), Article e12435.

Song, X.-Y., & Lee, S.-Y. (2012). A tutorial on the Bayesian approach for analyzing structural equation models. *Journal of Mathematical Psychology*, *56*(3), 135–148.

Soofi, M., Ghoddousi, A., Zeppenfeld, T., Shokri, S., Soufi, M., Jafari, A., Ahmadpour, M., Qashqaei, A. T., Egli, L., Ghadirian, T., Chahartaghi, N. R., Zehzad, B., Kiabi, B. H., Khorozyan, I., Balkenhol, N., & Waltert, M. (2018). Livestock grazing in protected areas and its effects on large mammals in the Hyrcanian forest, Iran. *Biological Conservation*, *217*, 377–382. https://doi.org/10.1016/j.biocon.2017.11.020

Soofi, M., Qashqaei, A. T., Mousavi, M., Hadipour, E., Filla, M., Kiabi, B. H., Bleyhl, B., Ghoddousi, A., Balkenhol, N., Royle, A., Pavey, C. R., Khorozyan, I., & Waltert, M. (2022). Quantifying the relationship between prey density, livestock and illegal killing of leopards. *Journal of Applied Ecology*, *59*, 1536–1547.

Soofi, M., Qashqaei, A. T., Trei, J. N., Shokri, S., Selyari, J., Ghasemi, B., Sepahvand, P., Egli, L., Nezami, B., Zamani, N., Yusefi, G. H., Kiabi, B. H., Balkenhol, N., Royle, A., Pavey, C. R., Redpath, S. M., & Waltert, M. (2022). A novel application of hierarchical modelling to decouple sampling artifacts from socio-ecological effects on poaching intensity. *Biological Conservation*, *267*, Article 109488.

Spencer, K. B., Charbonneau, A. K., & Glaser, H. (2016). Implicit bias and policing. *Social and Personality Psychology Compass*, *10*(1), 50–63.

Stephan, W. G. (2014). Intergroup Anxiety. *Personality and Social Psychology Review*, *18*(3), 239–255. https://doi.org/10.1177/1088868314530518

Stephan, W. G., Diaz-Loving, R., & Duran, A. (2000). Integrated Threat Theory and Intercultural Attitudes. *Journal of Cross-Cultural Psychology*, *31*(2), 240–249. https://doi.org/10.1177/0022022100031002006

Stephan, W. G., Ybarra, O., & Bachman, G. (1999). Prejudice Toward Immigrants. *Journal of Applied Social Psychology*, *29*(11), 2221–2237. Portico. https://doi.org/10.1111/j.1559-1816.1999.tb00107.x

St John, F. A. V., Mai, C. H., & Pei, K. J. C. (2015). Evaluating deterrents of illegal behaviour in conservation: Carnivore killing in rural Taiwan. *Biological Conservation*, *189*, 86–94.

Stephan, W. G., Boniecki, K. A., Ybarra, O., Bettencourt, A., Ervin, K. S., Jackson, L. A., McNatt, P. S., & Renfro, C. L. (2002). The role of threats in the racial attitudes of Blacks and Whites. *Personality and Social Psychology Bulletin*, *28*, 1242–1254.

Stephan, W. G., & Stephan, C. W. (1985). Intergroup anxiety. *Journal of Social Issues*, *41*, 157–175.

Stephan, W. G., & Stephan, C. W. (2000). An integrated threat theory of prejudice. In S. Oskamp (Ed.), *Reducing prejudice and discrimination* (pp. 23–45). Lawrence Erlbaum Associates.

The World Bank. (2023). World Development Indicators. https://data.worldbank.org/

Turner, R. N., Hewstone, M., Voci, A., & Vonofakou, C. (2008). A test of the extended intergroup contact hypothesis: The mediating role of intergroup anxiety, perceived ingroup and outgroup norms, and inclusion of the outgroup in the self. *Journal of Personality and Social Psychology*, *95*, 843–860.

Turner, R. N., Tam, T., Hewstone, M., Kenworthy, J., & Caims, E. (2013). Contact between Catholic and Protestant schoolchildren in Northern Ireland. *Journal of Applied Social Psychology*, *43*, E216–E228.

Ulitzsch, E., Lüdtke, O., & Robitzsch, A. (2021). Alleviating estimation problems in small sample structural equation modeling—A comparison of constrained maximum likelihood, Bayesian estimation, and fixed reliability approaches. *Psychological Methods*, *28*, 527–557.

United Nations Educational, Scientific and Cultural Organization (UNESCO). (2019). *Hyrcanian forest (Caspian forest), description*. http://whc.unesco.org/en/tentativelists/5214/

Ursachi, G., Horodnic, I. A., & Zait, A. (2015). How reliable are measurement scales? External factors with indirect influence on reliability estimators. *Procedia Economics and Finance*, *20*, 679–686.

Wilfred, P., Kayeye, H., Magige, F. J., Kisingo, A., & Nahoyo, C. L. (2019). Challenges facing the introduction of SMART patrols in a game reserve, western Tanzania. *African Journal of Ecology*, *57*, 523–530.

Wright, S. C., Aron, A., McLaughlin-Volpe, T., & Ropp, S. A. (1997). The extended contact effect: Knowledge of cross-group friendships and prejudice. *Journal of Personality and Social Psychology*, *73*, 73–90.

Young, J. C., Rose, D. C., Mumby, H. S., Benitez-Capistros, F., Derrick, C. J., Finch, T., Garcia, C., Home, C., Marwaha, E., Morgans, C., Parkinson, S., Shah, J., Wilson, K. A., & Mukherjee, N. (2018). Methodological guide to using and reporting on interviews in conservation science research. *Methods in Ecology and Evolution*, *9*, 10–19.

SUPPORTING INFORMATION

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

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