


CONTRIBUTED PAPER

More than a feeling: Cognitive beliefs and positive—but not negative—affect predict overall attitudes toward predators

Laura R. Perry  | Tom P. Moorhouse | Kim Jacobsen | Andrew J. Loveridge | David W. Macdonald

All at the Wildlife Conservation Research Unit, Department of Zoology, University of Oxford, Oxford, UK

Correspondence

Laura R. Perry, All at the Wildlife Conservation Research Unit, Department of Zoology, University of Oxford, Tubney House, Abingdon Rd, Oxford OX13 5QL, UK.

Email: laura.perry@zoo.ox.ac.uk

Funding information

Darwin Initiative for Biodiversity, Grant/Award Number: 23-018; National Geographic Society; Robertson Foundation; Rufford Foundation; WWF UK

Abstract

Attitudes, which can be thought of as the sum of individuals' thoughts, feelings, and beliefs concerning an attitude object, inform how people interact with the world around them. An understanding of attitudes may play an important role in promoting desirable human behavior, and attitudes studies should be incorporated into any behavior-change intervention. One framework for understanding attitudes is the ABC, or "tripartite" model, which says that affect ("A," i.e., emotional response); previous behavior ("B"); and cognition ("C," i.e., beliefs) are the basis for an individual's attitude. Although this framework is widely used in social psychology, few conservation studies break down the "attitude" monolith into these more usable components. In this study, we sought apply the ABC framework to understand how affect and cognitive beliefs relate to overall attitude toward predators across southern Kenya and north-west Zimbabwe. We used a factor analysis approach to identify latent affective ($n = 3$) and cognitive ($n = 3$) factors relating to human–predator interactions. These factors were then used to construct a regression model, which examined the power of the psychological factors to explain overall attitudes toward predators. We found that the model explained 27% of variation in attitudes, with four independently significant factors: location; perceived harms of living with predators; perceived benefits of killing predators; and positive affect. Although effect sizes were relatively small, these results suggest that cognitive beliefs may substantially influence attitudes, and therefore that interventions which seek to (a) remove the factual basis for negative beliefs and (b) improve perceptions or dispel unfounded beliefs may play a significant role in changing overall attitudes toward predators.

KEYWORDS

behavior, conflict mitigation, conservation psychology, human–wildlife conflict

This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2021 The Authors. *Conservation Science and Practice* published by Wiley Periodicals LLC on behalf of Society for Conservation Biology.

1 | INTRODUCTION

Although there is debate concerning which parts of human behavior are predicted by attitudes, and under what circumstances (Forward, 1997; Friese et al., 2008), it is often true that attitudes inform behavior (Ajzen, 2001; Ajzen & Fishbein, 2000; Wallace et al., 2005), and therefore interventions which focus on improving attitudes can be used to encourage or discourage certain behaviors (Hunecke et al., 2007; Sparks & Shepherd, 2002). In conservation, where human behavior is perhaps the leading cause of threats to biodiversity, from trade in exotic wildlife to predator persecution, understanding how to modify attitudes to encourage pro-conservation behavior is of considerable importance.

An attitude can broadly be summarized as a person's overall evaluation of an object or topic, with both emotional and evaluative dimensions (Ajzen, 2001; Ajzen & Fishbein, 2000). In other words, attitude is the sum of all thoughts, feelings, judgments, and opinions about a particular object (Ajzen, 2001; Petty et al., 1997). One commonly used model of attitude is the ABC, or tripartite model, which includes affect, behavior, and cognition as predictors of attitude (Breckler, 1984; Jackson et al., 1996; Millar & Tesser, 1989; Wolff et al., 2011). "Affect" is generally used to refer to the overall feelings toward an attitude object, including emotions and strength of feeling toward that object (Ajzen, 2001; Watson et al., 1988). "Behavior" reflects the fact that attitudes and behavior are interlinked, and attitude can be informed by prior behavior and vice versa. Finally, "cognition" refers to the evaluations, beliefs, and perceptions of an object, that is, all the factual or perceived factual information available to an individual (Ajzen, 2001; Haddock & Zanna, 1999).

Understanding the components of attitude can have practical implications, either through greater understanding of an individual or community's "psychological landscape" (see Perry, Moorhouse, Loveridge, & Macdonald, 2020), or through the relationship between these components and actual behavior. Indeed, previous studies have shown that affect can influence both overall attitudes and behavioral intention: St John et al. (2018) showed that, in the context of illegal hunting within a national park, affective perceptions of danger substantially determined individuals' intention to hunt different species: more dangerous species held more appeal and hunters indicated a significantly greater behavioral intention to hunt those species. Amit and Jacobson (2017) found that distinct groups within a human population may be characterized by their attitudes toward predators; one cluster of participants were characterized primarily by their negative affect toward predators, and emerged as a substantially distinct attitude cluster on the basis of affect alone. Affect can also mediate perceptions

and beliefs regarding predators, as in central Italy, where affect mediated the impact of perceptions and beliefs on overall attitudes toward wolves and bears in the region (Glikman et al., 2012).

Other authors have found that cognition and beliefs may have an important role in influencing overall attitudes. For example, perceptions of the level of risk posed by wildlife species can explain the degree of tolerance, or willingness to coexist exhibited by human populations (Zajac et al., 2012). In southern Africa, Kansky et al. (2021b) found that perceived benefits accruing to communities from wildlife may explain variation in tolerance levels for certain wildlife species—so both costs and benefits, which are cognitive evaluations, appear to influence overall perceptions of wildlife (see also Kansky et al., 2021a). Knowledge (a form of cognitive belief) also predicted tolerance of predators in Italy, with better-known predator species tolerated to a greater degree than less-known species (Glikman et al., 2012).

Although both affective and cognitive factors have been shown to influence conservation outcomes, they have seldom been explored together using an attitude-focused theoretical framework. Here, we make use of perhaps the most used attitude model from social psychology—the ABC model—to examine the relationship between affect, cognition, and overall attitudes, as applied to human–predator conflict in southern Kenya and north-west Zimbabwe. We constructed a survey instrument with subcomponents for affective, cognitive, and overall attitudes, and used this to explore the contribution of affective and cognitive terms to overall attitudes toward predators across both study regions (see Figure 1). We hypothesized that (a) affective terms would contribute more to the explanatory power of the model than cognitive terms; and that (b) negative affect would be more influential than positive affect. We also hypothesized that (c) of the cognitive beliefs, perceptions of the harm or damage caused by predators would be the most important factor determining overall attitudes toward predators.

2 | METHODS

2.1 | Study areas

Data from two countries, totaling four different regions, was used in this analysis: in Zimbabwe, data were collected between October 2018 and February 2019 from areas around Hwange National Park; in Kenya, data collection occurred March–October 2019. Data were collected across the South Rift, on the southern edge of the Rift Valley; in community lands around Amboseli National Park; and the greater Tsavo area. In Zimbabwe, the Hwange area has

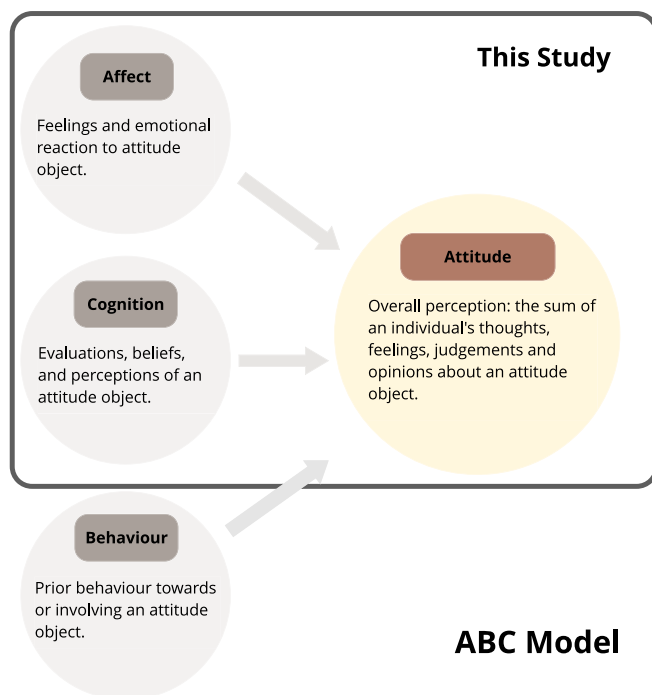


FIGURE 1 ABC model of attitudes, and the subsection of the model used in this study. Adapted from Breckler (1984)

historically benefitted from wildlife through the CAMP-FIRE programme (Frost & Bond, 2008) and ecotourism, although this has more recently been severely impacted by Zimbabwe's ongoing economic collapse (Guerbois et al., 2013). A mix of Ndebele, Nambya, Tonga, and other ethnicities, the people in the area have a long history of livestock, primarily cattle, ownership (Loveridge, Kuiper, et al., 2017). As the largest national park in Zimbabwe, Hwange has large resident populations of lion, hyena, leopards, and other smaller carnivores, and conflict between people and predators can be severe (Loveridge, Valeix, et al., 2017).

All three Kenyan regions that were included in this study are situated along the southern border with Tanzania. This part of the country is rich in wildlife, and contains some of the world's most popular national parks, including the Maasai Mara, Amboseli, and Tsavo. The landscape has relatively few barriers to wildlife movement, and the area has contiguous populations of large-bodied predators including lion, leopard, cheetah, and spotted hyena (Western, 2017). Similarly to the Zimbabwe study region, livestock production is a critical source of livelihood for these Kenyan communities, who are primarily Maasai, with some Kikuyu and Kamba people. Locals are traditional pastoralists, and keep large numbers of goats and cows. With resident predator populations, predation of livestock can be a substantial source of hardship for livestock producers; Maasai people

also practice traditional predator killing which, although declining, still has strong cultural and social roots (Hazzah et al., 2014).

2.2 | Survey

2.2.1 | Survey participants and data collection

Survey protocol was approved by the University of Oxford Social Sciences and Humanities Interdivisional Research Ethics Committee (Reference No. R53944/RE001). Surveys were pretranslated into a selection of the local languages (Kiswahili, Maa, Ndebele, and Nambya) through a group discursive process, with translate-retranslate methodology where there was low translation consensus (Lucas & Ware, 1977; Perry, Moorhouse, Loveridge, & Macdonald, 2020).

To overcome practical limitations, a convenience sample was used. Participants were selected at random as far as possible, and similar convenience-based approaches have been found to exhibit no significant differences from probability-based samples (Luschei et al., 2009). Participants were recruited at opportunistic meetings in communal spaces (e.g., markets), or via door-to-door surveying. Prior to the interview, participants were asked “Do you live in [the local area]?,” and “Do you or anyone in your immediate family work for [local conservation NGOs]?” Individuals who did not live locally or who worked in conservation were considered unsuitable, and were excluded from the sample. All surveys were conducted as face-to-face structured interviews, carried out by trained local research assistants, in the language preferred by the interviewee. Responses were logged in the Qualtrics offline survey application (Qualtrics, 2013). Each local research assistant operated in their home region; possible interviewees who were well-known to the research assistant (close friends, family members, etc.) were not included in the sample. Once willing participants were identified, they were asked to move to an area where they could be interviewed privately; no observers were present for interviews. All participants in the survey were involved in livestock management, and were 18 years or older. The data used in this analysis were collected as part of a larger survey. In total, 1285 usable responses were collected.

2.2.2 | Survey design

Qualitative interviews were carried out with community members and leaders in all the study communities ($n \geq 10$ on each site), to understand the background to

conflict with predators and predator control. These data were used to characterize predator control techniques, and inform question design and phrasing to capture the appropriate local meaning. Each question block subsequently was designed based on our understanding of the attitudes, beliefs, and behaviors exhibited by the study populations with regard to livestock management and predators. The core survey questions concerned attitudes, behaviors and beliefs regarding predators and predator control. Attitude questions were split into separate blocks for “global,” overall attitudes toward predators ($n = 5$, e.g., “Conflict with predators is a threat to livelihood in this area”); affect ($n = 15$, e.g., “How much do activities to do with predator control make you feel proud?”); and cognitive beliefs ($n = 13$, e.g., “For all predators in area to be killed in the next 5 years would be beneficial”), all of which were measured on 5-point Likert scales (see Appendix 1 for details; Perry, Moorhouse, Loveridge, & Macdonald, 2020).

2.3 | Data analysis

We aimed to explore how affective and cognitive components of attitude contributed to individuals' overall attitudes toward predators. All analyses were carried out using the statistical software R, version 4.0.2 (R Core Team, 2020).

2.3.1 | Explanatory variables

Exploratory factor analysis was used to identify the approximate structure of affect and cognitive beliefs (Perry, Moorhouse, Sibanda, et al., 2020). This technique identifies how participants' responses to subsets of questions cluster together, and therefore suggests the factor structure onto which the questions map. Based on these clusters, and the theoretical background used when developing the survey (see Figure 1 and Table 1), we developed five factors for affect, and four for cognition, onto which the survey questions mapped. Confirmatory factor analysis was subsequently used to test the construct validity of each of these factors ($n = 9$), and ensure they adequately represented the underlying psychological variables. We used the comparative fit index (CFI), standardized root mean square of residuals (SRMSR), and root mean square error of approximation (RMSEA) to test factor structure fit (see Appendix 2).

To confirm the internal consistency of the factors, we used Cronbach's alpha (see Table 1). Correlation tests using R package “arm” (Gelman et al., 2020) were then run to check that all factors were sufficiently independent to be

meaningful. Once we had determined which questions were to be included in each factor, a composite score was made for each factor containing between two and five separate questions. All responses were scored on the same 5-point Likert scale, so simple addition of the individual question responses was used to generate the composite scores.

2.3.2 | Response variable

To examine how affect and cognition explain participants' overall attitude toward predators, we used overall attitude terms to form a composite response variable (see Appendix 3 for details). Five global attitude questions were incorporated into this composite with equal weighting (“Predators are an important part of the natural environment”; “Livestock and predators can coexist, if managed correctly”; “If livestock is managed correctly, it is not killed by predators”; “Predator killing is important in my culture”; “Conflict with predators is a threat to livelihood in this area”), giving a composite range of 5 to 25 points.

2.3.3 | The attitudes toward predators model

Due to data collection limitations, we chose to include only site and respondent age as additional variables. Site was included as a simply coded categorical variable, with “Amboseli” as the reference level. Based on existing literature and the clustering approach outlined above, we retained all psychological factors which met our validity, consistency, and independence requirements. We then performed linear regression analyses, to test the effect of the retained psychological factors, site, and age on overall attitude toward predators. Assumptions of the model, including normal distribution and homoscedasticity, were met. Model fit was assessed using the adjusted R^2 , F -test, and root mean square error (RMSE).

3 | RESULTS

Overall, 1285 participants were included in the study sample. Of these, 16.1% were in Shompole, 17.9% in Tsavo, 12.1% in Olgulului, 22.3% in Amboseli, and 26.7% in Hwange. Reflecting social and cultural differences in livestock ownership, 74.4% of respondents were male. School attendance varied widely, with 38% of participants having had no formal education, 41.9% with primary level only, and 20% having secondary or tertiary education. The

median number of cattle owned was 11–20, and 21–50 shoats.

We explored how different aspects of affect and cognitive beliefs explained variation in overall attitudes and behaviors toward predators. The factor structures we developed using EFA (see Appendix 2 for factor loadings) and our hypothesized theoretical question clusters were

good fits to the underlying data (for all terms $CFI \geq .93$, $SRMSR \leq .05$, and $RMSEA \leq .1$; see Table 1). A relatively high Cronbach's alpha threshold of 0.7 was used; two factors—one affective factor, and one belief factor—failed to meet this threshold, and were excluded from further analysis. Two factors were considerably correlated ($>.59$; see Appendix 2) and had similarly high Cronbach's alpha

TABLE 1 Psychological factor structures underlying attitudes toward predators, with details on factor properties. Only factors that met our statistical requirements for validity, consistency, and independence are shown

Factor	Definition	Example	No. questions	CA	CFI	SRMSR	RMSEA
<i>Positive feeling</i>	Positive emotional responses to predator-related behaviors	How much do activities to do with predators and predator control make you feel strong?	5	.81	.99	0.021	.084
<i>Negative feeling</i>	Negative emotional responses to predator-related behaviors	How much do activities to do with predators and predator control make you feel afraid?	3	.81	1	<.001	<.001
<i>Predator control enjoyment</i>	Sense of predator-control related enjoyment	I enjoy being involved in predator control.	2	.78	1	<.001	<.001
<i>Social beliefs</i>	Perceptions of socially sanctioned predator-killing	My community feels I should kill any predators that kill livestock.	3	.86	1	<.001	<.001
<i>Perceived harms</i>	Perceptions of the local impact of predator populations	The presence of predators in this area is harmful.	3	.77 ²	1	<.001	<.001
<i>Predator killing benefits</i>	Perceived benefits from killing predators	Killing predators would decrease the number of my livestock that are killed by predators.	4	.73	0.94	0.048	.016
Composite response	-	-	5	NA	0.84	0.049	.072

Abbreviations: CA, Cronbach's alpha; CFI, comparative fit index; RMSEA, root mean square error of approximation; SRMSR, standardized root mean square residuals.

TABLE 2 Main effects in linear model of attitudes toward predators

Variable	Estimate	β coefficients	SE	95% CI		Likelihood ratio test statistic	p
				LL	UL		
Site ^a			0.264			91.83	p < .001
Hwange	−0.954	−0.526	0.162	−1.27	−0.63		
Olgulului	−0.178	−0.140	0.145	−0.46	0.11		
Shompole	−0.775	−0.927	0.135	−1.04	−0.51		
Tsavo	0.461	0.906	0.165	0.13	0.79		
Age	0.940	0.281	0.035	−0.01	0.13	2.67	p = .102
Positive affect	0.976	0.636	0.013	0.01	0.05	3.28	p = .047
Negative affect	−0.989	−0.283	0.020	−0.05	0.02	0.32	p = .570
Predator control enjoyment	1.063	0.186	0.024	0.01	0.11	6.35	p = .117
Social beliefs	0.992	0.176	0.015	−0.04	0.02	0.28	p = .596
Perceived harms	−0.912	−0.724	0.012	−0.12	−0.07	53.17	p < .001
Predator killing benefits	−0.918	−0.534	0.011	−0.11	−0.06	60.04	p < .001

^aReference level “Amboseli.”

scores, so the factor which was considered to be least central to the study's focus (i.e., which was composed of less targeted questions) was dropped, leaving six psychological factors (see Table 1). These six psychological factors (positive feeling, negative feeling, predator control enjoyment, social beliefs, perceived harms, and predator killing benefits) were used as explanatory factors in subsequent modeling. Tests suggested the model was an acceptable fit to the data (adjusted $R^2 = .27$; $F = 35.94$; $p < 2.2\text{e-}16$; RMSE = 1.3).

Overall, four variables significantly explained variation in overall attitudes toward predators: site ($p < .001$); positive affect (β coefficient = .636, $p = .05$), perceived harms ($\beta = -.724$, $p < .001$); and perceived benefits of predator killing ($\beta = -.534$, $p < .001$). There was no significant effect of social beliefs or negative affect on overall attitudes. The model explained 27% of variation in overall attitudes toward predators (adjusted $R^2 = .278$). Site-specific effects were notable and significant (β coefficients for Hwange—0.526; Olgulului—0.140; Shompole—0.927; and Tsavo 0.906, reference level Amboseli) (Table 2).

4 | DISCUSSION

Using a clustering approach, we found six psychologically distinct factors emerged from our data set: three affective and three cognitive terms. These can best be characterized as positive feeling, negative feeling, and enjoyment of predator control for the affective terms, and social beliefs, perceived harms of living with predators, and perceived benefits of predator killing for the cognitive terms (see Table 1). All of these terms were included in our model, along with a location term, and this model explained 27% of the variation in overall attitudes toward predators. Using the model, we found that one affective term (positive affect), two cognitive terms (perceived harms of living with predators, and perceived benefits of predator killing), and site all significantly explained overall attitude.

In this study, we used a simplified form of the ABC (or tripartite) model, incorporating additional terms for age and site (see Figure 1): due to limitations on either directly recording past behavior, and the unreliability of self-report measures, we chose not to include a behavioral component in this study. This limits the explanatory power of the model used, not only in terms of direct behavioral effects on overall attitudes, but also removing the possibility of detecting any interactions between behavior and either affect or cognitive beliefs. However, although multiple versions of the ABC model have been proposed, most authors visualize the model components as relatively separate entities, and we judged that there was merit in focusing on the

affective and cognitive components alone. Indeed, we found both cognitive and affective terms had significant explanatory power; however, future studies should integrate a behavioral measure to explore whether this would give greater explanatory power to the overall model. Other work has explored how the ABC model, or its components, can be used to understand attitudes toward wildlife or human–wildlife conflict scenarios and demonstrated the value of separating out the different attitude components. For example, researchers have shown that affect plays a substantial role in the formation of overall attitudes toward coyotes in Newfoundland, with implications for willingness to coexist (Frank et al., 2016). Similarly, Hudenko (2012) suggests that affect-led decision-making by people may contribute to human–wildlife conflict issues, such as in cases of carnivore habituation by tourists. Cognitions have also been shown to impact wildlife-related behavior, influencing willingness to tolerate panthers in Florida (Rodgers & Pienaar, 2018), and exacerbating conflict between people and snakes in Bahia, Brazil (Fita et al., 2010). As Wilson and Chatterton (2011) discuss, while various psychological models are used to understand and shape people's behavior, the ABC model is among the most useful. However, it behooves scientists and policymakers to make careful judgments about which models are most apposite and useful in any given context (Wilson & Chatterton, 2011). In relation to human–wildlife conflict, we argue that the ABC model offers a meaningful framework for research seeking to help conservationists to identify appropriate conflict mitigation strategies.

Of the affective terms, positive feeling was a statistically significant predictor of overall attitude toward predators. Similar research to understand attitudes toward livestock management in Kenya found that positive but not negative affect was a significant explanatory factor in determining conservation-compatible behavior (in this context, good livestock management practices; Perry, Moorhouse, Loveridge, & Macdonald, 2020). The positive affect associated with predators appears to be in direct conflict with the perceived harms of living with predators, and the benefits of predator killing also reported by study participants. It could be the case that positive affect stems from benefits derived through conservation projects, which mitigate the costs of living with predators (Broekhuis et al., 2020), although these benefits schemes were not available in all study areas. Similarly, individuals have more positive attitudes toward predators where they have greater perceived ownership of wildlife (Broekhuis et al., 2020), and the ability to be involved in land management and predator control activities may actually foster positive attitudes (Smith et al., 2014).

Contrary to our expectations, negative affect was not a significant predictor in the model. This is at odds with

some of the existing literature, which suggests that negative experiences, feelings, and intangible factors have a much greater impact on overall attitudes and behaviors than positive feelings (Barlow et al., 2012; Cohen et al., 2002; Conner et al., 2013; Jackson et al., 1996; Jacobsen et al., in press). In the context of large-bodied predators, it is understandable that feelings of fear and perhaps prior negative experiences can color people's future judgment. It can be incredibly difficult to reduce or prevent the development of negative affect, either as a consequence of a single negative event or long-term difficulties with a given source of conflict. Various studies suggest that an opportunity to fully discuss concerns, difficulties, or traumatic events, and feeling like these have been heard by an authority figure can reduce feelings of negative affect (Leitner et al., 2018; Ochsner et al., 2002), but such follow-up programs should be evaluated carefully, to ensure they are not cementing existing trauma (Van Emmerik et al., 2002). The lack of significance of the negative affect term here may reflect effective conflict mitigation work—or significant benefits programs—implemented by the multiple NGOs working on our study sites. However, this is not the case in other regions, and it is important that evidence-based programs to mitigate and manage negative affect are developed in the future.

Against our expectations, more cognitive terms than affective terms were significant model terms. We found that predator-killing beliefs (e.g., “killing predators would decrease the number of my livestock that are killed by predators”) had a significant effect on overall attitudes toward predators. Similarly, the harms associated with living with predators had significant influence on overall attitudes. This result met our expectations, since living with predators can be very costly for local people (Holmern et al., 2007; Kissui, 2008; Loveridge, Kuiper, et al., 2017; Van Niekerk, 2010). Evidence-based perceptions of real harm are undisputable justification for the intolerance many communities show toward predators, and for conservation programs seeking to preserve predator populations it is critical that the impact of predators on lives and livelihoods is minimized and mitigated. Mitigation and compensation measures must target the precise costs of living alongside predators—which may mean nonfinancial approaches. Indeed, compensation payments, while receiving high levels of social approval, may not result in any increased tolerance for wildlife or conflict (Naughton-Treves et al., 2003), so this must be carried out sensitively. In many parts of Kenya, for example, conflict can arise over the perception of unfair (i.e., low) compensation payments for predated animals. On the other hand, if people's key issue is the potential threat posed by wildlife to individuals, then strategies to increase local security may be more appropriate. In many

situations, however, predators' impact on livelihoods can be overestimated (Amit et al., 2013; Rasmussen, 1999). Efforts to mitigate real conflict—which leads to cognitive beliefs regarding the challenges of coexistence—must therefore go alongside efforts to undermine false beliefs, through tailored education campaigns.

Most conservation projects make a considerable effort to engage communities in outreach events and educational presentations (e.g., Sibanda et al., 2020). That cognitive terms proved more important than affective terms in this study highlights the importance of these education and engagement activities, and demonstrates that cognitive, evaluative judgments can be very important in informing overall attitudes toward human–wildlife conflict (Hudenko, 2012; Wilson, 2008). Cognitive beliefs may not always be rational, but irrational beliefs can often be changed if individuals are exposed to different information (Gawronski & Bodenhausen, 2006; Wyer & Albarracín, 2005). It is therefore important for conservationists to understand the precise mechanisms by which cognitive beliefs are established and changed, in order to maximize the effectiveness of conservation messaging, engagement activities, and education campaigns.

This model did not account for the various social and cultural factors which are thought to affect attitudes toward predators beyond the inclusion of “site” as a model term, which we found to be significant. We would expect various factors including, for example, cultural background (Ma et al., 2017), education (Junker et al., 2015), and affluence (Masud et al., 2014) to influence overall attitudes toward conservation problems. For the purposes of this study, it was not possible to collect the detailed information required to incorporate in these explanatory variables; however, it seems likely that these factors account for at least a portion of the unexplained variance in the model. In this study, we sought to understand the general principles relating the ABC model to attitudes toward predators; for individual conservation projects, there is more merit in carrying out a very applied, local approach. In these instances, integrating more social variables into the data collection plan would be essential to understand in any depth the factors influencing local attitudes.

This study was limited by practicalities: we used a convenience sample; we did not collect other layers of social context data; and the study only involved two locations. These considerations prevented a more nuanced understanding of the situation, and limited our ability to draw broader conclusions. We were also forced to exclude a small number of samples with incomplete entries. As with the nonrandom sample, we do not believe these limitations introduced any measurable bias into the study, but it is for future authors to explore how

a stratified approach, representing various community sectors, might influence results. The relationship between overall attitudes and behaviors is checkered (e.g., Frey & George, 2010) and it is essential that conservation programs use actual behavior change, rather than attitudes alone, to monitor the success of interventions (Nilsson et al., 2020). However, specific, targeted interventions which take advantage of the affective and cognitive components of attitudes and use highly focused messaging to achieve their aims have a promising track record (Kothe et al., 2012; Parrott et al., 2008; Sheeran et al., 2016). In this study, we showed that meaningful differences in attitude components can be identified through the use of a relatively simple surveying approach, and that differences in the composition of attitudes may have implications for the design of targeted conservation interventions. We argue that for the minimal cost of a brief attitudes study, projects could benefit significantly from the ability to focus interventions on specific cognitive beliefs, or affective reactions, and therefore that satisfactory solutions to conflicts are more likely to be found. We showed that both affective and cognitive factors were significant predictors of overall attitudes toward predators. That positive affect was a significant predictor suggests that activities which reinforce positive emotional reactions to wildlife may be effective. The significance of two cognitive terms suggests that, where attitudes toward predators contribute to conflict, programs should aim to (a) design targeted interventions which remove or reduce the conflict underlying these beliefs, and (b) implement education programs to counter false beliefs. Living alongside predators creates many challenges for communities, but with effective mitigation, targeted education, and appropriate benefits, it should be possible for conservation interventions to reduce both antipredator attitudes and behaviors.

ACKNOWLEDGMENTS

The authors would like to thank the groups and organizations who helped with this research, the Hwange Lion Project, the South Rift Association of Land Owners and Big Life Foundation. The authors are also grateful for the support of the Kenya Wildlife Service and Zimbabwe National Parks and Wildlife. This research was funded by the National Geographic Foundation, the Rufford Foundation, WWF UK, the Darwin Initiative for Biodiversity Grant No. 23-018, and the Robertson Foundation.

CONFLICT OF INTERESTS

The authors declare no potential conflict of interest.

AUTHOR CONTRIBUTIONS

Laura R. Perry, David W. Macdonald, and Andrew J. Loveridge conceived of the study. Laura R. Perry designed and carried out data collection, with Andrew

J. Loveridge's support on the Zimbabwean study sites. Laura R. Perry and Tom P. Moorhouse designed the data analysis. Laura R. Perry wrote the manuscript, with input from DWM, AJL, TPM, and KJ.

DATA AVAILABILITY STATEMENT

All data deposited on Open Science Framework, under DOI: 10.17605/OSF.IO/ZMG7J. Data accessible at https://osf.io/zmg7j/?view_only=bc8e08d74c4e406e89dc181030fd4604.

ETHICS STATEMENT

All research was carried out under University of Oxford Social Sciences and Humanities Interdivisional Research Ethics Committee (reference number R53944/RE001).

ORCID

Laura R. Perry  <https://orcid.org/0000-0002-9860-4528>

REFERENCES

- Ajzen, I. (2001). Nature and operation of attitudes. *Annual Review of Psychology*, 52, 27–58.
- Ajzen, I., & Fishbein, M. (2000). Attitudes and the attitude-behavior relation: Reasoned and automatic processes. *European Review of Social Psychology*, 11, 1–33.
- Amit, R., Gordillo-Chávez, E. J., & Bone, R. (2013). Jaguar and puma attacks on livestock in Costa Rica. *Human-Wildlife Interactions*, 7(1), 77–84.
- Amit, R., & Jacobson, S. K. (2017). Understanding rancher coexistence with jaguars and pumas: A typology for conservation practice. *Biodiversity and Conservation*, 26, 1353–1374.
- Barlow, F. K., Paolini, S., Pedersen, A., Hornsey, M. J., Radke, H. R., Harwood, J., Rubin, M., & Sibley, C. G. (2012). The contact caveat: Negative contact predicts increased prejudice more than positive contact predicts reduced prejudice. *Personality and Social Psychology Bulletin*, 38, 1629–1643.
- Breckler, S. J. (1984). Empirical validation of affect, behavior, and cognition as distinct components of attitude. *Journal of Personality and Social Psychology*, 47, 1191–1205.
- Broekhuis, F., Kaelo, M., Sakat, D. K., & Elliot, N. B. (2020). Human-wildlife coexistence: Attitudes and behavioural intentions towards predators in the Maasai Mara, Kenya. *Oryx*, 54(3), 366–374.
- Cohen, L. M., McCarthy, D. M., Brown, S. A., & Myers, M. G. (2002). Negative affect combines with smoking outcome expectancies to predict smoking behavior over time. *Psychology of Addictive Behaviors*, 16, 91–97.
- Conner, M., Godin, G., Sheeran, P., & Germain, M. (2013). Some feelings are more important: Cognitive attitudes, affective attitudes, anticipated affect, and blood donation. *Health Psychology*, 32, 264–272.
- Fita, D. S., Neto, E. C. M., & Schiavetti, A. (2010). 'Offensive' snakes: Cultural beliefs and practices related to snakebites in a Brazilian rural settlement. *Journal of Ethnobiology and Ethnomedicine*, 6(1), 1–13.
- Forward, S. E. (1997). Measuring attitudes and behaviour using the theory of planned behaviour. In *Traffic and transport*

- psychology: Theory and application (pp. 353–365). Sweden: Swedish National Road and Transport Research Institute.
- Frank, B., Glikman, J. A., Sutherland, M., & Bath, A. J. (2016). Predictors of extreme negative feelings toward coyote in Newfoundland. *Human Dimensions of Wildlife*, 21(4), 297–310.
- Frey, N., & George, R. (2010). Responsible tourism management: The missing link between business owners' attitudes and behaviour in the Cape Town tourism industry. *Tourism Management*, 31, 621–628.
- Friese, M., Hofmann, W., & Schmitt, M. (2008). When and why do implicit measures predict behaviour? Empirical evidence for the moderating role of opportunity, motivation, and process reliance. *European Review of Social Psychology*, 19, 285–338.
- Frost, P. G., & Bond, I. (2008). The CAMPFIRE programme in Zimbabwe: Payments for wildlife services. *Ecological Economics*, 65, 776–787.
- Gawronski, B., & Bodenhausen, G. V. (2006). Associative and propositional processes in evaluation: An integrative review of implicit and explicit attitude change. *Psychological Bulletin*, 132, 692–731.
- Gelman, A., Su, Y.-S., Yajima, M., Hill, J., Pittau, M. G., Kerman, J., Zheng, T., Dorie, V., Su, M. Y.-S. (2020). Package 'arm'.
- Glikman, J. A., Vaske, J. J., Bath, A. J., Ciucci, P., & Boitani, L. (2012). Residents' support for wolf and bear conservation: The moderating influence of knowledge. *European Journal of Wildlife Research*, 58(1), 295–302.
- Guerbois, C., Dufour, A. B., Mtare, G., & Fritz, H. (2013). Insights for integrated conservation from attitudes of people toward protected areas near Hwange National Park, Zimbabwe. *Conservation Biology*, 27, 844–855.
- Haddock, G., & Zanna, M. P. (1999). Cognition, affect, and the prediction of social attitudes. *European Review of Social Psychology*, 10, 75–99.
- Hazzah, L., Dolrenry, S., Naughton, L., Edwards, C. T., Mwebi, O., Kearney, F., & Frank, L. (2014). Efficacy of two lion conservation programs in Maasailand, Kenya. *Conservation Biology*, 28, 851–860.
- Holmern, T., Nyahongo, J., & Roskaft, E. (2007). Livestock loss caused by predators outside the Serengeti National Park, Tanzania. *Biological Conservation*, 135, 518–526.
- Hudenko, H. (2012). Exploring the influence of emotion on human decision making in human–wildlife conflict. *Human Dimensions of Wildlife*, 17(1), 16–28.
- Hunecke, M., Haustein, S., Grischkat, S., & Böhler, S. (2007). Psychological, sociodemographic, and infrastructural factors as determinants of ecological impact caused by mobility behavior. *Journal of Environmental Psychology*, 27, 277–292.
- Jackson, L. A., Hodge, C. N., Gerard, D. A., Ingram, J. M., Ervin, K. S., & Sheppard, L. A. (1996). Cognition, affect, and behavior in the prediction of group attitudes. *Personality and Social Psychology Bulletin*, 22, 306–316.
- Junker, J., Boesch, C., Mundry, R., Stephens, C., Lormie, M., Tweh, C., & Kühl, H. S. (2015). Education and access to fish but not economic development predict chimpanzee and mammal occurrence in West Africa. *Biological Conservation*, 182, 27–35.
- Kansky, R., Kidd, M., & Fischer, J. (2021a). Understanding drivers of human tolerance towards mammals in a mixed-use transfrontier conservation area in southern Africa. *Biological Conservation*, 254, 108947.
- Kansky, R., Kidd, M., & Fischer, J. (2021b). Does money “buy” tolerance toward damage-causing wildlife?. *Conservation Science and Practice*, 3(3), e262.
- Kissui, B. M. (2008). Livestock predation by lions, leopards, spotted hyenas, and their vulnerability to retaliatory killing in the Maasai steppe, Tanzania. *Animal Conservation*, 11, 422–432.
- Kothe, E. J., Mullan, B., & Butow, P. (2012). Promoting fruit and vegetable consumption. Testing an intervention based on the theory of planned behaviour. *Appetite*, 58, 997–1004.
- Leitner, J. B., Ayduk, Ö., Boykin, C. M., & Mendoza-Denton, R. (2018). Reducing negative affect and increasing rapport improve interracial mentorship outcomes. *PLoS One*, 13, e0194123.
- Loveridge, A. J., Kuiper, T., Parry, R. H., Sibanda, L., Hunt, J. H., Stapelkamp, B., Sebele, L., & Macdonald, D. W. (2017). Bells, bomas and beefsteak: Complex patterns of human–predator conflict at the wildlife–agropastoral interface in Zimbabwe. *PeerJ*, 5, e2898.
- Loveridge, A. J., Valeix, M., Elliot, N. B., & Macdonald, D. W. (2017). The landscape of anthropogenic mortality: How African lions respond to spatial variation in risk. *Journal of Applied Ecology*, 54, 815–825.
- Lucas, D., & Ware, H. (1977). Language differences and the family planning survey. *Studies in Family Planning*, 8, 233–236.
- Luschei, E. C., Hammond, C. M., Boerboom, C. M., & Nowak, P. J. (2009). Convenience sample of on-farm research cooperators representative of Wisconsin farmers. *Weed Technology*, 23(2), 300–307.
- Ma, G., Lin, J., Li, N., & Zhou, J. (2017). Cross-cultural assessment of the effectiveness of eco-feedback in building energy conservation. *Energy and Buildings*, 134, 329–338.
- Masud, M. M., Kari, F. B., Yahaya, S. R. B., & Al-Amin, A. Q. (2014). Impact of residents' livelihoods on attitudes towards environmental conservation behaviour: An empirical investigation of Tioman Island Marine Park area, Malaysia. *Ocean & Coastal Management*, 93, 7–14.
- Millar, M. G., & Tesser, A. (1989). The effects of affective-cognitive consistency and thought on the attitude-behavior relation. *Journal of Experimental Social Psychology*, 25, 189–202.
- Naughton-Treves, L., Grossberg, R., & Treves, A. (2003). Paying for tolerance: Rural citizens' attitudes toward wolf depredation and compensation. *Conservation Biology*, 17, 1500–1511.
- Nilsson, D., Fielding, K., & Dean, A. J. (2020). Achieving conservation impact by shifting focus from human attitudes to behaviors. *Conservation Biology*, 34, 93–102.
- Ochsner, K. N., Bunge, S. A., Gross, J. J., & Gabrieli, J. D. (2002). Rethinking feelings: An fMRI study of the cognitive regulation of emotion. *Journal of Cognitive Neuroscience*, 14, 1215–1229.
- Parrott, M. W., Tennant, L. K., Olejnik, S., & Poudevigne, M. S. (2008). Theory of planned behavior: Implications for an email-based physical activity intervention. *Psychology of Sport and Exercise*, 9, 511–526.
- Perry, L. R., Moorhouse, T. P., Loveridge, A. J., & Macdonald, D. W. (2020). The role of psychology in determining human–predator conflict across southern Kenya. *Conservation Biology*, 34, 879–890.

- Perry, L. R., Moorhouse, T. P., Sibanda, L., Sompeta, S. L., Macdonald, D. W., & Loveridge, A. J. (2020). Everyone is normal: Consistent livestock management norms and demographic clusters in Kenya and Zimbabwe. *Conservation Science and Practice*, 2(12), e313.
- Petty, R. E., Wegener, D. T., & Fabrigar, L. R. (1997). Attitudes and attitude change. *Annual Review of Psychology*, 48, 609–647.
- Qualtrics. (2013). *Qualtrics*.
- Rasmussen, G. (1999). Livestock predation by the painted hunting dog *Lycaon pictus* in a cattle ranching region of Zimbabwe: A case study. *Biological Conservation*, 88, 133–139.
- R Core Team. (2020). *R: A language and environment for statistical computing*.
- Rodgers, P. D., & Pienaar, E. F. (2018). Tolerance for the Florida panther in exurban southwest Florida. *The Journal of Wildlife Management*, 82(4), 865–876.
- Sheeran, P., Maki, A., Montanaro, E., Avishai-Yitshak, A., Bryan, A., Klein, W. M., Miles, E., & Rothman, A. J. (2016). The impact of changing attitudes, norms, and self-efficacy on health-related intentions and behavior: A meta-analysis. *Health Psychology*, 35, 1178–1188.
- Sibanda, L., Van der Meer, E., Johnson, P. J., Dlodlo, B., Parry, R., Mathe, L. J., Hunt, J. E., Macdonald, D. W., & Loveridge, A. J. (2020). Evaluating changes in attitudes towards lions (*Panthera leo*) after the introduction of a non-lethal human-lion conflict intervention in northwestern Zimbabwe. *Journal of Human Dimensions of Wildlife*, 1, 16.
- Smith, J. B., Nielsen, C. K., & Hellgren, E. C. (2014). Illinois resident attitudes toward recolonizing large carnivores. *The Journal of Wildlife Management*, 78(5), 930–943.
- Sparks, P., & Shepherd, R. (2002). The role of moral judgments within expectancy-value-based attitude-behavior models. *Ethics & Behavior*, 12, 299–321.
- St John, F., Linkie, M., Martyr, D., Milliyanawati, B., McKay, J., Mangunjaya, F. M., Leader-Williams, N., & Struebig, M. J. (2018). Intention to kill: Tolerance and illegal persecution of Sumatran tigers and sympatric species. *Conservation Letters*, 11, 4.
- Van Emmerik, A. A., Kamphuis, J. H., Hulsbosch, A. M., & Emmelkamp, P. M. (2002). Single session debriefing after psychological trauma: A meta-analysis. *The Lancet*, 360, 766–771.
- Van Niekerk, H. N. (2010). *The cost of predation on small livestock in South Africa by medium-sized predators*. University of the Free State.
- Wallace, R. M., Lord, C. G., & Bond, C. F. (2005). Which behaviors do attitudes predict? Meta-analyzing the effects of social pressure and perceived difficulty. *Review of General Psychology*, 9, 214–227.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54, 1063–1070.
- Western, G. (2017). Conflict or coexistence: Human-lion relationships in Kenya's southern Maasailand and beyond.
- Wilson, C., & Chatterton, T. (2011). Multiple models to inform climate change policy: A pragmatic response to the 'beyond the ABC' debate. *Environment and Planning A*, 43(12), 2781–2787.
- Wilson, R. S. (2008). Balancing emotion and cognition: A case for decision aiding in conservation efforts. *Conservation Biology*, 22, 1452–1460.
- Wolff, K., Nordin, K., Brun, W., Berglund, G., & Kvale, G. (2011). Affective and cognitive attitudes, uncertainty avoidance and intention to obtain genetic testing: An extension of the theory of planned behaviour. *Psychology & Health*, 26, 1143–1155.
- Wyer, R. S., & Albarracín, D. (2005). Belief formation, organization, and change: Cognitive and motivational influences. In *The handbook of attitudes* (pp. 273–322). Lawrence Erlbaum Associates.
- Zajac, R. M., Bruskotter, J. T., Wilson, R. S., & Prange, S. (2012). Learning to live with black bears: A psychological model of acceptance. *The Journal of Wildlife Management*, 76(7), 1331–1340.

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

How to cite this article: Perry, L. R., Moorhouse, T. P., Jacobsen, K., Loveridge, A. J., & Macdonald, D. W. (2022). More than a feeling: Cognitive beliefs and positive—but not negative—affect predict overall attitudes toward predators. *Conservation Science and Practice*, 4(2), e584. <https://doi.org/10.1111/csp2.584>