Intention to kill: Tolerance and illegal persecution of Sumatran tigers and sympatric species
St John, Freya A. V.; Linkie, Matthew; Martyr, Deborah; Milliyanawati, Betty; McKay, Jeanne; Mangunjaya, Fachruddin; Leader-Williams, Nigel; Struebig, Matthew
Conservation Letters

Published: 01/07/2018

Publisher's PDF, also known as Version of record

Dyfniad o’r fersiwn gyhoeddwyd / Citation for published version (APA):

Hawliau Cyffredinol / General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

• Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
• You may not further distribute the material or use it for any profit-making activity or commercial gain
• You may freely distribute the URL identifying the publication in the public portal?

Take down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.
Intention to kill: Tolerance and illegal persecution of Sumatran tigers and sympatric species

Freya A. V. St. John1,2 | Matthew Linkie3 | Deborah J. Martyr4 | Betty Milliyanawati4 | Jeanne E. McKay2 | Fachruddin M. Mangunjaya5 | Nigel Leader-Williams6 | Matthew J. Struebig2

1School of Environment, Natural Resources and Geography, Bangor University, LL57 2UW, United Kingdom
2Durrell Institute of Conservation and Ecology (DICE), School of Anthropology and Conservation, University of Kent, Canterbury, CT2 7NR, United Kingdom
3Wildlife Conservation Society, Indonesia Program, Bogor, 16151, Indonesia
4Fauna & Flora International, Indonesia Programme, Jakarta, 12550, Indonesia
5Faculty of Biology, Universitas Nasional (UNAS), Jl. Sawo Manila, Pejaten, Pasar Minggu, Jakarta, 12520, Indonesia
6Department of Geography, University of Cambridge, Downing Place, Cambridge, CB2 3EN, United Kingdom

Correspondence
St. John, School of Environment, Natural Resources and Geography, Bangor University, LL57 2UW, United Kingdom.
Email: f.stjohn@bangor.ac.uk

Editor
E.J. Milner-Gulland

Abstract
Tolerance may lessen when wildlife adversely impacts people. Models from psychology can help elucidate how people make judgments, why they act accordingly, and whether beliefs and norms influence support for policy and intervention. Working in a globally important region for tigers, we estimated hunting prevalence for this endangered species and three sympatric taxa using methods for asking sensitive questions. We also investigated the relative strength of ethnicity and social-psychological predictors in influencing intention to hunt. Men’s behavioral intention and perceptions differed by species: proconservation values were most prevalent for tiger, weakest for wild boar. Perceived behavioral control was the strongest predictor of hunting-intention; affect and injunctive norms were also important. The prominence of affect in determining intention suggests increasing environmental knowledge is unlikely to curb hunting. However, existing norms could be leveraged to incentivize behavior change. Integrating behavior-change models into conservation science is crucial where strategies require changes in people’s actions.

Keywords
affect, endangered species, hunting, Indonesia, norms, randomized response technique

1 | INTRODUCTION

As rural populations grow, people can come into greater contact with wildlife. Where wildlife adversely impacts people, tolerance may be lessened (Redpath et al., 2013). Tolerance can be attitudinal, such as beliefs and values, and behavioral, such as killing or political lobbying (Bruskotter & Wilson, 2013). Viewed on a continuum (Figure 1), intolerance and stewardship are expressed through actions including killing animals or political lobbying for/or against a species, while acceptance/tolerance is a passive concept requiring no action (Bruskotter & Fulton, 2012). This conceptualization permits the application of models and hypotheses from psychology to better our understanding of how people formulate judgments, and ultimately why they act as they do.

Observed behavior and behavioral intention are considered the best indicators of species tolerance, and antecedents of both have been studied extensively (Bruskotter & Fulton, 2012; Bruskotter & Wilson, 2013). For example, the theory of planned behavior (TPB) posits that behavioral intention, the immediate precursor to behavior, is shaped by attitude toward the behavior, perceived societal expectations (subjective...
Behaviours that positively impact wildlife.
(e.g. donating to interest groups, providing feed, housing or habitat, political support of actions to maintain/increase populations).

Behaviours that might negatively impact wildlife.
(e.g. unsustainable hunting, poisoning, political support of action to reduce/eradicate populations).

Intolerance
Acceptance/Tolerance
Stewardship

FIGURE 1 A conceptual model of wildlife conservation behavior adapted from Bruskotter and Fulton (2012). Intolerance and stewardship, expressed through actions, may be viewed as sitting at opposite ends of a spectrum of conservation-related behaviors. Acceptance/Tolerance sits in the middle and is not necessarily expressed through tangible acts.
FIGURE 2  Map of Kerinci Seblat landscape showing the density of human-tiger encounters and study areas sampled. Forest within and adjoining the Kerinci Seblat National Park is shown in dark shading.

Leader-Williams, (2007), and key prey species, boar and sambhar, crop raid. While sambars are hunted for meat (Bakels, 2013), Islam prohibits consumption of boar so hunting for this purpose is unlikely. However, snares found in KSNP where all hunting is prohibited, are indiscriminate (Linkie et al., 2015). Regionally, increases in wildlife trade, particularly in tiger and pangolin, may be encouraging poaching of these species which, together with sambhar, is prohibited throughout Indonesia (boar may be hunted outside of PAs).

Sampling was stratified across the landscape using information on 228 human-tiger incidents reported by local people (unpublished, Martyr). Each location was georeferenced and an observed incident density surface computed to identify low-, medium-, or high-incident study areas (Figure 2).

Following questionnaire piloting and revisions, data were gathered from a systematic sample of male and female heads-of-households between November 2014 and July 2016 by Indonesian enumerators. Sex of respondents was chosen at random and biased toward men because they are more likely than women to hunt (Wadley & Colfer, 2004; see Supporting Information).

Because hunting within KSNP is illegal, we used two forms of the randomized response technique (RRT), in addition to direct questions (DQ) to measure past hunting behavior. The proportion of people hunting was estimated using the forced response RRT (Warner, 1965). Equipment comprised 10 cards, 8 orange, one displaying, in Indonesian, “Yes” and another, “No.” Respondents selected one card prior to each sensitive question (Table 1). The “Yes” card demanded the prescribed answer “Yes”; the “No” card, “No.” The orange card required an honest answer, “Yes,” or “No.” The chosen card was never revealed to enumerators and was replaced after each question.

We estimated the prevalence of hunting using the partial additive randomized response technique (aRRT; Robinson, St. John, Griffiths, & Roberts, 2015). Forty-eight cards were held in a stack, 12.5% were marked “zero” and required respondents to answer honestly by reporting the frequency of the behavior defined in the question (Table 1). All other answers were randomized by the numbers 1, 2, 3, and 4 displayed on the cards with the corresponding frequencies 22, 6, 8, and 6. If a numbered card was selected, then respondents were asked to add their answer to the number displayed on the card. The frequency distribution of the cards had a mean of 1.95 and a variance of 1.28.

Respondents were randomly assigned to RRT or aRRT and completed an example prior to study questions. Hunting pressure was also estimated by asking respondents to report their yes/no (for RRT participants) or numeric response (for aRRT respondents) to the hunting questions directly at the end of the questionnaire. Acceptability of RRT and aRRT was measured using two statements (Table S1).

The questionnaire also included nine sections (Table S2) designed to examine factors underlying men’s intention to hunt specific species in the future, measured using a five-point ordinal scale (very weak = 1 to very strong = 5). Questions were asked separately for each species. To understand how people’s emotional response influences intention to hunt,
respondents identified their position on two five-point semantic scales (good-bad; harmless-dangerous) after being shown an image of each animal. Many tools exist for measuring affect (Jacobs, 2012); to minimize cognitive burden, we used semantic scales which have proven proficient (Slagle et al., 2012). Answers to remaining questions were given on five-point Likert scales (strongly agree to strongly disagree). Attitudes toward the existence of each species were captured using two target-, action-, context-, and time-specific (Conner & Sparks, 2008) statements for example, “These days I think that [animal] in the village, on the farm land around the village and in the forest should be caught.” To investigate the relationship of descriptive and injunctive norms on people’s intention to hunt, respondents were asked to indicate if they felt that most people try to hunt each animal, and if they felt social pressure to catch each animal. Respondents indicated how much perceived behavioral control they had over hunting by stating how much they agreed/disagreed to the following statement “If the opportunity arose, I am confident I could catch [animal] around here if I wanted to.” Two statements were used to capture the core elements of enforcement, the perceived probability of capture and perceived probability of penalty once captured. Crop and livestock loss to study species occurring in the preceding 12 months was also recorded.

2.1 | Data analysis

Data were analyzed using SPSS v22 (IBM Corp., 2013) and Rv.3.4.0 (R Development Core Team, 2012). The proportion of people admitting to hunting via RRT was calculated following St. John et al. (2015); aRRT data were estimated following Robinson et al. (2015; Supporting Information). For RRT, aRRT, and DQ, 95% confidence intervals were estimated from 1,000 bootstrapped samples. We considered there to be significant differences between estimates when confidence intervals did not overlap.

To examine relationships between men’s intention to kill and beliefs and perceptions, we fitted cumulative logit mixed models using the R packageOrdinal (Christensen, 2015) defined a priori drawing upon work of others (Fairbrass, Nuno, Bunnefeld, & Milner-Gulland, 2015; Marchini & MacDonald, 2012; Slagle et al.,2012). Affect, attitudes toward killing or conserving, injunctive and descriptive norms, PBC, and perceived probability of capture and punishment were all considered as potential fixed effects. Prior to modeling, these variables were scaled so that the higher the value, the less inclined people were to hunt in the future. Pearson’s correlation coefficients were calculated for each pair of variables to avoid issues of multicollinearity. Men with missing data were excluded from models. Since estimates from RRT, aRRT, and DQ were consistently low and hence unsuitable for modeling, past hunting behavior was omitted from models.

3 | RESULTS

The questionnaire was completed by 2,386 people, missing data were ≤1.7% for model variables; exceptions were probability of capture or punishment (≤3.5%). Mean age was 44 (SE ± 0.26), most had completed elementary (53.2%) or junior (23.0%) school and 73.9% were male. The majority were Minangkabau (45.4%) or Melayu (32.4%), 2.9% were Kerinci-nese (Table S3). Most people growing crops reported losses to boar (85.1%), but few to sambar (13.3%); 0.6% lost livestock to tigers. Among men, all DQ estimates significantly exceeded those of the RRT (Figure 3a). However, the aRRT estimated significantly higher frequencies of sambar and tiger hunting than DQ; while higher, women’s aRRT estimates of tiger hunting did not always differ significantly to DQ (Figure 3b). Men’s DQ reports of tiger capture by outsiders and villagers did not differ significantly to women’s (Table S4). RRT was considered significantly easier (U = 338,736.5, z = -12.85, P ≤ 0.001) and more private (U = 0.67, P ≤ 0.10, z < -0.83, P = 0.001) than aRRT, but perceived ease and privacy was limited (Table S5).

Men’s perceptions toward wildlife differed by species, with proconservation values most prevalent for tigers and weakest for boar (Figure 4). The perceived probability of capture, and punishment if captured, were significantly correlated for all species (Pearson’s R; P < 0.05; boar = 0.67, sambar = 0.78, tiger = 0.73, pangolin = 0.76), so probability of punishment was omitted from models. Across all species, PBC was the strongest predictor of intention to hunt in the future. As PBC declined, so did intention (Table 2). The relative importance of other variables differed by species. Injunctive norm was particularly important for tigers (β = -0.83, P ≤ 0.001). By contrast, while a significant predictor for all other species, descriptive norm was weakly and not significantly related to men’s intention to kill tigers (β = -0.10, P = 0.30). The affective measure of danger was negatively and significantly related to intention to kill (except sambar), implying greater perceived danger equates to greater intention. Contrary to expectations, affect for tiger and pangolin measured via “bad-good” was positively related to intention, indicating that intention to kill increased with perceived goodness. Attitudes toward killing significantly predicted intention across all species; the probability of capture was not significantly related to intention for tiger or pangolin (Table 2).

4 | DISCUSSION

Most respondents reported experiencing crop loss to boar, which 13% of men admitting to trying to catch on average seven times in the preceding year. Coupled with 2% of men admitting to hunting sambar once during the same period, this equates to a substantial number of indiscriminate snares
within or around KSNP. Indeed, 4,433 snares were removed by rangers between 2000 and 2010 (Linkie et al., 2015). Few men admitted (via DQ) to trying to catch tigers (1%) or pangolins (2%) since 2010. While 1% seems low, as >184,500 men live within 5 km of KSNP (Badan Pusat Statistik, 2010), 1% represents considerable poaching pressure. Indeed, 231 tiger snares were removed from KSNP between 2005 and 2014 (Risdianto et al., 2016). While recall is vulnerable to biases (Golden, Wrangham, & Brashares, 2013), we measured common events across short timeframes and where event rarity required longer periods (tiger hunting), actions were deemed memorable and thus accessible for recall.

As Indonesia modernizes and strong religious views permeate, worldviews held by groups such as the Minangkabau and Kerincinese, including that spirit tigers embody the souls of ancestors, are vulnerable. Incorporation into the market economy has increased the importance of money, which has encouraged some to sell tiger parts (Bakels, 2013; Bakels, Bhagwat, Drani, Infield, & Kidd, 2016). However, our models suggest that this may not be the result of beliefs attributed to particular ethnic groups. Ethnicity was incorporated into our models due to the prevalence of human-wildlife narratives in local ethnographic work. However, given evidence that sociodemographic characteristics generally fail to reveal underlying differences in how people relate to wildlife (Teel & Manfredo, 2010), we did not include other such variables.

Ethnicity was not related to men’s intention to kill boar, tiger, or pangolin. However, intention to kill sambar was higher among Melayu. Hunting for sambar is known to peak prior to Idul Fitri (Risdianto et al., 2016), yet all ethnicities surrounding KSNP follow Islam so the link between Melayu and sambar hunting warrants further exploration. Men’s PBC over hunting was the strongest predictor of intention across all species; when PBC was weak, so too was intention. PBC was low for all species (Figure 4), but particularly tiger. Species-specific injunctive norms and attitudes toward hunting were also important predictors of behavioral intention; those not feeling social pressure to hunt did not intend to, nor did those reporting proconservation attitudes toward killing. Few men (<7%) perceive that others were killing tigers which may explain why descriptive norms, while related to intention to kill other studyspecies, were unimportant regarding behavior toward tigers. Contrary to expectations, for sambar, tiger, and pangolin, affect measured via “bad-good” was weakly and positively related to intention, implying that the greater the level of goodness associated with the animal, the greater the intention to kill one. Given the desirability of sambar meat and commercial value of tiger and pangolin, the possibility that men equated “goodness” to dietary or financial gains cannot be ruled out. However, affective perception of tigers as dangerous was a stronger driver of intention to kill than perceived goodness. As perceived dangerousness increased, so too did intention to kill. Initial responses to stimuli are frequently affective; they occur automatically but then guide information processing and judgment (Slovic et al., 2007). While conservation agencies may want stakeholders to rationally deliberate facts (e.g., the probability of tiger attack) divorced from emotion, evidence abounds to the contrary (Slagle et al., 2012; Wilson, 2008).

Observed behavior and behavioral intention are considered the best indicators of tolerance for a species (Bruskotter & Wilson, 2013). When studying illegal acts, behavioral observation is challenging, so we used the RRT and the aRRT
while also asking people to directly report their rule-breaking behavior. While there is substantial evidence that RRT returns higher estimates of rule-breaking under varied conservation contexts (Razafimanahaka et al., 2012; St. John et al., 2015), it was of limited use surrounding KSNP. However, despite being perceived by respondents as more difficult and less private than RRT, compared to asking men directly, aRRT estimated significantly higher hunting frequencies for four of six questions. An exception was boar, but since this species can be hunted beyond KSNP boundaries, this question is of limited sensitivity. Nevertheless, proximity to protected areas can impact the likelihood of people reporting rule-breaking behavior (Razafimanahaka et al., 2012).

Integrating behavior-change models into conservation science is crucial as emerging conservation strategies increasingly require widespread changes in people’s actions (Reddy et al., 2017). Many studies, including ours, measure predictors of behavior directly. While using value or belief-based measures, such as wildlife value orientations (Teel & Manfredo, 2010), provide advantageous insights into cognitive foundations of behavior, these values are less easily influenced by interventions; hence our focus on higher-order antecedents of behavior. We provide estimates of hunting and identify determining factors in a globally important tiger landscape. We conclude that awareness raising activities aimed at increasing knowledge of our study species may be of limited use in curbing men’s intention to hunt given the prominence of affect in determining intention (Slagle et al., 2012). However, existing personal values could be leveraged to incentivize behavior change in a similar manner to that which has been operationalized to reduce energy consumption (Allcott & Rogers, 2014). Such an approach would appeal to people’s affective intuitive and rational thinking simultaneously (Reddy et al., 2017). Applied in a standardized manner, our assessment of tolerance and behavioral intention could be upscaled to monitor threats to tigers or other conflict species. Doing so

FIGURE 4  Distribution of social variables reported by men and described with mean and 95% confidence interval (wild boar n = 1,739, pangolin n = 1,686, tiger n = 1,687, sambar n = 1,713). With the exception of intention, variables are scaled such that the higher the value, the less inclined people were to hunt in the future. For example, an attitude toward killing or PBC score of 5 reflects disagreement with hunting and weak perceived control over performance of the behavior.
would enable pre-emptive or responsive interventions targeting the strongest predictor(s) and thus actors engaged in specific behaviors, which likely vary by site. Furthermore, where intervention design is informed by sociopsychological investigation, these data double as a monitoring and evaluation baseline.

Societal goals of conserving nature will unlikely be achieved with a blanket approach to enforcement. We recommend further interrogation of psychological components underpinning decision making including in the area of audience segmentation which strives to design optimal interventions for groups sharing common psychographic attributes (Kurtz, 2012). Our study provides evidence that behavior-change models provide informative material for practitioners seeking to encourage compliance and coexistence with wildlife.

ACKNOWLEDGMENTS

We thank our local project partner Fauna & Flora International and Darmawan Liswanto for facilitating the study, Ika Agustin, YulianAnggriawan, Karlina, and ErlindaKartika for collecting the questionnaire data, and the thousands of respondents who gave us their time. This work was funded by a UK LeverhulmeTrust Research Project Grant.

ORCID

Freya A. V. St. John http://orcid.org/0000-0002-5707-310X

Matthew Linkie http://orcid.org/0000-0002-0679-3684
Matthew J. Struiebig http://orcid.org/0000-0003-2058-8502

REFERENCES


Bruskotter, J. T., & Wilson, R. S. (2013). Determining where the wild things will be: using psychological theory to find tolerance for large carnivores. Conservation Letters, 7, 158–165.


Slagle, K. M., Bruskotter, J. T., & Wilson, R. S. (2012). The role of affect in public support and opposition to wolf management. Human Dimensions of Wildlife, 17, 44–57.


**SUPPORTING INFORMATION**

Additional Supporting Information may be found online in the supporting information tab for this article.