RESEARCH ARTICLE

Is human–rhesus macaque (*Macaca mulatta*) conflict in India a case of human–human conflict?

Shaurabh Anand, Sindhu Radhakrishna

Received: 8 May 2019/Revised: 24 October 2019/Accepted: 5 February 2020/Published online: 16 March 2020

Abstract The perceptions of wildlife managers regarding human–wildlife conflict (HWC) scenarios are likely to affect the outcomes of conflict mitigation measures. We studied the attitudes and perceptions of forest department personnel regarding the management of human–rhesus macaque conflict (HRMC) in Himachal Pradesh, northern India. We collected data through a questionnaire survey and used frameworks from organizational psychology to draw insights from our results. Forest department personnel belonging to different organizational levels varied with respect to their views on conflict mitigation measures. While the views of upper level management personnel aligned closely with the publicly-stated position of the forest department, the opinions of lower level management personnel were aligned with the opinions of farmers. Overall, wildlife managers differed from farmers in their opinions regarding causes and mitigation of HRMC. Our results indicate the presence of human–human conflict in the context of HRMC and we discuss the implications of this for the management of HRMC.

Keywords Human–human conflict · Human–rhesus macaque conflict · Private preferences · Public preferences · Social identity theory · Wildlife managers

INTRODUCTION

Several scholars have pointed out that human–wildlife conflict (HWC) events often are the manifestation of

conflict between different human groups that arise from differences in their opinions about wildlife management or due to interpersonal disputes between themselves (Marshall et al. 2007; Peterson et al. 2010, Redpath et al. 2015; Terblanche 2015). It has been suggested that conflicts between people, in wildlife management and other environmental contexts, may emerge due to “conflicts over beliefs and values, conflicts of interest, conflicts over process, conflicts over information, structural conflicts, and conflicts arising from personality differences” (Jones et al. 2005; Young et al. 2010; Sidaway 2013). Two major stakeholder groups in the context of HWC are lay citizens (farmers and urban residents) who are affected by conflict events, and wildlife managers/forest department personnel who are responsible for conflict management. Studies on the human dimensions of HWC typically focus on understanding the perceptions, attitudes and normative beliefs of common/lay citizens (Manfredo and Dayer 2004; Dickman et al. 2013; Marchini 2014; Frank et al. 2015). These studies show that common citizens often blame wildlife management organizations for inflicting the species and the consequent risks upon them (Ogra and Badola 2008; Dickman 2010; Radhakrishna and Sinha 2011). The role of wildlife managers in mediating the process of conflict mitigation, however, has received limited attention in human dimensions’ research (Brinson and Benson 2002).

What are forest department personnel’ attitudes toward human–wildlife conflict management? Social identity theory as applied to organizational behavior proposes that people working in an organization tend to identify with the goals and values of the organization due to a desire to establish a strong work identity to achieve personal goals (Ashforth and Mael 1989; Ashforth et al. 2008). This suggests that wildlife managers (as individuals working in an organization) may hold beliefs or views regarding

Electronic supplementary material The online version of this article (<https://doi.org/10.1007/s13280-020-01324-w>) contains supplementary material, which is available to authorized users.

conflict management that are aligned with the publicly-stated position of the Forest Department. However, all individuals within an organization may not subscribe to the same views regarding a contentious topic. Firstly, forest departments are typically structured formally with lower level management involved in the implementation of tasks at the field level and higher-level management involved in decision-making. Hence, it is possible that different management levels have divergent views regarding wildlife conflict management (Keeton and Mengistu 1992). Secondly, within organizations, individuals may adhere to private values or beliefs that are based on their personal experiences or desired actions in life (Wallace 2003). Thirdly, identifying with an organization may not necessarily lead to internalization of the values and beliefs that underlie the organization's mission (Martin and Siehl 1983; Ashforth and Mael 1989). This suggests that individual wildlife managers may hold private views or attitudes regarding conflict management or “problem” wildlife that are dissonant with the publicly-stated views of the forest department. Discordance in views among forest personnel belonging to different management levels may result in conflict between them over the process of wildlife conflict management. Hence the objective of our study was to investigate the attitudes and perceptions of wildlife management authorities with respect to wildlife conflict management and understand how their views and perceptions could impact the conflict mitigation process.

We investigated our study objectives through a case study of human–rhesus macaque (*Macaca mulatta*) conflict in northern India. Human–rhesus macaque conflict (HRMC) is the most widespread form of human–primate conflict in India and various measures have been implemented by state forest departments to manage conflict (Pirta et al. 1997; Singh and Thakur 2012; Saraswat et al. 2015). Apart from translocation and sterilization of problem rhesus individuals, state forest departments have also attempted to curb public feeding of rhesus macaques through bans and public awareness programs (Imam et al. 2002; Dhiman and Mohan 2014; Wildlife SOS 2016). More recently, a government sanction was issued to cull ‘vermin’ rhesus individuals in selected areas of Himachal Pradesh state in northern India (Ministry of Environment, Forest and Climate Change 2016). The specific aims of our study were to (i) assess the perceptions of forest department personnel regarding intensities and causes of HRMC, appropriate mitigation strategies, and state-sponsored management interventions, and (ii) evaluate the extent of intra-organizational differences in the views and perceptions of forest department personnel regarding conflict mitigation.

MATERIALS AND METHODS

Study area

We conducted our study in the mountainous state of Himachal Pradesh, northern India (30.37–33.20 N and 75.78–79.07 E (Fig. 1). Approximately 25% of the geographical area of the state is covered with forest. Shiwalik Chir Pine (dominant species: *Pinus roxburghii*) and Moist Deodar (dominant species: *Cedrus deodara*) are the most prominent forest types (Forest Survey of India 2017). The state of Himachal Pradesh is severely affected by HRMC which occurs in the form of crop-raiding (rural areas), house- and kitchen-raiding, attacks on humans, property damage and other nuisance activities (urban areas).

Study group

We considered forest department personnel belonging to the territorial wing of Himachal Pradesh state forest department as our study group and included personnel representing upper management, middle management, and lower management in the study sample. State forest departments in India typically have two main administrative wings—Territorial and Wildlife (Appendix S1). The Territorial wing oversees management of forest areas that fall outside designated Protected Areas, such as reserved forest (RF), demarcated protected forest (DPF) and undemarcated protected forest (UDF). The Wildlife wing is responsible for the management of protected forest areas (such as Wildlife Sanctuary and National Park) and enforcement of wildlife laws (Fleischman 2016). As human presence is minimal within protected forest areas, HRMC in the form of macaque crop-raiding is mostly concentrated in rural settlements around forests that fall under the jurisdiction of the Territorial wing and significantly lower in the areas under the jurisdiction of the Wildlife wing. Hence, we only interviewed personnel from the Territorial wing to collect data for this study. The Territorial wing of state forest departments is organized in a hierarchical structure consisting of Circles, Divisions, Ranges, Blocks, and Beats (Appendix S1). We considered Forest Divisions as units for our study, as the head of the Forest Division, the Divisional Forest Officer (DFO), belongs to the lowest tier of the upper management level and therefore occupies an organizational role that combines administrative and executive duties. We considered Divisional level personnel as representative of the upper management level, Range and Block level personnel as representative of middle level management and Beat level personnel as representative of lower level management. The state of Himachal Pradesh

Fig. 1 Location of study area (Re-drawn from Himachal Pradesh State Forestry Portal (https://bhuvan-app1.nrsc.gov.in/hp_forest/hpfd.php). Boundaries of forest divisions are approximate due to creation from a secondary source)

has a total of 37 territorial forest divisions and rhesus macaques are known to be present in 36 of these forest divisions. Hence, we considered these 36 territorial divisions as our potential study sample for this study.

Data collection methods

We used semi-structured questionnaire surveys to collect the following data: (a) respondent's demographic details and details of service period (b) types and intensity of HRMC in the area under jurisdiction, (c) respondent's views regarding causes of and possible mitigation measures for different types of HRMC, and (d) respondent's opinions with respect to state-sponsored mitigation measures. The data collection was carried out in two phases. In the first phase, we interviewed Divisional Forest Officers (DFOs) in the territorial wing of HP FD. We were unable to contact/obtain oral consent from the DFOs of four forest divisions. Interviews with DFOs were conducted in-person and via the telephone. In the second phase, we interviewed all forest department personnel, in-person, in two Forest Divisions (unidentified here for confidentiality reasons) using the same questionnaire that was used for the DFO interviews. Oral consent was obtained from the respondents before beginning all interviews. Interviews were conducted in Hindi (the regional language), English or using a combination of both languages. All the Hindi parts of the interviews were translated into English by SA before data analysis.

Data analysis

We summarized respondents' socioeconomic characteristics such as gender, age, education and period of residence in the study area in terms of percentages. For multiple-response questions, we calculated the percentage of respondents for each response and often, they summed to over 100%. We used DFOs' rankings (negligible, moderate, high, or severe) regarding HRMC intensities in their forest divisions and created a map of conflict intensity for forest divisions in Himachal Pradesh. We then performed a visual comparison of the results of this map (Fig. 2) with a rhesus density hot-spot map prepared by Himachal Pradesh Forest department (HPFD) (accessed from <https://hpforest.nic.in/files/Proposal%20under%20Sec%2062%20for%20declaring%20Macaque%20as%20Vermin%20in.pdf>). The latter [based on a rhesus macaques' population survey—Singh et al. (2016)] has been used by HPFD as a guide to notify HRMC high conflict zones in the state, and thus represents the publicly-stated view of HPFD regarding rhesus macaque conflict intensity in the state (Himachal Pradesh Forest Department 2016). We classified respondents into three categories: Upper Level Management (Divisional Forest Officers (DFOs), Middle Level Management (Range Officer (RO), Range Assistance (RA), Block Officer (BO)) and Lower Level Management (Forest Guards (FGs)), and used Fisher's exact test ($\alpha = 0.05$) to check for significant differences in the attitudes and perceptions of the three groups regarding causes of conflict, potential mitigation measures and attitudes toward state-

Fig. 2 Intensity of human-rhesus macaque conflict as reported by DFOs (a) Rural conflict (b) Urban conflict (Boundaries of forest divisions were re-drawn from Himachal Pradesh State Forestry Portal (https://bhuvan-app1.nrsc.gov.in/hp_forest/hpfd.php). Boundaries are approximate due to creation from a secondary source)

sponsored measures. We classified respondents' responses regarding state-sponsored interventions as neutral (unsure about the effectiveness of measure), negative (critical of a measure), or positive (respondents claimed measure was effective). People often publicly express their preference for a certain course of action which may be at odds with their personal view on the same matter (Kuran 1997). In order to check for such potential divergence in views, we analyzed respondents' answers in two ways. Respondents' answers to close-ended questions about HRMC issues were brief and immediate. Hence, we considered these responses as echoing their public preferences (Kuran 1997). In contrast, interviewees responded to open-ended questions about the reasoning behind their opinions regarding HRMC with lengthy explanations that were reflective and discursive in nature. Hence, we considered these body of comments as reflective of the private preferences (Kuran 1997) of foresters. We carried out a sentiment analysis of respondents' private preferences comments using "AFINN" semantic in R. Sentiment analysis is used to

characterize the sentiment content of a text unit based on natural language processing (NLP), and thus reveals the attitude of the speaker (Danneman and Heimann 2014). Natural language processing refers to a "computerized approach to analyzing text that is based on both a set of theories and a set of technologies" (Liddy 2001). Before beginning the sentiment analysis, we pre-processed the comments to remove the impacts of modifiers (verbs, adjectives) and to make it context independent (Appendix S2). We first carried out sentiment analysis on the entire corpus of comments of all study respondents. In the second stage, we carried out sentiment analysis after classifying the comments according to the designation-level of respondents (upper, middle, and lower) and subject of conversation (species (rhesus macaque and HRMC), forest department (forest department's actions as related to HRMC), and lay citizen (lay citizen and HRMC)). We also generated word clouds to visualize and highlight terms that occurred most frequently during the interviews using R. Word cloud is used to create a visual representation of the text corpus and provides a readily available snapshot of most frequent themes of the text. The relative font size of words depicts the frequency of their occurrence, so most frequently used words appear bigger in comparison to less frequently used words (Miley and Read 2011). We used the same classification scheme of comments as used in sentiment analysis and generated seven types of word clouds (one for overall comments and three each for designation-level and subject of conversation). All analyses were conducted using R version 3.5.053 (R Foundation for Statistical Computing 2018) and Quantum GIS version 3.0.354 (QGIS Development Team 2018).

RESULTS

Respondents' characteristics

We surveyed a total of 135 respondents (upper level = 32; Middle level = 34 and lower level = 69) from our study group. The majority of the respondents were male ($n = 127$, 94.1%), and years of education varied from 10 years to 22 years. The majority ($n = 122$, 92.4%) were native residents of Himachal Pradesh and were involved with farming activities (84.8%, $n = 112$). Respondents had been in service for approximately 17 years (mean: 17.39 years, range 1–38.9 years).

DFOs' views regarding conflict intensity

DFOs (upper management level personnel) reported HRMC in 29 (90.6%) out of total 32 divisions surveyed. Rural conflict was the most common form occurring in all

29 divisions, while urban conflict was reported for 16 divisions (50.0%). Respondents rated rural conflict as moderate to severe (Fig. 2), whereas urban conflict was rated as negligible and moderate (Fig. 2). The intensity of macaque conflict as described by DFOs was largely similar to the conflict intensity map reported by the state forest department. The match between the state forest department conflict map and DFO conflict zonation was better for rural conflict as compared to urban conflict.

Respondents' perceptions regarding causes of conflict, preferred mitigation measures, and attitudes toward state-sponsored management interventions

The majority ($n = 87$, 70.2%) of the respondents identified scarcity of wild food resources as a primary reason for rural HRMC. Increase in rhesus macaque numbers ($n = 44$, 35.5%), destruction of rhesus habitats ($n = 28$, 22.6%) and provisioning ($n = 17$, 13.7%) were other reasons mentioned for rural conflict. With respect to urban conflict, human provisioning of macaques ($n = 54$, 79.4%) and improper disposal of food waste (57.4% $n = 39$) were top cited reasons. When questioned about mitigation measures for rural conflict, the majority of respondents ($n = 55$, 44.4%) suggested increasing availability of wild food resources. Other recommendations included translocation ($n = 25$, 20.2%), sterilization ($n = 26$, 21.0%) and culling ($n = 24$, 19.4%) of problem macaques. Prohibition on human provisioning ($n = 45$, 66.2%) and improved garbage management ($n = 26$, 38.2%) were the main measures suggested for management of urban conflict. With regard to the efficacy of currently implemented mitigation measures to reduce conflict, forest department personnel were most positive about measures that aimed to increase the availability of wild food resources for rhesus ($n = 99$, 81.8%). They were very critical about culling orders for rhesus macaques ($n = 86$, 71.1%) and ambivalent about the effectiveness of the sterilization program for rhesus macaques ($n = 63$, 52.1%).

Influence of management level on perspectives of conflict

Respondents belonging to the three management level categories differed significantly in their views with respect to factors that drive rural conflict (Fig. 3). While a significantly high proportion of respondents from the lower management level identified translocation of rhesus (Fisher's exact test, $p = 0.03$) and lack of natural food (Fisher's exact test, $p = 0.03$) as factors that primarily cause conflict, middle and upper management level respondents said that rhesus population increase was the critical causative factor.

Respondents did not greatly vary in their views regarding HRMC drivers in urban areas (Fig. 3). Respondents also differed significantly in their views regarding preferred mitigation measures for rural conflict (Fig. 3). Lower management level respondents thought plantation activities were a suitable management intervention (Fisher's exact test, $p = 0.01$), while middle and upper management level respondents declared that macaque culling was an appropriate mitigation strategy. Again, respondents' opinions did not greatly vary regarding mitigation measures for urban conflict (Fig. 3).

Respondents' views regarding the efficacy of currently implemented mitigation measures also differed significantly with respect to their administrative category (Fig. 4). While upper level forest personnel were positive about the effectiveness of the sterilization program (Fisher's exact test, $p = 0.002$) and macaque culling (Fisher's exact test, $p \ll 0.001$), middle level forest personnel were critical of the sterilization initiative (Fisher's exact test, $p = 0.006$) and lower level forest personnel criticized the macaque culling strategy (Fisher's exact test, $p = 0.006$).

Personal preferences of respondents regarding HRMC

The overall sentiment value for conversations about HRMC was -390, indicating that respondents' attitudes regarding the subject matter was predominantly negative. Among management levels, sentiment values were lowest (-174) for lower level respondents (highest degree of negative attitude) and highest (-65) for upper level respondents (lowest degree of negative attitude). With respect to the subject of discussion, sentiment value was least for lay citizen (-272) and highest for species (-22). The sentiment value was positive (1) only when upper management level respondents talked about the role of HP forest department in HRMC (Fig. 5).

Prominent common themes across all word clouds (Fig. 6) were forest (forest encroachment by humans), food (reduced availability of wild food for rhesus, easy availability of human food in forms of food waste and provisioning), damage (crop-damage and damage to forest plantations) and human (provisioning and forest encroachment by humans). Some categories of conversations were dominated by specific topics. For example, conversations with upper management level respondents mostly centered around the negative actions of humans (forest encroachment leading to decreased wild food for rhesus and provisioning rhesus monkeys). In contrast, although conversations with middle and lower management level respondents touched upon the negative actions of humans, they tended to meander over a wide range of topics that included changing lifestyles and agricultural

Fig. 3 Perspectives of different management level on human–rhesus macaque conflict. **a** Causes of rural conflict, **b** causes of urban conflict, **c** Mitigation measures for rural conflict, **d** Mitigation measures for urban conflict. LL lower level, ML middle level, UL upper level, Ban Ban on human provisioning, Cull Culling of rhesus macaques, Garb improper disposal of garbage, Hab decrease in rhesus habitat, Food scarcity of food for rhesus macaques, Mang management of garbage, Plant plantation of feeding resources for rhesus, Pop increase in population of rhesus macaques, Prov human provisioning of rhesus macaques, Ster sterilization of rhesus macaques, Trans translocation of rhesus macaques

practices (people), the role of religion in rhesus protection (religious, sentiment, killing), and the rhesus sterilization program (sterilization). Conversations about the forest department was dominated by the rhesus sterilization program (sterilization), while conversations about the rhesus macaque focused on human provisioning of the species (food, provisioning) and rhesus macaques being attracted towards human habitations (habitation). Conversations about lay citizens revolved around financial losses caused by crop-damage (damage), forest encroachment (human, forest) and religious beliefs inhibiting people from killing rhesus (killing, religious).

DISCUSSION

Several studies acknowledge that the attitudes and perceptions of human stakeholders affected by wildlife conflict critically impact the process of conflict management

(Gillingham and Lee 2003; Naughton-Treves and Treves 2005, Riley and Priston 2010). Wildlife managers are an important stakeholder group in wildlife-related conflict issues, yet there has been little examination of how their perceptions and attitudes towards the problem species and lay citizens likely influence their decisions and actions in the context of conflict management, and thereby the efficacy of conflict management measures. Studies on wildlife managers have typically examined their attitudes towards conflict wildlife (Kaltenborn et al. 1999), how their values and beliefs may differ from the public (Saltiel and Irby 1998; Bjerke and Kaltenborn 1999), their perceptions regarding research needs for wildlife (Bruggers et al. 2002), how they respond to conflict situations (Spencer et al. 2007), and even the subculture of wildlife managers (Kennedy 1985). Only two studies have highlighted the role of organization on wildlife managers; Sullivan and Messmer (Sullivan and Messmer 2003) discuss the role of organizational culture in influencing the reactions of

Fig. 4 Perspectives of different management level groups about state-sponsored mitigation measures. *LL* lower level, *ML* middle level, *UL* upper level

Fig. 5 Sentiment analysis of HRMC conversations. Classified on the basis of (a) Respondents' group (b) Subject of conversation

wildlife managers to conflict issues while Muth et al. (2002) report differences in professional and personal

values between younger and older wildlife managers and point out the impacts of these for the stability of conservation agencies.

The results of our study show that wildlife managers differ amongst themselves regarding wildlife conflict issues. Our findings, when compared with the results of an earlier study from the same region (Anand et al. 2018) also reveal that foresters hold divergent views from farmers regarding best practices for conflict management. In the current study, forest department personnel reported that scarcity of wild food resources is the main reason for rural HRMC and that increasing the availability of wild food resources would help mitigate rural HRMC. Interestingly, our earlier study from the same region showed that farmers believed that the extensive release of rhesus macaque troops into rural areas by the forest department was the primary reason behind rural HRMC (Anand et al. 2018). Again, while department personnel in the current study suggested sterilization and culling of rhesus macaques as potential conflict solutions, our previous study showed that farmers are critical of both these measures as they believe that the sterilization drive has resulted in the indiscriminate release of rhesus in rural areas, and their cultural and religious beliefs inhibit them from culling macaques (Anand et al. 2018). Such a discordance in views between farmers and wildlife managers regarding human–wildlife conflict issues has the potential to negatively impact the process of conflict management (Weladji et al. 2003) and underscores the role of human–human conflict in human–wildlife conflicts.

Organizational studies highlight the importance of conceptualizing social identity and personal identity to

understand how individuals function within organizations (Hornsey and Jetten 2004; Ashforth et al. 2008). Social identity can be seen as arising from the individual's membership of a social group (Tajfel 1974), while personal identity is a sense of self that is based on idiosyncratic attitudes and beliefs (Postmes and Jetten 2006). Sentiment analysis and word cloud generation results reveal that even in their personal views, forest personnel look upon the public or lay citizen as adversaries whose various actions such as provisioning, encroachment within forest areas, changing agricultural practices, and hesitation to cull rhesus are responsible for increasing conflict. Interestingly, the sentiment value of their conversations about the forest department was also negative. This was primarily because lower and middle level respondents were critical about rhesus sterilization program and rhesus culling strategy. The sentiment score for rhesus macaques was significantly higher than that for forest department and lay citizen, indicating that forest personnel are least disapproving about the role of macaques in conflict. This shows that wildlife managers' antagonism towards farmers is largely about how they view farmers' actions and has little to do with the 'problem' wildlife (Dickman 2010; Redpath et al. 2015).

Hierarchical levels within an organization also play a role in influencing individuals' perceptions regarding their organizational identities (Corley 2004; Cole and Bruch 2006). While upper management personnel tend to see organizational identity as tied up with organizational strategy or the way the organization seeks to fulfill its mission and purpose, and therefore prone to change, lower management personnel see it as linked to organizational culture, which they describe as a stable set of values and beliefs that guide appropriate organizational behavior. Middle management perceives organizational identity as a combination of organizational strategy and culture; they tend to describe their organizations both in terms of the actions carried out as well as the values honored by the organization (Corley 2004). This framework of understanding lends greater insight to the findings regarding the divergence between public preferences and personal preferences amongst the three management levels of the HP forest department. Within the forest department, upper management level personnel showed the least dissonance between their public preferences and their personal preferences. Their public views regarding conflict intensity and management were aligned to the official stance of the Forest Department; there was also a close degree of similarity between their public preferences and their personal preferences as revealed by sentiment analysis and word cloud generation. This indicates that upper management personnel fully supported the policies adopted by the forest

department and personally believed that these were the best practices to manage wildlife conflict.

Lower and middle management level personnel, however, showed discordance between their public views and their personal views. Lower level management personnel publicly reported answers that were similar to farmers' perspectives on causes of HRMC; however, sentiment analysis revealed that they privately held negative attitudes toward farmers. The congruity in the public opinions of lower level personnel and farmers may be because most of the former are native to Himachal Pradesh (97%) and practice farming at their home locations (90%). Therefore, they likely face many of the wildlife crop depredation issues that farmers do. That their personal views were antipathic to farmers indicates that they identify more strongly with the forest department than they do with the farmer community in their region, and therefore view farmers as out-group members (Ashforth and Mael 1989). Middle level management reported answers that were aligned to the public stance of the forest department; however, sentiment analysis showed that personally they are very critical of the role of the forest department. We suggest that this dissonance arises from the role of middle management as a bridge between upper and lower management levels that impels them to be simultaneously sensitive to the concerns of lower management personnel as well as sympathetic of the constraints on upper management personnel (Corley 2004).

How do these intra-organizational differences in perceptions of conflict impact conflict management? The divergence in opinions within the forest department, particularly with respect to state-sponsored mitigation measures suggests that the skepticism of lower management level personnel regarding the efficacy of the measures has the potential to reduce their involvement and commitment in the implementation of the measure and would thereby affect its overall outcome. Conflict management measures currently being implemented by HP forest department are long-term, landscape-level measures aimed at stabilization of rhesus macaque populations and improvement in habitat quality. Rhesus sterilization and rhesus culling have been aggressively promoted by the HP forest department as effective conflict mitigation measures. Yet, it was forest plantation, an age-old activity of forest departments, now recast as a conflict mitigation measure that received maximum support from lower level forest personnel. This could be because forest personnel are very familiar with this activity and do not need to invest extra effort to undertake this activity or learn new skills to pursue it. However, there are numerous operational-level details, such as the location of the plantation, species planted, survival rate and protection against forest fires, that need to be carefully considered before plantation activity can be established as an

effective conflict mitigation measure. Farmers' organizations have often criticized the forest department for engaging in the plantation of gymnosperm species and have cited it as one of the reasons for decreasing food resources for rhesus macaques (Himachal Gyan Vigyan Samiti, unpublished report). In the recently launched 'habitat enrichment program' the forest department hopes to address this critique by planting at least 30% fruiting trees and fruiting shrubs out of the total number of species used in the plantation drive. Similarly, other mitigation measures promoted by the Forest Department also need to be revisited and revised for greater acceptance by department personnel as well as by farmers and lay citizens.

The human–rhesus macaque conflict situation in Himachal Pradesh highlights that wildlife-related conflict issues are often deeply complex matters wherein the human–human conflict components have the potential to adversely impact the management of conflict in the long term. Lower management personnel and farmers are linked by their shared concerns regarding wildlife crop depredations; this should make forest guards the most effective means to reach out to farmers and build better relations between the forest department and farmers. Yet, the adversarial attitude of the lower management level towards farmers, as revealed by the results of this study, may potentially increase tensions between the two stakeholder groups and escalate the intensity of human–human conflict.

While some aspects of human–human conflict such as the discordance between the farmers and the forest department in Himachal Pradesh may be more visible (Saraswat et al. 2015), many dimensions of conflict remain hidden and may not always be expressed forcefully (Ogra 2008; Barua et al. 2013). However it is important to be aware of such hidden dimensions of conflict and to understand their causes, for early recognition of sources of distrust between human stakeholders will only aid in developing a more participatory approach to conflict management (Redpath et al. 2013).

CONCLUSION

A combination of novel, interdisciplinary, and shared approaches is required to combat the component of human–human conflict in the context of HRMC. A greater degree of transparency, both within forest departments as well between farmers and wildlife managers, when explaining the rationale behind carrying out current mitigation measures as well as its success rate would help mitigate tensions between human stakeholder groups involved in conflict management (Frank et al. 2015; Terblanche 2015). Such dissemination of information can be achieved through targeted distribution of communication

materials, and discussion fora such as workshops and seminars. Outreach efforts from the forest department must focus on improving relations between the lower management level and the farmers' community through community level activities. There is also a need to develop shared solutions where all stakeholders participate effectively and contribute to the management of conflict (Redpath et al. 2013). Mitigation strategies need to move from being wildlife species-centric, technical strategies to human-oriented and empathetic in approach (Rust et al. 2016). Only a deeper understanding of human factors that underlie human–wildlife conflict issues can help resolve human–wildlife conflicts.

Acknowledgements We are thankful to all officials of Himachal Pradesh Forest Department for their permission to participate in this study and for their support during the course of our study. We also gratefully acknowledge the field support of Jagdish Chand and Vikram Singh for data collection. SA is thankful to National Institute of Advanced Studies (NIAS) for fellowship support during the period of the study.

REFERENCES

- Anand, S., V.V. Binoy, and S. Radhakrishna. 2018. The monkey is not always a God: Attitudinal differences toward crop-raiding macaques and why it matters for conflict mitigation. *Ambio* 47: 711–720. <https://doi.org/10.1007/s13280-017-1008-5>.
- Ashforth, B.E., and F. Mael. 1989. Social identity theory and the organization. *The Academy of Management Review* 14: 20–39. <https://doi.org/10.1097/EDE.Ob013e31812e5535>.
- Ashforth, B.E., S.H. Harrison, and K.G. Corley. 2008. Identification in organizations: An examination of four fundamental questions. *Journal of Management* 34: 325–374. <https://doi.org/10.1177/0149206308316059>.
- Barua, M., S.A. Bhagwat, and S. Jadhav. 2013. The hidden dimensions of human–wildlife conflict: Health impacts, opportunity and transaction costs. *Biological Conservation* 157: 309–316.
- Bjerke, T., and B.P. Kaltenborn. 1999. The relationship of ecocentric and anthropocentric motives to attitudes toward large carnivores. *Journal of Environmental Psychology* 19: 415–421. <https://doi.org/10.1006/JEVP.1999.0135>.
- Brinson, A.A., and D.E. Benson. 2002. Values and Attitudes of National Wildlife Refuge Managers and Biologists: Report to Respondents. U.S. Department of Interior, U. S. Geological Survey, Open File Report OF 02-459.
- Bruggers, R.L., R. Owens, and T. Hoffman. 2002. Wildlife damage management research needs: Perceptions of scientists, wildlife managers, and stakeholders of the USDA/Wildlife Services program. *International Biodeterioration and Biodegradation* 49: 213–223. [https://doi.org/10.1016/S0964-8305\(02\)00042-2](https://doi.org/10.1016/S0964-8305(02)00042-2).
- Cole, M.S., and H. Bruch. 2006. Organizational identity strength, identification, and commitment and their relationships to turnover intention: Does organizational hierarchy matter? *Journal of Organizational Behavior* 27: 585–605. <https://doi.org/10.1002/job.378>.
- Corley, K.G. 2004. Defined by our strategy or our culture? Hierarchical differences in perceptions of organizational identity

- and change. *Human Relations* 57: 1145–1177. <https://doi.org/10.1177/0018726704047141>.
- Danneman, N., and R. Heimann. 2014. *Social Media Mining with R*. Birmingham: Packt Publishing Ltd.
- Dhiman, S.P., and L. Mohan. 2014. Prospects of managing human-rhesus monkey conflict in Himachal Pradesh India. In *Human-Wildlife Conflict in the Mountains of SAARC Region: Compilation of Successful Management Strategies and Practices*, 48–60. Kathmandu: SAARC Forestry Centre.
- Dickman, A.J. 2010. Complexities of conflict: The importance of considering social factors for effectively resolving human-wildlife conflict. *Animal Conservation* 13: 458–466. <https://doi.org/10.1111/j.1469-1795.2010.00368.x>.
- Dickman, A., S. Marchini, and M. Manfredo. 2013. The human dimension in addressing conflict with large carnivores. In *Key Topics in Conservation Biology*, 2nd ed, ed. D.W. Macdonald and K.J. Willis, 110–126. Hoboken: Wiley-Blackwell. <https://doi.org/10.1002/9781118520178.ch7>.
- Fleischman, F. 2016. Understanding India's forest bureaucracy: A review. *Regional Environmental Change*. <https://doi.org/10.1007/s10113-015-0844-8>.
- Forest Survey of India. 2017. *India State of Forest Report 2017*. Dehradun: Forest Survey of India.
- Frank, B., A. Monaco, and A.J. Bath. 2015. Beyond standard wildlife management: A pathway to encompass human dimension findings in wild boar management. *European Journal of Wildlife Research* 61: 723–730. <https://doi.org/10.1007/s10344-015-0948-y>.
- Gillingham, S., and P.C. Lee. 2003. People and protected areas: a study of local perceptions of wildlife crop-damage conflict in an area bordering the Selous Game Reserve, Tanzania. *Oryx* 37: 316–325. <https://doi.org/10.1017/S0030605303000577>.
- Himachal Pradesh Forest Department. 2016. Proposal for Declaring Rhesus Macaques as a Vermin. Retrieved July 20, 2018, from <http://hpforest.nic.in/files/Proposal> under Sec 62 for declaring Macaque as Vermin in.pdf.
- Hornsey, M.J., and J. Jetten. 2004. The individual within the group: Balancing the need to belong with the need to be different. *Personality and Social Psychology Review* 8: 248–264. https://doi.org/10.1207/s15327957pspr0803_2.
- Imam, E., H.S.A. Yahya, and I. Malik. 2002. A successful mass translocation of commensal rhesus monkeys *Macaca mulatta* in Vrindaban, India. *Oryx* 36: 39–87. <https://doi.org/10.1017/S0030605301000011>.
- Jones, P.S., J. Young, and A. Watt. 2005. Biodiversity Conflict Management: A Report of the BIOFORUM Project: CEH Banchory.
- Kaltenborn, B.P., T. Bjerke, and J. Vitters. 1999. Attitudes toward large carnivores among sheep farmers, wildlife managers, and research biologists in Norway. *Human Dimensions of Wildlife* 4: 57–73. <https://doi.org/10.1080/10871209909359157>.
- Keeton, K.B., and B. Mengistu. 1992. The perception of organizational culture by management level: Implications for training and development. *Public Productivity & Management Review* 16: 205–213.
- Kennedy, J.J. 1985. Viewing wildlife managers as a unique professional culture. *Wildlife Society Bulletin* 13: 571–579.
- Kuran, T. 1997. *Private Truths, Public Lies: The social consequences of preference falsification*. Cambridge: Harvard University Press.
- Liddy, E.D. 2001. Natural language processing. *Encyclopedia of Library and Information Science*, 2nd ed, 1–15. New York: Marcel Decker Inc.
- Manfredo, M.J., and A.A. Dayer. 2004. Concepts for exploring the social aspects of human-wildlife conflict in a global context. *Human Dimensions of Wildlife* 9: 1–20. <https://doi.org/10.1080/10871200490505765>.
- Marchini, S. 2014. Who's in Conflict with Whom? Human dimensions of the conflicts involving wildlife. In *Applied Ecology and Human Dimensions in Biological Conservation*, ed. L.M. Verdade, M.C. Lyra-Jorge, and C.I. Pina, 189–209. New York: Springer. <https://doi.org/10.1007/978-3-642-54751-5>.
- Marshall, K., R. White, and A. Fischer. 2007. Conflicts between humans over wildlife management: On the diversity of stakeholder attitudes and implications for conflict management. *Biodiversity and Conservation* 16: 3129–3146. <https://doi.org/10.1007/s10531-007-9167-5>.
- Martin, J., and C. Siehl. 1983. *Organizational culture and counter-culture: An uneasy symbiosis*. *Organizational Dynamics*, 12th ed, 52–64. Amsterdam: Elsevier.
- Miley, F., and A. Read. 2011. Using word clouds to develop proactive learners. *Journal of the Scholarship of Teaching and Learning* 11: 91–110.
- Ministry of Environment Forest and Climate Change. 2016. Gazette Notification No. S.O.1922 (E) dated 26.05.2016 regarding listing of Rhesus Macaque in Schedule-V of the Wild Life (Protection) Act, 1972 in the State of Himachal Pradesh.
- Muth, R.M., R.R. Zwick, M.E. Mather, and J.F. Organ. 2002. Passing the torch of wildlife and fisheries management: Comparing the attitudes and values of younger and older conservation professionals. In *Transactions of the Sixty-Seventh North American Wildlife and Natural Resources Conference*, ed. J. Rahm, 178–193. Washington, DC: Wildlife Management Institute.
- Naughton-Treves, L., and A. Treves. 2005. Socio-ecological factors shaping local support for wildlife: Crop-raiding by elephants and other wildlife in Africa. In *People and wildlife: Conflict or coexistence?*, ed. R. Woodroffe, S. Thirgood, and A. Rabinowitz, 253–277. Cambridge, UK: Cambridge University Press.
- Ogra, M. 2008. Human-wildlife conflict and gender in protected area borderlands: A case study of costs, perceptions, and vulnerabilities from Uttarakhand (Uttaranchal), India. *Geoforum* 39 (3): 1408–1422.
- Ogra, M., and R. Badola. 2008. Compensating human-wildlife conflict in protected area communities: Ground-Level perspectives from Uttarakhand, India. *Human Ecology* 36: 717–729. <https://doi.org/10.1007/s10745-008-9189-y>.
- Peterson, M.N., J.L. Birkhead, K. Leong, M.J. Peterson, and T.R. Peterson. 2010. Rearticulating the myth of human-wildlife conflict. *Conservation Letters*. <https://doi.org/10.1111/j.1755-263X.2010.00099.x>.
- Pirta, R.S., M. Gadgil, and A. Kharshikar. 1997. Management of the rhesus monkey *Macaca mulatta* and Hanuman langur *Presbytis entellus* in Himachal Pradesh, India. *Biological Conservation* 79: 97–106.
- Postmes, T., and J. Jetten. 2006. Reconciling individuality and the group. In *Individuality and the Group: Advances in Social Identity*, ed. T. Postmes and J. Jetten, 258–269. Thousand Oaks: Sage. <https://doi.org/10.4135/9781446211946.n14>.
- QGIS Development Team. 2018. *QGIS Geographic Information System*. Open Source Geospatial Foundation Project.
- R Foundation for Statistical Computing. 2018. *R: A language and environment for statistical computing*. Vienna: R Foundation for Statistical Computing.
- Radhakrishna, S., and A. Sinha. 2011. Less than wild? Commensal primates and wildlife conservation. *Journal of Biosciences* 36: 749–753. <https://doi.org/10.1007/s12038-011-9145-7>.
- Redpath, S.M., J. Young, A. Evely, W.M. Adams, W.J. Sutherland, A. Whitehouse, A. Amar, R.A. Lambert, et al. 2013. Understanding and managing conservation conflicts. *Trends in Ecology & Evolution*. <https://doi.org/10.1016/j.tree.2012.08.021>.
- Redpath, S.M., S. Bhatia, and J. Young. 2015. Tilting at wildlife: Reconsidering human-wildlife conflict. *ORYX* 49: 222–225. <https://doi.org/10.1017/S0030605314000799>.

- Riley, E.P., and N.E.C. Priston. 2010. Macaques in farms and folklore: Exploring the human-nonhuman primate interface in Sulawesi, Indonesia. *American Journal of Primatology* 72: 848–854. <https://doi.org/10.1002/ajp.20798>.
- Rust, N.A., J. Tzanopoulos, T. Humle, and D.C. MacMillan. 2016. Why has human–carnivore conflict not been resolved in Namibia? *Society and Natural Resources* 29 (2016): 1–16. <https://doi.org/10.1080/08941920.2016.1150544>.
- Saltiel, J., and L.R. Irby. 1998. Perceptions of game damage in Montana by resource agency personnel and agricultural producers. *Wildlife Society Bulletin* 26: 84–91.
- Saraswat, R., A. Sinha, and S. Radhakrishna. 2015. A god becomes a pest? Human-rhesus macaque interactions in Himachal Pradesh, northern India. *European Journal of Wildlife Research* 61: 435–443. <https://doi.org/10.1007/s10344-015-0913-9>.
- Sidaway, R. 2013. *Resolving environmental disputes: From conflict to consensus*. London: Routledge.
- Singh, M., H.N. Kumara, and A.D. Velankar. 2016. *Population status of Rhesus Macaque (Macaca mullata) in Himachal Pradesh, India*.
- Singh, V., and M. Thakur. 2012. Rhesus macaque and associated problems in Himachal Pradesh-India. *Taprobanica: The Journal of Asian Biodiversity* 4: 112–116.
- Spencer, R.D., R.A. Beausoleil, and D.A. Martorello. 2007. How agencies respond to human–black bear conflicts: A survey of wildlife agencies in North America. *Ursus* 18: 217–229. [https://doi.org/10.2192/1537-6176\(2007\)18%5b217:HARTHB%5d2.0.CO;2](https://doi.org/10.2192/1537-6176(2007)18%5b217:HARTHB%5d2.0.CO;2).
- Sullivan, T.L., and T.A. Messmer. 2003. Perceptions of deer-vehicle collision management by state wildlife agency and department of transportation administrators. *Wildlife Society Bulletin* 31: 163–173.
- Tajfel, H. 1974. Social identity and intergroup behaviour. *Social Science Information* 13: 65–93. <https://doi.org/10.1177/053901847401300204>.
- Terblanche, R. 2015. *Good fences make good neighbours: A qualitative, interpretive study of human–baboon and human–human conflict on the Cape Peninsula*. Stellenbosch: Stellenbosch University.
- Wallace, M. 2003. Managing the unmanageable? Coping with complex educational change. *Educational Management & Administration* 31. Sage Publications: 9–29.
- Weladji, R.B., S.R. Moe, and P. Vedeld. 2003. Stakeholder attitudes towards wildlife policy and the Bénoué Wildlife Conservation Area, North Cameroon. *Environmental Conservation* 30: 334–343. <https://doi.org/10.1017/S0376892903000353>.
- Wildlife SOS. 2016. Tackling Monkey Menace in Agra. Retrieved 20 October 2018, from <http://wildlifesos.org/blog/wildlife-sos-tackling-monkey-menace-in-agra/>.
- Young, J.C., M. Marzano, R.M. White, D.I. McCracken, S.M. Redpath, D.N. Carss, C.P. Quine, and A.D. Watt. 2010. The emergence of biodiversity conflicts from biodiversity impacts: Characteristics and management strategies. *Biodiversity and Conservation* 19: 3973–3990. <https://doi.org/10.1007/s10531-010-9941-7>.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

AUTHOR BIOGRAPHIES

Shaurabh Anand is a Post-doctoral Research Associate at the Animal Behaviour and Cognition Program, National Institute of Advanced Studies. He conducts research on human–wildlife conflict, human–environment interactions, and effects of anthropogenic activities on wildlife.

Address: Animal Behavior and Cognition Programme, School of Natural Sciences and Engineering, National Institute of Advanced Studies, Indian Institute of Science Campus, Bangalore, Karnataka 560012, India.

e-mail: shaurabhanand@gmail.com

Sindhu Radhakrishna (✉) is a Professor with the Animal Behaviour and Cognition Program, National Institute of Advanced Studies. Her research interests are in the fields of primate behavioral ecology, ethnoprimatology, human animal relations, and conservation biology. *Address:* Animal Behavior and Cognition Programme, School of Natural Sciences and Engineering, National Institute of Advanced Studies, Indian Institute of Science Campus, Bangalore, Karnataka 560012, India.

e-mail: sindhu.radhakrishna@gmail.com