

The monkey is not always a God: Attitudinal differences toward crop-raiding macaques and why it matters for conflict mitigation

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Received: 17 July 2017 / Revised: 5 December 2017 / Accepted: 15 December 2017 / Published online: 13 January 2018

Abstract Attitudinal differences toward wildlife have important implications for conflict management and when the species in question have strong cultural and religious associations, conflict mitigation becomes a challenging endeavor. We investigated farmers' attitudes toward two different crop-raiding macaque species, the rhesus macaque in northern India, and the bonnet macaque in southern India. Apart from regional differences in attitudes, we also assessed temporal changes in attitude toward the rhesus macaque. We carried out household surveys using a semistructured questionnaire to collect data. Our findings reveal that respondents in southern and northern India differ significantly in their views regarding species sanctity and preference for mitigation options. Although people's perceptions of the rhesus macaques had changed over time in northern India, farmers were still unwilling to cause harm to the macaques. We discuss the underlying causes of these observed differences in attitude and their impact on the management of human–macaque conflict.

Keywords Bonnet macaque (*Macaca radiata*) · Conflict · India · Management · Rhesus macaque (*Macaca mulatta*)

INTRODUCTION

Human–wildlife conflict (HWC), inarguably, is one of the more pressing environmental challenges facing the world today (Madden 2004), not only because it poses a serious threat to wildlife species conservation (Mateo-Tomás et al.

2012) but also because it endangers the sustainability of human livelihoods (Rao et al. 2002). Traditionally, HWC studies only considered the ecology and conservation status of the concerned wildlife species (Brennan et al. 1985). However, over the last decade, HWC studies acknowledge that inclusion of human dimensions in HWC interventions will 'make our tool box full' and increase the success of conflict-mitigation measures (Baruch-Mordo et al. 2009).

Among factors related to the human dimensions of HWC, perceptions regarding conflict-causing species are particularly significant for our understanding of conflict management (Treves 2009). Perceptions of wildlife species impact conflict mitigation in three major ways: (i) people's attitudes toward a species directly influence their perception of the damage caused by the species (Knight 2000; Kansky and Knight 2014); (ii) negative attitudes toward a species exacerbate the perceived levels of conflict with that species, and people may continue to report high intensity of conflict even after reduction of damage (Nyhus et al. 2003); and (iii) people's attitudes toward a wildlife species strongly affect the acceptability and relative success of the state-sponsored conflict-management measures (Treves et al. 2006; Thomas and Jones 1999). Some studies have shown that when crop- or livestock-raiding is caused by large and dangerous animals, people estimate greater damage than caused by the animals (Mishra 1997; Naughton-Treves and Treves 2005). Other studies report that when crop-raiding is visible and frequent, and seen as wasteful, people label the species as causing more economic damage than they really did (Riley 2007).

Several studies have assessed human attitudes toward wildlife species, and the typical approach has been to look at one or more widely differing species within the same landscape and its correlates (for example, Marchal and Hill 2009; Campbell-Smith et al. 2010). A less-common approach has been to look at different attitudes toward

Electronic supplementary material The online version of this article (<https://doi.org/10.1007/s13280-017-1008-5>) contains supplementary material, which is available to authorized users.

similar/related species (for example, attitudinal differences toward crop-raiding baboons and chimpanzees—Watkins (2006), McLennan (2008), and attitudinal differences toward livestock-depredating carnivores—Mishra (1997), Suryawanshi et al. (2013)) or the differences between human communities in their attitudes toward a particular species such as the elephant (Fernando et al. 2005). Investigations of the latter kind have revealed intriguing differences in people's perceptions regarding conflict species even within the same landscape. Factors like education, income levels, and economic losses incurred due to crop and livestock depredations (Kruse and Card 2004; Treves et al. 2006) strongly influence attitudes toward conflict-causing wildlife. Religious beliefs also play important roles in mediating attitudes toward wildlife (Knight 1999), and it is likely that in such countries where human society is composed of highly diverse religious and cultural communities, attitudes toward conflict species and mitigation measures are divergent, dissonant, and extremely complex.

In common with many countries across Asia, incidences of HWC have a widespread presence across India, and primates constitute a significant proportion of the species involved in HWC (Anand and Radhakrishna 2017). At the same time, many primate species in India have strong religious associations and are often venerated as God (Radhakrishna 2013). This situation holds true for a number of other countries in Asia where macaques have strong religious connotations (Knight 1999). In such scenarios, the employment of a management strategy without considering people's attitudes toward the species is unlikely to work in the long term.

In this paper, we examine farmers' attitudes toward two crop-raiding macaque species in different regions of India, namely the rhesus macaque (*Macaca mulatta*) in northern India and the bonnet macaque (*Macaca radiata*) in southern India to understand differences and similarities in their perceptions. We also report the results of our investigation into changes in perceptions toward the rhesus macaque over time. Similar in ecology and behavior, but with largely separate geographic distributions, the rhesus and the bonnet macaques are ideal for examining the issue of regional disparities and temporal shift in perceptions vis-à-vis wildlife. We also discuss the conservation implications of our findings for wildlife species involved in HWC.

MATERIALS AND METHODS

Study Species

The rhesus macaque and the bonnet macaque are the most commonly found macaque species in India. Both species are well recognized as crop-raiders (Singh and Rao 2004;

Sengupta and Radhakrishna 2013; Saraswat et al. 2015). Although similar in ecology and behavior, they have largely separate geographic distributions—the rhesus macaque is distributed across north and north-eastern India (Fooden 2000), while the bonnet macaque is endemic to peninsular India (Singh et al. 2008). Conflict due to crop-raiding by rhesus macaques is a much-discussed problem across northern India, with its impacts being particularly severe in the twin hill states of Himachal Pradesh and Uttarakhand (Jardhari et al. 2008; Saraswat et al. 2015). In response to the intensity of rhesus macaque conflict, the state government of Himachal Pradesh declared the species as vermin (permitting lay citizens to cull individuals at will) twice: once in 2010 (Saraswat et al. 2015) and more recently in 2016 (Ministry of Environment, Forest and Climate Change 2016). The conflict between humans and bonnet macaques due to crop-raiding by bonnet macaques is well documented (Jayson 1999; Sengupta and Radhakrishna 2013). Although public demand for conflict mitigation is not very politically prominent in the case of the bonnet macaque (unlike the rhesus macaque), yet, long-term population monitoring has revealed that bonnet macaques have become locally extinct from high conflict areas due to culling (Singh and Rao 2004; Singh et al. 2011). Hence, it may be assumed that conflict due to bonnet macaques is as intense as that due to rhesus macaques.

Study area

We conducted our study in two locations in northern and southern India—Solan district in the state of Himachal Pradesh in northern India (for rhesus macaques) and Kasaragod district in the state of Kerala in southern India (for bonnet macaques) (Fig. 1a–c). Geographically, Solan lies in the lower *Shiwalik* region of Himachal Pradesh and occupies a geographic area of 1936 km². Solan is one of the districts highly affected by human–rhesus macaque conflict in Himachal Pradesh (Singh and Thakur 2012).

Kasaragod is the northernmost district of Kerala with a total geographic area of 1992 km². Physiogeographically, the district consists of the coastal plains on the eastern sides, the midlands, and the eastern highland regions. Kasaragod is well known for the high incidences of HWC occurring in the district (Jayson 1999).

Methods

Regional differences in attitudes toward macaques

We used semistructured questionnaire surveys to assess the attitudes of farmers toward crop-raiding macaque species and random sampling methods to select participant

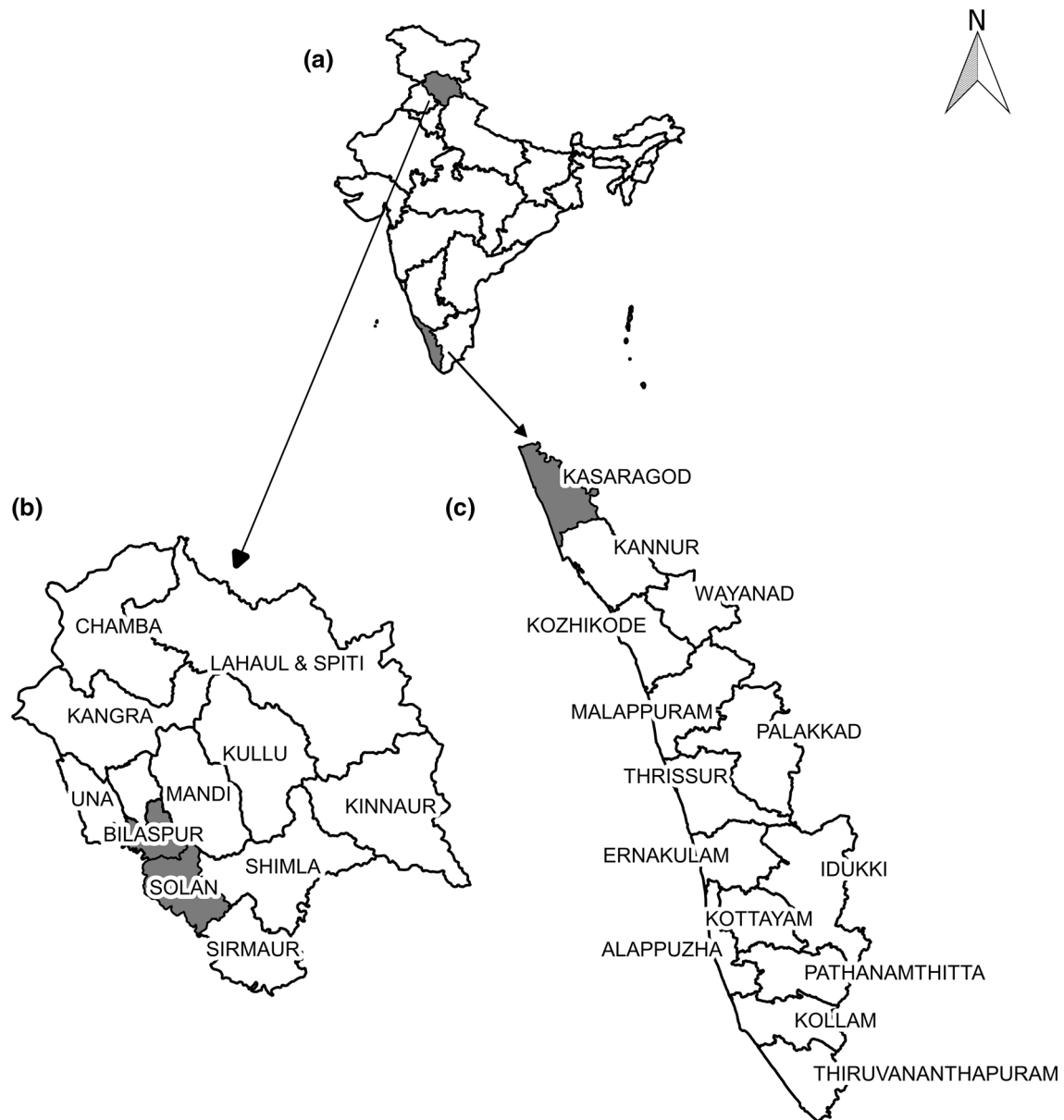


Fig. 1 Study areas: **a** Locations of Himachal Pradesh and Kerala in India, **b** Location of Solan district in Himachal Pradesh, **c** Location of Kasaragod district in Kerala

households for our survey. The survey in Solan district was carried out during March–November 2015, while that in Kasaragod district was carried out during July–September 2015.

In Solan, we first divided the entire study area into grids of 16 km² and then randomly chose one village in each grid for our surveys. For the random selection of villages, every village in a grid was assigned a serial number and one number (i.e., village) was chosen using the random number function in Microsoft Excel. In a selected village, a total of nine households were randomly surveyed using a semistructured questionnaire. We chose to sample nine households in every village because the least number of

households in a village was ten. For the random selection of households, we opportunistically selected the first accessible house and identified subsequent houses according to a random choice of one of four cardinal directions (i.e., we wrote down the four directions East, West, North, and South on chits of paper and randomly selected one chit of paper when required to identify the next household). We continued this process until we sampled nine households in a selected village. We sampled a total of 81 villages located in 81 distinct grids distributed across the study area (Table S1). We interviewed one adult person from each household who agreed to talk to the interviewer and share information about farming practices and crop damage by

rhesus macaques. In most of the cases, due to the existing social norms at the study site, it was an adult male member of the family who came forward for interview. As we did not wish to cause discomfort to our respondents, we did not specifically request to speak to an adult female from the household. We collected information with respect to (a) respondents' socioeconomic characteristics, (b) farming practices and types of crops grown, (c) identity of crop depredating wildlife, (d) attitudes toward the rhesus macaque, and (e) people's perception regarding possible causes of crop-raiding and mitigation measures.

In Kasaragod, we used a combination of purposive and random sampling methods to identify the villages and households for our survey. Initially, we selected villages affected by bonnet macaque crop-raiding based on the information provided by key informants at a local organization, the Institute of Sustainable Development and Educational Research (ISDER), Malom, Kasaragod. ISDER works closely with indigenous communities in Kasaragod and hence is well informed about wildlife crop depredations in this region. In selected villages, we randomly chose households for our questionnaire survey using the random cardinal direction approach described above. As in Solan, we requested to interview one adult person from each household and did not specifically ask to speak to an adult female from the household. In most of the cases, it was an adult male who responded to our request for an interview. We surveyed a total of 247 households in seventeen sub-villages (that fell under 8 census-villages) spread over two *talukas* (equivalent to subdistrict) of the district (Table S2). The number of households surveyed in each sub-village ranged from 1 to 40 (mean: 14.5) depending on the size of the villages and logistical feasibility. We collected information on (a) respondents' socioeconomic characteristics, (b) farming practices and types of crops grown, (c) reasons for crop damage, (d) attitudes toward the bonnet macaque, and (e) people's perception regarding possible causes for crop-raiding and mitigation measures.

Temporal shift in attitude toward rhesus macaques

In order to assess if there are attitudinal changes toward the rhesus macaques in Himachal Pradesh, we compared the results of our household surveys to those reported by Saraswat et al. 2015. The latter reports the findings of a study conducted by Saraswat and colleagues in 2010 to assess the attitudes of farmers toward the rhesus macaque in the Bilaspur district of Himachal Pradesh. We chose Saraswat et al. (2015) for purposes of our comparison for three reasons: (1) One of us (SR) was part of the Saraswat et al. (2015) study and hence ensured that the methodologies used in both studies were similar. (2) The Saraswat et al., (2015) study was conducted in Bilaspur district that like Solan is

identified as one of high conflict districts of Himachal Pradesh (Singh and Thakur 2012). Bilaspur and Solan are adjacent districts (Fig. 1b) and are characterized by similar socioeconomic demographics (Table 1). (3) The Saraswat et al. (2015) study was conducted during the year 2010 when rhesus macaques were first declared as a vermin species. Our study was conducted in 2015 when the state witnessed the high demand for declaration of rhesus as vermin species.

Data analysis

We summarized respondents' characteristics such as gender, age, occupation, land-holding size, and farming systems in terms of percentages. We quantified data emerging from multiple-response questions as percentage of respondents for each response and, in many cases, these summed to over 100%. Respondent answers regarding causes of crop damage, preferred mitigation measures, and the views about macaques that were collected through open-ended questions were categorized for analysis. Following Saraswat et al. (2015), we classified mitigation measures suggested by respondents into the following categories: 'evasive' (capture and translocation/confinement of problem macaques), 'manipulative' (culling, sterilization), 'constructive' (plant fruiting trees near forests, increase in forest vegetation), and 'preventive' (ban provisioning, crop-guarding). We compared attitudinal differences between farmers in Kerala and Himachal Pradesh with respect to bonnet macaques and rhesus macaques against the following parameters: status of

Table 1 Socioeconomic characteristics of Solan and Bilaspur (figure in parenthesis represents percentage of the total) (Census of India 2011)

	Bilaspur	Solan
Population	381 956	580 320
Religion		
Hindu	371 973 (97.39)	548 579 (94.53)
Muslim	6984 (1.83)	14 678 (2.53)
Other religions	2999 (0.79)	17 063 (2.94)
Occupation		
Cultivators	127 169 (33.29)	141 267 (24.34)
Agricultural laborers	4138 (1.08)	10 283 (1.77)
Household industry	2561 (0.67)	4969 (0.86)
Other livelihoods (government employee/private industry employee/self- employed)	72 003 (18.85)	142 218 (24.51)

species as agricultural pest or wild animal, factors driving macaques to crop-raid and proposed mitigation measures. We also compared farmers' attitudes toward the rhesus macaque in 2010 and in 2015 with respect to the following parameters: status of species as divine, pest or wild animal, and mitigation measures. For both cases, we used Fisher's exact test to check for significant differences in farmers' attitudes.

RESULTS

Solan, Himachal Pradesh

We surveyed a total of 729 respondents in Solan. Respondents' ages ranged from 20 to 89 years, and the majority (45.0%, $n = 328$) belonged to the age category of 30–50 years. Most of the respondents were male (87.9%, $n = 641$), and predominantly (78.1%, $n = 569$) depended on agriculture as their sole means of livelihood. The average land holding/household was 0.70 ha, and more than two-thirds of the farmers (70.1%, $n = 511$) belonged to 'small-holdings farmer' category (landholding size < 2 ha). Farmers engaged in two distinct cropping seasons—*Rabi* (winter cropping—October–May) and *Kharif* (Monsoon cropping—June–September), and the major crops are wheat, maize, tomato, capsicum, peas, potato, and ginger. Farmers reported that there were many crop-raiding species, namely rhesus macaque, wild boar (*Sus scrofa*), blue bull (*Boselaphus tragocamelus*), sambar deer (*Rusa unicolor*), Hanuman langur (*Semnopithecus entellus*), Indian hare (*Lepus nigricollis*), peacock (*Pavo cristatus*), Indian crested porcupine (*Hystrix indica*), red jungle fowl (*Gallus gallus*), and Indian muntjac (*Muntiacus muntjak*). However, in terms of frequency and intensity of crop damage, the rhesus macaque was reported (84%) to be the worst crop depredator. In response to questions about reasons that drive rhesus macaques to raid crops, most of the farmers (43.1%, $n = 313$) suggested that mismanagement by the forest department, particularly with respect to the indiscriminate release of rhesus troops in rural areas, was the main cause for high crop damage by rhesus macaques. Others variously blamed depletion of natural resources (25.0%, $n = 182$) and macaque fecundity 23.8% ($n = 173$) for rhesus crop-raiding and crop damage.

Respondents predominantly (99.0%, $n = 722$) resorted to human guarding to protect their crops from rhesus macaque depredations. While the majority of them (86%, $n = 621$) only depended on human guarding, some respondents (14.0%, $n = 101$) also used dogs and/or fire-crackers to aid them in their guarding. A very small number of respondents (1.0%, $n = 7$) used electric fencing to keep away rhesus macaques from their fields.

When asked to comment on the best practices to mitigate conflict, most of the respondents favored evasive measures such as capture and translocation/confinement of crop-raiding macaques (47.3%, $n = 342$), or manipulative methods (overall: 35.5%, $n = 257$; culling: 27.4%, $n = 198$; sterilization: 8.2% $n = 59$). Some farmers (13.1%, $n = 95$) suggested constructive approaches like increasing the natural food resources of macaques, and a few of them (4.0%, $n = 29$) felt that preventive measures like crop guarding or banning macaque provisioning would help resolve the matter. When asked to describe their views regarding the rhesus macaque, approximately three-fourths of respondents (73.3%, $n = 534$) termed the species as an agricultural pest. Only 26.7% ($n = 195$) of the respondents considered rhesus macaques to be a wild animal, and none of the farmers referred to it as divine or a representation of god.

Kasaragod, Kerala

We interviewed a total of 247 persons from 17 sub-villages. The age of the respondents ranged from 22 to 86 years and the majority of the respondents (64.8%, $n = 160$), belonged to the age category of 30–50 years. Males constituted the majority of respondents ($n = 167$, 67.6%). Farming was the sole occupation for 39.7% ($n = 98$) of respondents, while 60.3% ($n = 149$) were engaged in various secondary occupations such as government employment, private business, and daily wage work. The average landholding size/household is 0.87 ha. The vast majority of the farmers (89.9%, $n = 222$) belonged to the 'small-holdings farmer' category (landholding size < 2 ha). Approximately two-thirds (63.7%, $n = 156$) of the respondents cultivated only perennial tree crops such as coconut, areca nut, rubber, and cashew nut; a smaller percentage (36.3%, $n = 89$) cultivated seasonal crops like banana and tapioca in addition to the perennial crops.

Respondents identified rodents (93.5%, $n = 231$), large-bodied wildlife (66.0%, $n = 163$), crop diseases (21.9%, $n = 54$), and small insects and pests (8.1%, $n = 20$) as primarily responsible for crop depredations. Among large-bodied wildlife, bonnet macaque topped the list of crop-damaging species with approximately all respondents (99.2%, $n = 245$) describing it as a crop-raider. The wild boar (56.3%, $n = 139$) and elephant (*Elephas maximus*) (53.0%, $n = 131$) were other problematic crop-raiders. A minuscule percentage (1.2%, $n = 3$) reported crop damage by various bird species. When asked to compare between the bonnet macaque and wild pig, more people rated bonnet macaques as the worse crop-raider (bonnet macaque worse than wild pig: 46.6%, $n = 108$; wild boar worse than bonnet macaque: 14.7%, $n = 34$, both equal in damage-causing status: 38.8%, $n = 90$).

Farmers reported that the main reasons that caused bonnet macaque crop-raiding was depletion of natural resources (81.3%, $n = 195$) and increase in population of bonnet macaques (18.8%, $n = 45$). When questioned on how they reacted to macaque crop-raiding, most of the farmers (61.9%, $n = 153$) responded that they resorted to changing crop type. About 36.0% ($n = 89$) said that they chased macaques from their farms, and only 4.9% reported that they killed macaques in retaliation. However, when farmers were asked whether macaques are killed, most of them ($n = 114$, 46.2%) chose not to answer the question. About 27.1% ($n = 67$) agreed that macaques are killed, and almost the same number ($n = 66$, 26.7%) denied that macaques are killed.

When asked to comment on the best practices to mitigate conflict, most of the respondents suggested manipulative measures (overall: 90.5%, $n = 181$; culling: 3.5%, $n = 7$; sterilization: 87.0%, $n = 174$), while a small percentage recommended evasive (8.5%, $n = 17$) and

constructive measures (1%, $n = 2$). About 19.0% ($n = 47$) of the respondents did not wish to suggest any mitigation measures.

Only 20.4% ($n = 46$) of the respondents considered bonnet macaques to be a wild species. When asked to describe their views regarding the bonnet macaque, most of the respondents (94.2%, $n = 228$) termed the species an agricultural pest. A few (4.1%, $n = 10$) opined that humans should take care of bonnet macaques and 1.7% ($n = 4$) saw it as a performing species. None of the respondents viewed it as divine or a representation of God.

Attitudinal differences toward rhesus macaques and bonnet macaques

There was a significant difference in attitudes toward the bonnet macaque in Kerala and the rhesus macaque in Himachal Pradesh, both with respect to the pest status of the macaque species as well as its identity as a wild animal (Fig. 2a). There were also interesting differences between respondents in Kerala and Himachal Pradesh over what they saw as reasons driving macaque crop-raiding (Fig. 2b). Significant differences in peoples' attitudes toward macaques also extended to proposed mitigation measures for macaque conflict; while respondents in Kerala suggested that macaques be sterilized or killed, people in Himachal Pradesh recommended that problem macaques be translocated (Fig. 2c). All respondents in Himachal

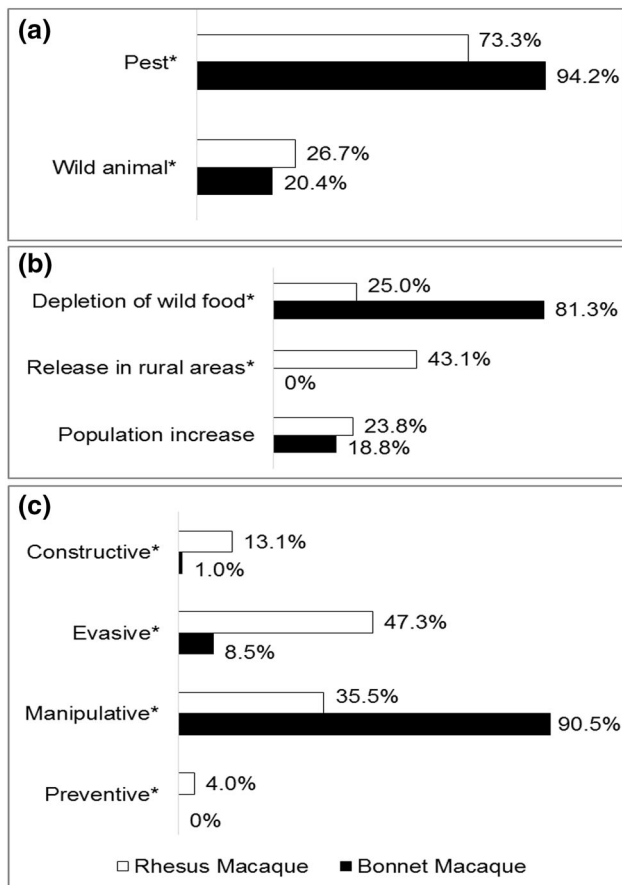


Fig. 2 Attitudinal differences toward rhesus macaques and bonnet macaques in Himachal Pradesh and Kerala. **a** Respondents' perceptions regarding rhesus macaques and bonnet macaque. **b** Reasons that drive macaques to raid crops. **c** Proposed mitigation measures for conflict management (*statistically significant difference, Fisher's exact test, $\alpha = 0.05$)

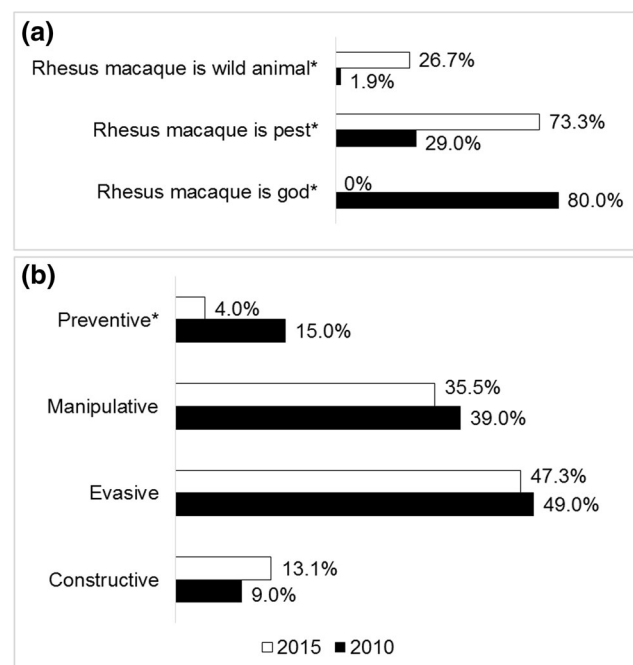


Fig. 3 Temporal changes in attitudes toward rhesus macaques in Himachal Pradesh. **a** Respondents' perceptions regarding rhesus macaque. **b** Proposed mitigation measures for conflict management (*statistically significant difference, Fisher's exact test, $\alpha = 0.05$)

Pradesh agreed that compensation should be paid to affected farmers. However, only a small percentage of people (21%) felt this was necessary in Kerala. People in both regions were equally vocal about their resentment toward what they saw as government apathy; all respondents believed that the government ignores the issue and that managing this problem should be the responsibility of the government.

Temporal differences in attitudes toward the rhesus macaque

A comparison of the results of this study to those of Saraswat et al. (2015) brought out interesting differences in attitudes toward the rhesus macaques over time in Himachal Pradesh. Respondents in Solan significantly differed in their perception, from respondents in Bilaspur regarding the divine, wild, or pest status of the macaque (Fig. 3a). With respect to mitigation measures, the two sets of respondents did not differ in their preference for manipulative, evasive, and constructive measures. However, the preference for preventive measures decreased significantly in the current assessment compared with the previous study (Fig. 3b).

DISCUSSION

Cultural values represent implicitly or explicitly shared abstract ideas about what is good, right, and desirable in a society (Williams 2006). These cultural values are the bases for specific norms that guide people regarding appropriate behavior in various social situations. Cultural beliefs and values shape human attitudes toward wildlife and the environment, and this strongly impacts the development of HWC and its management (Knight 1999). Cultural differences between societies or social groups are likely to bring about differences in HWC situations in different regions/areas; hence a cross-cultural investigation of HWC should be a priority for ensuring successful HWC mitigation (Manfredo and Dayer 2004).

Respondents in the two locations in Solan and Kasaragod differed significantly in their attitudes toward crop-raiding macaques. Findings from our study suggest that in comparison to farmers in Himachal Pradesh, people in Kerala may be less tolerant toward macaque crop-raiding activities. Although participants from Kerala claimed that they changed crops as a way of dealing with macaque crop depredations, it is unlikely that farmers actually practiced this, as their cropping system is largely based on perennial tree crops and cannot be easily changed. It appears more likely that many farmers kill problem macaques in retaliation for crop-raiding. This conclusion is supported by our

finding that though only 5% reported killing macaques as a retaliatory measure, 27% of the respondents agreed that they knew macaques were killed in their area. Even more telling, nearly half the respondents refused to answer whether macaques are killed in their area, indicating that they were uncomfortable sharing information on this topic.

In contrast, although people in Himachal Pradesh have grown disenchanted with the rhesus macaque, they preferred evasive measures such as translocation to deal with problem macaques. Farmers' differing responses in 2010 and 2015 clearly show that their conviction in the religious sanctity of the rhesus macaque has been eroded. A more visible statewide expression of *Himachali* farmers' agnism toward the macaque was their demand to declare the rhesus as 'vermin' wildlife in 2014–2015 (Radhakrishna and Raman 2016). Respondents did recommend macaque culling as a mitigation strategy, yet, in reality there have been very few incidents of macaque culling in the state, despite government's permission to do so (Bisht 2017). Hence, we suggest that *Himachali* farmers' reluctance to kill problem macaques stem from cultural values that are not just driven by religious beliefs.

It is interesting that a larger percentage of people in Kerala recommended sterilization than people in Himachal Pradesh (87 vs 8%). However, this finding should be understood with reference to government-led macaque mitigation strategies in Himachal Pradesh and Kerala. Himachal Pradesh government initiated a macaque sterilization program in the state in 2007 that is still active (Rattan 2011). As farmers continue to complain about macaque depredations in Himachal Pradesh, it is likely that *Himachali* farmers have little faith in this mitigation strategy. On the other hand, macaque sterilization has not been implemented in Kerala, and therefore people may be more hopeful of this measure.

Cultural perspectives may differ between social groups and an important point of divergence is how humans perceive themselves with relation to nature and wildlife (Manfredo and Dayer 2004). While some societies may be oriented toward an outlook that believes in the domination of nature, others may hold a worldview of subjugation by nature. However, concern for the environment and cultural beliefs in the importance of forests may not extend to the wildlife residing within them (Malone et al. 2014). We propose that the attitudinal differences between Keralite farmers and *Himachali* farmers arise from differing cultural values between the two regions, particularly with respect to perceptions regarding the role of forests and wildlife in human lives. Research on the environmental history of Kerala indicates that people's relationship with nature is rarely one of reverence or gratitude, but rather one of establishing dominion over wild nature, i.e., forests and its resources, including wildlife. Religious attitudes as

depicted through *teyyam* songs in Kerala celebrate the killing of wildlife that threatens human lives and food crops (Freeman 1999). Research on HWC in Kerala has also documented that indigenous communities living near protected forest areas often trap and hunt wildlife species in order to protect crops (Jayson 1998). Himachal Pradesh, on the other hand, has a rich historical legacy of local forest protection and community forestry initiatives (Vasan 2001). Primates, particularly the rhesus macaque, are religiously significant, and therefore people are loath to harm them (Pirta et al. 1997). During our fieldwork in Solan, we observed that despite the recent government order in May 2016 that classified rhesus macaque as vermin and permitted farmers to kill macaques at will, there were only three incidents of macaque culling over a period of 10 months (Anand, personal communication). There were also no reports of macaque shooting elsewhere in the state (Bisht 2017). Indeed, in April 2017, the state government of Himachal Pradesh acknowledged that religious sentiments were preventing farmers from shooting macaques and that a special eco-task force would be set up for the purpose of culling vermin monkeys (Indian Express 2017). The lack of macaque culling in Himachal Pradesh, despite the monetary incentive (INR 500, i.e., ~ USD 4.5 for killing one macaque individual) offered by the state government (Himachal Pradesh Forest Department 2016), supports our assertion that cultural beliefs constrain *Himachali* farmers from causing harm to problem macaques.

It is interesting that although macaque crop-raiding is a problem in southern and northern India, the issue was elevated to the status of a political issue only in northern India, and the rhesus macaque was declared vermin only in Himachal Pradesh. A simplistic reading of these events would lead to the conclusion that the rhesus macaque is a bigger problem in Himachal Pradesh than the bonnet macaque is in southern India. Insights from our study, however, suggest that other factors may also play a role in mediating the different trajectories of human–primate conflict in southern and northern India. We propose that farmers and lay people in Himachal Pradesh are unwilling to cull the rhesus macaque in retaliation for crop deprecations, and therefore experience an enormous sense of frustration at the loss of their livelihoods (Madden 2004). It is this feeling of helplessness that has resulted in the politicization of the rhesus macaque in Himachal Pradesh. Farmers in Kerala, however, respond to crop-raiding bonnet macaques in a more forceful manner, possibly because they are less hindered by such cultural inhibitions. Studies on bonnet macaques in the states of Karnataka and Goa confirm that the bonnet macaque has been locally exterminated from many regions, most probably in retaliation to crop-raiding (Singh and Rao 2004; Singh et al. 2011; Sengupta and Radhakrishna 2013).

Sociocultural characteristics such as gender (Miller and Jones 2006; Ogra 2008), religion (Knight 1999), and period of residency within a region (Lee et al. 2009) have been recognized as crucial factors that shape human attitudes toward wildlife and management of HWC. In our study, we were unable to consider the role of these parameters in shaping the attitudes of people in Kerala and Himachal Pradesh and this certainly reduces the scope and broader applicability of our findings. However, the results of our study do indicate that there are some interesting differences in the ways people perceive macaques in the two regions and in their attitudes toward conflict management involving these species. A more in-depth study that takes into account the effects of gender and religion would add more valuable insights into cultural differences in attitudes toward wildlife with respect to the two regions.

CONCLUSIONS

The findings of our study have important implications for management decisions taken with respect to HWC issues. We argue that cultural differences, particularly with respect to attitudes toward wildlife must be taken into consideration before nationwide mitigation strategies are proposed or implemented. A mitigation strategy that may be appropriate for a certain region or community may not be acceptable elsewhere, even within the same country (Dandy et al. 2011). Even more important, reasons for conflict escalation may have less to do with wildlife species behavior and be more directly related to people's cultural values. Hence wildlife management strategies that are instituted to resolve conflict may not achieve their intended effects (Rust et al. 2016). Rather than initiating top-down mitigation strategies that attempt to be a panacea for all wildlife conflict issues, it may be more useful to examine conflict situations at regional levels to try and understand the context behind people's grievances and how they may wish to resolve them.

Acknowledgements The authors thank Vijay Rajput, Sumith Lal, and Girija for their assistance in the field. They would also like to thank Neha Lakhani for insightful discussions on the subject matter of the manuscript. Shaurabh Anand was supported by an institutional fellowship during the course of this study.

REFERENCES

- Anand, S., and S. Radhakrishna. 2017. Investigating trends in human–wildlife conflict: Is conflict escalation real or imagined? *Journal of Asia-Pacific Biodiversity* 10: 154–161. <https://doi.org/10.1016/j.japb.2017.02.003>.

- Baruch-Mordo, S., S.W. Breck, K.R. Wilson, and J. Broderick. 2009. A tool box half full: How social science can help solve human–wildlife conflict. *Human Dimensions of Wildlife* 14: 219–223. <https://doi.org/10.1080/10871200902839324>.
- Bisht, G. 2017. Monkeys again declared vermin in Shimla. *Hindustan Times*, March 22.
- Brennan, E.J., J.G. Else, and J. Altmann. 1985. Ecology and behaviour of a pest primate: Vervet monkeys in a tourist-lodge habitat. *African Journal of Ecology* 23: 35–44. <https://doi.org/10.1111/j.1365-2028.1985.tb00710.x>.
- Campbell-Smith, G., H.V.P. Simanjorang, N. Leader-Williams, and M. Linkie. 2010. Local attitudes and perceptions toward crop-raiding by orangutans (*Pongo abelii*) and other nonhuman primates in Northern Sumatra, Indonesia. *American Journal of Primatology* 72: 866–876. <https://doi.org/10.1002/ajp.20822>.
- Census of India. 2011. Primary Census Abstract Data Tables - Himachal Pradesh. Office of the Registrar General & Census Commissioner, New Delhi, India.
- Dandy, N., S. Ballantyne, D. Moseley, R. Gill, A. Peace, and C. Quine. 2011. Preferences for wildlife management methods among the peri-urban public in Scotland. *European Journal of Wildlife Research* 57: 1213–1221. <https://doi.org/10.1007/s10344-011-0534-x>.
- Fernando, P., E. Wikramanayake, D. Weerakoon, L.K.A. Jayasinghe, M. Gunawardene, and H.K. Janaka. 2005. Perceptions and patterns of human–elephant conflict in old and new settlements in Sri Lanka: Insights for mitigation and management. *Biodiversity and Conservation* 14: 2465–2481. <https://doi.org/10.1007/s10531-004-0216-z>.
- Fooden, J. 2000. Systematic review of the Rhesus Macaque, *Macaca mulatta* (Zimmerman, 1780). *Fieldiana Zoology* 96: 1–192. <https://doi.org/10.5962/bhl.title.7192>.
- Freeman, J.R. 1999. *Gods, groves and the culture of nature in Kerala*. Modern Asian Studies 33, 257–302. Cambridge: Cambridge University Press.
- Himachal Pradesh Forest Department. 2016. Order for payment of incentive for killing of monkeys. Retrieved January 15, 2017, from <http://hpforest.nic.in/files/orderforpaymentofincentiveforkillingofmonkey.pdf>.
- Indian Express. 2017. Soon, special task force to cull vermin monkeys in Himachal Pradesh. Retrieved February 15, 2017, from <http://indianexpress.com/article/india/soon-special-task-force-to-cull-vermin-monkeys-in-himachal-pradesh-4608168/>.
- Jardhari, V., P. Rao, and A. Choudhary. 2008. *Crop damage by wildlife in a Garhwal Himalayan village*. Pune: Kalpvriksha.
- Jayson, E. A. 1998. Studies of Man-Wildlife Conflict in Peppara Wildlife Sanctuary And Adjacent Areas. KFRI Research Report No 140:1-71.
- Jayson, E. A. 1999. Studies on crop damage by wild animals in Kerala and evaluation of control measures. KFRI Research Report No. 169: 1–48.
- Kansky, R., and A.T. Knight. 2014. Key factors driving attitudes towards large mammals in conflict with humans. *Biological Conservation*. <https://doi.org/10.1016/j.biocon.2014.09.008>.
- Knight, J. 1999. Monkeys on the Move: The Natural Symbolism of People-Macaque Conflict in Japan. *Journal of Asian Studies* 58: 622–647. <https://doi.org/10.2307/2659114>.
- Knight, J. 2000. *Natural enemies: People–wildlife conflicts in anthropological perspective*. London: Routledge.
- Kruse, C.K., and J.A. Card. 2004. Effects of a Conservation Education Camp Program on Campers’ self-reported knowledge, attitude, and behavior. *The Journal of Environmental Education* 35: 33–45.
- Lee, T.M., N.S. Sodhi, and D.M. Prawiradilaga. 2009. Determinants of local people’s attitude toward conservation and the consequential effects on illegal resource harvesting in the protected areas of Sulawesi (Indonesia). *Environmental Conservation* 36: 157–170. <https://doi.org/10.1017/S0376892909990178>.
- Madden, F. 2004. Creating coexistence between humans and wildlife: Global perspectives on local efforts to address human–wildlife conflict. *Human Dimensions of Wildlife* 9: 247–257. <https://doi.org/10.1080/10871200490505675>.
- Malone, N., A.H. Wade, A. Fuentes, E.P. Riley, M. Remis, and C.J. Robinson. 2014. Ethnoprimatology: Critical interdisciplinarity and multispecies approaches in anthropology. *Critique of Anthropology* 34: 8–29. <https://doi.org/10.1177/0308275X13510188>.
- 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>.
- Marchal, V., and C. Hill. 2009. Primate crop-raiding: a study of local perceptions in four villages in north Sumatra, Indonesia. *Primate Conservation* 24: 107–116. <https://doi.org/10.1896/052.024.0109>.
- Mateo-Tomás, P., P.P. Olea, I.S. Sánchez-Barbudo, and R. Mateo. 2012. Alleviating human–wildlife conflicts: Identifying the causes and mapping the risk of illegal poisoning of wild fauna. *Journal of Applied Ecology* 49: 376–385. <https://doi.org/10.1111/j.1365-2664.2012.02119.x>.
- McLennan, M.R. 2008. Beleaguered chimpanzees in the Agricultural District of Hoima, Western Uganda. *Primate Conservation* 23: 45–54. <https://doi.org/10.1896/052.023.0105>.
- Miller, K., and D. Jones. 2006. Gender differences in the perceptions of wildlife management objectives and priorities in Australasia. *Wildlife Research* 33: 155–159.
- 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.
- Mishra, C. 1997. Livestock depredation by large carnivores in the Indian trans-Himalaya: conflict perceptions and conservation prospects. *Environmental Conservation* 24: 338–343. <https://doi.org/10.1017/S0376892997000441>.
- 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: Cambridge University Press.
- Nyhus, P.J., H. Fischer, F. Madden, and S. Osofsky. 2003. Taking the bite out of wildlife damage: The challenges of wildlife compensation schemes. *Conservation in Practice* 4: 37–40. <https://doi.org/10.1111/j.1526-4629.2003.tb00061.x>.
- Ogra, M.V. 2008. Human–wildlife conflict and gender in protected area borderlands: A case study of costs, perceptions, and vulnerabilities from Uttarakhand (Uttaranchal), India. *Geoforum* 39: 1408–1422. <https://doi.org/10.1016/j.geoforum.2007.12.004>.
- 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.
- Radhakrishna, S. 2013. Songs of monkeys: representation of macaques in classical Tamil poetry. In *The Macaque Connection: Cooperation and conflict between humans and macaques*, ed. S. Radhakrishna, M. A. Huffman, and A. Sinha, 53–68. Springer Science + Business Media.
- Radhakrishna, S., and T.R.S. Raman. 2016. Get the monkey off the back. *The Tribune*, August 23.
- Rao, K.S., R.K. Maikhuri, S. Nautiyal, and K.G. Saxena. 2002. Crop damage and livestock depredation by wildlife: A case study from Nanda Devi Biosphere Reserve, India. *Journal of Environmental Management* 66: 317–327. [https://doi.org/10.1016/S0301-4797\(02\)90587-6](https://doi.org/10.1016/S0301-4797(02)90587-6).

- Rattan, S. 2011. Managing human–macaque conflict in Himachal, India. In *Monkeys on the edge: ecology and management of long-tailed macaques and their interface with humans*, ed. M. Gumert, A. Fuentes, and L. Jones-Engel, 283–284. Cambridge: Cambridge University Press.
- Riley, E.P. 2007. The human–macaque interface: Conservation implications of current and future overlap and conflict in Lore Lindu National Park, Sulawesi, Indonesia. *American Anthropologist* 109: 473–484. <https://doi.org/10.1525/AA.2007.109.3.473>.
- 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: 1–16. <https://doi.org/10.1080/08941920.2016.1150544>.
- 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>.
- Sengupta, A., and S. Radhakrishna. 2013. Of concern yet? Distribution and conservation status of the bonnet macaque (*Macaca radiata*) in Goa, India. *Primate Conservation* 27: 109–114. <https://doi.org/10.1896/052.027.0113>.
- Singh, M., and N.R. Rao. 2004. Population dynamics and conservation of commensal bonnet macaques. *International Journal of Primatology* 25: 847–859. <https://doi.org/10.1023/B:IJOP.0000029125.54747.ee>.
- Singh, V., and M. Thakur. 2012. Rhesus macaque and associated problems in Himachal Pradesh-India. *TAPROBANICA: The Journal of Asian Biodiversity* 4: 112–116.
- Singh, M., A. Kumar, and S. Molur. 2008. *Macaca radiata*. The IUCN Red List of Threatened Species.
- Singh, M., J.J. Erinjery, T.S. Kavana, K. Roy, and M. Singh. 2011. Drastic population decline and conservation prospects of roadside dark-bellied bonnet macaques (*Macaca radiata radiata*) of southern India. *Primates* 52: 149–154. <https://doi.org/10.1007/s10329-011-0234-x>.
- Suryawanshi, K.R., Y.V. Bhatnagar, S. Redpath, and C. Mishra. 2013. People, predators and perceptions: Patterns of livestock depredation by snow leopards and wolves. *Journal of Applied Ecology* 50: 550–560. <https://doi.org/10.1111/1365-2664.12061>.
- Thomas, L.K., and D.N. Jones. 1999. Management options for a human–wildlife conflict: Australian magpie attacks on humans. *Human Dimensions of Wildlife* 4: 93–95. <https://doi.org/10.1080/10871209909359160>.
- Treves, A. 2009. The human dimensions of conflicts with wildlife around protected areas. In *Wildlife and society: The science of human dimension*, ed. M.J. Manfredo, J.J. Vaske, P.J. Brown, D. Decker, and E.A. Duke, 214–228. Washington, DC: Island Press.
- Treves, A., R.B. Wallace, L. Naughton-Treves, and A. Morales. 2006. Co-managing human–wildlife conflicts: A review. *Human Dimensions of Wildlife* 11: 383–396. <https://doi.org/10.1080/10871200600984265>.
- Vasan, S. 2001. Community forestry: Historical legacy of Himachal Pradesh. *Himalaya* 21: 36–45.
- Watkins, C. 2006. Local ecological perceptions of chimpanzees and forest resources: A case study near Budongo Forest, Uganda. In *Primates of Western Uganda*, ed. N.E. Newton-Fisher, H. Notman, J.D. Paterson, and V. Reynolds, 423–437. New York: Springer.
- Williams, R. 2006. The analysis of culture. In *Cultural theory and popular culture: A reader*, 2nd ed, ed. J. Storey, 32–40. Athens: The University of Georgia Press.

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