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Guarding crops from monkey troops: farmer-monkey interaction near a nature reserve in Guangxi, China

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ABSTRACT

Crop damage by wildlife can cause significant economic loss and non-human primates can be nuisances to farmers following their ingenuity in crop-raiding strategies. There is an emerging research interest on interspecies interaction in human-wildlife conflicts, following the growing field of merging human-animal barrier, at least analytically. We collected qualitative data from two villages experiencing macaque crop damage near a national nature reserve in Guangxi, China, to understand how humans and macaques interact in a crop damage scenario and how the interaction evolves in time. We find the mutually interactive processes taken place between farmers and monkeys as they try to learn and adjust to the counterparts' daily activities and raiding/guarding strategies. Their interaction is also mediated by materiality: the crops, the topography of the landscapes and managerial tools. In recent years, socioecological changes such as afforestation, hunting bans and out migration have enabled macaques to grow their population and more boldly pursue for their preference of crops. Our finding reveals the role of non-human animal agency, conservation, and other social processes in shaping human-wildlife relations, as well as the potential of using more-than-human perspective and ethnographic methods in understanding human-wildlife relations. It further implies the need of enhancing farmers' knowing and adjustment, as well as encouraging human-wildlife cohabitation.

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Introduction

Keeping pest species out of built environments was historically a preoccupation that infused the everyday lives and societal organization of a community, which can be found in the form of ancient walls (Boonman-Berson, Driessen, and Turnhout 2018), religious superstitions (Bhatia et al. 2016), constitutions (Bergström, Dirke, and Dannell 2015), and various ceremonies (Tillhagen 1987). Contemporary typologies of interventions by researchers tend to include avoiding encounters, barriers, deterrents, livestock guarding animals and removal (Massei, Sugoto, and Richard 2011). Their effectiveness depends not only on the animal species and the environmental setting, but also subtler aspects such as seasonality and novelty of intervention (Nyhus 2016; Fungo 2011). It is also shown that the novelty of measures can wear off for many intelligent animals, who may be initially deterred by scent, visual or acoustic signals but learn to overcome them. These include, in particular, primates (Zhang and Watanabe 2009), but also wild boars (Knight 2003) and some species of birds (Linz et al. 2015).

Through research, we have gained relatively rich knowledge in characteristics and causal factors of wildlife crop foraging behavior. The species involved, crop types, temporal and spatial patterns, and the extent of crop loss have been investigated (Naughton-Treves et al. 1998). Animal crop foraging behavior can be affected by the boldness of the animal (Honda and Lijima 2016) and its social structure (Baranga et al. 2012); distance to the forest edge (Guinness and Taylor 2014) and wild food availability (Mikich and Liebsch 2014); and human activities, such as alteration of landscape into new land uses (Strum 2010), human mitigation strategies (Ueda et al. 2018), and their daily activities in the landscape (Sprague 2002).

Researchers from various fields have been trying to break the barrier between nature and culture when studying human-animal relations (Parathian et al. 2018). Ecologists, who used to prefer studying species in their 'natural' environment, now nevertheless start to look into the interconnectedness between human and non-human species. Fuentes (2010) introduces the concept of 'mutual ecologies', which involves an interweaving of the biotic landscape where organisms live and the social networks different agents create, including human and non-human, 'pest' species or local resident.

Anthropologists also try to bridge the gap between biological and cultural anthropology, exemplified in the developing field of ethnoprimatology (Riley 2006; Fuentes 2010). In many ethnoprimatological pieces, both animal behavior and human perception are investigated by integrating biological and ethnographic methods (Setchell et al. 2017; Riley and

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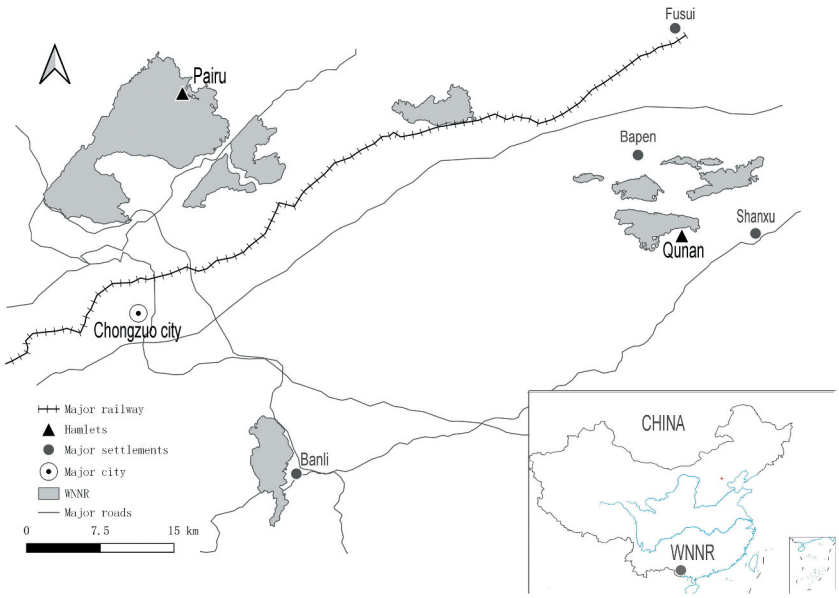

Figure 1. Illustration of the investigation site.

Priston 2010). Though providing a fuller picture, and attempting some impressive multidisciplinarity, many of these endeavours lack a more symmetrical and integrated analytical framework to treat humans and animals equally and understand their interactions as intra-actions; removing a boundary between two well-defined independent entities (Wilbert 2006).

An interaction perspective that looks into the reciprocal adaptations and behavioral strategies between human and non-human primates have gradually become the focus of studies. Researchers have depicted the micro-level interactions, such as the everyday, on-the-ground meetings between people and monkeys in Bali (Fuentes 2010) and Japan (Knight 2003). When zooming out, human-primate interaction is conditioned by factors such as land-use change (Fuentes 2006) and technological advancement (Robinson and Remis 2014; Hathaway 2013).

Macaques (in the genus *Macaca*) have been reported to cause significant crop loss in Asian countries such as Japan and Nepal (Regmi et al. 2013; Knight 2003). They are regarded as nuisances for farmers, because of their high intraspecies cooperation skills and adaptability that make developing strategies for crop protection a challenge (Hill 2005).

Our research investigated primate crop foraging behaviors and human mitigation strategies for crop damage, through the emerging 'interaction' perspective of human-animal relations with mutuality and intra-action. In the case of primate crop raiding, we need to understand **how farmers and monkeys interact, as well as how their interactions are shaped by socio-ecological factors – including the material landscape**. We have a special focus on the mutuality, namely how actors (either human or macaque) are perceived to consciously adjust their strategy in response to the changes of their counterparts and changes in the landscape.

Our research provides not only empirical evidence for the 'intra-action' perspective in human-macaque relations in a crop-damage scenario, but also a more symmetrical understanding in primate crop raiding that benefits management strategies. In addition to this, our field work captures the phenomenology of these intra-actions from the perspective of local farmers, allowing for on-site interpretations of material practices like guarding, shooing away monkeys and coping with losses (see e.g. Crowley, Hinchliffe, and Mcdonald 2018), on the importance of studying citizens interacting in natural outings). In our context of crop-raiding macaque monkeys in China, the animals are understood as 'sly', 'strategic' and 'relentless invaders' of cropland by the resident farmers (ZK, Qunan, 190215). They are demonstrated to have substantial creativity and even resistance in their repertoire of crop-raiding, even in response to protective interventions, showing a human-animal relationship that builds in complexity. This makes them an instructive case study for understanding mutuality and response in human-wildlife interactions.

Theoretical framework: understanding mutuality in human-animal intra-actions

Ontology in social science has recently gone through the wave of post-humanism, which rejects the exceptionalism of *Homo Sapiens*. Several paradigm shifts, such as the 'animal turn' (Ritvo 2007), 'multispecies turn' (Kirksey and Helmreich 2010) and 'material turn' (Pellizzoni 2016), call for a reconsideration of animals, living organisms and materials – in short, the agency of 'nature' in the broad sense. These shifts can be

Figure 2. A torn hut at the foot of the hill of Qunan, which was used to provide shade for guarding dogs.

Figure 3. Net used by farmers near Qunan to guard their sugarcane.

understood in two ways: from essentialism to relationality, and from (human) agency to material affectivity (Fox and Alldred 2020). Relational thinking rejects notions of pre-existent and fixed entities such as bodies and animals but suggests things as 'becomings' that gain their forms and continuity through their engagements with other material relations and are inherently fluid. It emphasizes the mutuality, which describes the intimately entangled back-and-forth character of affective relationships across species (Boonman-Berson 2018). Moreover, new materialists proclaim the liveliness and affectivity of all matter; a 'thing-power' associated with all materiality (Fox and Alldred 2020).

The relationality, non-human animal agency and human-animal-landscape relations set up the theoretical foundation for understanding human-animal interactions. In order to closely examine the mutual processes in human-animal relations, cognitive thought of embodiment is adopted. It recognizes that knowledge and practice are inseparable, illustrated as 'learning by doing' (Eden and Bear 2010). Therefore, both humans and animals experience embodied learning and attuning (Peltola and Heikkila 2015) or learning and adjustment (Boonman-Berson 2018) process in their interactions. Peltola and Heikkila (2015) believe embodied knowing requires an affective, corporeal relationship between animals and humans; it is based on

Figure 4. Plastic film used to guard the sugarcane in Pairu. Fallen sugarcane is said to be foraged by squirrels.

Table 1. Categories and numbers of individual interviewees in the field.

Category	Interviewee
Governmental official	1 from Guangxi wildlife rescue center, involved in legislation of wildlife damage compensation
Conservation staff	2 from Bapen station, 2 from Tuozhu station, and 1 from nature reserve administration
Ranger	2 from Bapen station, 2 from Tuozhu station
Farmer	11 from Qunan, 6 from Pairu, and 1 from Bapen region

'attuning to the others' ways of living, sensitivity to the rhythms, regularities, and individual differences'. Though frequently used in relations between human and companion animals (Haraway 2010; Brown and Dilley 2012), this is highly relevant for relations between human and wildlife.

Pellizzoni (2016) observes that as part of a new materialism turn in environmental studies, the generative capacities of landscape and natural resources are foregrounded, and the role of language and social construction, which have long occupied human-wildlife studies in particular, takes a backseat. We agree with Pellizzoni that the material matters. We would caution, however, against any assimilation of non-human animals, primates in particular, into 'material' with agency. Indeed, Pellizoni, on the ideas of Stengers (2008) and Hird (2009), subsumes living things like bacteria as nature, and therefore matter, which may establish a problematic category for non-human animals as essentially 'part of the landscape'. This may appear to be an extreme development of the post-humanist turn in environmental sociology. But we note that the view is actually long reflected in our relationship with nature, where animals are conflated with wilderness, or as in Marxist perspectives, are seen as a stock of natural capital (Barua 2014). In our study, we will instead show how also non-human animals respond to, and manipulate, matter: vegetation, topography, landscape. This is emphasized in our theoretical framework of human-animal-landscape relations (van Dooren 2014), which implies a *tripartite* relationship with matter: one that sees both humans and non-human animals as interacting with materiality. Animals remain central to the narrative (Philo 1995), but there is a greater emphasis on places and material as grounding more-than-human agencies (see e.g. Hodgetts 2016). For this reason, we next introduce the case context, including its changing environment and landscape.

Context of study

In China, macaques, especially the species *Macaca Mulatta*, are widespread in mainly southern regions, and historically in northern regions (Lu, Tian, and Zhang 2018). They are frequently reported to eat crops. Rural areas in the southwest of Guangxi (China) are no exception. These areas feature peak-clustered depression, where valleys (locally called 'nong') are surrounded by clustered limestone hills. Human settlements and farmland are distributed in valleys. The warm climate helps tropical and subtropical plants to grow, such as banana (*Musa Basjoo*), cassava (*Manihot esculenta*) and Eucalyptus trees (*Genus Eucalyptus*). Main cash crop in this area is sugarcane. Sugar industry is one of the most important industry of Chongzuo city, where the nature reserve locates, which is called 'the sugar capital of China' (Wang 20190). Surrounding hills are too steep to cultivate thus are left for wildlife to reside. As some farmland can be in remote valleys and distant from human

settlements, the topographical set-up makes them more prone to wildlife pestilence: access is easy.

This karst limestone landscape is one of China's most ecologically important regions, home to some endangered primate species like cao vit gibbon (*Nomascus nasutus*) and white-headed langur (*Trachypithecus poliocephalus*). Many such species face dramatic population decline (Li et al. 2007), which is considered to be caused by forest fragmentation and degradation, as well as unregulated hunting. Therefore, the government has established several nature reserves to protect these species and their habitats, and the white-headed langur national nature reserve (henceforth WNNR) is one of them.

Set up officially in 2012, the WNNR comprises four segregated sub-regions, with a total size of 25,578 hectares. Near the nature reserve locates 29 villages and 92 hamlets (Wang 2011). As most livelihood activities are prohibited in nature reserves, such a 'fragmented' and 'populated' nature reserve is generally undesirable to conservation practitioners, as it is hard to exclude human activities; however, valleys between disconnected mountains have long been cultivated and are important livelihood source for locals, thus economically and socially unviable to appropriate. Therefore, forest harboring rich biodiversity has to co-exist with farmland and human settlements.

The establishment of the nature reserve, together with the wild animal protection law and forest rehabilitation initiatives, has greatly limited natural resource use by local communities. Activities such as logging, collecting medicinal plants and trapping animals are prohibited in this reserve. Animals under state protection, such as macaques, are nearly impossible to be hunted as that requires permission granted by the provincial authority. Farmland in vulnerable regions is transformed into woodland. Wildlife populations are believed to have risen after these regulations were put in place, including those of macaques. These primates are reported to increasingly cause crop damage to nearby farms (Li et al. 2009), which not only harms the economic gains of farmers but also undermines support from the community for macaque conservation. As one conservation staff from this reserve states: "if crop damage by macaques is not being paid attention now, it can become the biggest problem between our nature reserve and nearby communities in the future' (MZ, Bapen, 190215).

Tuozhu and Bapen are relatively large sub-regions in this nature reserve, as illustrated in figure 1. We choose one hamlet from each sub-region (Pairu from Tuozhu and Qunan from Bapen) for investigation, where macaque crop damage is relatively severe and researchers have easier access to. Pairu, close to the largest and most intact sub-region Tuozhu in this reserve, has a small population (around 70 households) and smaller-sized farms (around 4 hectare) (HS, Pairu, 190301). People mainly grow sugarcane and many migrate out toward cities for a living. Qunan hamlet is a community-based conservation area at the edge of Bapen sub-region. It is more populated than Pairu (around 200 households), has a larger farm size per household (15–20 hectare) and more sparse hills (PS, Qunan, 190316). Farmers mainly grow sugarcane, and increasingly citrus fruits because of its high price, with few growing maize and peanut. Considering the unique socio-ecological characteristics of these two hamlets, our study is not intended as a comparative analysis of the two nor as a way to represent all hamlets' experiences of crop raiding. Nevertheless, considering the two cases together contributes to a more in-depth understanding of how locals make sense of crop-raiding monkeys.

Materials and methods

To fully understand the interactions between farmers and macaques, we adopt a more-than-human perspective, which aims to not only study farmer's perceptions and strategies, but also monkey's intentions and tactics (Boonman-Berson 2018). Due to the difficulty of directly observing monkeys raiding crops, we rely on *narratives* of farmers and conservation staff about monkey crop raiding, on-site direct observation on the remains of farmer-monkey interaction and literature about primate crop-feeding behavior elsewhere. The lack of direct interaction observation is partly mediated through the subjective experiences of farmers, which can be referred to as 'responsible anthropomorphism': recognizing that humans and other animals have shared experience and those who have long-term day-to-day contact with animals are allowed to speak for them (Keul 2013). We use 'narrative' as the term for describing farmers' stories, reflections, anecdotes and opinions, after common use in ethnographic studies that aim to capture people's conversation in relation to material practices and landscape (Cheng 2014). We recognise, however, that the data encompassed in this could be termed storylines, discourses, frames, rhetoric or otherwise by applying other theoretical and methodological directions, changing only somewhat in character.

The research applies an ethnographical approach, using interviews, discussions, and direct observations to gain a deeper understanding of farmers' 'life world', a phenomenological concept describing 'the mundane, everyday world in which people operate' (Inglis and Thorpe 2012, 90). We used 'go-along-with' interviews in which "fieldworkers accompany individual informants on their 'natural' outings and … actively explore their subjects stream of experiences and practices as they move through, and interact with, their

physical and social environment" (Kusenbach 2003, 463). We were guided by grounded theory, where analytical concepts are not fully pre-determined but grounded in information acquired from participants (Creswell 2014).

During February and March 2019, the principal investigator (PI) spent roughly one month with farmers and conservation officials. In total she conducted 28 individual interviews (details in table 1), held five focus group discussions (3 discussions in Qunan and 2 in Pairu) and carried out personal observation at the site. For participants in individual interview, sampling for range was used to identify sub-categories of the group being researched and ensure a given number of participants from that category (Small 2009). Snowball sampling and natural occurrence were used to target most affected farmers.

Interviews were conducted in Mandarin, which can be understood and mostly spoken by local people. Interviews were generally of an open-ended, semi-structured nature inquiring about wildlife (especially macaques) crop damage experiences and stories of participants, recent changes and causes (Kings and Ilbery 2015). The response rate of the interviews was quite high, as most farmers experience wildlife crop damage and they are willing to share their problems. Besides interviews, the PI observed the landscape where monkey crop raiding takes place and crop remains, as well as visual expression of conservation measures.

Interview records and pictures were stored and anonymized, with a label indicating the date and participant (e.g. Audio31HS). Records were transcribed into Chinese and labelled in a similar manner (e.g. Anote31HS). Following the grounded theory, findings were summarized and analytical concepts were reconsidered once the PI acquired the empirical data in the field, which also affected, to a lesser extent, the questions for the next interview. After leaving the field, the PI read through all transcripts and manually extracted key themes based on salience and recurrence, such as 'coping strategies of farmers', 'crop raiding strategies of monkeys', 'spatial and temporal movement pattern' etc. Only quotes were translated into English, with clear reference indicating the participants, location and date of the conversation, such as '(MZ, Bapen, 190215)'. These ensured the meanings of narratives were well interpreted and traceable.

Results

Farmer-monkey interactions in the micro level

Spatial and temporal mutual adjustment

After years of interaction, monkeys adjust their spatial and temporal crop-feeding behavior in accordance with the daily rhythm of humans. Farmers have noticed that crops in distant valleys are more prone to being raided by monkeys, and also more severe the damage:

'They dare not get too close to the land near the village, only to steal some now and then. But it's different in the valley. They come down (from the hill) in groups and can finish the whole plot of corn in 2–3 hours' (HS, Pairu, 190309).

Therefore, farmers have abandoned land in the distant valley, knowing 'wildlife will leave no harvest for me' (HS, Pairu, 190309), except for cases in Qunan where they lease large-scale remote land to private investors, which grow sugarcane only (DS, Qunan, 190316). The private investor still grows sugarcane on a large scale because of the low land price, even though it risks becoming a 'canteen' for monkeys, as farmers estimate that 100 tons out of 1300 tons of sugarcane being taken by monkeys.

Crops grown near the foot of the hill can also easily become a target for monkeys. Farmers argue that monkeys choose distant valleys and land near the foot of the hill because 'they are afraid of the risks of human presence' (ZK, Qunan, 190215). Therefore, it seems to be an unwritten rule for locals not to grow monkeys' 'favourite' crops, such as peanut and maize, along the foot of the hill (ZX, Qunan, 190216). When farmers grow crops at the foot of the hill, despite this, they express having to guard regularly and intensively.

Moreover, farmers also mention that monkeys usually come down to raid crops at dawn and at dusk, but not at noon, because that is when people are working in the field. Therefore, people need to visit the field quite early to prevent monkeys from coming down.

Farmers' experience reveals that they try to predict the movement of monkeys from daily observations: if you find monkeys appearing on the hill near your field, they say, you had better guard your field for 2–3 days, then they will leave and search for another target. If you find them raiding your field today, they are likely to come tomorrow, so you have to guard there tomorrow. If you find them passing the hill nearby to somewhere else, they will not come back in a week (ZK, Qunan, 190215).

Knowing where monkeys are at a certain moment also relies on social networks and cooperation across farmers in the hamlets. For example, farmers remind each other when seeing the monkeys moving towards the direction of someone's field (TS, Qunan, 190316). Even though farmers gain knowledge about spatial movement patterns of monkeys, it can still be uncertain which plot of land monkeys will visit and at what time. One farmer recalls with a sense of humour: 'So it depends on luck. If you are lucky, you gain some harvest, but if you're not, your crop will be eaten by animals' (WR, Pairu, 190311).

Monkeys adapt to surrounding vegetation and crops

Monkeys can make use of the surrounding vegetation, especially trees, to raid crops in the farmland. As a farmer explains: 'they rely on trees to jump into my land. They run very fast on trees. But if there're no trees but only grass at the foot of the hill, they will not come to my land, as they move really slow in grass' (FCG4, Pairu, 190302). Many farmers realize this and try to clear the boundary between farmland and the hill, such as by cutting trees, to stop monkeys coming onto their land. However, vegetation at the foot of the hill belongs to the nature reserve and is not allowed to be removed, which bring conflicts between farmers and conservation staff.

Monkeys are able to learn to eat non-familiar crop varieties quickly, such as watermelon and citrus fruit in Qunan. According to farmer ZX (Qunan, 190218), monkeys used to 'just rotate the watermelon in their hand but did not know how to break it'. They learned from an accidental drop of a watermelon, as they held the watermelon halfway up the hill, but it dropped and cracked, and they subsequently realized watermelon could be broken in this way. From another interview, monkeys also did not know how to eat citrus fruits before, as they did not know how to peel off the bitter skin. People believe monkeys learn from them, when they feel thirsty working in the field and open citrus fruits, because now monkeys peel the skin just as humans do (ZX-W, Qunan, 190215).

Monkeys can also reach crops buried underground by humans, which surprises some farmers. One woman maintains 'monkeys are even smarter than humans' (FCG1, Qunan, 190216), because after sugarcane stem has been planted and covered by earth, the monkeys know exactly where they are and pull them out of the earth.

Raiding-guarding interactions

Usually monkeys will flee when seeing people coming. The same applies to when people clear their throats, clap their hands, or light firecrackers. They have developed impressive raiding strategies to avoid being caught by humans. A particular individual macaque will be in charge of watching out for humans, usually the leader for the whole troop, as one farmer illustrates: "when they raid the crop, the monkey leader stays on a high tree and shouts once he finds human is coming, so that the monkeys down on the ground can flee' (FF, Pairu, 190311). They also act very quickly, as another farmer relays: 'they can pull out 2 acres peanuts in around an hour, with roughly 100 individuals. Once you see them coming down to your field, you don't expect anything remaining' (FCG5, Qunan, 190316). Moreover, farmers realize that monkeys are 'playing guerrilla' with them: 'Sometimes we return home from the field at noon, assuming they have left, but they come back and raid our field' (ZK, Qunan, 190,215).

It is worth noting that humans and monkeys have developed similar guarding mechanisms that require social cooperation. For farmers, they rely on neighbours in knowing where the monkeys are, while monkey troops reply on monkey 'guards' to watch out for humans during a raid. Both primates, as socialized animals, show high levels of social cooperation.

Humans make use of means against the monkeys

Farmers have tried out other strategies, such as replacing humans with dogs in guarding their field, as illustrated in figure 2. Scarecrows, billboards and banners are also erected in the field to scare monkeys away but can soon be overcome by monkeys' habituation. The same applies to noise, such as songs played in a radio.

Farmers state that smoke and newly-cut leaves can help. A farmer in Qunan suggests: 'find a clear ground, burn something to produce smoke, then they (monkeys) will come down less frequently' (BB, Qunan, 190315). Another farmer in Pairu reports that 'if you see monkeys visiting the field, cut down some leaves of nearby trees, so that they dare not to come for a period of time' (WR, Pairu, 190311). These methods work unlikely because of certain properties of the smoke or leaves, but the novelty that induces the fear of monkeys.

Setting up net (in figure 3) and (or) plastic film (in figure 4) is more commonly used in these hamlets, to guard crops near the foot of the hill. According to farmers, monkeys are afraid of new net and plastic film, because they are afraid of snares. But once the novelty of the nets and plastic film wears off, monkeys enter the field again. Plastic films, if applied multiple layers, are nevertheless said to be effective by some. One farmer living near Qunan recalls his strategy with a sense of pride: 'This year turns out to be perfect for me, as my sugarcane is well fenced by plastic films and none is taken by monkeys. When one layer is not enough, I apply the second layer, and if it is still not enough, then I apply the third layer' (NB, Bapen, 190227).

Nowadays trapping and poisoning are illegal. However, they are still used by some farmers as there is no compensation from the government for the crop loss. Snares are placed near the foot of the hill, intended for monkeys that damage crops. Snares are believed by many to deter monkeys, because 'once one is caught by snares, he dares not to come down for a year' (FCG3, Pairu, 190302). But other farmers say monkeys can sometimes avoid snares, as if they know where the snare is (HS, Pairu, 190309). Poisoning, on the other hand, is non-selective and can be ineffective after rainfall (WR, Pairu, 190311).

Changing farmer-monkey relations in the macro level

In this section, we present findings on the effect of changing social and environmental factors on human-animal-landscape relations. People in the field indicate a growing monkey crop raiding with an increase in population size and a decrease in fear, owing to i) preference of monkeys on crops, ii) changing human activities and iii) land uses, which closely link to the establishment of nature reserve and wildlife protection law, the reforestation program, as well as rural out-migration trend.

A growing monkey crop raiding

Both farmers and conservation staff suggest an increase in monkey population in recent years. Farmers report larger monkey troops, with 50, 60, even over a hundred monkeys. While in the 1980s, farmers anecdotally reported how there were typically only 20–30 individuals in a group (ZX-W, Qunan, 190,215). Conservation staff ascertains that there was an increase in monkey population after 2007, as the nature reserve stopped hunting for population control since then (MZ, Bapen, 190215). Farmers even express fear of monkeys in large troops: 'sometimes we see a huge group of monkeys enter the field like a troop, and it feels like they turn the whole plot of land into yellow color. Among them there are stronger and larger-sized male monkeys, so we dare not get close . . . ' (ZX-W, Qunan, 190215).

People also notice an alleged change in the monkeys' behaviors in terms of the extent of fear. More than one farmer mentions that monkeys were quite afraid of people back then, seemingly referring to over a decade ago: 'Before the nature reserve set up, monkeys would flee far away once seeing people with a shoulder pole, as if it is a rifle' (ZK, Qunan, 190215; MZ, Bapen, 190215). Nowadays, monkeys still dare not come down to the field in the presence of humans but come down and raid crops once people leave the field. Some monkeys are even accustomed to human presence when foraging on crops. A farmer near Qunan complains that 'when we are here, monkeys are there eating our sugarcane. We are just 20–30 meters away' (NB, Bapen, 190227). Another farmer in Pairu also reports that 'monkeys are not afraid of elders. When the older people are harvesting maize on this side, they come down and eat maize on the other side' (XF, Pairu, 190301).

Monkeys raid crops as preference, not instinct

Some conservation staff claim that it is because farmers cultivate land all the way up to the hill and thereby encroach on the monkey's habitat that crop damage by monkeys becomes a problem in the first place: 'Land up the hill is the monkey's homeland. You have cultivated so high up, to the monkey's door, that they have no room to turn around. How can they stop eating your crops?' (LZ-RS, Tuozhu, 190301). Another ranger at the reserve adds: 'Monkeys only eat crops that grow near the foot of the hill, where it's recently cultivated. It is like a revenge because you have invaded their land, you know?' (XF, Pairu, 190301).

However, deforestation has ceased in this nature reserve since early 2000s. Farmers and conservation staff admit there was habitat loss for the macaques in 1980s, but that was before the establishment of the nature reserve and thus was not illegal at the time. Cultivating new land happened mostly during 1980 and 1981, when collective land was distributed to private households' (NF, Chongzuo, 190305). Since 2000s, vegetation has been recovering in this nature reserve both because of a national afforestation program and farmers voluntarily abandoning land in remote valleys. Conservation staff NF further explains: 'Farmers no longer grow crop in areas where transportation is inconvenient. Moreover, most young people give up farming and migrate to the city, and the remaining old people cannot grow that much anymore' (NF, Chongzuo, 190305). One farmer in Pairu even expresses that people are not willing to plant on available land these days, let alone the newly cultivated land (FCG4, Pairu, 190302).

Crop raiding by monkeys in these hamlets seems to be affected by both naturally occurring wild food and planted crop availability, and there is a tendency for dietary shifts towards certain crops over time. Farmers report that monkeys ransack the crops during winter and early spring, as there is yet enough new leaves for them in the forest. They also visit crops more frequently just before it ripens, and not necessarily when wild food is scarce. One farmer even mentions that monkeys can gradually shift from natural food to crops: 'there is a kind of plant on the hill which is used for weaving at old times. Monkeys eat its roots in March or April, thus visit the farmland less frequently. In recent years we start to grow sugarcane, so monkeys expand and feed more on sugarcane. Now they don't try this plant in the season because crop is available in farmland' (ZX, Qunan, 190318). Conservation staff and farmers believe that monkeys prefer crop to 'natural' food, as 'crop is tastier, more abundant and accessible, and has higher energy' (NF, Chongzuo, 190305). Research on primate crop feeding behavior finds that crop-feeding increases animals' nutritional status and reproduction success. Crop is also easy to access/process and reduces risks of parasite infection (Hill 2017).

Monkeys raid crops in lower perceived risks

Lethal control towards monkeys has been regulated under the wildlife protection law since 1990s in the

nature reserve. Macaques are under second class state protection and cannot be hunted without a special license. For farmers this means they can be caught and sent to jail if they are found to be hunting monkeys. To this end, around 1993 there was a large-scale gun confiscation program by police in this region. Moreover, jaw traps are categorically forbidden under the wildlife protected law, even under special licensing. The designation of nature reserve in 2003 further restricts the use of lethal control towards monkeys. All the wildlife, including monkeys, are primarily managed by the nature reserve by patrolling, monitoring, community outreach etc.

Many farmers assert that decreased fear in monkeys during raiding crops has to do with the establishment of the nature reserve and wildlife protection law. In a compelling distinction between macaques living inside or outside of the nature reserve, a farmer says: 'monkeys out of nature reserve dare not to come down to the field at all, because jaw traps are waiting for them' (FCG4, Pairu, 190302). Another farmer in the same discussion even ascertains that monkeys come down because they know they are protected and off-limits: 'Now they eat our crops deliberately, as if saying 'what can you do to me? I have superiors (shang ji) protecting me."

Another noticeable change is the decrease in human presence in forest and farmland, which further emboldens monkeys. As almost all direct natural resource use in this nature reserve has been banned, very few people go to the mountains anymore, and 'many routes become unrecognizable now' (FCG3, Pairu, 190302). Though farmers are allowed to collect firewood for subsistence use, the energy transition to coal and natural gas further reduced people's visits to the forest. The rural-urban migration widespread in China has also led to less farmers in this nature reserve, especially in Pairu, where almost all youth have left farming. Moreover, farmers who stay are also less present on their farmland because of the spread of agricultural machinery and supplies. For places like Pairu that mainly grows sugarcane, people seek non-farm jobs after planting and harvesting sugarcane. To them, such change leads to monkeys becoming noticeably less afraid to enter farmland and damage crops.

Discussion

Recognition of non-human animal agency

The macaques' adaptations to daily rhythms of humans, their assimilation of vegetation and crops into their diets, as well as fine-level raiding strategies involving scouting look-outs, divisions of labour and targeted raiding parties, cannot be simplified as instinctual and automatic stimulus-response but as products of conscious learning and adjustment processes. This calls fundamentally for a recognition of non-human animal agency. Animals are neither passive objects that can be exploited or full controlled by humans, nor innocent and helpless creatures waiting to be saved by conservationists. Instead, they are active and sentient beings whose agency and manipulation of the landscape structure terms of interaction with other species, including humans, and resources over which the two compete. This further asks how this agency is affecting their interactions with humans in shared landscapes.

The non-human animal agency helps us to understand how the human-wildlife conflict term came to be applied. Increasingly, however, scholars are encouraging moving away from this term, on account of it falsely implying a mutual conscious antagonism (Hill 2017). Some suggest that human-wildlife conflicts are really disguises for *human-human* conflicts (Tadie and Fischer 2013), as animals cannot realistically be seen as enemy combatants. While we take this critique seriously and recognize that conscious mutual antagonism may not always be found between humans and wildlife directly, the perspective also risks minimizing the agency of non-humans and their critical material role in human wildlife conflict. It is interesting to note that previous research has shown an ambivalence among affected farmers in prescribing defiant agency to describe the efforts of crop-raiding animals to frustrate farming. It appears that the same respondents, at different parts of their narratives with researchers, sometimes characterise crop raiding losses as everyday accidents and as calculated acts of meaning and resistance by the animals (Mariki, Svarstad, and Benjaminsen 2015).

Attributions of antagonist agency to animals

Our investigation joins the effort of understanding how nature conservation and the broader social change affect human-animal-landscape relations (Dai et al. 2020). In the above study, afforestation programs in ecologically important regions since the 2000s, and land abandonment in remote valleys, have spared much habitat and food sources for macaques. Indeed, conservation measures including hunting bans, a reduced frequency of people venturing into the woods generally, have created safe havens for macaques. They continue to raid crops, seen to be emboldened by a new conservation regime (Li et al. 2013), which is also confirmed by our farmer respondents in both hamlets. They even imparted a distinction between emboldened nature reserve monkeys, and their 'timid' outsider cousins.

That wildlife, whether elephants, macaques or leopards, become more aggressive after receiving protected status, is a clearly felt reality among farmers,

through their observations that the animals seem to 'know' that people have no guns to shoot them anymore (Hathaway 2013). This is a common refrain in wildlife conservation conflicts, noting how protected animals lose their shyness (Ghosal, Skogen, and Krishnan 2015), even to the point of 'taunting' locals with their protected status (Theodorakea and von Essen. 2016). This was affirmed by our findings, in which Pairu farmers hinted at monkeys 'deliberatively' or 'out of revenge' eating their crops. Can we ascribe animals with such malicious intent (Liu et al. 2011)? Knight (2003, 93)'s study shows that Japanese farmers very much understand monkeys' misdemeanours in terms of revenge and that 'monkeys recognize the principle of reciprocity in their dealings toward people who harm or offended them'.

It has been argued that 'myths' of this demonizing kind arise in the absence of knowledge in conservation conflicts (Linnell 2013). But these narratives probably also serve social coping functions for farmers; they present wildlife as a common enemy and construe farmers as victims in times of uncertainty when their livelihoods, lifestyles and identities are under threat from protected wildlife and external socio-economic changes (von Essen and Allen 2017; Krange and Skogen 2011). This much was clear from our results, whereby crop loss in the region made farming a more precarious undertaking. Animals, then, are constituted in part by their own agency and in part by society's need to resolve them. Importantly, here, agency is then understood in a relational sense (Philo and Wilbert 2000), recently popularized in actor-network theory (Latour 2005) and making up an increasing volume of scholarship on animal resistance (Allen and von Essen 2018; Hribal 2013).

Such alternative stories of animal antagonists, retaliation and invasions (Jerolmack 2008) can help us to further understand how non-human animal agency, conservation and social change affect human-wildlife interactions in terms of mutuality or hostility. It calls us to reflect the fortress conservation guided by a dualistic view (Locke 2013), and consider co-habitation between human and other animals, rather than segregation. For cohabitation, it is rather important to improve the knowing and adjustment of farmers, so that they can better adapt to macaque crop raiding. For example, farmers' everyday experience on spatial and temporal pattern of monkey crop raiding provide important information for guarding, which can be supplemented by new technology such as drones and GIS (Chen et al. 2016b). Local practices, such as plastic nets, smokes, newly-cut leaves, shall be integrated into coping strategies, together with other technology innovations.

Narratives as subjective interpretations

In this paper, we mainly used narratives of farmers and conservation staff about people-monkey interactions, which can be regarded, cumulatively, as reservoirs of local knowledge grounded in everyday practice confronting monkeys: opinions, anecdotes, reflections, observations, stories. Such local knowledge is crucial for understanding people-monkey interactions, because it first grounds a phenomenological understanding of particular, situated everyday experiences in a way that direct observation by researchers alone cannot achieve, particularly when observations of animal behavior can be hard to come by. Narratives by the farmers also contributed with a longitudinal perspective, having them recall times past and the changing dynamics of crop-raiding in their years as active farmers. Moreover, farmers' interpretations help us to understand their projections of not only their own, but also the animals' life worlds as these center on crop-raiding. Monkeys' ascribed intentions and tactics, such as 'playing guerrillas', will not be fully known without acknowledging the shared understanding between humans and monkeys.

Nevertheless, using people's narratives of their subjective experiences of wildlife as evidence for actual wildlife behavior is not without its problems. For example, locals' estimation of the wildlife population can deviate from the actual number, consciously if they try to exaggerate the number for compensation, or unconsciously such as because of poor memory. That is why researchers still insist that there is no evidence supporting the population growth of snow leopards, though most locals interviewed claim so in Qomolangma (Chen et al. 2016a). In recent years, camera traps operated by locals have emerged as a way to verify sightings of animals in a way that appears increasingly agreed upon by all stakeholders.

Subjective interpretation of animal behavior can be also criticized as projecting the observer's own desire, emotion and conception onto the animal whilst shrouding the animal's real intention. Hence, farmers' narratives inevitably involve assumptions about animal subjectivity and interiority (Burt 2002). This ties to the critical question: 'How can we understand what animals really think?' Our findings clearly show that farmers claim monkeys eat crops more often because monkeys know they are protected. This raises empirical questions of cognitive ethology that farmers' stories necessarily cannot do justice to: do those monkeys really know they are protected? And do they do so really *because* they know they are protected?

To understand non-human animal life-worlds in relation to the interactions they have with people, we need to use subjectivity and multiple sensory experience from long-term interactions between the species (Keul, 2013; Haraway, 2008). Narratives help in this regard. To represent that rich and complex experience, we need to use thick description, described as 'paying attention to contextual details in observing and interpreting social meanings' (Geertz 1973). Within this, we should accommodate also figurative and audio methods to overcome

the constraints of concepts and symbols in language. As researchers studying others' experience, we can facilitate reflection and sharing of the participants, in order to get a fuller picture of their experience.

Conclusion

The recognition of non-human animal agency and a relational orientation, originated in post-humanism, helps us understand how humans and macaques interact and frustrate one another's efforts to get at crops. In the micro level, they both learn and adjust to the counterpart's temporal and spatial movements, as well as raiding/guarding strategies. They are also influenced by the crops, landscapes and means of coping strategies. This generates a detailed understanding of human-animal-landscape relations and implies the need for further investigation into the role of non-human animal agency in shaping these interactions, and including this agency to refer to their manipulation of the landscape as well as outsmarting humans.

In a macro level, conservation and other social changes in rural areas may exacerbate wildlife crop damage and weaken farmer's capability to respond. Afforestation, a hunting ban and out migration have benefited macaques and put farmers in a more vulnerable position, as macaques can fully utilize such changes to grow and more boldly satisfy their preference for crops. Our findings reveal the need of deeper investigation into the impact of conservation programs, policies and social processes in the mentality and behavior of both humans and other animals. Moreover, it calls for rethinking the fortress conservation separating human and wildlife, and encourage knowledge and practices for cohabitation, in which human and other wildlife share the same landscape.

Our research also serves as an example of using a more-than-human perspective and ethnographic methods in understanding human-animal relations. The value of the narratives of local people on human-wildlife interactions is recognized. The risk of mis-estimating wildlife crop damage is advised to be mediated by the triangulation of ecological data, and we suggest using subjectivity and multi-sensory experience from long-term interaction, as well as detailed and contextual description, to improve the understanding of animal's mental world.

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Disclosure statement

The authors declare no conflict of interest involved.

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