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Mind over matter: Perceptions behind the impact of jaguars on human livelihoods

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ABSTRACT

In an investigation of perceptions of the conflicts between people and jaguars on the Amazon deforestation frontier and Pantanal, Brazil, we explored how perceptions of the impact of jaguars on livestock and on human safety vary with experience of jaguars (including reported livestock loss), region, place of residence, attitudes towards jaguars, knowledge of the species, and perceptions of changes in jaguar abundance and the regional economic situation. Livestock loss and threat to human safety were not the only predictors of the perceived conflict with jaguars. Livestock loss acted in combination with attitudes, knowledge and perceptions of the economic situation to determine how people perceive the impact jaguars have on their livelihoods. Attitudes and knowledge were influenced by age, gender and whether respondents lived in urban or rural areas. An experiment in which respondents were shown photographs of dead livestock, and asked to ascribe the cause of death, revealed an interaction between attitudes and knowledge: of respondents whose knowledge of the species was low, those with negative attitudes towards jaguars assigned a larger number of photographs to jaguar depredation. Our evidence suggests that attitudes and knowledge can affect the conclusions a rancher draws from finding the carcass of a cow, or even from noticing that a cow is missing. The owners of smaller holdings believed that depredation was more serious on neighboring properties than on their own, which suggests that their perceptions of conflict with jaguars were shaped primarily by what is heard from other people, and not by personal experience.

1. Introduction

Jaguars (*Panthera onca*) often kill livestock and in some rare circumstances they can attack humans, both leading to severe persecution (Jędrzejewski et al., 2017). Killing jaguars is one of the most serious threats to their survival (Zeller, 2007; Galetti et al., 2013). Together with habitat loss, persecution has reduced jaguars to 46% of their historical range (Sanderson et al., 2002). Brazil arguably contains the largest population of jaguars, and it encompasses the two largest strongholds for the species (Sanderson et al., 2002): the Amazonian rainforests and the wetlands of the Pantanal. In both Amazonia and the Pantanal, jaguars occur mostly outside of protected areas. Strictly protected areas account for about 8.3% of the Brazilian Amazon (Ferreira et al., 2014) and 2.9% of the Pantanal territories. Most encounters between people and jaguars in Amazonia and Pantanal, and certainly in the other Brazilian biomes, take place in rural contexts. Therefore, the future of jaguars is likely to be tightly linked to the perceptions of Brazilian rural residents. However, despite the rapid growth of our understanding and acknowledgement of the role of social and psychological factors in determining human tolerance and behavior towards wildlife in general (Manfredo, 2008; Kansky et al., 2016), and carnivores in particular (Dickman et al., 2013; Bruskotter and Wilson, 2013; Treves and Bruskotter, 2014), little is known about the relationship between actual livestock loss and perceived impacts associated with jaguars. In conflicts between people and carnivores, the perceived impacts often exceed the actual evidence (Conover, 2002; Marchini and Macdonald, 2012). Such imprecise relationship between reality and perception could prove perilous to a threatened species, rendering ineffective many biologically based conservation and management actions (Cavalcanti et al., 2010). In the meantime, recommendations for conservation and conflict mitigation still emphasize the importance of retaliatory and preventive killing (Galetti et al., 2013).

Early studies on local perceptions of jaguars in Brazil assessed the role of socio-demographic factors in human-jaguar conflict (Conforti and Azevedo, 2003; Michalski et al., 2006; Palmeira and Barrella, 2007;

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Santos et al., 2008; Marchini and Crawshaw, 2015). Among the 50 landowners interviewed in northern Pantanal by Zimmermann and Walpole (2005), attitudes towards jaguars were more closely related to respondents' age and relative wealth than to cattle losses, with younger and wealthier ranchers holding more positive attitudes towards them. Also in the Pantanal, Porfirio et al. (2016) interviewed 50 riverside inhabitants and found that the negative perceptions of jaguars were related to people's safety and not to economic losses from livestock depredation. Marchini and Macdonald (2012) examined the influence of peers and social norms on poaching intentions. Based on interviews with 268 cattle ranchers in Amazonia and Pantanal, they concluded that social factors were more influential than retaliation for jaguar predation on cattle or perceived threats to humans. The ranchers' intentions to kill jaguars positively correlated with the size of their land holdings and were best explained by social norms; ranchers who believed that others kill jaguars or expected such poaching had a stronger intention to kill jaguars themselves. Altogether these studies revealed strong and contradictory attitudes towards the species and, along with our previous results (Cavalcanti et al., 2010), suggest that the perceived impact of jaguars on human livelihoods may often exceed the evidence.

We assessed peoples' perceptions of the impact of jaguars on livelihoods in Amazonia and the Pantanal, and explored relationships between these perceptions and socio-economic variables such as age, gender, place of residence (urban/rural) and property size, plus psychological variables such as experiences, attitudes and knowledge about jaguars. We hypothesized that perceptions of jaguar impact on human livelihoods are not explained solely by the loss of livestock to jaguars, or by attacks on humans, but socio-economic and psychological factors as well. Given the socio-economic and cultural differences between the Amazon deforestation frontier and the Pantanal (see below), we expected cattle ranchers in the two study areas to differ in their perceptions of the impact of jaguars on their livelihoods, irrespective of the damage posed by jaguars (Hypothesis 1). We also expected that perceptions of the impact of jaguars on livelihoods and attitudes to jaguars would not differ between cattle ranchers – who are exposed to both livestock loss and personal damage by jaguars – and farmers - who are exposed to personal damage but not livestock loss (Hypothesis 2). Furthermore, we hypothesized that the perceived impact of the jaguar on human safety would not be necessarily greater among rural residents – who are potentially exposed to the attack by jaguars – than among urban residents – who are not (Hypothesis 3). We expected negative experiences with jaguars (i.e. attack of jaguars on livestock and people) to determine perceptions of jaguar impact on livestock and human safety (Hypothesis 4). However, we hypothesized that attitudes towards jaguars and knowledge about the species would also influence these perceptions (Hypothesis 5). Age, gender and property size were expected to indirectly affect perceptions of impact by their effect on attitudes and knowledge (Hypothesis 6). To investigate further the role of negative experiences versus attitudes and knowledge in determining perceptions of jaguar impact on livestock, we conducted an experiment in which respondents were asked to interpret photographs of dead cattle and assign the most likely cause of death. We hypothesized that respondents with stronger negative attitudes to jaguars and less knowledge about them would assign more photographs to jaguar predation (Hypothesis 7).

2. Materials and methods

2.1. Study areas and participants

This study was conducted in Amazonia and Pantanal (Fig. 1). In Amazonia we worked in the districts of Alta Floresta and Novo Mundo, on the frontier of deforestation in the north of the state of Mato Grosso, southern Amazonia. Alta Floresta was founded in 1976 and colonized by migrant farmers, mostly from southern Brazil. Today, its economy is based primarily on cattle ranching, timber extraction and agriculture,

Fig. 1. Map of Brazil showing major biomes and study areas: (1) southern Amazonia and (2) northern Pantanal.

although 80% of Alta Floresta's approximately 50,000 inhabitants live in its urban area (Brazilian Institute of Geography and Statistics, 2016). The district hosts a sizable cattle herd (over 716,000 head) (Brazilian Institute of Geography and Statistics, 2016). Cattle depredation by jaguars is considered severe (Michalski et al., 2006), and persecution and habitat loss are major threats to jaguars in Alta Floresta (Michalski and Peres, 2005). Novo Mundo has around 8500 inhabitants, many of them small-scale landowners recently arrived from other parts of Mato Grosso. The district is home to over 349,000 head of cattle. Alta Floresta and Novo Mundo together host the Cristalino State Park, one of the most important protected areas on the deforestation frontier, despite its relatively small size (184,900 ha). Properties surveyed in Amazonia were located between 9°23′2.13″S and 9°49′30.86″S and 56°20′25.59″W and 55°25′25.36″W.

In the Pantanal, we worked in the neighboring districts of Cáceres and Poconé, in the south of the state of Mato Grosso. Cáceresand Poconé have approximately 90,000 and 32,000 inhabitants respectively. The *Pantaneiro* landowner is typically from long-established, land-owning dynasties, and cattle ranching is their main economic activity (Brazilian Institute of Geography and Statistics, 2016). As with the Amazon frontier, northern Pantanal hosts large cattle herds (around 1,000,000 and 477,000 head in Cáceres and Poconé, respectively; Brazilian Institute of Geography and Statistics, 2016) and depredation attributed to jaguars is a major cause of complaint by the local ranchers (Marchini, 2003; Zimmermann and Walpole, 2005). Ranches surveyed in the Pantanal were located between 16°14′54.69″S and 17°26′58.17″S and 58°18′5.40″W and 56°22′28.04″W.

In both study areas, rural and urban residents were surveyed. In rural areas, the sample unit was the property, with either owner – wife or preferably husband - from each surveyed (in a few large ranches, the ranch manager was interviewed when neither of the owners were available). The Association of Rural Workers of Alta Floresta, Cáceres and Poconé provided a list of members, with landowner's name and contact information, from which we could randomly select ranches. However, the lists were not comprehensive. The lack of property registers was particularly pronounced in the settlements around Cristalino State Park in the municipality of Novo Mundo. Therefore, a combination of techniques was added to ensure randomness and