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Habitat use, ranching, and human-wildlife conflict within a fragmented landscape in the Pantanal, Brazil

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ABSTRACT

Deforestation, ecosystem homogenization, and diversity loss are frequent problems in tropical livestock systems, which can foster substantial human-wildlife conflict when wild carnivores with declining prey bases turn to cattle depredation. The objective of this paper was to examine spatial and temporal variation in the presence, composition, and diversity of wild fauna, including predators and their prey base, in a well-established tropical livestock system. The study was conducted on a ~140,000 ha ranch in the Cerrado-Pantanal transition zone in Brazil, where large areas of improved pasture are bounded by blocks of intact montane forests and seasonally flooded lowland habitat. The study sampled wildlife with camera traps distributed across the land use gradient and rancher depredation observations were also obtained. Depredation accounted for the loss of 0.9% of the total herd in the sampling year, and the number of depredation events was greater closer to intact forest and distant from centralized ranch structures and mechanized operations. Mammal diversity was greatest adjacent to intact forest and supported a complete representation of the native trophic structure, including large predators such as jaguar (*Panthera onca*), puma (*Puma concolor*), and maned wolf (*Chrysocyon brachyurus*) and a diverse and abundant prey base. Sites progressively distant from intact forest and with more intensive conversion and development supported smaller subsets of the diversity and composition, and no apex predators. Livestock management practices to reduce the economic impact of depredation on calves requires faithful adherence, while opportunities exist for landscape management that will enhance diversity and facilitate movement of large mammals between intact forests.

1. Introduction

Large-scale deforestation and conversion of tropical lands, including conversion to pasture for livestock production, has simplified and homogenized ecosystems to the point they often cannot support complex functions and diversity (Lamb et al., 2005; Murgueitio et al., 2010). Few forest specialists can maintain viable populations in tropical livestock systems (Esquivel et al., 2008). The impacts of livestock on wildlife may be direct, e.g. interference competition, or indirect with changes in vegetation structure that influences the availability of food, cover, and nesting sites (Schieltz and Rubenstein, 2016). Some wild predators are associated with large undisturbed sites (Noss et al., 1996; Gittleman et al., 2001; Athreya et al., 2013), because overhunting, habitat loss, and fragmentation can disrupt trophic interactions by reducing wild prey species (Crawshaw, 2003). For example, jaguars (*Panthera onca*), which require 3000–7000 km^2 of intact habitat to maintain viable populations (Zanin et al., 2015), are emblematic of these impacts. As many as 75% of Brazil's jaguar populations may not be viable in the long-term due to increasing habitat loss and fragmentation (Harris et al., 2005; Sollmann et al., 2008; Zeilhofer et al., 2014).

Tropical livestock systems are subject to substantial human-wildlife conflict because of the distinct vulnerability of domestic herbivores to depredation (Frank and Woodroffe, 2001). Consequently, depredation of large predators on livestock is one of the more frequently studied human-wildlife conflicts in Brazil (Marchini and Crawshaw, 2015). When humans and carnivores compete for resources and habitat is lost and/or fragmented, wild carnivores specializing in wild ungulates may begin to prey upon domesticated species, which may result in predator extermination without regard to their ecosystem role or conservation status (Linnell et al., 1999; Ogada et al., 2003; Polisar et al., 2003;

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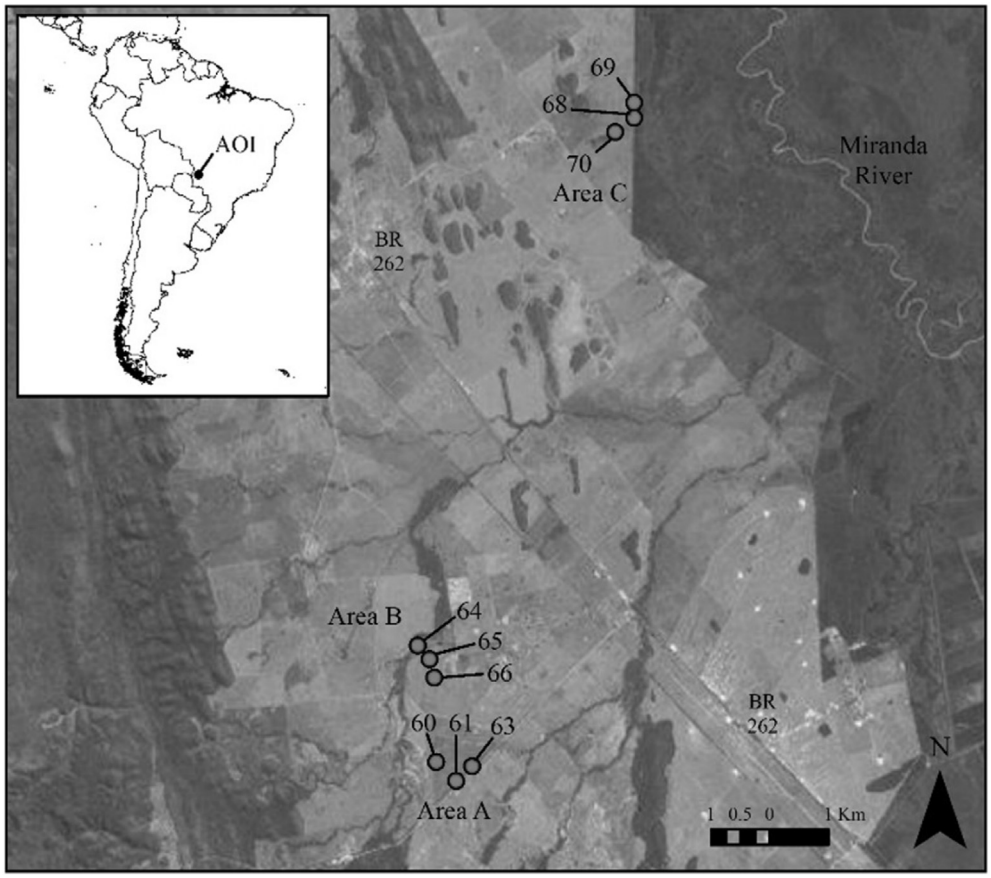

Fig. 1. Map of study Areas A, B, and C and their corresponding camera locations. Area of interest (AOI) in southwestern Brazil shown on inset map.

Graham et al., 2005; Cavalcanti et al., 2010; Amador-Alcalá et al., 2013). Although livestock depredation represents economic loses for ranchers, most studies have found predation rates by large carnivores, such as jaguars, to be relatively low in comparison to losses related to low productivity, neonatal mortality, and mortality due to disease (Hoogesteijn et al., 2002; Hoogesteijn and Hoogesteijn, 2008; Azevedo and Murray, 2007; Loveridge et al., 2010).

Despite the potential for habitat loss and fragmentation, declines in wild populations, and increased human-wildlife conflict, grazing lands can have promising conservation value due to their potential to preserve wildlife habitat and open space on private lands and connectivity between fragmented ecosystems (FAO, 2009; du Toit et al., 2010; Schieltz and Rubenstein, 2016). In the Brazilian Pantanal, where 95% of the land is privately owned and beef cattle production has occurred for ~300 years, jaguar densities are high in relation to other regions of Brazil because land management practices are influenced by a seasonal flooding regime that has preserved native vegetation and high prey abundance (Swartz, 2000; Soisalo and Cavalcanti, 2006; Silveira et al., 2014). Both Boulhosa and Azevedo (2014) and Cavalcanti et al. (2010) have reported that ranchers in the Pantanal perceive that jaguar populations are increasing. The correlation of these impressions with increased deforestation, human populations, and improved pastures (Seidl et al., 2001; Alho et al., 2011), suggests that the push of people into forested habitat is increasing human-jaguar interactions (Boulhosa and Azevedo, 2014). However, only a minority (28.6%) of ranchers in the Pantanal region of Brazil suggest a preference to living without jaguars in the environment (Boulhosa and Azevedo, 2014).

Ecotourism is booming in the Pantanal and provides an alternative economy in a region dominated by ranching (Alho and Sabino, 2011). Although some of the unregulated tourist trade in the region has contributed to environmental degradation (e.g. overfishing, wildlife harassment, and improper waste management), wildlife watching and ecotourism are based upon conservation and making positive sustainable contributions to the natural and cultural environments that benefit the host communities (Tapper, 2006; Alho and Sabino, 2011). Unfortunately, baiting by tourist operators to guarantee jaguar sightings has contributed to acclimation to people (Boulhosa and Azevedo, 2014). The combination of habitat and prey loss, association of humans with food, and an increase in the tourist population have potentially contributed to jaguar attacks on humans and one death in the Pantanal (Neto et al., 2011).

The objective of this project was to examine spatial and temporal variation in the presence, composition, and diversity of wild fauna, including predators and their prey base, in a well-established tropical livestock system. The study was conducted in the Cerrado-Pantanal transition zone in Brazil, where habitat conversion for improved pasture has resulted in a landscape of large areas with intensive habitat loss bounded directly by vast blocks of intact montane forests in the Cerrado and seasonally flooded lowland habitat in the Pantanal. This land use and landscape pattern introduces potential for conflict between ranching activities and local wildlife and concomitant opportunities for ecotourism and conservation. The study sampled wildlife with camera traps distributed across the land use gradient and obtained rancher depredation observations. The results interpreted in the context of habitat use patterns of wild fauna, especially predators and their prey base, human-wildlife conflict due to depredation on cattle, and sustainable husbandry and land management practices in tropical livestock systems for simultaneous livestock production and wildlife conservation.