

## Dynamics of hunting territories and prey distribution in Amazonian Indigenous Lands



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### ABSTRACT

Indigenous Lands in the Brazilian Amazon intend to guarantee indigenous rights and conserve forests, although many do not correspond to peoples' territorial needs and may not effectively preserve wildlife. Most indigenous people rely on game for subsistence, and the spatial distribution of hunts and prey determine hunting sustainability and wildlife conservation. I examined the Kaxinawa hunting territory dynamics through the participatory monitoring and mapping of 10 ILs. The Kaxinawa are central-place foragers whose ideal hunting territories have a circular shape with a radius of 5 km. The geopolitics of the Kaxinawa combined with spatial occupation distort hunting territories to maintain indigenous control while respecting the territories of nearby villages. The fission of large villages leads to reduced hunting territories but increases the overall hunted area, consequently affecting game populations. Kaxinawa hunting did not lead species to extinction. The Kaxinawa hunted 65% of prey within 2.5 km of the villages and the other 30% within 5 km. Although all of the species were hunted close to villages, the prey were smaller, and several sensitive species were rarely hunted. The replacement of such sensitivity for more resilient low-ranked species on hunting bags suggests that these species might be depleted near villages. These findings provide objective standards for titling Indigenous Lands and for improving wildlife management within these lands.

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### Introduction

Wildlife remains fundamental to most Amazonian indigenous peoples as the main meat source and for structuring their society (Nasi et al., 2008). However, in a feedback loop, the social and cultural organization of an indigenous group may be unsustainable, impacting game populations, while the reduction of game availability affects the indigenous social organization as well as the ecosystem on which these people rely (Milner-Gulland, Bennett, & SCB 2002 Annual Meeting Wild Meat Group, 2003). Therefore, when Indigenous Lands<sup>1</sup> are titled in Brazil to ensure the indigenous rights to maintaining the wellbeing, physical and cultural reproduction of the indigenous people, wildlife conservation is one of the mechanisms that accomplish indigenous rights (Brasil, 1988; Stocks, 2005). Particularly in the Brazilian Amazon, ILs are expected to contribute to wildlife conservation as much as other protected

areas given their strategic location and extension (Azevedo-Ramos, Amaral, Nepstad, Soares-Filho, & Nasi, 2006; Nepstad et al., 2006).

Many features of hunter–prey dynamics, such as hunting effort, strategy, technology, extension and distribution, may have differential effects on game populations and communities that can threaten both wildlife and the indigenous people relying on them. Estimates on wildlife population size and hunters' offtake are used to determine the causes of variation in Amazonian wildlife communities (Alvard, Robinson, Redford, & Kaplan, 1997; Peres, 2001; Robinson & Redford, 1994) and to evaluate the hunting sustainability to set wildlife-management standards (Bodmer & Robinson, 2004). However, the spatial dynamics of hunters and their prey have been overlooked despite their high relevance in Amazonian hunting systems (Milner-Gulland et al., 2003; Novaro, Redford, & Bodmer, 2001; Peres, 2001). The arbitrary choice of catchment area shape in these models, for example, resulted in inadequate conclusions regarding the sustainability of subsistence hunting in the Amazon, where species would theoretically be locally extinct but were still present (Levi, Shepard, Ohl-Schacherer, Peres, & Yu, 2009).

The shape of the catchment area of a group of hunters would not differ from that of a hunting territory (Novaro et al., 2001; Peres &

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<sup>1</sup> Abbreviation: IL(s) – Indigenous Land(s).

Nascimento, 2006); however, the latter concept is associated with hunter's social organization. A hunting territory is the parcel of the territory as recognized by the indigenous social unit, either a single village or the entire ethnic group, as the area of hunting over which they exert some degree of control and ownership (Descola, 1994). These territories are constructed as a consequence of the indigenous relationship to space (Read et al., 2010), which frequently involves characteristics of the landscape and environment, prey availability, indigenous belief systems, their occupation pattern, and space use by other people (Lopez, Beard, & Sierra, 2013). Similar to territories, the boundaries and "ownership" of hunting territories are dynamic and defined by local norms that are not necessarily recognized, regulated or granted by the state (Little, 2001). Therefore, the social dynamics of the indigenous groups influence the shape and boundaries of hunting territories, consequently reflecting the distribution of game species and hunting sustainability.

Recent studies have described the spatial distribution and dynamics of hunters, hunts, prey, and hunting territories (Ohl-Schacherer et al., 2007; Parry, Barlow, & Peres, 2009; Smith, 2008), but few have analyzed the causes of territory variation relating to hunters and their prey (Lopez et al., 2013; Read et al., 2010). The studies on indigenous hunting, however, were conducted within large, well-protected areas (Ohl-Schacherer et al., 2007) or in villages without titled land (Read et al., 2010), which are rare in the Amazon. Therefore, describing hunter behavior, prey distribution, and the processes influencing the dynamics of hunting territories of contemporary traditional societies in delimited protected areas represent necessary knowledge not only for improving wildlife conservation but also for complying with indigenous rights (Levi, Lu, Yu, & Mangel, 2011; Read et al., 2010).

This study intends to determine 1) the processes driving the variation in the shape of indigenous hunting territories and 2) how

prey distribution might be affected by hunting territory dynamics. I hypothesize that hunting territories vary according to geopolitical processes as composed by village social organizations and constraints that are imposed by other settlements and societies. In addition, I hypothesize that variation in hunting territories indicates in changes in prey catch distribution. I described the patterns of indigenous hunting strategies, hunting territory dynamics, and hunted prey distribution inside the Kaxinawa ILS in the state of Acre, Brazilian Amazon.

## Material and methods

### Study area

The Kaxinawa, which are auto-denominated *Huni Kuin*, are a Panoan-language-speaking indigenous people occupying the Brazilian-Peruvian border. After the arrival of non-indigenous people in the region in the late nineteenth century, the Kaxinawa corresponded to 55% of the total indigenous population in Acre State, Brazil, with more than 7200 people (IBGE, 2010) living in 12 ILS that were demarcated from the late 1970s to the early 1990s (Iglesias, 2003). Game meat is a highly valued good that is mostly hunted for subsistence and is relevant to determine social relations within and among villages even when Kaxinawa families have access to alternative meats (Constantino et al., 2008; Kensinger, 1985; Navarro, 2004). Prey can be classified as preferred species, which are mainly represented by large game; species of secondary preference; and low-preferred species, which are only hunted when hunters cannot find any other species and must return home.

This research was conducted in 45 Kaxinawa villages of 10 Indigenous Lands that are located in Acre State, western Brazilian Amazon, in a region of app. 72,000 km<sup>2</sup> between the Alto Juruá and Alto Purus Rivers (Fig. 1). The study encompasses 83% of the ILS that

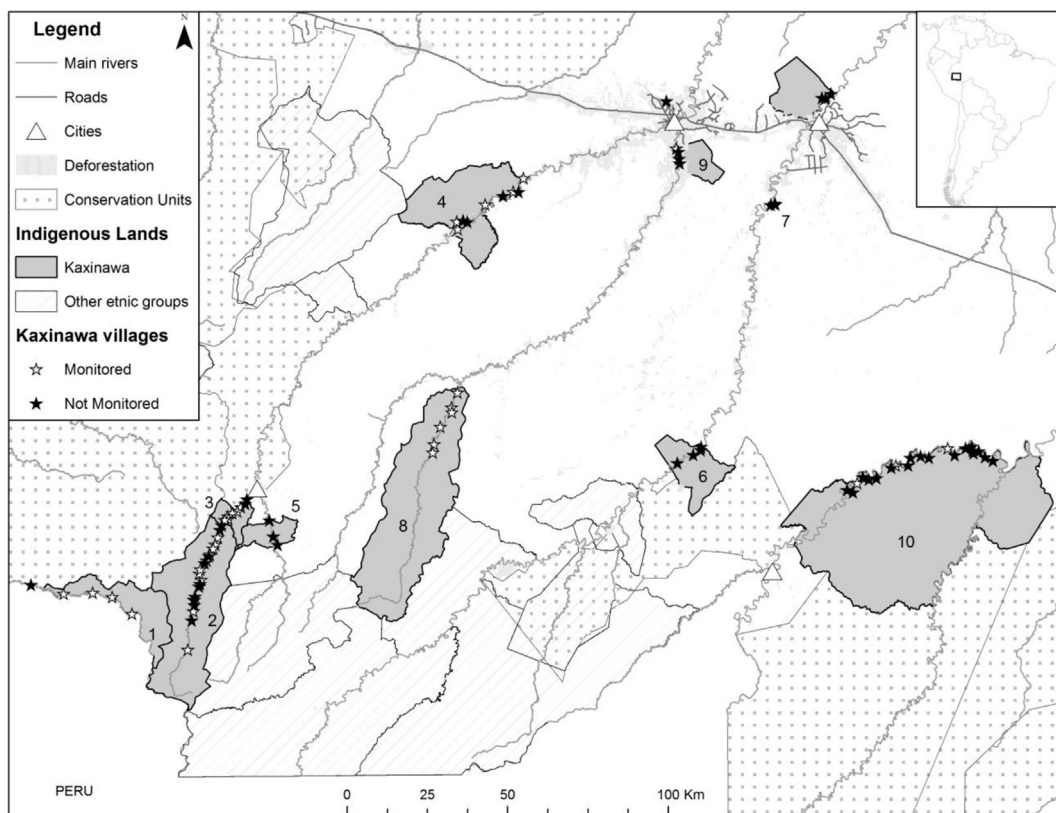


Fig. 1. Kaxinawa Indigenous Lands and villages that are studied in the state of Acre. Indigenous Land numbers correspond to Table 1.

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