
LEARNING TO HUNT BY TENDING THE FIRE: XAVANTE YOUTH, ETHNOECOLOGY, AND CEREMONY IN CENTRAL BRAZIL

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Xavante (A'uwẽ) hunting with fire in the cerrado landscape of Central Brazil has garnered considerable attention by the public for its purported threat to the environment and by the scientific community as an example of responsible Indigenous landscape management. The practice and transmission of associated traditional knowledge now face acute challenges due to territorial circumscription, increased sedentarization, and economic change. In this article, I draw on my observations during a ceremonial hunting trek to discuss the process by which boys and young men acquire knowledge and skills required to autonomously participate in group hunting with fire in ways their elders consider proper, effective, and sustainable. I focus on a particular didactic strategy whereby young mentors assume primary responsibility for encouraging restrained participation by their even younger protégés while elders create opportunities for youth to gradually participate in increasingly direct capacities. This cultural configuration encourages active learning and entrusts younger people to assume responsibility for their own acquisition and production of knowledge pertaining to the ecology of anthropogenic fire, the burning calendar, group hunting strategies, and ceremonial aspects of the hunt.

Keywords: *Indigenous youth, Indigenous landscape management, cerrado ecology, anthropogenic fire, ceremonial hunting*

Introduction

Commencing the Xavante (A'uwẽ) group hunting season of 2005 for Pimentel Barbosa village, Central Brazil, was a much-anticipated ceremonial trek held in May for the benefit of young mentors (*danhohui'wa*) responsible for overseeing pre-ignite boys (*wapté*). This was the first of three extended hunting excursions held in conjunction with the boys' initiation rites of passage (*danhono*) into novitiate adulthood (*ritei'wa*), which culminated in an intense six month sequence of ceremonies from March to August the following year. The May trek was the pre-ignite boys' first opportunity to accompany adults on collective hunts in which the vegetation was burned to flush out large game animals (Welch 2014; Welch et al. 2013a; Welch et al. 2013b). As such, many elders described it to me as an important opportunity for pre-ignites, as well as novitiates, to learn to hunt before assuming responsibility for providing for their future wives and parents-in-law. However, very few members of these two age sets actually hunted during the trip. Rather, the majority remained in camp tending to the roasting fires, collecting firewood, and performing other camp chores. Those who did accompany older hunters in the field did not ignite fires or carry bows or firearms. The apparent dilemma of youth purportedly learning to hunt by performing chores only indirectly related to the act of hunting caused me

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to question when and how they acquired hunting skills and, more specifically, learned the sophisticated cultural knowledge associated with group hunting with fire among the Xavante.

In this article, I draw on my observations during the hunting expedition of May 2005 to help answer this question. Focusing on contemporary intergenerational dynamics of Xavante youth participation in group hunting with fire, I emphasize a particular didactic strategy whereby young mentors assumed primary responsibility for encouraging restrained participation by their even younger protégés (*hõ'wa nõri*) while elders (*ĩhĩ*) created opportunities for youth, including mentors, novitiate adults, and pre-initiates, to gradually participate in increasingly direct capacities. This configuration encouraged active learning and entrusted younger people to assume responsibility for their own acquisition of knowledge pertaining to the ecology of anthropogenic fire, the burning calendar, group hunting strategies, and ceremonial aspects of the hunt.

Hunting with fire and associated cultural knowledge are documented among several other Indigenous groups in the tropical savanna-like cerrado biome of Central Brazil including the Apinayé, Krahô, and Kayapó (Anderson and Posey 1989; Hecht 2009; Mistry et al. 2005; Nimuendaju 1939). Each of these peoples has extensive cultural knowledge about cerrado fire ecology and management. Previous studies on hunting with fire among the Xavante have focused on environmental sustainability (Briani and Palma 2004; Leite 2007; Melo and Saito 2011; Prada and Marinho-Filho 2004; Villalobos 2002; Welch et al. 2013a), astronomical markers of the burning season (Melo and Saito 2013), and social and ceremonial motivations (Welch 2014). In this article, I seek to complement this literature by taking a closer look at how traditional Xavante ecological knowledge associated with effective and responsible group hunting with fire is learned by young hunters.

As I explore here, Xavante men consider age-appropriate constraints on youth hunting activities and indirect teaching strategies to promote their gradual and autonomous acquisition of basic capacities, such as knowledge of the terrain and self-sufficiency skills, before safely and effectively participating as competent members of hunting groups (Welch 2014). This dynamic is also integral to how youth learn to properly conduct ceremonial aspects of hunting. This ethnographic account contributes to the literature on Indigenous anthropogenic fire and cerrado fire ecology by exploring Xavante traditional ecological knowledge and the process by which it is acquired and transmitted under contemporary circumstances of environmental and economic transformation (Coimbra et al. 2002; Santos et al. 1997; Welch 2014; Welch et al. 2013a; Welch et al. 2013b). The study also dialogues with the anthropology of Indigenous youth in Brazilian Amazonia, which has focused largely on childhood (Lopes da Silva et al. 2002; Tassinari 2007) and increasingly addresses issues of cultural transformation among youth (High 2010; Virtanen 2012), by investigating how autonomy and constraint coexist in this society's ideology of how young men properly become adults.

In the following section, I begin by outlining key historical, cultural, and ecological aspects of Xavante hunting with fire in the cerrado, focusing on the dynamics of trekking, ceremony, and youth participation. I then present a

narrative of my observations during the 2005 hunting trek to illustrate the social, ceremonial, and physical contexts within which youth of different ages participate in hunts and acquire relevant ecological knowledge. This account is divided into three sections: 1) the initial preparations, departure from the village, and setting up camp the first day; 2) a recounting of two relatively unsuccessful days of group hunting with fire in open grasslands; and 3) a description of three sequential hunts targeting large bands of white-lipped peccary (*Tayassu pecari* Link) in forested waterways. Finally, I report on a day spent with pre-initiates and novitiates in camp and our ultimate return to the village. I then place the 2005 trek in wider context by discussing young hunters' gradual assumption of greater responsibilities and the ecological knowledge they thereby accessed and ultimately helped produce. I conclude with a few remarks about the role of ceremony in how contemporary youth engage with hunting.

Research informing this article was conducted with residents of Pimentel Barbosa and Etênhiritipá villages in the Pimentel Barbosa Indigenous Reserve, Central Brazil, and during their excursions to the nearby Wedezé Indigenous Reserve. These are two of ten Xavante Indigenous reserves located in the cerrados of eastern Mato Grosso State, some of which have larger population densities, more degraded landscapes, and different hunting patterns than those reported here. Typical of the cerrado biome, the local vegetation is highly varied, ranging within short distances between open grasslands, scrublands of various heights and densities, and tall gallery and dry upland forests (Eiten 1972). The Pimentel Barbosa reserve, which has been my primary study site since 2004, benefits from largely intact or recovering vegetation cover (Welch et al. 2013a) and, according to mature hunters, ample game animal populations. The Wedezé reserve, which was first officially identified by the Brazilian federal government in 2011, is also occupied by large ranches and suffers from moderate to severe degradation due to cattle production and other agribusiness activities. Due to the diversity of conditions that exist in these and other reserves, some of the cultural practices, viewpoints, and landscape conditions I describe may not be shared by Xavante living elsewhere.

Hunting with Fire: Past and Present

Xavante hunting with fire receives considerable public attention as a purported threat to the cerrado environment, among the world's most important biodiversity hotspots (Mittermeier et al. 2004; Myers et al. 2000), and by the scientific community as an example of effective Indigenous landscape management (Welch 2014; Welch et al. 2013a). Contemporary men continue to hunt with fire, as they have for centuries, but the practice and the transmission of associated traditional knowledge now face acute hurdles due to territorial circumscription, increased sedentarization, and economic change. Despite these challenges, studies have shown the practice to have negligible or positive environmental effects in terms of vegetation cover and animal abundance (Briani and Palma 2004; Leeuwenberg and Robinson 2000; Leite 2007; Prada and Marinho-Filho 2004; Villalobos 2002; Welch et al. 2013a). These findings coincide with studies on cerrado fire ecology, which show vegetation and animal populations to be highly

resistant to the impacts of anthropogenic fire (Pivello 2011; Simon et al. 2009) and periodic fires to reduce overall fire intensity and destructiveness (Coutinho 1990; Pivello 2011; Ramos-Neto and Pivello 2000).

According to Xavante elders and historical accounts, hunting with fire (*du*) was frequently done while on family (*zõmoni*) and male ceremonial (*hõmono*) treks throughout a vast region west of the Araguaia River (Aureli 1952; Maybury-Lewis 1967; Pohl 1951[1837]; Welch et al. 2013b). Trekking became less frequent and more localized with territorial circumscription and economic changes in the 1980s (Flowers 1983, 2014; Leeuwenberg and Robinson 2000; Maybury-Lewis 1967). It is now uncommon with the exception of men's hunting treks associated with boys' rites of initiation into adulthood, such as the one described in this paper, which continue to be held on several occasions approximately every five years. Xavante men from Pimentel Barbosa also may occasionally hold multiple-day hunting treks in conjunction with marriage ceremonies, but to my knowledge have not done so since 2003. Entire families also may, but have not recently, trekked to collect fruits, roots and rhizomes, honey, and hearts of palm, as well as to fish, hunt, and access many other seasonal and geographically dispersed landscape resources. Hunting with fire is a highlight of elders' often emotional recollections of trekking in the past, although now it is done most frequently during single-day excursions. As one elder man, who was an adolescent in 1946 when sustained contact was first established with the Brazilian government, explained to me:

We walked, moving through the landscape like animals. We walked, policing our territory. We walked like nomads, with total freedom and unlimited space. That life was very good! I miss that time, when we went on family hunting trips and the men hunted with fire during the day. Life was good then.

Hunting with fire now occurs within a transforming economy and at the intersection of worldviews. Elders consider themselves an intrinsically mobile cerrado people who prefer open landscapes to closed forests. Elder men also consider themselves to be quintessential trackers who usually prefer to give chase to animals over long distances rather than stalk, wait in ambush, or use traps. Their notions of traditional hunting coexist with contemporary realities involving a dramatically reduced territory¹ circumscribed by large cattle ranches and soy farms, and a comparatively sedentary lifestyle. This change in particular is cause for considerable concern by mature hunters that they burn in an environmentally responsible fashion and has motivated numerous collaborations addressing the effects of hunting with fire with ecologists and other researchers for nearly a quarter century (Briani and Palma 2004; Fragoso et al. 2000; Graham 2000; Leeuwenberg and Robinson 2000; Leite 2007; Prada and Marinho-Filho 2004; Villalobos 2002; Welch 2014; Welch et al. 2013a). Recent decades also brought changes in how boys and young men view hunting. Whereas elders remember a time when hunting competency was important for one's prestige and furnishing game meat was an essential means of demonstrating respect for one's parents-in-law, these values are shifting among some young people.

Consistent with David Maybury-Lewis's (1967) observations in the 1950s of pre-initiate boys frequently accompanying their mentors on hunts to learn

tracking (*abazé para'ri*) and other skills, most elders I interviewed, many of whom were youth when Maybury-Lewis visited their community, killed their first large game animal while pre-initiates or novitiate men. They also reported having mastered hunting with fire as novitiate men, before becoming mentors to their own protégés. In contrast, in 2005 no pre-initiates or novitiate man reported ever having done so. Elders often criticized young people, including pre-initiates, novitiates, and mentors, for their lack of hunting interest and experience (Welch 2009). Interestingly, these disparaged youth tended to agree with their elders that they did not hunt often and knew very little about hunting. Many young men explained their disinterest to me in terms of difficulty and discomfort: hunting is tiring, walking in the sun is hot, and it hurts when one's legs are scratched in the brush. Yet, every one of them who was physically able attended the ceremonial hunting trek in 2005. Also, later the same year, most of them accompanied group hunts undertaken for marriage ceremonies. It is my opinion that they participated more frequently and more enthusiastically during these hunts than non-ceremonial hunts because they were invested personally as ceremonial participants (initiators, mentors, grooms, fathers-in-law, etc.) or relatives and friends of participants.

Research on Indigenous peoples in Brazil has highlighted a tendency for children to learn informally as subjects of their own education according to principles of autonomy, self-determination, and permissiveness (Cohn 2002; Lopes da Silva and Nunes 2002; Schaden 1945; Tassinari 2007; Zoia and Peripolli 2010). As these scholars consistently describe for numerous ethnic groups, childhood is often distinguished by a lack of formal instruction and free circulation in diverse social settings from which they may be restricted after reaching adulthood. Consistent with these conditions, child learning in such societies occurs through voluntary observation and imitation of adult behavior. Xavante childhood is similarly described as an unrestrained and autonomous time in which children act on their own initiative to recreate the social world around them (Nunes 2002, 2011). As an elder woman told me, "It was not that our mothers taught us, but that we paid attention. We learned through curiosity." Specifically, young boys initially gain familiarity with game animals while hearing myths and playing with captive wild animals and later gain practical hunting experience by pursuing small animals, such as crickets, grasshoppers, lizards, mice, and small birds, with miniature bows (Carrara 2002; Lopes da Silva 2002; Nunes 2002).

Indigenous childhood learning is not, however, restricted to informal observation and imitation. For Kayapó Xikrin children, for example, there are also opportunities for group learning in ritual contexts by members of young age classes (Cohn 2000). For Xavante boys, such opportunities begin when they join a formal age set (*da'usú za'ra*) and take up residence in the pre-initiate boys' house (*hö*), located at the periphery of the village. This important moment in boys' lives signals a shift in the social relations through which they are expected to learn about adult life, as well as adults' expectations of their behavior and modes of thinking. Whereas beforehand they were guided by their fathers and other male relatives, in the pre-initiate house this responsibility is assumed by their relatively young mentors, who were themselves pre-initiates about ten years

previously (for more information on this age group system, which involves lifelong membership in a series of age sets or cohorts allocated alternately between age set moieties, see Maybury-Lewis 1967; Welch 2009, 2010). As an elder described the pre-initiate experience, “Boys’ lives of liberty and freedom are ending and they start thinking like adults. Everything is learned in the pre-initiate house. It is not the elders who teach them; it is their mentors.” Although mentors assume roles of responsibility in relation to their protégés and are considered mature hunters by virtue of their ceremonial passage into full adulthood (*iprédu*), members of both age sets, as well as the one in between (novitiates), are considered youth (*ihöibaté*, literally ‘young life/body’). Although Xavante age set membership is not strictly determined by chronological age, their relative ages may be useful for understanding how mentors and their protégés are grouped together as youth. In 2005, the pre-initiate boys ranged from 9 to 15 years, the novitiates from 14 to 20 years, and the pre-initiate boys’ mentors from 21 to 27. As I explore in this article, each of these groups of boys and young men engaged with hunting differently in a process that elders believed prepares them effectively for full participation in hunting activities.

In the following section I describe my observations during the men’s ceremonial trek in 2005, which involved daily group hunts, almost all in conjunction with burning, in order to help make sense of my initial observation that youth were expected to learn to hunt while being restricted to largely non-hunting activities, as well as to highlight the cultural knowledge about sustainable burning available to them. In this narrative, my observations of these three youth age groups (pre-initiates, novitiates, and mentors) provide a cross-sectional view of how youth participated differently as they grew older. Given the approximately five-yearly recurrence of ceremonial hunts associated with boys’ rites of passage, members of each of these groups would participate in all three roles over the course of about 15 years. For example, although I describe here a single hunt, the individuals who were pre-initiates in 2005 also participated in the same ceremonial hunt as novitiates in 2010 and are expected to participate as mentors in 2015. My initial insertion as a researcher into this age sequence was as an adoptive member of the novitiate age set. As my age peers and closest friends in the community, members of this group were my most valuable sources of information about youth experiences. Since that time, my age set assumed mentorship of our own set of protégés, thereby providing me with firsthand experience and close contact with all of the youth categories I address in this paper.

Departure and Setting up Camp

In mid-May, the landscape was beginning to dry out. The soil in most places was no longer waterlogged, as it had been just a few weeks earlier. The streams were running lower and clearer. The air now felt dry on the skin. The possibility of rain had diminished and isolated thunderclouds now passed only sporadically. For several months I had heard rumors that a special mentors’ hunt (called *úwede zada’rã*, which literally refers to a ceremonial pole presented in the village at the hunt’s conclusion but is also commonly glossed by the Xavante as ‘the

mentors' hunt'), held just once every five years and lasting up to two or three weeks, was to begin this month. Given many elders' concern with what they saw as a growing tendency for male youth to be overdue in acquiring hunting experience, they told me this was an important opportunity to help them get back on track by offering opportunities for them to learn from mature hunters. They also sternly instructed me to not mention the hunt to women.

Although Xavante women belong to the same secular age sets and age set moieties as men, all-male age group activities often take on the character of a secret society (Gregor 1979). Among the Xavante, secrets are highly valued in certain social contexts and do not necessarily carry negative connotations. They are abundantly used to protect information held by members of age-based sodalities, families, and gender groups from outsiders. In this case, the secrecy I was drawn into involved a sometimes comical series of scheduling gymnastics initially to elude women as to the existence of the trip and later about the exact date of departure. Despite men's numerous efforts to surprise women by rescheduling the trip over the course of a week, the secret escaped by May 14 and women busily helped their husbands and sons with preparations to leave the following day.

That evening almost all men I spoke with planned to join the trek. The few who did not had good reasons. For example, remaining in the village were several elders who no longer hunted actively and two men awaiting news from the hospital of a gravely ill relative. Also, virtually all pre-initiates (approximately 40 individuals), novitiates (30), and mentors (20) planned to go. Nevertheless, some novitiates seemed less than eager about the trip, warning me that camping and hunting in the cerrado is enormously difficult and the numerous chores expected of them burdensome.

At the evening men's council meeting (*warã*), an elder leader delivered a speech advising hunters to be safe and return quickly. He advised the mature men to watch out for the well-being of pre-initiates and novitiates, who were unfamiliar with portions of the reserve and might get lost. He continued, instructing them to avoid snakebite, not let the truck run out of diesel, and not push youth beyond their capacities. Village elders often take a hard line when deriding youth about their deficiencies, such as their lack of interest and skill in hunting, poor personal grooming, and disrespect for others. However, when talking amongst themselves, they are measurably more empathetic and concerned with not pushing youth beyond their limits.

The next morning, the community truck shuttled hunters to the hunting camp in staggered groups based on age. Leaving earliest, soon after sunrise, were the mentors with their pre-graduate protégés. Older men belonging to diverse age sets left at about 10 a.m. Members of the novitiate age set left in the early afternoon. Each participant brought a modest carrying basket with several personal items, such as a blanket, sleeping mat, accoutrements for the ceremonial return to the village after the hunt (such as body paint and cotton neckties), and perhaps a drinking cup, as well as a modest amount of food, such as rice, manioc flour, or coffee, to contribute to group meals during the first few days. Additionally, mature men brought rifles, shotguns, or bows. Although many Xavante men hunt with dogs, they do not use them during group hunts and did

not bring them on this expedition. I was impressed by how little they carried as compared to what Dennis Werner (1978, 1983) described for the Kayapó Mekrāgnoti, speakers of a related Gê language, who bring large amounts of agricultural foods to sustain themselves while on trek.

Arriving at the basecamp before noon, my attention was drawn to the thick yellow pall of smoke around me, obscuring my vision of the landscape beyond a radius of about 20 meters. The mentors who arrived first had set fire to the vegetation near camp for a small-group hunt, the first of the trip, before elder hunters and novitiates arrived. They had assumed full responsibility for igniting the fire and conducting this initial hunt, but only after prior consultation with elders regarding the burn location. I was surprised by the proximity of this fire to basecamp. Its smoldering edges were evident less than 100 m from where they had stashed their baskets of supplies, but moisture in the soil and vegetation helped to maintain a safe margin between them. I noticed the tall grasses and forbs were green but showing signs they would soon begin to dry. The fire still burned with open flames in a few isolated patches, but had petered out everywhere else. The charred areas were patchy and I saw no evidence the fire had climbed into the trees punctuating the grasslands. Hunters' footprints remained moist and green as though the fire had skipped over them. I estimated the patchy fire had consumed only a third to half of the grassland cover.

While their mentors hunted, pre-initiate boys collected green palm fronds and arranged them on the ground several layers deep in a series of open arcs along the perimeter of the campsite to serve as sleeping mats. When the novitiate men arrived several hours later, they dropped their baskets in a pile on these mats and immediately left to go fishing several kilometers away. Sharing between them several small bundles of hooks and line, they quickly succeeded in catching over 20 kg of modestly sized fish, which they strung on long twigs through the gills to share with others back at camp. Although the main objective of the trek was to hunt, the novitiates' contribution of fish was also important to help sustain the group without eating game meat intended for ceremonial distribution back in the village. In the late afternoon, the mentors returned from their hunt and additional participants arrived, including several from neighboring villages that split from Pimentel Barbosa village in recent decades and often returned to participate in age set ceremonies. In total, the number of participants had reached well over 100 individuals.

The camp bustled with activity that afternoon, with each of the youth age sets assuming a different task. Mentors butchered the first game of the expedition—a marsh deer (*Blastocerus dichotomus* Illiger), a red brocket deer (*Mazama americana* Erxleben), and a tapir (*Tapirus terrestris* L.)—and placed the meat over a large roasting fire. While pre-initiates tended to the roasting meat, I accompanied my novitiate peers collecting firewood.

One of our mentors (our elders by two age sets) drove us in the truck to a private location, where everyone went to work dragging fallen logs into a huge pile and loaded them onto the truck. The task took no more than a half hour, after which we gathered in a circle to rehearse our most recent and as-yet not publicly presented song repertoire. My age set had been initiated into novitiate adulthood in 2001, before I began research in the community. Since that time, much of their

group attention focused on developing and perfecting song performances, an important activity contributing to the creation and reinforcement of social bonds within age sets (Aytai 1977; Graham 1994, 1995). Consequently, they routinely retreated to secret locations in the forest under some pretense, such as collecting firewood or fishing, to teach one another their songs and rehearse them to perfection before performing publicly. At the rehearsal's conclusion, our mentor spoke to the group in a gentle voice about the importance of representing our age set moiety, comprised of the continuous chain of alternate age sets serving as mentors and protégés to one another, with dignity during the expedition. He encouraged us to behave ourselves, keep quiet, do our share of camp chores, and mind our elders in order to avoid negative gossip by members of the other moiety, which included the pre-initiates and their mentors. His speech anticipated an age group dynamic I would observe throughout the hunt, whereby mentors quietly and supportively encouraged their protégés to responsibly carry out their functions and pay attention to the examples set by elder men.

The assumption of responsibilities according to age set membership continued that night as the pre-initiates stood in a circle beside the roasting fire to perform their songs for the elders' enjoyment. Several of their mentors joined in the singing, using their own strong voices to guide and reinforce their protégés' more tentative voices. Although not directly related to the activity of hunting, evening song performances by pre-initiates and novitiates were an important and thoroughly enjoyed ceremonial dimension of the hunting trek. Most people went to sleep between 8:00 and 10:30 p.m. Although one person brought a tent, everyone else slept under blankets on the semi-circular palm frond matting. The chilly night was filled with snores but otherwise still. The nighttime quiet in camp contrasted remarkably with the noisy nights I experienced in the village, during which my sleep was regularly interrupted by dog barks, rooster calls, and children's cries.

I first heard morning movement around 5 a.m. the following day as several people arose from their sleeping mats, played tapes of their own recent song performances, and bathed in the stream. The first morning business after snacking on cold bits of fish, meat scraps, and rice was to select hunting teams, which was done in animated discussion around the refreshed roasting fire. Werner (1978) published a similar account of Kayapó Mekrāgnoti hunting team selection according to kinship principles. For this ceremonial hunt, Xavante men selected teams irrespective of kinship with the goal that each of the four teams should have an even distribution of elders and youth. As I would come to learn, the mentors had claiming rights to the largest and choicest selections of meat killed by any hunter from a different team in order to take generous gifts of meat back to their new parents-in-law in the village. Smaller and less desirable pieces could be claimed by novitiate men, similarly for the benefit of their parents-in-law or, if unmarried, parents. By contrast, elders only had claiming rights to the least desirable bits of meat, including innards and small game animals, which were not considered appropriate as ceremonial gifts. Thus, a team's success in acquiring choice meat for the benefit of its mentors and novitiates required that it have a mix of experienced hunters to kill animals,

mentors and novitiates to claim meat from other teams' hunters, and pre-initiates to help roast the meat and perform other camp chores. After the teams were chosen, each would pool its meat separately, maintain its own roasting fire, and sleep in its own segment of camp. All Xavante hunts involve claiming rights to other hunters' meat, but this particular arrangement based on age and hunting team was different than I had observed during other kinds of group and individual hunts (Welch 2014).

After selecting teams, the morning discussion turned to the day's hunt. Decisions as to when and where to hunt, as well as who would ignite the fire and what paths they would follow to establish its perimeter, were ultimately made by elders but evolved through continuous group discussion over the course of days and weeks. This particular discussion had its roots in men's council discussions before the trek began, during which the general sequence of hunts and their respective footprints had been outlined, as well as longer-term conversations beginning several years before as to what general area would be reserved for this excursion. On this particular morning, the discussion turned to more immediate factors, such as sighted animal tracks, soil moisture, morning condensation, air humidity, wind direction, and natural fire barriers, in order to plot a specific hunting perimeter and orientation. Mature hunters, including mentors, freely participated in the debate, contributing observations and making arguments in favor of one configuration or another. Novitiates and pre-initiates did not speak, but many listened as they went about their other business. Ultimately elder hunters made a final decision and explained their reasoning to younger hunters. Listening to and participating in such discussions are essential to how youth gradually gain exposure to traditional ecological knowledge and how it is used to effectively and responsibly hunt with fire.

Hunting with Fire in *Murundu* Grasslands

Once the sun had risen and condensation began to dry from the foliage, it was time to leave camp. While I accompanied the hunt, all pre-initiates and novitiates remained in camp to collect firewood and tend the roasting fires. As one elder explained, they would mostly focus on setting up camp during the first few days of the trip. Later in the trip they might, should they choose, accompany older hunters into the field to help carry game back to camp. At about 9 a.m., all of the mentors and other mature adults, totaling some 50 individuals, left camp on foot toward the southeast, walking through the burn scar from the previous day until reaching the day's starting point just beyond its edge, about 7 km from camp. This region was predominantly *murundu* grasslands, which are open, seasonally inundated grasslands punctuated by small wooded hills (*murundu*, in Portuguese) usually no more than 1 to 2 m in height and possessing a termite mound (Araujo Neto et al. 1986). The soil was still waterlogged in places because the rains had stopped only recently. My adoptive Xavante grandfather, Antônio, whom I accompanied for the day, explained he expected the fire would not burn past sunset due to the moisture of the vegetation and nighttime condensation. These *murundu* grasslands, he told me, are the only appropriate place to burn in May because taller vegetation had not yet dried out sufficiently. He also

considered burning grasslands later in the season inappropriate because dryness and increased wind cause them to burn too aggressively.

The particular grasslands selected for this hunting expedition had not been burned for three years, I was told. In interviews with hunters, I came to understand that this temporal spacing did not happen by chance. Whereas until the 1970s the community had access to a much larger territory for trekking and hunting, today many mature hunters consider it an enormous but essential challenge to distribute hunting fires spatially and temporally to avoid undesirable landscape impacts within their limited reserve. As I was told by many experienced hunters, each location has its appropriate moment for burning but their present diminished access to traditional hunting areas makes it difficult to adhere to this schedule. With respect to the grasslands in which we now stood, they had refrained from burning for three years in order to allow it time to recover before this ceremonial hunting event.

Before beginning the day's hunt, elders from each exogamous patrilineal moiety (not to be confused with age set moieties²) selected a runner (*ĩwa*) to represent it in a ritual footrace. Although runners may be of any age from novitiates to elders, both must be from the same age set. Their task was to set fire to the vegetation while running in opposite semicircular paths towards a predetermined finishing place about 6 km away. This race begins every hunt involving fire whether or not it occurs within larger ceremonial contexts such as rites of initiation or marriages. The runner representing the Tadpole moiety (*poreza'õno*) always takes the eastern route, while the Big Water moiety (*õwawe*) runner follows the western route. The first runner to overreach the finishing point wins, thereby earning his moiety cheerful bragging rights that are indicative of the symbolic rivalry between these two intermarrying consanguine groups. The jovial competitiveness of the race is unmistakably expressed through exaggerated exchanges of accusations of weakness and inferiority amid rounds of laughter by onlookers. Although I never observed anyone younger than a mentor serve as runner, elders reported that even inexperienced novitiates could do so if older hunters were stationed ahead at intervals to help them follow the proper route and thereby learn to assume this task autonomously in the future.

The runners left at about 10 a.m. Within minutes, plumes of smoke arose from each of their paths. Whereas some hunters followed the runners along the perimeter, Antônio and I joined other hunters inside the circle. As we walked, he repeatedly picked up dead palm fronds, lit them with a lighter, and ignited patches of grassland (Figure 1). He did so in no particular hurry, often skipping over large areas before picking up another dry leaf. We spent most of the morning alone, occasionally passing other hunters walking in the same general direction or resting in the shade of small trees. I noticed that mentors, despite their relatively younger age, also ignited the vegetation and hunted alone or in small groups of two or three without the apparent need to accompany more experienced hunters.

We also periodically rested while Antônio waited for signs of game animals fleeing in our direction. In fact, most of our time that afternoon was spent waiting in strategic positions. Although I hadn't yet worked out the dynamics of their cooperative hunting strategy, I perceived that Antônio and the other hunters had similar ideas as to the expected movement of animals and travelled in



Figure 1. Antônio ignites grassland vegetation during group hunt (Photo by James R. Welch, 2005).

coordinated fashion to intercept them. I observed a steady flow of hunters walking in our general trajectory and occasionally spreading out to form loose receiving lines when the terrain and the position of the fire indicated the possibility of encountering fleeing animals. Once the fire progressed and a window of opportunity closed, the hunters would abandon their positions and resume walking.

I did not observe a single kill before most of the fire died out by 2:00 p.m. On the walk back to camp, we encountered my adoptive father carrying a pampas deer (*Ozotoceros bezoarticus* L.) on his back. Protected from claims by members of other teams because he had already bundled it for carrying, this entire carcass would contribute to his own team's yield for the day. Joining his small group of hunters, we walked together the 11 km stretch back to camp.

Back in camp, with each team's kills tabulated and in the process of being butchered by the mentors, hunters from all teams agreed that the day's hunt had been a failure. The entire yield for all teams was one pampas deer, one marsh deer, one giant anteater (*Myrmecophaga tridactyla* L.), and two red-footed tortoises (*Geochelone carbonaria* Spix). Most hunters blamed their lack of success on a jaguar (*Panthera onca* L.) that had been spotted walking with her cub within the hunt perimeter and left behind a mutilated collared peccary (*Pecari tajacu* L.) carcass. They argued that such a predator likely caused most game to flee the vicinity long before the fire and hunters reached them. My team did particularly poorly, having killed not a single animal. Consequently, we were labeled the day's



Figure 2. Hunters converse and eat meat in camp at dusk (Photo by James R. Welch, 2005).

“losers” and suffered lighthearted ridicule from members of the other teams during the evening banter around the roasting fires.

By the time the hunters returned to camp, each team’s pre-initiates and novitiates had prepared a large cooking rack of green saplings, an enormous pile of firewood, a long semicircular sleeping cushion made from freshly picked palm leaves, and a wind barrier constructed from entire cut shrubs. These improvements were arranged in four discrete clusters, one for each team, facing the central area of camp. In the diminishing evening light, with some individuals already wrapped in blankets and others standing around the fires, sharing and eating meat was the pastime of choice (Figure 2). Mentors periodically called to their protégés to offer them small pieces of freshly roasted meat. Such gifts were well received by members of my hunting team, since the only meat on our roasting rack were a giant anteater arm and a small cut of marsh deer that had been claimed from hunters on other teams. As the sky darkened, the pre-initiates again sang for the group, as they did each night of the trip.

The hunt began earlier the next morning. Leaving camp on foot at about 8:00 a.m. allowed us to arrive at the day’s starting point before the morning condensation had fully dried. Differently from the previous day, several novitiate males accompanied older hunters during the hunt. However, all pre-initiates and the other novitiates remained in camp; while we waited for the moisture to dry and lagging hunters to arrive, elders occupied our attention by telling stories about a jaguar attack at this site many years ago. As they recalled, each

contributing details others had forgotten or omitted, it attacked a young hunter twice before he fatally stabbed it with a knife. In the past, this type of conquest would have been marked with a change of personal name and a special tattoo on the young man's abdomen, but this man was born after such tattoos had fallen out of favor. The mentors and several novitiates present listened to the story attentively, many never having heard about the attack or the historical importance of tattoos to mark important moments in men's lives. This scene illustrates the educational importance of young men being present during hunts even if they do not yet actively hunt with weapons.

As soon as the morning condensation had dried sufficiently, the two runners set off in their race and the other participating hunters again divided, some following the western perimeter, others the eastern perimeter, and a third set entering the area between the two. I again accompanied Antônio as he worked his way along an irregular path inside the fire perimeter. Accompanying novitiates spent much of their time fishing in nearby waterways, waiting for hunters to kill animals for the novitiates to carry back to camp. The hunt was similar in format and strategy to what I observed the previous day. Combining intimate knowledge of game behavior and the local terrain with tracking skills and a complex set of hunting calls, they efficiently articulated their efforts throughout an area measuring approximately 60 km².

Back in camp, it was apparent that the yield was only slightly better than the previous day: two giant anteaters, two collared peccaries, two deer, and one red-footed tortoise. Pre-initiate and novice helpers arranged the now blackened and drying meat from previous days to the cooler edges of the roasting racks and placed the fresh meat at their centers. The discussion around the fires that evening focused on whether we would move camp the next day. Maybury-Lewis (1967) observed in the 1950s that trekking camps with ample resources and bathing water were often occupied for up to two weeks. That night in 2005, some men expressed their preference to relocate to a more central site within the remaining unburned hunting grounds. However, others thought that campsite was still muddy and had too many mosquitoes. Consequently, the elders' final decision was to stay put for the time being and use the truck to travel to and from these more distant locations.

Pursuing White-Lipped Peccary

On the morning of the fourth day we travelled by truck about 10 km to the east of camp. I found this landscape especially beautiful, with park-like meadows meandering between forested marshes and waterways. As the designated runners set fire to the low vegetation during the first strides of their race, an animated discussion broke out among the other hunters about reports of white-lipped peccary tracks in a different location. The runners paused briefly until the decision was reached to relocate the hunt. Several men then used green palm fronds to beat out the recently ignited fire. Within about ten minutes the majority of flames were out and the elders deemed it safe to leave. Passing by this location that afternoon, I noted the fire had spread less than about 100 m before it died out without further intervention. The hunters' new destination was a large *ipuca*

(*buru'rá* in Xavante), or flooded forest fragment (Eiten 1985), in which the peccaries had taken refuge, another 4 km to the north.

Several hunters went by motorcycle to scout out the new location ahead of the larger group travelling in the comparatively noisier truck. According to hunters, this measure was necessary because peccaries are among the cerrado large game animals most easily spooked by sound. The truck parked about 1 km away and hunters approached on foot, quietly encircled the *ipuca* behind this day's runners, who ignited the bordering grasslands. The burn strategy was different than I had observed during the previous hunts, which sought more dispersed and taxonomically varied game animals. In this case, only this localized band of peccaries was targeted by tightly circumscribing the small *ipuca* with fire in order to clear its perimeter of vegetation, and thereby facilitate dispatching the animals as they fled into the surrounding grasslands.

Once the fire was burning on all sides of the *ipuca*, several hunters slowly entered from one side while others stationed themselves at intervals around the perimeter. As the hunters neared the animals, they used noise and movement to flush them toward waiting hunters. I heard loud shouts and gunfire before several animals broke from cover running in my direction. About four or five fled unharmed before another three were shot by nearby hunters. Similar flurries of activity occurred simultaneously all around the forest perimeter. The approximately eight novitiate men in attendance (no pre-initiates were present), patrolled the *ipuca* perimeter with clubs in case opportunity arose to strike a peccary as it ran past (Figure 3). Although to do so would earn these young hunters considerable prestige, none were so fortunate today.

It took about two hours after the fire was set for the peccaries to disperse or be shot and the fire to die out. I watched a steady stream of hunters emerge from the *ipuca*, congregating on one side to take stock of the yield. With a total of 26 adult peccaries killed, what elders estimated to be less than half of the original band, the day was a marked success. Before returning to camp, hunters debated which hunting team had killed the most peccaries and therefore won the day. Subsequently, due to the large number of animals killed, elders decided to allocate them equitably between the four teams irrespective of individual hunters' affiliations. This deviation from the usual rule of hunting team competition was made for the benefit of the mentors, so that each would have ample game to bring back to his parents-in-law in the village. The accompanying novitiate men assumed the chore of carrying the animals to the truck.

In camp, the butchering work was tremendous. I had heard several times from elders of their desire that novitiates learn traditional Xavante butchering techniques and prime cuts, which they considered a consequential responsibility that must be supervised by elders until mastered. When these young men progressed to mature adulthood and began hunting autonomously with firearms, they should be prepared to butcher game in the field without supervision. Today was the first day I saw novitiates participate, although it was evident that several had more experience than the others. In my team's camp, Antônio presided over their efforts by first demonstrating and then overseeing each animal's evisceration, cleaning, and separation into primary cuts. Meanwhile, the other novitiates left to replenish the firewood supply and



Figure 3. Novitiate hunters patrol burn perimeter with clubs (Photo by James R. Welch, 2005).

pre-initiates replaced the horizontal members of the roasting rack with freshly cut saplings in order to accommodate the day's ample fresh meat.

That night after the flurry of activity died down and the pre-initiates finished their nightly song performance, Barbosa, one of the village's elder leaders, stood on his sleeping mat, cleared his throat to draw everyone's attention, and began delivering a speech in the Xavante speaking style Laura Graham (1993) identifies as elders' speech (*ĩhi mrèmè*). Contrasting from his typical speeches at men's council meetings in the village, this one was a harangue directed toward members of the pre-initiate age set. It was now time for them to learn to hunt, he lectured. Their fathers, he continued, were getting on in years and no longer able to walk long distances or carry heavy loads. "We're too old and it hurts our bodies. Now it's your turn to hunt like adults," he said. His lengthy speech continued with instructions to the pre-initiates that they resist the urge to be lazy by waking up early each morning to take a bath in the river before sunrise (for more on the significance of bathing among the Xavante, see Giaccaria 1978). It was time for them to take an interest in hunting, he informed, because soon they will have their ears pierced and become true adults, and soon thereafter have wives and families to care for. He concluded by telling them they should begin accompanying the older men during the day in order to learn to hunt. Although most pre-initiates continued to stay in camp each day after this speech, at least one to three accompanied their fathers or mentors on each of the following days. Although they did not carry arms, not even clubs, they observed older hunters and helped carry their game back to the truck.

Barbosa's speech, an example of elders' lectures intended to prompt better behavior among members of young age sets, contrasted starkly with elders' usual policy of noninterference in youth affairs. For example, as one elder affirmed, "What the pre-initiates do with their time isn't my business. After leaving home, they become the mentors' responsibility, not mine." Only elders belonging to the same age set moiety are welcome to involve themselves in the affairs of younger age sets, and even these rarely do so without invitation and usually restrict their involvement to gentle advice. However, their aloofness must not be mistaken for disinterest. Elders may delegate direct responsibility for younger age sets to mentors, but also dedicate tremendous attention and resources of their own to promoting favorable circumstances and opportunities for young people to learn from their mentors and other mature men. This hunting expedition was such an example. Thus, elders reserved their opinions regarding the pre-initiates and novitiates for public harangues and left direct intervention in their affairs to their mentors, who did so with ample measures of fraternalism and indulgence.

The hunt on the fifth day again started after a humored debate about who would represent each patrilineal moiety as runner. After one moiety was unable to produce a mentor to face-off against the challenging moiety's representative, they were ridiculed for being cowardly. "Your hearts are pounding with fear. You're too intimidated to compete!" one man accused, provoking a round of friendly laughter. Thus prompted to resolve the impasse quickly, two men from an elderly age set stepped forward to assume the task of running and igniting the fire for their respective moieties. Today, rather than follow hunters into the center of the burn area, I went on motorcycle to the designated finishing point in order to observe the final stretch of the footrace.

Upon our arrival, my companion noticed sign of white-lipped peccary in a nearby waterway. Perceiving it to be a large band of perhaps more than a hundred animals, he took several shots, killing three. In an attempt to isolate the rest until other hunters could lend assistance, he ignited the surrounding grasslands before climbing a tree and calling for help. The Xavante have a highly specific series of hunting calls used to communicate over large distances information about game taxa and movement. The call he now used informed hunters about 4 km away that he had found white-lipped peccary and needed help pursuing them. Unfortunately, the 15 responding hunters delayed considerably in arriving. To their dismay, the complex terrain of grasslands punctuated by innumerable *ipucas* and patches of forest had permitted the peccaries ample cover beyond the fire. They were long gone by the time these hunters arrived.

The men who remained within the original fire perimeter had similarly poor success. Regrouping at the truck later in the afternoon, a small group of novitiate men arrived carrying the only large game animals killed that day: one giant anteater and three white-lipped peccaries. Back in camp after dark, Barbosa delivered another speech, this time directed to the novitiate men. Beginning with a discussion of the inappropriateness of continuing to call one another by their informal nicknames (such as "beast," "goofy," and "skinny"), his central message was about the importance of treating others with greater respect as they neared mature adulthood.

The following day's hunt was the only one of the trip that did not involve burning. Arriving in the morning at the prearranged starting point, several hunters noticed signs of another band of white-lipped peccary. Like the terrain at the previous day's hunt, this location also featured inundated forests. However, in this case, they were not *ipucas*, but rather an extensive network of interconnected forests giving rise to the intermittent headwaters of a small river. With the peccaries deep inside this dense vegetation, burning could not be used to extract them this early in the season. Instead, some men spread out along the forest margins before others attempted to drive the animals towards them with noise. I heard hunting calls and shots periodically throughout the day. However, the large size and irregular shape of the forest made this a difficult task and the total yield was less than hoped. Seven white-lipped peccaries, one red brocket deer, and two red-footed tortoises were killed by mature men and carried back by several men with the assistance of the day's three accompanying pre-initiates and five novitiates.

A Day in Camp and Return to the Village

On the morning of the seventh day, I stayed in camp to observe how pre-initiates and novitiates spent their days when they chose not to accompany hunters. Soon after the truck left, the contingent of novitiates left on foot to fish in a stream several kilometers away and rehearse their song performance. With no novitiate or mature adults left to monitor their behavior, the pre-initiates immediately began speaking with me. Before this moment, they had avoided directly addressing me in deference to elders' desire that our age sets, which belong to rival age set moieties, maintain a respectful distance between them (Welch 2010). However, now alone in camp, they eagerly engaged me with nonstop questions and efforts to draw me into their unruly games. As soon as the novitiates returned several hours later, the boys quieted down and returned to their chores.

Although there was no sharp division of work between them, pre-initiates often cooked while novitiates collected firewood and helped butcher game at the end of the day (Figure 4). Tending the roasting fires required near constant attention. To preserve well, I was told, each piece of meat required constant heat and smoke over a period of two to three days. Only when it was uniformly black on the exterior and thoroughly dry inside could it be removed from the fire and stored in baskets away from the heat. The boys and young men also periodically cooked rice and prepared coffee in pots supported on wooden spikes over small fires, on the ground over narrow excavated trough fires, or on stoves fashioned from hollowed termite mounds. In conversations with several novitiate men, I heard many complaints about the difficulty of their experience during the hunting expedition. As many explained, they felt burdened by expectations that they constantly collect firewood, butcher meat, tend the roasting fires, as well as accompany the older adults hunting, and practice their song repertoire.

The hunters returned around 5 p.m. with three giant anteaters, two pampas deer, and 28 red-footed tortoises. This abundance of tortoises pleased everyone except, perhaps, the mentors. Since they were not animals appropriate for the



Figure 4. Novitiate burns fur off giant anteater (*Myrmecophaga tridactyla* L.) in preparation for butchering into primary cuts (Photo by Hise, 2010).

mentors to take back to their families as ceremonial gifts, they could be eaten immediately by everyone present and the leftovers taken back to the village by novitiates and elders. During the excitement of cooking and eating these animals, a pickup truck arrived with the somber news that an elder who was in the hospital at the time of our departure had just died. The eldest men huddled for some time in conversation about this event before several made speeches advising the group that they were calling a halt to the trip so family members could grieve with the body and prepare for the funeral. As they explained, many of the trip's hunts had been underproductive but there was now sufficient meat to please mentors' parents-in-law.

We packed up around 9 p.m. and travelled by truck to a hidden location about 8 km from the village. At about 2:30 a.m., after the mentors had painted their bodies with red and black paint and adorned themselves with cotton neckties and other ceremonial accoutrements, we travelled on foot to the river separating us from the village. The entire hunting party, still loaded with baskets of meat and personal belongings, silently crossed the river on a fallen log and crept up towards the village, finally hiding under the cover of shrubs just behind the nearest houses. The mentors poised to storm the village center as women and children were beginning their daily chores. At the first signs of light on the horizon, the mentors broke from cover with piercing screams and dashed the 100 m stretch to the plaza center. The rest of us then emerged from hiding and crisscrossed the village to our respective houses, thus concluding the ceremonial hunt. Later that day, mentors' and novitiates' mothers-in-law and mothers

reapportioned the baskets of gift meat as they saw fit, often giving pieces to relatives or neighbors.

Contemporary Transmission of Hunting Fire Knowledge

The second and third hunting expeditions associated with this initiation cycle occurred at the peak of the dry season, August 2006, and incorporated young people in somewhat different roles. These, along with another six group hunts undertaken in conjunction with marriage ceremonies from August to October, 2005, and ongoing research since that time, provided me with comparative observations regarding youth involvement through time and the use of fire at different times of year and in taller forms of vegetation, including scrubby cerrados and dry upland forests. Whereas all but a few pre-initiates remained in camp during the 2005 trek, as their promotion to novitiate adulthood neared they voluntarily participated in greater numbers and some began carrying clubs and helping with game transport and butchering. Novitiate men also began attending group hunts more frequently and in greater numbers and some began carrying firearms as they increasingly became familiar with the landscape and acquired hunting skills. After their promotion to mature adulthood and mentorship of their own pre-initiates in 2006, I documented their first big game animal kills. These observations track with the progression during the ceremonial hunt in 2005 whereby pre-initiates, novitiates, and mentors, respectively, assumed increasing levels of engagement with the act of hunting.

In the remainder of this section, I briefly review selected elements of Xavante ecological knowledge associated with hunting with fire before reviewing how it is learned and reproduced by younger hunters. Finally, I conclude with remarks about the importance of ceremony as a motivator of hunting knowledge acquisition among contemporary youth.

The Xavante burning calendar unfolds through evaluation and interpretation by experienced hunters of numerous dynamic factors. A basic distinction exists between open grasslands, which are burned in the early dry season (May and June), and scrubby cerrados and dry upland forests, which are burned later in the season (July to October). Late season burning is quite different from the early season hunts described above. The vegetation and atmosphere are considerably dryer beginning in July and winds have the potential to quickly drive hot fires over long distances. For this reason, considerable attention is required to prevent their escape and mitigate danger to hunters. Several hunting fires in July 2005 continued burning from one day to the next. When they did, elders discussed with younger hunters what should have been done differently. Escaped late season fires are not unique to the Xavante. Cerrado fires lit by local non-Indigenous ranchers also contribute to the sometimes considerable accumulation of atmospheric smoke in the region in the late dry season months.

This annual cycle occurs within even longer temporal patterns, whereby burn timing is programmed over periods of several years according to each location's unique recovery time and the community's ceremonial needs for meat. As other researchers have reported (Melo and Saito 2013) and my data corroborate, experienced Xavante hunters report that *murundu* grasslands may

be burned about every year or two, while taller forms of vegetation require from two to four years to recuperate. They consider inadequate burning intervals to result in ineffective fires that die out too quickly and excessive intervals to cause destructive fires. Optimal burn frequencies result in effective hunts and controlled fires that do not kill shrubs and trees and are quickly followed by lush vegetative regrowth.

Maybury-Lewis (1967) reported that in the 1950s the same Xavante community used fire for the aesthetic purpose of clearing dense scrublands. I did not find evidence of this practice in the last decade even though my consultants recognized that fire can have the effect of opening dense vegetation and thereby render it more accessible. I did, however, find that hunters “clean” the forest with fire in a somewhat different sense. As one man explained, contemporary hunters “leave areas unburnt for several years until they get ‘dirty’ in order to permit their recuperation and allow game animals time to reproduce and grow.” Afterwards, they should be burned to clear accumulated fuel, facilitate the germination of fire-dependent plants, and stimulate reinvigorated vegetative growth. In his opinion, planned burn rotation is a recent practice, the result of a new environmental awareness that emerged through advocacy by several Xavante men who attended school in Southern Brazilian cities and developed partnerships with researchers and environmental nonprofit organizations (Briani and Palma 2004; Leeuwenberg and Robinson 2000; Leite 2007; Prada and Marinho-Filho 2004; Villalobos 2002; Welch et al. 2013a). He considered their effort important given their now limited access to territory and landscape resources, but challenging due to non-adherence by some elders. As he elaborated,

When the elders were young hunters they could and did burn anywhere they pleased. If a particular location was overgrown [‘dirty’], they had no need to clear it with fire because they could simply hunt elsewhere. Today some younger people have a different understanding and recognize the need to manage fires to protect the community’s resources for the future.

This example illustrates that among the Xavante culturally informed ecological knowledge about hunting with fire in the cerrado is not static. The discourse I observed regarding effective and responsible ways to burn was produced by younger hunters in dialog with their elders. In the same manner, members of the pre-initiate, novitiate, and mentoring age sets gradually came to participate in and thereby contribute to group discussions about how to hunt with fire. Thus, the Xavante cultural knowledge about hunting and fire ecology described above is continually constructed and reproduced by younger hunters in dialog with elders and informed by scientific discourse (Berkes 2009).

The seemingly contradictory assertions I had heard from elders that pre-initiates and novitiates should simultaneously pursue hunting experience and remain in camp tending roasting fires during hunting treks, along with my observations that these youth gradually assumed more diverse and direct hunting responsibilities over the course of the next year and with their passage to mature adulthood, suggests an ideology of restrained but self-directed youth

education. Elder Xavante hunters, recognizing that young people progress according to their own interests and capacities, wished for them to acquire preliminary experience before assuming more consequential and dangerous roles. They accomplished this by providing opportunities for youth to observe and assist experienced hunters, occasionally haranguing them about expected behaviors, and otherwise interfering minimally in mentors' more indulgent methods of encouraging age appropriate youth engagement. Ceremonial hunts, including the trek described in this article, explicitly provided youth with access to educational opportunities, including exposure to the cerrado landscape, collaborative hunting techniques, burning practices, and associated ceremonial activities.

As has been observed in other Indigenous societies in Amazonia and elsewhere (Blurton Jones and Marlowe 2002; Bock 2002; Gurven et al. 2006; MacDonald 2007; Walker et al. 2002), this learning process continues well into adulthood as Xavante men of diverse ages actively participate in group hunts cooperatively and in dialog with their elders. However, among the Xavante, the assumption of hunting responsibilities also occurs in conjunction with explicit constraints. As has been described for other Indigenous Amazonian societies (Cohn 2002; Schaden 1945; Tassinari 2007; Zoia and Peripolli 2010), young Xavante boys observe men and freely reproduce adult hunting themes through unconstrained play behavior (Carrara 2002; Lopes da Silva 2002; Nunes 2002). As they grow older, pre-initiates, novitiates, and mentors continue to be subjects of their own education, which largely occurs through observation and imitation, but with clear limits established through their mentor's encouragement and elders' harangues. As illustrated in the preceding narrative of the 2005 hunting trek, pre-initiates and novitiates were expected to remain in camp more often, avoid carrying weapons, assume supportive roles such as carrying older men's game, as well as listen but not speak when older men planned hunts and told stories. Mentors were expected to hunt autonomously, but only in consultation with more experienced hunters. This pattern of social controls on youth hunting education rooted in formal age hierarchies differs from some other Indigenous Amazonian societies in which children and young men have similar freedom to observe and imitate older hunters without explicit restraints (Mistry et al. 2005; Peters 1998).

Conclusion

Although some scholars of Xavante hunting practices have reported that game populations in the Pimentel Barbosa Indigenous Reserve declined and some reached critically low numbers (Leeuwenberg and Robinson 2000; Melo and Saito 2011), my interlocutors asserted that this trend had reversed in recent decades. According to elders, game has never been more abundant within the reserve than it is today. Some younger men attributed this perceived increase in local populations to a gradual decrease in hunting among members of younger generations, as well as the possible refuge effect of agribusiness deforestation around the reserve, which simultaneously underwent vegetation recovery (Welch et al. 2013a).

This decrease in hunting participation and concomitant delayed acquisition of hunting skills as compared to older men at similar stages in their lives does not signal loss of cultural values. Young men continue to concern themselves with providing for their families, but increasingly look to do so through agricultural production or by pursuing formal education and paid employment rather than by hunting. With many youth choosing to hunt less often, some men fear associated traditional knowledge will be lost and the practice discontinued in future generations. This concern is especially acute with regard to group hunting with fire, which involves a particularly specialized set of shared cultural knowledge, cannot be learned individually, and embodies Xavante cultural identity and social values through its link to ceremonial life.

Given these circumstances, mature hunters actively use contrasting strategies in line with traditionalist cultural values to encourage age appropriate hunting participation and knowledge acquisition and thereby mitigate emergent youth perspectives that often devalue the relevance of hunting. These men assert that the traditional mentorship cycle intrinsically perpetuates the most highly valued aspects of Xavante culture and social life, providing the necessary tools for youth to pursue hunting knowledge when they are ready, even if relatively later in life. Relevant to their positive evaluation of this learning process is the role of ceremony as a motivator of traditional subsistence and ecological knowledge acquisition among youth.

Youth, including mentors, novitiates, and pre-initiates, consistently attended group hunts with ceremonial objectives, such as acquiring meat to give as presents in conjunction with initiation rites and marriage ceremonies, more frequently and in greater numbers than those held purely to obtain meat for household consumption. Also, group hunts involving burning, which are ceremonial events unto themselves, were better attended than those undertaken without fire. Attendance by young people was least frequent during informal individual and small group hunts. This pattern suggests that contemporary young people's interest in hunting derives more from its role in realizing socially important events (Welch 2014) than as a subsistence activity. Youth enthusiasm for festive ceremonial occasions marking some of life's most important moments consequently motivates their voluntarily participation in ritual group hunts, especially those involving burning, making these especially valuable opportunities for them to learn and coproduce this highly complex set of cultural knowledge and skills.

Notes

¹ The Pimentel Barbosa Indigenous Reserve, where the trek described in this paper took place, has 328,966 ha. Hunters from Pimentel Barbosa also hunt in the Wedezé Indigenous Reserve, with 145,881 ha, but do not use fire there in order to avoid conflicts with co-occupant ranchers (Welch et al. 2013b).

² Exogamous patrilineal moieties help define Xavante consanguinity and have distinct symbolic and ceremonial associations but do not usually operate as corporate groups. They are unrelated to age set moieties, which do act as cohesive groups with explicit society-wide roles in the transmission of cultural knowledge between generations.

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