

CONSIDERING THE LIVES OF HUMANS (*HOMO SAPIENS*), JAGUARS  
(*PANTHERA ONCA*), AND PUMAS (*PUMA CONCOLOR*) IN THE NATION OF  
NATURE: MEASURING THE CAPACITY FOR COEXISTENCE WITH LARGE  
PREDATORS IN THE MESOAMERICAN BIOLOGICAL CORRIDOR

By

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## ABSTRACT

# CONSIDERING THE LIVES OF HUMANS (*HOMO SAPIENS*), JAGUARS (*PANTHERA ONCA*), AND PUMAS (*PUMA CONCOLOR*) IN THE NATION OF NATURE: MEASURING THE CAPACITY FOR COEXISTENCE WITH LARGE PREDATORS IN THE MESOAMERICAN BIOLOGICAL CORRIDOR

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One of the greatest threats to jaguars (*Panthera onca*), the largest predator in Latin America, is hunting. In an effort to understand conflict between humans and jaguars some conservation biologists, who lack training in the social sciences, have assessed human perceptions and attitudes of jaguars. Conclusions have resulted in a call for sociocultural and social psychological research. My dissertation is a response to this plea. To investigate the capacity for humans to coexist with jaguars and pumas (*Puma concolor*) I assessed sociocultural meanings embedded in conflict, explored the ability of a rancher outreach program to reduce conflict, and synthesized environmental and wildlife discourses on cognitive constructs in understanding human behavior toward wild animals. Results from over one year of participant observation and 131 interviews of Ticos and Cabécar indigenous in the Mesoamerican Biological Corridor (MBC) of Costa Rica reveal both direct encounters and traditions embedded in culture have an impact on human conflict with large felines. Furthermore, programs aiming to reduce conflict between humans and large felines need to consider that coexistence is both culturally sensitive and based on geographical proximity. Ultimately, this study offers insight into how indigenous peoples interweave both traditional and modernized meanings of large predators—perspectives that have important implications for conservation and coexistence. Despite positive initiatives toward coexistence in this part of the MBC, they are still in their infancy and face tensions against a prominent hunting culture. My findings offer recommendations for future

research surrounding human conflict and coexistence with large predators that will inform practical solutions and outreach interventions. Given this study is one of the first conducted by a social scientist on human jaguar relations it is important for both feline conservation efforts and for understanding human predator coexistence within biological corridors globally.

I dedicate this dissertation study to all wild animals because they deserve to live, but have no voice. I dedicate this to felines especially because of the profound prejudice that plagues them. I dedicate this to my feline companions for teaching me how to understand and love them. And I dedicate this to my husband Steve who believed in me and this work.

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## **Introduction**

Jaguars are a keystone predator and vital for maintaining ecosystem balance (Terborgh 1992). To date protected areas (PAs) have been a commonly used strategy for conservation, but are not enough to conserve jaguars given these felines move beyond PAs for food, space and to breed. Scholars are endorsing biological or wildlife corridors (Donaldson & Kymlicka 2011; Sillero-Zubiri, Sukumar & Treves 2007; Woodroffe, Simon & Rabinowitz 2005) and its enhanced counterpart rewilding (Fraser 2009), including not only corridors, but also core protected areas and the carnivores within these ecosystems (Fraser 2009; Solzenburg 2008). NGO's, such as Panthera are working to link jaguar populations from northern Argentina up to Mexico across both private and public land ([www.panthera.org](http://www.panthera.org)).

Hunting poses a problem for biological corridors and is one of the greatest threats to jaguars and pumas throughout their range. Hunting of jaguars occurs as a matter of social tradition (Adams 2012; Marchini & Macdonald 2012), because of the marketability of their paws, teeth, and other derivatives from their bodies (Caso, Lopez-Gonzalez, Payan, Eizirik, de Oliveira, Leite-Pitman, Kelly, & Valderrama 2008), and for traditional uses (González-Maya, Zarrate-Charry, Hernández-Arévalo, Cepeda, Balaguera-Reina, Castaño-Urbe, & Ange 2010). Motivations also include negative human perceptions rooted in competition (Carvalho and Pezzuti 2010; Saunders 1998), fear (Campbell and Alvarado 2011), feelings of jaguars as a threat to livelihoods (Zimmermann, Walpole, and Leader-Williams 2005) and human life (Zimmermann et al. 2005; Marchini & Macdonald 2012; Adams 2012; Saunders 1998). A lack of knowledge of jaguars, pumas and their role in the ecosystem also motivates hunting and killing (Conforti and Azevedo 2003) because people do not think large felines have a purpose.

Clearly the hunting and killing of jaguars and pumas has motivations ranging from cultural to economic. These motivations demand solutions to reduce conflict and create human coexistence with large felines to be multifaceted. Structural changes fostering education, sustainable development, and tourism (Inskip and Zimmermann 2009, 26) are vital for minimizing conflict and promoting large feline conservation and coexistence, but take time to implement. Directly a plethora of management strategies are used to reduce human-feline conflict, but few peer-reviewed studies of jaguars and pumas actually report on programs that use these approaches. In one study conducted in a biological corridor of Sonora, Mexico researchers reported the benefits of a program where hunters participated in deer trophy expeditions generating funds to compensate livestock predation by jaguars. While the study described the program it failed to highlight any barriers or suggest any improvements (Rosas-Rosas and Valdez 2010). In Costa Rica, only one study investigated conflict reduction strategies and found 32% of ranchers had implemented preventative measures (such as electric fences and livestock guarding) to avoid predation on livestock, but again these researchers did not list or present assessments of successes and failures of such methods (Amit, Rojas, Alfaro, and Carrillo 2009).

Not only is there a lack of research on programs aiming to reduce jaguar and puma livestock predation in Costa Rica—one of the primary motivations for hunting and killing large felines, but very few studies investigate sociocultural, cognitive and behavioral understandings of humans toward large felines. Of the few studies targeting human dimensions in Costa Rica, beliefs, attitudes and hunting behaviors toward jaguars and pumas have been examined. In one peer reviewed study regarding jaguar and puma attacks in the northern part of Costa Rica researchers found ranchers overestimated their livestock loss from feline predation. The

researchers stated this misconception among ranchers “probably” resulted in negative perceptions toward large felines (Amit, Gordillo-Chávez, and Bone 2013). In the grey literature a study was done by Corrales-Gutiérrez, Carazo-Slazar and Salom-Pérez (2011) in the San Juan-La Selva biological corridor in Costa Rica. The research team found just over half their sample held a positive attitude toward jaguars, but negative attitudes toward conservation efforts.<sup>1</sup> However, the researchers questioned the validity of the “positive attitudes” claiming it may have been the residents telling the interviewers what they wanted to hear. Finally, in the SBBD of Costa Rica, SINAC (Costa Rica’s governmental unit that oversees the country’s system of protected areas), conducted a study and reported that hunting was the primary threat to wildlife. Furthermore, their interviews revealed some residents admitted that they have killed or intended to kill jaguars and pumas after suffering the loss of a domestic animal. SINAC acknowledged the serious threat this has on the success of the biological corridor and the survival of jaguars and pumas traveling within the SBBD.

As illustrated above, to the best of my knowledge, only one peer reviewed study has been conducted on feline predation of livestock in Costa Rica. The paucity of knowledge surrounding not only jaguar and puma attacks on livestock, but human relations with large carnivores in Latin America positions Costa Rica as an appealing country to conduct research regarding human predator conflict and coexistence for two interconnected reasons. Tourism is the second largest industry in Costa Rica and is touted as one of the top destinations for ecotourism, symbolic of an economy that values wildlife including large predators. Moreover this economic position situates the country with the potential to reduce conflict and foster coexistence with large bodied felines. Finally, Costa Rica is also unique in that it has the most advanced wildlife policies on the continent. For example, in 2012 they passed a law that bans sport hunting.

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<sup>1</sup> Motivated by misconceptions from el Refugio Nacional de Vida Silvestre Mixto Maquenque

## Dissertation Outline

In this dissertation I examine human relations between jaguars and pumas in Barbilla Destierro Biological Sub Corridor (SBBD), part of the Mesoamerican Biological Corridor (MBC) of Costa Rica. This is done through three article-length chapters designed for publication in scholarly journals. Chapters one and two use data from 131 interviews with Costa Rican and Cabécar indigenous and participant observation at ecotourism establishments, private reserves, regular attendance at two monthly corridor meetings, and of *Panthera*'s rancher outreach program.

The first chapter, "The Conflict and Killing of Predators: A Socio-Cultural Perspective on the Capacity for Coexistence between Humans, Jaguars and Pumas in Part of the Mesoamerican Biological Corridor of Costa Rica," provides a foundation for how jaguars and pumas have been constructed in the SBBD. As discussed above, there is a paucity of social science research assessing human conflict with jaguars and pumas making this a ripe area for exploration. I build on the work of Adams (2012) and Saunders (1998), two scholars who have documented historical representations of felines, to explore current sociocultural constructions of conflict with jaguars and pumas. In this chapter I ask, *what are the socio-cultural meanings and constructs of conflict with jaguars and pumas in Barbilla Destierro Biological Sub Corridor (SBBD), part of the Mesoamerican Biological Corridor (MBC) of Costa Rica?*

In order for humans to coexist with jaguars and pumas in biological corridors programs aiming to minimize conflict are necessary. Bearing in mind that a program's existence does not alone reduce conflict chapter two, "Fostering Co-existence with Jaguars and Pumas through a Rancher Outreach Program in Costa Rica," describes not only the rancher program and its barriers, but also the conflict situation in the SBBD. Moreover, *I explored Panthera's rancher*

*outreach program's ability to reduce conflict and foster coexistence between ranchers, jaguars and pumas in the Barbilla Destierro Biological Sub Corridor (SBBD) of Costa Rica. I describe the functionality of this program and its impact on its participants, including barriers that exist. Within this aim I explore and describe perceived predation attacks and willingness of SBBD residents to coexist with jaguars and pumas. Only one other peer-reviewed study exploring a rancher program in Mexico exists (Rosas-Rosas and Valdez 2010), but the program's barriers and the conflict situation were not described.*

Solving conflict and creating successful conservation programs between humans and carnivores requires an understanding of human cognition (Zimmerman et al. 2010). Because the cognitive discourse surrounding human behaviors toward wildlife lacks in: cross-citation, reconciliation of definitions of concepts, and efforts to build and test integrated models with the cognitive discourse on environmental behaviors chapter three, "Understanding Cognition behind Behavior toward Wildlife," is an effort to bridge these discourses. Moreover, I synthesize the body of knowledge on the cognition behind behavior toward wildlife as a first step prior to designing a study to understand human cognition toward large predators such as jaguars. The key questions are: *How does the cognitive literature from environmental sociology and environmental and conservation psychology parallel and diverge from the cognitive constructs discussed in the literature on human dimensions of wildlife? And what other cognitive variables are used to understand human behavior toward wildlife?* I draw on data from chapters one and two in order to illustrate how ascription of responsibility and behavioral intentions toward jaguars and pumas in the SBBD are used in wildlife studies while highlighting the importance of these variables in informing practical solutions and outreach interventions.

**Chapter 1: The Conflict and Killing of Predators:  
A Socio-Cultural Perspective on the Capacity for Coexistence between Humans,  
Jaguars and Pumas in Part of the Mesoamerican Biological Corridor of Costa Rica**

**Abstract**

The sociocultural meaning embedded in human predator conflict is not well understood nor generally discussed in the literature on human conflict with jaguars and pumas. This chapter presents data regarding the cultural construction of jaguars and pumas in Barbilla Destierro Biological Sub Corridor (SBBD) part of the Mesoamerican Biological Corridor (MBC) of Costa Rica. Based on results from participant observation and 131 interviews of men and women living or owning property in part of the MBC, I analyze the multiple meanings of conflict with large cryptic carnivores. My findings reveal Ticos have a higher level of coexistence with large felines in comparison to Cabécar indigenous, but this could be the result of felines as imaginary to most Ticos. Moreover, my findings suggest there is a potential for an increase in conflict among Ticos when jaguars, pumas and their prey repopulate. Although variations exist for both the indigenous Cabécar population and Ticos, jaguars and pumas are at once man-eaters and competitors who threaten human food sources. In comparison to Ticos, Cabécar construct felines as food and have more conflict with large felines. This is most likely due to the fact that Cabécar live off the land and have more frequent encounters with felines than Ticos. Inclusion of indigenous peoples in remote regions, questions surrounding their diet, and utilizing indigenous traditions are vital to future conservation studies of large predators. Ultimately, this study offers insight into how indigenous relationships reflect both traditional and modernized meanings of large predators, perspectives that have important implications for conservation and coexistence. While efforts toward coexistence are underway in the SBBD, they are still in their infancy and still embedded in a hunting culture.

## Introduction

Humans have a unique relationship with large predators. Large carnivores have been constructed as attractions for wildlife viewing, emblems of conservation, objects of sporting activities, and as competitors for prey animals and livestock (Dunlap, 1988; Sillero-Zubiri, Sukumar, & Treves, 2007; An Smets & van den Abeelein, 2007; Hughes, 2007; Saunders, 1998). And yet, such animals can decenter humanity. As Shepard (1996, p. 330) contends, living with “large dangerous animals remind[s] us that we are small in the order of things.” These sociocultural meanings are diverse and challenge efforts toward conservation and coexistence.

Felines are present in most human-inhabited regions in the world, and historically they have both competed with (e.g. all jaguars hunt animals which are potential human prey) and preyed upon humans (Saunders, 1998). In his study of feline symbolism of Amerindian societies, anthropologist Nicholas Saunders has identified jaguars as agents, human competitors, and human threats. As agents, he writes, jaguars “constitute that part of the environment which is *in constant flux* and which possesses *activity-generating relationships of predation, avoidance, or symbiosis* with each other...*These relationships are seen through the lens of culture*” (my emphasis added). This means, as Saunders claims, that jaguar symbolism can be distinguished from real jaguars who produce “autonomous movement...which, in turn, begets distinctive reactions by humans” (Saunders 1998, p. 13). A view of jaguars as competitors and equally as threats is based on their predatory behavior. Saunders (1998:22) specifies,

The jaguar’s distinctive predatory qualities are shared, in part, by humans, who also have no consistent animal predators, and who hunt, kill, and eat all manner of other animals, including, on occasion, each other. The cluster of behavioral traits which jaguars and humans share, and which, to a degree, make them co-equivalent competitors, presents itself as one possible reason why adult human males (that is, hunters/warriors), are regarded as equivalent to adult jaguars.

Evidence that Amerindians saw jaguars as near equals is reflected in images of jaguar like creatures and humans with jaguar attributes and adornments (Benson, 1998, p. 17).

Pointing to further interspecies connections, Shepard (1996, p. 11) notes humans participated “by eating and being eaten by them, suffering them as parasites, wearing their feathers and skins, making tools of their bones and antlers, and communicating their significance by dancing, sculpting, performing, imaging, narrating, and thinking them.” As these cultural practices and artifacts make clear, human culture has been shaped by wild animals.

Similar to Shepard (1996) and Mason (2007) who acknowledge human thought developed alongside wild animals, Saunders (1998) professes felines challenged our abilities. He explains, “The origins and development of hominid cognitive processes may have been influenced by their inescapable interaction with predators which, by comparison, were stronger, faster, more agile, and equipped with deadly natural weaponry” (p. 1). This development bears on situations of killing today, as historical meanings blend with current knowledge and understandings.

I explored the sociocultural meanings of conflict with jaguars (*Panthera onca*) and pumas (*Puma concolor*) in the geographical space of a biological corridor in Costa Rica. The Barbilla Destierro Biological Sub Corridor (SBBD) in Costa Rica is made up of 37,589 hectares of land and is critical for the connectivity of the larger Mesoamerican Biological Corridor (MBC) between Nicaragua to the north and Panama to the south. The SBBD is inhabited by 8,000 people who live in 26 small settlements (Rojas & Chavarría 2005). The primary livelihood activities are livestock and agriculture (González & Poltronieri 2002). Other land uses include: Barbilla National Park (part of La Amistad Biosphere Reserve recognized by UNESCO); tourism; conservation and reforestation by means of Payment for Environmental Services



(PSAs); and the Pacuare, Reventazón and Siquirres rivers, which hold importance as water sources, tourist activities, and production of hydroelectric power.

The corridor is also home to the Cabécar, who live in Nairi Awari, Chirripó, and Bajo Chirripó indigenous reservations. These indigenous communities have a strong dependency on government subsidies (Rojas and Chavarría 2005) and are relatively isolated with little access to the outside market and little or no access to basic services such as telephones, electricity, water and public transport (Gonzalez and Poltronieri 2002). Living on subsistence agriculture, many families breed cows, pigs, horses and chickens (Gonzalez and Poltronieri 2002). While the majority of the land in these reserves is under PSA program (Rojas & Chavarría 2005), Costa Rica's System of Protected Areas (SINAC) identified the following threats: illegal cutting of trees, hunting, and extensive agriculture on the reserves.

In fact, within the SBB, SINAC reported hunting as the main threat to wildlife, both sport hunting with dogs and subsistence hunting. SINAC reported that some people in their 83 interviews admitted that they have killed or intended to kill jaguars and pumas after suffering the loss of an animal. SINAC acknowledges this poses a serious threat to the success of the biological corridor and the survival of jaguars and pumas traveling within the corridor.

Costa Rica is touted as one of the top destinations for ecotourism, an industry that values wildlife. In addition to Costa Rica's appeal as a site for a sociocultural study on large predators, there is a lack of social science research on jaguars and pumas, the two largest felines of the Americas. To date most work on jaguars has been done by conservation biologists with little or no social science training. Adams (2012) examines the narratives of nineteenth- and early-twentieth- century naturalists and hunters to document how the jaguar was encountered and represented, but to the best of my knowledge, there is no published study exploring the current

sociocultural constructions of conflict with jaguars and pumas throughout their range. To address this research gap, I ask, *what are the socio-cultural meanings and constructs of conflict with jaguars and pumas in Barbilla Destierro Biological Sub Corridor (SBBD), part of the Mesoamerican Biological Corridor (MBC) of Costa Rica?*

## **Methods**

I used participant observation and open-ended interviews in the Barbilla-Destierro Biological Sub Corridor (SBBD), a rural region and a vital sub corridor in connecting the larger Mesoamerican Biological Corridor (MBC) to explore my research question. Beginning August, 2013 I lived in Guayacan to access the east side of the sub corridor for five months and then Turrialba to access the west side of the corridor for nine months. Using my eight years of Spanish language skills I translated the interviews and corresponded with the people living and working in this sub corridor.

I separated my sample based on cultural distinctions between Ticos<sup>2</sup> and Cabécar indigenous. One male and one female local Tico and Tica research assistant conducted 86 interviews throughout the SBBD and one male local Cabécar research assistant traveled throughout the remote indigenous reserves to interview 37 Cabécar. I interviewed three North Americans, four Ticos<sup>3</sup> and my Cabécar research assistant.<sup>4</sup> My sample consists of 131 people, most of whom reside in, but some of whom own property or a tourism establishment in the SBBD, 38 Cabécar, 90 Ticos, and three North Americans (two Americans and one Canadian).

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<sup>2</sup> Both Ticos and Cabécar are Costa Rican citizens therefore to distinguish between these groups I use the term Tico which is informal for a Costa Rican—however—Cabécar are not referred to as Ticos—they are referred to as indigenous. Therefore this informal use of Tico fits well to create this cultural dichotomy. Throughout the chapter I use Ticos referring to the whole culture, Tico referring to males, and Tica referring to females in this culture.

<sup>3</sup> One in order to personally test my interview instrument and three who I knew well.

<sup>4</sup> Prior to him starting the work.

Interviews were conducted in 23 towns<sup>5</sup> and in 12 communities<sup>6</sup> within the Nairi Awari, Chirripó, and Bajo Chirripó indigenous reservations.

Of my North American sample, both Americans and the Canadian were male. Of my Tico sample, 28 were women and 62 were men. Female representation decreased in my Cabécar sample, where three participants were women and 35 were men. As part of Cabécar culture, felines are some of the wild animals about which Cabécar women are not able to speak about in public. Women are also not able to draw three cats (jaguars, pumas, and ocelots). This may be related to the Cabécar story where a jaguar is a lover of a young woman (see Stone 1961, pg. 129). However, Cabécar women over 75 years old are able, if they wish, to speak in public about these felines and therefore can participate in interviews. Of the three Cabécar women in my sample, two were over 75 years old: one was 90 and the other 86. The third was a 41 year old woman who did not follow the traditions or respect the cultural taboo of not discussing jaguars and pumas in public.

For 72% (94/131) of my sample, livelihoods primarily consisted of livestock and other agricultural production (e.g. cilantro). Other livelihoods included the following: three participants owned or administered a tourism establishment, one man owned a small convenience store but was previously a rancher, and one woman was an English teacher in the San Jose area. Fifty-eight percent (22/38) of my Cabécar sample did not have a livelihood outside of cultivating their own food (for some this included livestock animals), six were retired, and others worked in tourism, for the government, or as teachers and park rangers.

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<sup>5</sup> Including, but not limited to, Ojo de agua, Las Lomas, Guayacan, El Coco, Bajo del Tigre, Linda Vista, and Santa Marta.

<sup>6</sup> Including, but not limited to, Jameikari, Xinikicha, Muluibiri, Brisa, and Barbilla.

**Table 1: Demographic Characteristics**

<b>Sample</b>	<b>Size</b>	<b>Male</b>	<b>Female</b>	<b>Average Age</b>	<b>Ranchers/Agriculturalists</b>
Ticos	90	62	28	45	72
North Americans	3	3	0	52	0
Cabécar	38	35	3	46	22
<b>Total</b>	<b>131</b>	<b>100</b>	<b>31</b>		<b>94</b>

Interview questions are listed in appendix A. The interviews lasted on average between 20 and 40 minutes. Interviews started in Valle Escondido, Bajo del Tigre and Las Lomas, the home towns of the research assistants. From there the researchers conducted a snowball sample asking interviewees to recommend other ranchers and/or agriculturalists who would be willing to participate in the interviews. Participants voluntarily participated in the study without incentives. Most respondents were interviewed individually. I also collected a sample of ranchers (14) from Panthera's rancher outreach program.<sup>7</sup> IRB approval was obtained on October 31, 2013 #x13-1039e when the study was considered exempt. I did not keep record of the people who declined to be interviewed.

My participant observation consisted of multiple visits to seven ecotourism establishments and four private reserves in the SBBD; regular attendance at two monthly corridor meetings: one for the SBBD<sup>8</sup> group and the other for the larger corridor CBVCT<sup>9</sup> group

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<sup>7</sup> Since the program's inception they responded to 24 rancher attacks on livestock. I used this list of contacts for my 14 interviews. Of the 10 not interviewed, one was deceased, some declined, some directions to the ranchers' property were unclear and others were in remote areas not easily accessible.

<sup>8</sup> Subcorredor Biológico Barbilla-Destierro Paso del Jaguar

<sup>9</sup> Corredor Biológico Volcánica Central-Talamanca Consejo Local

(of which the SBBD is part of); and I accompanied Panthera in five of their seven rancher outreach program visits which lasted on average three days each time.<sup>10</sup>

Jaguars (*Panthera onca*) are the third largest feline in the world next to the Asiatic tiger and the African lion and the largest terrestrial carnivore of Latin American. The jaguar is spotted black or dark brown and yellow. There is also a melanistic form of jaguars which from afar may make them appear black, but in actuality these animals are spotted. Pumas (*Puma concolor*) are smaller than the jaguar and leaner in body mass. They are “café” in color (Marchini, Luciano, & Hoogesteijn 2010). In Costa Rica jaguars are also known as *tigre* or *pantera* and pumas as *león*. Jaguars are the largest and pumas the second largest feline in Costa Rica.

I measured human relations<sup>11</sup> with jaguars because they are a keystone species and, therefore, of critical importance for ecosystem balance. However, I documented and evaluated data related to pumas as well as jaguars for three reasons: 1) Research suggests people do not always know how to differentiate between felines; 2) My preliminary research suggested participants had encounters with pumas, and the perceptions and behaviors toward pumas were similar to those toward jaguars; 3) Panthera’s rancher outreach program includes the protection of both jaguars and pumas; and 4) Jaguars and pumas are the only large predators in Costa Rica able to take down a calf.

Conflict categories reflected the responses from the interview participants and themes that emerged during participant observation. These constructions of large felines represented the various meanings and motivations for killing that respondents attached to jaguars and pumas.

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<sup>10</sup> Between November 2013 and September 2014 I knew of two outreach visits that Panthera attended to without advising me—despite my repeated requests (two recorded and various verbal requests) to be included in all of the rancher relations for a one-year time period.

<sup>11</sup> Inclusive of coexistence and conflict

## Results and Discussion

Results from 131 interviews of men and women living the Barbilla-Destierro Biological Sub Corridor (SBBD) and over one year of participant observation at corridor meetings, visits to livestock ranches, ecotourism establishments and private reserves in the SBBD allowed the following themes of conflict and killing to emerge: felines surrounded by a hunting culture, felines as man-eaters, felines as competitors, felines as food, and felines as real and imagined.

**Table 2: Sociocultural Themes**

Theme	Ticos (n=90)	Cabécar (n=38)
Hunting Culture	56% <sup>12</sup>	84%
Man-eaters	37%	13%
Competitors	14%	55%
Food	1%	21%
Real and Imagined	33%	84%

*Hunting culture:* Eighty-four percent (32/38) of Cabécar respondents discussed hunting in some regard. This included hunting prey animals such as paca and peccary as well as jaguars, pumas, ocelots and other small felines. This high percentage among the indigenous is most likely a result of their subsistence way of life, as mentioned above livelihoods of just over half of my Cabécar sample consisted of cultivating their own food. Of the 16% (6/38) who did not discuss hunting in some capacity four were from Jameikari. Of these one a retired and one an active park ranger, another worked for the ministry of environment and energy (MINAE), and yet another worked for Pro-Panthera Barbilla. The fifth was from Brisa and he works with the

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<sup>12</sup> I included North Americans (n=3) here to equal n=93 because they were able to comment on their experiences with the Costa Rican hunting culture.

biological corridor and the sixth is a tour guide from Barbilla Tsiobata. The common thread among these six is their economic connection with conservation efforts.

Jameikari was the only Cabécar community that didn't appear to have a strong hunting culture. There were seven respondents from Jameikari and as indicated above four of them work or worked in conservation. I included three respondents from Jameikari in the hunting culture not because they revealed that they hunted, but they revealed there were still remnants of a hunting culture in Jameikari. Two respondents from Jameikari said, almost no one kills in their community/area and one 61 year old man from Jameikari said the young men kill felines. When asked if his neighbors kill them he didn't have any accounts he remembered, but he said it would be normal.

The competition category (see below) was included within the Cabécar hunting culture where participants had killed, would kill or knew someone who had killed a jaguar or puma themselves if he or she were preying on livestock or pets. In contrast to Ticos these were not stories or rumors,<sup>13</sup> but recent accounts. Of those participants who were able to provide an estimated date of the kill, the range was from three months to four years ago. Others disclosed that they killed these felines with frequency. One said, he kills a puma every six months, an elderly woman said she eats jaguar two times per year and they seek out the meat, although she doesn't do the killing. Yet another man said he kills a jaguar three times per year, but hasn't killed a puma for five years.

Of my Costa Rican (90) and North American (3) sample 56% (52/93) mentioned characteristics of a culture of hunting. This was measured through various hunting related questions (see questions two, three, seven, eight, nine and ten in appendix I). It included the data

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<sup>13</sup> Rumors are defined as statements of having heard a puma or jaguar was killed in the area, but having no further information regarding the event. They were vague.

from the competition category where participants had killed, would kill or knew someone who had killed a jaguar or puma themselves if preying on livestock or pets. It also contained 2% (2/93) of respondents who said if jaguars and pumas were in the area they should be moved to a location without humans because of the likelihood someone would kill him or her. Seventeen percent (15/90) of respondents reported old stories<sup>14</sup> of hunting and killing jaguars and pumas. Some stories were vague, including comments such as “before when I was young, yes there were many [jaguars and pumas killed here].” Other stories were vividly remembered, as the following account told by one 63 year old rancher shows:

Many years ago here in my ranch they killed a jaguar because Pa thought it would eat the livestock. It came to the neighbor's calves during the night after passing through our ranch. My Pa and the neighbor shot and killed it. That was like the year 1965 I was still young. I remember that my mother was scared because we always left lunch for the ranch hands' almost in the exact same place where they killed the jaguar. Now that area is pasture but back when they killed the jaguar it was forest.

Of the 15 stories of hunting jaguars or pumas in the SBBD, only two of these participants also had recent accounts of killing or knowing someone who killed a jaguar or puma. In other words, of those who told stories of past jaguar and puma killings, most no longer participated in the hunting culture. When a 28 year old female from Bajo del Tigre was asked if her neighbors kill jaguars and pumas she says, “Perhaps the older men of the town yes, but now I don't believe they do because it is difficult to find those animals.” A 68 year old rancher from Lomas explained he knows a jaguar was killed around 40 years ago in Lomas. The animal was killed because the people thought he or she was dangerous for the locals, although he didn't remember who killed the jaguar.

Hunting for sport is illegal in Costa Rica. In 1992, the government passed a law criminalizing killing wild animals in danger of extinction, while in 2013 a hunting ban set a

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<sup>14</sup> Stories are defined as accounts that were more than 10 years old and included someone other than the respondent who had done the killing.



\$3,000 fine for sport hunters. Such policies have deterred hunting. According to 39 year old American researcher, hunting has slowed down during his 11 year residency in the SBBD. The last time hunters were on his property, he recalls, he approached them with two Ticos and explained hunting is not permitted on his land. He says, “See we have signs that say hunting is prohibited.”

The enjoyment of and love for the hunt was a common theme expressed by non-hunters who explained this tradition. Two park rangers said, hunters kill whatever they see—they do not hunt anything special. There are many hunters here and “they hunt very very little for food.” One of the park rangers kept repeating, “It’s a lie that they say they are hunting for food—it is for sport and tradition.” Another owner of a tourist establishment claims, “It is not an economic issue it is an educational issue they don't need better jobs, they are killing animals because they love to do it.” According to one employee of tourism, who is also a rancher, his neighbor is a hunter and has hunting dogs and this hunter thinks it is an art, a tradition to hunt, having collected 260 skulls of peccary, jaguar prey, over the years. “Hunters in the area do it for fun, for tradition,” this employee/rancher says. My findings reveal tradition motivated the culture of hunting.

Discussions of hunting as well as the traditions and enjoyment experienced in this culture emerged during corridor meetings as well. One corridor member explained that hunting now is done for sport and to uphold tradition and culture. Another member agreed, claiming, “The mentality is my grandfather and father did it back then because they needed money and meat, but now we do it to keep tradition. Such a reasoning in this ecological sub corridor where ranching and agriculture are the primary livelihoods is reflected in Brazil where “jaguar hunting has been passed from generation to generation as an element of that culture...linked to the economic and

cultural cattle ranching of the region" (Marchini and Macdonald 2012, 219). This cultural tradition stays within a person for life as one corridor member from Guayacan expressed concern and disgust with the generational hunting tradition in her family. She explained that her cousin and uncle hunt and says, "My uncle is nasty. He is almost 70 years old and still hunting."

Some regions, Tres Equis (a town right outside the sub corridor) and Guayacan, were repeatedly depicted as embracing a hunting culture. However, such a culture was not restricted to the SBBD. For example, during one corridor meeting the topic of hunting emerged and many members agreed that hunters come from Siquirres, Turrialba and Cartago (nearby big cities) and with the help of locals hunt within the biological sub corridor. Yet another corridor member echoed this infiltration of city hunters when he said many hunters are entering the indigenous reserves with local friends in order to hunt. They find ingress through private ranches on the east side of the SBBD borders. This phenomenon is not unique to the SBBD, as one corridor member explained, there are many hunters that come in from Turrialba to Barre Pacuare on the Caribbean coast (in the Tortugero Biological Corridor) to hunt jaguars. Another allure of Barre Pacuare for hunters is that there are many jaguars on this coast and therefore easy targets.<sup>15</sup> Furthermore, the local people assist these hunters because they are concerned about the children.

One Turrialbanian member of the larger CBVCT corridor explained some people are traditional, using the forest (the wood, the timber, the wild game). Within some of these traditional people there is still *muchisimo*, where the men go out into nature for the entire weekend, live off the land, all to prove their masculinity. She says "they hunt and kill whatever they see." In fact she explained that her husband came from such a family in Tres Equis (one of

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<sup>15</sup> It is common to see jaguars on the beaches of the Northern Caribbean coast right now. There is a current phenomenon where jaguars are eating sea turtles on the northern coast, two protected species in Costa Rica (Veríssimo, Jones, Chaverri and Meyer 2012).

the communities known for embracing hunting) and when he was young they didn't want him to be feminine so his dad and his older brothers would take him out hunting on these primitive survival sojourns. She explained that her in-laws make jokes about her because she is a conservationist. Such a derogatory remark illustrates an ideological opposition—hunter versus conservationist in the Tico culture.

*Montainers* was commonly used in the interviews to describe these hunters and their traditions and is similar to Adams (2012) depiction of a campfire culture, where it is man against nature. Adams says jaguars were seen as competition to humans and especially men. This intersection of masculinity and rivalry was perpetuated in a hunting culture,

These jaguar hunting expeditions were not simply naked expressions of masculine bloodlust. They were also an opportunity for a team of men to 'take on' the wilderness. Camaraderie and brotherhood are shared in the difficulties and dangers of the trek, the mastery of the kill, and remembrances after the hunt has ended. Around the campfire, stories are woven and rewoven growing into legend. This was an opportunity for men to claim and enact rituals of the mythic frontier identity so cherished in America (p. 92-93).

Similarly, Marchini and Macdonald (2012: 219) found evidence of this hunting culture in their sample of ranchers in Brazil.

Ranchers and cowboys in the region often refer, with apparent pride, to the '*Pantaneiro* culture'....Stories of jaguar hunting spread quickly among the community, are told repeatedly, and are often remembered vividly as a consequence...A vicious circle may exist in which hunts are readily remembered and repeated, often reaching other landowners, and creating the perception that jaguar killing is common and acceptable, which in turn causes more jaguars to be killed.

Brotherhood, connection with the primal self, domination of nature, stories of the trek are all embedded in this hunting culture and override legal regulations about hunting. Similar to Brazil, in Venezuela sport hunting of jaguars is a common hobby despite the fact that jaguars have been a protected species under Venezuelan law since 1996. Although hunting is usually performed by specialized hunters almost any hunter who spots a jaguar will shoot it which is known as

opportunistic killing. Most sport hunting of jaguars is performed with dogs, which is seen as the most efficient method used (Jedrzejewski et al. 2011).

Unlike the *Pantaneiro* culture in Brazil and the jaguar hunting culture in Venezuela, the *mountainer* hunting culture in Costa Rica is not focused solely on jaguars, it is a “survive off the land as our ancestors have” tradition. Embedded in that, they hunt whatever they see. In that regard it is different from the Brazilian or Venezuelan jaguar hunting culture which clearly has a focus on this apex predator. The lack of feline focus in this *mountainer* hunting culture is corroborated by the relatively small percentage of my Costa Rican sample who admitted to killing or knowing someone who killed a jaguar or puma.

Cultural tradition is not the only motivation for hunting. Masculine identity was connected to killing, owning and selling the skin of felines. One rancher told the story of how he and a friend had killed a puma more than 15 years ago. The friend is called *the man of the forest*. The rancher said he kept the skin and his friend kept the bones and ate the liver. Eventually years later the rancher hired someone to make his furniture for his house in exchange for the puma skin, highlighting not only masculinity, but also the economic use of these skins in recent times. Yet another 56 year old rancher from a well-known family of hunters in Guayacan says, "Look girl you know that I am a hunter and that I live half the time in the mountain and I am sure that no one has killed a *tigre*. About 5 years ago I killed a small ocelot." The interviewer says, "Why did you kill it?" The rancher/hunter says, "They pay a lot for the skin and my family needs the money. Also I feel powerful when I kill an animal like that I don't know how to explain it." He sold the skin for 1.000.000 colones (\$2,000 US). This feeling of power signifies the masculinity embedded in this hunting culture when one choses to take the life of a feline. Interestingly the price of this ocelot (third largest cat in Costa Rica) sold for a high value.

Interlaced with masculinity, there is a plethora of evidence that suggests killing jaguars was a sign of social status. For example, the husband of one female interviewee is an accountant in San Jose and bought a jaguar skin from a Cabécar. There was also a corridor member who has a friend who is an accountant living in San Jose.<sup>16</sup> The corridor member explained of his friend, he has a lot of money and a room full of natural artifacts. It is like a museum he said. And off of that room is a secret room that has illegal natural artifacts including jaguar skins, a jaguar head as well as remnants of other wild cats found in Costa Rica. This modern day display of dead jaguars symbolizes masculinity and status (by wealthy men in San Jose) which is rooted in historical contexts. Saunders (1998) explains, “Imbued with great strength, ‘courage’, ‘ferocity’, and ‘nobility’, the jaguar was regarded as the self-evident choice for symbolic associations with Pre-Columbian elites, and an obvious emblem for hierarchical, sophisticated, and perhaps imperialistic Pre-Columbian civilization” (p. 4). The symbolic exhibition of dead felines today does not exist in the SBBD, a rural low income region. Moreover my interview assistants and I did not see a jaguar, puma or other wild cat skin in any of the homes within the biological corridor during all the interviews and all my participant observation visits.<sup>17</sup> In a study conducted on jaguars in Sinaloa, Mexico researchers found it to be common for jaguar skin to be sold to people in larger cities, such as Mazatlán, Concordia, Culiacán, and Escuinapa (Navarro-Serment, López-González and Gallo-Reynoso 2005). My findings shed light on this rural versus urban divide which is perpetuated by social status and affluence. Moreover, such evidence suggests the exposition of dead felines continues to be entangled deeply in masculine identity and social prestige—concentrated in larger cities.

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<sup>16</sup> It appears as though both the interviewee’s husband and the corridor member’s friend may be the same person.

<sup>17</sup> There was talk of one jaguar or puma skin in a home in *El Sauce*, just outside the corridor boundaries on the southwest side, but this was never reconciled.

My data reveals a large variation in the sale of jaguar skin which may be a reflection of culture (Cabécar), economic conditions of the seller, location of sale (urban versus rural), and a lack of professional jaguar hunters in Costa Rica. For example, in a discussion with six Cabécar, ages ranging from 19-91, they agreed that the general value of skin, teeth and nails is 150.000 mil colones (about \$300). Usually these items are sold to “people from outside” (Ticos) who use the skin for rugs, wallets and luxury shoes. Another Cabécar sold a jaguar skin for \$50 to a Tico, an accountant, who lives in San Jose, the capital city, but has a second home in the mountains of the SBBD. This is similar to another account in Puerto Viejo, on the Caribbean coast, which reported that some Italians who own a bakery/restaurant bought a jaguar skin for \$50 from indigenous peoples to then sell it on the black market for \$3,000-\$5,000. The plan was to sell it to friends/family in Italy or somewhere in Europe. According to two informants, the indigenous sell skins for whatever price because they usually need money. The drastic ranges in the value of jaguar skin is a reflection of the cultural, economic and geographical (removal from society and therefore knowledge of market costs of skin) situation of Cabécar.

Value of feline skins also fluctuated with Ticos. An elderly rancher from Guayacan explained many years ago a jaguar skin sold for just under 300.000 colones (about \$600). A Tico hunter who has an uncle living outside of the SBBD (southern Talamanca mountains part of the La Amistad Region) has killed many jaguars. This hunter explained that the skin of jaguars and pumas is valued between \$1,500 and \$5,000 and is largely attached to the drug market, although he knew of a skin that sold in 2014 for much less, 225.000 colones (about \$500). He also explained that the price depends on the sellers and how quickly they need money.

The information on how much a jaguar skin costs in the SBBD, although not readily available, was not hidden. For example, when I asked five informants who I knew well what the

cost of a jaguar skin was, while only one person knew the price off of the top of their head the other four knew of a close contact who they could then ask for the information. The corridor member who had a tremendous amount of information on the sale of feline skin explained in 2014 a jaguar skin sold in Turrialba for 775.000 colones (about \$1,500) and is the price for a good quality skin—a young rather than old jaguar has better skin and is worth more. It also depends on the finish from the hide smith. He explained that in Costa Rica someone who makes clothing from cows and pigs would also use crocodiles and jaguars. Feline skins are sold as rugs, tapestries, and boots while their heads are then mounted as a trophy. A skin of a puma sells for less than a jaguar. Place is also a determinant of price. For example, a jaguar skin is worth more in San Jose, the capital city, versus Turrialba. Similar to the sale of feline skin among the Cabécar economic and geographical situations are at play within the Tico culture.

Research suggests selling jaguar skin is not unique to Costa Rica. In Belize Rabinowitz (2000, p. 92) found one Maya man who wanted to sell him a jaguar skin said, “I can sell to American for maybe hundred dollar.” In a study conducted on jaguars in Sinaloa Mexico researchers found it to be common for jaguar skin to be sold for a range of \$150 to \$300 (Navarro-Serment, López-González and Gallo-Reynoso 2005). In Venezuela jaguars are commonly hunted by professional hunters for commercial sale of jaguar skin which are then sold for between \$400 and \$600 (Jedrzejewski et al. 2011). In my study I found no evidence of professional jaguar and/or puma hunters, but the value of the jaguar skin is much higher in Costa Rica in relation to Belize, Mexico, and Venezuela which may be a product of inflation (2014 versus 2000, 2005, and 2011) and/or stricter Costa Rican laws and less abundant large felines.

*Felines as competitors:* Twenty-six percent (34/131) of the entire sample, 55% (21/38) Cabécar and 14% (13/90) Ticos, constructed jaguars and/or pumas as competitors for livestock

and/or pets. If respondents had killed, knew someone who had killed and/or would kill (if they had a problem of predation on livestock and/or pets) one of these felines they constructed jaguars and pumas as competitors. Eight percent (10/128) of the entire sample,<sup>18</sup> 2% (2/90) of Ticos and 21% (8/38) of Cabécar, said they would kill one of these felines if they had a predation problem. Of those ten 60% (6/10)<sup>19</sup> stated the only option would be to kill the jaguar and puma. Of these six, two were ranchers and four were Cabécar. Seven percent (6/90) of Ticos and 47% (18/38) of Cabécar said either themselves, a relative, or neighbor had killed a jaguar or puma.

Among Ticos, jaguars and pumas were constructed as competitors for two concrete reasons, first, because they attacked livestock and impinged on the livelihoods of ranchers. One administrator of a tourism lodge stated, that in August or September 2014 the neighboring rancher had two puma attacks within one month. The rancher then allowed hunters to come on his property to hunt and kill the puma. This is not uncommon as Ronit Amit from the Department of Environment Organization Guanacaste Fellowship notes, “The cat is taking away the farmer’s money. The farmer doesn’t have much money. The easiest solution is to kill the cat” (Fendt 2014). In chapter three some ranchers state their concern of the economic factor (without being probed) of a change in husbandry practices validating Amit’s comment. For example, one 56 year old rancher from Guayacan chose the option to kill the jaguar or puma when asked what solutions they would employ if they had a predation issue with jaguars or pumas. He followed up by saying, “I don’t believe I would change the way I work because it takes money and I don’t have the money. Sincerely it is just easier to kill the animal.” He ended with a final justification in saying these felines are also dangerous for people. Another 32 year old rancher from Guayacan, who happened to be the nephew of the previous rancher, echoed the above rancher

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<sup>18</sup> Excluding North Americans (n=3).

<sup>19</sup> Categories were not mutually exclusive meaning participants could choose more than one option.



that changing requires money, he also says, "...we are used to working in a certain way and it is very difficult to change." As illustrated here SBBD residents construct jaguars and pumas as competition to a livelihood that is hard to transform.

Others reported retaliation intentions not connected to workload or economic difficulties. One 43 year old rancher from San Isidro de Pascua says he "Would buy a gun to kill the feline." He says, "I don't care about the law." Killing the feline is the only thing he would do given he knows that no one in the community would say or do anything about it.<sup>20</sup> One 28 year old woman from Pascua Abajo responded to the question do your neighbors kill jaguars and pumas, "No, and if they do it is because the jaguar or puma is causing problems in the area it would be normal to kill an animal for that reason." Although these statements were not common, they reinforce the construction of jaguars as competitors. Daniel Corrales, who is in charge of Panthera's<sup>21</sup> Rancher Outreach Program in the SBBD, sums it up well, "Time has passed, things have changed, but the rancher has always seen the tiger, or the jaguar, as an enemy" (Fendt 2014).

I found only occasional accounts that jaguars and pumas were constructed as competition for prey animals. This is the result of two main factors. First, sport hunting is illegal in Costa Rica so hunting of these prey animals is restricted to indigenous populations. Second many of the interviewees were ranchers and live in deforested areas where prey habitat has been depleted. Of the interviewees that did conceptualize jaguars or pumas as competition the stories were old. For example, one 92 year old woman said that the last time she saw a jaguar was when she was 60 years old, she says, "my husband and I were hunting a agouti" when suddenly they saw a jaguar who hunted and ate the agouti.

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<sup>20</sup> See below where communities will need to develop a "no tolerance" for hunting and killing if humans are to coexist with jaguars and pumas in the SBBD.

<sup>21</sup> Panthera is the world's leading group in conserving wild cats.

Jaguars have been constructed as human competitors throughout history (Saunders, 1998). Marchini, Luciano, and Hoogesteijn (2010: 8) echo Saunders depiction of human-jaguar similarities, as described in the introduction, when they state: “Jaguars and humans are approximately the same size; we both eat meat, and, therefore, we contend for the same prey species, wild or domestic. The most common argument for not wanting to coexist with jaguars is the fact that they feed on what should be exclusively people’s food: domestic cattle.” My findings suggest much less than half of the Ticos construct jaguars and pumas as competition and if they do view them as competition only a very small percentage is willing to kill these large felines as a result of their predatory nature. These results corroborate previous research reporting jaguars and pumas are a threat to livelihoods (Rabinowitz, 2000; Rabinowitz, 2005), but suggest that killing the jaguar or puma is not the first response to predation problems among Costa Rican ranchers in the SBBD (see chapter three).

In regards to my Cabécar sample, just over half constructed the jaguars and/or pumas as competitors. Future studies need to evaluate ancient traditions connected to the symbolic importance of jaguars in order to better understand how customs may encourage or discourage the killing of large felines today. This requires ethnographic research in indigenous communities.

*Felines as man-eaters:* Thirty seven percent (33/90)<sup>22</sup> of Ticos thought jaguars and/or pumas would attack humans, of these three had heard of a story where a jaguar or puma actually attacked a human, although none of the respondents actually knew a person who had been

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<sup>22</sup> Two respondents had heard news coverage of human attacks. One was a 26 year old educated Tica who is a tourism administrator and the other was a 38 year old educated American researcher who lives in the sub corridor. The tourism administrator explained jaguars don’t attack humans. When they smell humans they leave making it very difficult to see a jaguar. She had heard of a puma who attacked an investigator doing a study on the Tapir. Apparently the investigator smelled of a Tapir, prey for a jaguar. The researcher discussed a zookeeper who was killed by a jaguar when she was on her cell phone. He had heard it in the news.

attacked. Reasons participants thought felines would attack were: to protect their family, if they are hungry, if they feel intimidated or scared, or because they are innately aggressive and dangerous.

One 47 year old rancher from Bajo del Tigre explained whether jaguars attack depends on many situations like for example if it is hungry and if someone is bothering it. He says “About 3 years ago an Indian told me that a jaguar had attacked a man there in *Pacuarito* [a town on the main road to Limon about 5km from Siquirres].” They only found the clothes of the man—he was hunting with his dog. The man was very well known in the area. He was an amateur in the mountain. The participant says, “Poor guy—that the end was so awful to die as the food of one of those animals.” In this same region, Bajo del Tigre, there was a recent rumor going around with a similar storyline where a Cabécar was killed by a jaguar near the Pacuare River and only parts of his body were found. Both instances demonstrate how the construction of man-eating jaguars penetrates human relations with large felines in the SBBD.

These detachments between actual behavior and perceptions of jaguar behavior are present in Leopold’s narration in *A Sand County Almanac* (1949), “In these narratives, the jaguar is not present, and yet the idea of the fierce man-eater remains a provocative image that ‘pervades’ the landscape” (Adams 2012, p. 92). Jaguars as man-eaters are but representations, according to Rabinowitz (2005:2780), since there have been “no verified records of man-eating jaguars, and relatively few accounts of jaguars killing people.” There is evidence of three cases in Brazil where jaguars attacked humans. While the authors explain in one case the jaguar was provoked (Neto, Neto and Haddad 2011), a Brazilian jaguar expert speculated the other two incidents had been triggered by humans as well (personal communication May 2014 with Rafael Hoogesteijn). My data reveals what is imagined and what is real fails to bare resemblance to one

another. In other words, the stories illustrate that the construction of jaguars and pumas as man-eaters still persists in this biological sub corridor.

As compared to Ticos fewer indigenous, only 13% (5/38), thought jaguars and/or pumas would attack humans. Of these, two believed felines would attack out of fear, one said it was only when the feline has small offspring, the other two provided mythical reasons. In Cabécar tradition jaguars regulate social norms. For example, one elderly Cabécar woman said jaguars only eat people of incest. This statement reflects Bribri<sup>23</sup> myths that felines punished people who had transgressed social norms, such as incest (Bozzoli 1979, pg. 182). In order to co-exist with large felines, the indigenous followed these myths which justified jaguar attacks on humans engaging in incest. Such traditions also warned Cabécar not to walk with cats, cubs or small children in the mountain. For example, one Cabécar stated it was prohibited to carry domestic cats in the mountain reflecting this cultural norm. Such a norm was not respected in one situation where another participant knew of. He explained a jaguar attacked a man in the mountain road because the man was carrying a small domestic cat in his backpack. The jaguar thought it was one of her cubs and attacked the man. Apparently, the man's life was spared because he lived close to where the attack took place. Such stories resemble a Cabécar origin myth that describes a brave mother jaguar that protected her child with great care (Stone 1961, pg. 121-122). Another Cabécar says, "I haven't heard of a jaguar attacking a human for a little while, but history says that jaguars and pumas eat people therefore we believe that they are able to attack." In fact, one Cabécar story entitled, *Birök wä sä katälä* (Small Tigers that Eat the Cabécares) sends a warning message: Cabécar are able to lose their life to the tigers that live in the peaks of Telire, Chirripo, and Tayni mountains (Morales 2013).

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<sup>23</sup> Bribri and Cabécar indigenous peoples show a geographic, temporal, and cultural continuity in the areas they currently inhabit that go back to pre-Columbian times (Barrantes 1993).

*Felines as Food:* Eating the meat of felines was uncommon among Ticos, where only one man had eaten the liver of a puma. Another 42 year old rancher from Bajo del Tigre responded to the question, “Have you ever killed a jaguar or puma?” He says, “No never” and explains that he does not go to the mountain to hunt because he does not eat the meat of cats. Occasionally he goes fishing, he said, noting that fishing does not damage nature because he uses the meat of the fish. It is interesting that this rancher even brought up eating cats if this isn’t something that had been done even on rare occasions. The community of Bajo del Tigre is very close to the Cabécar reserve and this may be the reason this rancher has heard of eating felines.

In stark contrast, 21% (8/38) of the Cabécar sample mentioned felines as food in the interviews (four of the Cabécar were 60 years old or older 90, 80, 85 while one was mid-late 20’s, 31, 33, and 42). One of the eight explained he had heard stories about eating feline meat while the other seven had regularly or at one point ate the meat of a feline. The 90 year old Cabécar woman said she gives her permission to kill jaguars in exchange for meat. She explained they seek out the meat because she doesn’t eat rice, only mountain meat which is healthier. Jaguars are killed two times per year because it is hard to find them. It is normal to kill *Nama*<sup>24</sup> because it is a tradition to eat spirt of the mountain. This description suggests that jaguars would be killed more frequently if abundant. Such indigenous ways of living illustrate their persistence in eating jaguars despite the reduction in population of large felines. An 85 year old man revealed the cultural myth that humans kill and eat jaguars and this is why jaguars don't

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<sup>24</sup> For indigenous in Costa Rica “*Namú* generically refers to all felines” (Esquivel, Gutiérrez-Espeleta, and Jiménez 2012, p.94), but was spelled *Nama* by my Cabécar research assistant. Specifically *Dínámú* refers to a puma and *Dulëkolo* refers to the jaguar (Esquivel, Gutiérrez-Espeleta, and Jiménez 2012, p.97). My Cabécar research assistant said *Nainamei* refers to the jaguar and *Duenamei* to the puma. These differences most likely speak to different indigenous tribes in Costa Rica and even within one tribe such as the Cabécar it may be the result of differences in geographic location.

come close to people. Another 80 year old man said he killed a jaguar a long time ago in order to eat.

Eating felines was not only restricted to elderly indigenous upholding ancient traditions. One of the younger participants explained three years ago he was visiting another Cabécar reserve in the mountains and they served him *Nama*. While another 33 year old male says, “I kill some to eat and leave the rest.” Not only are Cabécar killing and eating felines sometimes “outsiders” (defined by Cabécar as Ticos) kill. For example, one 60 year old man says, “A jaguar was killed by three outsiders. They took the skin and teeth and gifted us the meat to eat.” Another Cabecar who was 42 years old admitted eating wild animals, but says, “Felines I don’t eat” illustrating a separation of himself from Cabécar who do eat felines.

My findings corroborate previous research that found jaguars and pumas are also consumed in Colombia (Gonzalez-Maya et al 2010: 67) and by the Maya in Belize (Rabinowitz, 2000). In Colombia the consumption of puma meat within a small community was considered a big event for the town (Gonzalez-Maya et al 2010: 67). My data does not reveal any traditions associated with the eating of jaguars or pumas, except for the one elderly woman who commented that it was tradition to eat the spirit of the mountain. Ethnographic research needs to be conducted in indigenous areas to understand how cultural traditions, such as eating felines, impacts conservation of jaguars and pumas.

*Felines real and imagined:* My findings show 33% (30/90) of Ticos have seen, killed or neighbor/relative had killed a jaguar or puma. Further, of these 30, 73% (22/30) remembered an approximate date where 68% (15/22) provided dates ranging from three to 40 years ago. Memories of large felines as dated as some of these demonstrate the kind of lasting impression of the siting and/or killing experience. The fact that the majority of the sitings/killings are older

also reveals the lack of large felines in the region, which is also reflected in the 14% (13/90) of respondents who said jaguars and pumas do not exist in their area. Take for example one rancher/hunter who says, “I would love to see a puma. It is my favorite animal, but they are very difficult to see. I have been going to the mountain since I was a child, and I have never seen one.” This demonstrates that even avid hunters rarely encounter jaguars and pumas in the SBBD. These results indicate felines are imagined to most Ticos.

One American living in the SBBD reports, “To tell you the truth I am glad the large cats aren't close to my house because I have two small kids and my dogs.” This theme was reflected in the corridor meetings where one SINAC representative says “we [the people in Costa Rica] are not used to living next to wild animals.” As a representative of SINAC, she receives calls when people see jaguars or crocodiles and other dangerous animals near their home. Local people want them removed, but she says that “we need to respect their space.” These calls are excellent because it means “the forest is coming back,” she explains. “We are seeing more living wild animals now, but we are not accustomed to it.”

Jaguars and pumas were constructed as dangerous animals, although my data did not reveal any evidence of threatening feline behavior toward humans. Adams (2012) claims of jaguars, this is common in the Western world, “Through the process of representation, jaguars are removed from their own animality, or jaguar-selves, and enter cultural discourse as objects” (p. 82). Moreover, Adams contends scientific reports, photographs, videos, and discourse are confused or conflated with jaguars themselves, misunderstanding their actual behavior. In reality, jaguars are hard to identify, as Adams (2012, p. 86) acknowledges, “Encounters with jaguars are typically fleeting (unless an animal is killed as a result).” Adams finds disconnects between jaguar behavior and representation in John James Audubon, an ornithologist, naturalist,

and hunter. He writes of jaguars in his scientific text as “ferocious beasts” leading people to be more terrified of the predator than the animal warrants (Adams, 2012, p. 90). Adams (2012, p. 94) maintains, “The jaguar frequently figures into these narratives not as an animal, but imagined as a cunning villain or worthy foe.”

Fabricated accounts contribute to misunderstandings of feline attacks. For example, Esther Pomareda, a biologist from Las Pumas Rescue Center in Costa Rica says, “Most people kill jaguars because they are misinformed...People think that if it attacks cows, it will attack them or their children” (Fendt 2014). This statement was reflected in one of my respondents where a 43 year old rancher from San Isidro de Pascua directly expressed his fear in relation with killing of jaguars, when he says, “I would be amazed if I saw a jaguar or a puma, but I would probably kill it.” He explained that he has a child and cows and he does not want felines so close to the house. He expressed that killing the animals is the only solution to the problem.

Studies have found negative perceptions (Petracca et al. 2013) and killing (Jedrzejewski et al. 2011) to be the result of fear. With just over half of my sample fearful of large felines and one fourth of my sample who would kill, had killed or knew someone who has killed a large feline, it will be important to educate the SBBD population of jaguar and puma behavior to avoid further harm to large felines out of fear, when imagined turns into real. These results speak to the potential for conflict as jaguars and pumas repopulate the sub corridor.<sup>25</sup>

In contrast to Ticos large felines were real to my indigenous sample where 84% (32/38) discussed seeing and/or killing a jaguar or puma. Fifty-five percent (21/38) saw a jaguar and/or

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<sup>25</sup> Take for example the comeback of otters in Missouri which led to conflict with anglers and ponds owners who saw the otter as a competitor for fish. Otter protection activists on the other hand considered the otter’s valuable ecological role in the aquatic system. The activists purported nonlethal methods, relocation and better pond management practices be used in cases of conflict while the anglers and pond owners all perceived the otter as a nuisance animal that should be harvested and its pelt sold on the market (Goedeke 2005). Similar conflicts and tensions among various interest groups exist even when specie population numbers are not stable, such as both Scarce (2005) and Campion-Vincent (2005) have highlighted of wolf reintroductions.



puma (this does not include those who saw tracks of a large feline) and of the those 52% (11/21) saw one of the felines in the past 6 months or less, revealing the close proximity these people live to large felines. Thirty-four percent (13/38) expressed fear of large felines. Words such as bad, scared, afraid, nervous, and worried were commonly used by both Ticos and Cabécar. Of those participants who provided details on the timeframe in which the felines were killed, Cabécar had not only the most frequent, but also the most recent killings (see ranges in *hunting culture* above). These results suggest jaguars and pumas are real to most Cabécar, while the ghosts of large felines live in stories, they are only but imagined to most Ticos living in the SBBD.

### **Western versus Indigenous Meanings**

Saunders (1998) presents an important caveat to scholars who blend indigenous and Western knowledge. In his discussion of feline symbolism he examines the old world view of felines and explains Christianity and Cartesian philosophies developed views of animals which conflicted with those of Amerindians. Colonist views of felines did blend, but lost the indigenous meaning which led to “the construction of misleading western attitudes” (Saunders, 1998, p. 3). Saunders claims the meanings given to jaguars differ among western and indigenous frames. My data suggests indigenous meanings are the products of both a traditional and modernized relationship with jaguars and pumas. Moreover, while some evidence did reveal a traditional or a native relationship between Cabécar and jaguars and pumas, findings also reveal Cabécar not only kill jaguars and pumas, but sell the skins to Ticos suggesting a sign of Western influence on indigenous culture—one lacking in respect for jaguars and pumas. Undeniably these realities are tied to the political and economic situation that need to be further unraveled through ethnographic research.

Indigenous dramatically differed from Ticos in constructing felines as food, validating the work of Gonzalez-Maya and colleagues (2010) who first argued for the inclusion of studying traditional use of felines in order to gain a holistic understanding of feline conservation in Latin America. My findings reveal 21% of Cabécar have consumed or consume felines. With population estimates of large felines in Costa Rica as low as 300 jaguars and 1,000 pumas, a small sample of Cabécar, and only a small percentage of geographical space in Costa Rica these are troubling findings for conservation of large majestic felines. These results illuminate how cultural traditions have an impact on the survival of jaguars and pumas in remote regions.

Furthermore, my findings do not include the Cabécar in my sample who did not reveal that they had eaten jaguar or puma meat. Two obstacles stood in the way of this information: 1) some Cabécar may not want to disclose that they have eaten felines due to Costa Rican wildlife laws; and 2) my interview instrument did not specifically ask this question. My findings suggest Cabécar may include all animals, even predators, as food. I recommend future researchers include questions of: 1) traditions associated with feline consumption, 2) frequency of jaguar and/or puma consumption, and 3) how many neighbors, relatives, friends consume large predators (see appendix B). Few studies investigate and acknowledge the importance of indigenous cultures and their interactions with large felines. Given jaguars and pumas live in similar geographic spaces to indigenous populations—usually remote places largely untouched by civilization—such indigenous-feline and indigenous-predator research more broadly will be important for conservation efforts.

In addition to investigating the capacity for Ticos to coexist with large felines, efforts toward fostering Cabécar coexistence are urgent and need immediate attention. Cabécar encounters and killings exceed those of Ticos living in the biological corridor by 60% and 22%

respectively. Multiple methods toward encouraging coexistence need to be utilized. One avenue would be to use Cabécar cultural traditions to save the jaguar. For example, one 40 year old Cabécar who had killed a feline four years ago revealed an interesting myth. He explained that he only killed a feline one time because God isn't content if one kills felines. This is similar to findings from a study in Venezuela where a myth against killing jaguars existed because it may result in something bad happening to them or their family (Jedrzejewski et al. 2011).

A second possibility in fostering coexistence is related to the 16% (6/38) of Cabécar who did not discuss hunting in some capacity. Four were from Jameikari, a community where educational outreach efforts have been employed. Furthermore, all six respondents were in a profession that was related to conservation (e.g. park ranger, MINAE, and a tour guide). Such findings suggest coexistence initiatives that include cultural traditions benefiting both feline conservation and economic livelihoods are necessary if we are to save jaguars and pumas. My findings speak to the importance of cultural understandings which are vital for coexistence and essential for conservation efforts toward felines, including the jaguar corridor initiative and human-predator coexistence overall.

### **Conflict and Killing of Jaguars and Pumas in the SBBD**

Conflict between humans and large felines in the SBBD is still a prominent theme where Ticos and Cabécar reveal a culture of hunting, 56% and 84% respectively. For Cabécar traditional subsistence is a way of life embedded in a hunting culture to survive off the land. Additionally, their remote living allows real encounters with large felines leading to a higher level of conflict motivated by competition and the use of felines as food. The result is more killings.

I found Ticos have a higher capacity of coexistence in comparison to Cabécar. For example, a small portion of Ticos constructed jaguars and pumas as competitors, 14% respectively, and of those even fewer responded to predation problems by killing or wanting to kill the feline. Despite this positive finding, felines are imaginary to most Ticos. Moreover, my findings reveal fewer Ticos encounter large felines. At the same time hunting in the SBBD has slowed down but occurs simultaneously to the decrease of prey animals killed and consumed by both hunters and large felines. Moreover hunting has decreased as a result of less prey to hunt.<sup>26</sup> This suggests potential for competition and conflict when jaguars, pumas and their prey repopulate. In other words, when the population of jaguars and pumas increases will this capacity of coexistence among Ticos toward large felines change, remain the same or decrease?

To measure the conflict and killing of jaguars and pumas more accurately, future research needs to address the marketability of jaguar and puma derivatives. Such research would ask, for example: Are there professional jaguar and puma hunters in the area? Is there a market for selling jaguar and/or puma skins? If so, what is the value of a jaguar/puma skin, who is the buyer, and where are the buyers from (see appendix B)? The fact that there is a higher price attached to good quality skins from young jaguars and my research exposes high values of feline skins in comparison to previous research raises a red flag for conservation efforts in this region. My interview instrument did not ask specifically about selling skins of jaguars and pumas and therefore did not produce significant numbers from my sample. However it remains interesting that when I asked about selling jaguar and puma skins people knew of the price or knew someone who would know the value of these skins. This suggests selling and purchasing feline skin may be a common practice in the SBBD.

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<sup>26</sup> Hunting has also most likely decreased as a result of stricter Costa Rican wildlife laws although I do not evaluate that here.

Felines were constructed as man-eaters, and competitors embedded in a hunting culture among both an indigenous and Tico population, however, most Ticos have not or do not intend to kill or hunt jaguars and/or pumas. This reinforces Bergman's (1996:16) contention that it is a cultural construction or phenomenon rather than natural which leads men to kill wild animals. Men are not born hunters rather it is an identity they assume. As described below, conversion is possible and has been possible in this remote biological sub corridor.

### **Faced with Challenges Coexistence Efforts are Underway**

Although I found the conflict and killing of jaguars and pumas embedded in traditional hunting culture, other opportunities exist for hunters. For example, my data reveal three Ticos who were previous hunters now work in tourism. This suggests livelihoods have the potential for conversion. One corridor member validated the need for these previous hunters: "There are two types of hunters, one that really knows everything about the animals, behaviors, and habitat. This hunter is very important for conservation." Such encouraging comments in my data show informed hunters have a lot to offer in a country where tourism is the second largest industry.

The corridor groups provide promise for coexistence as well. The jaguar stands as the symbol of the biological corridor, of conservation goals. Both felines, although the jaguar more prominently, were discussed regularly in the SBBD corridor group and to a less extent the larger CBVCT corridor group. This has an impact on corridor members. For example, one corridor member told a story at one of the meetings. He had attended a meeting in Lomas about water issues. The meeting was nice, he said, but when he got up to talk about protecting the jaguar, people asked, "Why protect the jaguar?" He explained people kept asking the same question, "Why protect the jaguar?" People are concerned about the children when they know there is a jaguar around...so they are scared. The corridor member continued explaining the problem in

Lomas is farmers let hunters enter through their farms to hunt the land. The corridor member acknowledged the prey is then depleted and as a result jaguars attack cows. He explained the ranchers wonder why they attack, they don't make this connection. After explaining his frustrations with his hometown he says "The SBBD represents the passage for the jaguar and Panthera taught us [the corridor members] that the jaguar is an umbrella species and without jaguars there would be nothing, no diversity, nothing." Such a story signifies that education is disseminated to communities through corridor members.

The corridor members and tourism establishments are concerned with hunters, but the reality is everyone seems to know a hunter and that makes it difficult to file a complaint with the police against someone. One corridor member wanted to reward the local people, around \$100, to report someone. A member of another corridor group in San Juan responded with a word of caution in that their corridor group had two cases where reports were filed. The corridor member of the San Juan group explained that the process is very slow. A precedent of no-tolerance must be set and that will depend on the ability for some community members to turn against others in defense of jaguars, pumas and nature.

My research speaks to the work of Zimmerman and colleagues (2010: 138) who argue interventions will have little impact on conservation without understanding the social and cultural lives of people living among large felines. As I highlight above coexistence is emerging in the SBBD, but still in its infancy. So while there is potential for coexistence between humans and large felines in Costa Rica, my study provides evidence that present cultural constructions of jaguars and pumas tend to encourage conflict and killing. Given this, qualitative research methods are needed to understand more deeply these existing meanings and investigate possibilities for human coexistence with jaguars and pumas. Through my findings I have

developed research questions to assist in deeper considerations of sociocultural constructions of conflict—these are vital to our understanding of how humans coexist with large felines. What remains is the grandest challenge of all: learning to coexist with jaguars and pumas. For Ticos, this means allowing large felines back into ecological space people have claimed for themselves. For Cabécar, it requires that their frequent encounters with large felines do not end in the killing of these apex predators.

## **Chapter 2: Fostering Co-existence with Jaguars and Pumas through a Rancher Outreach Program in Costa Rica**

### **Abstract**

In recent years shrinking habitat and depleted prey source have increased the conflict between humans and jaguars in Latin America. A rancher outreach program exists in part the Mesoamerican Biological Corridor (MBC) to reduce conflict and foster coexistence with jaguars and pumas in Costa Rica. Based on participant observation and open ended interviews I explored the program's ability to reduce conflict between humans and large felines. Findings reveal half of participants are willing to coexist with large felines through a change in husbandry practices (enclosures, electric fences, use of large Eurasian dog breeds); just under half are willing to coexist with felines through predator relocation; and one third think their livestock have been attacked by large felines, but are not connected to the rancher program. Results suggest coexistence is multidimensional—based on geographical proximity to large felines—and strategies of coexistence are culturally sensitive—Cabécar indigenous have the highest conflict with large felines, but were not included in the rancher program. I conclude with six recommendations for rancher programs: 1) peer-reviewed research on feline relocation needs to be conducted in order to analyze if it is a viable option for coexistence; 2) prior to implementation residents of a program's region need to be questioned to determine the level of conflict and evaluate strategies that fit into the pre-existing way of life; 3) data collection needs to be conducted analyzing ranchers who have had feline attacks, but are not added to the rancher program—this data will determine how best to foster coexistence with these ranchers and situations; 4) citizen science is one method that could foster education and social investment while alleviating program resource limitations; 5) rancher programs need to have various venues of marketing to create awareness among residents who may have future livestock attacks; 6)



communication is important to the success and continuation of a rancher program and thus careful attention needs to be deployed at every step of the process.

## Introduction

In recent years shrinking habitat and depleted prey source has increased the conflict between humans and jaguars in Latin America (Hoogesteijn and Hoogesteijn 2011). Studies often measure tolerance of jaguars and pumas without assessing what strategies people are willing to employ for coexistence. For example, Zimmerman and colleagues (2005) found 64% of cattle ranchers' in the Pantanal of Brazil agreed they cannot tolerate jaguars taking cattle and Campbell and Alvarado (2011) found 23% of people in El Salvador would not tolerate jaguars, pumas and coyotes. In addition to measuring toleration in El Salvador, they also found 73% of participants supported trapping and removing these animals. Relocation is an important strategy to measure, but other strategies exist and were not measured in either study. The threatened status of jaguars and their conflict with humans is pressing research to examine what direct strategies are available to create an environment of human-jaguar co-existence.

Structural changes that foster education, sustainable development, and tourism (Inskip and Zimmermann 2009, 26) are vital for minimizing conflict and promoting large feline conservation, but take time to implement. Direct management strategies are used to improve tolerance while these long term strategies take hold. Some management methods include: financial compensation for cattle loss by predation (Vaughan and Temple 2002), livestock husbandry and management improvements (Crawshaw and Quigley 2002), use of water buffalo (Hoogesteijn 2003),<sup>27</sup> livestock guarding (Inskip and Zimmermann 2009, 26), relocation of (Vaughan and Temple 2002) and trophy hunting of problem jaguars (Swank and Teer 1992), and wildlife tourism (Conforti and Azevedo 2003).

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<sup>27</sup> The social and defensive behavior of adult water buffalo in protection of their calves makes depredation "less or non-existent in comparison to bovine calves" (p. 26)

To the best of my knowledge one peer reviewed study exists regarding a rancher program to protect jaguars. In Sonora, Mexico (located within The Jaguar Corridor Initiative) the benefits of a landowner-based jaguar conservation program was described. U.S. hunters participated in deer trophy expeditions that generated funds to use as compensation for livestock predation by jaguars. The program not only compensated for cattle loss, but produced profits to participating ranchers (Rosas-Rosas and Valdez 2010). However, while this study highlighted benefits of their rancher program, it failed to describe any barriers or improvements to be made. In Costa Rica, only one peer-reviewed study targeting rancher jaguar conflict exists. Findings suggest 32% of ranchers had implemented preventative measures (such as electric fences and livestock guarding) to avoid jaguar predation on livestock (Amit, Rojas, Alfaro, and Carrillo 2009). However, this study did not evaluate the successes and failures of such methods.

As demonstrated here there is a plethora of incentives and strategies available, but very few studies have actually reported on a program's ability to reduce conflict between humans and large felines. In one systematic study assessing relocation as a management strategy, Isasi-Catalá (2010) reported surprise that very few concrete studies existed on jaguar relocation as it is a widely proposed solution to conservation. In fact such a research gap extends beyond jaguars. For example, Woodroffe, Thirgood and Rabinowitz (2005:395) emphasized the lack of "well-designed studies" evaluating the efficiencies and barriers of programs related to human-wildlife conflict.

Although not an evaluation of a program, my study reports on the barriers of a rancher outreach program in fostering human coexistence with jaguars and pumas in Costa Rica. I chose to conduct this research in a biological corridor. Encompassing large areas of private and public land biological corridors are important units of analysis to evaluate co-existence between

large predators and humans.<sup>28</sup> In the Barbilla Destierro Biological Sub Corridor (SBBD) sport and subsistence hunting were found to be the main threats to wildlife, where residents have killed or intend to kill jaguars and pumas after suffering the loss of an animal (SINAC). This situation of conflict as described in chapter two emphasizes the serious threat hunting has on the success of the biological corridor and the survival of jaguars and pumas traveling within the corridor (SINAC).

To the best of my knowledge aside from Rosas-Rosas and Valdez (2010) no other study has investigated a rancher program or any program that directly promotes co-existence between humans and jaguars (*Panthera onca*) and pumas (*Puma concolor*) within a biological corridor. *I explored Panthera's rancher outreach program's ability to reduce conflict and foster co-existence between ranchers, jaguars and pumas in the Barbilla Destierro Biological Sub Corridor (SBBD) of Costa Rica. I describe the functionality of this program and its impact on its participants, including barriers that exist. I also explored and described perceived predation attacks and willingness of SBBD residents to coexist with jaguars and pumas.* Unlike Rosas-Rosas and Valdez (2010) my study investigates the barriers to a rancher outreach program—important for future growth and implementation in other parts of the globe.

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<sup>28</sup> Programs of co-existence are even more pressing today when jaguars are permitted to cross private lands through biological or wildlife corridors (Donaldson & Kymlicka 2011; Sillero-Zubiri, Sukumar & Treves 2007; Woodroffe, Simon & Rabinowitz 2005) and scholarship is promoting rewilding (Fraser 2009), including not only corridors, but also cores and carnivores (Fraser 2009; Solzenburg 2008; Terborgh 1992) as an urgent conservation tool. NGO's, such as Panthera are working to link core jaguar populations from northern Argentina up to Mexico across both private and public land through a Jaguar Corridor Initiative. In Costa Rica, the Jaguar Corridor Initiative was integrated into to the largest biological corridor system in the world, The Mesoamerican Biological Corridor (MBC) in 2006 (SINAC).

## **The Research Site**

The Barbilla Destierro Biological Sub Corridor (SBBD) is critical for the connectivity of the larger Mesoamerican Biological Corridor (MBC) between Nicaragua to the north and Panama to the south. Made up of 37,589 hectares of land it is inhabited by 8,000 people who live in 26 small settlements (Rojas & Chavarría 2005) whose primary livelihood activities are livestock and agriculture (González & Poltronieri 2002). Cabécar, who live in Nairi Awari, Chirripó, and Bajo Chirripó indigenous reservations also inhabit the SBBD. They are relatively isolated with little access to the outside market and few public services (Gonzalez and Poltronieri 2002). They live on subsistence agriculture (Gonzalez and Poltronieri 2002) and are largely dependent on government subsidies (Rojas and Chavarría 2005).

## **Methods**

Through participant observation and 131 open-ended interviews in the SBBD I explored and described barriers facing a rancher outreach program, ranchers perceived predation attacks by large felines, their willingness to co-exist in the SBBD, and the program's impact on ranchers. Interview participants consisted of people whom reside, own property or a tourism establishment in the SBBD, 38 Cabécar, 90 Ticos, and three North Americans: two Americans and one Canadian. Two local research assistants, one female and one male who were from the SBBD, conducted 86 interviews throughout the sub corridor and one local male Cabécar research assistant interviewed 37 Cabécar. Interviews started in Valle Escondido, Bajo del Tigre and Las Lomas, the home towns of the research assistants. Research assistants were between the ages of 25-35 years old. I interviewed three North Americans, four Ticos and my Cabécar research

assistant prior to him starting the work. Interviews were conducted in 23 towns<sup>29</sup> and in 12 communities<sup>30</sup> within the Nairi Awari, Chirripó, and Bajo Chirripó indigenous reservations.

Livelihoods primarily consisted of livestock and agriculture (e.g. cilantro) in 72% (94/131) of my sample. Other livelihoods included: three participants owned or administered a tourism establishment, one man owned a small convenience store but was previously a rancher, and one woman was an English teacher in the San Jose area. Fifty-eight percent (22/38) of my Cabécar sample did not have a livelihood outside of cultivating their own food (for some this included livestock animals), six were retired, and others worked in tourism, for the government, as teachers, and as park rangers.

Twenty eight women and 62 men made up my Tico sample, three men made up my North American sample, and there were three women and 35 men in my Cabécar sample. The large decrease in female representation from Ticos to Cabécar is because felines are some of the wild animals about which Cabécar women under the age of 75 are not able to speak about in public. This tradition may be related to the Cabécar story where a jaguar is a lover of a young woman (see Stone 1961, pg. 129). Of the three Cabécar women in my sample, two were over 75 years old: one was 90 and the other 86. The third was a 41 year-old woman who did not follow traditions or respect the cultural taboo of not discussing jaguars and pumas in public.

A snowball sample design was used asking interviewees to recommend other ranchers and/or agriculturalists who would be willing to voluntarily participate in the interviews without incentive. Included in the 131 sample were 14 ranchers where Panthera had responded to a predation attack (some of whom were participants in Panthera's rancher program). With these

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<sup>29</sup> Including, but not limited to: Ojo de agua, Las Lomas, Guayacan, El Coco, Bajo del Tigre, Linda Vista, and Santa Marta.

<sup>30</sup> Including, but not limited to: Jameikari, Xinikicha, Muluibiri, Brisa, and Barbilla.

ranchers I did not use a snowball sample rather they were targeted using Panthera's list of 24 ranchers. The list of ranchers dates back to the program's inception in 2010. Panthera responded to these ranchers in regards to a feline attack. I did not keep track of the people who declined to be interviewed. IRB approval was obtained on October 31, 2013 #x13-1039e when the study was considered exempt. The interviews lasted on average between 20 and 40 minutes. I chose not to audio record my data because it would have excluded so many participants. With that said, quotations are only in places where my research assistants or I was able to capture the direct quote in interviews or I was with my participant observations. Most respondents were interviewed individually.

In addition to jaguars I documented data related to pumas because Panthera's rancher outreach program includes both jaguars and pumas given they are the only large predators in Costa Rica able to take down a calf. Following are the interview questions included in this chapter. The first was a survey of how many people in the SBBD have experienced livestock loss from feline predation. Two questions were asked: Have you experienced livestock loss due to jaguar or puma predation? Have any of your neighbors experienced livestock loss due to jaguar or puma predation (Conforti & Azevedo, 2003)? The second question asked if jaguars or pumas were close to their home/ranch and attacking livestock and/or pets what would they do to solve the problem (Conforti & Azevedo, 2003). The third and fourth questions explored how the participant felt about Panthera. Without provoking a positive or negative evaluation (which is not useful toward understanding effective programs) the questions asked: have conservation efforts (Panthera, government, national park, private reserves, etc.) to protect nature impacted you in anyway and are you associated with Panthera?

I accompanied Panthera in five of their seven rancher outreach program visits which lasted on average three days each.<sup>31</sup> My first rancher visit for November 2013 was rescheduled and took place in January 2014. My rancher outreach visits came to an end in September 2014 when the coordinator emailed to cancel our visit because Panthera only had one rancher in the SBBD in their program. The coordinator informed me that any future visits to that rancher would be scheduled when they had other activities or meetings in the area. We both agreed he would advise me if they conducted the visit in October 2014. My last rancher visit was August 2014. In addition to the rancher program my participant observation consisted of multiple visits to seven ecotourism establishments and four private reserves in the SBBD as well as regular attendance at two monthly corridor meetings: one for the SBBD<sup>32</sup> and the CBVCT<sup>33</sup> (the SBBD is part of this larger biological corridor)—some meetings took place in remote areas that required overnight stays.

### **Panthera's Rancher Outreach Program**

I explored Panthera's rancher-outreach program, entitled, Wild Cat-Cattle Coexistence. Panthera is the largest wild cat conservation organization in the world ([www.panthera.org](http://www.panthera.org)). In 2007 Panthera had a workshop surrounding issues of human conflict with large felines—recognizing it as one of the main reasons felines are killed in Costa Rica. Born from this workshop, the rancher program developed in 2010. The regional Panthera office is located in San Jose which is approximately a two and a half hour mountain drive to the SBBD.

The program functions as a response to jaguar or puma attacks on livestock. Each rancher is in Panthera's program for ten months. When a rancher has an attack on their livestock

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<sup>31</sup> Between November 2013 and September 2014 I knew of two outreach visits that Panthera attended to without advising me—despite my repeated requests (two recorded and various verbal) to be included in all of the rancher relations for a one-year time period.

<sup>32</sup> Subcorredor Biológico Barbilla-Destierro Paso del Jaguar

<sup>33</sup> Corredor Biológico Volcánica Central-Talamanca Consejo Local



they may contact Panthera who then responds by sending a representative to the ranch to investigate if a jaguar or a puma had attacked. The investigation includes a 74 question interview with the rancher. Since the inception of their program in 2010 they attended 12 ranchers who were not added to the program and 12 ranchers who were part of the program. The reasons ranchers are not added to the program include: a rancher does not demonstrate interest or commitment,<sup>34</sup> the ranch is more than 300 hectares with more than 100 animals, there is not sufficient evidence that the attack was done by a feline. Again, 14 of the 24 ranchers Panthera attended to during their four year program were part of my 131 sample.

After the initial interview ranchers are added to the program if they fit the characteristics stated above. During the initial visit, Panthera analyzes the situation at the ranch and prescribes the most appropriate solution including: electric fences, enclosures, and bells for the cows (the sound scares off large felines).<sup>35</sup> Ranchers sign a contract and Panthera's field assistant returns to the ranch to place four cameras<sup>36</sup> in areas where the jaguar or puma would travel. In the past Panthera bought and provided the ranchers with labor and materials for enclosures. That has changed recently where material and labor are paid for by Panthera, but the labor is conducted by the rancher. The coordinator of the program said such efforts "promote much more participation with the ranchers." This is different for electric fences where electrical skills are necessary. In this case Panthera provides the materials and labor.<sup>37</sup>

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<sup>34</sup> For example, during the February 2014 rancher visits, the field assistant told me there was a puma who attacked a calf in "La Fuente" 15 days ago. The field assistant explained that he responded to the call with the program coordinator and while the rancher showed interest in the program, he never followed up by calling Panthera—signifying a disinterest in the program and Panthera's help. The field assistant indicated one reason may be that the rancher already had a corral for the cows.

<sup>35</sup> In all my visits enclosures and electric fences was the most common strategy used. I never once saw bells on the cows used although one rancher did state in his interview that he was waiting for Panthera to bring him bells.

<sup>36</sup> There were many instances during my visits where a ranch had less than four cameras due to a lack of resources.

<sup>37</sup> With the last ranch in the program Panthera had placed an electric fence which was solar powered.

Although rancher visits are supposed to be conducted monthly, during my time communicating with the coordinator for these visits (November 2013 through September 2014) there were only seven. The field assistant does not always phone the ranchers ahead of time to let them know he is coming because he wants to see if they are using the enclosures and electric fences that have been supplied.<sup>38</sup> During July 2014 I noticed they were distributing “Panthera” yard signs for the ranchers to place on their property in order to advertise that they were participants of the rancher outreach program. During the last month of the program Panthera gathers their cameras from the ranch. Although I only accompanied Panthera on three rancher visits where it was the participants’ last month in the program—during all three occasions cameras were collected and we left the property without speaking to the rancher.

In addition to the SBBD Panthera works in Tortugero (the location of Barre Pacuare—see relocation below) and San Juan-La Selva as they are the most important biological corridors to Panthera—with more people and more ranchers. Despite the geographic range of Panthera, they still have limited resources. The coordinator of the rancher outreach program said, “The hardest part of my job is to turn down a farmer who needs help...The only way this problem will ever be solved is if the government gets involved” (Fendt 2014). In September 2013 SINAC<sup>39</sup> designated 14 of its officials as members of United Attention to the Conflict with Felines (UACfel), a feline conflict response unit. It is Costa Rica’s first government-funded large feline-livestock program. The program is not limited in geographical range as is Panthera. “UACfel

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<sup>38</sup> Although during one rancher visit I observed that the field assistant did not check if the cows were in the enclosure. As we were leaving I asked if he knew if the rancher was using the enclosure and he said, “It doesn’t look like it, maybe they will do it later.” It was already by then 5:20pm and the climate was cold and rainy. In my experience from living and working in the SBBD cows regularly roamed freely and rarely did I see a peon out past 5pm. Just then the field assistant backed up to see the enclosure more closely and indeed the cows were in the enclosure.

<sup>39</sup> MINAE and SINAC are the government agencies in Costa Rica responsible for wildlife. SINAC (Costa Rica’s national system for conservation areas) is under the auspices of MINAE which is the Ministry of Environment and Energy in Costa Rica.

responds to all conflict situations all over the country in order to help ranchers protect their livestock through preventative measures” (Fendt 2014). The coordinator of Panthera’s rancher outreach program explained in September 2014 his role is also the external coordinator for Panthera y UACFel programs which include a larger geographical range. The program is fully funded through Panthera and in 2015 MINAE is expected to include UACFel program in its budget.

Panthera’s program is different from Yaguará, another jaguar and puma conflict program in Costa Rica, which offers compensation to replace the value of the livestock animal killed. Yaguará is a regional organization located in the Osa Peninsula, the South Pacific, where Panthera is a global organization with headquarters in New York and is more centrally located in Costa Rica attending to a wider geographic range of conflict situations. To the best of my knowledge Yaguará is currently not active.<sup>40</sup>

## **Results/Discussion**

Findings from exploring Panthera’s rancher outreach program and measuring ranchers’ ability to coexist with jaguars and pumas in the SBBD of Costa Rica suggest one fourth of the sample reported having or their neighbors having had an attack by a large feline.<sup>41</sup> Cultural differences exist. For example, more Ticos are willing to coexist at a closer proximity than Cabécar although only Ticos chose relocation of large felines as an option of coexistence. Further, more Cabécar are willing to use dogs to scare away jaguars and pumas where more Ticos are willing to use electric fences, enclosures and keeping livestock away from the forest as preventative methods. Barriers to Panthera’s program include: lack of inclusion (and an understanding of cultural differences) of Cabécar in the rancher program; failure to collect

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<sup>40</sup> There website is inactive.

<sup>41</sup> This data is largely unreliable—see discussion on jaguar and puma attacks on livestock below.

rancher specific data on why ranchers who have had feline attacks are not added to the program; lack of awareness among ranchers in the SBBD regarding the rancher program; and a deficiency in communication with participants of their program. Below are the details of these results.

*Jaguar and puma attacks on livestock:* Thirteen percent of participants (17/131) and 19% (25/131) of participant's neighbors had experienced a loss of livestock from predation of jaguars or pumas. Although these reports are unreliable (without evaluation by an expert) I draw on this data to illustrate three important points. First, whether jaguars or pumas are actually attacking livestock may not be as important as the fact that people believe that large feline predation is to blame. For example, retaliation efforts toward these predators could be based on false knowledge of attacks. Secondly, future research should not only ask these questions, but also follow-up questions such as: *how do you know it was a jaguar or puma* and *how long ago did this happen* in order to record reliable data.<sup>42</sup> Future research needs to contrast the reliable with the unreliable data to answer the question of how many people have knowledge of these large felines. With such juxtaposition one could also compare beliefs or misconceptions with actions and behaviors toward large predators. For example, a rancher who falsely accused a jaguar of attacking a calf could retaliate—resulting in a large feline death from a misinformed rancher. This would demonstrate the importance of feline knowledge among ranchers. Finally, livestock attacks in the SBBD may go unreported. Moreover, my data reveals 42 unreliable reports of people in the SBBD (participants and their neighbors) who have experienced a livestock loss—potentially from large feline predation. In comparison Panthera was called by 24 ranchers who experienced an attack since the program's inception in 2010. This leaves at minimum 18

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<sup>42</sup>In operationalizing “reliable” and “unreliable” data I suggest reliable data is evidence of a jaguar attack provided by an expert. Unreliable data is someone indicating there was an attack with no expertise.

ranchers<sup>43</sup> who thought they experienced an attack, but did not call Panthera (which would have resulted in verification of a feline attack). This leaves a tremendous amount of room for program growth and suggests Panthera is not contacted regarding many attacks that take place in the SBBD.

Regionally, the attacks took place located on the west side of the corridor in communities such as: Torito, San Antonio, and San Isidro de Pascua where 69% (29/42) of participants claimed to have had or thought their neighbor had an attack. This region is also where most of the program's misconceptions and concerns are (see below). Thus, the geographical location of attacks has important implications for misconceptions related to livestock attacks.

*Willingness to coexist:* included two dimensions of coexistence: 1) willingness to change husbandry practices (e.g. predator proof-enclosures, electric fences, keep herds away from the forest, and/or buy a dog); and 2) jaguar or puma relocation. I separated these dimensions based on geographical proximity with the predators. In other words, participants who chose option one were willing to coexist in close proximity whereas those who chose option two were willing to co-exist, but at a distance. Participants who chose killing the jaguar or puma as an option were not willing to coexist, but instead socially constructed their relationships as one of conflict as found in chapter one. Options were not mutually exclusive and some respondents chose more than one option.

Sixty-three percent (57/90) of Ticos and 18% (7/38) of Cabécar were willing to change husbandry practices (dimension 1 above) to prevent feline predation. My findings were much lower than another study conducted in Costa Rica that found 93% of ranchers were willing to implement preventative methods in the future (Gordillo-Chávez 2010). Of those who were

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<sup>43</sup> This statement is for discussion purposes only and to point out that many attacks go unrecorded. This data does not take into account that some interviewees may have referred to the same neighbor and that the 42 people were only a representative sample from the SBBD.

willing to change husbandry practices 11% (6/57) of Ticos and 29% (2/7) of Cabécar brought up the concern of financing the physical change and/or extra workload. For example, one 45 year old rancher from Las Lomas said “I would change and enclose my animals only if it was necessary because enclosed animals are double the work.” Two percent (2/90) of Ticos and 37% (14/38) of Cabécar chose to buy a dog to scare the large feline (included in dimension one above).

*Relocation is coexistence at a further proximity:* While for the Cabécar relocation of jaguars or pumas to another area was not an option, 12% (11/90) of Ticos chose to relocate the problem feline if they had a problem. Thirty-four percent (31/90) of Ticos indicated they would contact Panthera, MINAE, park rangers or another expert if they had a problem of predation with jaguars or pumas assuming it would result in the removal of the feline. Together that makes 45% of Ticos who chose to relocate the feline and/or contact Panthera, MINAE, etc. I merged these choices together based on several comments from participants who made this connection. For example, one 45 year old rancher from Las Lomas chose the option to relocate the large feline and followed by saying that he would call MINAE to see what they are able to do. He thought perhaps MINAE would relocate the feline. Another 67 year old rancher from Santa Marta chose relocation and said, “I would call MINAE to do something, they are the only ones that are able to take these animals, for others it isn’t permitted. It would be better to place the puma or tigre in a safe place like a park.” Another 47 year old female rancher/agriculturalist (cilantro) from a near town, Linda Vista, made a similar comment after choosing relocation. She said, “If it were a jaguar or puma I would talk with MINAE in order to take it to a national park...to change the place of the animal is easier than the people.” This statement suggests she is not willing to co-exist in close proximity with large felines.

Relocation poses a concern on multiple levels. First and foremost jaguars have a low rate of survival (Isasi-Catalá 2010).<sup>44</sup> Secondly and perhaps as a result, relocation as a policy and practice does not exist in Costa Rica. According to Panthera's Costa Rican Director, "The government is supposed to respond for cases where wildlife affects people, but this is not done<sup>45</sup> or very rare. The government can remove an animal if they prove it has caused a damage (again very rare, I only know of one case)." This statement was verified when I traveled outside of the SBBD in July of 2014 to Tortugero Corridor (one of the three priority corridors for Panthera) with Panthera's rancher outreach program in order to attend to a jaguar conflict situation.<sup>46</sup> One MINAE official accompanied us as the point of the visit was to transition this ranch on the Caribbean coast from Panthera's program into the hands of MINAE officials.

The rancher was 41 years old and had lived in Barre Pacuare his whole life. He said about 20 years ago there were two jaguars in the area, but they were killed. As we trekked through the marshy terrain, the Panthera field assistant took down the three cameras explaining one of the cameras had captured a jaguar three times in one month—which was practically unheard of in his experience in this program. He commented that all three photos were of the same female jaguar presumably living there. The rancher as well as others in the area had seen her. He said she had been living there for about one year, but until recently she had not killed anything. The rancher said she killed three of his small dogs and one calf. This ranch had been in Panthera's program for two months.

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<sup>44</sup>According to the only systematic study that evaluated the outcomes of jaguar relocation programs over the feline's entire geographical range findings—although not conclusive due to small sample size, n=3.

<sup>45</sup> Prior to contacting Panthera, the 46 year old rancher from Torito said, "When the puma killed some of my animals I called MINAE and they said they can't do anything about it." This sentiment that MINAE does not respond to issues of livestock attacks by felines was illustrated again in a relocation case discussed below.

<sup>46</sup> During my study period the rancher outreach program in the SBBD did not have any jaguar attacks so in order to gather data on a conflict situation with a jaguar I traveled outside of the SBBD.

We stopped at the coast guard station before heading out. The MINAE official went in to talk to the coast guard about the jaguar situation. He reported that the coast guard says, “They see her pass often and she passes close to the school. Many people in the area are concerned.” The MINAE official claimed the problem is that she is on the beach, close to the children, too close—the community is worried. The coast guard specified that people want to kill her if she isn’t removed soon. The rancher made a similar statement, “Many people in this community want to kill this jaguar in retaliation for loss of their domestic animals.” According to the rancher on the other side of the reserve there is a subdivision that is owned by a Spaniard and the jaguar has killed some of the dogs. When I asked the MINAE representative if they had received many complaints he said, “Yes many.” The rancher said “If you don’t take her soon, they will kill her.” The rancher felt differently than many of his neighbors, being a part of Panthera’s program had provided evidence of that, but also he had mentioned multiple times that he wanted to buy a dog that would keep jaguars away—evidence that he was exploring many options of co-existence where the community did not accept coexistence at a close proximity.

As we were leaving the MINAE official said he was meeting with his supervisors to discuss what to do, but he thought it would mostly likely involve trapping her and bringing her up to the Talamanca Mountains. He was going to contact two or three scientists who study jaguars and live in Turrialba, he gave me his contact information and invited me to join them for the relocation of this jaguar. However, the attacks continued and nothing was done to remedy the situation. During one week in September 2014 the community of Barre Pacuare experienced four jaguar attacks on livestock and dogs according to one Barre Pacuare resident and SBBD corridor member.



Although reports from this beach community that a female jaguar and three cubs live in the Barre Pacuare vicinity, when I questioned the Costa Rican Director of Panthera he says, “We only have evidence of a female jaguar and a cub who is six months.” The Panthera biologist said when a female has cubs they usually stay in the area for one year. To the biologist’s recollection these attacks had been going on for roughly one year and more frequently the past six months because of her cub. Unfortunately, the Amistad Caribe region of MINAE/SINAC is not very cooperative and collaborative he explained. He was concerned, but emphasized that Panthera did not have any solutions given this rancher was now in the hands of MINAE. Furthermore, most of the attacks are on dogs and the rancher outreach program includes only cows and pigs. “We don’t have a program for dogs,” he says. They also don’t have anyone in the country who has expertise to relocate jaguars and pumas despite what the MINAE official indicated back in July. Additionally he identified the further challenge with this situation—the problem of moving the mother and her cub. He was scheduled to give a talk on the conflict situation in Barre Pacuare during the latter part of September but it was cancelled because the community was busy fishing for shrimp. He thought it would probably happen after shrimp season.

After observing this Barre Pacuare relocation case and speaking with the jaguar experts at Panthera it appears as though the expertise for relocation does not exist in Costa Rica. This is problematic for those ranchers and individuals who think this is a potential solution to a predation problem. Furthermore, although I observed SINAC officials participating in training to deal with conflict situations in May 2014 at the *International Symposium: Wild Cats Conservation in the Americas* in Sarapiquí, it appears as though (some regions) may not be prepared to pursue the intensity of these conflicts when it becomes a community problem rather than only a rancher issue. Although Panthera’s plan is to have MINAE/SINAC in charge of

many of these conflict situations more work will need to be done toward this end. It doesn't appear that they have the same level of commitment as Panthera to these conflict issues with large felines.

*Impact of Panthera:* Of the 14 ranchers interviewed, 29% (4/14) expressed discontent and/or concerns with the program. These concerns were: Panthera had brought wild cats to the area; Panthera microchips/radio collars (locatable via GPS) felines for monitoring; Panthera does not financially reimburse for losing a cow to feline predation; Panthera places cameras on their property, but program participants never see the resulting pictures; and Panthera does not provide any kind of information at the end of the program.

Misconceptions of Panthera emerged from my data. Although only 5% (6/131) of respondents thought Panthera had brought wild felines to the area, they were all from the west side of the corridor (San Isidro de Pascua, four and Torito, two) where most of my sample reported having an attack. This may be a common misconception as it was found in one other study in south Brazil where 68% of respondents believed that jaguars had been brought in from other regions and released into the Iguaçu National Park (Conforti & Azevedo 2003). However, in this study they specifically asked the question: "What is the origin of the jaguars living in this region? a) Native, b) Brought from other places; c) Some are Native, some are brought; d) Don't know" (Conforti & Azevedo 2003: 217), whereas in my study these questions were not asked but emerged from my data. Below is one program participant who describes some of these concerns and misconceptions.

A 46 year old rancher from Torito who also has ranches in Bonilla Arriba was part of the program. Of the four he was the most direct with his expression of dissatisfaction with Panthera. He says, "I heard that they brought wild cats to the area. Growing up in Torito I never saw a

puma, jaguar or ocelot and now I see all of these different animals in the area.” His frustration was exacerbated through his feelings of economic loss when he emphasized that he suffered more attacks than anyone else in the area—he lost 15 animals—although he acknowledged it was “difficult to keep an eye on all the animals.” For this rancher it may have been easier to express his discontent with Panthera given the attacks and program activities took place at one of his Bonilla Arriba ranchers managed by his two sons. As a matter of fact, during all my rancher outreach visits to this farm I never met this Torito rancher even once. At this same ranch Panthera’s field assistant was concerned because they did not have the Panthera sign up. That could be a result of this rancher’s discontent and the general regional tone of dissatisfaction with Panthera. During the interview, he indicated that he is waiting for Panthera to bring bells to place on the cows. At the time of the interview, his time in the 10 month program had ended and he had not yet seen bells on the cows. Such frustrations are evidence of a lack in communication between Panthera and ranchers. This case also signifies the importance of speaking directly with the owner of the ranch and could be accomplished by coordinating periodic visits so that the owner is available during Panthera’s visit.

The sentiment expressed by this 46 year old rancher in that Panthera brings wild cats to the area reflected a question from the neighbor<sup>47</sup> of another rancher in the program. He asks Panthera’s field assistant if they had been “hunting and trapping jaguars?” The field assistant explained to me that this was a common misconception of rural people. In general they think Panthera hunts the large felines, traps them, to then release them into other areas—assuming the cameras are traps (they are called *camera traps*) that cage felines for transport to another region. Such misconceptions are correlated with research methods used by biologists when they use

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<sup>47</sup> Although this neighbor and the rancher were from Bajo del Volcan, the rancher’s brother is from Torito, a town where this belief exists.

traps to collar large felines. From a social psychological standpoint these misconceptions are dangerous as they have the potential to reaffirm that hunting and trapping felines is acceptable. Although it is difficult for any organization to avoid misconceptions efforts toward clearly identifying the mission of Panthera and its rancher program need to be revealed both publically and privately at every opportunity possible. Otherwise, such a misconception is sure to have an impact on the program.

A 51 year old woman from San Isidro de Pascua owns a ranch with her husband. She discussed their concerns with Panthera and also a related misconception. She says, “They put up an enclosure and placed cameras on the property, but we were never offered a reimbursement for the loss of our calf.” She said, “One milk calf about two months old is worth 180 mil colones [about \$360]. The program lasted 10 months and when they finished they left without giving us any information. We are upset and will not call Panthera in the future.” She expressed her feelings that Panthera should help with more than monitoring the felines. She also explained that she knew some of the felines have a microchip so they can be tracked via GPS. Such examples further illustrate communication barriers that result in misconceptions of large felines and Panthera’s program. This rancher had a lack of understanding of what Panthera offers in their program as Panthera does not offer compensation because they believe it is not a sustainable solution to problems of predation.

This example also highlights communication problems between Panthera and program participants. One 48 year old rancher who lives below Volcano Turrialba never expressed discontent with Panthera, but he had an issue with his plastic enclosure—it was completely torn. He brought this up to Panthera’s field assistant in month nine of the ten month program. The assistant was concerned and didn’t know what exactly to do to remedy the situation during that

visit. The field assistant expressed to me that it was his first time purchasing plastic for an enclosure and admitted to a bit of ignorance in this area where he entrusted the hardware store to provide him with the correct material. When I asked him about other ranches where the plastic seems to be holding up he said, "Those ranchers bought the plastic on their own." In the tenth and last month, August 2014, I accompanied the field assistant to this ranch. He collected all of the cameras on the property. The rancher was not present that day so we left. Then in October 2014 I received a phone call from the brother of this rancher who lives in Torito. He asked if I could help repair the plastic for his brother given the rancher was unable to get in touch with Panthera's field assistant. I said I would talk to Panthera for him. I tried to speak with Panthera's field assistant several times about the rancher's problem with the plastic and finally went to Panthera's Costa Rican director at the end of October 2014. I spoke to the director about the situation and he said he would look into it. In December 2014 I spoke with the rancher to see if Panthera had contacted him regarding the problem with his plastic he said, "No one from Panthera contacted me." This situation began in July (when the issue was first brought up) and during the last contact I had with the rancher, February 2015, nothing had been done yet to repair the plastic. During my conversation with the rancher in December 2014 he was concerned because a puma was seen in the area. He told me, "I am concerned about that puma attacking one of my calves." This rancher has nine dogs and no problems with coyotes who are abundant in the area and are known for killing and eating chickens. Interestingly, back in July this rancher had requested another Panthera sign for his ranch as he wanted to place a deterrent in an area where hunters usually enter his property.

One rancher had not finished the enclosure for livestock after funds were already dispersed. I had accompanied Panthera on four separate visits to this ranch and never once met

the rancher. Panthera's coordinator felt that the rancher wasn't committed because he was never at the ranch during their visits (even when called ahead of time). During my first visit to this ranch the coordinator says, "I spoke to him eight times and he always says 'yes next week it will be done' I am thinking of dropping him from the program" which he indicated he had never done in the three years the program has been operating. According to this rancher he disagreed with Panthera's requirements for how the enclosure was supposed to be constructed. Although this rancher failed to elaborate during his interview, he noted that Panthera wanted him to do other things that he wasn't able to do.

One barrier other participants discussed that this rancher may be eluding to is Panthera's program can only assist in so many ways. For example, it is up to the rancher to place the livestock in the enclosure in the evenings. Some ranchers expressed this challenge in the interviews where 3% (4/131) emphasized the extra workload a change in husbandry practices brings. Such changes necessitate new habits. Habits do not form easily as illustrated in one rancher visit when a calf had been attacked a week prior to our visit. The field assistant explained to the rancher's son that Panthera wanted to help, but there was nothing they could do about the attack if the calves were outside of the enclosure. The rancher was already in the program and the son who was in charge of the ranch did not appear upset about the attack. As a matter of fact he was anxious to see the photos the field assistant retrieved from the camera traps.<sup>48</sup> As part of the program Panthera informed ranchers that they needed to keep livestock in the enclosures/fences and had a check in place for it, in that they didn't always advise ranchers of their visit in order to see if the rancher was using the fence, enclosure, etc.

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<sup>48</sup> This was the only occasion in all my rancher visits that I saw the field assistant share photo information from the camera traps with a rancher.

## Conclusion

My findings suggest coexistence is multidimensional—based on geographical proximity to large felines. Half of my sample is willing to coexist with large felines through a change husbandry practices (enclosures, electric fences, use of dogs, etc.) that allow jaguars and pumas to coexist in close proximity. Just under half of my sample is willing to coexist through relocation—signifying one is willing to live with large felines, but at a distance. Future research needs to analyze these as distinct from one another. The challenge for the rancher program in Costa Rica is currently relocation is not an option but a substantial portion of SBBD residents consider it a solution to the problem of predation. Therefore, my first recommendation is that peer-reviewed research on feline relocation needs to be conducted in order to analyze if it is a viable option for coexistence (Isasi-Catalá. 2010) in Costa Rica. My findings illustrate Panthera's rancher outreach program is able to be impactful with at least the portion of the SBBD residents who are willing to change husbandry practices. Such evidence is hopeful in promoting coexistence.

My findings suggest solutions to conflict and co-existence need to be addressed based on cultural meanings and understandings as discussed in chapter one. For recommendation two, determining the level of conflict and measuring what strategies of coexistence are possible in a given region/culture are necessary prior to program implementation. Moreover what are people in a given ecological space already willing to do to solve problems of predation? For example when asked about how they would handle situations of predation the most common response among Cabécar was not to choose any preventative method. This could be the result of not agreeing or not understanding the concept(s) of the proposed solutions in my Cabécar sample. An acceptable strategy that resonates with Cabécar culture is the use of dogs to scare off jaguars

and pumas, where Ticos preferred electric fences, enclosures, and keeping herds away from the forest. In sum, prior to implementing a program that fosters coexistence, the residents in the program's region need to be questioned to determine what strategies fit into their existing way of life—and these will be different based on culture.

Not only does the program not address cultural differences—and probably as a result—none of the ranchers (including program participants) who contacted Panthera in regards to feline attacks were Cabécar. This speaks to the gap in program attention to the indigenous population of the SBBD, a culture and area in the SBBD where conflict exists as described in chapter one. Moreover the rancher program excludes the indigenous population—holding the most encounters and killings of large felines as reported in chapter one. In sum, strategies of coexistence are culturally sensitive—Cabécar indigenous have the highest conflict with large felines as found in chapter one, but were not included in the rancher program.

Further I found one third of SBBD residents think their livestock have been attacked by large felines, but are not connected to the rancher program. Such evidence speaks to the need for program improvements. Moreover, rancher programs need to have various venues of marketing to create awareness among residents who may have future livestock attacks—this is my third recommendation. A response by Panthera or MINAE to all reported attacks would also educate ranchers and eventually displace misconceptions that all livestock attacks are caused by felines. According to Panthera's program coordinator, it is common for some people in the area to take livestock and leave the head. These people sell the meat on the market. These attacks are blamed on jaguars.



Recommendation four speaks to the eleven<sup>49</sup> ranchers who had attacks, Panthera responded, but the ranchers were not added to the program. How did these ranchers handle their predation problem? Did the attacks continue? Given Panthera responded to 24 attacks since 2010, but only added half of these ranchers to their program, recommendation four is to gather data on each and every rancher who contacts Panthera regarding an attack (including ranchers not added to the program). Moreover, reliable “systematic records of causes of [livestock] mortality” (Amit et al. 2013) are important for efforts of rancher coexistence with large felines. Such data over time will enable future research to target program gaps and enable a better understanding of how to remedy predation problems. For example, did Panthera respond to these 12 ranchers and the ranchers failed to show interest in the program because livestock compensation or feline relocation were not options offered?

The fifth recommendation is to improve communication with participants. All of the concerns expressed by the participants could be addressed with a targeted communication strategy. For example, I recommend Panthera describe their program in more detail upfront including: what they offer *and* what they do not offer (e.g. compensation for livestock loss), why Panthera no longer provides assistance after termination of the program, and the importance of having the Panthera sign placed on the property. Such enhancements would clarify Panthera’s work and open communication channels between Panthera and program participants. When possible these discussions should include the ranch hands and the wives of the ranchers so there is clear communication for all involved.

My final recommendation aims to improve communication, educate ranchers, increase social investment and create coexistence among ranchers. I recommend ranchers accompany

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<sup>49</sup> One rancher had deceased.

Panthera in checking the camera traps.<sup>50</sup> Following these revisions Panthera could upload the photos onto a laptop to show the participants: how the camera trap functions (unlike a jaguar or puma trap that will relocate the feline) and the identification of specific wild animals including large felines on their property. This would be the perfect opportunity to clarify, in layman's terms, that jaguars and pumas were not brought to the region, but rather it will be common to see them more often now as compared to past years because they are beginning to repopulate. This process would help clarify some misconceptions as well as educate ranchers.

This educational activity with camera traps could also be used as a model for training ranchers toward a citizen science framework. Citizen science "is a method of integrating public outreach and scientific data collection" (Cooper, Dickinson, Phillips, and Bonney, 2007: 11). Rocky Mountain Cat Conservancy (RMCC) founded a citizen science project where "Mountain lion biologists taught students about mountain lion ecology, identifying wildlife signs, and using cameras" (Barbara 2012). If implemented teaching ranchers of jaguar and puma prey will be an important component as well. Such a strategy would lighten the burden on Panthera and MINAE and allow SBBD residents to socially invest in the monitoring and management of jaguars and pumas in their community. This structure moves beyond educational efforts toward something much more tangible and engaging. As indicated above, cultural distinctions should be made with every management, outreach and educational effort employed.

Any program designed to foster coexistence between large predators is sure to have barriers in its infancy. It is easy to blame a program for not functioning properly, but much harder to recognize the challenges that any program of fostering human coexistence with large predators faces. The rancher outreach program in the SBBD has been a valuable tool leaving many Costa Rican ranchers content and their livestock protected. It exists as the only direct

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<sup>50</sup> This did occur in some of the visits.

solution to problems of conflict in the SBBD. Despite its positive intentions and impacts, my results demonstrate that there are many challenges facing this program. In this chapter I have made recommendations on how to improve Panthera's program, these should be directed toward MINAE as they take an active role in human feline conflict situations. My findings and recommendations also speak to global efforts toward implementing programs of coexistence between ranchers and large predators.

### **Chapter 3: Understanding Cognition behind Behavior toward Wildlife**

#### **Abstract**

The purpose of this chapter is to merge discourses on the cognition behind behavior toward wildlife. The key question driving this chapter is: *How do cognitive constructs in discussions of behavior toward wildlife and environment parallel and diverge?* Moreover I describe cognitive discourses surrounding human behavior toward environment and wildlife in order to arrive at a consensus of labeling, defining and measuring concepts of cognition for purposes of consistency, clarity, and progress. This chapter contributes to future research on human behavior toward wildlife (including jaguars and pumas) in five dimensions: 1) attitudes do not sufficiently measure behavior; 2) values, beliefs and norms are necessary measures to understand human behavior toward wildlife; 3) research on wildlife conservation would benefit by employing Theory of Planned Behavior and Value Belief Norm Theory, two widely used theories, in future research; 4) The *ascription of responsibility* (AR) cognitive variable from Value Belief Norm Theory and *perceived behavioral control* (PBC) cognitive variable from Theory of Planned Behavior are closely related constructs that are vital to future research on the cognition of behavior toward wildlife; 5) jaguar and puma data and measurements related to AR and behavioral intentions emphasize the importance of these variables in informing practical solutions and outreach interventions, such as a rancher program.

## Introduction

Human dimensions research often assumes that measuring attitudes is sufficient to understand and change behavior. This has been referred to as the cognitive fix, which assumes: (a) “attitudes must change in order to change behavior”; (b) “attitudes have a direct influence on what people actually do, not what they say they might do or would like to do”; (c) “information can change attitudes and the resulting attitude change leads to an increase in pro-environmental behavior” (Heberlein 2012, 11-12). The lines between attitudes and behaviors, however, are often blurred. “Several studies have collected data on attitudes towards a protected area or species and concluded that respondents hold positive attitudes, yet either do not engage in pro-conservation behaviours, or continue to perform behaviours that have negative consequences to conservation goals. These findings are largely a result of a mismatch in the information collected on attitude and behavior” (St John, Edwards-Jones, and Jones 2010, 661).

Due to the critiques of using attitudes alone to predict behavior I turn to existing cognitive theories which highlight the importance of other variables. Fishbein and Azjen (2010), for example, reflect on the theory of planned behavior and highlight the need to include more variables and feedback loops to better understand the relations between cognition and behavior. Stern (2000, 415) identifies contextual and behavioral factors, in addition to attitudinal (including not only attitude, but also norms, values and beliefs among others), which all interact to produce proenvironmental behaviors.<sup>51</sup>

Discussions of cognition behind behaviors toward environment and wildlife have developed complementary concepts and at times have also drawn from some of the same authors (e.g. Shalom Schwartz). But because of a lack of cross-citation, reconciliation of definitions of

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<sup>51</sup> Although contextual and structural variables influence behavior (Heberlein 2012; Stern 2000) these variables are outside of the scope of this chapter.

concepts, and efforts to build and test integrated models, the benefits of sharing understandings across fields has not been accomplished.<sup>52</sup> This chapter is a first attempt to bridge these discourses. I synthesize the body of knowledge on the cognition behind behavior toward wildlife and environment. The key question is: *How do cognitive constructs in discussions of behavior toward wildlife and environment parallel and diverge?* I draw on three key literatures: environmental sociology, environmental and conservation psychology, and human dimensions of wildlife (HDW). I focus Value-Belief-Norm Theory (VBN)<sup>53</sup> and Theory of Planned Behavior (TPB), while also drawing on norm activation theory and new ecological paradigm. I utilize previous studies in order to compare and contrast cognitive variables including: values; beliefs, value orientations; norms; ascription of responsibility and perceived behavioral control behaviors; behaviors and behavioral intentions and their relationships to one another.<sup>54</sup>

### **Integrating Discourses of Cognition**

VBN theory is grounded in: a) ecofeminism's "ethic of care," b) values (e.g., Milton Rokeach, Shalom Schwartz), commons/collective action theory (Elinor Ostrom) and c) norm activation (Shalom Schwartz) literatures. The VBN posits a causal chain of variables that lead to environmental support—defined as: environmental activism, environmental citizenship, willingness to sacrifice, and consumer behavior (Stern, Dietz, Abel, Guagnano, and Kalof 1999, 95-96). VBN theory has been labeled as one of the most comprehensive sociological contributions to understanding attitudes and pro-environmental behavior (Dunlap and Marshall 2007) although to the best of my knowledge it has only been used in one peer-reviewed wildlife study. Similar to how VBN is viewed in relation to pro-environmental behavior, TRA (later

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<sup>52</sup> Henry and Dietz (2012) undertook a similar task with regard to studies of environmental policy systems (ACF) and VBN theory. My chapter, in part, is undertaking a similar task with VBN and TPB.

<sup>53</sup> This theory is also considered to be a part of Environmental Social Psychology, but Dunlap and Marshall in 2007 also place it under "environmental awareness and concern" within Environmental Sociology.

<sup>54</sup> This is not an exhaustive list of the cognitive variables, but a focus on the most common and well-researched.

evolved into TPB with the addition of perceived behavioral control) has been “One of the most influential approaches to attitude over the past 35 years” (Manfredo 2008, 85).<sup>55</sup> And is the most frequented used theory to predict attitudes<sup>56</sup> toward wildlife (Manfredo 2008; Vaske and Whittaker 2004; see also Daigle, Hrubes, and Ajzen 2002; Marchini and Macdonald 2012). However, it isn’t without flaws. Manfredo (2008, 120-121) provides a review of TPB measurement and conceptual limitations.

VBN has been compared to theory of planned behavior (TPB; Ajzen 1991; rooted in Ajzen and Fishbein 1980). Kaiser and colleagues compared the TPB to the VBN Theory and found TPB was able to identify behavior and behavioral intention more fully than VBN. Oreg and Katz-Gerro (2006) on the other hand used some variables from TPB and VBN theory and rather than using VBN values, they included values of harmony and postmaterialism. They found harmony and postmaterialism to have a direct influence on pro-environmental behaviors (e.g. recycling, refraining from driving, and environmental citizenship).

In his chapter on values, Dietz (in press) concludes both TPB and VBN are useful theories and differ in their approach to behavior change. Where the TPB narrows in on very specific behavioral actions, VBN approaches the behavior change indirectly through a change in values. Changing values has the potential to have long term impacts and perhaps influence many decisions regarding wildlife.

*Values:* Stern and colleagues position values as core moving through beliefs (general beliefs/new ecological paradigm flowing to specific beliefs/awareness of consequences) then

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<sup>55</sup> Using a theory of behavior to explain attitudes may be problematic. Attitudes and behaviors, while related, are distinct logically and are less than perfectly correlated. For convenience in language, in this chapter the term attitude is used to cover a diverse set of constructs. I acknowledge the point that ultimately we need precise consensus on definitions of attitudes, behaviors and related constructs to integrate across fields (personal communication with Thomas Dietz September 2014).

<sup>56</sup> Manfredo (2008, 77) validates the use of attitudes within human dimensions of wildlife by citing Allport’s (1954, 45) statement that “the attitude unit has been the primary building stone in the edifice of social psychology.”

through norms (ascription of responsibility and personal norms), which influence behavior. HDW scholars (Manfredo 2008; Vaske 2008;<sup>57</sup> Vaske and Manfredo 2012) have also situated cognitive variables within a hierarchy labeled as the value-attitude-behavior hierarchy (VAB). Manfredo (2008, 151) maintains the “VAB proposes that values affect mid-range attitudes and that mid-range attitudes influence behaviors.” Given the VAB model offered by Manfredo and Vaske includes only three cognitive variables (values, attitudes and behaviors) where VBN contains six cognitive variables I contend wildlife research on cognition would benefit by integrating the VAB and VBN models for future assessments.

Although Stern and colleagues as well as Vaske and Manfredo use values as the base of the cognitive hierarchy there is some confusion in both literatures as to whether beliefs or values are the foundation of the hierarchy. Allport’s (1961, 454) definition of a value is “...a belief upon which a man acts by preference.” Scholars within the HDW have drawn on Allport. For example, Manfredo, Teel, and Zinn (2009, 36) claim, “Beliefs and affect are the building blocks of many key concepts in psychology, including attitudes, norms, and values”. While scholars such as Allport make statements about the relationships of beliefs and values, others suggest the relationship is ambiguous. Dietz and colleagues (2005) claim many studies have verified a strong association between values and other cognitive concepts and this has led to a “theoretical consensus” regarding the assumption “that values are causally prior to beliefs, norms, and other social psychological variables included in models.” However, Dietz concludes that we simply do not have sufficient studies that allow us to assess the causal relationship among values, beliefs of various sorts, attitudes, etc. (personal communication with Tom Dietz September 2014). Whether beliefs or values are the foundation of the cognitive hierarchy is outside of the scope of

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<sup>57</sup> Vaske (2008) is citing Vaske and Donnelly (1999).



this chapter, the point is that more research will need to include and measure these variables in order to understand their relationship in the cognitive hierarchy

In addition to clarity between values and beliefs within the cognitive hierarchy, beliefs and values are often used interchangeably in the literature. VBN Theory found values and beliefs to be separate constructs. Specifically, values were found to have both a direct and indirect impact (i.e., values flowing through beliefs) on behavioral intentions (Stern, Dietz, Kalof, & Guagnano 1995, 1630).

Research has found value differences between environmentalists and non-environmentalists (Dunlap, Grieneeks, and Rokeach 1983). Using Rokeach's work on values, as derived from Maslow, they found environmentalists emphasized higher order values such as aesthetics and an exciting life and deemphasize values such as security. Such value constructs fit rather loosely<sup>58</sup> into Schwartz's openness to change (i.e. environmentalists via aesthetics, an exciting life) versus conservation dimensions (i.e. non-environmentalists via security).

In the HDW literature, Daigle and colleagues (2002)<sup>59</sup> use Schwartz's (2001) two bipolar dimensions: openness to change versus conservation and self-transcendence versus self enhancement. Hunters hold *conservation* values (labeled as traditional by Stern and colleagues) that include security, conformity and tradition (via Schwartz 2001) as well as *self-enhancement* values that include achievement and power and these relate to utilitarian and domination views<sup>60</sup> of wildlife. This is further validated by Manfredo, Teel and Henry (2009, 419) who found

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<sup>58</sup> In order to compare the work by Dunlap and colleagues accurately to the work of Schwartz one would need to include the relevant citations by Milton Rokeach in the analysis.

<sup>59</sup> Manfredo (2008, 150) also discusses the work of Daigle and colleagues to compare it with Schwartz's work in values.

<sup>60</sup> At times the HDW literature considers the label "views" and at other times they are conceptualized as "orientations". I suggest future research come to a consensus on what these concepts should be labeled.

hunting participation to be positively associated with domination.<sup>61</sup> In contrast to their hunting sample, Daigle and colleagues found wildlife viewers and recreationists to be more concerned with equality and global world views of *self-transcendence* values associated with aesthetic and mutualistic perspectives of wildlife.

While these HDW studies have used value orientations, to the best of my knowledge they have not cited the well-established VBN research on values and beliefs. Manfredo (2008, 150) takes important first steps in integrating the HDW research on these cognitive variables with the VBN work. In his synthesis of the research he suggests two correlations: those who have strong values of *openness to change* and *self-transcendence* tend to hold strong *aesthetic* and *mutualistic* views toward wildlife, and those who have *conservation* (often labeled as *traditional* in the environmental value literature) and *self-enhancement* values also tend to have strong *utilitarian* and *domination* views toward wildlife.

Recent advances demonstrate that altruism has a humanistic and a biospheric component (Ciecuch and Schwartz 2012; Dietz in press; Steg, Bolderdijk, Keizer, and Perlaviciute 2014). Steg and colleagues (2014, 106) emphasize human altruism and biospheric altruism values are two kinds of self-transcendence values where hedonic and egoistic are two types of self-enhancement values. Steg, Perlaviciute, Van Der Werff, and Lurvink (2014) argue future research on environmental cognition should include these four values: hedonic and egoistic (part of self-enhancement) and altruistic and biospheric (part of self-transcendence). Dietz (in press) expands on this and suggests environmental decision-making is based on six values rather than four: (a) biospheric, (b) altruism (Schwartz's labels these as self-transcendence), (c) self-interest

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<sup>61</sup> Manfredo, Teel and Zinn's (2009) work also supports HDW's utilitarian value orientation (which is later in their work labeled mastery or domination) as aligning with Schwartz's self-enhancement typology and the mutualistic value orientation with Schwartz's self-transcendence typology.

(self-enhancement according to Schwartz), (d) traditional values (Schwartz's conservation), (e) openness to change, and (f) hedonism.

There appears to be some confusion on value terminology within the HDW literature. To begin, *utilitarian* and *domination* orientations are discussed interchangeably in various places appearing as the same construct. Further, the HDW literature uses the concept *mutualism* which is used interchangeably with *egalitarian*. Both *egalitarian* and *mastery* in the HDW literature appear to be drawn from Schwartz's work on cultural values making them consistent terms for cross-referencing. However, labels such as *utilitarian*, *domination*, and *aesthetic* are also used in the HDW literature and coincide with the earlier work done by Kellert<sup>62</sup> (Manfredo 2008). *Mastery* is a cultural value used by Schwartz and also used in the HDW literature and could replace *domination*<sup>63</sup> and *utilitarian* orientations.<sup>64</sup> Using labels created by Schwartz will draw on his well-established value literature, reduce confusion where various labels have the same meaning, and provide clarity on concepts for future research.

*Beliefs and Value Orientations:* In the HDW literature, value orientations<sup>65</sup> "reflect the influence of ideology on an individual's values" (Manfredo, Teel and Zinn 2009, 38).<sup>66</sup> While value orientations are part of HDW cognitive discussions, beliefs are not, which may be an indication these concepts are similar (Vaske & Manfredo 2012). Value orientations in HDW

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<sup>62</sup> Kellert claimed to be defining value typologies, but actually measured attitudes.

<sup>63</sup> For example, Manfredo and Teel (2008) use domination and mastery to present a value orientation. Throughout the article they drop the mastery and keep the domination label. It would be better to do the reverse. In other words, drop the domination label connected to Kellert's work and keep the mastery label connected to Schwartz's work.

<sup>64</sup> Measures of these concepts would need to be compared in order to come to a consensus on terminology.

<sup>65</sup> That being said, value orientations may not have clear boundaries, as Manfredo (2008, 156) asserts, "The values literature uses the concept of orientations somewhat loosely". Such constructs may not only have ambiguous parameters, but they have been defined using multiple labels including not only values orientations (e.g. domination and mutualism; Manfredo, Teel, and Zinn 2009), but also cultural ideologies (e.g. domination and egalitarianism; Vaske and Manfredo 2012), and cultural value orientations (e.g. mastery and egalitarianism; Schwartz 2006). To complicate matters further, Schwartz (2006) brands these orientations or ideologies mastery (rather than domination) and egalitarianism (rather than mutualism), while Manfredo, Teel and Zinn (2009) use both mastery and domination and egalitarianism and mutualism.

<sup>66</sup> Manfredo et al. draw on the work of Clyde Kluckhohn to define value orientations toward wildlife.

may be similar to what VBN labels as general beliefs or worldviews (e.g. new ecological paradigm, NEP). “The NEP scale primarily measures broad beliefs about the biosphere and the effects of human action on it...The NEP is a worldview that predisposes an individual to accept more narrowly focused AC [awareness of consequences] beliefs” (Stern et al. 1999, 85).

Manfredo and Teel (2008) find two primary value orientations toward wildlife exist in their research on public attitudes: egalitarian or mutualism and domination or mastery. A *mutualism wildlife value orientation* “views wildlife as capable of living in relationships of trust with humans, as life-forms having rights like those of humans, as part of an extended family, ...as deserving of caring and compassion...more likely to engage in welfare-enhancing behaviors for individual wildlife” (Manfredo 2008, 198-199), and are “less likely to support actions resulting in death or harm to wildlife” (Manfredo et al. 2009, 39). The NEP, in a broad sense, may be similar to those with a mutualism orientation toward wildlife. For example one measure from the NEP scale suggests agreement with the statement, “Humans are severely abusing the environment” (Stern et al. 1999, 95).

The dominant social paradigm (DSP) from environmental sociology and VBN literature may be a parallel concept to mastery and domination in the HDW literature then. For example, a *domination wildlife value orientation* can be defined as “human mastery over wildlife...the stronger one’s domination orientation, the more likely he or she will be to prioritize human well-being over wildlife, accept actions that result in death or other intrusive control of wildlife, and evaluate treatment of wildlife in utilitarian terms” (Manfredo, et al. 2009, 38-39). Likewise, the DSP suggests agreement with the statement, “The balance of nature is strong enough to cope with the impacts of modern industrial nations” (Stern et al. 1999).

Domination/mastery and mutualism/egalitarianism in HDW may be connected to Schwartz's cultural values work. This cultural research is separate from his work on basic individual human values, which Schwartz (2006) calls his "individual-level" work. He has also conducted "cultural-level theories"<sup>67</sup> which include seven cultural value orientations: intellectual and affective autonomy/embeddedness; hierarchy/egalitarianism; mastery/harmony (Schwartz 2011). Future research will need to disentangle whether HDW value orientations of domination/mastery and mutualism/egalitarianism are cultural values (Schwartz), general beliefs/worldviews as I suggest similarities above (NEP/DSP) or specific beliefs (e.g. awareness of consequences).

TPB differs from the above theoretical discussions in that it attaches the three primary pre-behavioral antecedent variables: attitudes (referring to an individual's positive or negative evaluations of the behavior), subjective norms (social networks that may or may not approve of the behavior) and perceived behavioral control (the individual's perception of their ability to perform the behavior) to beliefs (Fishbein and Ajzen 2010, 223). Ajzen claim these three variables are founded in readily accessible beliefs (Ajzen 2012, 18). In Ajzen's (2012) assessment of the study done by Hrubec, Ajzen and Daigle (2001, 21) who defined behavioral beliefs in relation to wildlife Ajzen said:

In pilot work, the investigators identified a set of twelve accessible behavioral beliefs, Including the beliefs that this behavior can lead to familiarity with nature and a sense of competence, to viewing scenery and enjoying nature, to observing and learning about wildlife, and to developing or maintaining significant relationships with family and friends. Additional behavioral beliefs had to do with the perception that hunting is relaxing and relieves stress and that it affords solitude and time to think.

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<sup>67</sup> Schwartz (2011) acknowledges his work in both the individual and cultural dimensions of values may be confusing and has produced a chapter to clarify how these theories work together.

However, in the study done by Hrubec and colleagues (2001) they define these variables as *wildlife value orientations*.<sup>68</sup> For example, Hrubec and colleagues found enjoyment of wildlife was a value orientation where Ajzen referred to enjoying nature from that study as a behavioral belief. This example demonstrates *beliefs* (Ajzen 2012) and *value orientations* (Hrubec et al. 2001) have been used interchangeable in the literature which comes as no surprise, as I have suggested above, these concepts are very closely related if not the same.

In comparing values and beliefs or value orientations across VBN and VAB there are similarities with VBN and VAB in that they both use values at the base of the cognitive model, as suggested above. VBN and VAB contrast in that value orientations in the VAB model follow values, whereas in VBN NEP (i.e. general beliefs) follow values. Following NEP in the VBN theory is awareness of consequences (AC) or specific beliefs (as opposed to general beliefs such as NEP) where VAB does not use a measure for specific beliefs. This is yet another indicator that value orientations used in VAB and the HDW literature in general appear to be closely related to general beliefs (NEP) in VBN.

Finally, reflecting on TPB and VBN, one commonality regarding beliefs exists in that both models position beliefs to precede norms in the cognitive hierarchy. Further both VBN and TPB use a measure of specific beliefs. Unlike VBN these beliefs in TPB underlie specific variables: attitudes, subjective norms and perceived behavioral control.

Overall the literature has been imprecise and not sufficiently self-referential in defining and operationalizing ideologies,<sup>69</sup> beliefs/worldviews, and value orientations across studies.

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<sup>68</sup> Wildlife value orientations and fundamental life values (Schwartz) were both measured in this study in addition to TPB variables.

<sup>69</sup> Manfredo, Teel and Zinn (2009, 37) consider ideology “a broader and more inclusive concept than values” and further “Manfredo and Teel (chapter 8) proposed that integrating ideology into the VAB model is critical in understanding the meaning people assign to values and will enhance the use for VAB in intergroup and cross-cultural study” (Manfredo 2008, 156). Further, ideology has been equated with the notion of worldview (Manfredo 2008, 155 citing De St. Aubin, 1996) which would position it alongside of NEP. Manfredo and Teel (2008) cite

While research in this direction is underway (Kelly et al. forthcoming) future research on cognition behind behavior toward wildlife must engage in these discussions in order to bring about a consensus on the use of terminology, as well as articulating empirical distinctions in order to disentangle these cognitive constructs from one another.

*Norms*: are usually discussed in two ways: social and personal. *Social norms* are defined as “standards shared by the members of a social group” (Vaske and Manfredo 2012, 47). There are two types of social norms: *Descriptive norm* are what people *should* or *ought* to do (Vaske and Manfredo 2012, 47), which are similar to *behavioral regularities* (Heberlein 2012, 92); and *injunctive norm* are what people say they should do, even if people don’t always do it (Heberlein 2012, 92). *Personal norms* are defined as an individual’s own expectations, learned from experience, and modified through interaction (Vaske and Manfredo 2012, 47) where “feelings of personal obligation that are linked to one’s self expectations” (Schwartz 1977) can go against *social norms* (Heberlein 2012, 93).

Another research agenda for norms has been in how norms are perceived or in the perceptions of social norms (Heberlein 2012, 93). TPB labels this as *subjective norm/perceived social pressure* (i.e., what you think others would want you to do) (Vaske and Whittaker 2004, 284). Critiques of the subjective norm as being too narrow reflecting only the injunctive component of social norms and leaving out the descriptive norm<sup>70</sup> have been made (Manfredo 2008, 122). Such analyses are supported by empirical evidence. For example, in Marchini and Macdonald (2012) study of ranchers’ jaguar-killing behavior subjective norms were not found to influence ranchers’ intention to kill jaguars,<sup>71</sup> while descriptive norms were found to be an

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Schwartz’s (2006) three biopolar dimensions as ideologies (embeddedness/autonomy; hierarchy/egalitarianism; harmony/mastery), where Schwartz (2006) labels these cultural value orientations.

<sup>70</sup> Descriptive norm was included in TRA (Ajzen 2012).

<sup>71</sup> This could be a matter of conclusions that fail to differentiate between direct and indirect effects.

influence. Unlike Marchini and Macdonald (2012) other HDW researchers found subjective norms to be important in predicting behavioral intent (Hrubes et al. 2001; Martin and McCurdy 2009; Willcox, Giuliano, and Monroe 2012).

Not only does TBP fail to address descriptive norms, but it does not include personal norms (Vaske and Whittaker 2004, 290) which is problematic because “personal norms are far more influential and enduring than social norms in the moral choice context” (Manfredo 2008, 119 citing Schwartz). Further VBN work by Stern and colleagues suggests a personal norm is “the main basis for individuals’ general predispositions to proenvironmental action” (Stern 2000, 413). VBN findings suggest proenvironmental personal norms are predictors of all three dimensions of non-activist environmental support (behavioral intentions and self-reported behaviors) in the form of policy support, private-sphere behaviors, and environmental citizenship<sup>72</sup> (Dietz, Stern, and Guagnano 1998; Stern, et al. 1999). The differences could be the result of the stronger association between ascription of responsibility (AR) and personal norms, where subjective norms are not as predictive of moral choice decisions (Manfredo 2008). In contrast to TPB, VBN attends to this personal norm element in connection with moral choice, but fails to include social norms in the model. Future research should consider including measurements for both social (descriptive and injunctive) and personal norms.

*Ascription of Responsibility:* contains a total of three belief dimensions: personal moral obligations, obligations of government, and obligations of business and industry (Stern, Dietz and Black 1999).<sup>73</sup> Drawing on these distinctions, chapter two findings reveal some participants

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<sup>72</sup> This is another area where the literature could be more coherent and less ad hoc. For example, what decisions and behaviors matter and how should they be categorized. The trichotomy offered by Stern and colleagues might be a starting point to be later modified.

<sup>73</sup> Stern, Dietz and Black (1999, p. 96) used a personal normative beliefs scale in measuring ascription of responsibility in three dimensions: “I feel a personal obligation to do whatever I can to prevent climate change;” “The government should take strong action to reduce emissions and prevent climate change;” “Business and industry should reduce their emissions to help prevent climate change.”



ascribed personal responsibility to solve the problem of feline predation where others ascribed responsibility to government or Panthera, an organization. As reported in chapter two, 63% of Ticos and 18%<sup>74</sup> of Cabécar were willing to change husbandry practices and 34%<sup>75</sup> of respondents believed it was the obligation of Panthera, MINAE, park rangers or another expert if they had a problem of predation with jaguars or pumas. In a study conducted in Brazil researchers measured ascription of responsibility, labeling the question as part of an attitude scale. It reads: “Who should solve the problem of jaguar and puma predation.” They found 80% of their participants thought local authorities should address the problem of predation, whereas 44% thought each ranch should solve the problem of predation on its own (Zimmerman et al. 2005). In Costa Rica less people think it is the responsibility of local authorities (government/organizations) than in Brazil. The differences between the Tico sample and the Brazilian sample could have resulted from the way the data was gathered. Moreover, in the Brazilian study the above question was part of their interview instrument whereas in the Costa Rican study, the data emerged.

Ascription of responsibility is an important indicator in understanding human behavior toward wildlife and large predators in that it informs conservationists what regional beliefs exist regarding who is responsible for solving problems of predation. This has important implications for programs of coexistence, such as the rancher outreach program discussed in chapter two. Moreover, if ranchers who have predation problems think local authorities should solve the predation problem and the problem is not solved this could result in negative consequences for large predators.

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<sup>74</sup> I cannot conclude with certainty that the 63% of Ticos and 18% of Cabécar considered it a personal obligation to change husbandry practices without asking them directly as done in the Zimmerman et al. 2005 study.

<sup>75</sup> This figure could be as high as 45% as I discuss in chapter two given 12% of Ticos chose relocation which is commonly understood as a responsibility and practice conducted by experts.

*Perceived Behavioral Control: Ascription of responsibility* (AR) from VBN and *perceived behavioral control* (PBC) from TPB may be closely related constructs (Dietz in press) in the sense that they may be highly correlated. For example, one may avoid placing AR on themselves if they do not perceive behavioral control over the desired action. As explained above, AR is an obligation one places on self “for the undesirable consequences to others, that is, the belief or denial that one’s own actions have contributed to or could alleviate those consequences” (Schwartz 1977), whereas, *perceived behavior control* (PBC) draws from control beliefs in TPB, meaning, “beliefs about the presence of factors that may facilitate or impede performance of the behavior and the perceived power of these factors (Ajzen 2012, 18). For example, Marchini and Macdonald (2012) used subjective norms and perceived behavioral control, components of the TPB,<sup>76</sup> to understand motivations of ranchers’ *jaguar-killing behavior*. Although variation existed between their Pantanal and Amazonia sample, they found that while jaguar impact on livestock influenced ranchers’ intention to kill jaguars, it was not the only motivation. Perceived behavior control both motivated and deterred ranchers’ jaguar-killing behavior. Ranchers who owned large properties had a stronger sense of control over killing jaguars, while lack of skills and equipment as well as illegality prevented some ranchers from killing jaguars. Unlike TPB, in VBN theory it is assumed that AR captures PBC.

In chapter one I found the majority of ranchers did not kill jaguars and pumas. Undeniably a PBC measurement would have been useful. For example, the majority of ranchers may not kill large felines because of illegality issues. If these questions would have been asked, it would have demonstrated the impact of policy on whether jaguars and pumas are killed in Costa Rica, for example. If ranchers do not perceive behavioral control due to issue of national law against killing jaguars and pumas, then ranchers may ascribe responsibility to the

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<sup>76</sup> The Ajzen (1985) version

government to solve the problem of predation. This has important implications for feline conservation efforts. I suggest future studies incorporate questions of PBC and AR.

*Behavioral Intentions and Perceived Behavioral Control:* The link between PBC and behavioral intentions is weak. One study found PBC to influence behavioral intentions (Marchini and Macdonald 2012) where other studies measuring behavioral intentions (Martin and McCurdy 2009; Wilcox et al. 2012) and self-reported behaviors (Hrubes, et al. 2001) did not find PBC to influence behavioral intentions. Ajzen (2012, 20) summarized the research claiming the intention-behavior relationship has been correlated in only a few studies using perceived control as a moderator. More research is needed to understand the relationship between these two cognitive variables.

*Behavioral Intentions:* are often measured due to the challenges of measuring actual behaviors. While collecting data on human behaviors can be done through observations, self-reports are usually common. In two of VBN's three behavioral categories *environmental citizenship* and *consumer behavior* they use self-reported behaviors, whereas the third category *willingness to sacrifice* is a behavioral intention. Fishbein and Ajzen (2010) clarify these measurement constructs where willingness, behavioral expectations and intentions are all considered "readiness to engage in a behavior" (p. 43).

In the HDW literature the willingness variable most commonly used is willingness to change husbandry practices and is closely related to willingness to sacrifice. For example, in the literature on human feline relations Conforti and Azevedo (2003) found 71% of Brazilian ranchers were willing to change husbandry practices especially if they could get financial support. I suspect the financial support element may differentiate willingness to sacrifice from willingness to change husbandry practices. For example, if a rancher is willing to change

husbandry practices without financial assistance from an external source this would be considered a more intense sacrifice than a rancher who would change only if the transformation was paid for by another institution or government agency. In comparison to Brazil, less Costa Rican participants were willing to change. Moreover 50% (64/128) of a Costa Rican sample were willing to change husbandry practices to prevent feline predation, 63% (57/90) of Ticos and 18% (7/38) of Cabécar indigenous respectively (see chapter two).

The actual behavioral intention construct is not commonly used in the HDW literature. In one study measuring behavioral intentions of Brazilian ranchers to kill jaguars, 46% of the Pantanal sample and 15% of the Amazonia sample intended to kill the next jaguars that appeared on their property (Marchini & Macdonald 2012). In Costa Rica findings reveal 8% (10/128) of residents in a biological sub corridor would kill felines if they had a predation problem, 2% (2/90) of Ticos and 21% (8/38) of Cabécar indigenous respectively (see chapter one). Including levels of willingness to sacrifice will be crucial in future wildlife studies. For example, whether a rancher is willing to change husbandry practices only with the assistance of an outside source is essential data that will inform outreach interventions and practical solutions regarding human conflict with large predators.

*Behaviors:* Stern and colleagues approach to the behavior element in the VBN theory was through individual behaviors that support the environmental movement. In addition to activism behaviors, Stern and colleagues (1999, 82) delineate non-activist behaviors into three categories: 1) low commitment active citizenship involves: “political activities that are less public or present less risk than engaged activism. These include writing letters to political officials, joining and contributing funds to movement organizations, and reading movement literature; 2) support and acceptance of public policies: “may require material sacrifice in order to achieve the movement’s

goals...For example, environmental and wildlife policies often require individuals to pay higher prices or higher taxes or to submit to regulation of their behavior (e.g., hunting bans)”; 3) changes in behavior in the personal or private sphere: “consumer behaviors such as reductions in energy use and purchases of environmentally benign products”.

Through a much different lens than VBN, Fishbein and Ajzen (2010, 29) describe four characteristics that make up individual behavior, “the *action* performed, the *target* at which the action is directed, the *context* in which it is performed, and the *time* at which it is performed”. All four of these components can be general or specific. Comparing these four behavioral components with the three non-activist forms of behavior from the VBN work of Stern and colleagues (1999) it appears as though VBN uses *action*, *target*, *context*, and *time*.

I illustrate here how VBN uses these characteristics of behavior as explained by Fishbein and Ajzen in one wildlife study measuring pro-conservation behaviors after a zoo visit (Skibins and Powell 2013). The study dichotomized species oriented and biodiversity oriented behaviors where actions included: charitable contributions, volunteering, membership of an organization, newsletter sign up, endorsing public policy, electing officials, and purchasing wildlife friendly products. These are *action* elements within environmental citizenship, willingness to sacrifice, and consumer behavior of VBN. The *target* in these questions is to reduce the harm and increase the protection through various levels of support to wildlife. The *context* is within personal sphere domains.

While the *time* element was not included in the above study, measurements in VBN ask “how often” on a scale of not at all, to actions taken in the previous twelve months. According to Fishbein and Ajzen (2010, 34) time has three elements: *dichotomous criterion*, *magnitude criterion*, and *frequency criterion*. *Consumer behavior* in VBN for example uses two of these

three: 1) *dichotomous criterion* can be measured by whether a person did or did not donate within a given time period; 2) *frequency criterion* of how many times a year, for example, these donations were made; 3) *magnitude criterion* is the amount of money donated within a given period of time. Future research using VBN will need to develop action elements oriented around wildlife.

## **Conclusion**

Scholarship on cognition should be engaged in a cross-disciplinary dialogue to build on foundational work accomplished throughout the last few decades. This chapter helps to bridge that gap examining similarities and contrasts with different theoretical approaches to understanding behaviors toward environment and wildlife. In synthesizing cognitive variables associated with well-known theories, specifically VBN and TPB, this chapter offers future research ideas embedded in these theoretical constructs. Without a doubt, future research will need to arrive at a consensus of labeling, defining and measuring concepts of cognition for purposes of consistency, clarity, and progress. As demonstrated in this chapter, values, beliefs and norms have many points of integration. As these two areas engage in a dialogue with one another, the foci of application in human dimensions of wildlife as well as theory in environmental sociology and environmental and conservation psychology are sure to be complementary providing fruitful ideas for studies and methodological approaches to build upon the existing knowledge and predictions of behaviors toward wildlife.

## Conclusion

Human conflict and coexistence with jaguars and pumas cannot be understood without a theoretical and methodological foundation in the social sciences. Thomas Heberlein explains in *Conservation Biology* in 2012, “Before conservation biologists and others plunge into the social sciences they need training” (584). He continues to describe the concern that many conservation biologists are conducting research on the human dimensions of wildlife, but lack theoretical grounding in the social sciences. Such research, he proclaims, leads to false understandings of how attitudes and behaviors play into large predator conservation (Heberlein 2012, 585). Heberlein’s point is relevant to research on human dimensions of jaguars where to date most work has been done by conservation biologists with little or no social science training.

My dissertation study then was designed to understand the human dimensions of jaguar and puma conflict and coexistence from a social science perspective. Moreover, my study has produced a foundation for social science research regarding sociocultural meanings, social barriers inhibiting programs of coexistence, and cognitive constructs behind human behavior toward jaguars and pumas. These diverse research areas are building block to understand human behavior toward jaguars and pumas. As Dickman, Marchini and Manfredo (2013) highlight the direct economic costs posed by large carnivores (e.g. livestock predation) does not alone predict attitudes toward predators, rather attitudes are driven by interconnected components of an individual, society and culture. In an effort to draw together these units of analysis surrounding jaguars, where only a paucity of research exists, I argue these chapters provide a baseline of knowledge toward the overarching goal of coexistence with jaguars and pumas in a biological corridor—an ecological space untraversed by many humans and therefore an exceedingly difficult geographical place to cohabit with large dangerous animals.

In chapter one I identify the situation of conflict through the existing sociocultural meanings ascribed to large felines in the SBBD. Moreover, I present data on the multiplicity of meanings and cultural differences embedded in human conflict with jaguars and pumas. Findings suggest indigenous peoples encounter and kill jaguars and pumas more than Ticos. Cabécar indigenous have more conflict with large felines and have constructed felines as food, as opposed to Ticos. The more frequent conflict is most likely a result of the fact that Cabécar have real encounters with felines while there are fewer among the Ticos. Although variation exists, for both Cabécar and Ticos jaguars and pumas were constructed as man-eaters and competitors embedded in a hunting culture.

In chapter two I describe the functionality and barriers of a rancher outreach program designed to reduce conflict with jaguars and pumas. My findings reveal half of the SBBD sample is willing to coexist with large felines through a change in husbandry practices (enclosures, electric fences, use of large Eurasian dog breeds), while just under half of my sample is willing to coexist with large felines, but at a much further proximity, through predator relocation. These findings suggest coexistence is multidimensional—based on geographical proximity to large felines—and strategies of coexistence are culturally sensitive—Cabécar indigenous have the highest conflict with large felines, but were not included in the rancher program. Furthermore, coexistence efforts are impinged by misconceptions among SBBD residents. Moreover, a much larger portion of SBBD residents reported livestock predation by large felines than the rancher program responded to.

I close with an integrative chapter on cognitive discourses surrounding human behavior toward wildlife in order to arrive at a consensus of labeling, defining and measuring concepts of cognition for purposes of consistency, clarity, and progress. This chapter contributes to future



research on human behavior toward wildlife (including jaguars and pumas) in five dimensions: 1) attitudes do not sufficiently measure behavior; 2) values, beliefs and norms are necessary measures to understand human behavior toward wildlife; 3) research on wildlife conservation would benefit by employing Theory of Planned Behavior and Value Belief Norm Theory, two widely used theories, in future research; 4) The *ascription of responsibility* (AR) cognitive variable from Value Belief Norm Theory and *perceived behavioral control* (PBC) cognitive variable from Theory of Planned Behavior are closely related constructs that are vital to future research on the cognition of behavior toward wildlife; 5) jaguar and puma data and measurements related to AR and behavioral intentions emphasize the importance of these variables in informing practical solutions and outreach interventions, such as a rancher program.

My study not only offers a theoretical foundation for social science research on sociocultural and individual behaviors toward jaguars and pumas in chapters one and three, but in chapter two practical recommendations for implementation in rancher outreach programs are described. First, peer-reviewed research on predator relocation needs to be conducted in order to analyze if it is a viable option for coexistence in a proposed region. Second, prior to program implementation residents of the proposed region need to be questioned to determine the level of conflict that exists. In turn, these results would then be evaluated to find strategies that fit into the pre-existing way of life. Next, data collection needs to be conducted with each rancher who has had or who think they have had a feline attack on their livestock. This includes also ranchers who have experienced livestock predation, but are not added to the rancher program. Such data will determine how best to foster coexistence with various ranchers and situations. Fourth, citizen science is one mechanism to simultaneously foster education and social investment while at the same time alleviating program resource limitations. Fifth, rancher programs need to have

various venues of marketing to create awareness among residents who may have livestock attacks, but not be aware of what solutions may exist. This includes a tight connection between the coexistence program and the government ministry managing human-wildlife conflicts. Sixth and finally communication between the program and the ranchers is important to the success and continuation of the program and thus careful attention needs to be deployed at every step of the process.

In addition to pragmatic suggestions for programs of coexistence, I offer an array of measurement questions to be used in future research designs targeting conflict with humans and large bodied predators. These include questions of predator market use such as: are there professional jaguar and puma hunters in the area? Is there a market for selling jaguar and/or puma skins? If so, what is the value of a jaguar/puma skin, who is the buyer, and where are the buyers from? Questions of predator consumption and use by indigenous peoples are also vital to understanding the conflict situation. These include: traditions associated with feline consumption, frequency of jaguar and/or puma consumption, and how many neighbors, relatives, friends consume large predators. Measurement questions targeting perceived behavioral control, ascription of responsibility, and levels of willingness to sacrifice are will be useful for practical solutions to human conflict with large felines.

Finally, in both chapter one and two I identify culture as a key determinant in conflict reduction efforts as well as coexistence endeavors. In chapter one I argue indigenous meanings capture both a traditional and modernized relationship with large predators. While this creates ambiguities in the conflict situation with jaguars and pumas it is imperative to avoid romanticizing of a kinship between indigenous people and large predators that is based solely on respect. For example, while Amerindians may have kept the skin of a dead jaguar in the past as

a symbol of bravery (Roe 1998) today the skins are sold by Cabécar indigenous to outsiders for profit in the SBBD of Costa Rica. This illustrates that current day economic and political interactions blend with ancient traditions to create new relationships and meanings.

Furthermore, cultural differences are present in coexistence efforts. For example, large Eurasian breed dogs were chosen over enclosures and electric fences for predation reduction among Cabécar. This is evidence of a cultural sensitivity in programs aiming to reduce conflict. These findings emphasize the complexities and intricacies in the human relationship with large cryptic carnivores as well as the implications for conservation and co-existence.

Sociocultural meanings inherent in human predator conflict, programs to minimize rancher conflict with large predators, and the cognitive constructs that motivate behavior toward wild animals are all vital research avenues toward understanding human coexistence with large bodied carnivores in the ecological space of biological corridors. These chapters have created a multidimensional foundation for social science research on jaguars and pumas. My study is the first social science research aimed at understanding the capacity for human coexistence with jaguars and pumas in a biological corridor within the largest corridor system in the world, the Mesoamerican Biological Corridor. This research is important for jaguar and puma conservation efforts, for understanding coexistence within biological corridors, and for human coexistence with large bodied predators globally.

## APPENDICES

APPENDIX A:  
Interview Questions

1. Do you think jaguars would attack humans without being provoked? If so, do you know of any such incidents (retrieve as many details as possible)?
2. Are you aware of any big cats killed close to your house or in the area (retrieve as many details as possible)?
3. How many of your neighbors do you think kill jaguars and pumas?
4. When was the last time you saw a jaguar or a sign of jaguars (tracks, etc.) and/or pumas and what was the location? What happened when you saw the jaguar or puma? And how did that make you feel? If you were to see a jaguar how would you feel? If you were to see a puma how would you feel?
5. **\*If participant has livestock:** Would you be willing to change in your husbandry practices in order to minimize predation on your livestock? If yes...what would you suggest for solving the problem? (Let them respond w/o probing. If they don't understand the question or have no response, then you can give them the below choice):  
I have 6 suggestions, which one(s) do you prefer?
  - a. Using preventative methods in the property (use predator proof-enclosures during night, use electric fences to surround pastures and/or enclosures, keep herds away from the forest, etc.).
  - b. Purchase a dog to scare jaguars and pumas away.
  - c. Killing the problem jaguar/puma.
  - d. Financial compensation for livestock losses by jaguars or pumas.
  - e. Relocating the problem jaguar/puma.
  - f. Removing/eradicating all jaguars/pumas from the area.
  - g. Restructuring the food chain (reintroduction of native species extinct locally).
6. **\*Participant without livestock:** If you had a jaguar or puma close to your house what would you do? What would you suggest for solving the problem? (Let them respond w/o probing. If they don't understand the question or have no response, then you can give them the below choice):  
I have 6 suggestions, which one(s) do you prefer?
  - h. Using preventative methods in the property (use predator proof-enclosures during night for pets; electric fences to keep predators from entering your yard).
  - i. Purchase a dog to scare jaguars and pumas away.
  - j. Killing the problem jaguar/puma.
  - k. Financial compensation for livestock losses by jaguars or pumas.
  - l. Relocating the problem jaguar/puma.
  - m. Removing/eradicating all jaguars/pumas from the area.
  - n. Restructuring the food chain (reintroduction of native species extinct locally).
7. Have you hunted jaguars and/or a pumas ever? Do you hunt jaguars and/or pumas regularly (Retrieve as many details as possible)?
8. Have you ever killed a jaguar and/or puma? Do you kill them regularly (Retrieve as many details as possible)?
9. Do people poach wildlife on your land? If so which animals (Retrieve as many details as possible)?

10. Has anyone ever poached a jaguar or puma on your land (Retrieve as many details as possible)?

\*Data related to “killing the problem jaguar/puma” is described in this chapter. Other findings related to this question can be found in chapter three.

APPENDIX B:  
Interview Questions for Future Research

1. Who should solve the problem of jaguar and puma predation?
2. What has prevented you from killing jaguars and pumas?
  - a. lack of skills
  - b. lack of equipment
  - c. it is illegal
  - d. they are rare
  - e. it is immoral
3. Which animals do you consume that have spirit of the mountain? (use local animal names)
  - a. Jaguars
  - b. Pumas
  - c. Other local predators and common prey species

*Jaguars*

4. **If choose a or b above:** How often do you consume jaguar?
5. **If choose a or b above:** What parts of the jaguar do you consume?
6. How many neighbors, relatives, and friends consume jaguars?
7. What parts of the jaguar generate money? What is the value of each?
  - a. Skin
  - b. Teeth
  - c. Bones
  - d. Other?
8. Are there professional jaguar hunters in the area?
9. Is there a market for selling jaguars skins?
10. What type of person purchases the jaguar skin (e.g. wealthy)?
11. Where does the buyer live (e.g. nearest big city)?

*Pumas*

12. **If choose a or b above:** How often do you consume puma?
13. **If choose a or b above:** What parts of the jaguar do you consume?
14. How many neighbors, relatives, and friends consume pumas?
15. What parts of the puma generate money?
  - a. Skin
  - b. Teeth
  - c. Bones
  - d. Other?
16. Are there professional puma hunters in the area?
17. Is there a market for selling puma skins?
18. What type of person purchases the puma skin (e.g. wealthy)?
19. Where does the buyer live (e.g. nearest big city)?

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