

Residents' Attitudes, Perceptions, and Encounters with Predatory Cats in El
Cielo Biosphere Reserve, Tamaulipas, Mexico

THESIS

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By

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CHAPTER 1

INTRODUCTION

What spatial characteristics play the greatest role in the occurrence of human–predatory cat encounters in El Cielo Biosphere Reserve? What are the perceptions and attitudes of residents towards these carnivores? This study examines residents’ experiences with large predatory carnivores in El Cielo Biosphere Reserve, Tamaulipas, Mexico (Figure 1.1). The location of encounters and the perceptions residents have of these mammals play a role in people’s experiences with large predators. This study examines the spatial interactions between people and the large predatory mammals [mountain lions (*Felis concolor*) and jaguar (*Panthera onca*)] found in northern Mexico.

By examining the spatial aspects of encounters, I seek to understand where and in what kinds of places in the reserve these encounters most frequently occur. Understanding the place characteristics of these encounters will aid in the effort to educate the residents and tourists alike. Temporal

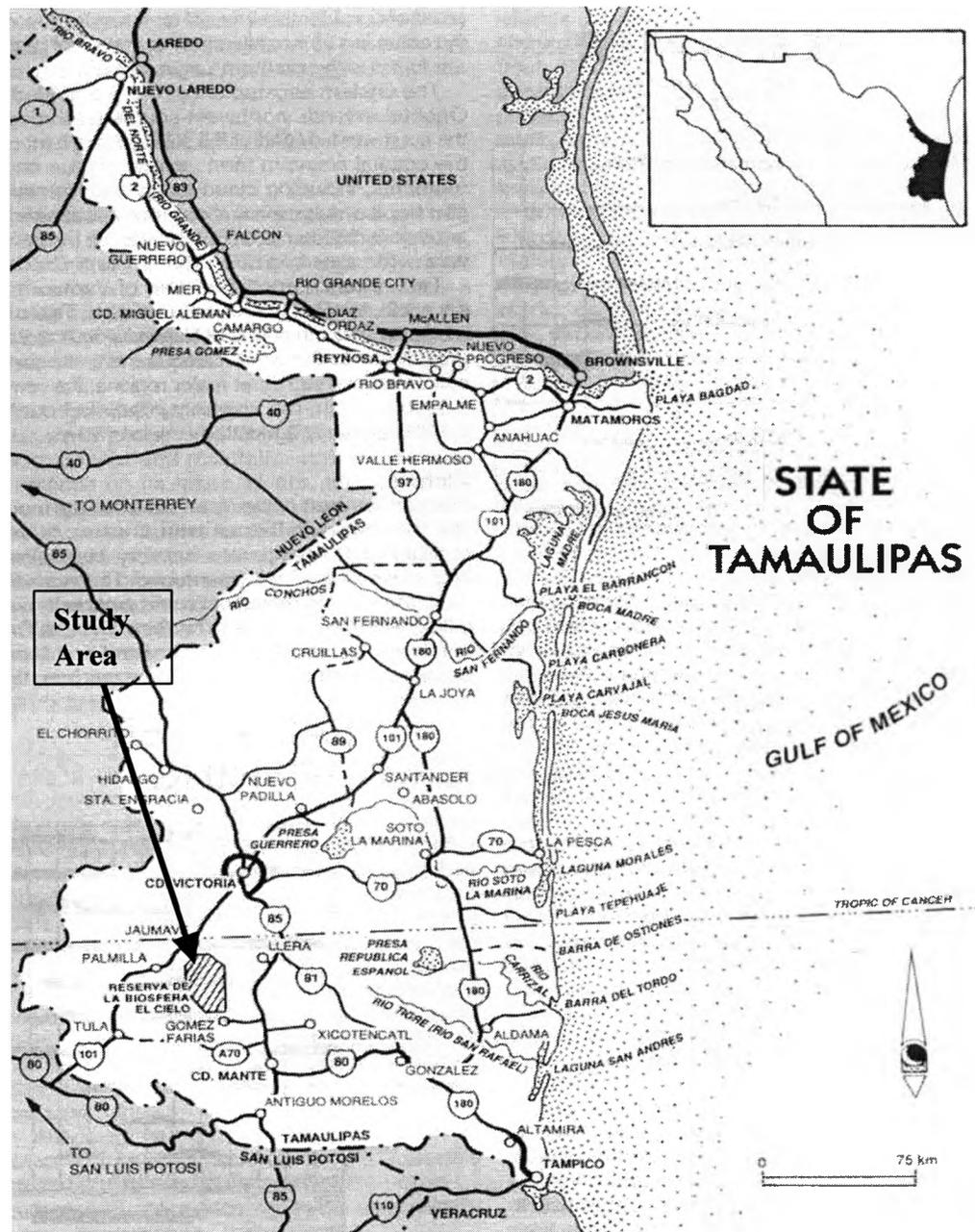


Fig. 1.1. Map of Tamaulipas (Aguilar 1996)

variables, including season and time of day, are coupled with the spatial variables and are examined to determine the times at which encounters most often occur. This information is important for understanding the risks that tourists will incur when they visit the reserve. Furthermore, it adds to the body of research that is concerned with understanding the spatial behavior and numbers of these mammals.

In addition, I examine the general perceptions of citizens within the reserve in regards to these large predatory mammals. This aids wildlife managers and tourism planners within areas of the Sierra Madre Oriental in developing sound environmental education programs that both support conservation of these species and make the area safer for those who live and visit there. Furthermore, this information identifies where environmental education efforts aimed at wildlife conservation and hazard mitigation will be most important and effective within the Sierra Madre Oriental.

In summary, I pose two research questions:

1. Which spatial characteristics play the greatest role in the occurrence of human–predatory cat encounters in El Cielo Biosphere Reserve?

2. What are the reserve residents' general attitudes and perceptions of these large predatory mammals?

CHAPTER 2

SITE DESCRIPTION

El Cielo Biosphere Reserve is a 144,530-hectare (356,442 acres) biosphere reserve located in the Sierra Madre Oriental in the state of Tamaulipas, Mexico, covering the districts of Llera, Jaumave, Gómez Farías, and Ocampo (Aguilar 1996). It is 130 kilometers from Ciudad Victoria. The biosphere reserve is known for its cloud forest that is a rainwater catchment for the low tropical forest and agricultural region to the east and southeast of the reserve. The forests of El Cielo are unique because it lies within a zone of ecological transition that includes the tropical climate of southern Mexico and the temperate climate of the northern Mexico (Ortíz 2000). In the 1930s, with the completion of the Pan-American Highway, the forests and lowlands of this region became more accessible, accelerating development. Exploitation of this unique forest began in the early 1940s. With time, the timber industry destroyed some portions of the forest. But timber operations were not extensively destructive as El Cielo's rough mountainous topography and general inaccessibility triumphed over forest

exploitation. In the winter and spring of 1970 and 1971 a forest fire destroyed a large portion of the forest. Only one small area (approximately 25 hectares) remained untouched, in more or less its “original” state (Hernández 1989).

In 1971, a movement was initiated to preserve the area of El Cielo and its biodiversity. The founders of this movement were Andres Marcelo Sada, Gonzalo Halffter, and Alcala Vargas. The Secretariat of Social Development-Tamaulipas (SEDESOL) established El Cielo Biosphere Reserve in 1985. Once established by SEDESOL, the United Nations Educational, Scientific, and Cultural Organization accepted El Cielo as a Man and the Biosphere Reserve of international significance (Walker 1999).

El Cielo Biosphere Reserve is divided into zones. A core area is set-aside as a securely protected site specifically to preserve biological diversity, monitor ecosystems, and to undertake non-destructive research and other low-impact uses such as education. A second zone, known as the transition zone, contains the *ejidos* of Alta Cima and San Jose. The transition zone is open to a variety of cooperative activities compatible with sound ecological practices, including sustainable tourism, research, agricultural activities and settlements. A third zone, known as a buffer zone, is a region of mixed activity with more intensive land-use than the other two zones, and lies on the outer fringes of the reserve. This system makes El Cielo an ideal environment to study human-predatory

encounters. The design of a biosphere reserve, as set forth by the United Nations, does not displace inhabitants upon creation of a new reserve (UNESCO 2002). It allows inhabitants to live in the areas under guidelines of restricted land and natural resource use. These guidelines prohibit logging and hunting. Hence, the predators retain a healthy prey-base and live in close proximity to the residents. Although there are no studies showing the exact numbers of mountain lions or jaguar in the area, they are known to inhabit the reserve (Hernández 1989).

There are four main vegetation zones within El Cielo (Figure 2.1). They are: the tropical jungle, the mesophyte fog forest, the temperate pine-oak forest, and the semiarid shrub-land. This reserve contains plants ranging from cacti to acacias, begonias, magnolias, orchids, poplars, cedars, and oaks (CONABIO 2001). Notable fauna of the region include the jaguar, mountain lion, bobcat, ocelot, margay, black bear, gray squirrel, and three species of fox. There are 255 resident species of birds and 175 migratory species (Aguiar 1996). Elevations range from 200 meters to 2300 meters (650 to 7,500 feet) above sea level. Annual precipitation ranges between 1000 and 2000 millimeters (40 to 80 inches) per year, depending on elevation and distance from coast. The *ejidos* of Alta Cima and San Jose, founded in 1943, lie within the most heavily visited portion of the

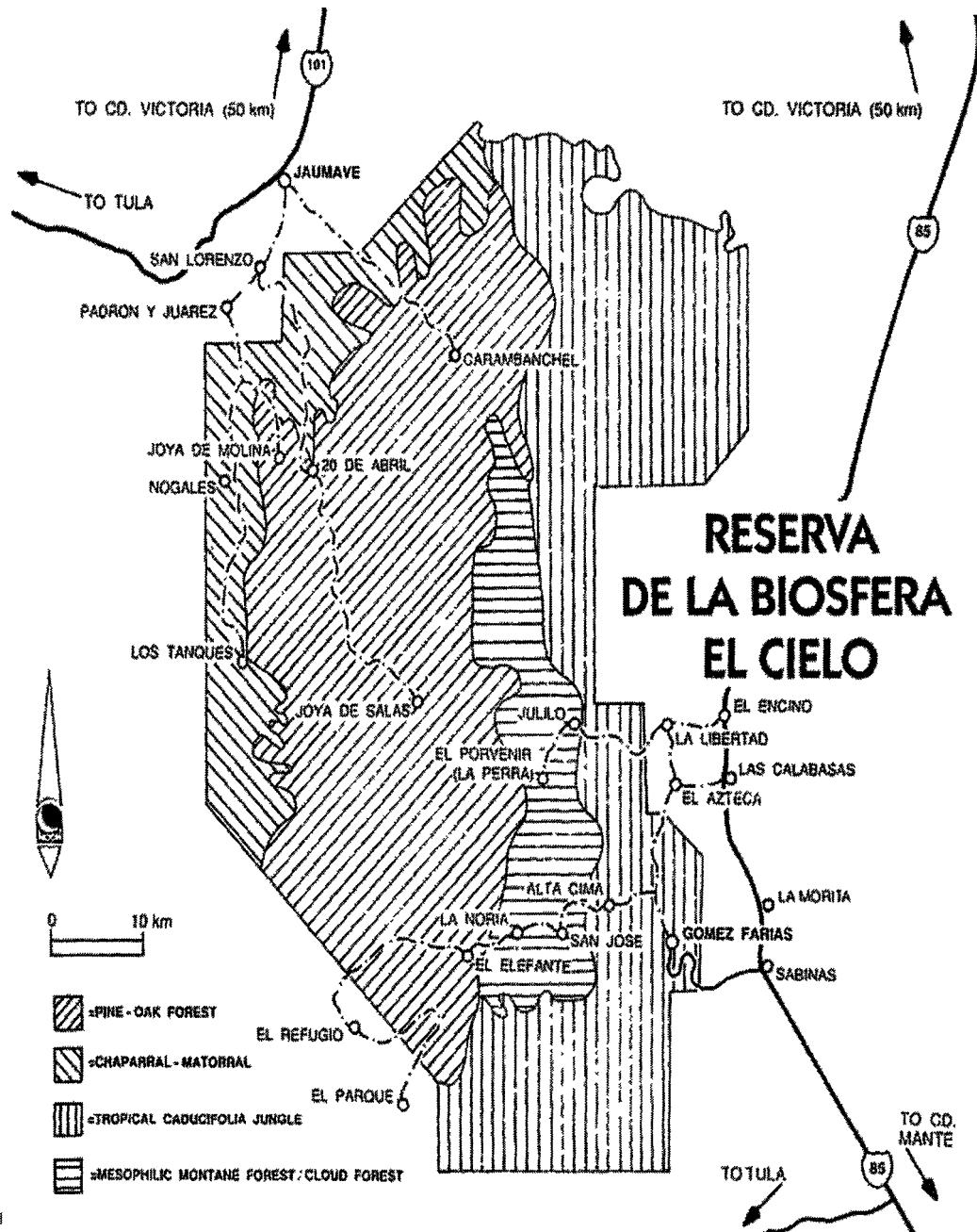


Figure 2.1. Vegetation Map of El Cielo (Cummings 1998)

reserve (Walker 1997). Their main sources of income are eco-tourism, collection of ornamental plants, and cattle ranching.

CHAPTER 3

PREVIOUS RESEARCH

There is an abundance of research concerning mountain lions and jaguar. These large predators entice curiosity because of their top predator role in the eco-system and their potential threat to humans. Almost everywhere humans have settled in the Americas they have come into contact and competition with these predators. Tribes throughout the Americas show reverence for as well as fear of these cats that is evident throughout Native American mythology and lore. The mountain lion had strong religious significance to the Lion People, the Mixtec nation of Central Mexico, who considered the animal their progenitor (Chunn 1995). The jaguar was revered as a being of the highest order throughout Mexico. Thrones carved in the image of jaguar, relics of these ancient cultures, show the kinship of a ruler to these predators. Similarly, classic Maya rulers took names such as "Jaguar-Lord-Sky" and "Serpent Jaguar" (Saunders 1998). The images predatory cats surface time after time within the art of Meso-American cultures.

During the 1500s European explorers recorded encounters with the predatory cats and many compared them to the maneless female lion and the tigers of the Old World (Chunn 1995). These comparisons still carry weight today, as many Mexicans use the term *el león* to name the mountain lion, and *el tigre* to name the jaguar. The explorers carried with them a new design of how to tame the land, and the settlers that followed began to have an impact on native wildlife. Making their living from the land, those settlers saw no beneficial value in the large carnivores that they encountered (Chunn 1995). Many considered the mountain lion, jaguar, bear, wolves and coyotes to be nuisances and pests that did damage to their livestock. This problem together with fear of personal injury led settlers to begin exterminating predators. Fear and dislike of the European settlers replaced the reverence and respect of indigenous cultures.

Conservation Issues

Today, in a world with biosphere reserves and eco-tourists, one can be sure of a variety of differing opinions of these animals. In order to aid in the battle to conserve the cats we must understand and mitigate for human perceptions of these animals. One estimate claims that there may be only 15,000 jaguar left in the wild (Garman 2002). The major threat comes from habitat loss that endangers the prey population of these cats and fragments their range into

isolated pockets. The mountain lion population is believed to be stable in the Americas (Seidensticker and Lumpkin 1992). However, modern research demonstrates that this has not always been the case. There was a time when the settlers of the American west had almost succeeded in eliminating them. Due to this, conservationists must stay vigilant in order to keep track of their status in the wild.

Predatory Cat Behavior

There have been significant numbers of mountain lion attacks on people in North America in recent years (Seidensticker and Lumpkin 1992). Researchers reported 53 attacks resulting in eleven deaths during the past one hundred years. One such attack in the state of Colorado in 1991 ended in the death of a teen-age boy. In an effort to understand these incidents, researchers have postulated hypotheses on mountain lion behavior. One such hypothesis states that the lions are becoming conditioned not to fear man. (Seidensticker and Lumpkin 1992, Danz 1999). Danz (1999) hypothesizes that when a mountain lion perceives that humans are potential prey, it will become conditioned, and henceforth, the likelihood of an attack is increased. This conditioning is thought to be positively correlated with urban sprawl into rangeland.

Young mountain lions leave the region of their birth and youth in order to establish their own territories (Sweaner et al 2000, Beier 1995). There is a limited amount of suitable habitat available and some lions inevitably end up coming into contact with humans. Beier (1995) demonstrates that in areas of human settlement, a young male mountain lion ventures to the fringe of this development when it first leaves its mother. It is at this time that there is an increased chance of a mountain lion-human encounter. Seidensticker and Lumpkin (1992) point to commonalities in locations where attacks occur. Plentiful mountain lion prey (deer and small mammals) and a non-threatening human population are hypothesized to be major positive influences on the likeliness of a human-lion encounter. Fitzhugh (1988) states that high-density individual human use of areas where mountain lions are resident creates another unusual risk. This raises a question: Is it true that areas fitting the criteria listed above are geographical centers where attacks are more prevalent?

This study addresses this question and tests the hypothesis of learned behavior in mountain lions. El Cielo is an area that fits the criteria for a location where attacks are likely to occur. There is a healthy population of whitetail deer, squirrels, armadillos, badgers and other small mammals that are typical mountain lion prey (Hernandez 1989). Presently, the people are non-threatening because of the restrictions of the biosphere reserve. Hunting or killing of the cats

is illegal. It is possible that after fifty-nine years of human settlement, the predatory cats of El Cielo have had time to become conditioned not to fear humans.

Spatial and Temporal Elements

Understanding a complex interactive experience between a human and another large predator is a daunting task. Looking at spatial and temporal qualities of these encounters is a contribution that geographers can make to the literature on the human dimensions of wildlife. There is considerable literature within the natural sciences on wildlife management and population trends. However, analyzing the spatio-temporal variables of the individual encounters is a relatively new area of research. One such study defined the locations of human–mountain lion encounters within U.S. National Parks, identified the spatial types of settings within which the encounters occur, and distinguished the types of visitors that would most likely visit these types of settings (Tiefenbacher, Shuey, and Butler 2000). This information was derived from encounter information stored in the national park database. The main goal of this research is to determine the important spatial aspects of encounters while simultaneously gaining an understanding of who has encounters most frequently.

A number of studies focusing on movement patterns and habitat preferences of predatory mammals can be found within the fields of biology, wildlife management, ecology, and other natural sciences (Baer and Butler 2000, Beier 1995, Choate and Barret 1995, Garman 2002, Sweanor, Logan, and Hornocker 2000, Laing 1988). Some of them provide insight into the spatial characteristics of the animals' domain, for example, *A Track Count For Estimating Mountain Lion Population Trends* (Smallwood and Fitzhugh 1992). This work detected population trends of mountain lions such as travel routes and habitat preferences. The study was accomplished by evaluating counts of track sets on 48 selected quadrants in the state of California. Although this work does not directly involve issues of mountain-lion-human encounters, it does provide useful information by defining typical areas across which mountain lions prefer to travel. It was determined that carnivore (mountain lion and black bear) tracks were most often found along mountain streams, knolls and peaks, mountain slopes, and in mast-producing habitats (areas where nuts accumulate on the forest floor). These are the locations where the mountain lions find food, water, and shelter. These results were confirmed by Beier (1993) who utilized radio collars to derive travel routes and dispersal patterns.

The literature shows that jaguar prefer habitats such as lowland jungles, dry woodlands, and grassland (Garman 2002). It is a rare occurrence to see a

jaguar at high elevations. Garman (2002) states that they are hardly ever seen at areas above 2400 meters (8000 feet).

Jaguar are shown to alter their hunting patterns in areas where there is human activity such as El Cielo. In these areas, jaguar will hunt at night. However, they are known to hunt during the day or diurnally in areas absent of human habitation (Garman 2002).

Human Perceptions of Predatory Carnivores

It is important to understand public perceptions when it comes to developing environmental education strategies designed to help humans live in harmony with predatory carnivores (Kellert 1991). Predators earn the hostility of humans because they are allegedly out of step with the goals of our survival strategies. Attention to predators comes from ranching and hunting interests who have sought to exterminate these animals wherever found (Hibben 1939).

Previous research sought to understand human perceptions of predators (Kaltenborn, Bjerke, and Vitterso 1999). This study used an attitude typology to compare and contrast perceptions of carnivores (bear, lynx, wolf, and wolverine) in Norway. The perception survey instrument included 35 items, in which five responses were possible using a Likert scale (1: strongly agree to 5: strongly disagree). They placed the responses into one of six attitude types, a system

developed by Kellert (1991). The doministic attitudinal type is defined as interest in the mastery, control and dominance of the animals. Ecologistic is interest in the ecological value (contribution to the health of the ecosystem as a whole), and its relationship to the environment. The moralistic type is defined as having opposition to cruelty and harm toward the species. The naturalistic attitudinal type is defined as interest in direct outdoor recreational contact with the species. Utilitarian is interest in utilization of the species, or subordination of their habitat for the practical benefit of humans. Finally, the negativistic type is fear, dislike, or indifference toward the species.

The Kaltenborn, Bjerke, and Vitterso (1999) study identified the common perceptions of the people most likely to come into contact with the animals (sheep ranchers, research biologists, and wildlife managers). Many of these sheep ranchers had much to lose economically from problems of depredation. The researchers also considered the socio-economic characteristics of those interviewed and drew conclusions about how these characteristics influence perceptions. As might be expected, the research shows that sheep farmers exhibited the highest tendency towards doministic, negativistic, and utilitarian profiles. Wildlife managers and researchers scored highest in the ecologistic and naturalistic categories. This study provides good baseline information in the area of carnivore perception.

The findings concerned with perceptions of sheep ranchers are confirmed in research dealing specifically with mountain lions of the Texas-Mexico borderlands. In this area, sheep farmers have historically supported the killing of mountain lions in order to protect their herds (McBride 1978). The research reports depredation on several domestic animals including horses, cows, sheep, chickens, and mules. All of these animals are raised within the boundaries of El Cielo Biosphere Reserve. The main difference is that there are no citizens within the reserve whose sole source of income comes from sheep ranching.

These studies show how attitudes are likely to change with the occupation of the individual who is in contact with carnivores. El Cielo residents hold a variety of jobs. However the majority of the work is in the collection of an ornamental plant known as palmilla (Walker 1995). It can be assumed that those involved in this livelihood are likely to have encountered one of these predators.

CHAPTER 4

METHODOLOGY

To address the two research questions, a face-to face interview with a questionnaire was designed and then administered (Dillman and Salant 1994). The survey was administered by interviewing heads of households. Heads of household were chosen because of their role as income producer. I assume that they are the ones most likely to work within the habitat area of the predatory cats. A random sample of heads-of-households was taken by walking door to door. I designed this face-to-face survey methodology under the principles established by Dillman and Salant (1994). The interview is presented in Appendix A.

I obtained thirty-two interviews over a three-week period from February 3rd to February 24th, 2002. This followed an exploratory reconnaissance of the reserve in November of 2001 in which the survey was designed and the research site was examined. I obtained sixteen interviews with residents who had encountered a predator.

Spatial and Temporal Variables

Spatial and temporal elements of human-large mammal encounters were gathered. These included:

- Reserve zone
- Elevation
- Forest type
- On or off trail
- Season in which encounter occurred
- Time of day or night

By interviewing residents of El Cielo, this research helps to expand the knowledge previously acquired in the area of human-cat encounters utilizing a methodology that is in contrast with the Teifenbacher, Shuey, and Butler (2000) paper. The goal is to utilize the knowledge of local inhabitants, as opposed to getting encounter information from a computer database. By doing so, I sought to develop a new research model for examining the temporal/spatial patterns of human-predator encounters.

Furthermore, this research seeks to clarify the findings of biologists who use various quantitative methods to determine the movement patterns of these

cats. This is attempted by analyzing first-hand reports of people who work within the territories of mountain lions and jaguar in northeast Mexico.

Perception Methodology

The perceptions and attitudes of reserve inhabitants towards large carnivores were also acquired. The answers of the respondent were scored in one of the six attitudinal typologies developed by Kellert (1991): Doministic, Negativistic, Ecologistic, Naturalistic, Utilitarian, and Moralistic (Figure 4.1).

I expand upon the information found in the Kaltenborn, Vitterso, and Bjerke (1999) study in order to further develop the theory of carnivore perception. I apply the typology developed by Kellert (1991) to the study in El Cielo through personal interviews. Through this process, I expand upon the findings of previous researchers. Is it true that those who have the most to lose from carnivores have negative perceptions of them?

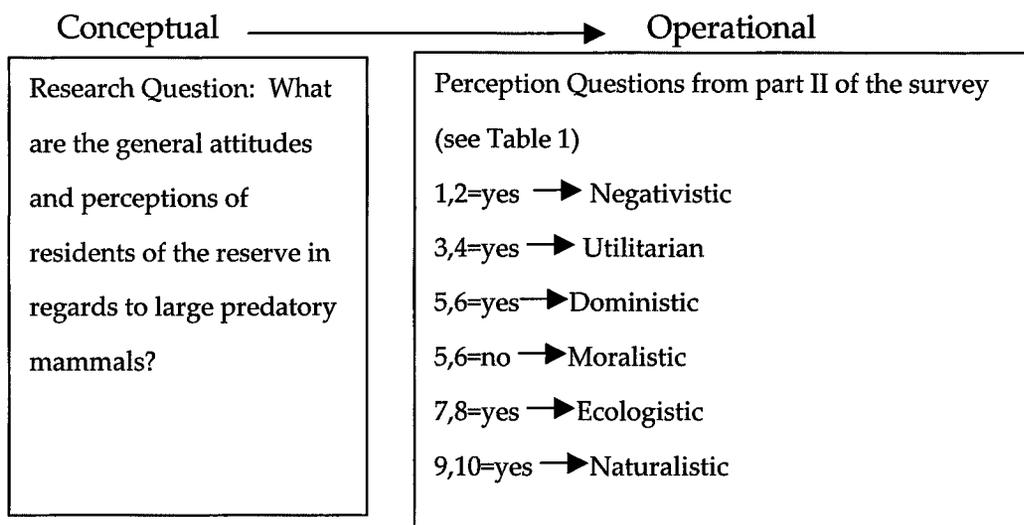


Figure 4.1. Perception Type Methodology

CHAPTER 5

RESULTS

Sixteen of the 32 respondents encountered a predator. All of these encounters were visual without physical contact of any kind. There were seventeen jaguar sightings and seven mountain lion sightings reported by the 16 respondents.

It should be noted that there was one-second hand report of an attack in the *ejido* of El Tigre on the far western side of the reserve. This was a second-hand report by one of the guides who I interviewed. El Tigre is just outside the western border of the reserve, in the semiarid shrub-land.

Respondent Residency

Four respondents reported residence outside of the reserve, in Ciudad Mante and El Nacimiento. Alta Cima and Gomez Farias lie within the tropical jungle. San Jose and La Gloria are within the mesophyte cloud forest.

Alta Cima and Gomez Farias are the largest *ejidos* within the boundaries of the reserve (Walker 1995). Therefore the majority of respondents reported one of these *ejidos* as their place of residence (Figure 5.1). San Jose and La Gloria have small populations, which is also reflected in the number of respondents from these two *ejidos*. Residents from El Nacimiento and Ciudad Mante live outside the boundaries of the reserve, but they work within the boundaries and were interviewed in one of the *ejidos* within the reserve.

Spatial Dimensions of Encounters

All of the encounters reported by respondents occurred within the buffer zone of the reserve. There were second-hand reports of encounters in the nuclear zone and transition zone. Respondents often gave additional information not asked on the survey about the general movement patterns of the cats. Jaguar were seen most frequently within the tropical jungle, at the lower elevations [200-800 meters (650-2600 feet)] of the study site, between Alta Cima and Gomez Farias. This terrain is dominated by the Sierra Cucharas, a band of rough limestone mountain peaks riddled with caves and springs. There were also reports of jaguar near Rancho El Cielo and San Jose, which are at relatively high elevations within the reserve, between 800 and 1400 meters (2600-4600 feet). Mountain lions were also reported in the tropical jungle, at the lower elevations,

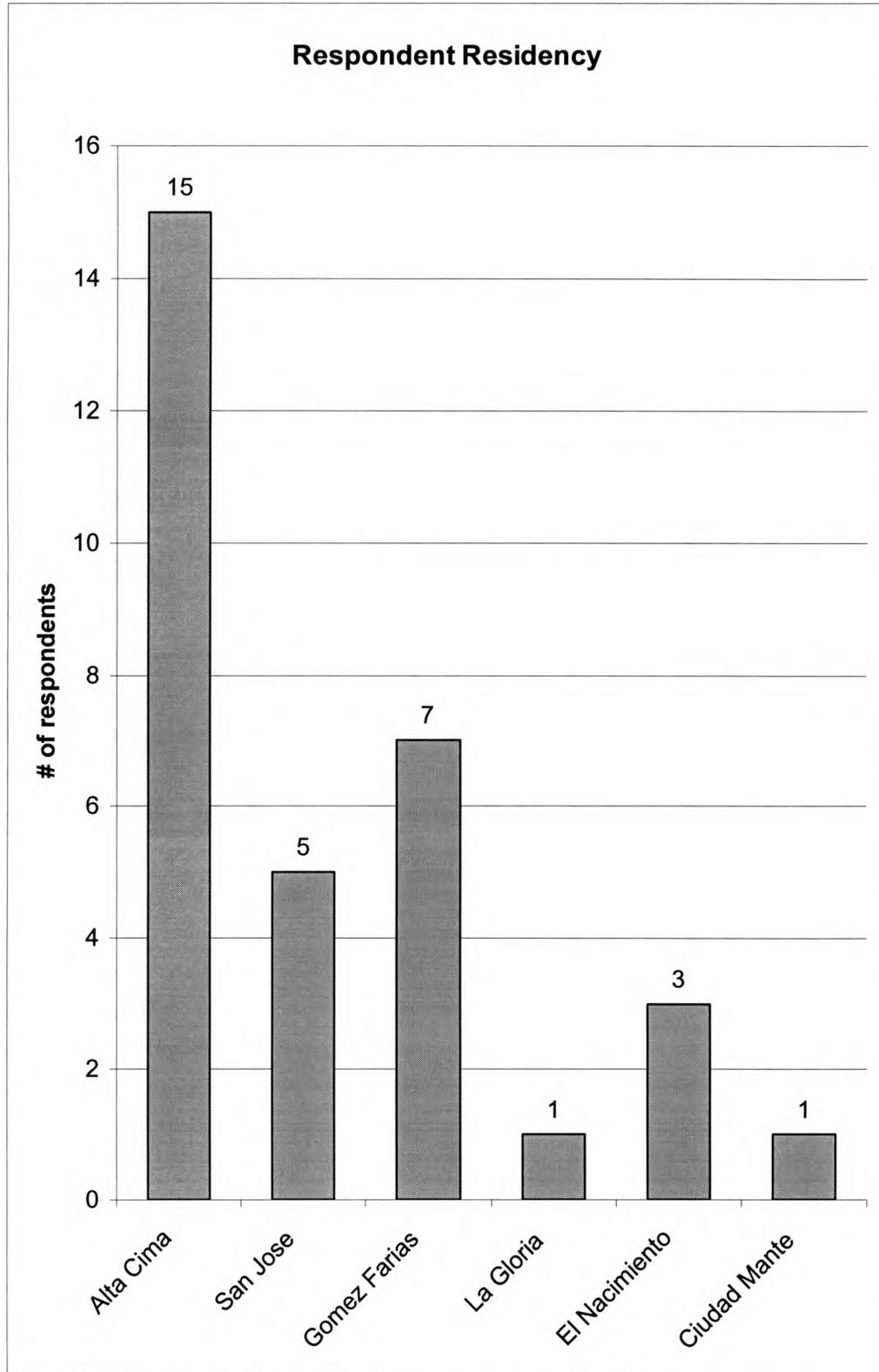


Figure 5.1. Respondent Residency

but with less frequency than jaguar. There were only three reports of lions in the Sierra Cucharas area as compared to fourteen jaguar sightings in this area. The proportion of mountain lion sightings to jaguar sightings increased with rise in elevation.

All of the cat encounters were reported in the tropical caducifolia jungle (tropical jungle), the mesophytic montane cloud forest (cloud forest), and the pine/oak forest (Figure 5.2). These forest types are largely a function of elevation, with the tropical jungle between 200 and 800 meters, the pine/oak forest between 1400 and 2500 meters. The cloud forest lies between these at 800 to 1400 meters. Overall, the majority of human-cat encounters took place in the tropical jungle. This is the area in which the majority of respondents lived and worked (collecting of *palmilla*). There were more than three times as many jaguar sighted in the tropical jungle than mountain lions. However, in the cloud forest, the number of jaguar sightings and mountain lion sightings were equal. Only one mountain lion encounter, and no jaguar encounters occurred within the pine oak forest that is at the highest elevation within the reserve. This portion of the reserve is very sparsely populated and the workers do not search for *palmilla* here.

The respondents were asked whether their encounters were on the main roads between villages or on one of the numerous footpaths that cross the

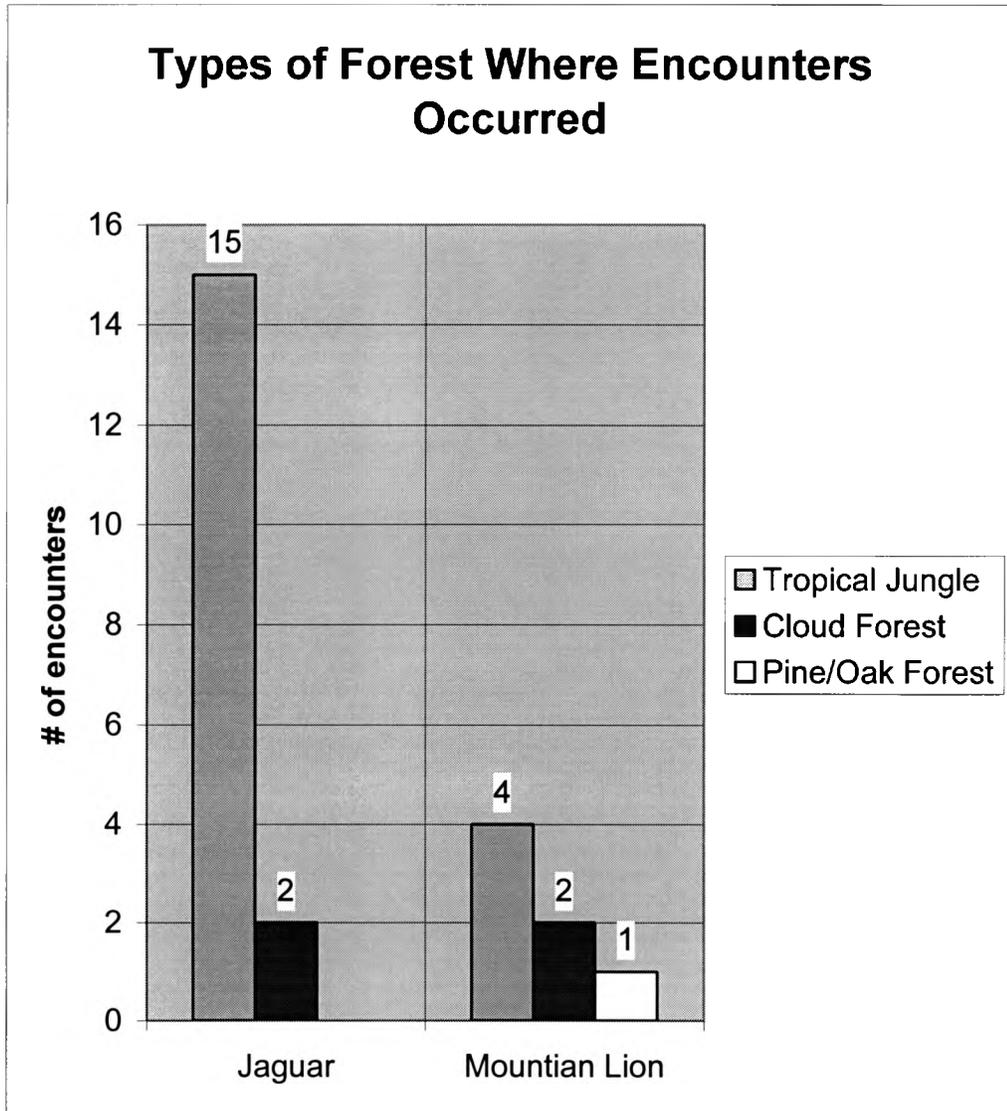


Figure 5.2. Types of Forest Where Encounters Occur

reserve. This information could be useful to tourism managers for warning visitors of potential locations where they might encounter a predatory cat (Figure 5.3). Jaguar sightings occurred more often on the roads, with 71 percent of encounters taking place on major travel routes. The other 29 percent of jaguar sightings occurred on foot paths used by the *palmilla* collectors.

The case of mountain lion encounters is different. Fifty-seven percent of encounters occurred on the road and 43 percent occurred off the road. This affirms remarks that were made during interviews. During interviews, two respondents informed me that the jaguar are less wary of humans than are mountain lions. This will be discussed in more detail in the next chapter.

Temporal Dimensions of Encounters

Temporal variables were collected along with the spatial variables in order to determine the times of the day and year during which encounters most frequently occur. Exact months and time of the day were often vaguely recalled by the respondent. However, all respondents were able to tell me the season and the general part of the day during which the encounter occurred (Figure 5.4). All encounters occurred either in the morning or evening hours. There were four mountain lion encounters in the evening and three in the morning. Jaguar sightings were more common in the early morning hours. Eleven encounters

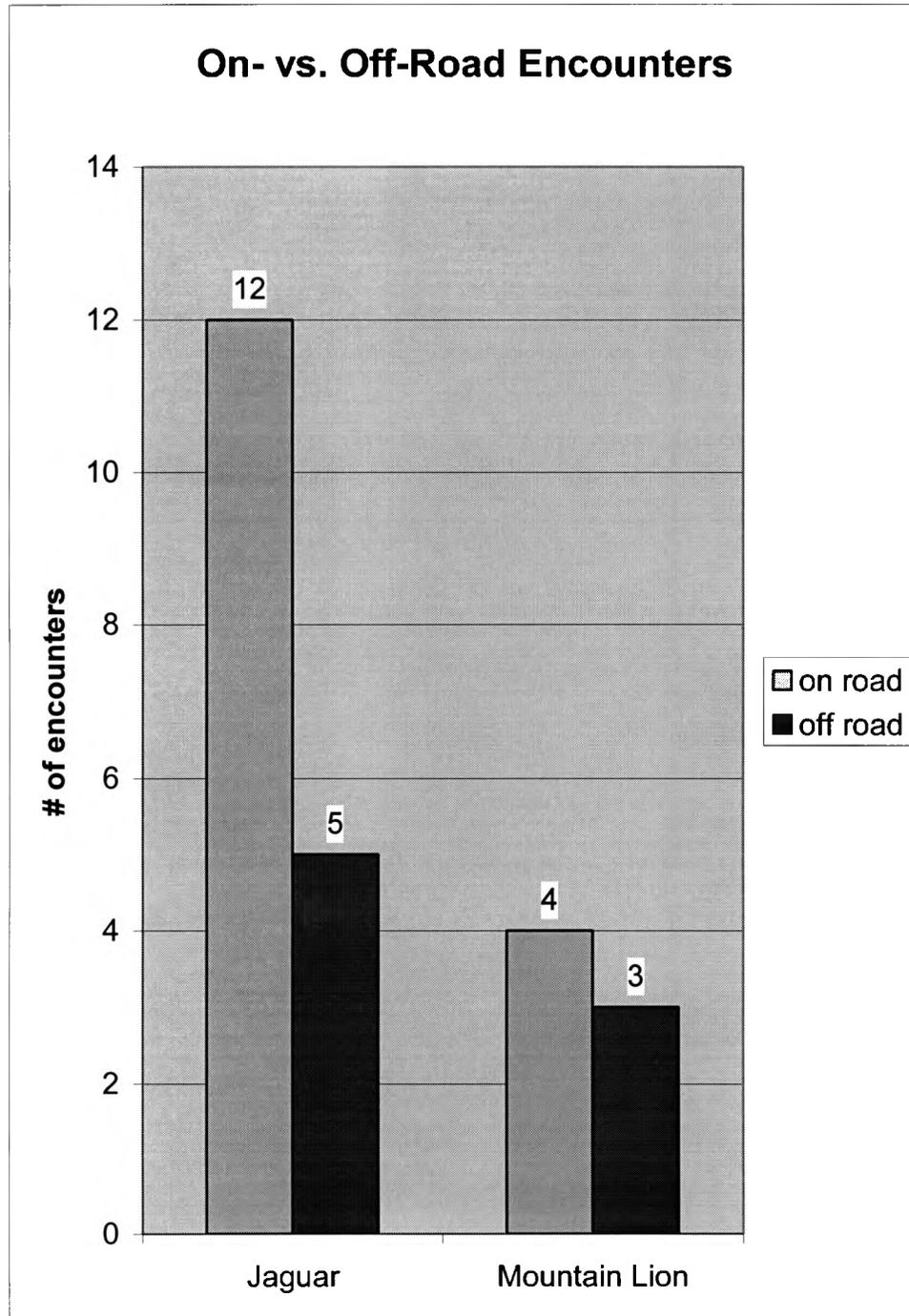


Figure 5.3. On-Road Versus Off-Road Encounters

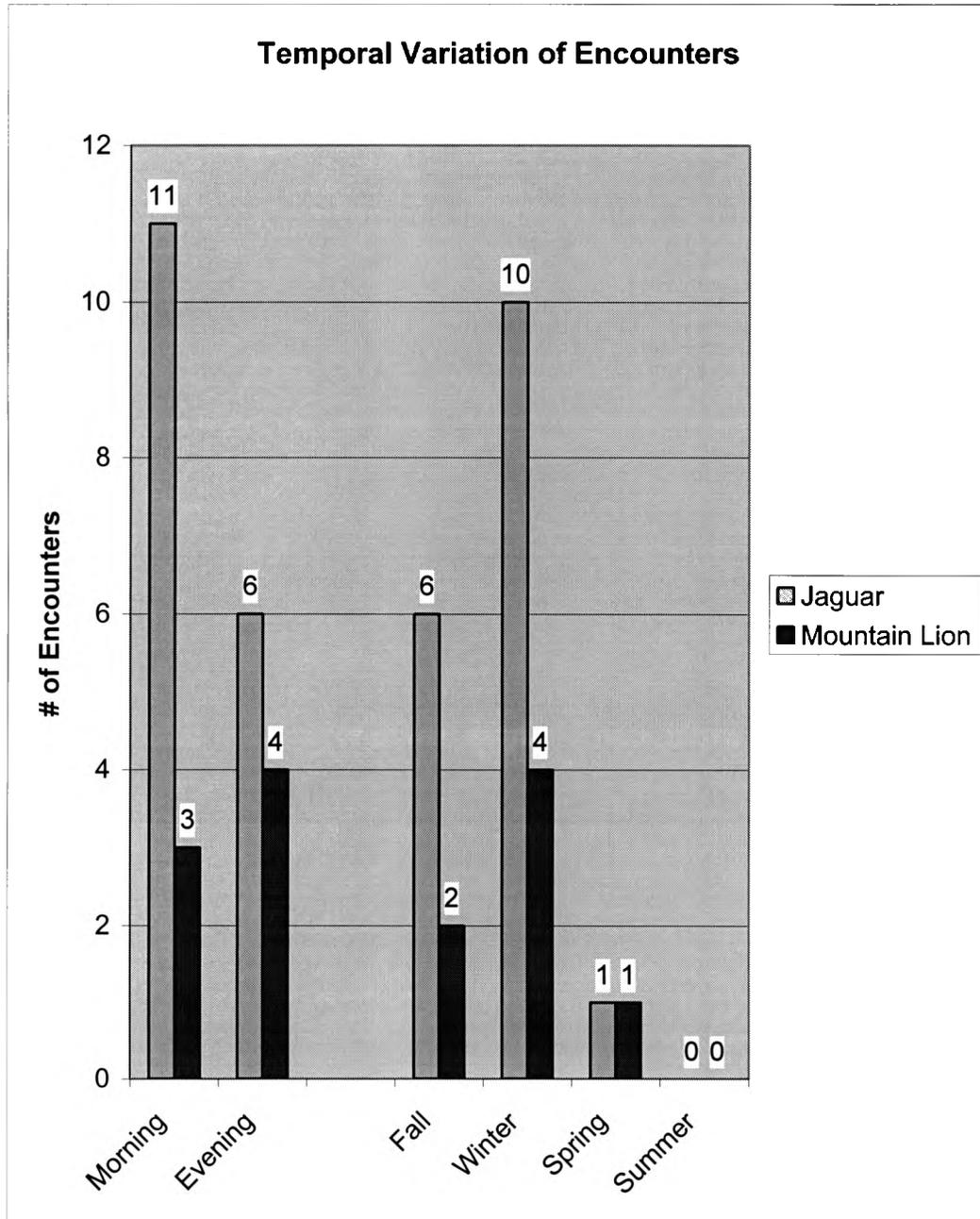


Figure 5.4. Temporal Variation of Encounters

took place in the early morning hours while the other six occurred in the evening. Often, respondents reported that encounters occurred around dawn or dusk when light is very low in the mountains.

The majority of jaguar and mountain lion encounters took place in the winter. There were six jaguar sightings in the fall, ten in winter, and one in the spring. There were two mountain lion sightings in the fall, four in the winter, and one in the spring. There was not a single report of a jaguar or mountain lion encounter during the summer months.

Perceptions and Demographics

Respondents were surveyed to obtain information about their general attitudes and perceptions toward the predatory cats that inhabit El Cielo. This information can be used in environmental education, wildlife resource management, and other issues regarding the human dimensions of wildlife. Respondents were asked for their place of residence and occupation. They were also asked ten yes or no questions aimed at gaining a better understanding of their general attitudes towards the jaguar and mountain lions (Appendix A). The responses were categorized into one of the six attitude types developed by Kellert. Responses to these questions are listed in Appendix B.

Of the thirty-two respondents, eighteen collected *palmilla*. A variety of other occupations were reported (Figure 5.5). Agricultural employment involved all aspects of farming corn, sugarcane, and *nopales* (an edible cactus). The two respondents who reported caretaker as employment oversaw the maintenance of the research stations within the reserve. They are Rancho El Cielo, operated by Southmost University in Brownsville, Texas, and Canindo Research Station. The caretaker of Rancho El Cielo was the only permanent inhabitant of the nuclear zone I encountered. He spent weekends at the research station, and the rest of the week in Alta Cima.

Although all of the respondents who lived within the villages of Alta Cima and San Jose owned or cooperatively owned cattle or goats, none reported ranching as their employment. These domestic animals were sold occasionally to supplement income or were raised for personal consumption. All heads of household in Alta Cima and San Jose owned chickens or turkeys that were raised for personal consumption.

It is important to understand the cooperative ranching strategies employed by the reserve's inhabitants. In general, cattle and goats are owned by an entire family, and therefore the animals are cared for by a number of people. The residents placed importance on the number of cows, horses, mules, and

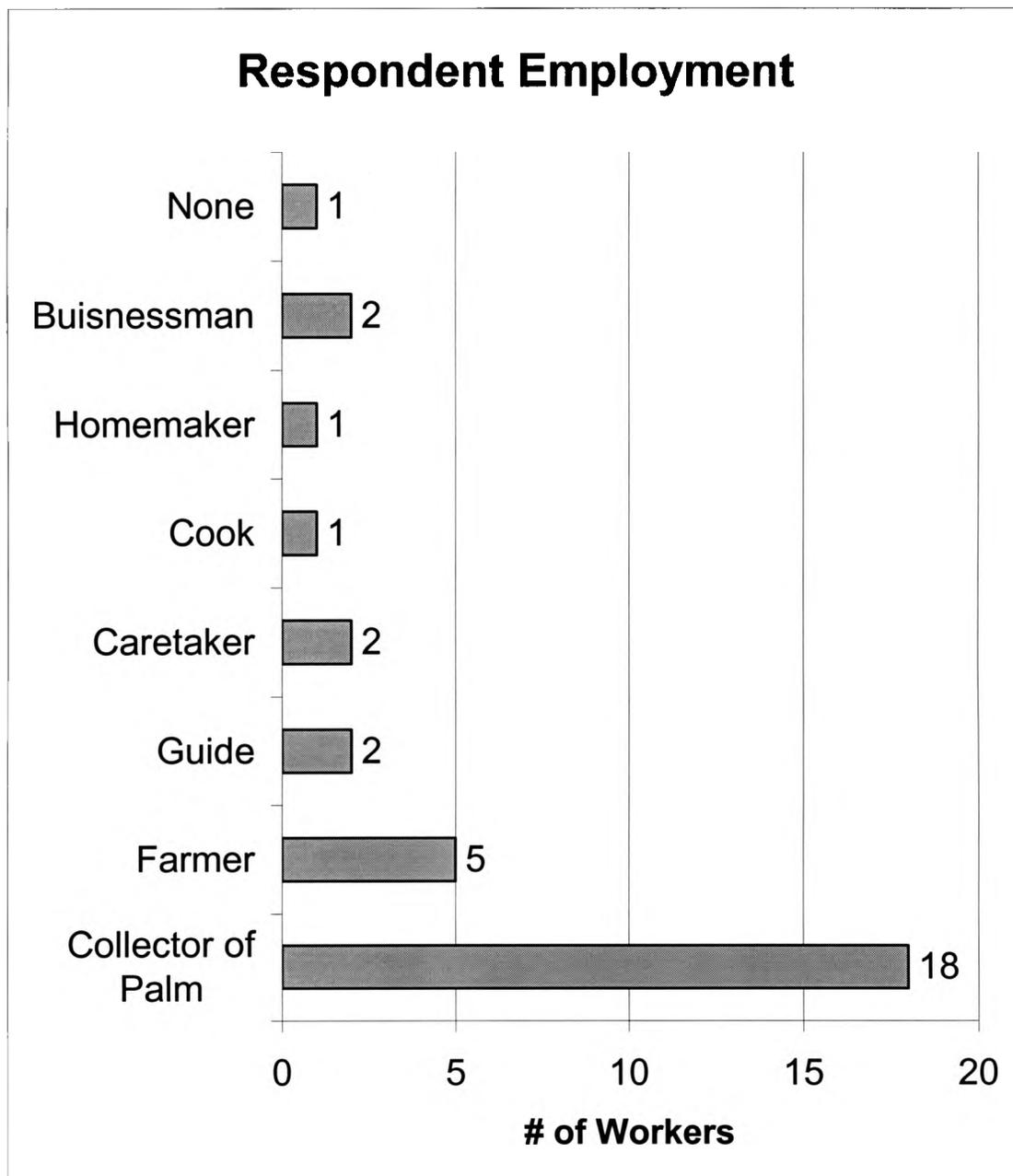


Figure 5.5. Respondent Livelihood

goats owned. Ranching and the care of domestic animals is a major characteristic of all of the villages visited within the buffer zone. Domestic animals graze in the middle of the villages on land owned cooperatively by residents. This ought to be a crucial factor influencing perspectives of predatory cats. As will be shown later, many residents believed that jaguar and mountain lions are a threat to the domestic animals.

Responses to the perception part of the survey were scored into one of the following six categories: negativistic, doministic, moralistic, utilitarian, ecologicistic, and naturalistic (Figure 5.6). Three respondents scored in the negativistic type. One was a *palmilla* collector, one an agriculture worker, and the other was temporarily unemployed. Only one respondent was categorized as the utilitarian type. This respondent worked in agriculture.

No one scored in the doministic profile. These negative groups are low in number when compared to the more positive typologies. When respondents were asked if they thought all predatory cats should be eradicated from the reserve, every single one answered no. This means that all thirty-two respondents fit the moralistic category. Eighteen respondents were of the ecologicistic type. Twenty-seven respondents would be considered naturalistic. All of these respondents expressed a desire to see a mountain lion or jaguar in a recreational context.

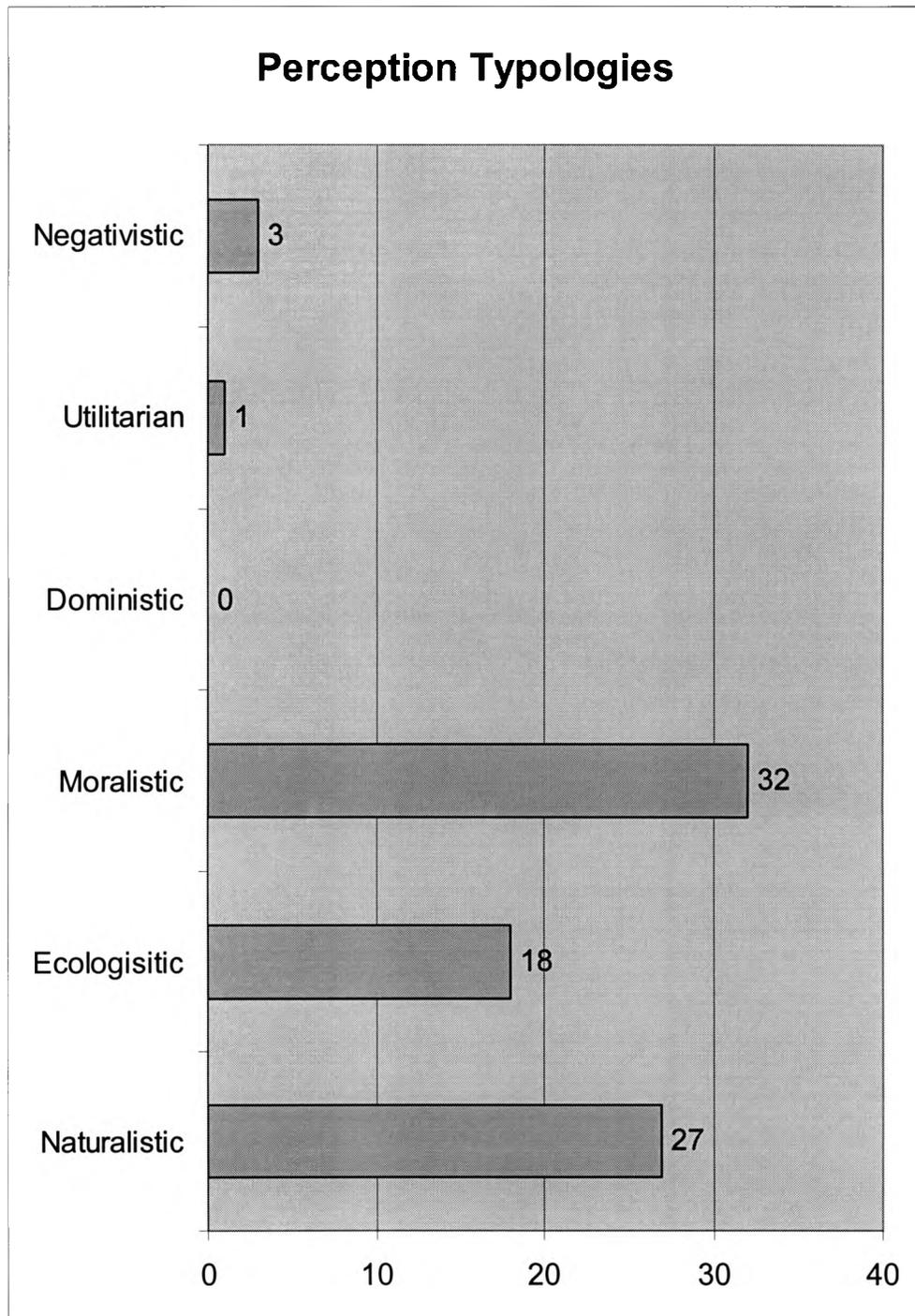


Figure 5.6. Perception Typologies

Each category has an opposing category such as non-negativistic and non-doministic (Figure 5.7). At times, respondents could not answer some questions. They simply answered "I don't know." These responses were not scored in one of the perception types, and therefore the sum of each typology and its corresponding opposite does not equal 32, the total number of interviews.

It is relevant when a question is answered "no" instead of "I don't know." For example, many respondents answered, "I don't know whether or not a mountain lion is good for the health of the forest." Others answered with a definitive "no" to the same question. Answering "no" scores in the non-ecologicistic category while answering "I don't know" does not. In this way we get a better overall understanding of residents' perceptions.

Folk Wisdom

Additional relevant information was often given during interviews. This information is presented here because it sheds light on the research. Many respondents do not view jaguar and mountain lions as a threat to their livelihood. However, they are often quick to add that the cats often attacked their domestic animals. This was mentioned by ten respondents. The domestic animals often preyed upon were chickens, turkey, pigs, cows, horses, and goats.

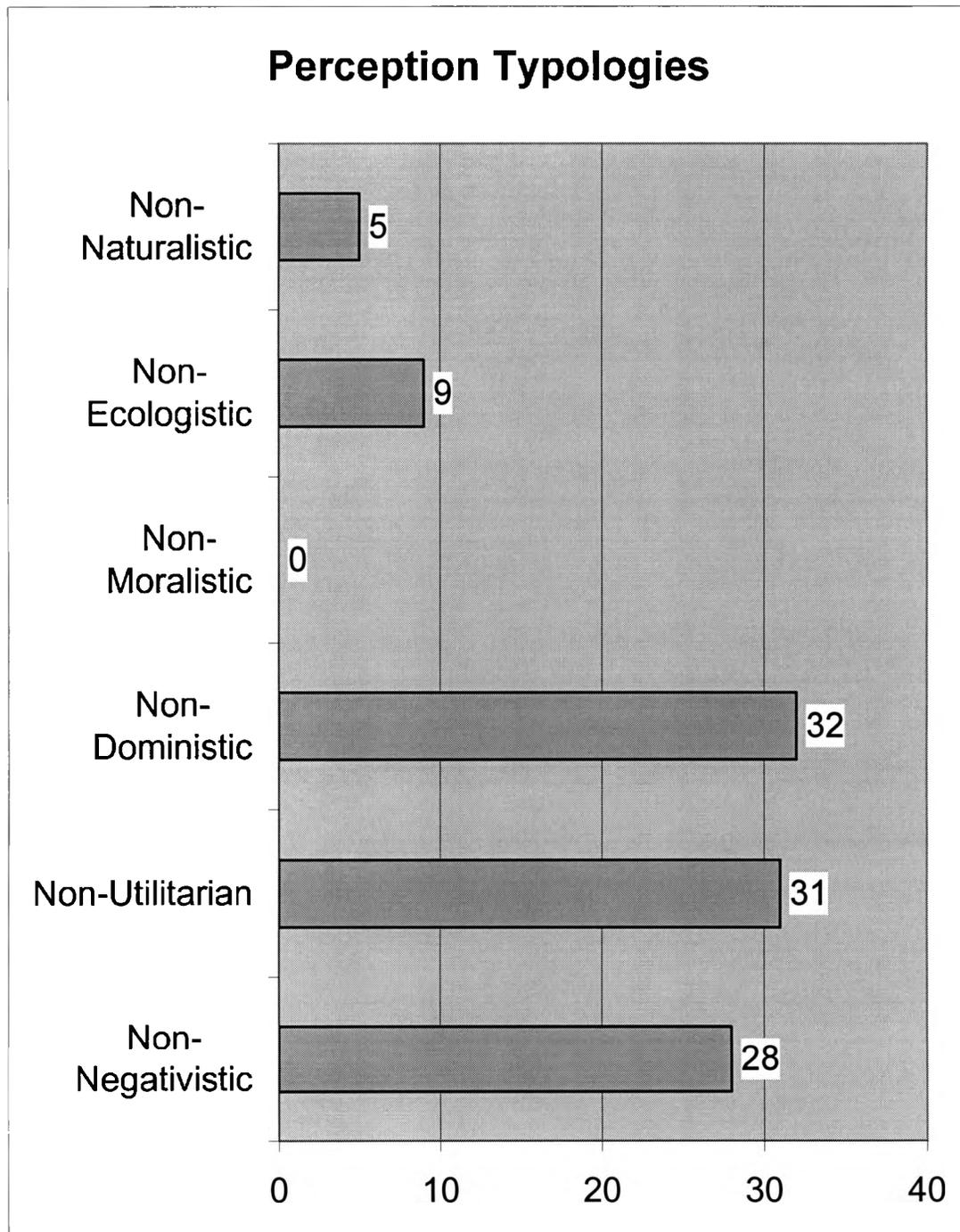


Figure 5.7. Perception Typologies 2

It is interesting and noteworthy that although this was mentioned by a third of the respondents, none thought the cats to be real threats to their livelihood. Perhaps this is because all had sources of income other than raising animals or ranching. This will be discussed in the next chapter.

Many respondents feel that the predatory cats are beneficial to the health of the forest. This response scored in the ecologicistic type. Often this was underscored by the statement that the cats eat snakes. The snakes of the reserve are often poisonous and can threaten the inhabitants. This additional response was given four times.

The question that was designed to identify the utilitarian attitudes asked, "Do you feel that the predatory cats are a threat to the livelihood of workers in El Cielo and should be controlled?" Nobody answered yes to this question. However, three commented that it would be okay to kill a cat if it was known to have killed a domestic animal.

One respondent felt that we couldn't control the cat populations even if we wanted to. He had hunted mountain lions as a child before the land was a biosphere reserve. This respondent was of the opinion that the cats' survival instincts could not be overcome by an attempt to eradicate them. His experiential knowledge of cat behavior was the basis of this opinion.

Respondents often expressed a desire to see one of the predatory cats of El Cielo. Ten respondents expressed this desire. This attitude expressed a naturalistic attitude. Four respondents added that they would like to see them, but from a distance!

One unique response was given to the question of whether jaguar are a danger to people. One man stated that if a jaguar is caught in a tree by your dogs, and your dogs turn and run back to you, then you will be in danger. He felt that the running dog would trigger the predatory instinct of the jaguar. This had never happened to him, he just understood this to be the case.

Two respondents gave additional comments regarding the population distribution patterns of the cats in El Cielo. They stated that the mountain lions were much more cautious, or wary of humans, than are the jaguar. They also stated that at the higher elevations within the reserve, there were many more mountain lions than jaguar.

One respondent told me that the inhabitants of El Cielo are learning how to live in harmony with the cats by building enclosures for their livestock. Furthermore, he stated that they were developing cooperative strategies to better protect their animals. For example, they corralled the livestock in the center of the village at night as opposed to letting them graze on its outskirts. This allowed better oversight of the cattle at night and gave the dogs a good chance of

sounding a warning if a cat approached in the dark. This respondent also mentioned that these cats were hunted in the past because of problems of depredation.

Only one respondent mentioned the other cats that inhabit the reserve. The caretaker of Rancho El Cielo, who spent a great deal of time within the boundaries of the nuclear zone, reported seeing ocelots (*Leopardus pardalis*) and bobcats (*Lynx rufus*) watering at the springs near Rancho El Cielo. According to him this area was also frequented by jaguar and mountain lions.

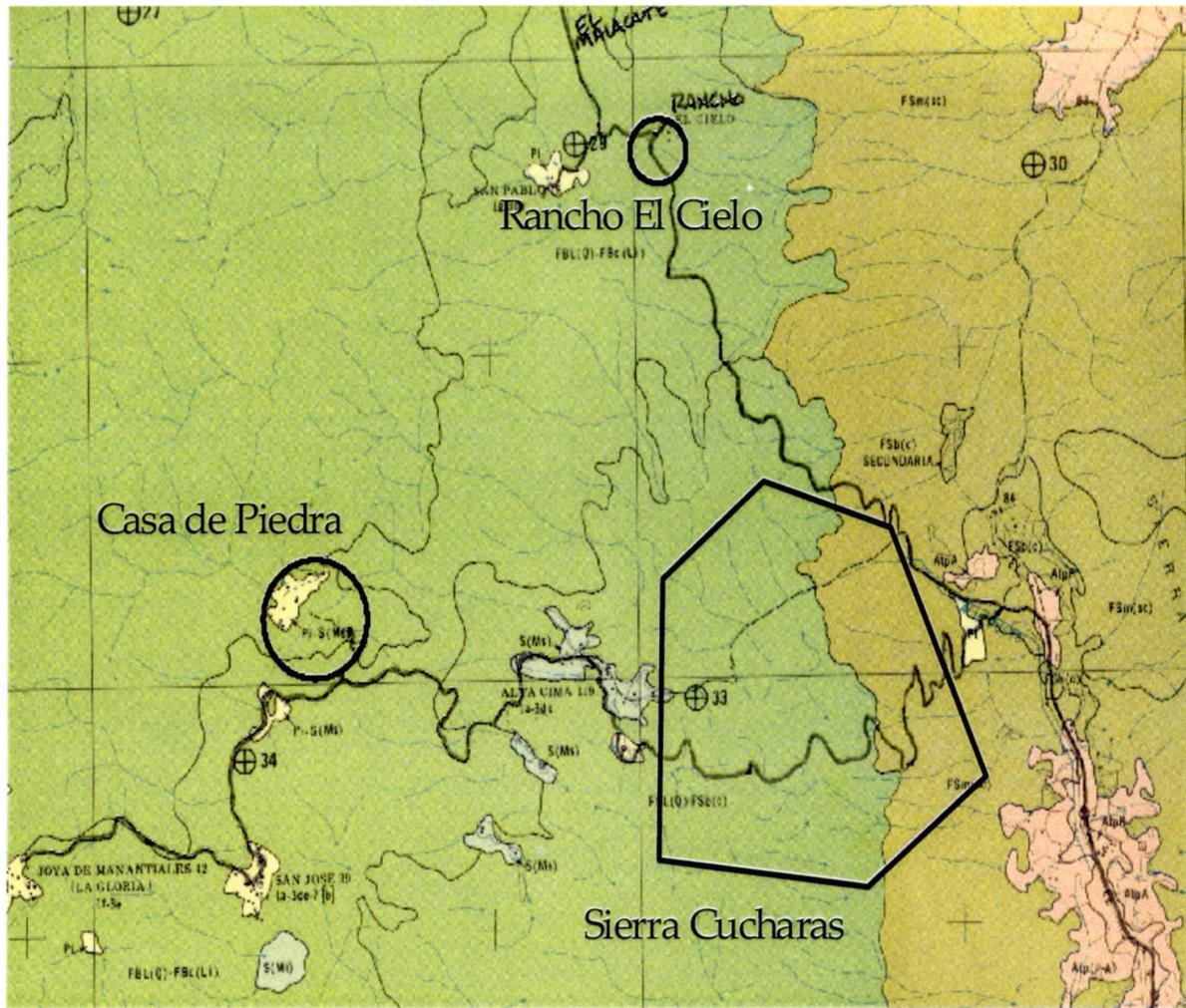
One very interesting comment was given. The respondent stated that a jaguar entered the main plaza in Gomez Farias one evening and circled several times before being chased off by a group of locals. This second-hand report was the only mention of a predatory cat outside of the buffer zone of El Cielo. It was not included in the list of encounters because it was only hearsay.

CHAPTER 6

Discussion

The high percentage of respondents who had encountered a predatory cat in El Cielo Biosphere Reserve was likely due to the nature of their occupations and the fact that they have spent their entire lives within the domain of the cats. Approximate zones where encounters frequently occur were mapped (Figure 6.1). The region between Gomez Farias and Alta Cima dominated by the Sierra Cucharas is a major center for encounters. The roads between these villages, as well as the footpaths that are heavily used by *palmilla* collectors were the most frequent locations for encounters. Most tourists enter the reserve through the town of Gomez Farias, and travel to Alta Cima and San Jose. The water crossing just to the east of Rancho El Cielo and the springs at Casa de Piedra were also cited on several occasions as a location for predatory cat sightings. These locations lie within the area most heavily visited by tourists (Walker 1997).

Regions of Encounters, El Cielo Biosphere Reserve



 **Regions of Encounters**



Figure 6.1. Regions of Encounters

Discussion of Spatial Variables

There was a high percentage of encounters on roads as compared to areas away from roads. These are the roads used by tourists as they ascend out of the tropical jungle into the cloud forests and pine/oak forests of the higher elevations. The physical terrain within which sightings occurred are in line with the findings of biologists who employ track counts and radio collars to determine habitat preferences of predatory cats. Mountain streams, peaks and knolls, and mountain slopes were areas of preferred habitat reported in previous literature (Smallwood and Fitzhugh 1992, Beier 1995). These habitat preferences were confirmed through first hand reports by the survey respondents. The water crossing near San Jose known as Casa de Piedra, the water crossing near Rancho El Cielo, the peaks around San Jose and La Gloria, the peaks and mountain slopes of the Sierra Cucharas are the areas in which encounters occurred. The fact that these results parallel the results of the research biologists affirms the effectiveness of the research design of using personal interviews in a biosphere reserve for determining movement patterns and habitat preferences of these cats.

There are spatial differences between mountain lion and jaguar encounters. On two occasions, respondents reported that high populations of mountain lions occurred in the upper elevations of the reserve. This area includes the peaks around the village of La Gloria, El Elephante, and the terrain

to north and west. Unfortunately, this region is unpopulated, and so there were no inhabitants to interview. However, first hand reports of those inhabitants who lived closest to this area indicate that there are mountain lions present.

The forest in this section of the reserve is mixed cloud forest and pine-oak forest. Here, there were three mountain lion encounters and only two jaguar encounters. The proportion of mountain lion encounters to jaguar encounters (3:2) is much higher than the proportion in the tropical jungle that dominates the lower elevations of the reserve (4:15). We can conclude that the proportion of mountain lions to jaguar is relatively higher at the upper elevations. The large number of jaguar sightings in the tropical jungle compared to mountain lion sightings suggests that the lower the elevation, the higher the proportion of jaguar to mountain lions.

Two respondents stated believed that the mountain lions are more wary of humans than the jaguar. There are no population estimates for mountain lions or jaguar in the reserve. This study suggests that mountain lions avoid humans more than jaguar. This is demonstrated simply by the difference in the number of encounters reported; seventeen jaguar encounters compared to seven mountain lion encounters. However, this may be either a function of differences in mountain lion or jaguar populations or a result of the shy nature of the mountain lion. It may also simply be a result of people using the jaguar habitat

more. As mentioned in the literature review, jaguar have also been shown to avoid humans. Perhaps future research in El Cielo could shed more light on these uncertainties.

Discussion of Temporal Results

The results of the inquiry into the temporal elements of predatory cat encounters seem straightforward. All encounters occurred during the low light conditions of the early mornings or late evenings or during the night while driving on the main roads. This is not to say that cats never hunt during midday. It has been shown in other areas of human use and recreation that cats prefer to hunt at night and bed down during the day (Garman 2002, McBride and Ruth 1988). This could be because the cats are aware of the human presence and avoid encounters. It is also possible that this phenomenon is due to the cats' preference for hunting under low light conditions. They are known to use the cover of darkness as an ally while stalking prey.

These times and places of activity should be communicated to tourists so they can understand the risks they incur when they hike or drive into the reserve. It would be ideal if they were given recommendations for avoiding an attack in the case of an encounter in addition to the temporal and spatial patterns of previous sightings. The solution to avoiding encounters employed by the

local population is to travel with dogs. Locals stated that the dogs usually scare off the predatory cats. It was also reported by respondents that if a cat does decide to attack, it will choose a dog over a human. Since most tourists will not travel with a dog, or desire to have the family pet consumed on their vacation, appropriate response to an encounter should be conveyed to them upon entering the reserve. This information coupled with the seasons and time of day in which cats are on the prowl, will provide a more complete source of information than providing the response behavior alone.

Remarks on Conditioning and Learned Behavior of Predatory Cats

Researchers who study mountain lion behavior assert that predatory cats may become conditioned to accept humans as prey, especially under certain circumstances (Seidensticker and Lumpkin 1992, Danz 1999). Danz (1999) postulates that this conditioning or learned behavior could be the reason behind the rise in mountain lion attacks in the United States and Canada. He states that these cats can become man killers as urban sprawl moves into areas of cat habitat. Seidensticker and Lumpkin (1992) add to this model of learned behavior by citing incidents and attacks in British Columbia where human habitats and mountain lion habitats overlap. El Cielo possesses the ingredients for mountain lion attacks based upon the work of these researchers. Why then were there no

first hand reports of incidents involving cat attacks or hostility to humans within the reserve? Several answers to this question are presented here.

First of all, it could be that previous research does not acknowledge that the increase in number of attacks could simply be a function of disappearing mountain lion habitat and prey base. This seems more likely than mountain lions learning to consider humans as attractive prey. Without a sufficient prey base, a hungry predator will have to find a way to eat. In times of scarcity, mountain lions have been known to consume porcupines and skunks. El Cielo is a large area (144,530-hectare). Respondents often stated that the mountain lions and jaguar had ample prey, and therefore had no reason to attack a person. The obvious yet elusive solution is to maintain a healthy habitat area, and hence a healthy prey base for the predatory cats. This solution is elusive because of the high demand for land in North America for urban and suburban development.

Another possibility is that the inhabitants of El Cielo have adopted effective strategies to protect themselves against the potential hazard of cat attacks. As previously mentioned, the inhabitants of El Cielo do not travel within the reserve without the company of dogs. It is not immediately obvious or clear why there are so many dogs in the *ejidos*. When children go to a field outside the *ejido* to play soccer they are accompanied by a pack of dogs. When asked why this is so, their parents explained that it is for protection. This is

probably not an option in the United States, due to the attitudinal difference in human-dog relations. In El Cielo, dogs serve a purpose that goes beyond companionship. They function as guard dogs but very differently than the guard dogs of the United States. These protect the inhabitants of the reserve from predatory cats, not from criminals.

In future research, when looking at places where the risk of an attack is heightened, researchers may want to pay attention to areas where the prey base is threatened. The results of this research certainly point to this as the most likely reason for the increase in attacks in North America and Canada. If we want to avoid another tragedy such as the attack in Colorado, it will be necessary to consider all the possible factors that contributed to it. Hunting down a “problem cat” will not eradicate the risk of another attack if the mountain lions in the area are running low on habitat and prey. El Cielo Biosphere Reserve is currently not likely to see an attack by a predatory cat. However, caution demands that tourists be educated in the proper response behavior in the case of an encounter with a cat.

The literature on response behavior to a cat encounter generally has commonalities. The advice “do not to run away” is one of these commonalities (Fitzhugh 1988, Danz 1999). It is said that running away triggers the cats’ predatory instincts and greatly increases the chance of attack. However, three

respondents in El Cielo reported doing this very thing when they saw a cat. The cats still did not chase and attack the person during these encounters for unknown reasons. It could be that the cats had no desire whatsoever to eat a human. Once again, this is most likely due to an abundance of natural prey.

Discussion of Respondent Perceptions

Previous research concerning human perceptions of carnivores and predators has demonstrated that the perception of the individual is largely a function of demographic and economic variables (Kaltenborn, Bjerke and Vitterso 1999). The work by Kaltenborn et al (1999) determined that sheep ranchers often have negative perceptions of the wild cats and dogs that threaten their herd. They would often score in the doministic, negativistic, and utilitarian attitude types. It is also shown in this research that scientists and wildlife managers scored high in the moralistic, ecologicistic, and naturalistic types. None of the inhabitants of El Cielo reported ranching as their form of livelihood, however, as previously mentioned, ranching is an integral part of life in the reserve. Many respondents reported that jaguar and mountain lions have historically preyed upon their domestic animals. However, this did not result in their scoring in the utilitarian type. They did not feel as if the cats should be “controlled” to protect their livelihood. They thought the answer to protecting

livestock came in the form of strategy. One solution mentioned by respondents was to build better enclosures for the smaller domestic animals. Field observations confirmed that this was common practice. Furthermore, inhabitants would gather the cattle together every evening in one fenced central area and close the gates. This provided for control and constant observation of the herds. It was thought that the dogs would have a better chance of sounding an alarm or scaring away a predatory cat if the cattle were managed this way. Three respondents stated that it would be okay to kill a specific cat if it was known to prey upon domestic animals. Although they did not score in the utilitarian type, they did demonstrate this utilitarian characteristic. The one person who did score in the utilitarian type reported working in agriculture with sugar cane and *nopales*. He had once seen a jaguar on the road while driving.

The negativistic attitude was identified three times during interviews. These three respondents felt as if the predatory cats of El Cielo were a danger to human life. It was unclear why they thought so. Perhaps it resulted from some innate feelings or understanding of the power these cats have over a human. None of the respondents who scored in the negativistic type were aware of an attack on a person in the past. Two of these three respondents reported that their livelihoods are not threatened by the cats. Only one of these respondents

thought the cats were a threat to his livelihood and should be controlled to protect it. He was a farmer and worked with sugarcane.

Not a single respondent scored in the doministic category. The question was searching for an extreme negative attitude. It asked if the respondent felt that all the predatory cats within the reserve should be killed. Although the three respondents answered that it was okay to kill a cat under certain circumstances, even they reacted with an emphatic no when asked if all cats should be removed. It seems odd that scoring in this category was not uncommon in the previous research done by Kaltenborn et al (1999). Many ranchers in the this study scored in the doministic type. Perhaps this is due to the fact that sheep are their sole source of income. It is hard for many of us to understand what it is like to wake up one morning and find half of your herd destroyed in a single night. Reports of this type are not uncommon in the literature (McBride 1978). An event like this could easily make a person harbor a doministic attitude towards the predatory cats. It could also be a result of a negative experience in the past such as witnessing an attack on a friend or family member.

Among the respondents in El Cielo that I was able to reach, this doministic attitude is non-existent. In a way, these results support the idea that

perception is a function of occupation. There were no residents who only relied on ranching, so there were no doministic attitudes.

By denying the doministic questions, all respondents were placed in the moralistic type. They were shown to have a general opposition to cruelty towards the predatory cats. Stewardship over all the species in the reserve is a source of pride among the inhabitants of El Cielo. It is stated on an interpretive sign that can be read on a trail outside of Alta Cima: "We are the caretakers of this forest!"

The residents of the reserve would have a good chance of increasing their income if they were to move to the city. This is often the case with the young men and women. They grow up and leave the *ejidos* of the reserve to make more money in the cities. The ones who do stay remain in El Cielo to work because they prefer life in the mountains surrounded by vegetation and animals. The fact that residents have made the decision to stay could say something about their feelings toward the natural environment in the reserve. I see this as a major influence in the results of the perception research question.

The score of the moralistic type is affirmed by the results of the naturalistic score. Twenty-seven respondents are categorized as this attitudinal type. They stated that they would like to see a jaguar and/or mountain lion in a recreational context. Many smiled and added only at a long distance would they

want to see one. These inhabitants often play the role of guide and host to the eco-tourists who visit the reserve. It is a positive sign to see that they share awe and interest in these large predatory cats. This will aid conservationists in their attempts to keep populations of these animals stable.

Conservationists strive to make others understand the unique role members of the animal and plant kingdoms play in their larger ecosystems. It is this understanding that I attempted to identify in respondents. If they answered that they felt the cats were beneficial to the health of the forests in El Cielo, they scored in the ecologicistic category. Eighteen respondents answered yes to these questions. Several respondents added the statement that the cats ate snakes. They demonstrated a specific understanding that the cats played an intricate role in the ecosystem, and that humans benefited from that role. This question had the highest number of non-responses where the answer was "I don't know." Seven respondents answered this way. Nine respondents said no, they didn't think the cat had anything to do with the health of the forest. This shows that any effort to further the environmental education of inhabitants could be fruitful and worthwhile if conservation of predatory cats is a priority.

CHAPTER 7

CONCLUSIONS AND CONTRIBUTIONS

The first research question asked what spatial characteristics play the greatest role in the occurrence of human-large mammal encounters in El Cielo Biosphere Reserve. It was shown that elevation plays a role in the type of predatory cat one is likely to encounter. This elevation is correlated with vegetation type and prey habitat. This research demonstrates that within El Cielo, one is more likely to encounter a jaguar in the tropical jungle portion of the reserve at lower elevations. Mountain lions were proportionally more common at higher elevations in the cloud forest and pine/oak forest. Both cats can be encountered on-road and off-road. Jaguar in particular were encountered more often on-road. Sightings occurred most often at night, early in the morning, or late evening. Areas where the cat sightings were most frequent were identified within areas of high tourism use. It was also shown that the areas where cats were encountered affirmed the findings of previous researchers. This

information should be conveyed to tourists along with appropriate response behavior in the event of an encounter.

The second research question asks about residents' general attitudes and perceptions of predatory cats. Residents scored high in positivistic and conservation-minded typologies. However, there is room for environmental education concerning the ecological role predatory cats play in the forests of the Sierra Madre Oriental. I conclude that employment of respondents does effect perception of predatory cats. No respondent reported to be a rancher. There were no scores in the doministic type associated with ranching. Therefore, my research supports the work done by Kellert (1991) and Kaltenborn, Bjerke, and Vitterso (1999). However, all respondents did have ties to ranching in one aspect of their lives, yet very few demonstrated negativistic or utilitarian perceptions. This phenomenon could be explored further in future research done on predatory carnivores in El Cielo and elsewhere.

The hypothesis of learned behavior or conditioning of predatory cats to consider humans as a prey species was not supported here. I found no evidence that predatory cats were becoming conditioned to accept humans as suitable prey. More extensive research in the area of human-predatory cat encounters will clarify this uncertainty. Studies in areas of differing land use, differing cat

habitat size, and differing levels of prey base will help to address the issue of cat behavior towards people.

APPENDIX 1

SURVEY

Part I

1. Do you work outdoors?
2. Do you travel often between ejidos?
3. What job do you do outdoors?
4. Have you encountered any of the large predators recently? (black bear, jaguar, or mountain lion)
5. Has anyone you know encountered any of the large predators recently? (If yes, continue to next question; If no, proceed to part II)
6. What were you doing when you made the encounter?
7. Where (what is the location) did you see the animal?
 - A) Can you show me on the map?
 - B) Can you tell me the exact location?
8. Were you on or off the road?
9. What ejido were you closest to?
10. What was the distance to that ejido?
11. What time of day was it? (dawn, morning, afternoon, evening, dusk, night)
12. What season was it? (Fall, Winter, Spring, Summer)
13. What month was it?

Part II

1. Do you think jaguars are a threat to a person's life while walking in the forest?
2. Do you think mountain lions are a threat to a person's life while walking in the forest?
3. Do you feel jaguars are a threat to you livelihood and should be controlled to protect it?
4. Do you feel mountain lions are threat to your livelihood and should be controlled to protect it?
5. Do you think jaguars should be eliminated?
6. Do you think mountain lion should be eliminated?
7. Do you think the jaguar is good for the health of the forest?
8. Do you think the mountain lion is good for the health of the forest?
9. Would you like to encounter a jaguar?
10. Would you like to encounter a mountain lion?

APPENDIX 2

RESPONSES TO PART II OF SURVEY

Home	1	2	3	4	5	6	7	8	9	10
Alta Cima	no	no	no	no	no	no	yes	yes	yes	yes
Alta Cima	no	no	no	no	no	no	yes	yes	no	no
Alta Cima	no	no	no	no	no	no	yes	yes	yes	yes
Alta Cima	no	no	no	no	no	no	yes	yes	yes	yes
Alta Cima	no	no	no	no	no	no	yes	yes	yes	yes
Alta Cima	no	no	no	no	no	no	yes	yes	yes	yes
Alta Cima	no	no	no	no	no	no	yes	yes	yes	yes
Alta Cima	yes	yes	no	no	no	no	dk	dk	yes	yes
Alta Cima	no	no	no	no	no	no	yes	yes	yes	yes
Alta Cima	no	no	no	no	no	no	yes	yes	yes	yes
Alta Cima	no	no	no	no	no	no	yes	yes	yes	yes
Alta Cima	no	no	no	no	no	no	yes	yes	yes	yes
Alta Cima	no	no	no	no	no	no	yes	yes	yes	yes
San Jose	no	no	no	no	no	no	no	no	yes	yes
Cd. Mante	no	no	no	no	no	no	yes	yes	yes	yes
San Jose	no	no	no	no	no	no	no	no	yes	yes
San Jose	no	no	no	no	no	no	dk	dk	yes	yes
La Gloria	no	no	no	no	no	no	yes	yes	yes	yes
San Jose	no	no	no	no	no	no	no	no	no	no
San Jose	no	no	no	no	no	no	no	no	yes	yes
Alta Cima	no	no	no	no	no	no	no	no	yes	yes
Gomez Far	no	no	no	no	no	no	yes	yes	yes	yes
Rancho El										
C./AC	no	no	no	no	no	no	yes	yes	yes	yes
Gomez Far	no	no	no	no	no	no	dk	dk	yes	yes
Gomez Far	yes	yes	yes	yes	no	no	no	no	no	no
Gomez Far	no	no	no	no	no	no	yes	yes	yes	yes
Gomez Far	yes	yes	no	no	no	no	dk	dk	no	no
Gomez Far	no	no	no	no	no	no	yes	yes	yes	yes
Gomez Far	no	no	no	no	no	no	no	no	yes	yes
El Nacimiento	no	no	no	no	no	no	yes	yes	yes	yes
El Nacimiento	no	no	no	no	no	no	no	no	no	no
El Nacimiento	no	no	no	no	no	no	no	no	yes	yes

dk= don't know

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