CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

OBSIDIAN EXCHANGE IN PREHISTORIC BAJA CALIFORNIA: AN INITIAL LOOK AT REGIONAL EXCHANGE NETWORKS IN THE PENINSULA

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DEDICATION

Para los mejores padres del mundo

mama y papa…

Gracias por siempre estar ahí apoyándome en todo.

Los quiero mucho y los amare por siempre.

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ABSTRACT

OBSIDIAN EXCHANGE IN PREHISTORIC BAJA CALIFORNIA: AN INITIAL LOOK AT REGIONAL EXCHANGE NETWORKS IN THE PENINSULA

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Very few studies focus their attention on obsidian artifacts from the Late Holocene in Baja California. The published data from San Quintín, El Rosario, Guerrero Negro, Isla Cedros, Bahía de Concepcion, San Borja, Bahía de Los Angeles, and San Ignacio demonstrate valuable information pertaining to sourcing and addressing possible exchange routes. In a peninsular context, obsidian appears restricted in small quantities throughout specific locations. The distribution of obsidian can be partially explained using two models that focus on the distance to the primary obsidian source, the distance to the next nearest obsidian source, and population density. The rich ethnohistoric record, ethnographic record, and rock art of Baja California provide sufficient contextual information to develop an alternative explanation using a landscape framework for obsidian distributions that do not fit the model. Both perspectives paint a geographical picture of obsidian exchange routes in the Late Holocene. Obsidian exchange in Baja California interconnects and crosses both cultural and ethno-linguistic boundaries to establish a coherent social mechanism through reciprocity. The development of alternative interpretations encourages the multifaceted social and cultural dimensions of small-scale societies often ignored within the hunter-gatherer literature.

CHAPTER I: ADDRESSING THE RESEARCH PROBLEM

Expectations of Project

The goal of this thesis is to contribute a perspective that utilizes obsidian exchange as a vantage point to understand interregional exchange networks in the Baja California peninsula during the Late Holocene. Previous archaeological work throughout Baja California is limited to several scholars in the United States and Mexico. They are aware of the need for research to explore other avenues in Baja California archaeology. Enough archaeological data exists to explore obsidian exchange networks within the peninsula. The assortment of published XRF data from obsidian artifacts of over one hundred sites can be used to model exchange networks during the Late Holocene. Obsidian assemblages can be situated within a socially and meaningful landscape by exploring exchange systems as interconnected, crossing both cultural and ethno-linguistic boundaries to establish a coherent social mechanism through reciprocity. Ethnographic and ethnohistoric perspectives are included in this approach.

New perspectives arise with the help of the ethnohistoric and ethnographic record to challenge the standard evolutionary views and to appreciate the dynamic social and ideological dimensions of small-scale societies. The exchange of lithics, in this case obsidian, offers a gateway into one of those dimensions. The use of non-local obsidian in most areas suggests that distance, population size, and procurement methods are not the only factors that play into obsidian exchange in the region. Factors such as agency, geographic constraints, and landscapes can help further our understanding of exchange networks. The distribution of obsidian assemblages plays an important role in the acquisition of raw materials and the interactions with other groups.

Presentation of Research

Chapter 2 lays out the previous archaeological work done in Baja California. A brief history of archaeological work at each region (San Quintín, San Borja, Bahía de Los Angeles, Guerrero Negro, San Ignacio and Bahía Concepcion) gives a description of the location, the obsidian artifacts, and the nearest obsidian quarries. This is followed by date approximations of each region based on either obsidian hydration dates or shell midden dating. Most of the sites with obsidian date from the Late Holocene (~500 AD) to contact period.

In chapter 3, a literature review covers the most prominent theories in California Archaeology describing various perspectives on small-scale societies. A brief history of the theoretical perspectives includes some of the ecological, Marxist, and neo-evolutionary interpretations on hunter-gatherer groups in Baja California. The discussion on small-scale societies transitions into the trade and exchange perspectives from around the world. The applicable theories on obsidian exchange show promising interpretations useful to Baja California archaeology. This includes incorporating theoretical perspectives such as reciprocal exchange theories and more recent theories such as Complexity Theory and agency.

Chapter 4 outlines the methodology used in the thesis. The data consists of published archaeological work, including XRF sourcing, dating, approximate distance from other sites, and theoretical perspectives relative to each individual region. This chapter also explains the models and statistical tests useful to interpret the data. The first model is the Law of Monotonic Decrement, or distance decay model. The second model incorporates statistical analysis using a multiple regression equation. These analytical tools are the first steps towards developing new perspectives on obsidian exchange networks in Baja California.

Chapter 5 is divided into two sections: results and analysis. The results section explains the statistical outcome offering comparable data. The charts and table in this section demonstrate the results of using both distance decay model and the multiple regression models. These results are interpreted in the last section of this chapter offering an analytical perspective that coincides with much of the archaeological work. Included in this chapter are maps demonstrating obsidian distribution patterns during the Late Holocene.

Lastly, chapter 6 attempts to make the argument that obsidian exchange is a form of social mechanism in small-scale societies that establish relationships between groups. Obsidian distribution patterns demonstrate the potential to attribute agency to individuals within these groups through culturally motivated exchange. The argument unfolds by exploring the interpretation of reciprocal exchange within obsidian networks. As material objects can relate back to places and space, obsidian emerges as an artifact of cultural significance. Finally, the last section explores some of the gaps and potential future research that could be essential in understanding and mapping exchange networks in Late Holocene period Baja California.

CHAPTER II: PREVIOUS ARCHAEOLOGICAL WORK IN BAJA CALIFORNIA

The Baja California peninsula serves as a broader archaeological canvas to investigate and develop the study of hunter-gatherer lifestyles. Previous archaeological work has emphasized on specific regions leading to multiple interpretations of prehistoric society. The premise of this thesis engages with the procurement, mobility and interaction of obsidian within a meaningful context in Baja California. This view focuses on obsidian exchange at a peninsular level to develop an interpretation of obsidian exchange networks of small-scale societies during the Late Holocene period. No previous body of work currently exists on this topic regarding Baja California and, hopefully, this thesis can engage the reader in viewing hunter-gatherer lifestyles from an alternative perspective.

An overview of Baja California archaeology can be derived from the body of radiocarbon dates assembled in the past few decades, contextualizing occupational sites from the Late Pleistocene to the Late Holocene (approximately 10,000 B.C. to 1300 A.D.) (Carmean & Molto 1991; Davis 2002, 2007; Des Lauriers 2006, 2010; Drakic 2010; Fergusson & Libby 1963; Fujita 2008a, 2008b, 2010; Fullola et al 1994; Gruhn & Bryan 2008, 2009; Hubbs et al 1960, 1962, 1965; Hyland 1997; King 1997; Libby 1952; Linick 1977; Moll & Santamaría 1989; Molto & Fujita 1995; Moore 1999, 2001, 2008; Porcayo 2010; Raab & Boxt 2007; Ritter 1979; Ritter & Burcell 1998; Ritter and Schulz 1975; Ritter & Payen 1992; Ritter et al 1995; Rosales & Fujita 2000, Stewart et al 1998; Suess 1954; Téllez et al 2001; Tuohy & Van Wormer 1995). These archaeological studies focus on several areas. These include: San Quintín, San Borja, Bahía de Los Angeles, Guerrero Negro, Isla Cedros, San Ignacio, Bahía Concepción, and San Javier (see map 2). For the purpose of this thesis, this overview of archaeological work will only focus on middle to late Holocene sites containing obsidian artifacts already sourced using x-ray fluorescence (XRF) in each region.

San Quintín

Many archaeological sites lie within San Quintín and El Rosario regions. The San Quintín and El Rosario regions are the northernmost areas with Late Holocene obsidian in the Baja California peninsula. Approximately 200 km south of the U.S.-Mexico border, much of the geographic locations of sites are near the Pacific coastline (Moore 2006: 182). Abundant marine resources such as Pismo clam, California mussel, and black abalone could account for the archaeological sites found in the region (184). In addition, agave, sage, pear cacti, cardón cacti, and cholla provide a rich reliable food source available during late prehistory (Wiggins 1980: 22; Moore 1999, 2001). Further inland are volcanic cones north of Bahía de San Quintín, and mountainous ranges that expand along the coast to El Rosario. The Rosario River Valleys expand approximately 40km west providing fresh water. Puerto El Parral and Arroyo Matomí are the two obsidian sources closest to San Quintín. The two sources are east of San Quintín with Puerto El Parral being substantially closer.

Unlike other regions in the peninsula, archaeological work prior to 1990 in San Quintín-El Rosario consisted of observational non-systematic surveys. The main focus of these surveys reported shell middens, radiocarbon samples, and brownware from the mission period (Hubbs et al 1962; Meigs 1935:60, 1939:37; Shor 1980). The most important ongoing archaeological work is Jerry D. Moore's Proyecto Arqueológico San Quintín-El Rosario (PASE). The project's original intent was to examine contact period demography and settlement (Moore 1999), but the project continued to find promising archaeological evidence for prehistoric occupation. By providing more radiocarbon and stone tool samples, the project opened a discussion to the lifestyle of human occupation during prehistory.

Although the context of artifacts and the radiocarbon chronology in San Quintín-El Rosario is still highly debated (Moore 2006: 187), the stone tools shed some light into the region's timeline. There are only a handful of projectile points found from 200+ archaeological sites. Point types found in the assemblages resemble the same Comundú period desert side-notched and triangular points found in other regions of the peninsula (Hyland 1997; Massey 1966; Ritter and Burcell 1998). However, obsidian only appears in small quantities. Yet, enough exists to interpret San Quintín-El Rosario relationship with the rest of the peninsula.

San Borja and Bahía de Los Angeles

Bahía de Los Angeles lies on the southeast coast of Baja California (see Map 2). San Borja lies inland at the narrowest width of the peninsula just northwest of Bahía de Los Angeles. This region encompasses Bahía de Las Animas, the Sierra San Borja, and extends to Laguna Seca. The region is quite arid and contains plants such as ocotillo, palo verde, and various cacti that resemble the Sonoran Desert (Wiggins 1980). Shallow wells and seasonal *tinajas* (natural water tanks) near the mountainous areas provide a stable water source. Other geographic features include rock shelters, volcanic cliffs, and granite boulders useful for Cochimí-speaking people (Gastil et al 1975; Ritter 2006b). The obsidian source Ensenada el Pescador lies within this region. The second nearest obsidian source Isla Angel de la Guarda is located on an island east from the bay.

Previous archaeological work in this region dates back to the 1880s (Mathes 1992). It was not until the 1960s when scholars (Massey & Osborne 1961; Noble 1973; Tyson 1975) began to analyze and publish the collection stored at the U.S. National Museum in Washington, D.C. By the late 1960s to the 1970s, others began to examine the region. Emma L. Davis (1968) recorded several sites dating to the early Holocene. Other scholars (Alvarez Williams 1973; Crosby 1975, 1997; Hambleton 1979; López 1972) reported pictographs and petroglyphs with distinct imagery from that found at the Sierra de San Francisco. With the popularity of the pictographs, the Instituto Nacional de Antropología e Historia (INAH) is the first major archaeological project to examine mollusk remains and lithic tools near the original excavated sites from the 1880s (Bendímez et al 1993). The most recent work by the Archaeological Research Facility in the mid 1990s, cataloged and analyzed many artifacts (Ritter 1998), including most of the obsidian examined in this thesis. The fieldwork extensively sampled the shoreline of the Bahía de Los Angeles. Other unpublished work continues exploring sites further inland from the bay (Ritter 2006b: 171).

Radiocarbon dates and obsidian hydration readings place the majority of discovered sites between mid and late Holocene. Although other sites show evidence of occupation before the mid-Holocene, the majority of obsidian artifacts correspond to the late Holocene (Hubbs et al 1960: 206; Ritter 2006b: 172). The small triangular or side-notched Comundú projectile points series reflect a later period in prehistory before contact. The technology places obsidian projectile points roughly 1,500 years old (Ritter 1998; 2006b). The chronology and context of some of the sites rely on radiocarbon dates. The focus lies on a rough outline of stone tool technology comparable to the Great

Basin and the American Southwest. However, by placing obsidian projectile points in a regional context, the dates strongly coincide with the Comundú Period projectile points found at Guerrero Negro.

Guerrero Negro (Vizcaíno Desert)

The most extensive archaeological work lies in the town of Guerrero Negro near the lagoons in the Vizcaíno Desert. The desert lies between Baja California and Baja California Sur. The area is flat, has sandy rich plains with active dunes surrounded by the Pacific Ocean on the west and the Sierra de San Francisco on the east (Ritter 2006a: 135). The nearest obsidian sources available to this region are Valle de Azufre and Ensenada del Pescador located to the southeast and northeast respectively (see map 2 and 3). Significant to the area are the lagoons. Seafood resources are abundant in the region, suggesting a year-round stable useful to Cochimi-Yuman speaking people (Nelson 1921; Scammon 1970). However, fresh water was not available year round. Miguel del Barco (1973: 253) writes about the difficulties of living on the beach and how potable water came from "batequis" (excavated wells) or dew accumulations. Eventually people would return to the nearby mountains for more secure fresh water sources.

The archaeological work done in the Vizcaíno Desert comes from a handful of scholars. William C. Massey (1947: 353) reports found prehistory stone tools and artifacts that predate the mission period. Other reports of midden deposits, charcoal samples (Hubb et al 1962), parts of redwood canoes (Moriarty & Moriarty 1980), and archaeological remains (Ritter & Payen 1992) lead to further archaeological studies done by the Instituto Nacional de Antropología e Historia (INAH). The program focused on prehistoric and protohistoric investigations near Laguna Guerrero Negro, Laguna

Manuela, and Laguna Ojo de Liebre (Ashley et al 2003; Ritter 1999, 2002, Ritter and Burcell 1998). The obsidian artifacts discussed in this thesis pertain to Laguna Guerrero Negro and Laguna Manuela.

Obsidian artifacts from this region show variability in the style of projectile points. The different style of projectile points found in the Vizcaíno Desert reflects other traditions from the Great Basin and the American Southwest (Ritter 2006a: 142). Four different types of projectile points made from obsidian include the Guerrero Negro Series, Comundú, Manuela contracting-stem point, and an unnamed series (Ritter and Burcell 1998). The Guerrero Negro series and the Comundú are almost always obsidian, whereas the Manuela and unnamed series projectile points are not exclusively obsidian. In conjunction with radiocarbon dates and obsidian hydration readings, obsidian tools date to the Middle and Late Holocene. However, Obsidian tools are more apparent after ca. A.D. 500 near the time of the Comundú period.

Isla Cedros

Isla Cedros is an island off the western coastline of the peninsula (see map 2). The island extends 36 km north to south and 16 km east to west containing a mountainous typology (Des Lauriers 2010: 13). The island's agave, cacti, abalone, shellfish, oysters, sea otters and gray whales offer rich resources for small groups on the island. It also contains fresh water sources not found immediately off the coast of the mainland. But Isla Cedros is not completely isolated. Ethnohistoric and archaeological evidence point to the existence of watercrafts that allowed people to travel between the island and the mainland (Montané 1995; Des Lauriers 2005). There are no obsidian sources on the island. The closest obsidian sources are Valle de Azufre and Ensenada del

Pescador located on the mainland. But strangely only Valle de Azufre appears on the island.

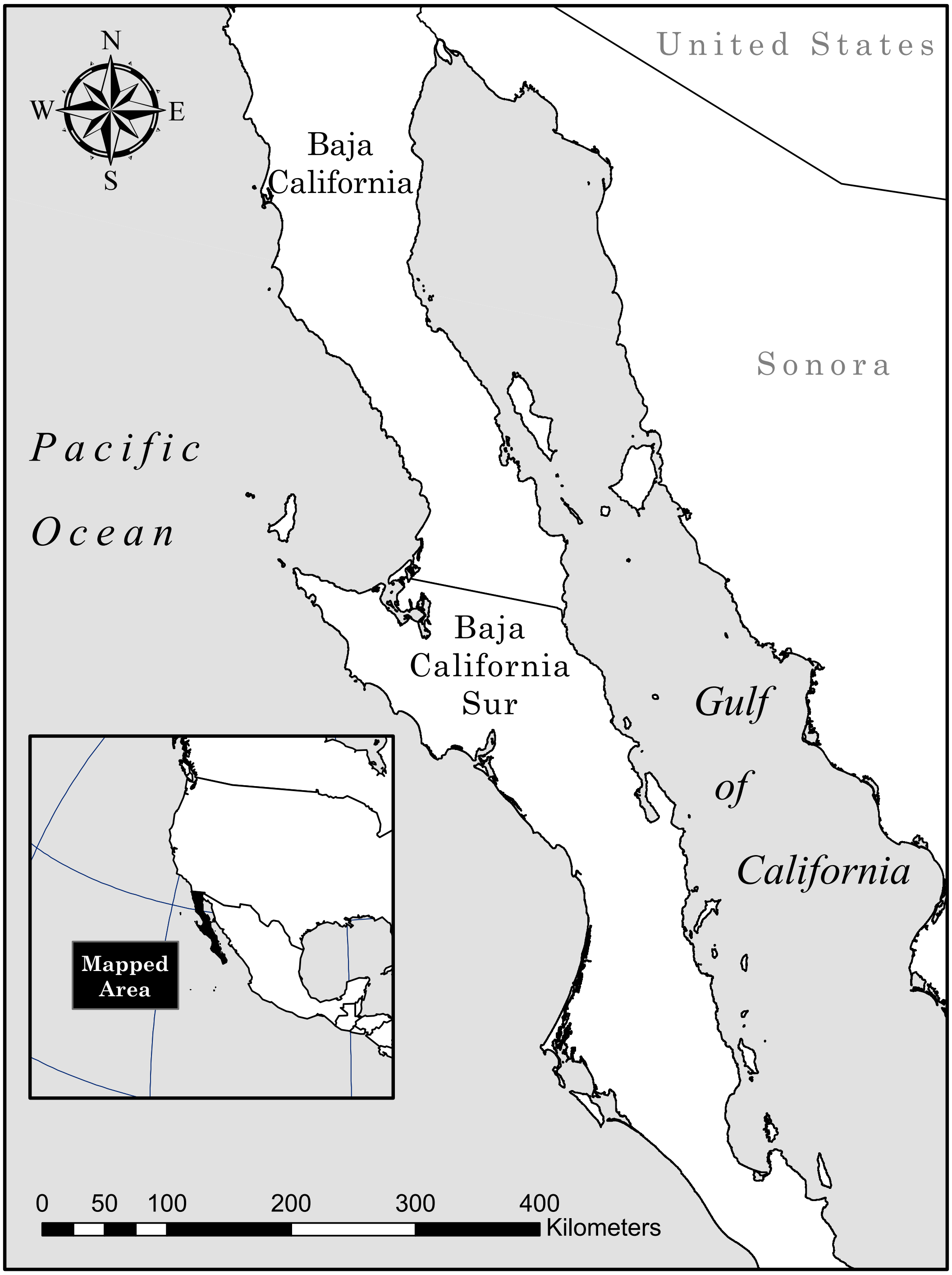
Before any major archaeological research, Spanish explorers like Francisco de Ulloa in the 1540s and Juan Rodríguez Cabrillo in 1542 explored Isla Cedros (Kelsey 1998; Wagner 1929). It was not until the late 1960s when archaeologists began to take an interest. Archaeological research on the island is still at its infancy and only a few scholars (Banks 1978; Davis 1973; Des Lauriers 2010) contributed to the island's prehistory. Banks (1972, 1978) reported several midden deposits, house features, and camps for gathering pine nuts. However, the reports published by Banks are problematic. Such details, as the "pine nut camps", cast doubt to their existence on the island (Des Lauriers 2010: 5). The Proyecto Arqueológico Isla de Cedros (PAIC), headed by Matthew Des Lauriers (2006: 165, 2010:174-178), explores the island's relationship with the mainland and studies maritime hunter-gatherer lifestyles through the idea of "insularity".

All obsidian artifacts from the island originate from the PAIC research. Obsidian appears in small quantities on the island. With no quarries on the island, the obsidian came from the mainland. The chronological context of obsidian coincides with a late arrival to the island approximately 600 BCE. Obsidian appears on the island late in the Middle Holocene and all through the Late Holocene. The typology of obsidian projectile points present on the island are small equilateral-form Comundú series and "Huamalgüeño" point, a variation of the Comundú point (Des Lauriers 2010: 158, 177).

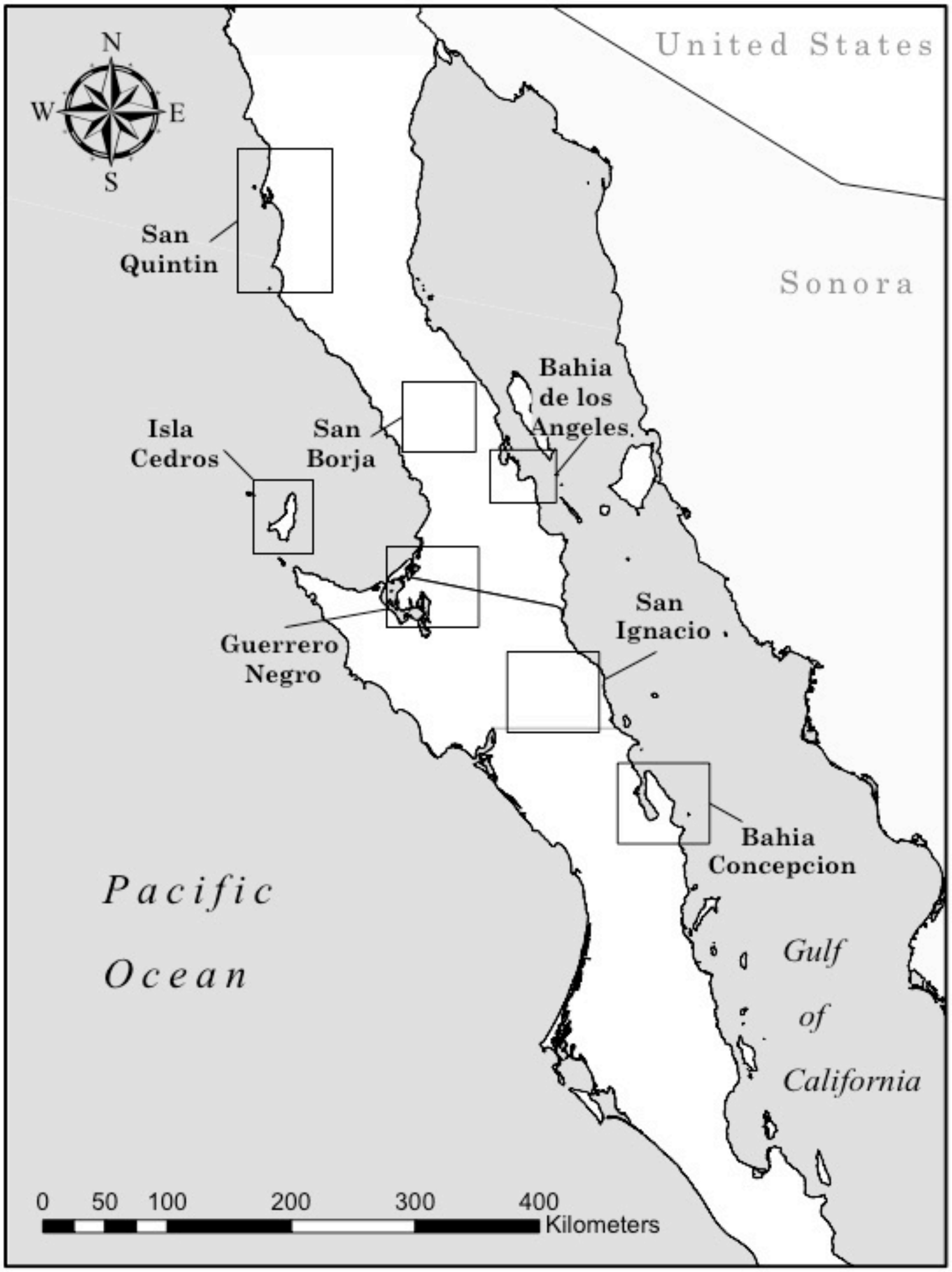
Bahía de la Concepción

The furthest point south that obsidian appears in the archaeological record is in Bahía de la Concepción (Map 2). The peninsula narrows to 75 km in width. This mountainous region forms the Sierra de Guadalupe, which includes rock art, obsidian quarries, and silicates (Ritter 2006c: 100). The regions vegetation contains dry land flora including agave and yucca. Various trees and cacti, such as palo verde, cardón, mesquite and lomboy extend throughout the region. Freshwater marshes, swamps, and salt marshes partly encompass south of the bay (Wiggins 1980: 21-23). There are two main obsidian sources important to this region. The closest source is Punta Mangles. This is the southernmost known obsidian source in the peninsula, located no more than 40 km south of Bahía de la Concepción. The second nearest source is Valle de Azufre, which interestingly appears in the archaeological record more than Punta Mangles.

The most prominent archaeological and historical research done at Bahía de la Concepción lay near the rock art sites of Mulegé. The first recording of the rock art sites began late in the 19th century (Diguet 1895) with accounts from Jesuit priests, explorers, and travelers. There is no consensus on the dates of rock murals. The works of several scholars (Massey 1966; Hyland 1997; Ritter 1979) outline a rough chronology that begins from the Early (~5500 B.C.) to the Late Holocene (~A.D 500), coinciding with human occupation in the region. Some archaeological evidence such as obsidian artifacts and several Comundú points associate with some of the rock art found in the sierras. However, the art does not resemble that of the Great Mural paintings or the traditions found further north in the Sierra de San Francisco (Ritter 2006c: 111). Nevertheless, the few obsidian artifacts found in the region source to Valle de Azufre. This relationship demonstrates a north-south interaction that has yet to be explored in the archaeological record.



Map 1: Baja California Peninsula



Map 2: Location of archaeological sites in Baja California.

CHAPTER III: THEORY, EXCHANGE, AND BAJA CALIFORNIA

Theoretical perspectives in Baja California archaeology adopt a functional, neo-evolutionary framework to explain prehistoric hunter-gatherer behavior. The ongoing research in Baja California continues to draw new theoretical perspectives, including ecological, Marxist, foraging strategies, maritime, and feminist theory (Carmean 1994a; Des Lauriers 2010; Fujita 2010; Fujita & Poyatos de Paz 1998; Laylander 2006; Moore 2001; Ritter 1998). The focus of these perspectives emphasize on localized groups within the peninsula. Laylander (2006:204) points out the increasing research on networks and connections between the different regions in the peninsula.

This project offers to add an old theoretical framework never before used in Baja California. Obsidian distribution models offer an initial theoretical framework to explain aspects of social and economic prehistory. World system theories provide models with a "top-down" perspective useful in explaining patterns of behavior. These and other theoretical perspectives offer opportunities to develop a more elaborate picture. Obsidian distribution in the peninsula of Baja California associates heavily with the landscape, ethno-linguistic boundaries, and cultural identities. The ethnohistoric and ethnographic literature provides context for material objects of cultural significance, identifying meaningful landscapes, and recognizing cultural identities.

Although problems are associated with the use of ethnohistoric and ethnographic literature, exploring these avenues continue to develop new potential perspectives associated with geographical areas (Jordan 2003; McCaffrey 2011). The following sections present a summary of theoretical perspectives drawn from archaeological work around the world.

Distance Fall-Off and Regression Model

The distance fall-off model is Renfrew's (1977: 72) theoretical framework for expressing the law of monotonic decrement, stating:

> "In circumstances of uniform loss or disposition, and in the absence of highly organize directional (i.e., preferential, nonhomogeneous) exchange, the curve of frequency or abundance of occurrence of an exchanged commodity against effective distance from a localized source will be a monotonic decreasing one".

This means that the number of artifacts will appear less frequently the further it is from the source. Renfrew (1977:72) points out that effective distance is the "measure of energy required to move goods between two points." This includes the type of transportation needed to cross natural barriers. Mathematically, the analysis expresses a negative linear, exponential, or Gaussian slope. The x-axis represents the distance of the artifact to the source. The y-axis graphs the indices of the object either in proportions or absolute values. The trend explains distribution patterns as people exchanging goods in one particular direction or "organize directional exchange." This direction characterizes a "down-the-line" or middleman mode of operation.

Some archaeological examples from the Near East (Wright 1969, 1970) failed to fit the model, as the percentage of obsidian against distance from the obsidian source did not align perfectly. Although the distance-decay model may not apply in some cases, this still opens new ways to view exchange between small-scale societies instead of concluding automatically a direct procurement strategy.

Other cases (Findlow & Bolognese 1980; Ericson 1977) point out the limitations of relying solely on distance as the factor for exchange. Ericson (1977: 110-121) examines the distribution of prehistoric obsidian exchange in Alta California. The study demonstrates that obsidian distribution declines as the distance from the source increases, matching Renfrew's Law of Monotonic Decrement. The study further argues that distance is not the only contributing factor influencing the distribution of exchange in Alta California.

Ericson (1977: 121) includes other factors that affect obsidian exchange into a multivariable regression using the following equation:

$$Q = a + bP + cX + dY$$

This model takes the percentage of obsidian of one source as the dependent variable or "exchange index" (Q) and uses distance from the primary source (X), population density (P), and distance from the second closest obsidian source (Y) as independent variables. The variable "a" is the general coefficient and b, c, and d are coefficients belonging to each of the independent variables. The regression model builds upon the law of monotonic decrement to explain the multi-directionality of obsidian exchange in Alta California. The results in Ericson's study examined ten obsidian exchange systems and three of the systems did not fit the model, suggesting distance is only one of many factors influencing exchange. Ericson accounts for the low correlation values by explaining how the population estimates heavily influence those exchange systems not fitting the regression model. Nevertheless, Ericson was still able to interpret these results and develop a comprehensive scheme of obsidian distribution throughout Alta California.

Complexity Theory

Models provide a holistic view that often ignores the individualistic aspects and human agency. To account for this problem, the idea of emergence within the "complexity theory" framework places an emphasis on this dilemma. Complexity theory is:

> "The study of how new complex properties emerges from the interactions of many agents interacting in often quite simple ways…the properties that emerge from those simple interactions are nonlinear, complex and not predictable from the study of the individual agents themselves" (Bentley & Mashner 2008: 245).

The theory originates from world systems theories that look at various aspects of human interactions to understand behavior.

The roots begin from Marx's (1852, 1859) worldview on the political economy. Social, political, and economic studies provide "top-down" or "bottom-up" perspectives with contradictory conclusions explaining the same research or data. The debate concerns whether individuals influence the major social structure or vice versa. As Marx (1859: 3-4) famously states:

> "In the social production of their life, men enter into definite relations that are indispensable and independent of their will, relations of production which correspond to a definite stage of development of their material productive forces. The sum total of these relations of production constitutes the economic structure of society, the real foundation on which rises a legal and political superstructure and to which correspond material life conditions the social, political and intellectual life process in general. It is not the consciousness of men that determines their being, but, on the contrary, their social being that determines their consciousness."

The broader scope of Marx's work acknowledges the importance of action from individual actors. Fundamentally, this poses the ontological and epistemological concerns of "mother culture" versus "sister culture" debates in prehistoric civilizations. For small-scale societies, exchange networks arrive at a similar dilemma. Complexity theory engages in this discussion of networks and world systems theory to recognize incorporating both individual agents and social structure simultaneously shaping our explanation of past societies.

In archaeology, complexity theory is slowly gaining traction as more perspectives try to challenge the processual and postprocessual paradigm (Bentley & Mashner 2008; Bintliff 2008; Johnson 2002; Watts 2003). The one main component to this theoretical perspective relies on the idea of emergence. Emergence, in this context, is the idea that closed systems at equilibrium change. This change can come from small, independent groups influencing different components of a system. Individuals play an active role as collective agents within the whole structure (Durkheim 2004 [1895]). However, it must not be mistaken that emergence creates or disrupts equilibrium. The idea encompasses other variables that otherwise studies on world, networks, or exchange systems would not consider as factors directly or indirectly influencing change. These "emergent properties" come from cultural norms inevitably embedded in society. This influence slightly chances the system, but does not full disrupt it.

Reciprocal Exchange Theory

For most people on earth, social relationships are inevitable in life. These interactions and connections happen in multiple ways, and in some cases it develops trust. Reciprocal exchange, either at the individual level or social group level, allows for the creation of trust for another person or group. The reciprocity between two groups can be characterized as a simple material exchange of goods or joining in arms in solidarity to fight your allies' enemy. These relationships develop through the "combined power of exchange and symbolic reinforcers to construct lasting ties of mutual aid" (Johnson & Earle 2000:47).

Mauss (1967 [1925]) examines the notion of reciprocity through the simple act of gift giving. The notion of gift giving establishes several implicit rules that obligate the person receiving a gift into action. Three obligations emerge from this practice: (1) to receive the gift; (2) to repay the person; and (3) give a gift. The first obligation is to receive the gift. On the one hand, accepting a gift displays trust and confidence by establishing a socially acceptable dynamic between two individuals or groups. On the other hand, refusing or declining a gift establish a sense of doubt about the other and may even insult the gift giver as not acknowledging their efforts to develop the social relationship. The second obligation establishes that the repayment must be of something of equal value. It does not always have to be a material object that matches in value. The obligation to repay characterizes value beyond economic means and place value into tribute, time, or effort. The final obligation is to give. The sharing of wealth and resources strengthens the relationship with others as you receive gifts, then you can give gifts too whenever possible. Among small-scale societies the notion of reciprocity, within a cultural context, determines the social dynamics among individuals and between larger social groups. In egalitarian societies, reciprocity establishes a social organization that determines the economic structure (Polanyi 1957). The development of social ties determines the relationships the individual or group will maintain throughout their lifespan.

Reciprocal exchange is not perfect as obligations are like promises, they can be broken. Sahlins (1972) identified reciprocity as more than the simple “giving and receiving” social mechanism within egalitarian societies. How close the relationship is determines the type of reciprocal behavior. For instance, at the family-level, reciprocity is not always filled with obligation as close family members share resources without need to repay. The Maussian sense of reciprocity containing implicit obligations begins outside the family-level within the village or tribal community as balanced reciprocity. Any interaction outside any of an individual's social circle constitutes as either a stranger or enemy. In this last case, a negative reciprocal relationship establishes an uneven balance of trust and determines whether effort should be invested to develop the relationship.

Ultimately, reciprocal exchange extends to the level of cooperation in the social organization of society. The transaction during exchange develops personal connections and the material objects play a role in developing the level of trust and social distance (Mauss 1967: 44-46). The commodities during exchanges become more than utilitarian resources needed for survival (Appaduari 1986; Kopytoff 1986;). They shift into gifts that establish new forms of relationships outside the circles placed by Sahlins or Mauss (Gregory 1982). Obsidian is but one example whose physical properties lend itself to symbolic interpretations and possible indicator of social identity (Saunders 2001; Spence 1996).

The Landscape Perspective

In discussions of landscape theory, spatial relationships tie people, environments, places, and ecology. The most relevant idea from landscape is ethnogeography, more specifically the idea of understanding the space of ethno-linguistic groups and their use of space surrounding rock art. Ethnography and ethnohistory in archaeology provide a descriptive resource that captures the way people perceive places. The symbiotic relationship between space and place strengthens as landscape markers, such as monumental architecture, trails, mountains, rivers, and rock art among many more, contains information significant to these landscapes from a non-scholar perception (Abercrombie 1998; Myers 1986).

In addition, cultural objects my associate closely with particular landscapes. Obsidian can obtain a symbolic meaning through reciprocal exchange and further identify as an extension to the landscape (Taçon 1991). Basso (1996:107) claims, "Sensing places, men and women become sharply aware of the complex attachments that lead them to features of the physical world." The exchange of objects near landmarks as relevant as rock art portrays the movement of people. Objects become closely associated with the places of exchange and the geographical space.

Ethno-linguistic groups identify these places, sometimes under different names. If multiple ethno-linguistic groups identify a similar place, even if by different name, then archaeologist must acknowledge its importance. These places that share multiple groups sustain a system of exchange networks or ritualistic gatherings. Basso (1996: 107) continues:

> "For the self-conscious experience of place is inevitably a product and expression of the self whose experience it is, and therefore, unavoidably, the nature of that experience…places possess a marked capacity for triggering acts of self-reflection, inspiring thoughts about the who one used to be, or musings on who one might become."

Although Basso is speaking about sensing places, material objects, such as obsidian, can act as a "trigger" for those experiences. Obsidian and other material objects are an extension of the landscape. Thus, the importance of ethnohistory and ethnography provides a unique perspective to encourage new theoretical frameworks.

Diverse Studies on Obsidian Exchange

Since Polanyi (1957), investigating prehistoric exchange systems characterize a new focus on the aspects of past societies related to cultural systems, social networks, technological innovations, and object symbolism in archaeological theoretical perspectives. The main framework investigates the social and evolutionary significance in exchange (Sahlins 1972; Flannery 1972; Wilmsen 1972; Webb 1974). These studies of exchange systems extend to non-centralized small-scale societies with specific focus in several archaeological aspects involving, the chemical characterization of objects, using ethnohistoric and ethnographic records to describe or systematically model exchange networks (Earle & Ericson 1977). Other theoretical perspectives on exchange focus on the symbolic and social interactions through obsidian exchange. Exchange as a “gift” and the commodification of obsidian shifts the focus from an evolutionary framework involving group cohesion toward that of social interactions that recognize landscape, cultural practices, and agency (Appaduari 1986; Gregory 1982; Koptoff 1986; Mauss 1967; Sheppard 1993; Spence 1996; Torrence 2002, 2011).

One of the obligations of gift exchange states that repayment must be of equal value. The determination of value in exchange depends highly on the context of a region. In Mesoamerica, commodification of obsidian from Teotihuacan into the Maya region served as a way to express a relationship with Teotihuacán and even proclaim their identity as Teotihuacano (Spence 1996). The symbolic representation of objects during an exchange plays a role in the reciprocal exchange. Trigger (1998: 8-9) points out that people live in a “symbolic world” and this symbolic representation will continue, so long as the symbolic world corresponds well with the real world. This suggests that internal cultural norms or cultural traditions factor into the systems of social and economic organization. Ultimately, these factors play out across linguistic and cultural groups that result in emergent properties found in networks systems. These cultural norms or cultural traditions serve as a broader base for alternative models to explain exchange systems among egalitarian small-scale societies.

Torrence (2011: 34) argues that we must view obsidian within a social landscape aiming to create and sustain social relationships. These implications are much more apparent in larger regional exchange networks. For example, the staged production of stemmed tools granted a special status to the different craft specialist throughout the peninsula. Obsidian stemmed tools appear in the Bismarch Archipelago, Biak Islands, inland Morobe, and other islands scattered throughout Melanesia (Torrence 2011:36). These stemmed tools found within early Melanesian societies suggest successful long-distance exchanges across several islands. Obsidian exchange, in this case, serves as a social networking mechanism. This perspective offers insight into human agency in prehistory. Archaeologists are not only answering "how?" we are learning to address "why?"

Not all obsidian exchange associates a symbolic representation for people, but it can also represent modes of exchange and production. Other scholars, such as Robin Torrence (2011) and Burger et al (1994), have done studies on obsidian procurement and exchange. The studies show obsidian present at sites regardless of diverse topology, environment, or geographic markers (Torrence 2002; Torrence & Doelman 2007). Torrence's study presents large quantities of obsidian throughout the Willaumez Peninsula. The initial studies suggesting predictions for "a reduction in mobility through time" resulting from a transition from dispersal to obsidian clusters (Torrence 2002: 71). However, the regional distribution of obsidian throughout the mainland does not coincide with the preliminary results. The frequency of obsidian artifacts emerging from the archaeological data has not change significantly. Other studies (Specht 2002) of the Willaumez Peninsula use the law of monotonic decrement to explain the utilitarian use of obsidian throughout the region. Large nodules of "foreign" or far away obsidian appear in large quantities in sites where other obsidian sources are present and of similar quality. This suggests that obsidian is more than of utilitarian use in the peninsula.

Burger and colleagues (1994) examine site OGSE-46 located on the western most part of the Ecuadorian coast on the Santa Elena Peninsula. Obsidian flakes and blade fragments analyzed from the site associate mainly with Yanasurco-Quiscatola source in the central part of the mainland. The uniqueness of this site, compared to the rest of the sites, is the unusual pattern of obsidian procurement and distribution patterns. Other sites located approximately 40km away from site-46 contain obsidian from the Mulleumica source suggesting different procurement strategies between sites from the same culture (Burger et al. 1994: 235). The rest of the mainland follows the distance decay pattern, yet this site seems to be engaging in direct acquisition strategies with little implications of intraregional exchange in the peninsula. Direct acquisition meant that people at the site of OGSE-46 must interact and exchange with people from the highlands. Furthermore site OGSE-46 contains prismatic blade fragments and prepared cores. Since the more homogenous obsidian source in the region is the Yanaurco-Quiscatola obsidian, people at the site exploited this source through middlemen exchange.

Other studies argue that obsidian distributions correlate with cultural and migratory boundaries of procurement strategies in small-scale societies. Mitchell and Shackley (1995) examine obsidian artifacts from four prehistoric Hohokam sites in southern Arizona. They argue three exchange strategies occur that were initially suggested by Doyel (1991): down-the-line-exchange, middlemen, and direct procurement. However, Mitchell and Shackle (1995: 298) complement Doyle's argument for direct acquisition by arguing that Hohokam uses direct acquisition relates to the acquisition of other resources. For example, Sauceda and Los Vidrios obsidian relates closely to shell acquisition from the Gulf of California. Obsidian is only one aspect of interactions happening in the region. By establishing a relationship between obsidian and another resource, more complex regional patterns emerge painting a fuller picture of prehistoric interactions.

Notably, two sources, Government Mountain and Superior obsidian, show up in quantities that counter the law of monotonic decrement. Mitchell and Shackley (1995) suggest that Government Mountain probably held important social and cultural significance as this source appears in large nodules possibly tying the Hohokam with the Sinagua and Anasazi. The Superior obsidian source appears in small percentages throughout all sites. Compared to other sources, the Superior obsidian may be affected by the proximity of the Salado cultural system (Mitchell & Shackley 1995: 300). This source is outside the Hohokam region and the small amount in every site suggests a redistribution of Superior obsidian within the Hohokam. Although this is the closest source, it makes a strong case for drawing cultural boundaries between the Hohokam and Salado.

More recently obsidian studies are beginning to explore correlations between ethno-linguistic data and obsidian distribution (Hughes 1992; Whitaker et al 2007; Brandt et al 2014). Ethno-linguistic boundaries explore part of the obsidian procurement in the past. Obsidian sourcing recognizes specific chemical patterns to identify the geological origin. These patterns reveal links between ethno-linguistic groups and obsidian sources. Hughes (1992) examines the potential archaeological problems from a case study involving the extensive database of ethno-linguistic words of the Miwok and Patwin in Alta California. Problems with ethnohistoric and ethnographic data do not strictly correspond to the past. The correlations rely on several large assumptions that archaeological data primarily with discontinuity of ethnohistoric record of the past to today. Whitaker (2007) explores these correlations by modeling the average weight of flakes and the average distance from the source. Unlike Renfew's distance decay model, a positive correlation appears in the data. The association of flake size with each ethno-linguistic group suggests obsidian exchange served advantages to groups in north coast California.

For this project, both Renfrew's and Ericson's models provide a basic theoretical exercise. Borrowing form various theoretical frameworks, these initial findings serve as a hypothesis for elaborating obsidian networks in the Baja California peninsula. If the pattern of distribution for Valle de Azufre, Isla Angel de la Guarda, Puerto El Parral, and San Felipe obsidian is different than the other sources, then we can begin to confirm or rework our theoretical framework in comprehending exchange networks in the past.

CHAPTER IV: METHODOLOGY

Baja California Obsidian Data

This project looks at the obsidian distribution throughout the peninsula. The data consists of 101 recorded obsidian artifacts and only 84 were used as a sample in the statistical calculations. There are enough published data to examine the distribution patterns of San Felipe, Puerto El Parral, Isla Angel de la Guarda, and Valle de Azufre obsidian and test the data against two well known models, the distance fall-off model (Renfrew 1977) and regression model (Ericson 1977). These models display a basic analysis of distribution patterns.

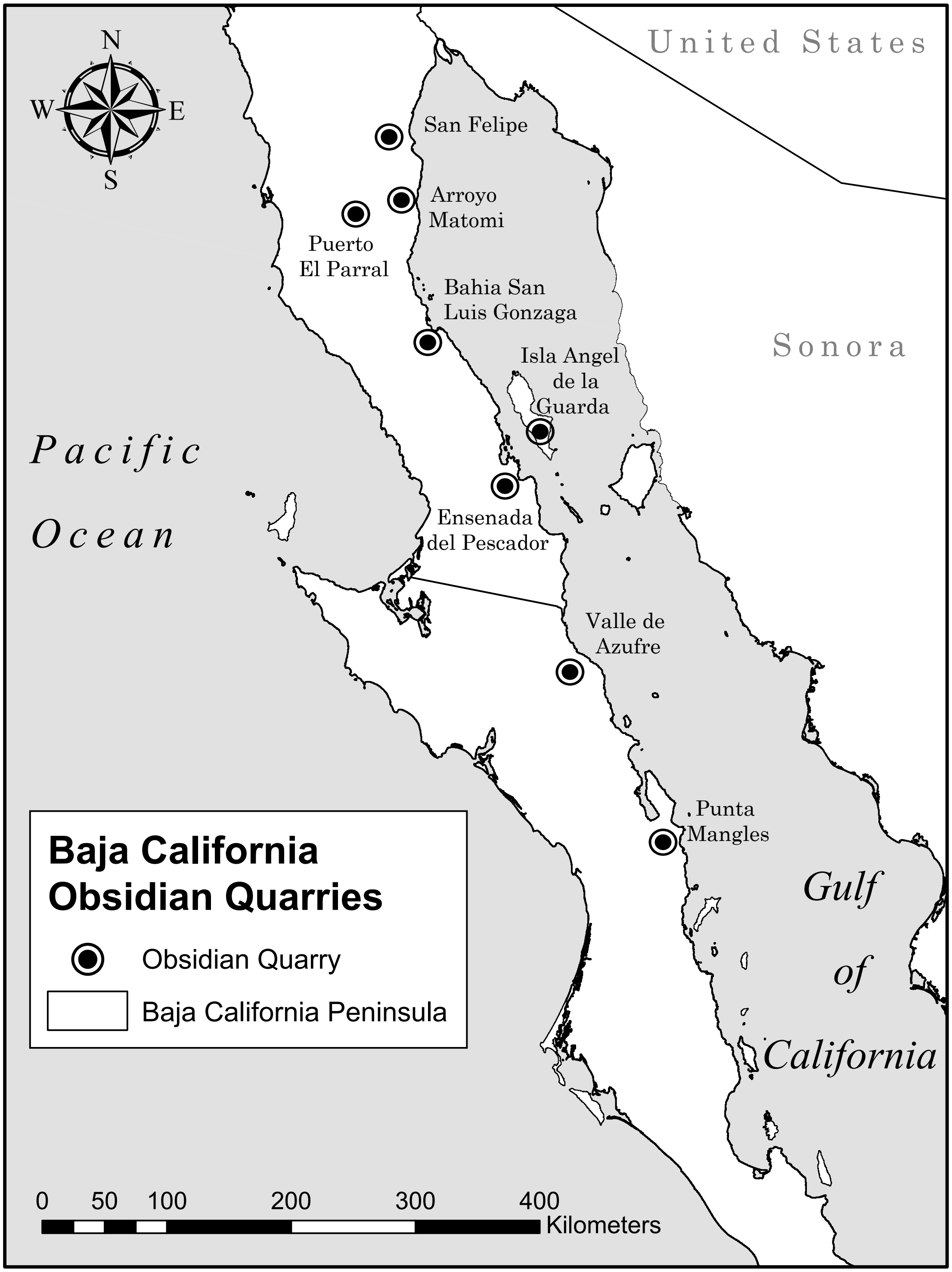
Using ArcGIS software and the program ArcMap, the program calculated the approximate mean distances (in kilometers) from the archaeological sites to obsidian quarries. Unfortunately, due to the nature of the data, the unknown variables and samples sizes of less than or equal to 1 were not calculated into the models. However, they are taken into consideration in the broader interpretive analysis in the following chapter.

Obsidian Quarries

Currently there are eight obsidian sources located on the eastern side of the peninsula. This map (Map 3) displays the location of each quarry based on previous studies (Banks 1971; Bouey 1984; Douglas 1981; Gutiérrez and Hyland 2002; Hyland 1997; Moore 2001; Ritter and Payen 1992; Shackley 1994, 1995, 1997, 1998, 2004a; Shackley et al. 1996). The most prominent source throughout the central peninsula is Valle de Azufre occurring in San Borja, Guerrero Negro, Isla Cedros, San Ignacio, Bahía Concepción, and San Javier. Obsidian from other sources appears in multiple sites across different regions that include Isla Angel de la Guarda, Puerto El Parral and San Felipe.

Some archeological sites contain obsidian from unknown sources, mostly occurring in Bahía de Los Angeles. These sources remain to be identified. The rest appear as single events and in small quantities that could be impossible to model statistically.

The top four obsidian source frequencies were chosen: Valle de Azufre, Isla Angel de la Guarda, Puerto El Parral, and San Felipe covering over 80% of the sites distributed throughout the Baja California Peninsula. All the sources within the sample data come from published works with x-ray fluorescence spectrometry analysis already completed (Carmean 1994b; Gutiérrez and Hyland 2002; Hyland 1997; Moore 2001; Ritter and Payen 1992; Shackley 1994, 1995, 1997, 1998, 1999, 2002, 2004a, 2004b; Shackley et al. 1996).



Map 3: Obsidian Quarries in Baja California

CHAPTER V: RESULTS AND ANALYSIS OF DATA

Results

Figures 1-4 demonstrate a distance plot against the amount of obsidian. The blue and orange lines represent the observed and expected values respectively. The expected values represent Renfrew's distance decay model under ideal conditions. In Figure 1, the average of the observed obsidian values is 5.3, rounding it to 5. This value becomes the value for the expected obsidian site located furthest from the source. We add one to each subsequent value until the closest archaeological site to the source contains the most obsidian. Equally, choosing the minimum and maximum observed values work well to determine the expected values. The important point is to illustrate whether or not the distribution of a particular exchange system resembles the distance fall-off model. Figures 1-4 each contain two black linear slopes running through each graph. These lines illustrate the relationship between distance and obsidian. A negative relationship establishes that as distance increases, the amount of obsidian decreases. For the exception of San Felipe, visually the difference between observed and expected in the other three obsidian sources (Isla Angel de la Guarda, Puerto El Parral, and Valle de Azufre) suggest obsidian exchange in Baja California conforms to Renfrew's law.

Renfrew's model assumes obsidian frequency decreases in a particular direction. However, the directionality of exchange in Baja California appears in multiple regions displaying an asymmetrical obsidian distribution. Ericson's (1977) study provides an example of a similar instance where the data conforms to Renfrew's model, but the distribution is not symmetrical. Ericson explains distance as one of many factors that influence obsidian distribution. And conclude that the direction in which obsidian flows is not centralized. This suggests that obsidian exchange in Baja California is not centralized as in Ericson's study.

The problem now is to determine the other factors influencing the obsidian distribution pattern. Table 1 shows the results of using the same multivariable regression equation in Ericson's (1977: 120) study to explain the obsidian distribution of three sources in Baja California. The correlation variables correspond to similar designations for the Baja California data. The data include the amount of obsidian found at each of the sites "Q", the distance to the primary obsidian source "X", population estimates "P" (Aschmann 1959; Casteel 1979), and the distance to the next nearest obsidian source "Y". The coefficient values are taken from the ones given by the statistical program SPSS.

The distribution of Valle de Azufre obsidian fits both Renfrew's and Ericson's model. The R-value of 0.719 shows a strong fit for the model. Population estimates and the distance of the two nearest obsidian sources can explain the asymmetrical distribution for Valle de Azufre obsidian spread throughout the central peninsula. On the other hand, Isla Angel de la Guarda and Puerto El Parral have a low R-value showing the model does not clearly explain these two exchange systems.

Unlike the rest of the obsidian sources, Isla Angel de la Guarda and Puerto El Parral follow an asymmetrical distance decay distribution pattern, but does not fit Ericson's model. Among the three variables, effective population and distance to the primary obsidian source have high correlation values in Isla Angel de la Guarda and Puerto El Parral. Ericson (1977: 123) noted the effective population variable as "less significant" than distance for Alta California. In the case for Baja California, effective population correlation values are statistically significant enough to consider the impact obsidian had in interactions between linguistic groups. Even if there are errors in the original population estimates by Aschmann (1959) or Casteel (1979) data, the peninsula's variable width distances and geographic limitations make interactions inevitable between linguistic groups. This suggests many single event interactions or exchanges that coincide with a non-centralized distribution. The remaining sources do not show a distinctive pattern other than direct procurement as suggested by Moore (2006a). The San Felipe source is a good representative of the pattern of the other obsidian sources.

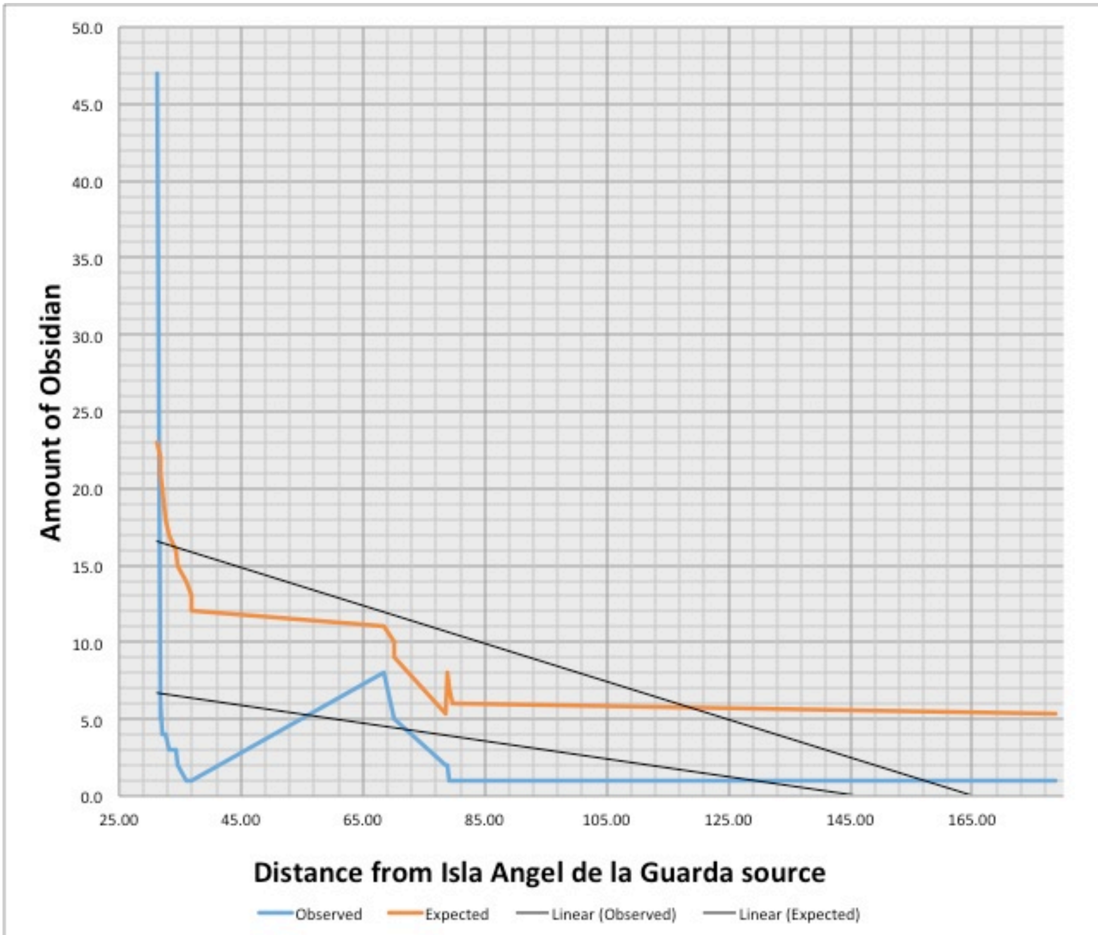
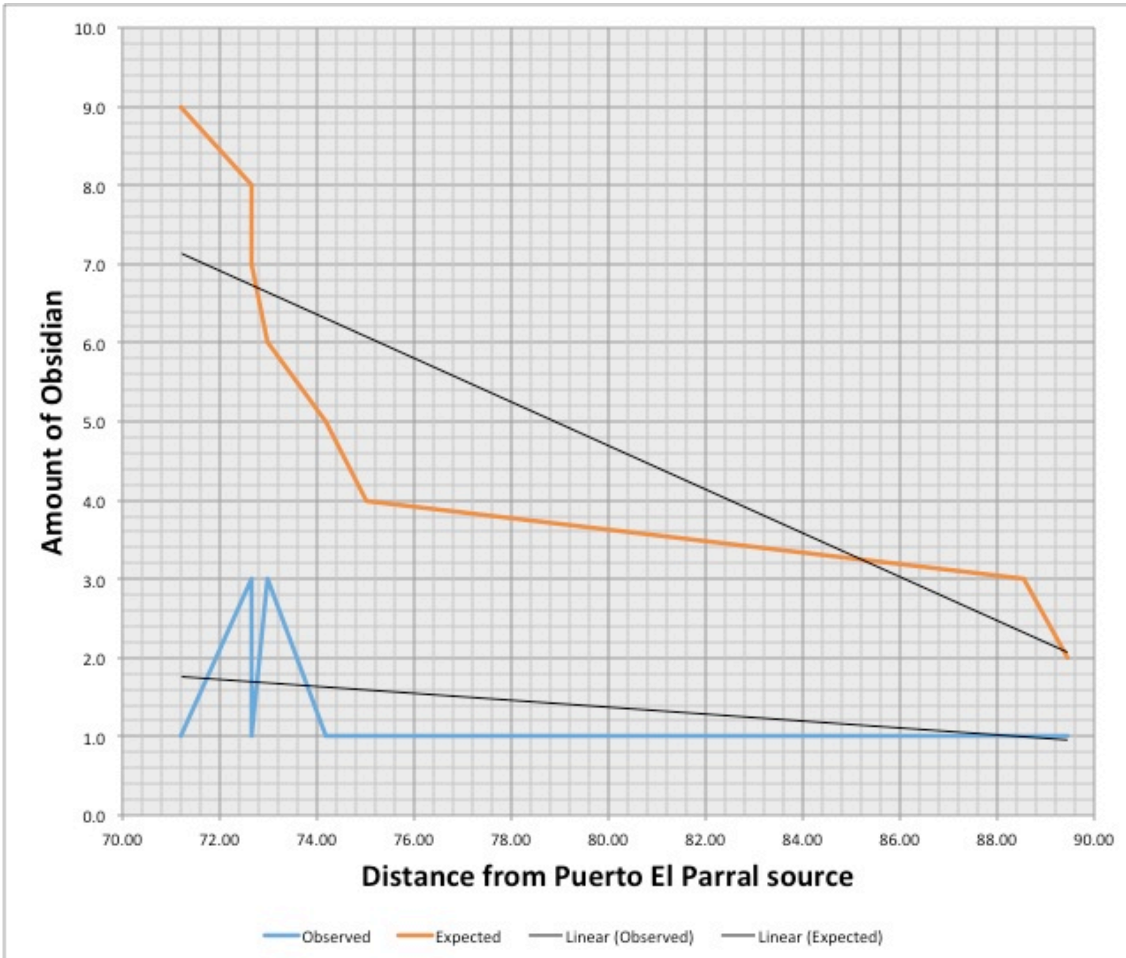


Figure 1 demonstrates the distance from the obsidian source to the amount of obsidian found at the archaeological site. The black lines represent the negative linear slope of the values.



10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Amount of Obsidian
70.00
72.00
74.00
76.00
78.00
80.00
82.00
84.00
86.00
88.00
90.00
Distance from Puerto El Parral source
Observed
Expected
Linear (Observed)
Linear (Expected)

Figure 2

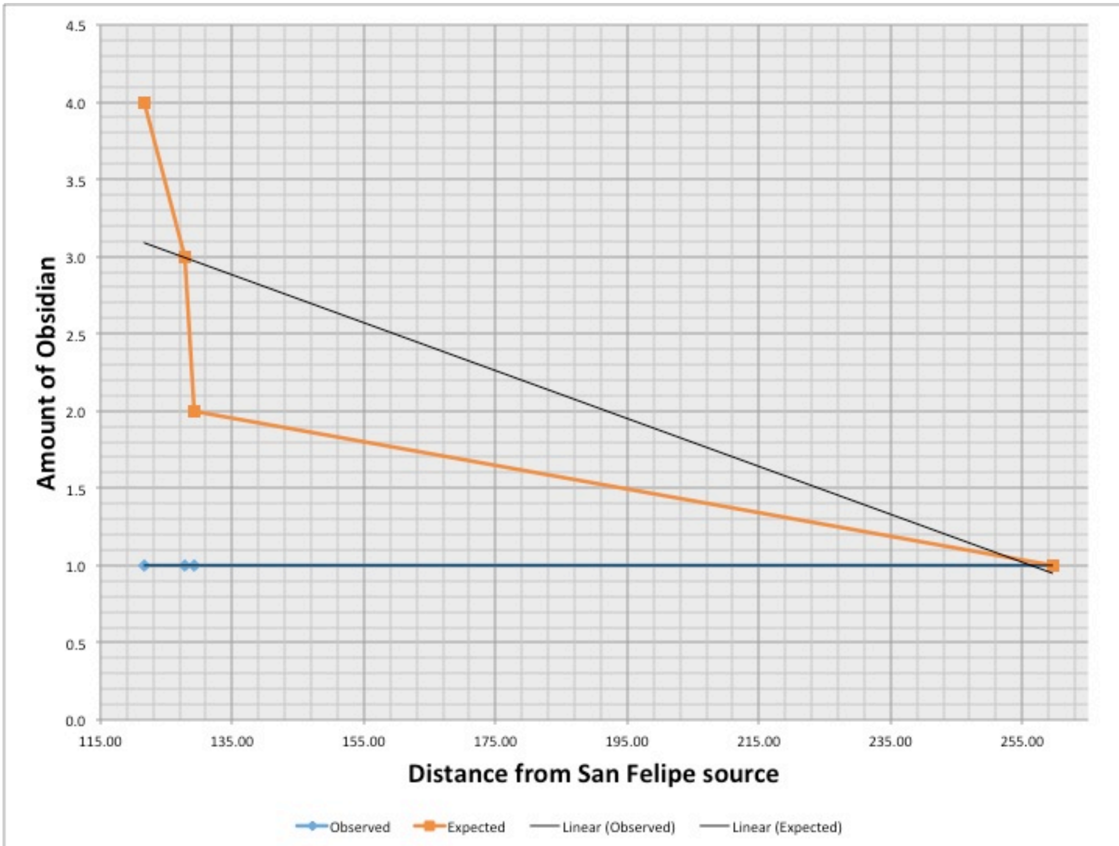


Figure 3 The San Felipe source is consistent and does not follow the distance decay pattern. The other sources (Arroyo Matomi, Punta Mangles) display a similar distribution pattern.

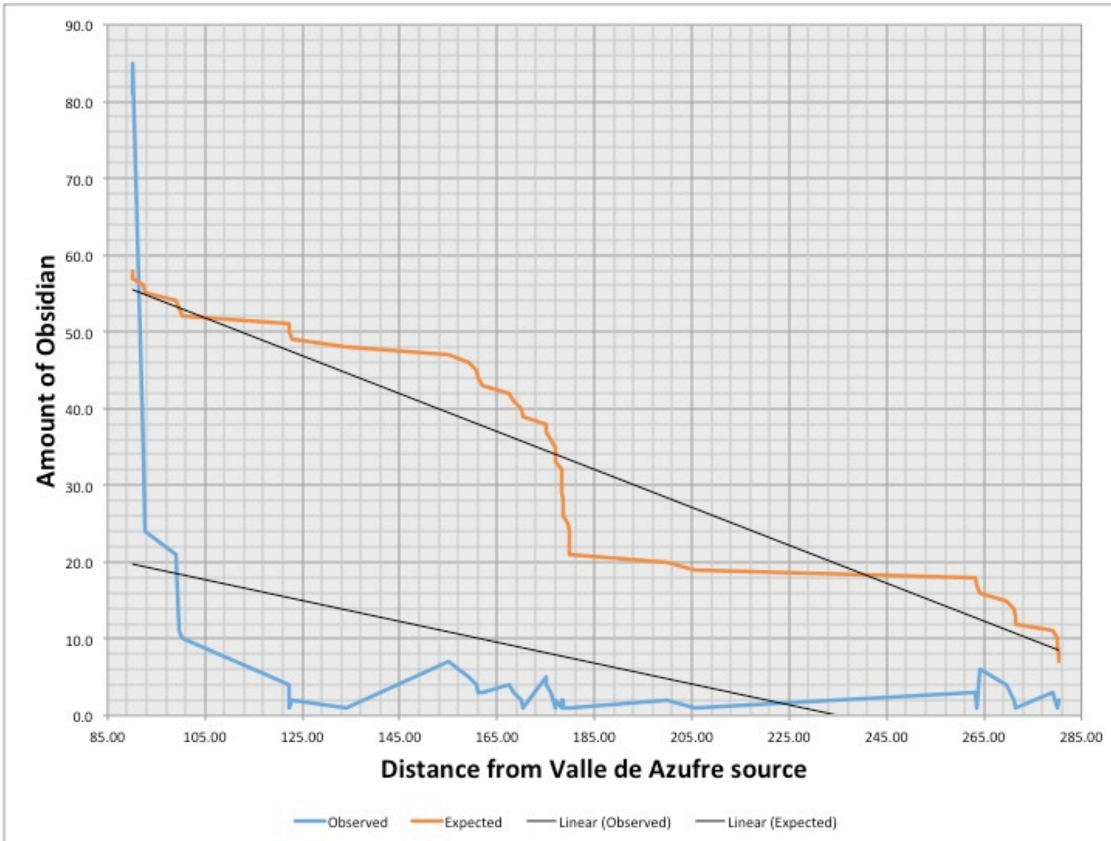

90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Amount of Obsidian
85.00
105.00
125.00
145.00
165.00
185.00
205.00
225.00
245.00
265.00
285.00
Distance from Valle de Azufre source
Observed
Expected
Linear (Observed)
Linear (Expected)

Figure 4

Table 1

RESULTS OF MULTILINEAR REGRESSION ANALYSIS OF THREE SYSTEMATIC VARIABLES OF THREE EXCHANGE SYSTEMS IN BAJA CALIFORNIA

	Isla Angel de la Guarda	Puerto El Parral	Valle de Azufre
Multiple R	0.223	0.236	0.719
Degrees of Freedom	0.1875	0.75	3/48
F ratio	0	0.045	15.083
P (tail)	0.977	0.495	0.054
Sample Size	20	8	52
Correlation			
Q-P	-0.571*	-0.387	-0.582*
Q-X	-0.589*	-0.378	-0.565*
Q-Y	-0.125	-0.378	-0.372*
P-X	0.994*	0.976*	0.996*
Coeffficients			
a	8.523	4.899	31.998
b	-0.175	1.415	-1.038
c	0.114	-1.732	0.628
d	-0.009	-0.04	0.328

*Correlation significant at the 0.01 level (2-tailed).

Analysis of Data

Having seen the results in the previous section, we can now compare them to the hypotheses laid out at the beginning of this thesis. The hypothesis for this project renders each obsidian distribution as a "down-the-line" exchange network. If the pattern of distribution for Valle de Azufre, Isla Angel de la Guarda, Puerto El Parral, and San Felipe obsidian is different than the other sources, then Renfrew's model will help observe distinct patterns in the data. If the data demonstrates a distance decay pattern, then using Ericson's regression model can help identify if other factors play into the obsidian exchange in Baja California. The goal is to fill knowledge gap in Baja California exchange networks in Baja California by looking at the peninsular obsidian distribution during Late Holocene. Different types of exchange systems may have existed during this period, including down-the-line exchange, reciprocal exchange (both boundary and home base), and direct access.

Down-the-Line Exchange

Valle de Azufre obsidian distribution expands throughout most of the northern parts of Baja California Sur and into the southern part of Baja California. The northern route passes through Guerrero Negro, and expands into San Borja. Another northern route passes through the western side of the Sierra de San Francisco, where coincidently the present day roadways exists. The western route heads to Isla Cedros. This route traverses through the southeastern parts Vizcaíno Desert, then heads north through the mountains and onto the Isla Cedros. This route particularly avoids the marshes, as there are no water sources in the area. The only water sources in the area are near the Sierra de San Francisco and the small mountains located on the western coast of the peninsula. The last route on the map heads south. Valle de Azufre obsidian appears at Bahía Concepcion and San Javier. There are no sources or archaeological findings of obsidian beyond San Javier.

According to Renfrew and Ericson models, Valle de Azufre has an asymmetrical distance decay distribution affected by distance and effective population estimates. Map 4 demonstrates the Valle de Azufre obsidian distribution. When you map the data, the San Ignacio site is close enough to have direct access and procure obsidian. From San Ignacio, obsidian distribution heads in three separate directions ending at San Borja, Isla Cedros, and San Javier. A notable exception may be Bahía de Concepcion. A possible route along the eastern coastline gives the Didu group direct access to Valle de Azufre obsidian bypassing San Ignacio. However, more archaeological research along this coastline may shed some light into the matter.

Other Exchange Networks

Isla Angel de La Guarda and Puerto El Parral have an asymmetrical distance decay distributional pattern, but do not fit the regression model. These sources do not have a down the line distribution. Map 5 shows the distribution pattern of these two sources. When we look closely at Puerto El Parral, most of the obsidian is traveling from east to west with the majority found at San Quintín sites. The outlier is located down in Guerrero Negro.

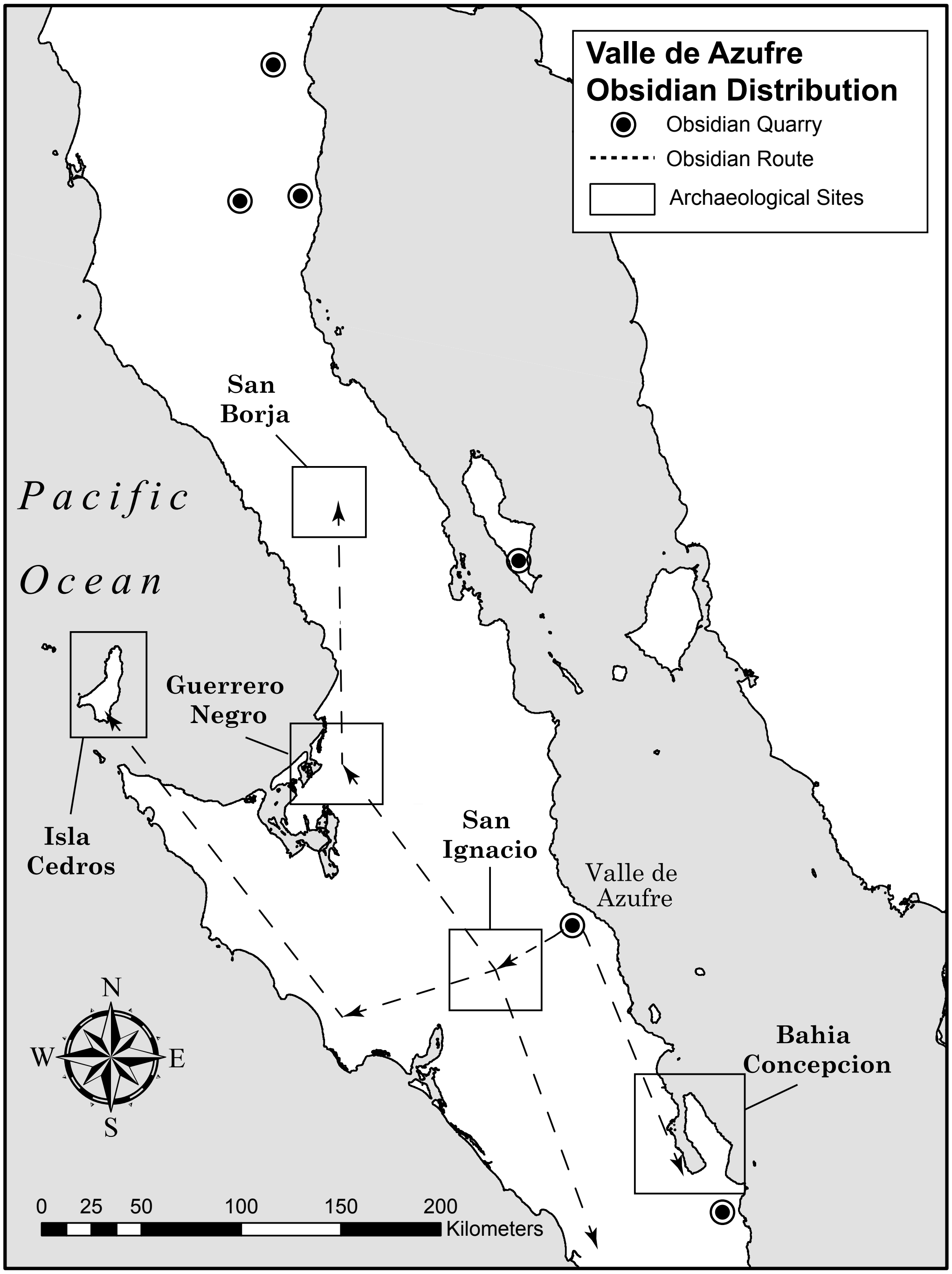
The heavy presence of Puerto El Parral in San Quintín could better be described as San Quintín groups having direct access to the source, which coincides with Jerry Moore's work at San Quintín. Moore (2001, 2006) reported obsidian artifacts at San Quintín are from Puerto El Parral and transported across the peninsula during seasonal migrations. The appearance of this source at Guerrero Negro suggests a possible exchange route existing between San Quintín and Guerrero Negro. A hypothesis could be formulated. If Puerto El Parral obsidian appears as far as Guerrero Negro, then other mechanisms, besides seasonal migrations are responsible for explaining this occurrence. However, this is beyond the scope of this project. Not to mention that more archaeological research is needed to develop a fuller picture. As of now, Moore's explanation best describes the distribution of Puerto El Parral obsidian in San Quintín.

Isla Angel de La Guarda obsidian appears in the central part of the peninsula between San Borja and Guerrero Negro. A little over half of Isla Angel de La Guarda obsidian appears at Bahía de Los Angeles. This suggests people living at Bahía de Los Angeles have direct access to this source. San Borja sites contain obsidian only from this source, evoking questions about a direct exchange between the two regions. One possibility is the people at San Borja and at Bahía de Los Angeles is the same migrating group from one region to the next. However, evidence of cores and flakes favor an exchange relationship between the two regions (Shackley 1997). Approximately less than 5% of all Isla Angel de la Guarda obsidian appears in Baja California Sur at Guerrero Negro. The presence of obsidian at this region promotes a reciprocal exchange between Borjeños and Ignacieños linguistic groups, as both Isla Angel de la Guarda and Valle de Azufre obsidian cross into each group's boundaries.

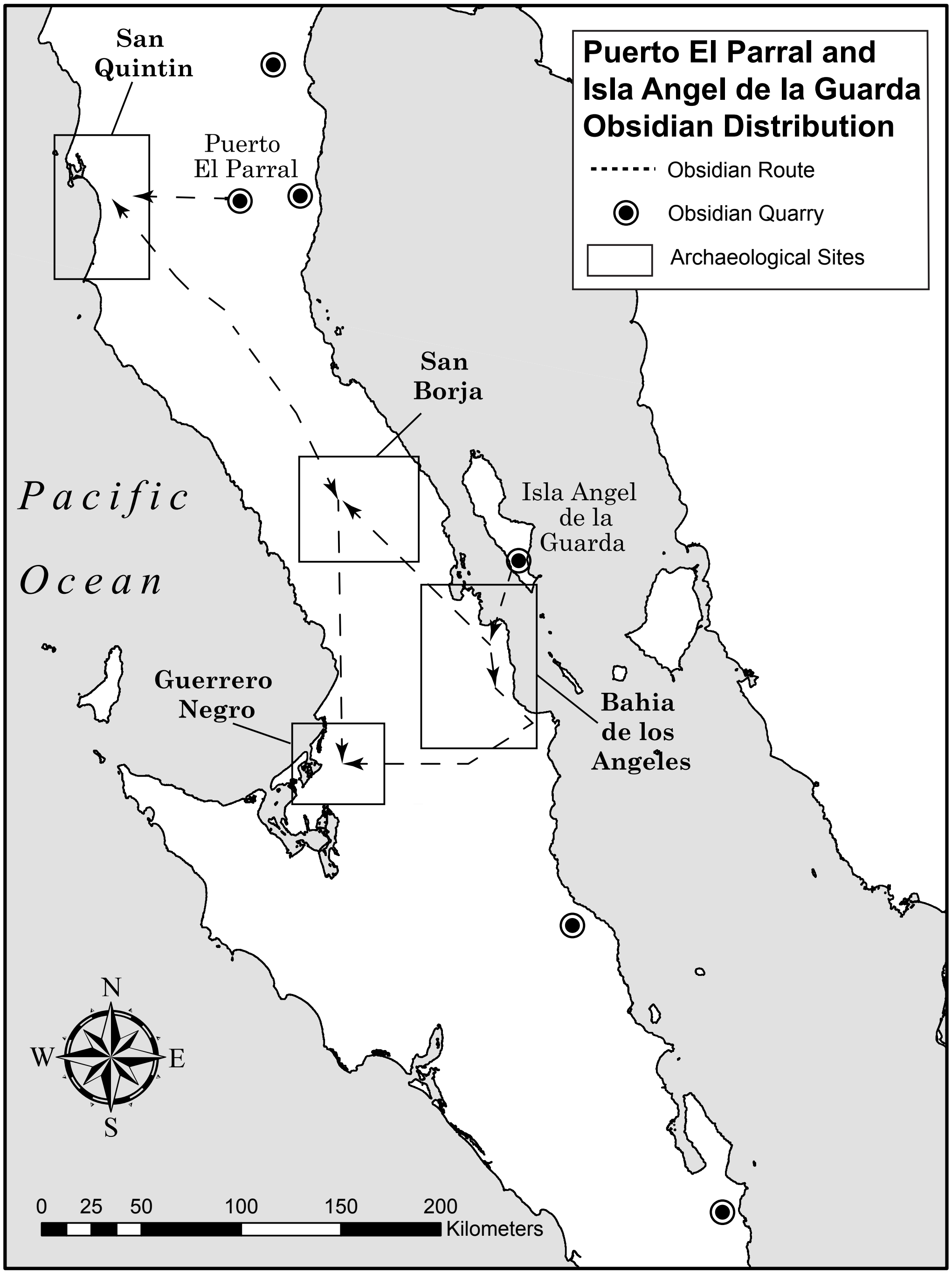
Both Puerto El Parral and Isla Angel de la Guarda obsidian appear in small, but significant quantities. It is more likely that Borjeños incorporated these obsidian sources into an already existing exchange network that also contained shell, chert, fishhooks, agave and pelts throughout the northern and central part of the peninsula. In addition, as small bands migrated from coast to coast, these routes demonstrate the level at which individuals procured and exchanged these obsidian sources. Unlike the level of distribution of Valle de Azufre in the Ignacieño, reciprocal exchange may have occurred at a much lower intensity and probably at the individual level. This would account for the currently small frequency of Puerto El Parral and Isla Angel de la Guarda obsidian. Map 6 displays a comprehensive look at the distribution of all known obsidian sources.

Furthermore, there are other obsidian artifacts of unknown sources. At least 45 obsidian artifacts found at San Borja and Bahía de Los Angeles. There is currently no published data on the specific quarry or source. When you take into account Valle de Azufre, Puerto El Parral, Isla Angel de la Guarda, the unknown sources and the rest of the sources, there is a major overlap at Guerrero Negro.

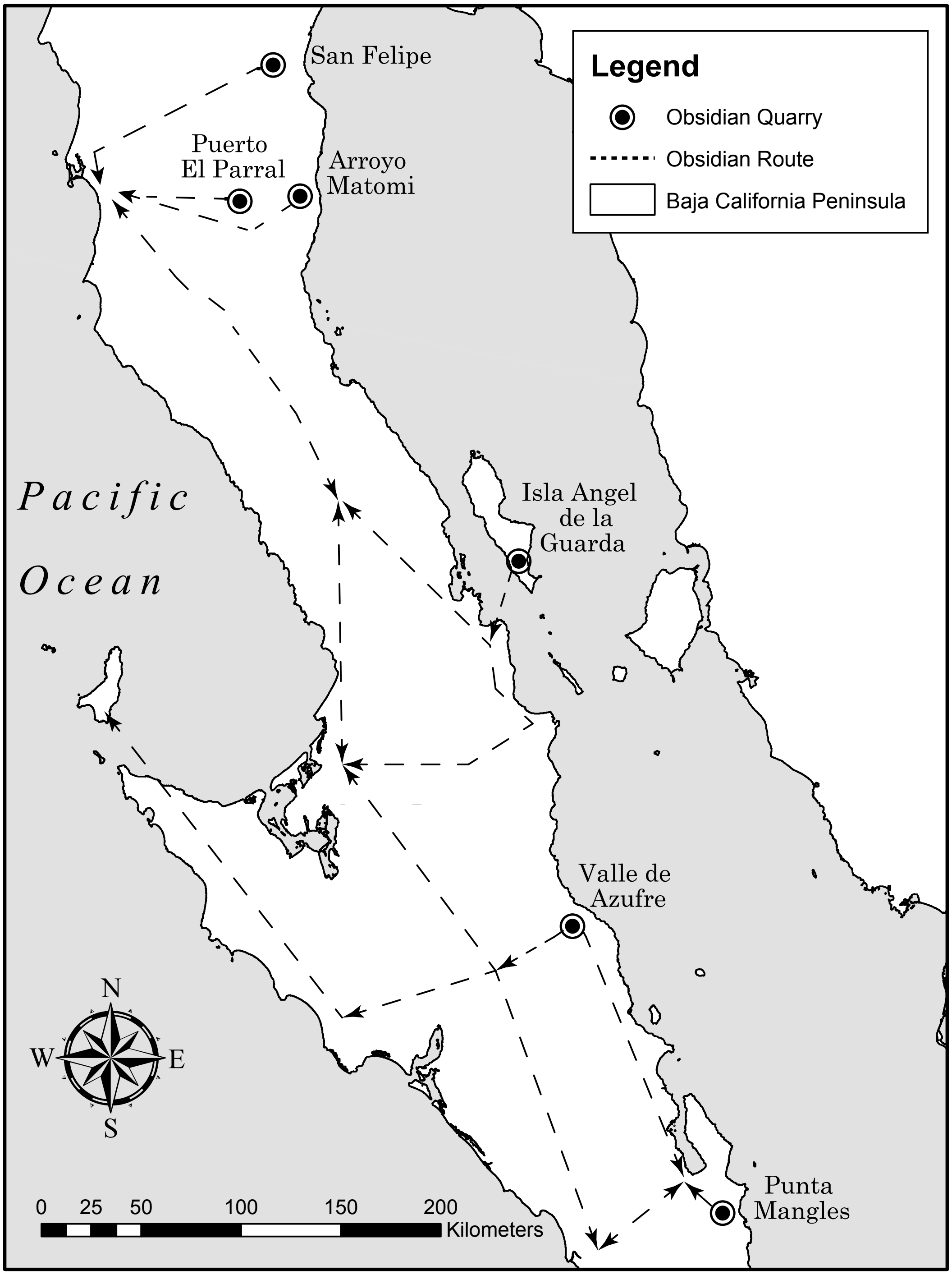
The boundaries of the ethno-linguistic groups and the changes in distributions of obsidian correspond with down-the-line and reciprocal exchange systems. Map 7 demonstrates the distribution of all obsidian sources with the data of major linguistic groups, originally by Massey & Osborne (1961: 340). Most of the activity appears at the central part of the peninsula surrounding the Sierra de San Francisco, where major rock art exists.



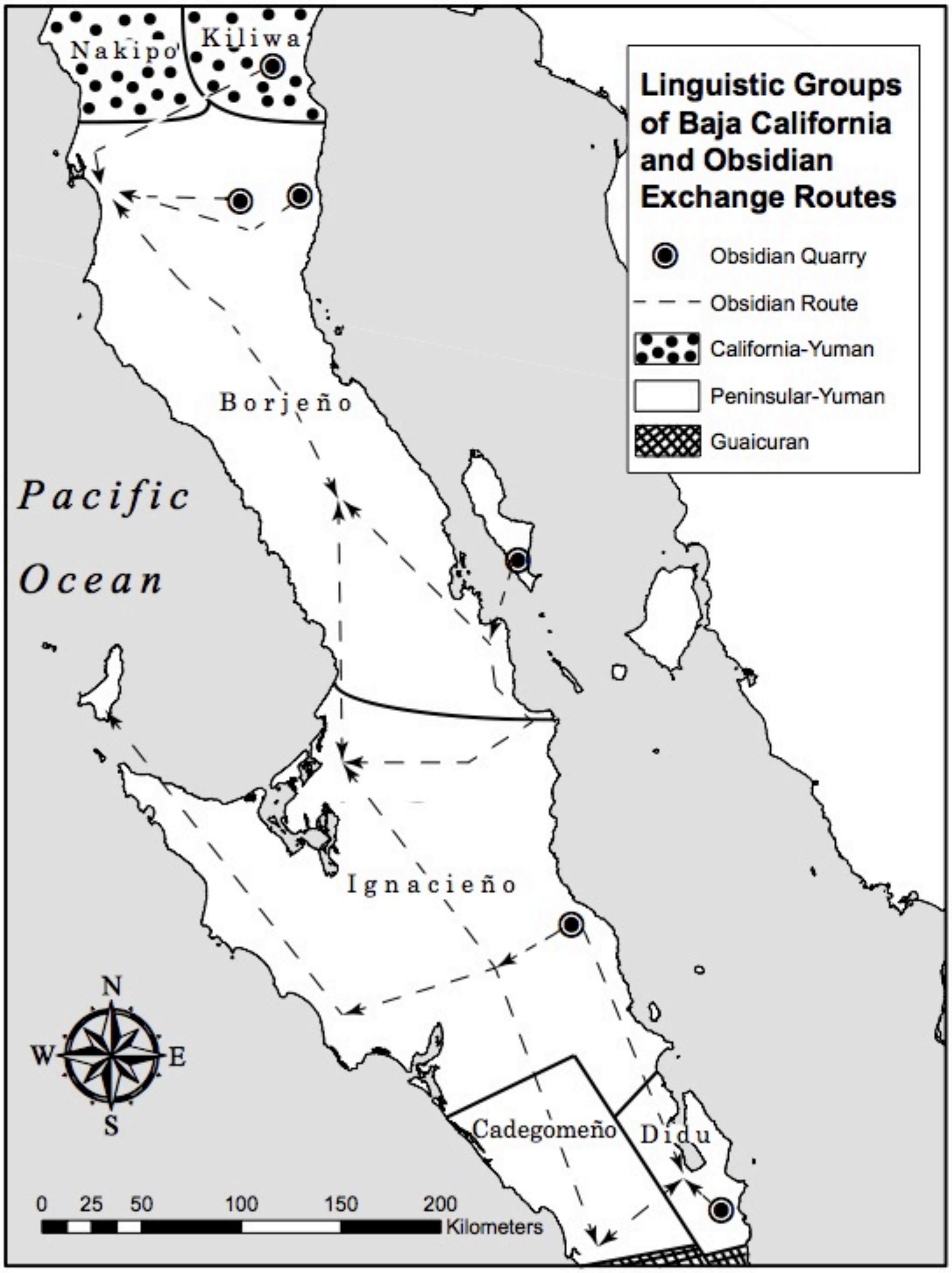
Map 4: Valle de Azufre Obsidian Distribution



Map 5: Puerto El Parral and Isla Angel de La Guarda Distribution



Map 6: Distribution of all obsidian found throughout the peninsula.



Map 7: This is a replica of Map 6 incorporating linguistic data of Baja California by Massey & Osborne (1961: 340).

CHAPTER VI: CULTURALLY MOTIVATED EXCHANGE NETWORKS

People, Obsidian, and Landscape

Landscapes and memories of places are important to understand some of the deeper connections in small-scale societies. Baja California contains various rock art sites, trails, and names of places in diverse dialects. These places stand out in the ethnohistoric, ethnographic, and archaeological record. The most relevant to this project is the Great Mural rock art located in the large sierras east of the Vizcaino Desert.

The Great Mural rock art incorporates four sierras: San Borja, San Juan, San Francisco, and Guadalupe. The rock art is representative of a worldview system of Baja Californian groups. It depicts large individuals painted half red and half black. Animals, such as crows, goats, fish, and deer appear next to people with no animal hunting imagery. The rock art dates are still controversial, but a general discussion of the art suggests that these depictions represent the various clan lineages existing in the peninsula (Bendímez Patterson & Navejas 1991; Ochoa Zazueta 1978).

Both ethnohistoric and ethnographic data reveal more about the interactions between groups, including the significance in the landscape. The ethnographic and ethnohistoric accounts describe people with various body paint colors covering their entire body. These descriptions by Venegas and Baegert depict Cochimí shamans painting their bodies' red and black during ceremonies (Mathes 2006: 62). Ceremonies included rituals to cure illnesses with a "black stone tube" and performed funerary rituals, during cremations. The shaman would ask for tribute consisting of fish or deer, which happens to coincide with the rock art imagery in the Great Murals.

The Kiliwa, for example, have a worldview that incorporates four mountains and ancestral animals during the time of creation. Each mountain follows a cardinal direction that associates with a specific color, animal, and sacred person. As the story goes, each mountain has a goat at its peak to hold up the sky and the quail, cat, deer, and fish each headed in one direction (north, east, south, west, respectively) to keep the goat company (Ochoa Zazueta 1978: 30). Each mountain had an associated color: the northern mountain is red, the eastern white, the southern yellow, and the western black. Finally, the last of the myth calls out the creation of four priests each associated with a cardinal direction: the "soldier" priest headed north, the "common people" priest headed east, the "shaman" headed south, and the "crow" headed west (Ochoa Zazueta 1978: 42). These animals, colors, and priest figures symbolically represent the places that identify the Ignacieño and Borjeño clans and kinship lineages in Baja California.

The Cochimí may have had a similar worldview that encompasses mountains as important places. Exchange routes and group migration patterns emerge not only from practical reasons, but also from culturally motivated agency. The capacity for groups or individuals to constitute a cultural landscape build on several factors, such as clan lineage, connection to places, beliefs, and their environment. As Snead (2009: 50) points out,

> "Moving through a world defined by mountains, springs and other meaningful topography would have structured the experience of such landmarks. Walking the trails [or routes] would have emphasized continuity with the natural order, and with the human history that it encompassed."

The majority of obsidian distribution happens to revolve around the Great Murals. Near the Sierra de San Borja, the sites of Guerrero Negro and Bahía de Los Angeles share routes from three distinct obsidian sources in the Borjeño region. The site of San Ignacio borders the Sierra de San Francisco and Sierra de Guadalupe. Valle de Azufre obsidian is the most prominent source in the Ignacieño region.

Furthermore, Valle de Azufre is the nearest obsidian source to these sierras that appears in the largest quantity through most of the central peninsula. In Baja California the Great Mural associates greatly with creation stories of clan lineages within the Cochimí. These landmarks represent the human history of Baja Californians and mostly likely played an important role as a socially and meaningfully constituted landscape (Hodder 2002: 322). The acquisition of Valle de Azufre from these mountains, by association may hold a similar significance. In other words, acquiring Valle de Azufre obsidian represents an association with the Great Mural and its importance.

In this case, obsidian procurement is not opportunistic. Instead, it shows agency within small-scale societies. Valle de Azufre obsidian appears to match the linguistic boundaries that are consistent with ethnographic, ethnohistoric, and the linguistic record. Sites closer to other sources like Punta Mangles, Ensenada del Pescador, and Bahía San Luis Gonzaga fail to appear near any of the sites like San Borja, Bahía de Los Angeles, Guerrero Negro, San Ignacio, and Isla Cedros. Scholars such as Green (1987) and Kirch (1988:113) recognize the potential obsidian has in providing people with a symbolic tie back to the place. These "social connections" develop through exchange systems creating "lifelines" among small-scale societies from emerging social mechanisms.

Obsidian Exchange as a Social Mechanism

Obsidian studies (Bamforth 1990; Mitchell & Shackley 1995; Reepmeyer et al 2011; Silliman 2005; Spence 1996; Torrence 2011; Yellin et al 1996) from other regions of the world use this raw material as a means to address prehistoric exchange and group interaction. The Baja California peninsula is no different as Map 7 (see chapter 5) demonstrates the interactions between linguistic groups emerge by looking at obsidian distribution networks.

Factors of agency, establishing social relationships, and the facilitation of sharing resources encompass the patterns brought about by the data. The actual patterns drawn from the data are a bit anomalous from what is expected from small-scale societies. Yet, it is important to note which obsidian sources appear in the archaeological data the most allowing patterns to emerge from exchanging goods. There are a total of eight obsidian sources and only four of those sources appear distributed throughout the peninsula. Sites like San Quintín, San Borja and Bahía de Los Angeles all exist within the Borjeño boundaries. San Borja, for example, does not acquire their obsidian from Bahía San Luis Gonzaga or Ensenada el Pescador. The majority of the obsidian comes from further away in Isla Angel de la Guarda suggesting that the acquisition of this raw material is not opportunistic.

The emerging patterns are most likely part of other established exchange systems of goods and people incorporated obsidian into this system very late in the Middle Holocene. Radiocarbon analysis dates the majority of obsidian artifacts roughly from 500 AD to before contact period. The emergence of obsidian exchange in the peninsula began possibly at the sites of Bahía de Los Angeles, San Quintín, San Ignacio, and Bahía Concepcion through direct acquisition. Before Baja California stone tools consisted primarily of chert and basalt. Even the description of arrow tips by Ulloa and Vizcaino as “stone-tipped” suggests nothing extraordinary about projectile points. Obsidian did not emerge as a necessity. So then why are Baja Californians using obsidian from distant sources if not for practical reasons?

Obsidian may serve other purposes in Baja California. Other studies (Ammerman 1979; Burger et al 1994; Healey 2007; Merrick & Brown 1984; Ritter 2012; Spence 1996; Taçon 1991; Torrence 2011) argue that obsidian could be seen as a commodity that represents a certain inherent value beyond its utilitarian use making it either ritualistic, culturally significant or a gift. Obsidian exchange in Baja California may serve as an emerging social networking mechanism similar to other exchange systems around the world. The Baja California Peninsula holds several varieties of chert that serve as effective stone tools. Even in the Late Holocene, stone tools made from basalt or chert outnumber obsidian stone tools significantly in the archaeological data. Evidence for assigning obsidian as a non-utilitarian commodity lies in the burial context found in Baja California and choosing particular obsidian sources over nearby sources. Michael Spence (1996: 32) applied this idea to Teotihuacan obsidian in the Maya region concisely stating:

> "Goods need not, however, remain in the commodity state throughout their use-span (Appaduari 1986; Kopytoff 1986). Under certain conditions they can be transformed into gifts, to be exchanged as inalienable things between mutually dependent actors (Gregory 1982: 12, 19). A fundamental distinction between commodity and gift lies in the inalienability of the gift, here taken to mean that the identity of the donor is of paramount importance to the recipient (Gregory 1982:18; Mauss 1967:31). The transaction becomes a very personal interaction, the goods symbols of the actors themselves (Mauss 1967: 44-46). Such a shift from commodity to gift is most likely to occur across a cultural boundary, where any understanding associated with the object can be negotiated anew or simply replaced."

As time progressed, the exchange of major obsidian sources, like Valle de Azufre, may have helped establish relationships across wide parts of the peninsula into different linguistic groups establishing cultural significance to obsidian tools.

Map 7 shows Massey and Osborne (1961) view on linguistic groups in Baja California. Yet, Mixco (2006) adds a cultural context by examining these groups from a broader perspective. Groups in the peninsula are not linguistically different. But they do have different dialects. These dialects were similar enough that neighboring groups could communicate with each other. Yet, they were also different enough that if Ignacieños living in the southern portion of the peninsula near the Cadegomeño and Didu travel north to the Kiliwa and Nakipo territory, they would not be able to communicate effectively (Mixco 2006: 31).

However, these kinds of expeditions were most likely rare. The Cochimí social structures consisted of small family level societies that alternated between mobility and sedentism, varying on seasons. Given the peninsula's geographical and ecological area, interaction was inevitable when looking for resources. A more plausible explanation is reciprocal exchange. Mauss (1967 [1925]) notion of gift giving, obligation, and reciprocity may be key factors that establish relationships with similar cultural customs in sites like Guerrero Negro and San Borja.

Obsidian exchange acts as a social mechanism. The central portion of the peninsula is extensive and the diverse linguistic groups within cultural boundaries must have a way to relate to each other. With sources such as Valle de Azufre and Isla Angel de la Guarda, obsidian plays an important social and cultural role tied directly to the exchange systems between the Borjeño and Ignacieño linguistic groups. Similarly, these instances occur with San Felipe obsidian between the Kiliwa, Nakipo and Borjeño, and Valle de Azufre obsidian between the Didu, Cadegomeño, and Ignacieño linguistic groups.

Further south of the Didu and Cadegomeño, the Guaycura and the Pericu have a recorded history of conflict. Interestingly, no obsidian source exists in the cape region and, as of yet, no obsidian artifacts have been found in region. Both groups have never exchanged obsidian, which happens to coincide with the notion that obsidian helps forge a relationship that the conventional exchange of goods does not establish. As stated earlier, obsidian may serve other purposes in Baja California. Obsidian artifacts as a commodity in Baja California creates a certain inherent value beyond its utilitarian use making it either ritualistic, culturally significant or a gift. Obsidian exchange in Baja California may serve as an emerging social mechanism similar to other exchange systems around the world.

Prospects for Future Research

Given the limitations of this thesis, this project only raises more questions about the extensive exchange networks in Baja California. For starters, there are still obsidian artifacts with no identifiable sources. XRF technology and other obsidian sourcing methods continue to develop bring new interpretations from obsidian data sets (Shackley 2005, 2012). Hopefully as new sources appear, it will shed new interpretations and perspectives on the exchange networks in Baja California.

While looking for archaeological published data, there are some gaps where no archaeological work has yet been done in Baja California. For instance, the coastal region south of Isla Cedros has been ethnohistorically documented, but no archaeological work has been done in this region. The exchange route from San Ignacio to Isla Cedros is solely based on ethnohistoric accounts from Jesuits who traversed through the area. Exploring this region with survey and excavation could potentially demonstrate other sites and even add other exchange routes. Another region that needs to be explored archaeologically is south of San Javier, another coastal region with a gap in archaeological work. As of yet, no obsidian exists south of Bahía Concepcion and San Javier. Exploring this new area might shed new insights into that region and how it might be incorporated with the rest of the peninsula.

There is the potential for a doctoral dissertation by incorporating exchange networks of shell, chalcedony, jasper, and basalt. More geological studies are chemically sourcing other raw materials to see ecological and environmental changes. These methods can help us make conclusions about the acquisition of these raw materials in comparison with other exchange goods. These studies will benefit archaeological research and possibly change our ideas of small-scale societies living in the Baja California peninsula.

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