And You Shall Know Us by the Trail of Our Dead: Detecting Signatures of Sublethal Warfare Through Healed Cranial Fractures in Baja California Hunter-Gatherers

BY

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ABSTRACT

Warfare results where environmental change confronts social complexity in hunter-gatherer groups. Lethal outcomes as a result of extragroup violence result. In this thesis, the links between warfare and environment are examined. Hunter-gatherer groups living under environmentally deprived conditions are more likely to engage in violent conflict as the result of competition between groups for resources. The use of violence within groups also adapts to environmental conditions by offering non-lethal outcomes. Where warfare is systemic and environmentally motivated, groups may turn to a regulated means of violent internal conflict resolution mitigating population destabilization. The Santa Barbara Chumash and the Las Palmas culture both reflect an opportunity for regulated conspecific violence to mitigate lethal outcomes through evidence of survived cranial trauma. This comparative study highlights similarities between Phillip Walker's previous study of the Santa Barbara Chumash in contrast with the Las Palmas culture of Baja California Sur. Both groups subsisted under marginal environmental regimes and encountered perennial warfare and violence as a result of perceived changes in their environment. Changes to their environment also acted as the impetus for culture change in both groups. A spectrum of violence that includes non-lethal outcomes can result through cultural perceptions of environmental deprivation. Sub-lethal outcomes improve group survival chances when posed with ongoing extragroup predation and unpredictable environmental changes.

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Introduction

The geographic and cultural focus of this thesis is on the Las Palmas culture of Baja California Sur and the archaeology that has been conducted in this cultural area (Figure 1). Previous archaeological efforts in this area of Baja California Sur span almost 200 years and reflect the evolution of archaeological practice in method and theory from cultural historical approaches, the emergence of New Archaeology, and the current hypo-deductive methods of processualism. Through the use of processual research efforts and current cultural resource management initiatives, information about Las Palmas lifeways, including information about their material culture, subsistence, linguistic boundaries, and migration emerged. The result of these efforts allows archaeology to view the birth and terminus of an Aridoamerican prehistoric culture area, which encompasses the overlap of pre-Columbian cultures of the American Southwest and central Mexican states north and west of Mesoamerica.

The goal of this thesis exhibits that violence operates on a spectrum in prehistoric hunter-gatherers. The spectrum of violence from sub-lethal to lethal resulted in a range of outcomes. Some in anthropology prefer to adopt the position that prehistoric violence was minimal and indigenous people were engaged in a pacified version of the past (Keeley 1996). Contrary to this view of the past, this thesis will show that violence existed and was directed by environmental influences. By doing so, I also show that the existence of prehistoric violence was an outward manifestations of complex social processes reacting to perceived environmental influences. These environmental conditions influenced the formation of a structured outlet addressing internal group violence. A structured method of addressing violent conflict prevented population destabilization in prehistoric communities where lethal violence was systemic.

Figure 1: Culture Area Map of Baja California (Laylander 1997)

Review of the Las Palmas culture highlights the challenges it endured. These challenges most especially include obstacles in the natural environmental. From these natural challenges, this thesis will present an argument that cultural processes, including the chronic nature of violence, linked to impositions in their natural environment. Specifically focusing on the Pericú, a subculture within the Las Palmas, this thesis reviews their lifeways and changes in complexity over time due to the environmental influences in play. These environmental influences suggest changes in subsistence and territoriality due to an unanticipated climate cycle deviation, such as the possibility of the Medieval Climatic Anomaly's influence on the region. The resulting push to territorially control resources as the result of depressions in biotic productivity had a direct influence on the frequency and type of warfare in the Las Palmas culture.

Violence in the Las Palmas suggests more than just lethal outcomes. Extragroup lethal warfare and revenge feud cycles seem fueled by territoriality and resource control but intragoup

violence may have intended a less lethal outcome. To propose the possibility of structured sub-lethal violence, this thesis compares healed cranial trauma recorded in two contemporaneous prehistoric populations in the Californias, the Las Palmas and the Chumash. Both populations exhibit healed cranial trauma, engaged in systemic warfare, and operated in deprived environments after A.D. 1000. The Medieval Climatic Anomaly may have been the environmental event that influenced culture change in both groups and drove systemic lethal violence and the development of a conflict resolution system seeking internal non-lethal outcomes. Samples from both populations were taken from prehistoric Chumash groups living along the Southern California Bight and on the Channel Islands and Las Palmas populations living on or near the coast near La Paz, Baja California Sur. The orientation of the cranial injuries, the number of healed fractures in each sample group, and the presence of other traumatic elements and health profiles were compared in order to establish any possible parallels or differences between groups. The ratios of injuries by age and gender groups were also compared to make my case. From these data, this thesis proposes that violence in the Las Palmas had an opportunity for more than one outcome. Such an opportunity would have allowed the Las Palmas ways to address conspecific violence without reducing the overall fitness and productivity of their group. By doing so, they may have been less prone to the sometimes lethal effects of disease and violence in resource stressed environments.

Chapter 1: The Last Palmas Culture

Academic interest in the Aztec, Maya, and Toltec cultures of Mesoamerica eclipses the lesser known indigenous groups of Mexico. As a result of the lack of broader spectrum representation, Mesoamerican bias in archaeology provides an incomplete view of important historic and cultural narratives that have shaped Mexico as a whole. The indigenous cultures of Baja California Sur (BCS), Mexico are an important example of the opportunity that North American archaeology has to add to the body of its research about behavioral ecology, prehistoric conflict, and the emergence of social complexity in marginal environments. The cultural identities formed as the result of modes of adaptation that have emerged in response to Baja California Sur's challenging environment have been largely neglected by North American archaeology. North American archaeology's tendency to overlook Aridoamerican prehistory limits the overall narrative of North American and Mexican prehistory as a whole.

Advancing research in Baja California Sur also adds to the spectrum of the prehistoric and modern indigenous Mexican experience. By expanding this spectrum, North American archaeology bolsters previous research and adds new insights to the discipline's understanding of pre-Columbian hunter-gatherer lifeways, specifically social complexity, settlement patterns, mortuary practices and warfare. This thesis shall review the uniquely complex environmental, linguistic, and cultural details that define BCS and its direct role in shaping the intricate cultural paradigms of the Las Palmas culture. Drawing from multiple lines of evidence in this chapter, a case is made for the isolative effects on Baja California Sur social complexity due to environmental constraints and cultural processes. This chapter will review the culture history of the Cape Region of BCS and argue that violence emerged in reaction to marginal environmental circumstances within cultural groups. In doing so, this study will highlight the cultural narrative

of the Pericú, one of the prehistoric hunter-gatherer subcultures that participated in Las Palmas culture.

The Las Palmas Culture of the Cape Region

Only limited information exists regarding the Las Palmas culture of the Cape Region. Most of what is documented refers to the Pericú and derives from archaeological data, or ethnohistoric accounts by Spanish missionaries or European military members and private citizens. The bulk of these ethnohistoric accounts were authored by Jesuit missionaries and Spanish military personnel dispatched to the Cape Region. They brought Catholic missionization agendas or Spanish colonial empire directives, both of which were related to the Spanish *Requerimiento* of 1514 (Beebe & Senkewicz 2001). Jesuit written observations resulted from Catholic Church directives that required extensive written accounts of their encounters with indigenous peoples. Ethnohistoric records are helpful to archaeology as they allow access to information that may not leave detectable archaeological signatures. However due to the inherent bias present in ethnohistoric records, a critical approach to these documents is necessary. They are not thorough factual accounts of events, only subjective observations of those events. These records remain important as they offer insight into the sociopolitical and environmental conditions at the time of their writing.

Approaching these documents with care is especially prudent when ethnohistoric accounts contradict one another, as they do in the case of the Las Palmas culture. The result of these contradicting texts provides the appearance of a disjointed ethnohistoric narrative. Mathes (2006:50) provides an example of such a contradiction:

> The missionaries presented a generally negative picture of the Californians. The latter were ignorant, insensitive, greedy, lacking in reason, lazy, childish, given to pleasure in games and dances, and weak-willed. They were incapable

> of abstract concepts, natural reason, and divine grace, but were ambitious and proud without avarice, not thieves, and were only given to supplying their immediate subsistence. They were vengeful and violent but cowardly when confronted, and like children (2006:50).
>
> … [The Las Palmas were] friendly, honest, kind and happy… and did not lie, steal, nor use alcohol… Nevertheless, they were praised as good runners and tireless walkers. (2006: 50).

Despite contradictions regarding peninsular indigenous groups, these documents have been helpful in attempts to corroborate the Cape Region's archaeological record. As the Las Palmas culture is no longer extant, archaeological data and ethnohistoric documents are the remaining means of reconstructing the lifeways of Las Palmas culture hunter-gatherers.

An ongoing problem in Cape Region archaeology is defining the amorphous territorial boundaries held by the Guaycura and the Pericú in the Cape Region. The Cora are another possible addition to the Las Palmas culture but references to this group are sometimes thought to be another name for the Pericú (Mathes 2006). General linguistic boundaries have been drawn for Guaycura and Pericú in the Cape Region (Laylander 1997) and the skeletal traits attributed solely to the Pericú are employed in attempts to distinguish the two groups (Tyson 1977). However, a remaining problem is that much of the material culture in the Cape Region was utilized by all Las Palmas subgroups, so elements cannot be said to represent only one culture group. Massey (1955) expressed similar reservations about the overlaps between groups and was also reluctant to establish discrete cultural boundaries based on material culture.

The majority of archaeological data emergent from the Cape Region since Massey's work has focused on the Pericú. For the purpose of this thesis, the Pericú in the Cape Region is used as an example of a group within Las Palmas Cape Region culture. A lack of extensive Pericú research makes it difficult to determine which cultural practices were distinctly Pericú. The

Pericú kept no written records and have produced no modern descendants that might be able to provide insight into earlier cultural practices. Extant literature establishes that the Pericú occupied territory in the Cape Region of Baja California. Without knowing how they lived in non-violent contexts, there is difficultly in grasping more fully the context of violence and warfare within their society. Their overall sociocultural profile, based on archaeological data and ethnohistoric documents, suggests a group that used violence as a means to resist or limit interaction with other groups.

The relatively short period during which the Pericú existed permits archaeology to study the rise and fall of this culture. A span of 8,000 years of Pericú culture reflects chronological change that includes the inception of a Cape Region hunter-gather culture, its acquisition and development of social complexity, and the group's unfortunate demise when faced with European contact. The Pericú occupation of the Cape Region began in the early Holocene. Radiocarbon dating at several Cape Region sites indicates that Pericú occupation began between 10,000- 8,000 cal. BP (Fujita 2006). The end of the Pericú is attributed to multiple causes associated with European contact. A lack of resistance to Old World diseases played a primary role (Mathes 2006). The group's demise coincides with the mid-eighteenth century collapse of the Spanish mission system in BCS and the intensification of European salt-water farming ventures in the region. In 1733, an armed revolt involving the Pericú and the Guaycura took place against the Jesuit missionaries. The heavy loss of indigenous life that occurred as a result of that conflict hastened the rapidly approaching demise of the Pericú.

The Pericú appear to have operated in relative isolation from other indigenous groups on the Baja peninsula. The evidence for isolation includes archaeological and osteological data as well as ethnohistoric records. The imposing mountainous geography, which separates the Cape

Region from points higher up the Baja peninsula likely limited contact with other indigenous groups. Ethnohistoric records and material culture from archaeological excavations both support the Pericú geographic range in the Cape Region from *Los Cabos*, *Todos Santos* on the Pacific side of the peninsula, up through *La Paz* and its corresponding islands in the Sea of Cortez, and then northward toward *Loreto* (Mathes 2006, Fujita 2006). The same ethnohistoric and archaeological data support the notion that Pericú boundaries were reinforced through warfare with the Guaycura of the Cape Region, who claimed parts of this region as their own (Mathes 2006).

Osteological data reflects that the group was genetically isolated (Tyson 1977). Crania associated with the Pericú burials recovered from Cape Region sites exhibit distinct *hyperdolichocephalic* features (Figure 2). The elongated, thick walled cranial features are not present in other Cape Region groups though their genetic origin is debated. González-José and colleagues (2003) suggest that their distinct cranial morphology is the result of Pericú arrival in the Cape Region *via* trans-Pacific migration. Once the Pericú reached the Cape Region, the group remained without migrating up the Baja peninsula. The González-José hypothesis rejects Kirchhoff's 'Layer Cake' (1942) model of peninsular settlement where groups moved down the length of the peninsula over time and maintained fixed territories. Kowta (1982) suggests that the cranial features are the result of *in situ* genetic processes due to genetic drift. As *hyperdolichocephaly* is not represented in burials associated with Guaycura archaeological sites in the same area, it is reasonable to hypothesize that two groups may not have intermarried. The result of the distinct cranial morphology is not likely due to genetic admixture but instead retention of specific genetic traits within groups. Attempts to type the DNA of the Pericú have

so far failed due to the poor preservation of genetic material in Pericú burials (Gonzales et al 2003). Until DNA analysis is able to settle the debate, it is more likely that the unique cranial

Figure 2: Pericú Hyperdolichocephaly (López and Fujita 2002)

morphology of the Pericú is the result of genetic drift. Coupled with the osteological data with the previously discussed ethnohistoric and archaeological data regarding Pericú isolation, it appears that the group was enforcing a brand of isolation upon itself and resisted extragroup marriage practices.

The subsistence practices of the Pericú focused heavily on marine resource gathering and terrestrial hunting strategies. While they did hunt with the bow and arrow, their primary mode of subsistence was geared toward maritime fishing and gathering. These adaptations included the gathering of intertidal shellfish and the focused exploitation of *penipeds* migrating through the Gulf of California. The later were hunted through the use of sea rafts, spears, and nets beginning around A.D. 1000 (Porcasi and Fujita 2000, Fujita 2006). *Manos*, *matates*, and pounders found in Cape Region archaeological assemblages evidence the use of grinding tools for gathered

terrestrial resources (Fujita 2006). Phytolith analysis for these stone tools has highlighted their use in preparation of regional cactus and fruit taxa. After A.D. 1000, the balance of the Pericú diet was focused on marine exploitation strategies and was supplemented with terrestrial sources (Fujita 2006).

The group demonstrates two settlement patterns. They had static ceremonial site locations and high residential site mobility. Residential mobility may have possessed seasonal elements as groups moved in between seasonably exploitable resource niches on the Cape Region mainland while establishing more fixed ceremonial centers on the coast and islands in the Sea of Cortez off the coast. The scale of residential mobility reduced over time. A total of 219 Pericú shell midden sites have been recorded in the Cape Region (Fujita 2006). The middens represent residential sites activities:

> manufacturing, maintaining, and using tools of stone, wood, shell, and bone; to prepare and consume plant and animals foods that been acquired by hunting, gathering and fishing; to build fires, for human [primary] burial; to make ornaments from shells and other materials' and for activities particular to the community (Fujita 2006:90).

As previously discussed, ceremonial sites were primarily non-residential. These sites may represent staging areas for some combination of economic, ceremonial, or funerary activities. The sites were located across the Cape Region at *El Conchalito* (*La Paz*), *El Médano* (*Cabo San Lucas*), and *Cabo Pulmo* (*Cabo Pulmo*) and an island in the Sea of Cortez at *La Ballena* Complex (*Isla Espíritu Santo*) (Figure 3). These sites demonstrate that the Pericú had a level of complexity reflected by distinctions between residential and non-residential sites. Residential activities had a temporary element to them. The frequency and range of Pericú mobility decreased over in time and will be discussed in more detail below. Non-residential centers, on

the other hand were fixed to the landscape. The differentiation in site use suggests that Las Palmas social conventions dictated different protocols for site type permanency and use.

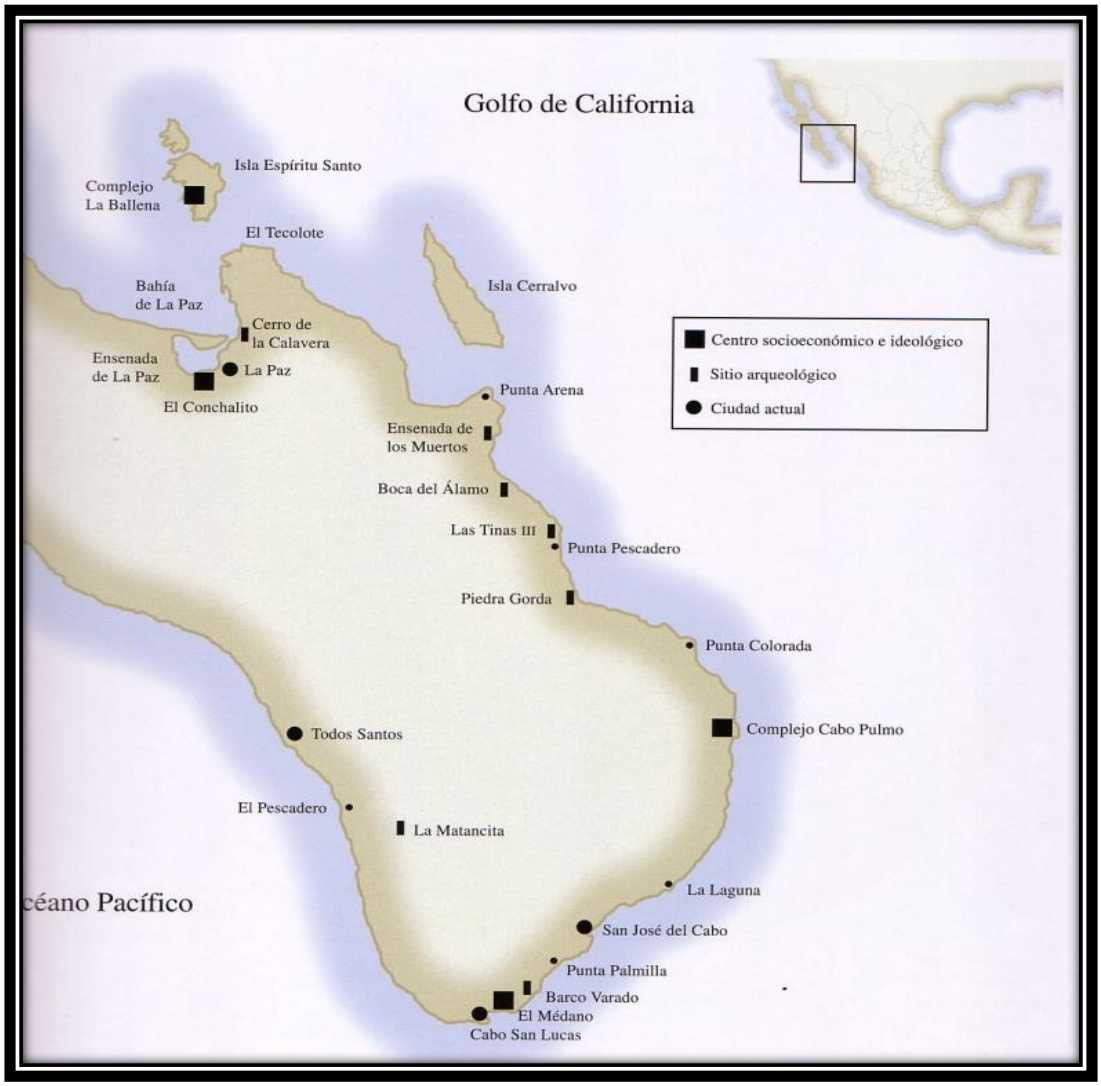

Figure 3: Cape Region Archaeological Sites (Molto & Fujita 1995)

Pericú residential settlement operated on a seasonal round that depended on access to food and fresh water. Most of the Pericú archaeological assemblages recorded occur close to coastal areas with fewer interior sites. Fujita (2006) proposes that this is likely due to groups retaining reliable access to coastal food and drinking water resources. The range of site types

and locations reflects a pattern of mobility within the Cape Region, where groups established residential camps near reliable food and water resources. As resources became less predictable in one locale, the group would move to other areas.

Archaeological data provides insight into Pericú religious practices through petroglyphs that suggest ceremonial activities at fixed site locations. Pictographs present at *Cabo Pulmo* and *La Ballena* as geometric and anthropomorphic reliefs appear on the largest granite formations at the sites (Fujita 2006). The selection for the largest available stone surfaces at the sites may indicate that these may have offered religious vantage points. Additionally, a network of pathways at *La Ballena #3* on *Isla Espíritu Santo* connect several key locations on the island including a burial site, a lithic manufacturing quarry, a cave containing pictographs, and several smaller residential sites. The specific meaning of these paths is unknown but Fujita proposes that one segment of the path measuring at 8 m x 500 m was used as a ceremonial race track (Fujita 2006). Grave goods and ceremonial objects also recovered from *El Médano* and *El Conchalito* indicate the use of these sites for secondary burial activities. The summary of the archaeological data supports organized, purposeful religious practice that made use of environmental features to facilitate its practice. On a macro scale, these activities indicate that the Pericú possessed a defined, complex cosmology by which they conducted symbolic or ritualized behaviors.

Ethnohistoric records also provide insight into Pericú symbolic or ritual behavior, including cultural conceptions of death, treatment of the dead, and deification. Records show that the group had shamans for the administration of religious ceremonies, recognized the existence of gods, and possessed a fear of the dead (Hyland 1997, Raab 2005). Funerary practices, as reported by Massey (1955) as part of his 'The Las Palmas Burial Complex', include

secondary burial as a center piece of Pericú funerary practices. Massey's Las Palmas Complex outlined a set of mortuary protocols, which began with initial burial of their dead. After a prescribed length of time, the body was then exhumed and defleshed. The defleshed bones were then disarticulated, painted with red ochre and bundled together with palm cordage and transported to an alternate location. The decedent was then re-buried, still bundled, at a secondary burial location. This practice may have been conducted as Ann Raab (2005) proposes as part of Pericú fear of the dead. Ethnohistoric observation by Jesuit missionary Johann Baegert also links the practice with Pericú based on informant narrative. Baegert's (1953) interpretation of this narrative speculated that Pericú secondary burial practices were to prevent contact with the dead:

> One of them told me that his people had formerly broken the spine of the deceased before burying them, and had thrown them into the grave rolled up like a ball, insisting that they would rise up again if not treated in this barbaric manner (1953:88).

In addition to the Baegert observation, Fr. Miguel Venegas (1979) recorded a handful of details regarding Pericú creation myths, including those that acknowledged the existence of gods associated specifically with the dead and those who died as the result of warfare. Hyland (1997) also hypothesizes that mural traditions throughout the Baja peninsula reflect a consistent preoccupation with the living's ability to contact the dead through ceremonial activity. The preponderance of information indicates that the Pericú had a preoccupation with ceremonial activities linked with the dead. It is not clear if this preoccupation was chiefly out of fear (Raab 2005) or more oriented toward veneration and ancestor worship (Hyland 1997). But, the Pericú did intend a significant cosmology based on ceremonial and funerary practice and were in

possession of a complicated cultural narrative about the religious dimensions of death, the afterlife, and the treatment of the dead.

The Pericú, and by extension the Las Palmas culture hold an underutilized wealth of information about hunter-gatherer adaptation and complexity in North American archaeology. The unique circumstances within which the culture operated present a picture of cultural continuity, from incipience, changes to complexity, and cultural termination. Though archaeological research about the Pericú and the Las Palmas has been limited compared to some other North American groups, the data rendered reflects information about cultural adaptations to harsh environmental regimes and culture contact. A key element of the Las Palmas culture is the frequency and meanings of warfare that appears pervasive within the culture. The following chapter addresses both the origins of warfare in North American prehistory and the reasons for warfare as related to the Pericú and Las Palmas culture.

Chapter 2: Environmental Setting and Constraints

Environmental Influences of Group Isolation

Operating in relative geographic isolation, BCS is the result of dissimilar climates and locales creating a unique environmental symbiosis in which the Baja peninsula operates. The whole of Baja California is 1,100 miles long and is located between 22º to 33º latitude and 109º to 117º longitude (Figure 4). In present day, the Baja California peninsula comprises the states of Baja California Norte and Baja California Sur, both members of the United Mexican States. Geologically diverse, the peninsula's majority land surface area is mountainous (62.9%), followed by desert (21.6%), and coastal plains (15.5%) (Davis 2006). The limited land mass of the Cape Region showcases the diversity of the southern end of the peninsula. It also demonstrates the potential difficulties of living in an environment where both the amount of land available and the terrain present challenges.

The length of the peninsula and the land surface impose a unique set of challenges on its modern day inhabitants. The *Sierra de La Laguna* mountain range bisects the Cape Region (Figure 5) from north to south and the extremely arid and mostly mountainous terrain has pushed the majority of its cities and towns into coastal areas. The division between the coast and the interior based on limited livable landmass also heavily influences the presence of industry. Mining and ranching are the main industries of the interior Cape Region; and fishing, small-scale agriculture, and tourist-related industries dominate the coastal areas. Given the environmental limitations imposed on the Cape Region, there is reduced opportunity for a spectrum of industrial transition between these two locations. As a result, a limitation in the productivity of the environment for certain industries is apparent.

Part of the arid tropics, BCS is a dry, hot place, and the availability of fresh water sources are considered a premium resource. The aridity of the environment has not always been the

Figures 4 & 5: Baja California Peninsula Map & La Paz/Cape Region Map (mexmap.com & mexconnect.com)

standard. Climate studies suggest that BCS has been a more temperate environment in the past and was subject to fluctuations in climate (Davis 2006). Davis' pollen analysis reflects that the peninsula was much cooler and wetter up until the terminal Pleistocene, with woodlands normally associated with higher elevations extending to near sea-level. The *Sierras Juarez*, *San Pedro Martír*, and *La Laguna*-- three of the four major mountain ranges on the peninsula-- all hint at the availability of pine and oak trees at lower elevations in much more expansive numbers earlier into the Holocene according to Lozano-Garcia and colleagues (2002) than at their current

high-elevation locations. The availability of pine-oak trees in higher numbers at lower elevations in conjunction with pollen data suggest higher rainfall totals resulted in a more productive biotic environment during the Pleistocene to Holocene transition. The Cape Region environment has been prone to more recent reversals is extrapolated from the environmental data. In a later chapter, information will be presented that shows that climate cycles within the Cape Region demonstrate these patterns of fluctuation.

In more recent times, the climate of BCS is hot and less productive. Transected by the Tropic of Cancer, the Cape Region is subject to high year-round temperatures averaging 26º C and 43º C during the summer. Yearly rainfall only averages 25cm, the majority occurring during the hurricane season from August through October. Desert-adapted scrub vegetation dominates the interior areas due to the low availability of immediate water sources and there is a low density of trees, especially at low interior elevations. The coastline makes palm trees available but palm wood is an extremely hard, dense material and is labor intensive to produce. The low biotic productivity of the Baja peninsula also limits the native range of fauna to aridity-adapted *artiodactyls, lagomorphs, ovis,* and *felis* genera. Coastal areas of the peninsula are considered far more taxonomically diverse with a high density of fish, gastropod, and bivalve genera as well as a variety of porpoise and whale. The difference in the terrestrial and coastal productivity is tied into the availability of water sources. What the difference reflects for the Cape Region is an environment operating at marginal capacity, where biotic productivity is potentially depressed and highly dependent on water availability. If surface water sources are unreliable due to low rainfall, biotic productivity and the resultant carrying capacity of the terrestrial environments would also remain low. In its current state, the environment of the Cape Region is a separation of high coastal and low interior productivity. The coastal and interior

portions isolation from each other compliments the separation of environmental productivity present.

Linguistic Evidence for Group Isolation

The indigenous language divisions estimated by field work and remnant text translations (Mixco 2006) on the peninsula reflect groups operating in relative isolation in the south and a higher degree of contact between groups in the north. Laylander (1997) has worked extensively on the linguistic breakdown of the peninsula and the majority of my presented information will come from his research efforts. He also questions whether the isolation in Cape Region groups is due more to ecological constraints or cultural causes. He has established that indigenous groups in the peninsula were in contact with each other in north. But continuing southward down the peninsula-- especially into the Cape Region-- the evidence reflects a reduction in contact between groups. Ethnohistoric records describe Cape Region groups interacting with one another in largely violent contexts but do not mention any frequency of contact with indigenous groups to the north. The missionary groups producing the ethnohistoric documents also do not note having contact with northern groups coming southward. Was there then a cutoff point of regular contact between groups in the north and the south of Baja peninsula? Environmental and cultural factors may have opposed efforts toward contact without any frequency. The result suggests that northern and southern groups were in limited contact, experiencing cultural histories separate of each other.

Ethnohistoric efforts to report on the linguistic diversity of BCS resulted in a linguistic map that unsurprisingly divides groups by region and linguistic group (Laylander 1997). The boundaries of these maps are largely predicated on lexical word lists recorded in ethnohistoric documents, early 20th century linguistic field work in northern Baja, and remnant translations of

Catholic religious texts into indigenous languages (Mixco 2006). The resulting linguistic boundaries divided the Kumeyaay, Cocopa, Paipai, and Kiliwa to the northern portion of the peninsula, from the international border southward to just beyond *San Pedro Martír*. A small mid-peninsula southeastern allocation was assigned to the Monqui, though the Cochimí occupied the largest region throughout the middle peninsula, and with the Guaycura and the Pericú in the south including the Cape Region, holding separate linguistic areas (Laylander 2006) (Figure 6). The linguistic segregation divided into neat boundaries appears to also support the theory of groups operating in isolation of one another. Laylander's linguistic map is helpful as it provides a general scale of Baja language divisions. It does not resolve whether Cape Region isolation began as a reaction to primarily ecological constraints followed by cultural phenomena or the reverse.

Figure 6: Linguistic Map of Baja California Based on Laylander Model (Laylander 1997)

In comparison, groups in the north of the peninsula were less linguistically and socially isolated. The territorial and cultural boundaries in the north were not discrete between the Yuman language family-associated Kumeyaay, Cocopa, and Paipai. Through linguistic records,

Laylander (2001) demonstrates that the Kumeyaay and Cocopa range of mobility included Arizona as well as California above the international border. Today, some remnant speakers of these Yuman dialects remain in northern Baja California and southern California reinforce evidence of the range of mobility and contact in northern Baja. It appears that only the Paipai made northern Baja California their primary territorial range. The common denominator between these Northern groups is language intelligibility. In order to have mutually intelligible languages, these groups would have been in a regular frequency of contact over an extended period of time.

Northern Baja language groups also shared common themes in their world creation myths also repeated in the Southern California Creation Myth complex (Kroeber 1925). The complex of themes was shared by Yuman-speaking groups such as the Ipai, Maricopa, Mohave, and Upland Yumans of Arizona and interior southern California and in the Utoaztecan Takic-speakers, the Luiseño, Cupeño, Cahuilla, and Serrano speakers of coastal southern California. Aspects of creation myth elements reflect a wider pattern of cultural transmission due to commonalities seen in Numic speakers of the Great Basin, Athabascan speakers of Alaska, the Canadian Yukon Territory, and the American Southwest, and Piman speakers of southern Arizona and Durango, Mexico (Krober 1925). Similarity of pottery styles between the northern Baja California, southern California, and Arizona groups also reflects evidence of cultural transmission, another indicator of contact between these groups. Yet, similar evidence is not found in Cape Region groups. The reasons for the lack of similar evidence remain unclear but the lack does add to further indications of Cape Region cultural isolation.

The linguistic and cultural origins of Baja California Sur are poorly understood. The origin of the languages and cultures of the Monqui, Cochimí, Guaycura, and the Pericú remain

obscure. The cultures are no longer extant and only scant, conflicting ethnohistoric accounts of their language and culture remain. There are few convincing arguments derived from those sources that connect southern group languages with either the Yuman or Hokan dialect families. There is also some ethnohistoric evidence of Pericú creation myths but the details are dissimilar from the shared elements of creation myths between groups in the north (Laylander 2011). Archaeological assemblages also reflect few similarities. Cape Region groups did not have pottery traditions due to the high mobility of groups that made transport unattractive. The arid conditions in the Cape Region would have also made available wood sources for cooking with ceramics difficult to locate, making for an inefficient investment and expenditure of energy and time. The environment and lack of contact with northern groups appears to have influenced a different track for cultural and linguistic development in the Cape Region.

Geographically speaking, the length of the peninsula and the relative isolation of the Cape Region would have made contact between northern groups and southern groups less frequent. The lack of contact would have influenced these cultures to evolve separately and more likely share sociocultural characteristics with groups which they were more likely to frequently contact. Laylander (2011) argues that isolation represented in language sharing is supported more by ecological factors than a lack of cultural transmission between all Baja indigenous groups. He also acknowledges that a less robust body of supporting ethnohistoric documents by which to classify southern Baja and Cape Region languages may also influence conclusions of dissimilarity between north and south. However, this does not mean that northern and southern groups were never in contact. The diffusion of the bow and arrow, the atlatl, and similar petroglyph and mural traditions throughout the peninsula support some frequency of contact (Hyland 1997). The ecological and geographical conditions warded off frequent contact

between north and south reflects without limiting it totally may be the reason for Cape Region cultural isolation. As a result, social conditions in the Cape Region were as marginal as ecological conditions when you consider all the groups in Baja California and their frequency of contact with one another.

Despite a paucity of ethnohistoric and archaeological data on the Cape Region, the data that is available favors a case for isolation. A lack of available ground water due to low rainfall produced and continues to produce a low overall biotic yield in the Cape Region environment. The Cape Region groups adapted to living in a marginally productive environment through seasonal mobility, high marine exploitation, and a resistance to lifeway traditions that could not be supported in a marginal environment based on the archaeological evidence. I agree with Laylander (2011), that the cultural isolation in the Cape Region has environmental origins. The low productivity of the environment when coupled with the land mass of the Baja peninsula and the presence of extremely arid and extremely mountainous conditions would have made continuous migration up and down the peninsula (1,100 miles) a costly proposition. This is most especially true when you consider that a lack of continuous access to water is incompatible with supporting frequent group migrations between north and south. Mural traditions and artifact assemblages support contact between groups but likely on a limited basis with a preference within the Las Palmas of the Cape Region to remain in their immediate environment. The effort to maintain repeat contact between groups farther to the north was inconvenienced by the geological and environmental conditions that stood in their collective way.

The environmental isolation had a direct impact on the cultural of isolation of the Pericú. The case for isolation in the Las Palmas is not just about isolation for the sake of isolation, however. The osteological data, as previously discussed, reflect a lack of genetic admixture

through retention of crania morphology in the Pericú that did not proliferate throughout the Cape Region. A lack of inclusion into extant linguistic groups and a high frequency of warfare sought to limit peaceful contact with other groups within the Cape Region. All of these findings support the hypothesis offered in this thesis that the culture of isolation was an adaptation to a marginally productive environment. This study will propose more broadly that though the environment may have influenced the Las Palmas culture in their cultural trajectory in specific ways; the Las Palmas culture responded to environmental isolation imposed on their culture by harnessing this isolation. The root motivation to do so was to support environmentally adaptive strategies in their environment. Primarily the key element to this isolation was controlling access to limited resources through territorial conscription and enforcing this brand of isolation through warfare.

Environmental Influences on Warfare

In North America, prehistoric groups living in arid locales where access to water is limited is a recurrent pattern for both hunter-gatherers and agriculturalists. Though their subsistence practices differ, both systems encounter resource stress when there is limited access to a reliable water supply (Taylor 1964). An example of such a scenario was experienced by the Santa Barbara Chumash during the Medieval Climatic Anomaly (MCA) (Jones et al 1999). In contrast, little archaeological research has been completed in Baja California Sur relevant to carrying capacity, biotic yield, and significant environmental changes like the MCA, as it may have impacted Cape Region groups. However, resource stress linked to water availability in arid environments is a repeated theme among North America indigenous groups with diverse subsistence strategies. It is likely that populations in the Cape Region experienced stress on water access especially during arid times.

The Santa Barbara Chumash

Reaction to resource crisis is represented in the Santa Barbara Chumash, where warfare and social disruption are associated with a prolonged change in available resources as the result of drought. The drought was related to the Medieval Climatic Anomaly (MCA), the period of time between A.D. 800 and 1350 where global climate scales experienced severe droughts concurrent with higher temperatures (Stine 1994, Jones et. al. 1999). The course of the events in the prehistoric climate of Southern California leading up to the MCA was similar to the climate events occurring in other parts of the North American archaeological record, including the Colorado Plateau (Petersen 1994). The Southern California climate pattern reflects cycles of expansion and contraction in the rainfall/drought ratio. Periods of drought punctate the climatic record of Southern California between A.D. 750 – 770 and A.D. 980 – 1030, with a period of heavy rainfall in between A.D. 800 – 980 (Larson and Michaelsen 1989: Jones et al 1999, Raab and Larson 1997). Another period of rainfall occurs from A.D. 1030 to 1100 before a sustained period of drought beginning around A.D. 1100 and continuing until A.D. 1250. Particularly dry conditions occurred between A.D. 1120- 1150. These dates overlap with widespread drought conditions reported as the result of the MCA (Petersen 1994, Lamb 1995, Fagan 2000). It is during the most intensive period of drought from A.D. 1100 – 1250, that evidence of warfare and settlement disruption is found in the Channel Islands Chumash.

The Santa Barbara Chumash in Alta California did not practice agriculture nor did they reside in permanent dwellings. Instead, they were small, mobile groups in possession of a foraging economy. Chumash territory was comprised of the western edge of the inland San

Joaquin Valley, the coastline from San Luis Obispo to Malibu, and the northern Channel Islands (San Miguel, Santa Rosa, Santa Cruz, and Anacapa) (Figure 7). Their economy was based on a

Figure 7: Southern California Bight (Ocean Conservation Society 2005. Web.)

broad range of resources, including terrestrial game, plant foods, fishing, and marine resources (Arnold 1992). The specific focus on Chumash within this chapter concerns those who occupied the California Bight, which spans the California coastline from Point Concepcion to San Diego, including the Channel Islands and Santa Barbara. The chronology of Channel Islands archaeology has been divided into the Early/Millingstone, Middle, and Late periods of the Holocene prior to European contact (Moratto 1984). The Early period (5500 – 600 B.C.) subsistence practices of the coastal Chumash focused on terrestrial game, plant sources, and gathered shellfish. Their Channel Islands-dwelling counterparts had fewer terrestrial resources available to them and instead drew heavily from gathered shellfish sources around the islands. During the Middle period (600 B.C. – A.D. 1150), the island-dwelling Chumash began to

heavily exploit fish resources and sea mammal colonies around the islands. Their change in subsistence strategy links to the adoption of the *tomol*, or plank canoe, which allowed the Chumash to travel greater distances in search of marine resources and to develop more advanced fishing tools to maximize their fishing yields (Arnold 1992).

The unanticipated environmental change at the terminal Middle period after A.D. 1150 was the catalyst for social change in the Chumash (Arnold 1992). The settlement patterns and social complexity of the Chumash change in conjunction with the MCA, the effects of which including the elevation of Pacific Ocean surface temperature. By A.D. 1300, Chumash groups had shifted away from mobile settlement strategies and had started to dwell in aggregated, sedentary coastal sites that averaged 50-250 persons (Arnold 1992). These sedentary communities relied heavily on gathered plant and coastal shellfish sources as a primary subsistence strategy, as terrestrial protein sources became scarce as the result of the arid conditions. Mainland aggregation coincides with the depopulation of the Channel Islands that took place about A.D. 1150-1200 (Arnold 1992). Contemporaneous to these events, elevated Pacific Ocean surface temperatures lasted from A.D. 1150-1250 (Pisias 1978). In conjunction with warmer sea temperatures, the previously discussed period of drought also affected mainland and island locales as reported by Larson et al (1986). This time period was one of heavy, noticeable social change in the Chumash as the result of environmental constraints.

The Channel Islands Chumash population was encountering resource stress as reflected by skeletal remains. Lambert (1993) examined the Chumash skeletal populations recovered from cemetery sites on Santa Cruz and Santa Rosa islands. Examining 327 individuals from burials on these islands and representing the Early/Millingstone, Middle, and Late periods, evidence of ossified periosteal lesions in the long bones and calviculae were found. The periosteum is a

membranous lining that covers all osseous surfaces in the body. When the membrane is lifted away from the bone by an intrusion of blood, pus, bacteria, or by traumatic injury, bone building cells known as osteoblasts begin to lay down new bone inside the gap. The result of this reaction creates a lasting osseous lesion on the surface of the bone. Lambert found that the frequency of these lesions increased at a rate of 1 per burial from between the Early and Middle periods before slowing in the late period. A rapid rate of appearance for periosteal lesions demonstrates that Chumash health was declining from the Early to Middle periods.

The size of these lesions also increases through time. Lambert (1993) attributes Early/Millingstone period lesions based on their size and frequency to accidental injury, but their larger size and frequency in the Middle period cannot be correlated to an accident-based causation. It is more likely that the island populations were developing them due to poor nutrition as the result of resource stress or an increasing frequency of pathogens within the island population. With resource competition high on the islands due to environmental decline, sustained drought in the later Middle period, and groups becoming increasingly sedentary on the mainland around resources, conditions were optimal for poor nutrition and disease to occur at increasing rates. Though islands groups were eating large quantities of marine-based proteins, deficiencies in their diet were the likely cause of shortfalls in essential nutrients. Parmalee and Kippel (1974) show that marine-based proteins, notably shellfish, exploited in high numbers are a supplemental protein source and not a staple. The environmental depredation forced island populations to consume marine-based proteins from the waters around the islands as a staple. The high caloric expenditure to gather and process these foods and the poor protein return created nutritional stress in the population. The issue was not that the Chumash were lacking

enough to eat but; they were apparently more susceptible to disease and opportunistic infections than previously and drawing nutritionally deficient sources.

Limited fresh water sources on the islands possibly subject to frequent contamination perhaps from diarrheal illnesses due to contact with human waste products. Walker (1986) has proposed that much of the health crisis in the island populations focused on the contamination of water and food sources. Parasitic elements introduced to the population came from fish eating from roundworm-infected kelp beds or raw consumption of tapeworm-infected sea mammals. Poor overall health and a competition for resources may have led to an escalation in violence. Illness compromised the viability of island populations but violence increased in the Late period indicating the violence occurred despite the extant health crisis. That violence occurred within a population exposed to severe illness implies the dire situation within the island populations.

The high marine isotopic values in island and coastal groups correlate to marine exploitation (Walker and Lambert 1991). Advances in maritime technology enabled a resource exploitation increase that fostered the high consumption of marine-based protein sources on the coast. Coastal groups enjoyed a more intermediate diet that drew from marine and terrestrial resources, including high-carbohydrate, high-grit foods such as tubers, wild yams, and acorns. The rate of dental caries in the coastal and island groups in association with the increase in marine proteins consumption indicates that marine proteins were replacing carbohydrate-based, high grit food items in the diet. In order to maintain a highly stratified method of subsistence, this thesis will suggest that Chumash society would have become more complex by stratification to support changes to subsistence strategies, settlement patterns, and craft specializations intended to support an exploitive maritime adaptation as a primary means of subsistence.

Evidence of warfare is also present in the Santa Barbara and Channel Islands Chumash. Osteological evidence of warfare related-injury peaks at the same time that periosteal evidence of poor nutrition appears in high frequencies in Middle and Middle-to-Late period transition populations. Walker (1989) recorded high levels of cranial trauma during these periods in Channel Island Chumash populations that outmatch the frequency of similar injuries seen in the Early and Late period. The nature and purpose of this kind of violence is discussed later in the preceding chapter. For now, this thesis demonstrates that violent episodes were occurring at a higher rate within the Chumash during this time period due to an increase in resource distress due to the onset of marginal environmental conditions.

Warfare was also occurring among populations found outside the Channel Islands during this time period. Raab (1998) recorded a large Chumash cemetery site at Calleguas Creek (CA-VEN-110) on the mainland at Point Mugu near Ventura which had high rates of sharp force projectile trauma, including recovered antemortem arrow points imbedded in individuals buried at the site. King (1982) found that the historic-period Medea Creek site (CA-LAN-243) (Figure 8) in mainland Malibu only evidenced traumatic injury and violence in 1.3% of the 300 burials recorded at the site. Rates of violence in the historic period evidenced in osteological trauma at Medea Creek were lower by comparison but prove that violence between Chumash groups was ongoing. The data from Medea Creek is in contrast to the rate of 10% for the Calleguas Creek site, a Middle-to-Late period coastal cemetery where the rate and types of traumatic injury between the sexes suggested indiscriminate community-level aggression. The osteological evidence from Calleguas Creek suggests that violent attacks on the population intended lethal or extermination-level fighting. As resource stress escalated in the Middle and Middle-to-Late transition due to drought and other possible environmental factors, the competition between

groups to protect and maintain resources apparently turned violent. The summary of osteological evidence at these sites suggests that the method of warfare intended to permanently eliminate competition for access to these resources.

The Las Palmas Natural Environment

The Pericú of the Cape Region of Baja California Sur were another group that operated an arid, marginal environment. The effects of the MCA are well documented in California, but there have been few climatic studies conducted in Baja California that have attempted to examine the MCA's range of effect on the peninsula. Even fewer of these studies have attempted to examine the environment in connection to settlement patterns and social change in Cape Region groups. Studies regarding the aridity of the peninsular environment have attempted to obtain a more conclusive idea of its duration. It is unclear if the MCA had deleterious effects on the Baja California peninsula but early indications of climate

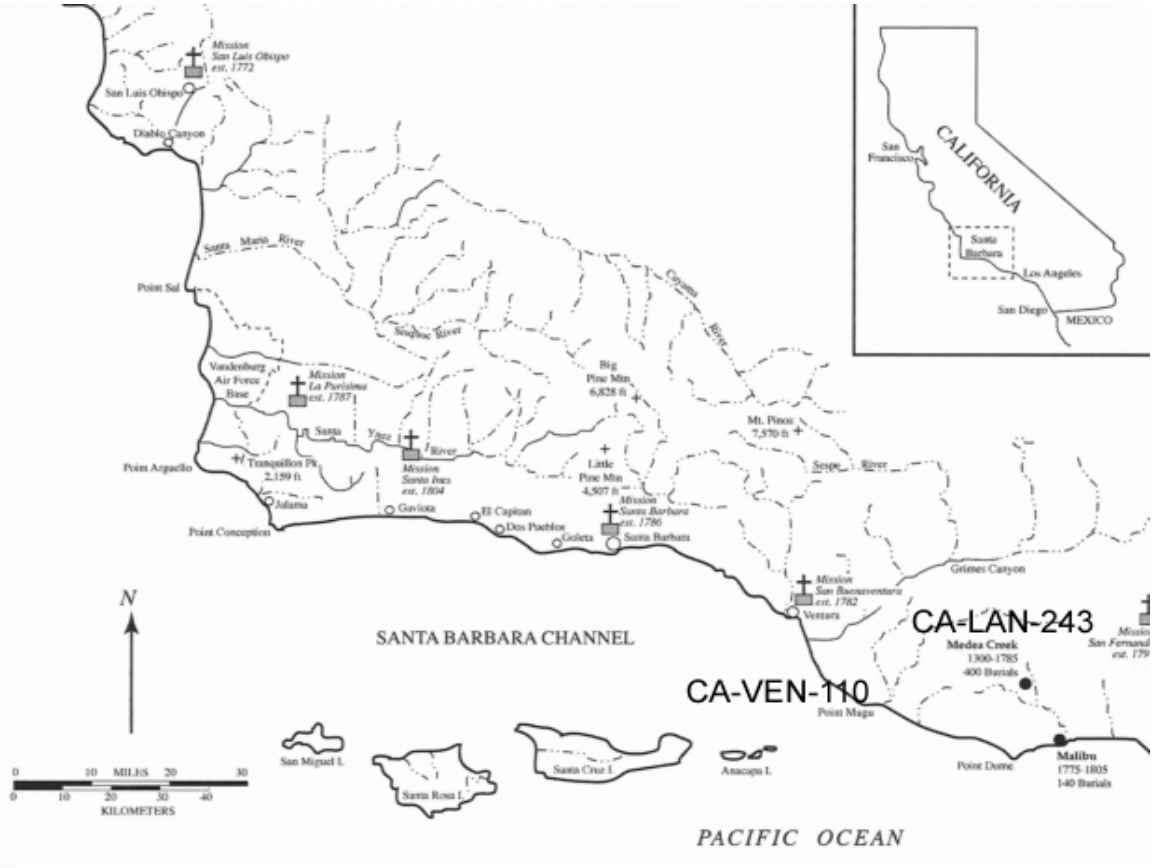

Figure 8: Map of Calleguas Creek (CA-VEN-110) and Medea Creek (CA-LAN-243) (Green 2001)

suggest that the MCA did not leave Baja untouched. Diaz and colleagues (1995) reconstructed the aridity of the *Sierra de la Laguna* in the Cape Region by measuring monthly rainfall at low and middle altitude points along the mountain range. Altitude data were compared with tree ring data from the same study from trees at these altitudes on the mountain. Their attempt at climate reconstruction was limited to the historic period from 1810 through the last few decades but reflected a pattern of fluctuating high and low aridity periods throughout the last 200 years. The climate of the Cape Region as a whole was apparently prone to shifts between wetter and drier intervals.

Recent studies have also attempted to reconstruct the rainfall record throughout the Holocene. A pack rat midden study in the *Sierra de San Francisco* in central Baja showed that the early Holocene (10,000-6,000 BP) climate of the peninsula was 5-6 degrees cooler than modern averages with more rainfall activity (Rhode et al 2002). A complimentary study of dune morphology in the *Bahía Magdalena* indicates that climatic conditions became much warmer and dryer in the Middle Holocene (6,000-3,000 BP) (De Nava 1999). The dune morphology study focused on the phenomena of reactivation. A dune reactivates as the surrounding vegetation allows dune sand to shift with the prevailing winds in the environment. Pronounced periods of reactivation are made possible when there is little vegetation preventing sand movement. A lack of vegetation preventing this movement indicates that a more arid period was in effect. The dune morphological data compliments the Rhode study demonstrating that a warmer, dryer climate sequence continued in the Holocene. When coupled with the Diaz rainfall study (1995) and the Rhode (2002) pack rat midden study, it can be reasonably assumed that climate cycles in Cape Region appear to follow a pattern of growing aridity over time. This aridity was occurring before and in spite of the beginning of the MCA.

The study of pollen at archaeological sites also allows an opportunity to reconstruct the Baja prehistoric environment, including the Brasket (2007) study at *Piedra Pintada*. Set in the interior of the Cape Region, this site is located in *Cañon de San Pablo* inside the *Sierra de la Laguna*, a primary mountain range of BCS and one which bisects the Cape Region on a north-south axis. Located 30 m above a dry arroyo that formed during a period of higher rainfall activity during the terminal Pleistocene; the site reveals evidence of Las Palmas residential and ceremonial activities. Brasket (2007) proposes that artifacts, feature assemblage, and rock art indicate that the site was used as a seasonal basis from A.D. 1240 and 1640 at wetter times, when

terrestrial food and water resources would be in greater abundance. A change in the abundance in pollen types was indicated by the presence of charcoal, *Boerhaavia* and *Kallstroemia* pollens, and fungal spores at *Piedra Pintada*. The pollen abundances at *Piedra Pintada* associated with cooler, wetter climate periods in Baja prehistory and higher traffic use of the site. The results indicate that the site was occupied when conditions were more optimal for Cape Region groups to be active in the interior. The site was abandoned during drier, warmer periods.

Brasket (2007) also hypothesized that the population density of Cape Region groups may have been lower during these warmer, drier periods. Brasket's hypothesis mirrors Cane's (1987) theory that groups will enforce an internal population cap in arid conditions. Cane's study was conducted in the Western Australian outback. If *Piedra Pintada* was not totally abandoned during drier times, it may have been subject to use by a smaller population group.

Around A.D. 1000, Cape Region groups make a major shift in their subsistence and settlement practices. Fujita and Porcasi (2000) note that Cape Region groups began a major exploitative push toward gathering shellfish and hunting dolphin at this time, which coincided with the appearance of a considerable number of residential site along the coast. *El Conchalito* and *El Médano* now served as year-round occupation sites, whereas before these sites were seasonal or used for ceremonial practices. The ceremonial sites of *Cabo Pulmo* and *La Ballena* also emerge around this time. Brasket (2007) proposes that similar patterns in increased sedentism and focused marine exploitation in the Cape Region are parallel to sedentism and resource exploitation events seen in the Santa Barbara Channel during this same time period and suggest that changes were climate-related. Brasket's hypothesis proposes that similar drought conditions imposed on Santa Barbara channel were also likely affected in the Cape Region.

Such drought conditions would have pulled populations to the coast were surface water and marine resources were obtainable.

Increased sedentism suggested by the coastal sites and the development of new sites in coastal areas during this time probably reflects Cape Region groups staying close to and maintaining control of key resource areas. Interior sites such as *Piedra Pintada* were still used but only when the availability of surface water and terrestrial resources in the interior were available. The paucity of paleoclimatic data for the Cape Region does not allow for full evaluation of Brasket's hypothesis. However, climate change data throughout California during period indicates that drought conditions were in effect. We can predict that groups in the Cape Region would have been impacted by climate changes just as those in the Santa Barbara Channel were. Cape Region groups not by necessity develop new settlement and economic strategies in the face of resource stress or in order to avert catastrophic impacts. For this reason, I find that Brasket's hypothesis has direct relevance to emerging Cape Region cultural and environmental change models.

Isotopic Data Regarding the Cape Region Environment

By examining the carbon and nitrogen isotopic signatures found in bone collagen it is possible gain insights into the diet of indigenous people (Brown and Brown 2011). Bone continuously grows and is remodeled throughout one's lifetime, with bone collagen a necessary protein needed to provide bone with strength and flexibility. Carbon isotopic values in bone collagen reflect the extent to which individuals were consuming carbon-based plants and other terrestrially occurring food sources. Similarly, marine resources will manifest themselves in

nitrogen values that enrich the bone collagen of individuals. Diet reconstruction through the use of stable isotope analysis permits archaeology to detect signatures of nutritional behaviors and preferences throughout the lifetime of an individual (Brown and Brown 2011).

Diet reconstruction through the use of stable isotope analysis during this the period (A.D. 1000-1500) reflects that Cape Region diets were broad but nutritionally stressed. In addition to marine resources, ethnohistoric records indicate that Cape Region groups were consuming genera of cactus, weedy plants, and tubers on a year-round basis well into the contact period (Claviergo 1971). Molto and Kennedy (1991) analyzed bone collagen from eight individuals and examined 26 teeth from individuals recovered from Cape Region archaeological sites in the precontact period (A.D. 1000-1500) for the purposes of diet reconstruction. The use of teeth in the Cape Region sample was to assess evidence of dental caries and antemortem wear or trauma. The data sets were compared with similar data from Channel Island Chumash groups as well as the Comundú, an indigenous group located in the middle section of the Baja peninsula. Molto and Kennedy (1991) found that the overall rate of dental caries for the Cape Region sample was high at 12.1%. The rate of antemortem trauma was low at 32%, with some evidence of high-grit abrasive wear, tooth fractures, lesions, and attrition. The teeth in the Cape Region sample with the highest rates of trauma were from older individuals who had lived long enough to accumulate such incidences. In contrast, the Santa Barbara Channel Island population on Santa Rosa Island had similar caries rate of 13% (Walker and Erlandson 1986). The Comundú data in comparison with the Cape Region sample show virtually no caries and minimal antemortem trauma, though these data may be skewed by the age of the sampled individuals. The ages of the Comundú individuals were all younger adults and so would have encountered fewer antemortem dental problems. Plant-based foods have high sugar or cariogenic values and contribute significantly to

the formation of dental caries. While it does not establish in what quantities or from what sources, the low trauma and high caries data reflects that Cape Region groups consumed a high sugar, low grit diet.

Stable isotope analysis of bone samples from the eight Cape Region individuals reflected a mean nitrogen value +16.3 ± 2.7% and a mean carbon value -10.5±1.1%. In contrast, a juvenile from the Comundú sample displayed a mean carbon value of -8.1% and a mean nitrogen value of +23.1%. Molto and Kennedy (1991) propose that the pattern expressed between the carbon and nitrogen values found in the Cape Region individuals is linked to an increased dependence on marine-based food sources. These results are in line with Las Palmas subsistence and residential changes focusing on coastal sites around A.D. 1000 (Porcasi and Fujita 2000). From this, I argue Cape Region groups were still consuming high-carbohydrate plant foods but were rapidly expanding marine resources into their diet.

The high occurrence of caries in the Cape Region sample supports these findings, especially as marine-resources tend to be cariostatic and do not enhance caries formation. Molto and Kennedy (1991) do not discount the Las Palmas consumption of terrestrially-based plant foods based on the carbon isotopic signature found in Cape Region groups. If the Las Palmas were primarily consuming marine resources, the cariostatic nature of these resources would have slowed the formation of caries development. Cape Region groups maintained an intake of high-sugar, high-carbohydrate elements through consumption of plant foods. Given the cariogenic nature of plant-based foods, moderate consumption of these foods could cause high caries rates. The Molto and Kennedy data support the previous research conducted by Brasket (2007) and Porcasi and Fujita (2000). Changes in the environment appear to have increased sedentism,

reduced in seasonal settlement mobility, and increased dependence on marine-based resources among Cape Region groups.

The Pericú of the Cape Region were also facing resource stress like that encountered by the Santa Barbara Chumash. This section touches only briefly upon these data here as there were discussed in more detail in the preceding chapter. It is important to note that resource stress was also evident in the Las Palmas. Tyson (1977) examined 48 individuals recovered from several Cape Region archaeological sites. She found evidence that Cape Region groups were experiencing marginal nutrition. This despite the evidence as communicated by Molto and Kennedy (1991) regarding expansion of their subsistence strategies into increasing dependence with marine-based resources. Approximately 60% of the 48 individuals examined by Tyson showed signs of mild *osteoporosis,* and four specifically showed signs of *cribra orbitalia,* the sponge-like pitting of the vault of the eye orbits. *Osteoporosis* is a typical osteological indicator of bone loss and deficiencies in bone formation due to nutritional deficits. *Cribra orbitalia* is associated with anemic disorders, where an individual's diet is chronically deprived of iron over a long period of time. She also found three cases of *spina bifida,* two marginal and one pronounced in the sample. The high rate of *osteoporosis* and occurrence of *spina bifida* in a sample of 48 individuals also reflects that nutritional stress was taking place in Cape Region groups. The high occurrence of resource related pathologies on Las Palmas individuals indicates that Cape Region individuals were experiencing poor nutritional probably due to a marginally productive environment.

The environmental data appears to further this theory. The Cape Region was experiencing drought and environmental shifts similar to those represented in the Santa Barbara Chumash beginning in A.D. 1000. It is telling that though all these groups were similar in their

social complexity and subsistence strategies; both had similar reactive patterns when facing unanticipated long term deviations from an already marginal environment. Both experienced increased rates of resources stress, settlement strategy changes that highlight increased sedentism, and the occurrence of warfare. Violence was perennial social condition within the Cape Region according to ethnohistoric and archaeological data but the intensification of this behavior was in reaction to drought pressures and demographic shifts beginning in A.D. 1000. Intensification of warfare in the Cape Region based on resource strategy and protection was based on four factors: the presence of potable drinking water, the availability of food resources, the ease of access to these resources, and the defensibility of these locales (Fujita 2006). These setting of these conditions would have been no different in the Santa Barbara Chumash. The significance of contrasting similarly occurring environmental and cultural histories in this chapter demonstrates that unforeseen changes to resource availability and resultant changes in social complexity follow similar tracks in like environments. If reactions are similar in environments subject to changes in conditions but are geographically distant of each other, it supports our argument that the Las Palmas of the Cape Region began to mitigate their administration of violence internally in the face of a new environmental regime and extragroup warfare in defense of new resource and territorial strategies.

Las Palmas Sample

The Walker study (1989) can be used to establish a comparative analytical framework for the study of sub-lethal violence. A non-lethal strategy resolves conflict and mitigates lethal outcomes and is present in other complex hunter-gatherer societies. The comparative approach uses environmental, cultural, and osteological lines of evidence to evaluate potential similarities between the Santa Barbara Chumash and the Las Palmas culture of Baja California. Much less is known about the La Palmas culture at present compared to the wealth of information available concerning the Chumash. The focus of my research is to establish connections, define patterns, and explore interpretive possibilities. There are a number of similarities between the Las Palmas and the Santa Barbara Chumash upon which my preliminary findings are based. The similarities between both groups express opportunities and may reflect in part the internal regulation of violence. Specifically, acts of warfare and violence within these groups commonly had sub-lethal outcomes. Sub-lethal violence enables these groups to retain population numbers and maintains each group's chance of survival within harsh, unpredictable environmental regimes.

Though smaller in size, the Las Palmas sample provides evidence that adults in this group were commonly subjected to and survived an event of head trauma during their lifetime. More specifically, analysis shows that 29% (n=11) of the total adult sample evidenced one or more healed cranial injuries. This represents 11% of per 41 adults out of a total sample size of 57 specimens recovered from the Molto and Fujita (1995) and Tyson (1977) studies (Table 1). The healed cranial vault fractures were most common to the frontal bone (54.5% n=6), with healed fractures to the parietal (36.3% n=4), right coronal, and sagittal sutures also observed. Due to a small sample size, injury orientation could only be assessed for one individual. However, this one individual at *La Matancita* showed three healed traumatic events to the left frontal bone over

Comparative Analysis			
Las Palmas Sample *Tyson 1977* *Molto & Fujita 1995*		**Santa Barbara Chumash** *Walker 1989*	
***La Matancita* (A.D. 1451-1633)**		**Late Period: A.D 1000 - European Contact**	
Adults	n= 14		
Subadults	n= 2		
Juveniles	n= 6		
Total	n= 22		
Tyson Sample (A.D. 1200 - 1700*)			
Adults	n= 27		
Subadults	n= 2		
Juveniles	n= 12		
Age Indeterminate	n= 2		
Total	n= 43		
Total Adults N = 41/ 29%		**Total Adults N=744/ 19.3%**	
Gender		**Gender**	
Male	n= 31	Male	n= 75
Female	n= 12	Female	n= 36
Orientation		Orientation	
Frontal	n= 6 (54.5%)	Frontal	n= 80 (55.5%)
Parietal	n= 4 (36.3%)	Parietal	n= 59 (43.2%)
Sagittal	n= 1 (.09 %)		
Coronal:	n= 1 (.09 %)		
Siding		**Siding**	
(1) Male from LM Sample:	Left	Left	n= 82 (58%)
		Right	n= 59 (42%)
** Massey 1955 Sample Only (Stewart et al 1998)*			

Table 1

his/her lifetime. Additionally, the other individual reflecting healed cranial trauma at *La Matancita* exhibited two healed cranial fracture events. Despite the comparatively small sample

size, the frequency of head trauma occurring in the Las Palmas culture indicates that violent but sub-lethal phenomena repeatedly occurred within the culture. Moreover, the healed nature of the Las Palmas cranial injuries indicates that survived violence regularly occurred within the group. Co-occurrence of these variables may reflect that social violence in the Las Palmas culture had more than one outcome. Namely, social violence was not always lethal violence and social organization in the Las Palmas was structured to accommodate non-lethal acts of violence.

La Matancita

La Matancita was described as a mortuary site by Molto and Fujita (1995). Much of the burial and archaeological assemblages were exhumed by the local ranch owner (near Todos Santos) in 1967. A subsequent analysis performed by local archaeologists, Dahl and Ramírez (1983) determined that the site was associated with the Las Palmas culture, more specifically the Pericú. The Molto and Fujita (1995) analysis focused primarily on the artifact assemblage contained within the site, and only limited analysis of the burials. Radiocarbon dating results adjusted for the marine reservoir curve, dates the assemblage between A.D. 1451 and 1633. The use of the site as a mortuary location spans from the prehistoric to historic time in the Cape Region. The significance of this long duration of use is that it encompasses the lifeways of the Cape Region indigenous populations prior to European contact and continues even after contacts. Because the site was disturbed prior to excavation, there are some concerns about data integrity and interpretation of the burial assemblage which may complicate previous research conclusions about the site.

La Matancita possesses some interesting archaeological features, including status differentiation among primary and secondary Las Palmas burials. High-status indicators include the use of red-ochre in the treatment of the dead and the presence of wooden *tablas* and dart

throwers. These associations indicate that some of the individuals interred *at La Matancita* may have held elevated political or social status in their community. Approximately 64% (n= 14 of 22) of the burials were treated with red ochre, including all children and some adults and sub-adults (Molto and Fujita 1995). An infant burial-(the only one of its kind in the assemblage) did not have red ochre treatment. An additional non-ochre burial was a primary internment but possessed grave goods associated with the high-status individuals at this site. The untrained excavator who removed the burials in 1967 reported an abundance of both materials but exposure to oxygen ruined these artifacts. One additional burial also had evidence of exposure to fire. Molto & Fujita (1995) suggest that this is evidence of a cremation. However, I disagree given the paucity of evidence for this type of mortuary treatment in the Cape Region. It is more likely that the carbonization in this burial is the result of secondary burial techniques used to process the individual. Exposure to a low heat temperature around 500 degrees Celsius supports this suggestion, as high, sustained heat is required for cremation (Mayne 1990). The lack of duration in exposure and the low temperature evidenced do not support a successful cremation attempt. Based on previous research conducted, I suggest that the carbonized burial reflects part of the secondary burial process perhaps abandoned or interrupted for unknown reasons. Alternatively, the introduction of fire as a post-depositional process.

The analysis of the burial assemblage at *La Matancita* performed by Molto and Fujita (1995) offers some insight into Las Palmas culture demography and health profiles. Their efforts included profiles of pathology, dental analysis, and some stable isotope analysis. In total, 22 individuals were buried at *La Matancita*, the majority of which were adults (66.6% n=14). Additionally, there were two subadults, five children, and one infant buried at the site. A remaining four individuals were age indeterminate due to the quality of preservation or quantity

of their remains. Most *La Matancita* remains were fragmentary, resulting in limited sex determination. Eight complete crania were available for sex determination. Six of the crania and eight pelves were interpreted as male through analysis and two of the complete crania appeared to be female (Molto and Fujita 1995). The small sample size of the *Matancita* assemblage and the non-professional excavation methods, inhibited more detailed demographic analysis.

Of specific interest in this assemblage are male crania that show evidence of healed depression fractures. Neither female crania exhibited similar trauma. The first male crania evidenced two healed depression factures, one on the right coronal suture and the other at the sagittal suture. The outline of the former is ovoid and the latter deeper but without a particular profile. This male individual also reflected a healed fracture to the inferior end of the nasal bones. The second male crania had three healed depression fractures to the left frontal bone, which also possibly represent bone reactive to infection (Molto and Fujita 1995). Molto and Fujita suggest that the frontal lesions resemble '*caries sicca*', which is associated with skeletal inflammatory processes for individuals infected with non-sexually transmitted forms of *treponematosis*. The authors suggest that this individual encountered *Bejel*. However, *Bejel* is a treponema generally considered endemic to the Middle East, so in my view based on the presented data by Molto and Fujita (1995) it is unlikely that *Bejel* was an active source of opportunistic treponemal infection in the Cape Region. The presence of reactive bone on the crania may represent some form of systemic infection. However, a differential diagnosis cannot be offered at present.

Other Las Palmas Samples

In 1977, physical anthropologist Rose Tyson examined human skeletal material from the Las Palmas culture region (Tyson 1977). The sample was composed of remains previously collected during Herman ten Kate, Edward Palmer, and Leon Diguet archaeological expeditions during the late 1800s. Additionally, the skeletal remains recovered by William Massey's mid-20th century excavations were also included in the Tyson study. The remains which Tyson studied came from the Robert H. Lowie Museum in Berkeley, California, the Smithsonian National Museum, and the *Instituto Nacional de Antropologia e Historia* in Mexico City. More recent work by Stewart and colleagues (1998) of material culture associated with the Massey remains dated the Massey portion of the Tyson study to A.D 1200 – 1700. Tyson is believed to be the first anthropologist to attempt a comprehensive study of the skeletal remains recovered from these Cape Region.

Tyson's multi-site study (1977) totaled 27 sex-specific specimens, 17 male and 10 female though 43 burials in total were a part of the study. Approximately 60% of the 48 individuals examined by Tyson showed signs of mild *osteoporosis* and four specifically showed signs of *cribra orbitalia*, the sponge-like pitting of the vault of the eye orbits. Tyson's (1977) presented data, however, does not note if the osteoporosis observed was found in cortical or trabecular bone. *Osteoporosis* is a typical osteological indicator of bone loss and deficiencies in bone formation due to nutritional deficits. *Cribra orbitalia* is associated with anemic disorders, where an individual's diet is chronically deprived of iron or as the result of repeated parasitic infections over their lifetime (Walker 1986). Tyson also found three cases of *spina bifida*, two marginal and one pronounced. *Spina bifida* occurs where the spinal canal at the sacrum remains open

instead of closing. The closure should take place as part of normal *in utero* development and its occurrence is generally associated with marginal nutrition during fetal development. When closure does not take place, an individual born with *spina bifida* may have trouble walking and with neurological development, including basic motor skills and even effective speech. The high rate of *osteoporosis* and *spina bifida* in a sample of 48 individuals demonstrates the presence of nutritional stress in Cape Region groups. The high occurrence of these pathologies in the sample of Las Palmas culture individuals demonstrates they were experiencing poor nutrition as the result of a marginally productive environment. From the Tyson study (1977), it is clear that Las Palmas people also suffered from resource stress. Tyson's study stands in interesting contrast Molto and Kennedy's results (1991) who found that the Las Palmas culture began an expansion from a predominantly terrestrial subsistence to increasing dependence on marine-based resources. The dietary expansion may reflect an effort to improve nutritional deficiencies or may signal exploitation of more available resources that offered poor nutritional returns.

The occurrence of injuries in the Las Palmas sample is predominately in males. Both specimens exhibiting healed cranial trauma examined at *La Matancita* were reportedly male, as were three of the six specimens with healed cranial trauma studied by Tyson (1977). The overall assessed age of all individuals in the Las Palmas sample was adult; subgroups such as young, middle, and older adult are underrepresented. Though both studies reported the presence of subadults in their respective samples, neither noted healed cranial injuries in subadult categories. From this, I determine that the Las Palmas individuals experiencing healed cranial trauma were primarily male and all were adults.

In addition to the presence of *osteoporosis* and *cribra orbitalia* in the Tyson sample, 23% of individuals in the sample reflected bowing of the long shafts with one possible case of *rachitis* (rickets). Exostosis of the auditory meatus occurred in 23.3% of the sample population. The etiology of exostosis in the auditory meatus is not completely understood but is thought to be linked to repeated exposure to cold, deep water during active growth phases of the ear canal. Behaviorally, the presence of exostosis in the auditory meatus is consistent with increased fishing and marine collecting activities present in the subsistence routine of the Las Palmas culture (Tyson 1977, Porcasi and Fujita 2000). The rate of osteoporosis and the long bone shaft bowing in the Tyson study indicate that the Cape Region was undergoing some level of chronic nutritional stress.

Examination of the 28 crania in the Tyson study revealed important insights about genetic and traumatic profiles of the Cape Region population. The majority of crania in this sample indicated *hyperdolichocrania*, a trait generally associated with the Pericú of the Cape Region. As there is some question about the overlap between the Pericú and the Guaycura of the Cape Region, the majority of the Tyson sample appears culturally aligned with the Pericú based on the skeletal evidence. Traumatic injuries accounted for in the sample included five fractures to the long bones of individuals. Two of these fractures were perimortem, indicating that these individuals encountered these traumatic episodes occurred just before or at death and reactive healing had not yet begun. Tyson, however, did not indicate the rate of healing to the other three nor the specific locations of all five. The cranial trauma represented in the Tyson study reflects six healed factures split evenly between the sexes on the frontal and parietal bones. Unfortunately, Tyson also neglects to provide specific data about the location of each traumatic event per individual, the profile, or the depth of the fractures recorded. Despite this, one

important feature of Tyson's study is that fully healed outer table crania fractures were present in the sample group.

Insight into the geographic distribution of injury is difficult to establish. This is due to the lack of provenience associated with early archaeological investigations in the Cape Region, and there are few details regarding excavation methods for Las Palmas skeletal remains. The majority of information about geographic distribution for the Tyson sample is from excavations conducted by Massey (1955), Molto and Fujita (1995), and previous field notes as recorded by Diguet, Palmer, and ten Kate. *La Matancita* is located near Todos Santos, a town located on the Pacific side of the Cape Region (Figure 9). Massey's excavations were throughout the Cape Region at locales oriented toward both the Sea of Cortez and the Pacific Ocean. From this information, I offer that the representation of traumatic injury in Las Palmas culture burials was wide spread throughout the entire culture region.

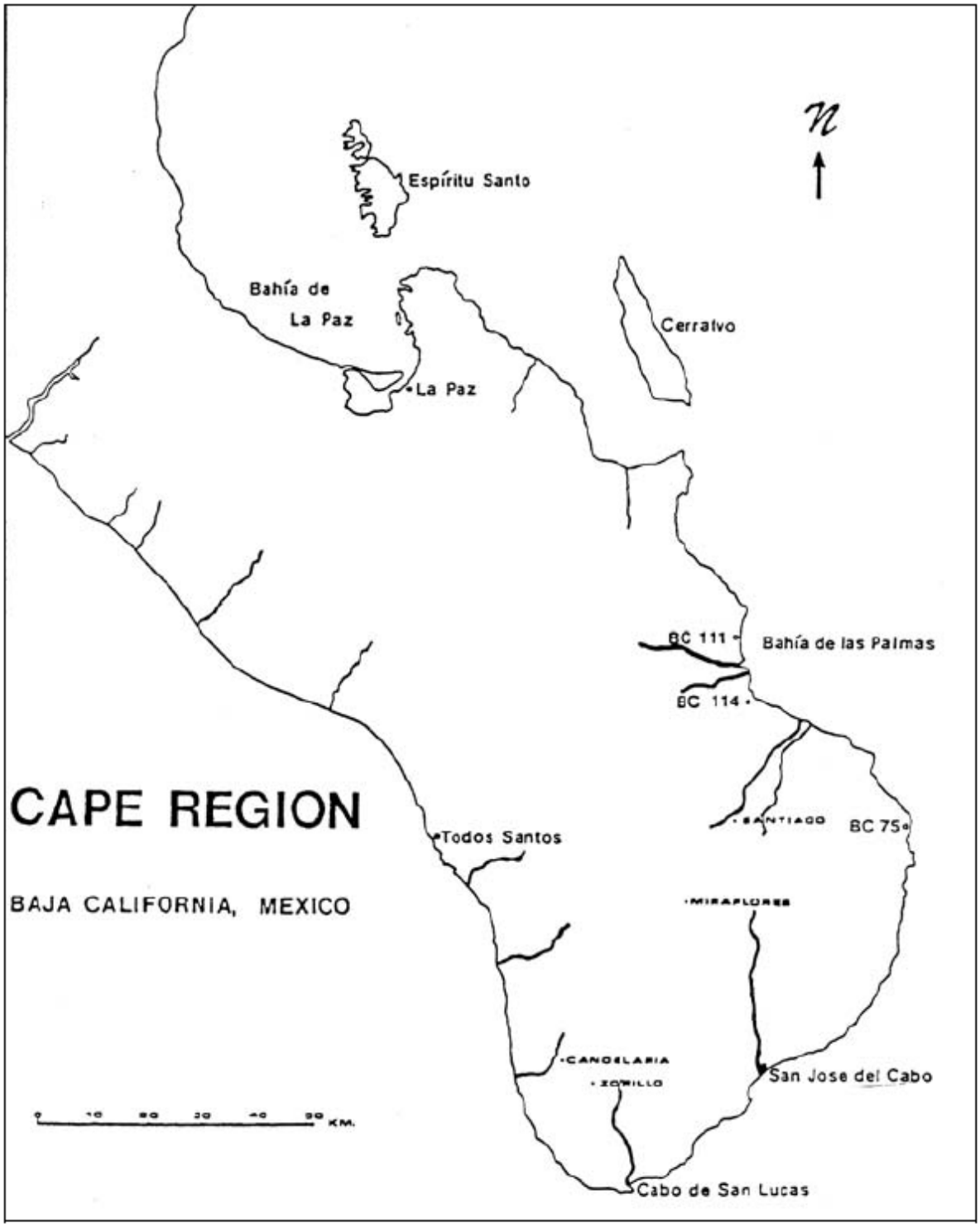

Figure 9 : Map of William Massey's Excavations at BC 75, BC 111, & BC 114 (Carmean & Molto 1991)

Sub-Lethal Cranial Trauma

Warfare among the Las Palmas culture operated on a spectrum of violence ranging from sub-lethal to deadly. Exterminative warfare defined in this work is warfare for the purpose of killing one's opponent. Crania from the Las Palmas burials in the Cape Region exhibits healed traumatic injuries from violent contact, specifically depressed fractures to the outer table of the cranial vault (Tyson 1977, Molto and Fujita 1995). Antemortem fractures such as these reflect in some cases significant traumatic injury was a survivable event within the Las Palmas culture. Major but survivable injuries, when recurrent within a population, imply one or more social mechanisms at work that allow for members sustaining such injuries to recover and continue to be contributors to the societal group. Of deeper interest is the nature of those social mechanisms and the environmental conditions contributing to their interpretation.

In this chapter, I give consideration to whether the traumatic injuries as evidenced in the Las Palmas burials may indicate a social framework favoring sub-lethal modes of violence, designed to address intragroup conflicts. Sub-lethal violence resolved social conflict without sacrificing defensibility as concerned warfare with outside groups. The results present a violence spectrum at work enacted to mitigate against resource loss or defensive capabilities.

A specific cultural example wherein healed cranial trauma is commonly represented is the Santa Barbara Chumash. Walker (1989) investigated the use of sub-lethal warfare among the Chumash, as a reaction to population pressures and resource loss. The Las Palmas culture here is a comparable culture. This chapter reviews the Walker Santa Barbara study. Application of Walker's model to similar conditions on a hunter-gatherer group with similar level of social complexity and environment peril provides one test of its viability.

The Walker Study

In 1989, Walker conducted a study documenting the relative high frequency of non-lethal depressed cranial fractures in the Santa Barbara Chumash during the Late period (A.D. 1000 to European contact) (Figure 10). As this section deals primarily with Walker's analysis, unless otherwise stated, the main citation source for the following sections are from Walker (1989). The Walker study analyzed 744 Chumash crania, establishing the following controls for identifying evidence of survived cranial trauma in his study sample (Walker 1989:313)

> 1) An absence of reactive bone indicative of infectious etiology, 2) a tendency for the injuries to be single and a lack of lesions elsewhere in the skeleton suggestive of systemic infection, 3) the well-delineated circular or ellipsoidal shape of many of the lesions, and 4) the retention in some cases of fracture lines at the periphery of the depressed area.

Cranial features evidencing fractures consistent with perimortem cranial injury were also excluded. The focus of the Walker study is the survivability of cranial injury and the social mechanisms that enable survival. Walker's criteria's inclusion eliminated cases which resulted injury caused primarily by infectious agents, accidental injury, or violence leading to the immediate death of individuals. Instances not fitting this profile were removed from the Walker sample to mitigate bias. The study therefore reflected the frequency of Chumash violence in the Late period and survivability of trauma resulting from that violence.

Intergroup warfare in the Chumash in the Late period was not an isolated event. Conspecific warfare among the Chumash is documented into the historic period (Walker 1989), including observations of warfare and civil unrest between Chumash groups observed by the early Spanish expeditions in the sixteenth and seventeenth centuries (Walker 1989, Johnson

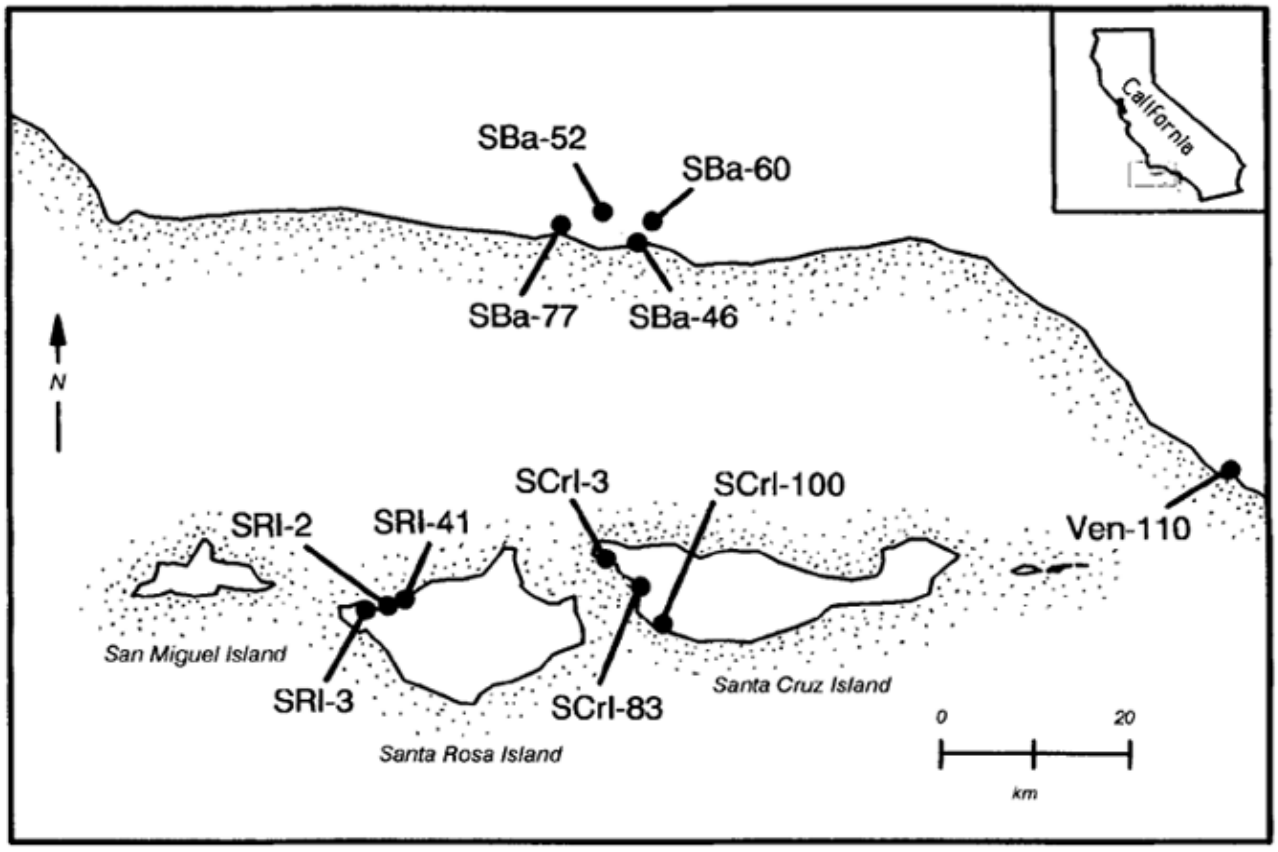

Figure 10: Map of Chumash Sites Incorporated into the Walker Model (Walker 1989)

2007). European culture contact was not the casual or primary factor in the Chumash violence presented here. Change in the frequency of healed traumatic cranial injuries can be linked to events occurring specific to the Late period (A.D. 1150 – European Contact). The violence in the Late period may be the result of factors linked to changes in the environment and increased competition for access to declining resources. Depressed cranial fractures did not occur in such high frequencies during the Early (5500 – 600 B.C.) and Middle (600 B.C. – A.D. 1150) periods in the region. The increased frequency of healed traumatic cranial injury is specific to events occurring in the Late period.

Walker's study indicates that individuals commonly survived at least one significant traumatic injury to their crania during their lifetime (Figure 11). The traumatic injuries appear

purposefully inflicted given the location to the front crania, most frequently occurring on the left side. The Walker study yielded a high rate of healed antemortem trauma, where 19.3% of the total cranial sample revealed one or more healed injury to the skull (n=744 individuals). The healed cranial vault fractures were most common on the frontal (55.5%, n=80) and parietal (43.2%, n=59) bones of the skull, with only two fractures in the sample recorded on the occipital. Injuries occurred more commonly on the left side of the skull (58%, n=82) than on the right side of the skull (42%, n=59). Only 16 cases in the sample exhibited one or more healed cranial injury including one individual with five healed cranial fractures. Facial fractures were not observed in the study. The predominantly left side orientation of injuries is consistent with received injury, rather than self-inflicted injury. A lack of injury to the face, in addition to the orientation and lateralization of the traumatic injuries, further suggests intentional infliction of injury by another individual. An established pattern of weapon type also eliminates the possibility that the cranial injuries represented in this group were the result of random or violent encounters. Being armed with a specific weapon suggests an anticipation of conflict, whereas if conflict were not anticipated fracture profiles might include the use of objects not normally intended as weapons and perhaps including objects within reach at the time of the encounter.

The sizes and the shapes of the healed cranial fractures provide insight into of the objects used to inflict injury. Most of the fractures resulted from an object possessing a circular (47.9%, n=67) or ellipsoidal (30.7%, n=43) profile (Walker 1989). In two observed injuries, pieces of chert were imbedded into the depressed facture surface, indicative of projecting points that broke

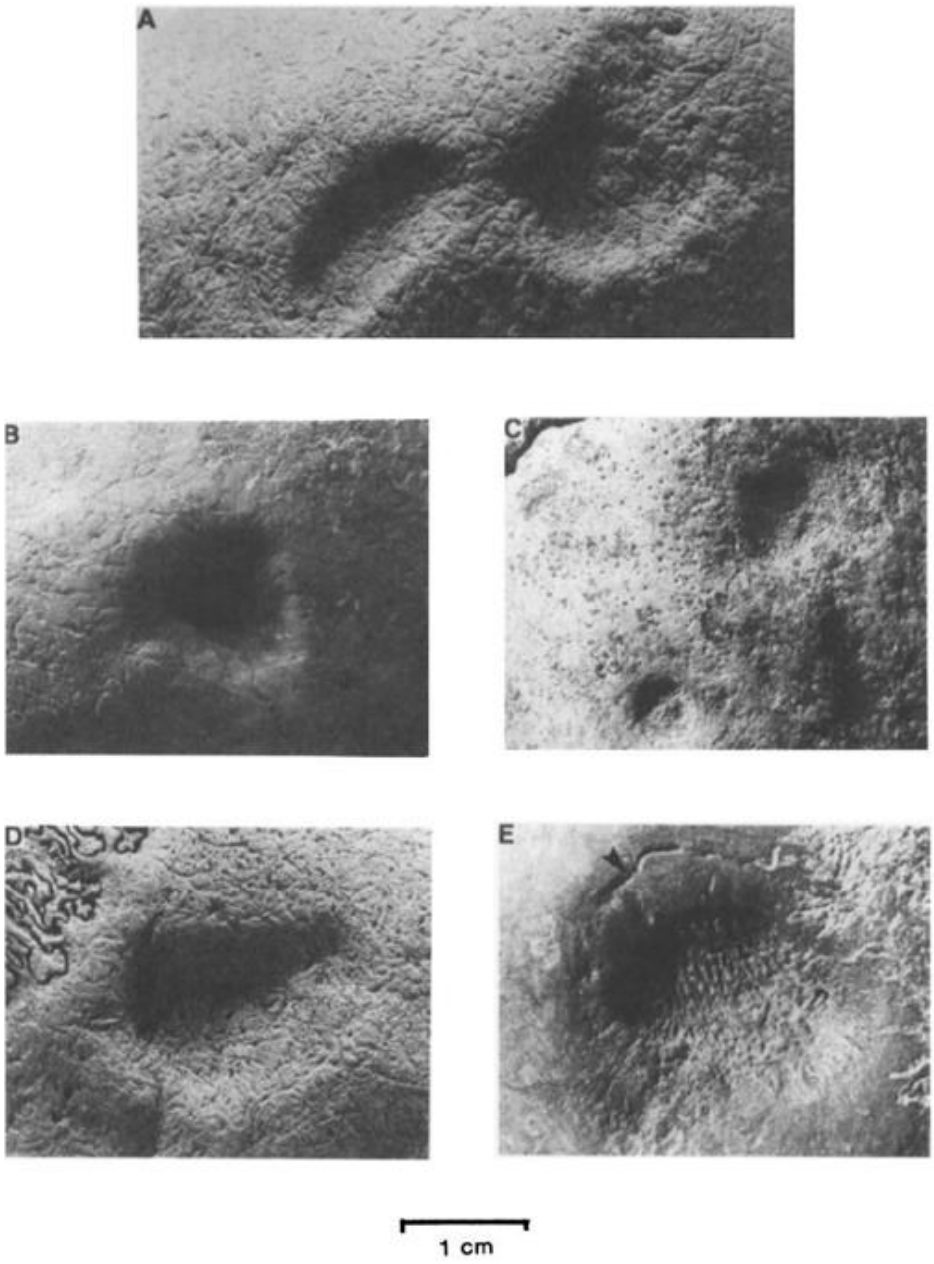

Figure 11: Photographs of Cranial Injuries Recorded for Walker's Study (Walker 1989)

off upon contact with the skull. The chert pieces were not removed from the injury location as the lesion began to heal; bone remodeling trapped the chert within the healing lesion. The chert pieces originated from weapons used to administer the blow to the head and remained within the wound as it healed. On average, the cranial depression injuries were approximately one

centimeter in diameter. The consistent sizes of the fracture profile suggest standard type instruments were used to deliver these injuries to the skull. An established weapon type also reduces the possibility that the cranial injuries represented in this group were result of random or single-occurence violent encounters.

The age and sex of injured individuals demonstrate a pattern of victims within the Chumash. The largest number of healed fractures were present in middle aged adults (21.5%, n=65), which Walker (1989) defines as ages 25 to 40 years. This age group has more healed fractures than post-adolescence young adults (12.1%, n=24) from 17 to 25 years. Male injury rates (24.0%, n=75) were higher than female rates (10.0%, n=36). However, the distribution of injury locales on the crania were even between the sexes, as were the diameter size and shape of the fracture outlines. The depth of the cranial depression was greater in males than females.

Walker's data indicates that injuries were occurring to both the sexes, but that males survived cranial trauma at higher rates. Although violence appears male-oriented in the Chumash, the evidence of female injury rates reflects a social phenomenon which affected all Chumash in the Late period. Therefore, instances of violent contact between individuals were apparently frequent. The frequency of injury age group also suggests individuals surviving into middle adulthood (25-40 year olds) encountered the greatest frequency of violent contact. By contrast, those individuals in the younger and older age groups evidenced lower rates of injury and apparently were involved less frequently in violent contact. The age-related results possibly link to the distribution of resources or social phenomena regarding of age roles in Chumash society. The significance of the common middle-age group healed traumas is unclear but may relate to modes of production, where middle-aged adults are the significant contributors to family and group resources. It may further relate to a combination of successful hunting, foraging, and

defense strategies, family support structures, and the overall activity and mobility levels of the individuals in this age range. Additionally, Chumash gender roles may play some part in the division but this is unclear. Despite a lack of information regarding the role of social processes in the distribution of violence among age groups, other differences may represent geographic or temporal causations.

Over time, the occurrence of sub-lethal cranial injuries rose until the concentration became prominent in frequency and geographic distribution in the Late period. Early period sub-lethal cranial injuries, by contrast comprised only 5 percent of traumatic injuries represented. A disparity between Chumash island and mainland injury rates also appeared in the Walker study, wherein the mainland injury population rates were lower than those of the island population. The frequency of injuries (18.5%, n=598) was higher in the northern Channel Islands population as compared to the mainland population (7.53%, n=146). The highest frequency of injuries concentrated on San Miguel Island (24.4%, n=41), followed by Santa Cruz Island (22.2%, n=33), and Santa Rosa Island (11.9%, n=21). A change in frequency over time, in addition to geographic distribution, reflects an increase in violence throughout the California Bight, with specific concentration on island populations. Whatever conditions affected the population as a whole apparently had stronger influence over the island Chumash.

The Santa Barbara Chumash were a single people, even if some were living on the mainland and others were living off-shore on islands. The locales do exhibit different injury rates and patterns. The geographic distribution of the injuries throughout the Channel Islands varies per time period. On Santa Cruz Island, the frequency of injuries peaked twice, once at the terminal end of the Early period and again in the Late period. On Santa Rosa Island, by contrast, the rate of injury decreased at the end of both the Early and Late periods. Comparing

the frequency of injuries between locations, Walker (1989) found Late period island populations as a whole incurred sub-lethal injuries at higher rates than their mainland counterparts. Walker suggests the opposing patterns at these locations are linked to local conditions. Local conditions dictated the range, frequency, and subsequent competition for resources. In summary, the constraints of geography impacted the overall carrying capacities between mainland and island locales, with island locales at a disadvantage for sustainable carrying capacity due to reduced land mass.

The requirements of island living had a direct effect on the biotic productivity of the islands. Geographic constraints impacted the island populations by limiting the number of individuals an island could support before competition for critical resources, such as water, escalated. As a result, the availability of resources on the islands was finite and conditions were poor which made competition severe. Walker (1989) classifies the competition for resources on the island as 'intense', where few resources were available to support the many island dwellers. The biotic resource decline is reflected in the overall health of the island populations, as well. The island populations directly impacted the biotic productivity of the islands' finite resources. As a result, the availability of resources on the islands was limited and conditions were poor. Ecological and geographic constraints impacted the island populations by limiting the number of individuals the islands could support, prior to competition for resources escalating. As time went on, the overall conditions on the islands continued to decline. This competition for critical resources may account for the higher frequency of cranial injuries in the island group.

As discussed in the previous chapter, the Channel Islands Chumash population encountered resource stress. Santa Cruz and Santa Rosa Islands are the two largest in the northern half of the Channel Islands chain and could theoretically support a larger island

population. Skeletal evidence from these islands burials indicates a different story. As previously reviewed, examining 327 individuals from burials on these islands across the Early, Middle, and Late periods, Patricia Lambert (1993) found evidence of ossified periosteal lesions in the long bones and clavicle. Lambert found the frequency of skeletal lesions in island populations increased at a rate of one per burial from between the Early and Middle periods (n= 138 burials) before slowing in the Late period. An interesting disparity emerges when reviewing the presence of skeletal lesions *versus* trauma. Island Chumash health declined beginning in the Early period but the frequency of traumatic cranial injury did not increase until the Late period.

The less common violent injury rates in the Early and Middle periods as compared against Late period is set against the presence of disease throughout all periods which indicates reflects that conditions were poor chronically. Violence in the island populations became frequent during the Late period where poor overall health and limited resources contributed to an escalation in violence. Even though illness compromised island populations, violence increased in the Late period indicating violence occurred concurrent with the extant health crisis. As previously discussed, Walker (1986) proposed that the high incidence of illness among the Chumash during this time period is linked to excessive population loads key resource niches. The contamination of these resource areas by already ill individuals passed and re-passed illnesses throughout and within Chumash groups, which led long term compromises in their collective health. That violence occurred in the midst of a population exposed to illness implies the dire nature of circumstances within the island groups.

Population increases in the Late period may also explain the increase in cranial injuries. The Chumash population numbers during this time period remains unknown. However, several

archaeological researchers indicate that the Chumash population increased through the Early, Middle, and Late periods (Moratto 1984). An increase in population would have made it difficult for Chumash groups to avoid each other and seek out contested resource niches. Increased size in Chumash settlements, an increase of population loads at settlements targeting specific resources, and a diminishing number of accessible resources are conditions which would have served to amplify the violence.

Resource Competition and Sub-lethal Violence

The Walker interpretation of survived cranial injury data extends the model that resource competition led to interpersonal violence which resulted in cranial trauma in the Chumash population. The occurrence of interpersonal violence correlates with fluctuations in the overall biotic productivity of the California Bight during the Medieval Climatic Anomaly. The frequency of cranial injury peaks around a significant drought period and the lowest ecological productivity for the Chumash (Walker 1989). Though significant across the general population, the island dwelling Chumash exhibit a higher frequency of trauma over their mainland counterparts. As discussed, the intense competition for resources on the Channel Islands− with low biotic and marine productivity and limited land mass− provided conditions for an escalation of conflict and violence. When resources are limited within a group, competition to access and control those resources escalates. The competition for resources forms within the group with possible external tensions between groups. The pitch of tensions resulted in an upswing of violent conflict but lacked a lethal goal and was not intended to be deadly encounters.

This is the key feature of the Walker study, that while violent conflict was frequent as a result of resource competition, it was not lethal violence. The violence in the Chumash resulted from conflicts leading to a form of culturally constrained or prescribed combat. The violence

may have been comparable highly structured, supervised club-wielded fights observed by Napoleon Chagnon (1968) among the Yanomamo. An administrated fight precluding the outcome of intentionally-caused death falls under the definition of structured conflict. In the Yanomamo case, a third party supervises the violence to better mitigate the outcome of a fatality occurring. An intentional system is in place from the beginning of the conflict until the resolution, keeping all combatants alive. Rehabilitated by the group, the injured parties return to making productive contributions to the entire group. Structured fights administrated by the Chumash addressed interpersonal tensions as they arose within the population. A mechanism to address violent conflict the likelihood of potential lethal outcomes provided a less critical impact on the Chumash. The reduction of lethal conflict was apparently due to a structure ensuring an outcome that did not negatively impact the entire population. Lethal outcomes would reduce overall group success in terms of defensive and cooperative behavior in a marginal environment.

In addition to the physical injury resulting from a blow to the head, afflicted Chumash victims potentially suffered cognitive, motor, or psychiatric side effects, in some cases. The burden of these associated symptoms fell on the group as a whole. When segments of the group cannot care for themselves nor contribute to group support, such as resource protection, unaffected members of the group become responsible for increased burden to support the group. The same unaffected members also assume care of the injured individuals. Without these mechanisms, the group's chance of success operating in an environment with marginal carrying capacity falters. A temporary reduction of overall group success is better than the permanent loss of group members due to lethal violence. In the former scenario, those who survived the head trauma eventually return to a contributory status in the group. In the latter scenario, no further contribution is possible.

The summary of evidence among the Chumash reflects a pattern of violence resulting from intentional but non-lethal combat which is interpreted as a means of mitigating further resource loss. The frequency, location, and lateralization of the injuries in the Chumash population represent intent to injure another individual without homicidal intent. Perimortem injuries present in higher numbers than antemortem injuries would indicate lethal violence was more common in the Chumash population. As there are few perimortem injuries relative to the number of antemortem injuries, this was not likely not the case (Walker 1989). Among 744 individuals in the Walker study, only one individual exhibited punch-through trauma to the cranial vault by an inflicted blow. An injury of this type is fatal, resulting in the immediate death of that individual. The healed nature of the majority of the cranial injuries, in addition to their location and lateralization, demonstrate that the population survived traumatic injuries probably due to structured conflict resolution exacted to avoid lethal outcomes.

I hypothesize that loss of group members deleteriously affects the long term chances of group survival, especially for groups operating in sub-optimal, resource stressed environments. Sub-lethal violence allows disputes to go forward without causing permanent loss of group members. By allowing controlled conflict but ensuring survival of the combatants, those group members remain as contributors to the overall group. Their contributions include the protection of resources outside predation or future environmental catastrophe. As a result, the overall chances of group survival are enhanced.

The Chumash population faced resource deficits due to low biotic productivity and carrying capacity in their immediate environment. The key issue is not the number of overall group members but members of the group that directly contribute to its long term success in those conditions. The young, the sick, and the old likely contributed less than healthy,

productive adult members of the group. Not coincidentally, these same healthy adult members are the individuals most likely to engage in violent conflicts (Walker 1989). The most productive members of the group require ways to address violent conflict as it arises without permanent impacts to the group's ability to protect resources.

The Walker model is the principal interpretive framework for this thesis. By examining similar cranial injury in a similar group, I provide an initial evaluation of Walker's model about intentional election of sub-lethal modes for conflict resolution. I use this framework to evaluate data regarding the Las Palmas culture. Based on the climate conditions, archaeological data, and warfare in the Las Palmas culture as discussed in previous chapters, parallels exist between the Chumash and the Las Palmas. The Cape Region also experienced resource impacts and subsistence shifts similar to those which occurred in the California Channel Islands beginning in A.D. 1000. Both groups possessed a social infrastructure that assigned status to group members, including religious and political leadership. Both groups possessed the social infrastructure dedicating individuals to the oversight of violence resolution in a ritualized or structured format. Both groups also possessed similar patterns of response when faced with unanticipated, long term environmental deviations in already marginal environments.

Warfare documented within the Cape Region through to ethnohistoric records and archaeological data reflects intensification correlated with to drought pressures and demographic shifts beginning about A.D. 1000. The frequency of healed cranial trauma among the Chumash (Walker 1989) also increases during this time period under similar environmental and demographic changes. Intensification of intergroup violence in the Cape Region based on resource procurement and protection owed to four factors: access to drinking water, access to food resources, control over access to both, and the defensibility of these locales (Fujita 2006).

The Chumash experienced similar concerns about resource predation. By analyzing the healed cranial trauma found in the Las Palmas culture of the Cape Region, I evaluate whether the Las Palmas culture followed a Chumash-like regime of controlled violence to mitigate their loss of members within the population needed to defend and procure resources. In the next chapter, I review previous Las Palmas cranial trauma data gathered by Cape Region archaeologists as an initial evaluation of Walker's model.

Warfare

For the purpose of this work, warfare is the interplay between cultural, social, and political processes reacting to economic or environmental conditions and change. At the intersection of these processes, warfare can result when the environment and resource productivity deviates from anticipated patterns. When climate deviation affects the biotic productivity of the environment, it may cause unforeseen shortages and increased competition for resources. Violence between groups may result from real or anticipated resource shortages which are a result of unanticipated environmental shifts. Groups reacting in anticipation of conflict, socialize their members to expect predation of the resources and to react in protection of key resources. The anticipation of resource loss can lead to extragroup conflict and violence. The replication of these patterns is widespread among hunter-gatherer societies, but may be most frequent and have greater impacts on groups already operating in marginalized environments.

Prehistoric populations in the North America are often viewed by anthropologists with preexisting conceptions of a utopian landscape, especially when the topic of warfare is concerned. Much of this false perception is linked to concepts of the abundance of prehistoric environments, the myth of the noble savage, and images of a pacified past (Keeley 1996). These misconstrued ideas were often cherry-picked with little or no supporting archaeological or historical evidence. In more recent times, these biased notions have been sometimes re-packaged as indigenous peoples' origin stories, ones that typically deny the occurrence of prehistoric warfare and view prehistory instead as a effortlessly comfortable period of life.

In truth, warfare's frequency and role in indigenous societies is more complicated. The reality is that the pre-contact indigenous populations of North America existed in comparatively low population densities and with large swaths of land available to them for their use. With so

few groups, by modern population standards inhabiting North America, environmental resources would theoretically require less competition for access. If the causes for warfare were limited to these criteria, most indigenous groups had ample opportunity for conflict avoidance by simply avoiding one another. As populations grew and expanded, avoidance of other groups and potential conflict was less feasible.

Through time groups continued to encounter each other in increasingly violent contexts time and time again (Keeley 1996, Walker 2001). Walker (2001: 590) writes that "…as far as we know, there are no forms of social organization, modes of production, or environmental settings that remains free from interpersonal violence for long." There are numerous examples of North American warfare between hunter-gatherers long before European contact, including but not limited to: conflict between Athabascan and Eskimo speakers in Western Alaska (Burch Jr. 2007), in the Tennessee Valley during the early Archaic (Ostendorf 1997), the Owens Valley Paiute (Dyson-Hudson & Smith 1978), and the Santa Barbara and Channel Islands Chumash of the California Bight (Raab 1998, Walker 1989, Johnson 2007).

When warfare occurs its causes and conditions are often as varied as are the indigenous groups engaging each other. In order to determine causes and conditions for warfare, more basic questions must first be asked. Basic questions regarding the occurrence of warfare hunter-gatherer societies begin with how warfare is defined and the mechanics behind its existence? Allen and Arkush (2006) define warfare as a cause of social change which includes increases in social complexity or as an effect of environmental, demographic, or technological changes taking place within a society. The Allen and Arkush model is a good starting point for examining the social processes involved in the occurrence of warfare as it looks to identify causal factors linked to warfare, but also how those causations operate. The Allen and Arkush model, however, does

not fully explain the complexity of the subject. The complexity of warfare is not that it happens or that it has a causal explanation but in the social, technological, or environmental processes that interact and result warfare. Warfare operates on a complex platform inclusive of multiple variables and conditions. Attempts to apply a non-complex (eg. prime mover) explanation to a complex social group runs the risk of producing an "unacknowledged complementarity" (Keeley 1996:17) about the causes and types of warfare and how warfare may be the violent manifestation of otherwise non-violent social processes.

Below I will focus on multiple social processes that can lead to warfare in hunter-gatherer societies, for now I focus on basic definitions. For present purposes, Thorpe's (2003) definition of warfare as an organized aggression between autonomous political units applies. This definition may only define warfare as a condition that exists between state-level groups, post-contact, or industrial societies. But, Thorpe (2003: 146) goes on to state that "the majority of conflicts occur between closely related groups, with the warring parties frequently acting as exchange or marriage partners before and after. I take this to mean that Thorpe's defines the political autonomy of groups on a much broader level where their autonomy is based in modes of access to and exchange of various resources or marriage partners, despite the existence of conflict between these groups. Like Thorpe, I also believe warfare is best defined broadly. Use of a too narrow definition for warfare limits our ability to consider multiple social processes occurring within warring groups processes that may lead to warfare. An umbrella definition of the term warfare sets up a foundation upon which the larger framework of this work. Instead of defining warfare narrowly, it is worth considering the variables that influence the occurrence of warfare.

Environmental factors often play a key role in the frequency of violent conflict. A host of causes for warfare related to politics or myths that groups promote from within or project onto each other may also play an additional part. The natural environment provides a plausible starting point. For example, Ember and Ember (1992) propose that the origin and causes of warfare among hunter-gatherer groups is a combination of factors that relate to the natural environment. Their hypothesis (Ember and Ember 1992:242) derived from patterns of warfare observed in 186 non-state societies, states:

> …war may be caused by a fear of nature and a partially resultant of fear of others. A history of unpredictable natural disasters strongly predicts more war, as does socialization for mistrust (but less strongly)" (Ember and Ember 1992: 242).

Ember and Ember define natural disasters as a sudden environmental event that causes an unanticipated, prolonged disruption to available food and water resources. The prolonged disruption expresses itself as a change in group subsistence patterns, which will then influence changes in group social organization or technology. Under the Ember and Ember hypothesis, these resultant changes will then lead to a social dynamic that fosters mistrust of other groups.

The psychology of unanticipated resource scarcity fosters mistrust and aggression between groups. With specific focus on 26 New Guinean non-state societies where population densities were relatively high, where land shortages are relative to population densities, and where methods of obtaining food resources were uniform, Ember and Ember (1992) reflect that non-state societies posed with severe food shortages tended to a higher frequency of warfare. The psychological aspect of their theory with regard to socialization of mistrust is based on the concept that these societies will begin to actively socialize its members to mistrust outside groups or individuals under such conditions. The fostering process will encourage aggressive

reactions in interactions where mistrust is extant. However, they are also careful to state that socialization for aggression is not a cause of war but instead the consequence of war. The Ember and Ember hypothesis (1992: 257) is thus:

> "…People who go to war more or less constantly may be trying not to cover present or regularly recurring shortages, but to protect themselves against future disasters that they cannot predict; they seem to be trying to protect themselves ahead of time by taking resources from enemies. It seems to us then that the main motive for going to war is the fear of future loss, not current deprivation (1992:257)."

Hunter-gatherers can prepare for periods of resource abundance and scarcity within a range of expectation. Groups who are living in a marginal environment, where the availability of resources undergoes a cycle of scarcity and surplus, can often reasonably rely on this cycle to predict the frequency of resource options. As marginal environments are more likely to produce resources on an irregular or cyclical basis, the ebb and flow of surplus and scarcity is an accepted feature of everyday life. The Ember and Ember hypothesis (1992) suggests that when productivity cycles take a catastrophic downturn due to environmental disruption, societal strategies that have already fostered mistrust of outside groups respond in violence. The violence protects resources now within their control and mitigates anticipated future loss from outside predation.

The fear of unpredictable environmental changes also permeates the psychology of the group. Looking at folklore that features aspects of environmental phenomena, a commonality is found in the lack of inclusion of natural disasters as events in these stories. Where groups are posed with a higher rate of risk for natural disaster events, an exclusion of their frequency in folklore appears to correlate (Ember and Ember 1992). Instead, where natural catastrophes exist as a variable of unpredictability for a group; an unpredictably aggressive character becomes a

representative of an unstable environment into the plot of the story. This aggressive character whose behavior cannot be anticipated in these folktales becomes instead a symbol of suspicion or distrust for that which cannot be reasonably predicted in the environment (Cohen 1990). When these fictive aggressive characters are treated with distrust and suspicion as a reasonable societal response to such behavior, then a societal protocol is set. The stage for warfare as a social mechanism by which to cope with resource scarcity becomes established as socially appropriate.

Some hunter-gatherer groups live or lived in marginal environments that are prone to resource instability. When the measure of risk-associated resource unpredictability in the marginal environments is high, then in accordance with the Ember and Ember hypothesis, the conditions create a predisposition for warfare. Water is vital as it plays a key role in determining the carrying capacity of the environment. Carrying capacity refers to an environment's ability to support a population with a given technology with necessary resources (food, water, and shelter) indefinitely. If availability of water in an environment is reduced, this will have a direct impact on the carrying capacity of a group within that environment. If biotic yield in an environment falls below a level that can successfully support the occupying group, then resource stress results. Sustained access to water was a key to success in Pericú settlement and subsistence and groups positioned themselves near it, moved to it as it became available, and defend it if competition for access developed.

Once stressed, a group reaches the point in the Ember and Ember model where they can no longer reasonably anticipate a change to the yield in their environment and system breakdowns occur. One such breakdown is demographic stress which may lead groups to mitigate their population size. Cane (1987), focusing on water resources, found that the population size of groups is regulated by the availability of water in environments. Studying

Australian Aboriginal groups in Western Australia's desert environments, Cane found that these groups would not increase in group size more than their access to water would support. As previously discussed, because water has a direct relationship to carrying capacity; it is also appropriate to find a causal relationship between water, biotic yield, and group size. For example, Cane reflected that the Western Desert Aboriginal population was so moderated by access to and availability of water that the population density on average was one person to 150-200 sq. km. This is a small number of people in a large area of territory but the small size mitigates future group losses by keeping group size small in an environment where resources commonly remain unpredictable.

Warfare in the Las Palmas

Evidence of death, warfare and conflict within the Pericú has both archaeological and enthnohistoric supporting data. As previously reviewed, Las Palmas groups within the Cape Region had a sociocultural "preoccupation" with death and the dead. Ethnohistoric literature recounts a fear of the dead, a cosmology that supports a deity system that acknowledges the occurrence of death as the result of warfare, and burial practices as a way of preventing the dead from being able to encounter the living (Baegert 1953, Venegas 1979, Raab 2005). Hyland (1997) documented the Great Mural rock art tradition that occurs in the Baja peninsula, primarily within the *Sierras de San Borja, San Juan, San Francisco,* and *Guadalupe*. The Great Mural tradition began around A.D. 200 according to radiocarbon analysis. Hyland observed that many of the murals are expansive representations of anthropomorphic figures, animals, and geometric designs. The geometric designs see replication at some Cape Region archaeological sites, such as *Piedra Pintada* near *Mira Las Flores*, which suggests that mural painting and rock art creation as a shared trait between differing Baja indigenous cultures.

Violence is depicted in these rock art images. The Great Mural images show anthropomorphic figures and animals being penetrated by projectiles. Hyland (1997) suggests that these depictions of violence may reflect shamanistic activities regarding the liminal separation of life and death. Laylander (2005) argues that these depictions are more literal representations of violence between groups. One such example is *Cueva De Las Flechas* in the *Sierra de San Francisco* located near *Mulegé* in the mid-peninsular region. The murals found in *Cueva De Las Flechas* (Figure 12) depict anthropomorphic figures transected by many arrows. While there may have been elements of warfare that were incorporated into peninsula religious activity, the occurrence of warfare especially in a marginal environment like the Cape Region seems reasonable.

Figure 12: Cueva De Las Flechas, Sierra de San Francisco, Mulegé, Baja California Sur. Web.

Revenge raids between Las Palmas groups fostered a constant cycle of violence. Ethnohistoric literature describes Las Palmas cultural violence as guerrilla-style raids that were organized, resulting from resource and territoriality disputes (Vizcaino 1596: Mathes 1965, Nicolas de Caronda 1615, Francisco de Ortega 1633, Barriga 1644, Carranco 1668: Matthes

1970, Mathes 2006, Mathes 2011). War parties were well organized with ranked leaders to ensure the best outcome in battle. They were also well equipped, employing the bow and arrow, fire-hardened tipped spears, and atlatls. The method of engagement between groups, by contrast was far less organized. Las Palmas extragroup conflict conducted itself in ambush-style raids, where a melee took place between groups until the raid was won or the losing side fled. The Las Palmas did not, however, take captives nor collect trophies. Further conflict occurred between groups as revenge for a previous attack as well as continued enmity over territorial boundaries.

Violence in the Cape Region also spread to conflicts between indigenous groups and the Jesuit missionaries. In 1733, the Pericú led a revolt against the Jesuit missionaries in which the Guaycura also participated (Baegert 1953, Taraval 1972). The causes of the revolt vary between ethnohistoric documents, some of which blame Pericú resistance to Catholic conversion, Pericú marriage practices that led to internal group conflicts that the Jesuits could not peacefully abate, or a general lack of willingness to get along between the indigenous groups and Jesuit missionaries. Before the revolt was put down in 1737, several Jesuit missionaries had been killed as the result of surprise-raids and missionary buildings containing resources plundered (Figure 13). Violence depicted in rock art murals indicates that warfare was a perennial activity as early as A.D. 200 and continued until European contact. Though some of the causes may have been specific to the circumstances imposed on groups at any given time, the existence of warfare as the result of continuing resource stress and depression in a marginal environment like the Cape Region seems plausible.

In a conflict rich environment, culture contact put additional strain on an already volatile situation. Violence also occurred between the Las Palmas and the Jesuit missionaries occupying

Figure 13: The Martyrdom of Fr. Carranco, Pericú Uprising, 1734 (Taraval 1972)

the Cape Region. Jesuit missionaries were aware of the continuing cycle of revenge and territorially driven violence between the Las Palmas groups, but they were largely indifferent to stopping its occurrence (Taraval 1972, Beebe and Senkewicz 2001). If anything, the Jesuit and Spanish military presence in the Cape Region took advantage of the enmity between Las Palmas groups, brokering deals for information or leveraging labor out of the Las Palmas contributed towards pitting groups against each other. They took exception to polygamous practices among the Las Palmas and spent much of their missionization of the region making active attempts to stop this practice. Jesuit culture contact, which included a stated purpose of Catholic religious conversion, placed additional sociopolitical pressures on Las Palmas groups already in conflict with one another.

Warfare operates within a complex junction of social processes as overlain by the unpredictability of environmental change. When the natural environment fails to yield resources within expected cyclical ranges, due to marginal conditions or other natural disasters, groups may react with violence and aggression toward one another due to competition for resources based on real or anticipated need. Changes in social complexity, behaviors, and territorial

ranges take place with the aim of maintaining resources that the group currently needs or territory it needs to control. Competition for resources between groups is the outgrowth of management or conscription choices. The Las Palmas faced such possible environmental pressures. These pressures led the Las Palmas to act and react aggressively as predicted by the scope of the Ember and Ember (1992) warfare hypothesis. It is from these factors that a constant cycle of warfare within the Cape Region emerged.

Discussion

Comparative Analysis

The Walker hypothesis (1989) is the principal framework employed to test similar cranial injuries noted in the Las Palmas culture sample. I apply that theoretical framework to data regarding the Las Palmas culture. Parallels exist in the climate conditions, archaeological data, and warfare conditions between the Las Palmas culture and the Chumash. The Cape Region experienced drought impacts and environmental shifts similar to those represented in the California Santa Barbara coastal region beginning in A.D. 1000. These shifts are in sync with the severest time of drought in the MCA elsewhere in California. The osteological data comparatively reviewed in this body of work will support my theory that each group experienced separate but similar conditions relative to their home environments and similar responses. Based evidence of similar group size and social infrastructure, including religious and political leadership, I suggest that both groups possessed the foundational social infrastructure to dedicate individuals to the oversight of warfare in a ritualized or structured format. Through this social format, both groups possessed similar patterns of response when faced with unanticipated, long term environmental deviations in an already marginal environment.

Sample sizes are very different between the two groups. The Walker study included 744 individuals, whereas the Cape Region to this point has produced a small number of individuals for study. Few specimens are available for study in the Cape Region, the archaeology of the Cape Region has less history and is less thorough than the archaeology of the Santa Barbara Chumash and so yields a different level of information. The engagement of archaeological science in this region continues to produce new data but currently, the inequality of sample sizes directs a comparative approach between the Walker data and data obtained from other studies

conducted in the Cape Region. The Walker study presents a comprehensive attempt to explain a notable lack of death specifically from cranial trauma even though cranial trauma in the group was common. The hypothesis suggests social mechanisms were in place to mitigate population and resource loss from interpersonal warfare. In order to further evaluate Walker's interpretations and to evaluate whether other groups endured similar conditions, a comparative study between Las Palmas and Channel Islands skeletal data was conducting using published analysis from Tyson (1977) and Molto and Fujita (1995).

Despite the disparity in sample size between the Las Palmas (Tyson 1977, Molto and Fujita 1995) and Walker (1989) samples, some similarities between the two were found. In both groupings, approximately one quarter of the individuals (Santa Barbara (SB) = 19.3% of 744 and Las Palmas (LP): 29% of 57) exhibit evidence of healed depressed fractures to the outer table of the crania. The orientation of the injuries for both sample sizes are to the frontal portions of the skull (SB 55.5% n= 80 and LP 54.5% n=6) with damage to the parietal areas of the skull with more frequent left orientation running only second (SB 43.2% n=59 and LP 36.5% n=4). Tyson's (1977) scoring of traumatic elements to Las Palmas crania also reflected healed depression fractures to the sagittal and coronal sutures in two individuals. Approximately one quarter of each sample reflects sub-lethal antemortem fractures to the outer cranial table that were healed at the time of the individual's death. All individuals in both samples were adults at various stages with no juveniles exhibiting healed trauma. The Las Palmas sample size reflects a much larger geographic range than that presented in the Santa Barbara Chumash; however, a sociocultural event was affecting adults throughout the Cape Region is suggested by the frequency of healed cranial trauma.

There are differences between the groups. The rate of healed injury between the sexes was different, where 75 men (24%) and 36 women (10%) of the Santa Barbara Chumash exhibited healed cranial trauma. The rate of injury in the Las Palmas sample was split evenly between men and women (n=6), and there were no female injuries in the *La Matancita* sample (n=2). The fracture profiles in the Las Palmas sample were recorded differently with only the *La Matancita* sample described as 'ovoid' in shape, though sizes and depths were not recorded. Tyson's examination of her sample only provided a brief description of the fracture profiles as "round" but also lacked size and depth measurements. Information on sides of the fractures is a detail lacking in the comparative analysis. The majority of Santa Barbara Chumash injuries occur on the left side (58% n=82); whereas the only one record of siding in the Las Palmas sample is a male having sustained 3 healed left frontal depressed fractures within his lifetime. Given the very small sample size in the Las Palmas group, the possibility exists that the recorded injuries were due to chance over these individual's lifetime. A rejection of that suggestion will be discussed in greater detail later in this chapter.

The Las Palmas and Chumash samples may both reflect a social phenomenon within both groups the expression of which is not particularly violent but is expressed through violence. Of all the documented cases of cranial trauma in both groups, only one individual out of 800 individuals in the sample size had healed facial trauma to the nasal bones. It is unknown whether that the injury was related to a cranial trauma event for this individual. This single nasal injury in more than 800 individuals suggests that a different kind of ideation of violence may be represented. Traumatic injuries that results falls and slips such as ankle, wrist, and long bone fractures amongst these groups are also not documented, with the exception of one individual possessing a fracture to the left acetabulum. This type of injury in prehistoric contexts is often

associated with high falls, where the individual impacts the ground feet first (Molto and Fujita 1995). The next section will review the possibility of these traumatic injuries resulting from accidental, self-inflicted, and religious contexts, as well as the role of environmental impacts on sub-lethal and deadly violence. When compared and contrasted with these scenarios, the evidence suggests the existence of a sociocultural mechanism that resolved conflict through non-lethal violence.

Accidental & Self-Inflicted Injury

The injuries in the Chumash and Las Palmas populations potentially represent four different injury scenarios. These scenarios include (1) injuries resulting from accidents, (2) self-inflicted injuries within a ritualized or ceremonial context, (3) injuries resulting from lethal violence, or injuries resulting from sub-lethal violence. The injuries documented by Walker were not the result of self-inflicted injury or accident. The frequency of head trauma in the study could imply that the Chumash were more hazard prone than other indigenous North American populations. Post-cranial injuries commonly associated with accidental trauma generally co-occur with significant head trauma but such evidence did not occur in the Walker study. There is no evidence to support an abnormally high rate of accidental injury among the Chumash.

Based on the orientation and scope of trauma these injuries inflict on the cranial surface, the possibility of cranial injury resulting from an accidental fall or a blow from a falling object is not likely. Accidental injury can occur as the result of a non-intentional event, such as a fall or being struck by a falling object. Walker (1989) concedes that a variety of accidental scenarios can lead to cranial trauma, but the resultant injuries would vary in size, shape, and distribution across the crania based on the circumstances of the event. Kremer et al (2008) conducted studies regarding blunt force trauma to the crania. They focused on cranial injury distribution above

versus below the hat brim line as a manner of detecting if the injury is the result of a fall or trauma inflicted on the victim. The hat brim line is defined as "the band-like area of approximately 3 cm whose lower limit [runs] from the top of the eyebrows, around the upper margin of the auricle, and along the occipital pole at the back [of the head] (Erlich and Maxeiner 2002: Kremer et al 2008). The Kremer hypothesis suggests that cranial injuries above the hat brim line were usually the result of malicious intent; whereas, injuries below the line were often the result of an accidents.

The Kremer et al (2008) study concluded that cranial injury above the hat line resulted from malicious blows when three concurrent factors were represented: 1. traumatic injury above the hat brim line are present, 2. the location of the injury is lateralized to the left side of the individual, and 3. lacerations to the soft tissue of the crania consistent with blunt trauma are also present. In the case of the Chumash, the presence of soft tissue injuries concurrent with cranial trauma is unknown. However, it is a realistic assumption that a blow to the head applied with significant force to cause a fracture to the outer table of the crania will also produce a soft-tissue laceration. The clubs used in the Chumash population possessed raised or sharp point attachments. It is reasonable to assume the third criteria— lacerations— in the Kremer et al (2008) study existed in the Chumash. The force of the blow to the head producing a resulting fracture would also create lacerations to the wound site.

Walker's (1989) study of the Chumash found no evidence of facial injuries to individuals. The facial injuries in the Chumash sample also contrast with injuries observed in indigenous populations, some of which possessed protocols, including causing facial injuries to opponents (Walker 1989) during conflict. For example, Walker notes Steward's (1973) observation of California Mohave violence protocol— stunning a victim with a facial blow before inflicting a

crushing blow to the skull. Similar injury patterns are represented in the Hawaiian-island of Mokapu where Snow (1974) noted facial fracture rates in 33% of males and 29% of females. These injuries were attributed to warfare or marriage disputes. Walker notes facial injuries in warfare is an indication of a "blitz" style violent attack, where disabling your victim improves the chances of success when the intent is to kill. Only one documented traumatic injury in the Las Palmas sample reflects an antemortem healed fracture to the nasal bones. This one injury cannot be correlated with other traumatic elements on the individual's person due to a lack of supporting data. Facial injury as a prelude to cranial trauma is indicative of warfare where the goal is killing the opposing combatant. Sub-lethal warfare does not share this motivation of killing the opponent and a different pattern of cranial trauma is expected.

A lack of facial injuries and the orientation of traumatic injuries, further demonstrates deliberate placement of the blows to victim's crania. The predominately left-side orientation of cranial injuries is consistent with being struck on the left-side of the head would by a right-handed aggressor. This patterning is consistent with data that reflects that the majority of human populations are right-handed (Uomini 2009). If the goal is to wound another individual in a direct, prescribed fashion by hitting them over the head, then hitting the same individual in the face might not be the appropriate way to resolve a conflict.

Self-mutilation may account for some of the frontal bone injuries in the Channel Island populations, though the extent to which this occurred is unclear. Ethnohistoric records provide no observations of Chumash or Las Palmas ritualized self-injury (Walker 1989). While many other indigenous cultures engage in ritualized or ceremonial violence, it is unjustified to draw analogies between religious or ritual practice with groups living in marginal environments. There is no evidence of the injuries in the Chumash possessing a self-inflicted ideation.

Environmental Impacts and Influences

Both the Chumash and Las Palmas populations faced resource deficits due to low biotic productivity and marginal carrying capacity in their immediate environment. The generally arid, water scarce conditions in the Cape Region likely underscores decisions about subsistence and territoriality in the Las Palmas culture. The impacts of environmental crises on decision making process of the Las Palmas and Chumash were probably greatest during events such as the Medieval Climatic Anomaly (MCA)-related drought. Environmental stressors raise concerns about the number of group members required to directly contribute to the group's long term success under such conditions. The young, the sick, and the old likely contributed less than did healthy, productive adult members. Not coincidentally, these same healthy adult members are the individuals involved in violent conflicts at the highest frequency (Walker 1989). The same rates of traumatic incidence are not demonstrated for the Las Palmas. The productive members of each group needed a means to address violent conflicts without permanent impacts to the population's survival. A structured method of practicing conspecific violence toward another group member, or members of other groups, satisfies the need for conflict but with a more positive resolution. If the MCA possessed factors that influenced changes in resources and subsistence behaviors, the resulting social crises in both groups may have created the need for a strategy for handling intragroup conflicts that addressed internal tensions leading to lethal outcomes.

The environmental phenomena of MCA had a cumulative effect on resources. During the period A.D. 1150-1200, a lack of reliable water sources plagued both the Santa Barbara

mainland and the Channel Islands. According to Arnold (1992b), the MCA reduced biotic productivity in the Santa Barbara coastal waters. In addition, warmer than normal surface sea temperature (SST) interfered in the production of large kelp (*Macrocystis*), a common species found in the eastern Pacific Ocean. The kelp contains giant brown algae, a bottom-level element essential to the food chain in the eastern coastal Pacific. Arnold proposes the reduction in this kelp variety negatively impacted the population sizes of sea mammals, fish, and shellfish available to fishers and foragers. Further, Arnold (1992a) contends that the reduction in marine mammal and fish populations spurred increased resource competition among Chumash groups. The conditions of scarcity led the Chumash to gather supplemental resources to address shortages in their diet. A prolonged lack of key resources reduced the carrying capacity of the Channel Islands and pushed the island dwelling Chumash on to the mainland, where the drought was also in progress. Mainland groups created permanent settlements along the coast where tidal and terrestrial plant sources and water were available with some reliability. The result was additional population load around key resources and territorial conscription by the Chumash at these locales.

Arnold's (1992a) SST productivity model is considered problematic and not widely agreed upon in California archaeology (Raab et al 1994). As critics of the model, they question several key details tied to the model's construction. These elements of her model which are contested include the use of *Macrocystis* as proof of causation, the recorded average seasonal round of surface temperatures in the eastern Pacific, and the supposed uniformity of indicators of resource stress across all the Channel Islands and the coastal mainland. Also questioned was the consideration of *Macrocystis* by Arnold to the exclusion of other commonly occurring species of kelp in the Pacific Ocean. It is suggested that the *Macrocystis* data would be stronger if

comparison to the viability of other kelp species during prolonged periods of warm surface water in the Pacific Ocean was considered. Raab and colleagues leave open the possibility that the *Macrocystis* decline was not in direct correlation to increased water temperature but instead the victim of natural selection factors when competing with other kelp species in that environment.

According to the Arnold model (1992a), the SST during A.D. 1150-1200 was 20°C above the normal seasonal range of surface temperatures and lasted for a sustained period of time. Raab et al (1994) counter that the SST within the Channel Islands varies by only five degrees year round, making the biotic productivity of kelp difficult. To combat these periods of inhibited growth, *Macrocystis* possesses an adaptation to store nutrients for surplus use in these lean times in order to survive in warm water periods for weeks. Having this adaptation, it seems less likely that *Macrocystis* would be susceptible to variations in surface temperature even over sustained periods of time.

Additionally, the rise in density of marine shellfish in middens over the Early/Millingstone, Middle, to Late time periods suggested to Arnold (1992b) that resources were depressed in the Middle and Middle-to-Late periods. The resource depression is in contrast with the explosive growth to assemblage densities in the Late period. However, Raab et al (1994) do not find that resource stress was uniform across mainland and Channel Islands sites. Arnold contends that the density of the Santa Cruz Islands middens increased from 87,000 NISP/m^3 in the Middle period to 101,000 NISP/m^3 in the Middle-to-Late period transition and then jumped to 537,200 NISP/m^3 in the Late Period. Raab et al take these results to mean that an exploitation of resources at these rates counters a suggestion of depression. Instead, they may simply reflect the fact that the Santa Cruz Island inhabitant's increased exploitation of marine resources over time. They note that midden assemblage densities on San Clemente Island, part

of the four islands that comprise the southern half of the Channel Islands chain, grew from 106,000 to 159,000/m^3 in the Middle-to-Late period transition (Raab et al 1994). Similarly, the Corral Canyon site on the mainland in Malibu also shows no evidence of resource distress during the same time period. It is likely that resource depression, as it was occurring on the Santa Cruz Island and the other coastal locales, was the result of drought conditions.

While increased SST may or may not have played a direct role in resource depression in the Channel Island Chumash, it is clear that Channel Island Chumash groups were showing signs of resource stress. This stress is indicated by a change in their subsistence economy. Unlike the carbohydrate-consuming agriculturists of the Southwest, the primary diet of the island-oriented Channel Islands Chumash was rich in marine-based proteins. Due to land mass and the frequency of rainfall on the islands-- factors that would have a direct impact on the propagation of plant-based or other terrestrial protein sources-- the Channel Islands Chumash subsisted primarily on fish, sea mammals, and shellfish beginning in the Early period (6000 – 2400 BCE) of island occupation (Lambert 1993). Their marine resource dependency appears to have increased over time as they developed more technologically advanced and elaborate fishing equipment and with the use of the *tomol* (plank canoe). Though their primary diet was rich in marine-based proteins, their consumption of plant-based or terrestrial game protein resources was limited. Island landmass is small, which limited the plants and terrestrial fauna that can be supported. Even with the possibility of trade between coastal Chumash groups and the island Chumash, gaps in their diet apparently led to deficiencies in essential nutrients as indicated by osteological material.

Sea surface temperature (SST) studies have also been conducted in the Gulf of California. There is evidence for an increase in SST and low biotic productivity of diatoms and

silicoflagellates during A.D. 920 – 1020 and 1100 – 1140. Barron et al (2003) found fluctuations in temperature took place similar to patterns established in the California Bight as discussed by Arnold (1992b). *Azpeitia nodulifera*, a diatom found in the Gulf of California, had periods of high abundance from A.D. 920-1020 and 1100-1140 and a period of low abundance in A.D. 1050-1090 (Baron et al 2003). The fluctuations in diatom productivity coincide with a sharp increase in the populations of the Pacific Sardine in the Gulf, which proliferate in warm water conditions, during these same periods. The time pattern also appears to be in sync with the progress of the MCA elsewhere around the world, though more study linking these phenomena is needed.

The arid conditions led to drought impacts affecting both the Las Palmas and Chumash populations. True's (1990) study regarding water supply, complexity, sedentism, and the fixation of territory compliments Cane's (1987) previous study with regard to population size concentration around available water sources. However, True's study takes the issue further by emphasizing that a limitation in water sources reduces the size of subsistence ranges. The ability for even small groups to pull up stakes and move to a different locale having water is diminished when watered territories are small and multiple groups are vying for access. This competition translates into a fixation of territorial boundaries and control of water resources. Though individual group size may not increase, the overall population load in a given range increases, thus True states:

> Population increases and pressure on resources leads to the formalization of territorial concepts (claims on space and resources), the degree of potential mobility is reduced, and, as a function of such restrictions the number of available water sources for any given group is reduced [1990:57].

Mobility patterns change and groups become more sedentary in order to retain control of and access to water sources. Territoriality over holding water sources may lead to changes in social complexity, including political changes, and may encourage violent conflict.

Following True's (1990) model which posits shrinking subsistence ranges, the use of Calleguas Creek in on the Santa Barbara mainland as a mortuary center reflects the result of territory formalization among the Chumash (Raab 1998). Mainland Chumash groups were aggregating heavily along the creek during a time of environmental stress and drought impacts during the Late period in the Santa Barbara Channel (Arnold 1992a, Raab 1994, Jones et al 1999). Increased population loads at Calleguas Creek are linked to poor health conditions that may have been worse than in contemporaneous populations of Chumash living on the Channel Islands.

Resource stress is reflected in the Channel Islands Chumash population by their skeletal remains. Patricia Lambert (1993) examined the skeletal remains of Chumash populations recovered from cemetery sites on Santa Cruz and Santa Rosa islands. These islands are the two largest of the four in the northern half of the Channel Islands chain and could theoretically support a large island population for a sustained interval of time. Examining 327 individuals from burials on these islands across the Early, Middle, and Late periods, evidence of ossified periosteal lesions in the long bones and calviculae were found. The periosteum is a membranous lining that covers all osseous surfaces in the body. When the membrane is lifted away from the bone by an intrusion of blood, pus, bacteria, or by traumatic injury, bone building cells known as osteoblasts begin to lay down new bone inside the gap. The result of this reaction creates a lasting osseous lesion on the surface of the bone. Lambert found that the frequency of these lesions increased at a rate of one per burial from between the Early and Middle periods before

slowing in the late period. A rapid rate of appearance for periosteal lesions demonstrates that Chumash health was declining.

The size of these lesions also increases through these time phases. Lambert (1993) attributes Early period lesions based on their size and frequency to accidental injury, but their larger size and frequency in the Middle period cannot be correlated to an accident-based cause. It is more likely that the island populations were developing these lesions as a result of poor nutrition due to resource stress or an increasing frequency of pathogens within the island population. With resource competition high on the islands and sustained drought in the later Middle period, groups became increasingly sedentary around mainland resources. Conditions were optimal for poor nutrition and disease to occur at increasing rates. However, the high consumption of marine-based proteins did not adequately reduce the periosteal lesion rate in Middle period populations. Though islands groups were eating large quantities of marine-based proteins, deficiencies in their diet likely caused shortfalls in other essential nutrients and trace elements. Parmalee and Kippel (1974) have shown that marine-based proteins such as shellfish were best utilized as a supplement and not a staple for the main source of protein in prehistoric diets. The high effort investment to collect marine proteins was undermined by their poor nutritional return. The issue was not that the Chumash were lacking enough to eat but their breadth of diet was limited and made them more susceptible to disease and infection.

An increase in the hunter-gatherer social complexity among the Chumash may also be a result of the resource stress exhibited in the population. By the time the Channel Islands Chumash were making contact with Europeans, many groups possessed the hallmarks of hunter-gatherer complexity. These features include ascribed status, sedentism, aggregated populations, craft specialization, and intensive exploitation of marine resources (Lambert and Walker 1991).

Isotopic analysis of their diet in the Late period indicates diversity correlates to geography. Island groups were eating primarily marine foods, while terrestrial groups were using a combination of resources intermediate between the others. The high marine isotopic values in island and coastal groups are correlated to advances in their maritime adaptions and technology (Lambert and Walker 1991). Coastal groups utilized a more intermediate diet of marine and terrestrial resources, including high-carbohydrate, high-grit foods such as tubers, wild yams, and acorns. The lower rate of dental caries in the coastal and island groups in association with the increase in marine proteins consumption indicates that marine proteins were replacing carbohydrate-based, high grit food items in the diet.

Warfare Signatures

Evidence of warfare and nutritional stress has been indicated in the Santa Barbara Chumash. Osteological evidence of warfare-related injury peaks at the same time that periosteal evidence of poor nutrition and the increase of infectious diseases appear in high frequencies in Middle and Middle-to-Late period transition populations. Walker (1989) recorded high levels of cranial trauma during these periods in Channel Island Chumash populations that exceed the frequency of similar injuries seen in the Early and Late period. Evidence of nutritional stress has been documented within the Las Palmas but at present, osteological examination of the Las Palmas samples discussed lacked information on antemortem or perimortem projectile point violence. Given the common evidence for Las Palmas warfare, this absence is probably the result of sampling and reporting, rather than a lack of such trauma evidence in Las Palmas burial assemblages.

The health and injury profiles at Calleguas Creek (CA-VEN-110), a Middle-to-Late period Chumash residential and cemetery site, demonstrate the long term ramifications of

environmentally stressed groups who were apparently packing populations around remaining water resources (Raab 1998). The use of Calleguas Creek extends over approximately 1700 years, from A.D. 1016 to 1282, according to radiocarbon dates (Raab 1998). A total of 114 discrete interments were recorded at Calleguas Creek, where approximately 10% of all adult burials reflected traumatic injuries. Walker et al (1988) describe the chances of injury as the result of violence as both "common" and "high" with all of the adult population reflecting projectile point trauma. Some of the Calleguas Creek individuals had either been encountered both lethal and non-lethal traumatic injury from more than one projectile point during the lifetime.

Individuals from Calleguas Creek also suffered high rates of dental hypoplasias and inflammatory bone diseases. These hypoplasias denote long periods of nutritional deficiency and disease impacts among at the Calleguas site population. Walker et al (1988) found that of 114 individuals, 10% of the population encountered significant developmental interruptions based on evident dental hypoplasias, nearly twice the rate noted in other contemporaneous Chumash sites. The rate of periostitis and other reactive processes on skeletons at Calleguas was 24% (n=114 burials). Though Walker et al (1998) state that this percentage in a population that size is unusually high, the severity of the periosteal lesions present on individuals from Calleguas suggest multiple encounters with disease and other infectious agents. These data, when coupled with shorter stature than average for this time period in the long bones for individuals at Calleguas Creek, reflects an overall pattern of arrested development and disease. These features are generally associated with nutritionally distressed populations. The osteological evidence from Calleguas Creek suggests that violent attacks on the population were ongoing and apparently with deadly intent.

Medea Creek (CA-LAN-243) was not occupied later than Calleguas Creek. Located 10 miles inland from the Pacific Coast, this Chumash village site dates from A.D. 1500 until 1785. The time span of Medea's use as a residential area and mortuary site is of interest as it came into use approximately 50 years prior to the first European presence in California and continued in use into the protohistoric period before ending approximately 20 years after Spanish settlement of California. King (1982) found that the historic-period Medea Creek site population in mainland Malibu exhibited minimal evidence for traumatic injury and violence (1.3% of the 397 burials at the site). The data from Medea Creek contrasts with the projectile point trauma rate of 10% for the Calleguas Creek site. Of the five burials reflecting violence at Medea Creek, four of the five had projectile point trauma, several individuals had been bisected or burned, and only one reflected a non-depressive cranial fracture. Poor preservation of the burials at the site leaves open the possibility that other burials may have possessed evidence of warfare and violence but were not detected.

The significance of the Medea Creek burials is two-fold. First, while only a small number of individual at the site exhibited traumatic injury as the result of violence; evidence of violence into the Late period leading up to and after Spanish missionization of California can be established. Second, projectile point trauma remained a consistent method by which violence and warfare was exacted on Chumash groups even during early European contact. The osteological evidence from the Calleguas and Medea Creek sites suggests that violent attacks on these populations indicate intentional deadly warfare among Chumash groups. Similar violence was ongoing within the Las Palmas and was not interrupted by attempts at intervention by Europeans during the Early contact period.

The significance of the Calleguas and Medea Creek burial sites provides key information about the type of weapons employed in warfare and the relationship of sedentism with lethal violence and warfare. None of the trauma recorded at either Chumash site reflects lethal blunt force violence, with the exception of one case at Medea Creek, only projectile point or sharp force trauma was recorded at these sites. The use of projectile points as the means to attain lethal outcomes appears to be present in the Las Palmas. The use of the bow and arrow in extra-group warfare appears consistent across Chumash and Las Palmas violence, if burial data, ethnohistoric documents, and interpretations of mural depictions are correct. Additionally, the groups occupying Calleguas and Medea Creek were demonstrably sedentary, having settled and established territory around available water sources, which were essential to group success and survival (King 1982, Raab 1998). Increased population packing resulted from the attempt to maintain territorial control of these water sources. The population packing resulted in disease and nutritional stress perhaps due in part to water contamination by the fixed population. Similar settlement constraints are also represented in the Las Palmas groups, where sedentism along coastal sites with access to fresh water and marine resources also led to population packing and encouraged territorial defense of Cape Region sites. In both cases groups opted for formalization of territory and permanent resource access in lieu of a mobile seasonal round in their uncertain environments. The natural outgrowth of this process was defensive warfare for control of these locales.

Both the Chumash and Las Palmas populations faced resource deficits due to low biotic productivity and carrying capacity in their immediate environment. At issue is not the overall number of group members, but members of the group that directly contribute to its long term success and survival in those conditions. The young, the sick, and the old likely across all

groups contributed less than did healthy, productive adult members. Not coincidentally, these same healthy adult members are the individuals commonly getting into violent conflicts Walker's (1989) study. The most productive members of the group require ways to address conflict as it arises without permanent impacts to resource protection. A structured method of exacting conspecific violence toward another group member satisfies the need for conflict but the structured method ensures long term group success.

Lethal Violence and Warfare in North America

Other North American indigenous groups also reflect evidence of cranial trauma. However, similar injury types can possess a different goals or behaviors. An example of cranial trauma reflecting a different behavior is the Crow Creek massacre victims. Although similar injuries occur in the victims of the Crow Creek massacre, they reflect different behaviors. The Crow Creek Village massacre site is located North Dakota where in 1325 A.D., 500 inhabitants perished as the result of a violent raid (Willey 1990). In the Crow Creek event, 90% of the victims suffered cranial trauma, including scalping and decapitation, seemingly regardless of age and sex. The widespread violence in the Crow Creek event lacked an age or sex bias, unlike traumas represented among the Chumash.

However, two similarities exist between the Crow Creek victims and the Chumash regarding patterns of trauma. First, in both groups depressed factures to the crania are common. Also, the use of the weapon type appears similar. Among the Crow Creek victims, 33.3% (n=22) of the factures were round and 66.7% (n=44) ellipsoidal in profile. By comparison, the fractures in the Chumash population were 47.9% ellipsoidal and 30.7% circular in profile. The weapons used in the Crow Creek massacre were likely clubs or maces with biconical stone heads (Courville 1948). However, the exact type and size of the weapon used at Crow Creek is

unknown as the identity of the assailants. Likewise, the exact type of weapon in the Chumash remains unknown. None of the ethnohistorically or archaeologically recorded weapons associated with the Chumash would produce this kind of injury profile to the cranial vault.

However, clubs are found in Chumash neighbor groups. The Gabrielino, who occupied the mainland to the southeast in the southern Channel Islands, used hard wood clubs with sharp, conical stud attachments. Walker (1989) reasons the Chumash likely obtained such clubs through contact with the Gabrielino. A blow with that type of weapon potentially created a fracture to the outer cranial table without puncturing the vault. A blow to the head with a Gabrielino-style weapon likely produced the circular or ellipsoidal fractures witnessed in the Chumash population. The imbedding of the chert pieces documented in the Walker study likely occurred when the sharp attachments broke off upon contact with the victim's crania.

Despite the comparable weapon types and cranial trauma between Crow Creek and the Chumash, a number of dissimilarities exist. A specific dissimilarity is the lateralization and location of wound sites on the crania. As noted, the majority of the Chumash injuries occurred on the frontal portion of the skull. In contrast, the Crow Creek cranial fractures presented at the parietal-occipital area of the crania (70%, n=67) (Zimmerman et al 1981: Walker 1989). The lateralization of Crow Creek victims injuries was the right side of the crania (39.7%, n=27) instead of the left lateralization found in the Chumash (26.5%, n=18). The pattern of injuries in the Crow Creek population suggests victims fleeing from their attackers when they were struck from behind. The Chumash cranial injuries reflect with individuals who were struck from the front, facing their aggressor. The behavior pattern of the Crow Creek aggressors demonstrates infliction of lethal trauma, while the Chumash aggressors apparently intended sub-lethal trauma.

Environmental Influence on Behavior

As this thesis maintain, the violence represented in the Las Palmas and Chumash possesses direct links to concern over resource competition and conflict resolution without undermining group viability and the institutionalization of violence. This thesis proposes that the environment was a key determinant in the link between changes in sociocultural patterns to environmental phenomena. Environmental determinism operates on the notion that the fate of culture change and complexity relies on the mercy of the climate in which that culture operates (Huntington 1924). Archaeology has produced compelling research suggesting that cultural outcomes are not the sole provenience of environmental phenomena while highlighting the importance of environmental factors (Harris 1968, Bettinger 1991, Kelly 1995). The interaction between culture change and behavior and environmental influences is complicated and should be considered alongside social factors and the magnitude of the environmental stressor acting upon the population (Moratto 1984, Carbone 1991, Raab 1998). The agency of a culture's ability to define its environment and the changes occurring therein determines culture changes in reaction to those perceptions, as defined by McGuire and Saitta [208: 1996]:

> Missing is a sense that environments are not "given" but rather are culturally constituted. That is, cultures define environments and even environmental stress because they filter experience through meaning frameworks of their construction.

Instead, I offer here that the environmental challenges faced by the Las Palmas and Chumash resulted in sociocultural alternations with regard how these populations approached resource control, settlement, and conflict resolution. These changes took place because both groups

perceived alterations to their environment. These changes thus influenced how these groups thought about and went about subsistence and settlement patterns, making changes in order to accomidate changes in their enviroment. Sociocultural preservation required alterations not because the environment changed as the only factor. Socialcultural change took place because the environment produced phenomena that countered existing cultural and subsistence behaviors. In order to maintain overall group success and sociolcultural preservation, the framework wherein culture operates encountered alterations in order to accommodate perceptions of environmental impacts to existing culture and subsistence.

Conclusion

The objective of this work has been to argue that healed cranial trauma represented in the Las Palmas culture resulted from sub-lethal warfare and conflict resolution. Walker's (1989) work regarding sub-lethal warfare among the Santa Barbara Chumash serves as the inspiration for this thesis, reflecting his hypothesis that sub-lethal warfare was a detectable signature in the spectrum of violence among California hunter-gatherers. Research on this topic was not furthered by Walker due to his untimely death in 2007. However, Walker's sub-lethal warfare hypothesis continues to resonate in California archaeology and bioarchaeology, where the subjects of warfare and environmental impacts continue to intertwine with hunter-gatherer lifeways in both Alta and Baja California. By contrast, the archaeology and bioarchaeology of Baja California Sur is still emerging and there is much that we do not know about the lifeways of the Las Palmas culture and the environmental record of Baja California, especially during the MCA. This thesis proposes that a recognizable pattern has emerged between two socially complex, non-egalitarian hunter-gatherer groups both operating in environmentally marginal regimes and seeking resolutions to socially complex aspects of their lifeways. The development of pattern recognition in this case draws on multiple lines of evidence: osteological, environmental, and archaeological data to establish a framework by which social complexity and behavioral responses to environmental crisis can be recognized in California hunter-gatherers.

The relative isolation of the Cape Region within Baja California Sur geography creates a unique opportunity for archaeology to witness a culture's trajectory, like that of the Las Palmas culture, from start to terminus. From these opportunities, archaeology contributes additional information to the body of knowledge about the lifeways of hunter-gatherers operating in Aridoamerica and within the wider context of North American archaeology. The effects of

geographic isolation on the Las Palmas witness a direct link to adaptations to their natural environment. Though the Las Palmas culture to this point has been an understudied and undervalued culture in California archaeology, it reflects as highly adaptive in its subsistence schemes and sociopolitical practices when posed with mounting environmental pressures. The rapid acquisition of layers of complexity extensively documented in the Chumash (Arnold 1992a&b, Raab et al 1994, Johnson 2007) is also identified here as similar to signatures detected in the Las Palmas. Though these cultures are not carbon copies in terms of development or levels of their social complexity, the cultural evolution of both groups were heavily influenced by their perception and reality of the environment and the resulting press on their lifeways.

The Las Palmas environment had a direct influence on group isolation and warfare. The constraints of living in an environment, where the geography was unfavorable to constant travel up and down the Baja peninsula to seek constant contact with other Baja groups and much of mobility and subsistence practice was dictated by the availability of water led to a form of cultural isolation. Las Palmas groups, especially the Pericú and Guaycura, were isolated from other Baja peninsula groups but also sought isolation from each other. This separation was enforced on multiple levels as represented through linguistic, genetic, and resource niche boundaries. Warfare was the prescriptive method for enforcing the divisions between groups in the Las Palmas culture.

Warfare, as previously stated, is the manifestation of complex network social processes reacting to perceptions of changes in one's surroundings. In the case of the Las Palmas culture, many of these changes, as perceived and culturally translated were precipitated by unanticipated shifts in the natural environment. These shifts impacted the availability of water and other resources. As demonstrated in the Ember and Ember hypothesis (1992), the Las Palmas reacted

to a sense of loss of participation in an unpredictable climate cycle by anticipating a threat. In order to maintain control of resources, intragroup members were conditioned to expect extra-group violence over control of these resources and to react with violence. A cycle of warfare through instigation and revenge over these resources incepted in the Las Palmas and continued, even at and beyond European presence in the Cape Region.

Resource competition and extra-group warfare suggests a direct relationship with the healed cranial trauma in both the Chumash and the Las Palmas culture. The occurrence of interpersonal violence seems concurrent with fluctuations in the overall biotic productivity within their environments. The resulting intense competition for limited resources provided ideal conditions for an escalation of violence and warfare. When resources are limited within a group, competition to maintain one's resources escalates. The competition contributes to external tensions between groups. Though the pitch of tensions also resulted in an upswing of violent conflict conspecifically; it lacked a lethal ideation. In the absence of intent for a lethal outcome, alternate goals that include violence but except death as a direct result may be at work within these groups.

Though violent conflict within the study groups resulted from resource competition, it was not lethal violence. The violence instead led to a mediated-style of violent combat. Walker (1989) in his own research suggests that the violence within the Chumash resembled highly structured, supervised club fights observed by Napoleon Chagnon among the Yanomamo (Chagnon 1968). I agree with Walker's assessment and offer that the osteological, environmental, and cultural evidence demonstrates similar social process may have been at work within the Las Palmas culture. An administrated fight precluding the outcome of intentionally-caused death falls under the auspice of structured conflict. Structured fights administrated by

the Chumash addressed tensions as they arose in the population. A mechanism to address violent conflict that normally would have led to a lethal outcome provided a stabilizing effect on the Chumash. Irrespective of the environmental shifts that the Chumash could not control; uncertainties with regard to group stability and survival could be better assured by a reduction in conspecific violence with a lethal outcome. The lack of lethality owes to a structure in place ensuring an outcome that benefitted the entire population. Lethal outcomes reduce overall group success in a marginal environment as the group now has fewer members to contribute toward subsistence and protection against extragroup violence.

The loss of group members due to lethal violence resulted in deleteriously effects on the long term chances of group survival. For groups operating in sub-optimal, resource stressed environments; this appears to be doubly true. Sub-lethal violence allows violent disputes to go forward without causing permanent loss of group members. By allowing controlled conflict to proceed but ensuring survival as a resolution of that conflict, those group members remain contributing group members. Their contributions include the protection of future resource loss from outside predation or future environmental uncertainty. In doing so, the overall chances of a better outcome result with regard to the group's chances of survival.

Appendix A: Review of Baja California Archaeology

A small clutch of archaeologists turned their focus to the Cape Region of Baja California Sur (BCS) beginning at the end of the nineteenth century. Their research interests largely focused on petroglyphs and mortuary data from the region. The benefit of a handful of researchers focusing on BCS is a manageable timeline emerges for research practices in the region. The study of the Cape Region as archaeological parcel of land encompasses the southernmost part of the Baja California peninsula from the BCS state capital of La Paz southward to Los Cabos encompassing both the Pacific and Sea of Cortez sides of the peninsula and the islands of *Espíritu Santo, La Partida, Cerralvo*, and *San Jose*. I have segmented periods of associated research in the southern Baja Peninsula into three periods: the late 19th century and early 20th century research, William C. Massey's work from the 1940's – 1960's, and post-1960's research. Distributing research into phases provides greater context for the types of archaeological methods employed in each phase. In doing so, I highlight the research efforts and the overall trajectory of Baja California Sur archaeology.

The Late 19th Century/Early 20th Century

Nineteenth century archaeologists used a cultural-historical approach to work done in BCS. The standard theoretical method for this approach conducted research and defined groups by their material culture. From this method, cultural-historical practioners formed abstract, inductive observations about study subjects. Researchers using cultural-historical approaches also often based their theoretical arguments on ethnohistoric records regarding indigenous groups. Those researchers, whom refrained from a cultural-historical approach, often limited their methods to recording their observations of archaeological locales without necessarily

offering much in the way of theory. As a result, sites recorded into the archaeological record were of limited benefit to the discipline.

Early archaeology in the Baja peninsula also highlighted the undertaking commanded by locating and excavating sites. In the late nineteenth century, limited infrastructure in BCS did not accommodate extended travel to sites via interior routes. Limited to what could be transported by boat; most researchers located sites via coastal access routes. Limited further by a lack of potable water sources, travel far into the interior was not a feasible option. Travel into the interior could be achieved by horseback but even this method was limited, as length of time spent in the interior was dictated by the amount of water that researchers could bring with them.

In 1883, Dutch archaeologist, Herman F.C. ten Kate, used Jesuit ethnohistoric records to locate burial caves in La Paz and on Isla Espíritu Santo. Often contradictory, the Jesuit records both praised Baja California for its richness of land and resources and derided it as a desert wasteland (van der Pas 1977). The larger intent of the ten Kate expedition sought the location of indigenous populations throughout North America, including Baja California. By the time ten Kate arrived however, he found no living indigenous populations in the Cape Region. Relying solely on ethnohistoric records, ten Kate first located petroglyphs on the peninsula. Located within the mountainous interior, ten Kate's re-discovery of the petroglyphs first noted by the Jesuits became the first official product of archaeological field work in the Cape Region. The ten Kate expedition also excavated burial caves located in *La Paz* and on *Isla Espíritu Santo*. ten Kate theorized the burials bundled by fiber cordage interred at these locations were the result of a secondary burial practice, including the treatment of bones with red ochre (Tyson 1977). The excavation yielded the following description of the burials:

> The bones had been bundled together and buried, without regard to orientation, in the floors of the caves. In some cases, the phalanges were placed inside the crania. The most striking characteristic of the skulls was their dolichocrania (ten Kate 1883: Tyson 1977).

The ten Kate expeditions marked the first organized efforts to record and excavate Cape Region archaeological sites. In doing so, ten Kate uncovered a secondary burial practice in this region not yet widely observed by archaeological science.

In the late 1800's, French anthropologist Leon Diguet also excavated several burial locations in the Cape Region, including locations south of La Paz and on the islands of *Espíritu Santo* and *Cerralvo* in the Sea of Cortez. Between the island and mainland locales, Diguet's geographic range covered approximately 775 square miles. Diguet (1905) also observed the bundled secondary burial practice associated with Cape Region cultures but provided more detail about the burial context. He noted the burials treated with red ochre sourced from crushed red pumice, the cordage used originating from palm or agave fiber cords, the remains wrapped in fibers or palms leaves, and oriented in a side-flexed position. In contrast, at two funerary cave sites at "*El Pescadero*" near *Cabo Pulmo*, Diguet observed a total of seven individuals that had not received the described secondary mortuary treatment in the Cape Region. Now with an observed range of mortuary treatment, Diguet theorized these individuals had been temporarily interred at this location awaiting final secondary treatment. From these efforts, a spectrum of mortuary practices among the Las Palmas culture was established.

Where ten Kate's efforts consisted more of reported observations, Diguet's work attempted critical connections between observations during his excavations and Jesuit records describing Cape Region indigenous groups. He also noted the lack of description regarding mortuary practices in the Jesuit ethnohistoric observations regarding Cape Region indigenous

groups. Despite the overall high level of detail about Cape Region indigenous groups, the Jesuit records said little about Cape Region mortuary practices. The absent details were incongruous with the elaborate level of detail recorded about Cape Region groups, especially given the specific nature of their mortuary practices.

Diguet's position on the lack of Jesuit mortuary description in the records changed over time. His earlier observation asserted their paucity as linked to culture contact but later, he revised his observation to offer an emic explanation for the lack of information. He first attributed this lack of recorded observation to cultural abandonment of these practices as these groups converted to Catholicism (Diguet 1905). Revised, his new position explained that the lack of Jesuit commentary about Cape Region burial practices was due to the extensive extragroup warfare taking place between indigenous groups in the Cape Region. Warfare episodes recorded by the Jesuits were the documents Diguet used as ethnohistoric corroboration of his new theory. Diguet's new hypothesis stated that Cape Region groups abandoned funerary practices at sites they had lost control of territoriality due to continued extragroup warfare. Whether correct or not, Diguet had improved on the emerging body of mortuary information about the Las Palmas culture by asserting and then revising theory about mortuary practice as interest and research about Cape Region prehistory continued.

The efforts of ten Kate and Diguet were the first observed formal attempts regarding Cape Region indigenous cultures as an archaeological endeavor. From these observations, both researchers formed theoretical frameworks regarding the Cape Region mortuary practices, warfare, and a possible link between the two practices. In doing so, they laid the early foundation for mortuary, warfare, and subsistence studies for Cape Region archaeology. After this brief flurry of archaeological inquiry in the Cape Region, interest in the area faded. A few

decades passed before a new researcher adopted Cape Region archaeology as his favored sphere of research.

Mid-Century Research

William Massey's work in the 1940s and 1950s introduced a more empirical method to data collection at Cape Region sites. His work in the region relied on excavation data when rendering his theoretical conclusions about Cape Region cultures. Massey also conducted research on the culture history and linguistic divisions represented in indigenous Baja California groups (Massey 1947, 1949, 1966). Like ten Kate and Diguet, the bulk of his archaeological excavations conducted in Baja California were during a time of little infrastructure. Roads were still generally non-existent and minimal infrastructure existed in the few towns and small cities established in the region. Reaching archaeological sites still required primary coastal access or carefully planned, limited radius forays into the interior by horseback.

Meticulous attention to the excavation process and deeper attempts at theoretical connections are the primary characteristics of Massey's work in the region. ten Kate and Diguet's previous work highlighted the need for more archaeological work in the region but possessed gaps, which included their observations but lacked empirical data. Additionally, the ten Kate and Diguet fieldnotes contained surface observations with little deeper consideration for the scientific or sociocultural underpinnings beneath their observations. Diguet was the only researcher of the two to attempt a theoretical connection from their observations. Through excavation of multiple burial sites, Massey presented a more complete picture of Cape Region mortuary practices in both the previously observed primary and secondary burial styles. Massey's expansion of the mortuary record in the Cape Region presents a more developed picture of hunter-gatherer lifeways and mortuary practices. Specific to the research contained

within this thesis, Massey's work contributed deeper context to ante- and perimortem trauma observed in Cape Region burials. Until Massey, no previous researcher in Cape Region archaeology attempted a similar theoretical approach.

Additionally, Massey located previously unexcavated Cape Region burial sites, relying in part on the previous field notes of ten Kate and Diguet. Massey's (1955) resultant dissertation incorporated mortuary data from burials in dry caves at BC 75 (*Cerro Cuevoso* Cave), BC 111 (*Punta Pescadero*), BC 114 (*Piedra Gorda*), and one open air burial site at BC 69 (*Los Frailes*) (Figure 14), which I briefly review in the preceding section. Massey recorded multiple instances of Cape Region mortuary treatment, where the deceased had been disarticulated and then rebundled, often with the remains stacked and tied together with cordage before final burial. Massey also noted the placement of grave goods in many of the burials. He also observed the application of red ochre to the burial bundles, obtained from pulverized volcanic materials available in abundance around burial locales. The extensive use of palm fibers was a focal point in Massey's work, used in both primary and secondary burial contexts. They provided the materials by which burials were lined, interred individuals were wrapped, and the cordage used in securing the secondary burial bundles and flexed primary burials. The abundant use of palm fibers in the burials became the signature for which the Las Palmas culture of the Cape Region is named.

The abundance of palm tree and palm fibers reflected the important utility of the palm leaf in the Cape Region. The lack of fresh water sources in the Cape Region would have made the availability of trees for fiber and wood infrequent. The costs associated with procurement were high, as Cape Region inhabitants located trees by venturing into the interior, cutting them

down, and then, transporting them back to coastal settlement sites. The palm tree and its leaves were an adequate substitute instead, found in limited interior environmental contexts but

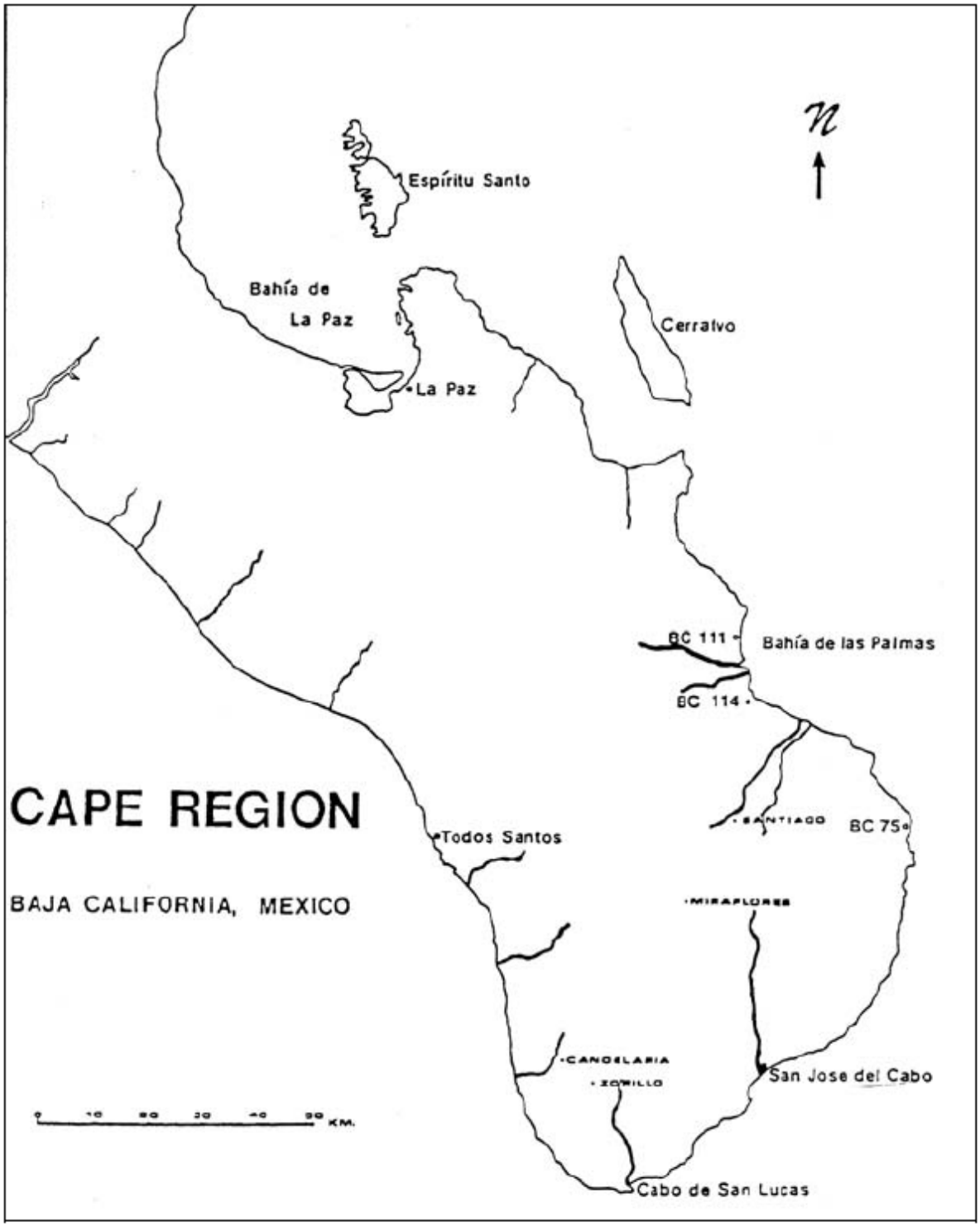

Figure 14: Map of William Massey's Excavations at BC 75, BC 111, & BC 114 (Carmean & Molto 1991)

available in greater numbers along the coast. The incorporation of palm fibers into Cape Region burial practices introduced an easily procurable resource into a complicated process.

The summary of Massey's excavation data demonstrated the labor and time intensive process of secondary burial. In the secondary burial process, individuals were disarticulated after death and then carefully repackaged for final internment. Secondary burial appears an inefficient method of disposal of the Cape Region dead, and lacked meaning in terms of efficiency or utility. Disarticulation of a body is a significant investment of time and effort on the individual processing the deceased. If utility is the only real concern for disposal of the death; the secondary burial processes negates that concern. The use of the practice possessed most likely affiliations with cosmology or social status, instead. Theories about social complexity in non-state or non-industrial societies as manifest in mortuary practice have been in use in archaeology since the 1970s. Arthur Saxe's (1970) 'Hypothesis 8' suggests that individual social persona or social complexity is manifest in mortuary ritual. Further, Saxe found that mortuary ritual establishes a formal partitioning of land for disposition of the dead (cemeteries, mounds, crypts, etc.) as a linked to establishing group territoriality. In reviewing Saxe's work, Joseph Tainter (1975) found that mortuary ritual was a symbolic process whose forms and meanings are relative and meaningful only to the group employing a ritual process and therefore, the use of establishing persona or complexity in ritual via the use of symbol was without much value. Instead, he proposed that vertical differentiations of rank within social systems can be detected archaeologically by how much energy is put into the mortuary ritual being employed with the decedent. The quantity of these energy expenditures would be represented in mortuary features

such as grave size, elaborateness of internment, disposition of the dead, and the grave goods associated. Saxe and Tainter both provide eloquent theoretical mortuary frameworks by which to identify and measure social complexity in non-industrial societies. From these theories, the complexity of secondary burial processes in the Las Palmas culture suggests a spectrum of equally complex social layers.

The significant expenditure of time and effort processing an individual for secondary burial reflects the importance of secondary burial as a distinct cultural feature within the Cape Region. The exact method of disarticulation is not fully understood as the Jesuits did not observe the practice firsthand. However, Jesuit missionary Johann Baegert (1953:88) provided insight into one step of the process where an indigenous informant "told [him] that his people had formerly broken the spine of the deceased before burying them, and had thrown them into the grave rolled up like a ball." However, given the time and effort required for the practice when it was not necessary to dispose of the dead in this fashion, it is likely the practice possessed a symbolically complex meaning. The depth of which I will touch upon in a preceding chapter.

The appearance, density, and type of grave goods observed in some of the burials also add to the likelihood of a social hierarchy within Cape Region prehistoric societies. A burial at BC 75 (*Cerro Cuevoso*) contained a child's secondary burial including Olivella shell beads, cone beads, and rolled bunches of feathers whereas; adult secondary burials at the same location contained no grave goods. At the same location, Massey (1955) recorded the only primary burial of an adult which also contained ash, charcoal, and oyster shell beads, San Miguel seeds, (4) dart throwers, (2) shark-tooth inlayed batons, a sewn bird skin, & a dried leaf. The placement of multiple grave good items afforded to this primary burial signifies that the individual within possessed an elevated social status within the Las Palmas culture. Additionally, the grave goods

associated with the juvenile burial at BC75 may be an indication of ascribed status. These social processes with regard to earned and ascribed within the Las Palmas culture are unknown, however. The suggestion of earned and ascribed social status in Las Palmas burial contexts provides insight into the social processes possibly operating within Cape Region groups. If Las Palmas groups operated under social protocols with one or more kind of status present in the community, then a likely complex, stratified sociopolitical structure was at work within these groups.

The aggregate product of Massey's excavative work in the Cape Region led him to group the culture that represented these sites "The Last Palmas Culture". Chiefly named for the prominent use of the palm leaf within these burial sites, Massey also developed the term as a way of grouping the sites into a cultural region within the geographical context of the Cape Region. The number of prehistoric indigenous groups present in the Cape Region is a matter of debate to current archaeology. Most archaeological scholars who work in the Cape Region agree that the Pericú, Guaycura, and possibly the Cora (who may have been the Pericú misidentified) held territory in the Cape Region. The exact scope of the presence of these groups, including defined territorial boundaries for each, remains indeterminate. As a result, the "Las Palmas Culture" term resisted associating the Massey burial sites expressly with any one Cape Region subculture as he theorized Las Palmas mortuary practices were shared amongst the Pericú, Guaycura, and Cora throughout the Cape Region (Massey 1955). In contrast to observed funerary data in the Cape Region, the mortuary practices of the middle and north of the Baja peninsula groups employed cremation as a primary and final method of burial. The practice of cremation did not occur in the Cape Region. The lack of cremation as a mortuary signature in the Cape Region also acts as a means to detect cultural affiliation within the culture region, in contrast to groups

operating at higher latitudes on the Baja peninsula, in an archaeological context. However, without mortuary practices discrete to the individual subgroups operating in the Cape Region, the practices remain general to the cultural region.

Massey's Las Palmas culture data could not establish broader conclusions about indigenous lifeways, lacked dates, and only offered insight about mortuary practices in the Cape Region on a macro scale. The mortuary data provided valuable information about Cape Region burial practices, but Massey (1955) provided no bridging insight from these practices to the general cultural heritage of Cape Region groups. However, Massey himself admitted a lack of extrapolation into more general theoretical framework about culture history in the Cape Region. Additionally, Massey's work possessed no dates. His excavations performed prior to the introduction of radiocarbon dating in the 1960's, a practice upon which current archaeology depends to establish chronological context, Massey was unable to provide specific dating information about the Las Palmas burials. A lack of dates creates difficulty with assigning a more meaningful temporal context to the Las Palmas burials. Finally, the burials recovered as part of the excavations provided no information about Las Palmas demography, including sex or age at time of death. Given a lack of dating, only general descriptions resulted from Massey's mortuary data and individuals in the burial assemblages were either determined to be an adult or a child based on physical appearance of the osteological remains *in situ*. The Massey excavation data remains important to Cape Region archaeology, however. Though offering general observations, I note Massey's work occurred at a time in archaeology before empirical methods became the gold standard of archaeological data analysis. Within that context, Massey's work was ahead of its time within the discipline.

Archaeological Work in Recent Decades

The majority of archaeological research in recent decades possesses two goals. The first improves upon previous research about the Las Palmas culture using empirical methods. The second, a use of salvage archaeology with the goal of obtaining archaeological data for cultural heritage resources in the Cape Region. Furthering research with these two spheres in mind, recent investigations in the Cape Region looked at previous archaeological inquiry to re-examine the cultural trajectory of the region using improved archaeological methods. With the advent of New Archaeology's processual methods and radiocarbon dating in the 1960's, archaeological methods became more empirical. Theory building sought a foundation of hypo-deductive reasoning strategies. More practically, the ability for archaeologists to conduct excavations in the region without the dangers and inconveniences of being cut off from the outside world also improved. Baja California Sur's infrastructure developed with the formalization of a modern highway throughout the region, and the reliability of access to potable water sources within cities and towns along the coast improved. Advances within archaeological science and the development of the Cape Region enables archaeology to extend previous research and advance new theoretical efforts contributing in significant ways to the narrative of Aridoamerican archaeology.

The sporadic nature of Cape Region archaeology in decades smoothed out into a more unified narrative by current researchers. Donald Laylander's (1987) thesis, *Sources and Strategies for the Prehistory of Baja California*, laid out a timeline of all research conducted in the Cape Region. Within his body of work, Laylander offered a detailed recounting of archaeological efforts in the mostly overlooked region. Revisiting previous archaeological research with more empirical methods corroborated previously evaluated theories about the migration into and settlement of the Cape Region and how these patterns contributed to the

development of Las Palmas culture. Previously, Paul Kirchoff (1942) suggested that the prehistoric migration into Baja Peninsula resembled a "layer cake," where groups migrated in one wave down the length of peninsula from top to bottom and then occupied discrete parcels of land on a static basis. The settlement of these discrete groups stacked on top of each other such that the cultural divisions of the peninsula resembled the layers of a cake. Makato Kowta (1984) challenged the Kirchoff model by examining artifact assemblages along the length of the Baja peninsula associated with artifact and language traditions in the Southwest, Southern California, and mainland México. Revising the "Layer Cake" hypothesis about static migration, Kowta's theory posited that migration took place in two distinct waves, the earlier from mainland México and a second, later wave from Alta California and the Southwest. As a result, the Kirchoff theory and Kowta's subsequently redefinition of Baja migration theory, new opportunities for establishing linguistic and cultural boundaries between Baja California prehistoric groups emerged.

Similar migration studies also occurred reviewing the Las Palmas culture mortuary practices in the Cape Region and mortuary practices for cultures at higher latitudes on the peninsula. The purpose of this study intended to establish the reasons for the cultural boundaries between north and south based on mortuary practice by region. As burial practices between the Cape Region and other parts of the peninsula appear discrete to their language family based on prior research, Tuohy and Van Wormer (1995) left the reason for the regional discrepancy unresolved. However, they did identify the need for comparative research in the California Bight among Channel Islands Chumash as a tool beneficial to strengthening archeological theory in the Cape Region. In this way, Tuohy and Van Wormer were early adopters of a theoretical

framework making comparative and contrasting connections between two discrete but similar culture regions.

The lack of quantitative data or radiocarbon dating associated with Cape Region archaeology provided a narrow scope of understanding about the lifeways of the Cape Region indigenous. Understanding of the culture history of the Cape Region advanced through the efforts of Fermín Reygadas Dahl and Gulliermo Velázquez Ramírez's (1983) *El Grupo Pericú de Baja California*. Reygadas and Velázquez synthesized the early Cape Region excavation data from ten Kate, Diguet, and others and Mexican archaeological sources to establish a more quantative approach to Cape Region archaeology and to offer more complete view of the lifeways, migration, and cosmology of the Pericú of the Cape Region. The Reygadas- Velázquez work is the foundation upon which archaeological theory specific to the Pericú now departs in current Cape Region archaeology.

Historic research also provides insight into the changes and turmoil experienced by Cape Region indigenous groups at European contact, including the indigenous revolt of 1737 and the consequences of European disease introduced to the indigenous populations. Historical documents allow archaeology to reconstruct details about indigenous groups when the archaeological record cannot provide those details. Though caution against bias is necessary, these details may include important information illuminating indigenous-European relations at contact and the way culture contact contributed to the termination of these indigenous groups. Michael Mathes drew heavily from historical documents regarding European contact with Cape Region indigenous groups, including the uneasy relationship between Cape Region groups and the Catholic clergy (Mathes 1966, 1970, 1974). The contributions of historical researchers permit a view of the development of the Cape Region indigenous on a more complete scale.

More practical archaeological endeavors protect Cape Region's cultural heritage through the use of salvage archaeology. Salvage archaeology becomes necessary when modern development permanently removes an archaeological feature or artifacts from the landscape. In the early 1990s, the *Instituto Nacional de Antropología e Historia* (INAH) began a comprehensive initiative to locate, record, and excavate (where possible) archaeological sites in the Cape Region before development in the Cape Region erased many of these archaeological features permanently. Salvage excavation performed at a number of Cape Region locations, including *Babisuri* rock shelter on *Isla Espíritu Santo, El Conchalito, El Médano, Barco Varado, Ensenada de los Muertos #6, Last Tinas #3,* and *Cerro de la Calavera #1*, highlight recent salvage efforts in the Cape Region (Poyatos and Fujita 1998, Fujita 1991, 1993, 1994a, 1995a, 1996a, 1996b, 1998a, 1998b, 1999, 2002, 2003: Fujita 2006, Rosales and Fujita 2000). In all, approximately 450 salvage sites produced additional evidence regarding open air and cave habitation sites throughout the Cape Region. Within these sites, additional evidence of lithic manufacture locales and processes, pictographs, human burials, and others lines of material culture provided additional archaeological data regarding Cape Region groups (Fujita 2006). Salvage archaeology brings controversy to our field, but its methods allow our discipline to extract data otherwise permanently lost to modern development. The inclusion of this data, even in a salvage archaeology context, is better than the alternative of not recovering any data.

Operating in relative isolation, the terminal end of the BCS peninsula is a laboratory for the development of the cultural history of its indigenous groups. The forbidding environment of the peninsula discouraging frequent migration allowed Cape Region groups to develop without additional or frequent contact outside the Ardioamerican area in the Cape Region. Though this chapter is a general overview of archaeological history of the Cape Region; it also reflects

methods of edification regarding indigenous lifeways in the region. The primary goal of this chapter demonstrates the origins of Cape Region prehistory through contributions to archaeological method and theory, both in the Ardioamerican area and as a whole.

The relative infrequency of archaeological investigation in the Cape Region both benefits and suffers from the irregularity of the discipline's attention. Disjointed narratives offer disadvantages about the culture history of the Cape Region and creates gaps in the archaeological record. The result draws attention to the need for more archaeology of the region. However, the benefit lies in the open opportunity for new archaeological investigation and applications for current theoretical models. The history of archaeology thus far conducted in the Cape Region also supports arguments for the cultural and geographic isolation experienced by Cape Region groups, as reviewed in the proceeding chapter.

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