TOMOL'S AND THE "CARRYING OF MANY PEOPLE"

INDIGENOUS CONTROL OF THE SEA IN THE SANTA BARBARA CHANNEL

By

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Major Department; Program in Maritime Studies of the Department of History

The Indigenous Chumash people of the California coast relied heavily upon the wealth of maritime resources that the Santa Barbara Channel provided. In order to access these vast resources, the use of advanced sewn vessels, known as the *Tomol*, were used and were of inestimable importance to the formation of their complex society. It is the purpose of this thesis to analyze the evidence of these vessels at the village site of *Helo'* (site CA-SBA-46) on Mescalatin Island in order to determine what effects Spanish colonization and missionization had on this integral technology. Additionally, this thesis attempts to synthesis a number of different lines of evidence in order to make such determinations. This includes physical remains of vessels themselves if identified, artifactual remains of tools necessary to build *tomol's* as well as the tools used in gathering maritime resources, along with historic and ethnographic records of *tomol* construction and usage. Finally, it is hoped that this thesis will inspire further study of Indigenous maritime cultures in other regions where physical remains of the vessels used are limited or non-existent. By demonstrating that such maritime culture can be studied through

analysis of associated materials, it is hoped that the dearth of information of vessels of which there are limited remains will no longer be left in the dark.

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Definitions and Abbreviations

‘ača - Axe

‘at - People

‘axipe’ni’ – Adze

‘axipenes - Dugout

‘ilil - Ocher

‘ipa’ni’iš – Maul

‘i-stapan - Tule

‘iwi - Knife

Mano - Hand stone

Matate – Grinding stone

Posh – Pinyon pine

qaši - Scraper

qweleqwe’l – Poplar

Šukumaša’aš - Measuring stick

Tak - Pine

ti’at – Carry many people

tipoyoqoni’ -Drills

tiwekeye’eš - Caulking scraper

tomol – Planked boat

tomol ‘i-stapan – Tule boat

tok - Cordage

ušqali’iš - Wedge

wi'ma – Red wood

woqo – Tar

yop – Adhesive

CRM – Cultural Resource Management

BIA – Bureau of Indian Affairs

DOI – Department of the Interior

MLD – Most Likely Descendent

Orthography

The Chumashan language is a difficult language for many English speakers to understand or pronounce. To help bypass this issue for the readers, while still providing the proper recognition to the Indigenous Chumash and their culture, conventional English spelling has been used. While most of the more esoteric linguistic symbols have been removed, those necessary are explained below:

‘ – represents a glottal stop. This precedes all words with begin with a vowel and can often occur in the middle of a word

Š – similar to the ‘sh’ consonant, as in ‘show’

C – similar to the ‘ts’ sound, as in ‘bits’

ɨ - represents a sound similar to the short ‘u’ found in English words like ‘tuck’

č – represents the ‘ch’ sound, as in ‘church’

x – similar to a heavily aspirated ‘h’ in English or a ‘j’ in Spanish

q – represents a ‘k’ sound that is pronounced in the back of the throat

Chapter I

Introduction

Upon entering the Santa Barbara Channel (Figure 1) and encountering the Indigenous population, the Chumash, the Spanish were immediately impressed by the maritime capabilities of the Chumash people. The most intriguing example of these traditions were the planked canoes (Figure 2) called *tomol* in the Barberano language group. These vessels were elaborately made by a specialized and secretive group known as the "*Brotherhood of the Tomol*" by adding planks to a hollowed-out keel (Hudson and Blackburn 1979).

Figure 1: Map of the Santa Barbara Channel (Courtesy of ESRI GIS)

Figure 2: Photo of a *tomol* during yearly crossing (Courtesy of Channel Islands National Marine Sanctuary 2014)

While these vessels were an important aspect of the maritime economic adaptation of the Chumash population, their true value lay in the role they had in the social-political organization of Chumash society. Some archaeologists (Jeanne Arnold 1992, 1995, 2001; Lynn Gamble 2008, 2002, 2003; Linda King 1969, 1982) argue that the *tomol* was one of the primary causes for the development of elite classes that occurred during the Late period (A.D. 1150-1300). *Tomol* owners presumably had control over cross channel trade, the most valuable being the massive shell bead trade, in addition to a monopoly on pelagic fish species and cetaceans, such as swordfish, dolphins, and porpoises. There are those who disagree with this hypothesis, such as Chester King (1990), who, while agreeing that the *tomol* came into being during the Middle period, argues that the socio-cultural complexity attributed to the vessels in question pre-dates their development by approximately 2000 years.

Regardless of their exact date of creation, or their place in the creation of the elite class, the *tomol* was an important tool for subsistence and trade as well as being vital to the complex social system of the Chumash observed by the Spanish. The *tomol* was necessary for the continuation of the socially complex society present, just as that society was necessary for these vessels continued existence; they were locked into an ever-looping system, with each requiring the other to exist. Without these vessels to assist in creating increased stratification and wealth inequality, Chumash society could not have evolved as it did and their loss during colonization had massive repercussions. Likewise, this increase in the ability to concentrate wealth allowed for the construction of the *tomol*.

Vessels

The maritime capabilities of the Chumash communities are well known and records of them are present from first contact. Almost every major expedition through Santa Barbara, both by sea and by land, has descriptions of their skill and vessels. The recorders include: Cabrillo (1542), Cermeno (1595), Vizcaino (1602), Ascencion (1602), Portola (1769), Fages (1769), Constanso (1769), Crespi (1769). Ortega (1770), Anza (1776), Font (1776), Menziens (1793), Vancouver (1793), Shaler (1804), and more. Of course, the majority of the descriptions are of the plank canoe, but there are some historical records of two other types of vessels as well as later ethnographic evidence for one additional type (Hudson and Blackburn 1982; Hudson, Timbrook, and Rempe 1978). Any conversation about the maritime traditions and abilities of the Chumash must begin with a basic understanding of these vessels, only three of which are of importance to this study.

The most basic of vessels mentioned are those made out of reeds. These are called *tomol ‘i-stapan* (Figure 3) by the Chumash, translated to “boat of tule” (Hudson and Blackbun 1982).

These were built by gathering large amounts of tule, making three bundles, and lashing them together into a form of a double ended canoe, after which it is waterproofed with local asphaltum; there is also ethnographic evidence of a similar vessel made with five bundles of tule rather than just three (Hudson, Timbrook, and Rempe 1978).

Figure 3: Photo of *Tomol ‘i-stapan* from Inter-Tribal Pow-Wow (Courtesy of Deborah Dozier, Palomar College American Indian Studies Department)

The next style of vessel is a well-known Indigenous watercraft, the dugout. Called *‘axipenes* in Chumash, which is translated as “finished piece of woodwork,” it is a craft constructed from hollowing out a single large log (Hudson and Blackburn 1982). Like the *tomol ‘i-stapan*, these vessels were also overlooked in favor of the *tomo/ti’atl*, but there is an early record of them from Friar Boscana (1978: 24). This watercraft was described as being “thirty feet long and three or four deep and wide” (Woodward 1934:120). *‘Axipenes* were primarily constructed of willow (*Salicaceae Salix*), but if not available, cottonwood and poplar (*Populous*) were also used. It seems that grain, lack of knots and cracks in the log, as well as the ease of working the wood were more important that the type of material itself (Hudson and Blackburn 1987).

The most important and conspicuous vessel used by the Chumash; however, is the *tomol*, translated as “boat.” These vessels were frameless boats constructed from planks made by splitting redwood driftwood; pine and fir were also used, but redwood was much coveted for the construction of these *tomol*. The planks were beveled and fit edge to edge before being glued together with an adhesive called *yop* that was made of tar (*woqo* in Chumash) and pine pitch. These boards were then sewn together with a twine that consisted of waxed *tok* (Hudson and Blackburn 1987). Seams between the planks were also caulked with organic material and *yop* (Hudson, Timbrook and Rempe 1978; Timbrook 2007).

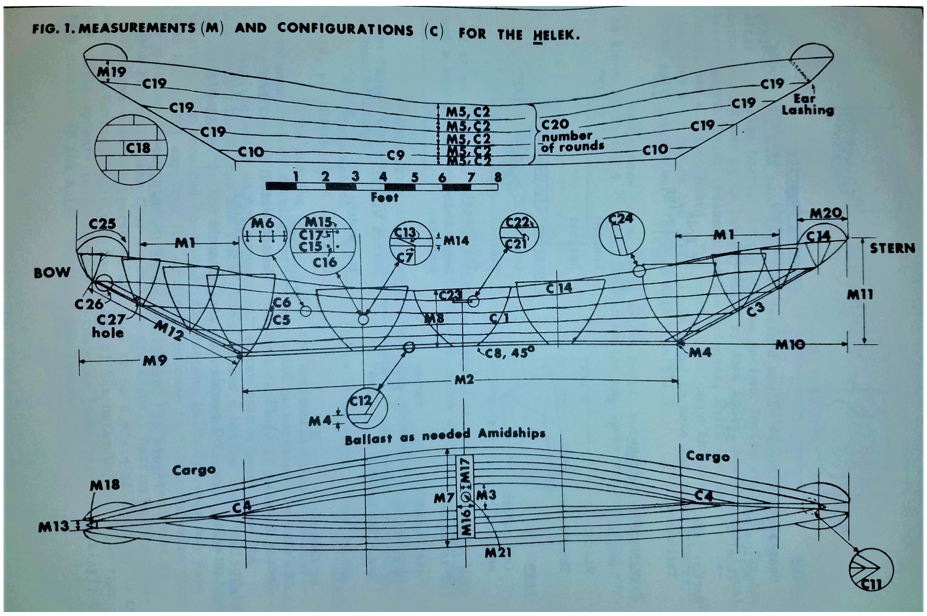

Figure 4: Plans for a *tomol* built by Fernando Librado for John P. Harrington (Courtesy of Santa Barbara Museum of Natural History)

Materials

The importance of these vessels is apparent when reviewing the integration of their raw materials into Chumash culture, and the sheer number of resources used in the construction of Chumash watercraft. In prehistoric times, no less than fifteen different materials were used to build watercraft (Hudson and Blackburn 1981; Hudson and Blackburn 1987; Hudson, Timbrook, and Rempe 1978; Timbrook 2007). This does not include the lithic material, such as groundstone or chipped stone tools, which would be necessary to process the resources needed for the vessel's construction.

The primary material used for this vessel was from the family of *Scripus* or Bulrush. Available along the Santa Barbara Coast are three different members of this family, *Scripus acutus, S. californicus,* and *S. americanus*. Both *S. acutus,* and *S. californicus* were used by the Chumash with the name of *stapan*, as was *S. americanus* which was called *swa'* (Timbrook 2007: 203-204). Noteworthy, only *stapan* was used to make the *tomol 'i-stapan*, not *swa'* (Cunningham 1989; Hudson, Timbrook, and Rempe 1978; Jepson 1925). This may be indicative of a high level of maritime specialization, in which the Indigenous population eschewed the use of certain materials in favor of others when building these watercraft. In order to bind the *stapan* bundles, individually and into the *tomol 'i-stapan*, cordage called *tok* was used (Hudson and Blackburn 1982; Hudson, Timbrook, and Rempe 1978).

There is debate about what *tok* was made with as archaeological remains are rare and there are disagreements between various ethnographic reports. While most consultants cite *Apocynum cannabinum*, or Indian-Hemp Dogbane, as *tok* (Timbrook 2007: 32), it is possible that *tok* was also a general term for all types of cordage. On the Channel Islands, for example, Surf grass *(Phyllospadix torreyi*) called *shkash,* was often used as a replacement of *Apocynum*, which did not grow on the islands. *Urtica dioica holosericea,* commonly known as Giant Creek Nettle and called *khwapsh* by the Chumash, was also noted to be used as lashings for both the *tomol 'i-stapan* and the *tomol* (Timbrook 2007). Consultants referred to the cordage used only as *tok* (Hudson and Blackburn 1987), mentioning the plants used to make it only when asked directly about the particular plant's uses (Timbrook 2007). These vessels were then waterproofed with *woqo*, before being dusted with grounded clay powder in order to remove the stickiness of the tar (Hudson, Timbrook, and Rempe 1978: 27-31; Timbrook 2007: 206).

Materials necessary for the construction of *'axipenes* were much more limited in demand, as all that is required is a large enough log that is clean of knots and cracks. Two such woods used were *Populus fremontii* and *Populus Balsamifera*, which were named *qweleqwe'l* (Timbrook 2007:150). While the Poplar tree, of the *Populous*, was also said to be used, no name has yet been recorded by the Chumash. This is either an indication of its lack of uses to the Indigenous population, or an issue of fact checking by previous ethnographic researchers with their consultants. Willow, *Salicaceae Salix*, was by far the most used of trees for this purpose according to consultants but, like Poplar, it has no recorded name within the Chumash language (Hudson, Timbrooke, and Rempe 1978; Hudson and Blackburn 1987).

The most time and resource extensive of Chumash vessels, the *tomol,* requiring planks, *tok*, and *yop*, captured the attention of early explorers into California. Already mentioned was the cordage used for the lashings of the planks, *tok*, as was the *yop* used as adhesive. This glue was a specific mixture of the pitch from *Pinaceae Pinus monophylla¸* One-Leaf Pinyon, known as *posh* (Timbrook 2007: 142). According to Fernando Librado, a Chumash consultant, *yop* was created by heating up an *olla* (soapstone vessel), filled halfway with high quality asphaltum [*woqo*], before adding two double handfuls of *posh* pitch (Hudson, Timbrook, and Rempe 1978: 50-53, 78-80). Doing this properly was important; if it was incorrect, the *yop* would be either too brittle, from lack of *posh* pitch, or it would not dry and harden properly, from too much *posh* pitch.

Other than the adhesive and cordage, various types of trees were used in the construction of the *tomol*. Of these, the primary and most treasured of wood comes from the Coast Redwood, *Taxodiaceae Sequoia sempervirens*, [*wi'ma*] (Timbrook 2007: 208). Logs were split with wedges to make the planks that were then bent and shaped during construction of the *tomol*. While *wi'ma* was favored, various types of Pine (*Pinaceae Pinus*), called *tak*, were also mentioned as being a tree from which planks were made if *wi'ma* was unavailable (Hudson, Timbrook, and Rempe 1978:46-50; Timbrook 2007:141). This was most likely more prevalent on the Channel Islands where *wi'ma* was an extremely rare and highly prized trade item, but Bishop pine (*P. Pinus muricata*) was easily available (Henshaw 1955).

Tools

All the materials necessary for the construction of all the Chumash vessels required the right tools in order to be gathered and processed. Wood for both the *'axipenes* and the *tomol* had to be collected and worked with various stone tools during the Prehistoric Period before the Chumash adopted European tools from the Spanish. These include the *'axipe'ni'* (adze), '*ača* (axe), *'ušqali'iš* (wedge), chisels, *'ipa'ni'iš* (maul), and *tipoyoqoni'* (tipoyoqoni'). Other tools used for the construction of these wooden craft, especially the *tomol*, include the *šukumaša'aš* (measuring stick), measuring bow, leveling guide, *'ilil* (ocher), caulking tool, *qaši* (shell scraper), application brushes, mixing bowls, *tiwekeye'eš* (caulking scraper) (Hudson and Blackburn 1987). In regard to the *tomol 'i-stapan,* tools were more limited in scope, needing at most *'iwi*, or a knife in order to cut and collect the *stapan* (Hudson and Blackburn 1987).

While some of these tools do not have specific Indigenous names, they are specific to the construction of the canoe, a practice limited to a small group of specialists. As this information came from the Chumash consultants it is possible that they, did not know the names. The researchers interviewing them were also much more focused on gathering information about the Chumash world as a whole, and were not focused on maritime technologies nor did they have the appropriate training or background in nautical archaeology

Research Question

The primary concern of this thesis is to explore the effect that colonialism had upon the maritime culture of the Chumash Indians of the Santa Barbara Channel in California, particularly in regard to the construction and use of their oceangoing vessels. In order to examine this issue, the site of *Helo'*, trinomial CA-SBA-46, located on Mescalitin Island in Goleta will be used (Figure 5). This study proposes to study the changes that occurred within the maritime traditions of the Chumash with the arrival of colonial powers, specifically the Spanish. A key element of Spanish colonial policy, the *reducción,* was the removal of the Chumash population from their native villages to Spanish mission communities where priests could give them religious instruction, vocational training, and most importantly watch over them. As a result, Chumash access to the ocean was severely limited (Walker 2002; Walker and Johnson 2002). With this access denied, or limited, the intricate network of trade and subsistence was disrupted along with Chumash culture as a whole. This thesis will attempt to answer the following questions:

1. What impacts did exploration, colonization, and missionization have on the construction and use of the *tomol* of the Indigenous Chumash at the site of *Helo'*?
    a. Can these impacts be identified in the ethno-historic and archaeological record?
        i. Does the ethno-historic record identify changes in construction or use of *tomol?*
        ii. Do artifacts related to the maritime culture change in or disappear from the archaeological record?

b. Specifically, what can be learned from the study of tools used in the construction of watercraft?

  i. Did the tools of Chumash maritime traditions change between the Prehistoric Period and the Historic Period?

    1. Is this recorded in the ethno-historic record?

    2. Did the amount, material or size change at *Helo'* over time, and is this indicative of changes to watercraft construction?

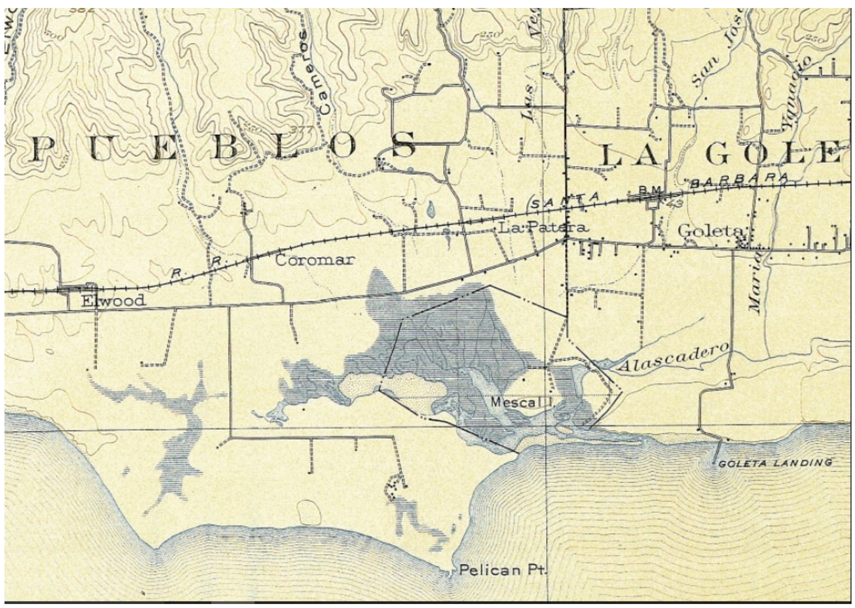

Figure 5: 1903 USGS Engraving of the Goleta Slough including Mescalitan Island (Courtesy of the University of California Santa Barbara).

Methods

With the limited amount of direct physical evidence of Chumash watercraft, it has been difficult for past archaeologist to determine much about them archaeologically. This has led to a reliance upon the ethno-historic record in order to study their construction and evolution. While this evidence has previously focused upon the existence of the planked *tomol,* its date of origin, and its construction, the importance of this evidence should not be regarded lightly, for it can allow for clear understanding of the processes behind these advanced vessels. Ethnographic information is also a valuable resource for guiding us in what to look for in the archaeological record. A review of the available literature will be undertaken, primarily that of Harrington (1917, 1918, 1925, 1927, 1928a, 1928b, 1934a, 1934b, 1935), John Johnson (1982, 1988, 1990, 2000, 2001) and Arthur Woodward (1932, 1934, 1938). As mentioned previously, there were a least a dozen tools used in the construction of the vessels themselves, as well as numerous other tools used in the activities practiced in conjunction with the watercraft, the analysis of which can be useful in determining trends in maritime practice.

This is not to say, however, that there is not a wealth of archaeological evidence available for analysis, as Lynn Gamble (2002) made clear in her study on fragmentary canoe planks, asphaltum plugs, asphaltum caulking, “canoe drills”, and model canoes. Similar, but much larger in scope with an emphasis on tools used for social control and maintenance, was Chester King’s (1984) comparative studies on Chumash artifacts which is likely the most complete documentation of the archaeological evidence of the inception of *tomol*. Both Gamble’s (2002) and King’s (1984) studies prove that extensive studies of watercraft can be undertaken with no actual watercraft available by analyzing the tools used, as do the studies of other prehistoric California archaeologist (Arnold 2001: Arnold and Bernard 2005; Brian 2004; Rose 2000). This can also be applied to other technologies, such as fishhooks, harpoons, and nets, which can be directly connected to open sea hunting and fishing (Arnold 1992; Bennyhoff 1987; Benard 2004; DuBarten 1992).

This thesis will follow the work these archaeologists have conducted, with their clear identification of canoe *tipoyoqoni'*. By studying and charting the changes of tool assemblages collected from excavated Chumash sites over time it should be possible to study the changes in Chumash culture and organization that they represent. Changes to be studied include the volume of the tools related to *tomol* and Chumash maritime practices, as well as the amounts of use-wear on these tools and any changes in form that may indicate shifts in construction techniques. In order to conduct this research, it is necessary to first identify these artifacts as having been used for canoe construction. Use-wear analysis will be useful in this process, along with the comparative collections available at UCSB. Adding this to a strong literature review that emphasizes the importance and evolution of the *tomol* in Chumash society, as well as studies on their construction and remains, a framework can be built to identify cultural resouces related to canoe construction.

A single site that has been extensively excavated and recorded, *Helo',* will be used as the basis for this study. *Helo'*, Trinomial CA-SBA-46, is located on Mescaltine Island in Santa Barbara As this village was a large, wealthy, and politically powerful Chumash center at the time of European Contact, before declining to the point of abandonment ca. 1803, it is a perfect subject of this thesis. Furthermore, it was closely integrated with the nearby Spanish Mission and Presidio located in Santa Barbara, while continuing to keep its independence until its abandonment.

Helo' is a perfect site to study the effects of missionization and colonialism on maritime culture for a number of reasons. Fr. Juan Crespi's diary provides the best narrative of the first Spanish land expedition up the California coast in 1769, noting that of seven "native" communities existing on the shores of the Goleta lagoon, the largest seemed to be the village on the island. He later estimated that 100 houses existed on the island and assessed its population at about 600 to 800 residents. He also noted that sixteen canoes were used by the island inhabitants for fishing offshore and for traveling back and forth to the shores of the lagoon (Brown 1969, Piette 1947).

Another reason for its use as a point of study is due to its long period of existence during the Historic Period. Most likely due to its insular nature of being an island within a lagoon, the rate of conversion of the residents of *Helo'* proceeded much more slowly than for other Goleta Slough settlements (Johnson 1989). This should mean that the effects of missionization on Chumash culture within a village can be more clearly identified and studied. Important to note is that three "chiefs" from *Helo'* were baptized on May 18 with another chief baptized the following day during the final migration to Mission Santa Barbara (Gamble 1990). The fact that *Helo'* possessed at least four chiefs indicates that it ranked among the more important political centers in the Chumash region, matching its larger and more important neighbor *S'axpilil.*

Looking at this site will allow for an in-depth analysis of the effects of the missions on the maritime culture due to the size and importance of the village, its close proximity to the Santa Barbara Mission, and its long period of occupation during the Historic Period, past even that of its larger neighbors. The excavations by UCSB, Berkely, the Smithsonian, and SRS provide a plethora of material for study, with the UCSB and SRS excavations undertaken using modern scientific methods. Furthermore, Mission Santa Barbara and its interactions with the Indigenous population has been well studied and reported on, allowing for interweaving the two stories together. While this will not answer overarching questions about change among the Chumash maritime culture through the whole of their sphere of influence, it will answer the questions posed at this specific site which can then be used in comparisons to other sites.

The UCSB Repository for Archaeological and Ethnographic Collections has a number of large collections of artifacts from this site curated. Efforts will be made to consult with the collections manager at the repository in order to identify relevant watercraft-related collections from *Helo'* for the study. A particularly useful source in narrowing down collections is Dr. Lynn Gamble, Collections Manager of the UCSB repository, who conducted extensive work in the area of maritime tools as well as at the site that is the focus of this study. In addition to these collections at UCSB, there are comparative collections from other sites held at the Los Angeles Museum of Natural History, the Phoebe Hearst Museum of University of California Berkeley, the Santa Barbara Museum of Natural History, and the Smithsonian Museum of Natural History, including replicas and recreations of *tomols/ti'ats*.

Previous archaeologists who excavated CA-SBA-46, determined the stratigraphic dates of deposits based on associated historic materials and *Olivella* bead typology (Mason 1990; Gamble 1990; Gamble 1991). Thus, this study with not undertake to date the contexts within the site but use existing dating schemes. As this data has been collected by previous archaeologist, there are some problems that may arise. First and foremost is the lack of information; by relying on the work of previous archaeologist, this study is dependent upon access to the data available. In some cases, this data may have been lost, or even never recorded. This ties in with a second issue, the excavation itself. Archaeological techniques have advanced from when these sites were first excavated, and some important data may be missing because of this.

A quantitative and qualitative analysis of these assemblages will be undertaken in order to examine the stated research questions. Data to be collected includes the amounts, materials, and use-wear of the tools, which will be used to extrapolate changes in the vessels they are used to construct. By determining a change in the volume of these artifacts through chronological and stratigraphic periods, it may be possible to determine a matching change in *tomol* production. As these tools were likely used only by members of the *Brotherhood of the Tomol,* and only a limited number of them necessary for each member's tool kit, an increase or decrease in the volume of these tools may indicate an increase or decrease in the numbers of members. These changes can be argued to directly correlate with an increase, or decrease, in the volume of *tomol* being constructed. The same argument can be used in regard to asphaltum. While asphaltum was used in a number of ways, such as for hafting, waterproofing of baskets, and in the creation of shell dishes, large increases in the volume of asphaltum at a site can indicate increases *tomol* construction if there is no commiserate increase in artifacts related to the other uses of asphaltum.

Changes in the use-wear of such artifacts, can offer further qualitative evidence to support changes in the construction of the *tomol.* As only a limited number of individuals are reported to have been members of the *Brotherhood of the Tomol*, the use-wear on their tools would indicate how often they were used. If demand for *tomol* increased or decreased, the increase or decrease of the use of the tools may be represented through the use-wear upon the artifacts. When tied together with changes in volume of these tools present, an understanding of the numbers of people constructing *tomol* may be extrapolated. However, there are a number of factors that limit this correlation including but not limited to a range of pre and post-depositional natural and cultural site formation processes such as: intra-site distribution, differential preservation, archaeological collection strategies, hardness of wood, and disposal patterns.

The types of materials used for the creation of these tools will also be analyzed qualitatively. In the pre-contact era of the Chumash, *tomol* construction tools were made out of shell, bone, and stone. The majority of these tools, such as *tipoyoqoni'*, were made with microcrystalline or cryptocrystalline silicates known as chert, as is common with many Indigenous groups throughout North America. The lithic materials commonly used by the Chumash were obsidian, fused shale, chalcedony and chert, which can be split into a number of different geological types. The primary types of chert in the Santa Barabara Channel include Monterey Chert, Franciscan Chert, Tremblor Chert, and Santa Cruz Blonde Chert. Each of these materials arguably held different levels of importance to the Chumash due to various elements; ease of flaking, availability, sharpness, ability to last, and size of raw material to name a few. Changes in the materials of these tools, either between types of chert or to materials introduced by the Spanish, such as ceramic or iron, while indicative of access restriction or other issues, could also indicate change in construction of *tomol.*

This is also applicable to the other materials that will be studied. The materials used to construct the vessels would be particularly useful in this regard, as there is a clear importance ascribed to the vessels themselves, as well as the woods used in constructing the *tomol*. The *tomol 'i-stapan* and the *'axipenes* were used for different tasks than the *tomol*. The use-wear on tools can indicate the materials on which they were being used on. In relation to the *tomol* specifically, by identifying the woods used for their construction, *wi'ma* compared to *tak,* their value can be measured.

In addition to tools, data in regard to volume and material will be collected on other artifacts connected to maritime vessel construction such as asphaltum plugs, boat remains, and *tok*. It is expected that the quantity and size of these artifacts may be representative of the same within the construction of the vessels themselves. This data will primarily be supporting evidence as remains of these artifacts are rare and difficult to study. Further supporting evidence will be found in an analysis of fishing and sea mammal hunting implements, such as fishhooks and harpoon barbs, and a review of dietary changes. This quantitative information can be used to study the effects of Spanish colonization upon the Chumash maritime traditions, in a number of ways. The volume of tools identified within the assemblages may provide information related to the volume of canoe builders present, as well as the volume of production of the *tomol.* This will be strengthened by the use-wear analysis on the tools, mentioned above. Matching changes in materials associated with *tomol* construction will also be a strong identifier of changes in maritime practices.

Theory

This study emphasizes the necessity of the scientific methods, with middle range theory bridging the gap between the material archaeological remains and the non-material aspects of the culture from which it came. However, it is impossible to ignore the subjectivity of the archaeologist studying and presenting the data (Tschauner 1996). This fits with the principles of middle-range theory that allow for the reconstruction of behaviors that only then can be interpreted (Schiffer 1976). Furthermore, it is the analysis of various types of material culture to be used in order to independently verify each other as observational frames of reference that truly solidifies this in regard to the framework of middle range theory (Saitta 1992).

Middle range theory, however, is just the framework within which this thesis hopes to investigate. Historically, archaeology has relied exclusively upon Western theories, methods, practices, and knowledge (Colwell-Chanthaphonh et al 2010). This is especially evident when looking at studies dealing with colonialism, which exclude the very people who could be said to have the greatest claim, the Indigenous populations. As these populations were being decimated by the effects of colonialism, their lifestyles and history were being claimed by Western archaeologists and anthropologist who used the Eurocentric nature of their knowledge in order to analyze, write, and even teach, Indigenous culture and heritage (Atalay 2006). In doing so, archaeologists have only further marginalized Indigenous populations and participated in the destruction of their identity. As research of this thesis is integrally tied with the Chumash population, it is necessary to use decolonizing methods and ethics that are not just for, but with, the Chumash. This requirement is not only for archaeologically trained Chumash, or Chumash Native American Monitors, but the Chumash community as a whole; the knowledge and history being uncovered is theirs.

Limitations

There are clear limitations to this thesis. For one, it requires a broadness of study to truly do justice to its focus. Separate lines of evidence must be drawn upon, each having been studied individually by archaeologists for their entire career. With the work and information available, only a small section of the true history of the Chumash has been uncovered. This thesis cannot hope to cover even a fraction of the available information, but only by combining these lines of evidence can a more complete understanding of the Chumash and their maritime traditions come to be. Only with a solid understanding of the period being studied, and the various possible effects on cultural change, can the focus of this thesis be grasped and studied properly.

There is also the issue with the availability of assemblages to study. Collections of these sites are scattered across a number of institutions and museums, with some assemblages split between two institutions. Furthermore, the number of artifacts necessary to make a definitive statement on this topic may not be available, which is why evidence of subsistence and ethno-historic documentation, along with a strong literature review must also be used. A more complete understanding of the topic may come from this, but it is also possible that it may bias the study as a whole, particularly in regard to the literature review.

Much of the available literature emphasizes terrestrial sites and their relation to the Chumash sphere of influence. Subsistence, trade, and the Chumash rise to political chiefdoms has been the focus of most studies. The maritime aspects of their culture have been left largely untouched, with the little research that has been conducted primarily engaged with its use only in transportation and control of goods. Furthermore, the lead researchers are not specialists in maritime studies or even trained in the field of maritime archeology. This has lent a bias to the information in the available literature, both archaeologically, historically, and ethnographically. As the sheer amounts of the collected physical remains limit the amount of work that can realistically be conducted, literature is left to fill the gap. Yet the biases, and aims of it itself, limits what can be gleaned from its pages.

Indigenous involvement can also be problematic, as only by including the local Chumash into this study can it be successful. Failure to include Indigenous people into archaeological studies and excavations has plagued the field for the entirety of its existence, and has formed a divide of distrust between archaeologists and Indigenous populations, including the Chumash. Surpassing this divide may be difficult. Additionally, with the disintegration of Native American culture caused by decades of aggressive legislation, forced migrations, destruction and theft of land, as well as other issues caused by colonialism and United States expansionism, much information has been lost. This is not to say that what has been passed down, or what is currently practiced, is any less “authentic Chumash” for it is an expression of the Indigenous populations’ choices in gathering what they want from the colonizing forces that beset them and make them their own. In relation to this is the debate over who is "really Indian". Snipp (2000) thoroughly examines the numerous criteria used to assign tribal identity, as well as agendas that are attached to them. Snipp concludes that in the end, the contemporary criteria for tribal membership are the prerogatives of sovereign tribes. As such, any evaluations of authenticity, regardless of it coming from the subject or the investigator, should be respected within this principle.

The final limitation of this study is due to the fact that it is a study of not only a concept, but one in which the primary physical evidence is extremely limited, if not non-existent. No complete Chumash watercraft has ever been located in an archaeological context, leaving only fragments of evidence to be uncovered during excavations. As stated previously however there are lines of evidence that can be used to infer the presence of these vessels, and these same lines of evidence can be used to examine culture change. The first line of evidence is the presence of tools and materials that have been shown to be used for the manufacture of plank canoes. Jeanne Arnold states, supported by Chester King and Lynn Gamble, that indicators of canoe making include discarded redwood planks, cakes of asphaltum, large tipoyoqoni', and related gear (Arnold 1995).

Justification

The study of Indigenous archaeological and cultural heritage resources can be traced to the very beginning of the discipline of archaeology. There has been a reluctance, however, to study the maritime traditions of these populations, one that has long been held as justifiable for three distinct reasons. Maritime archaeology is a growing discipline, just now graduating into adulthood. This early lack of recognition as a legitimate archaeological field of study has plagued the use of such studies in Indigenous populations, being passed over in favor of a terrestrial emphasis as has been the case for centuries. While archaeologist have begun to address this lack of knowledge, they have come up against a wall, the lack of extant materials. Archaeology, particularly maritime archaeology, has always emphasized the use of existing materials. To study hunting practices, it is necessary to study the remains of traps, arrows, spears, and their ilk; to examine foodways, one must look at bowls, baskets, utensils, etc. In order to look at maritime traditions it is necessary to look at docks and the remains of vessels, but in the case of Indigenous populations they are extremely limited. This issue is further compounded by the distinct lack of recognition towards Indigenous watercraft as "real" ships; canoes and rafts made of hollowed-out logs or bundled reeds simply do not inspire the same adrenaline as a 1733 plate galleon and so are left to languish by the wayside.

While these vessels may not have the same visceral attraction as ships from the Age of Sail or the great fleets of Greek triremes, they are just as important especially in regard to the Chumash communities. Technological advancements in various fields, such as irrigation, storage, and transportation, have a long history of recognition as catalysts in the development sociopolitical complexity throughout the world. This is especially true in regard to boat technology of groups reliant upon maritime resources, as reliable vessels are an integral innovation for the intensification of maritime resource acquisition and long-distance exchange (Arnold 1995; Kirch 1991; Yesner 1980). In regions where water transportation is feasible, boats are efficient means of moving goods, people, and information. With advancements in substantial and reliable vessels, exchange is enhanced which increased access to resources, including prestige goods, marriage partners, and knowledge (Gamble 2002).

Numerous archaeologists have indicated that the innovation of the *tomol* played an equally important role in creation of Chumash sociopolitical complexity as well as the economic and power inequality that was observed by early Spanish explorers (Arnold 1995, 2001, 2007; Arnold and Munns 1994; King 1982, Gamble 2002, Fagan 2004). It has been suggested that the control of transportation and the distribution of goods was an important avenue for individuals to organize labor, and that control of exchange between the mainland and the Channel Islands by the canoe owners was fundamental to the rise of hereditary leadership among the Chumash populations (Arnold 2001, Gamble 2001). Yet discussion regarding changes in these vessels over time is nonexistent. It is the goal of this publication to bring this important aspect of Indigenous maritime traditions to the forefront of the debate about culture and to further address the effects of colonialism upon Chumash traditions and identity.

Chapter II

Background

The Santa Barbara Channel, as the center of Chumash culture and having a long history of archaeology and anthropology in the area, is the regional focus of this thesis. This area is defined as the Santa Barbara sub-region of the Southern California Archaeological region (Moratto 1984). The Southern California Archaeological Region extends south from Morro Bay all the way down the Pacific coast to the border of Mexico, with the Santa Barbara sub-region lying between Mono Bay and Santa Monica. The environs of these regions have been determined by the geography/geology of the area and has had clear effects upon the development of the cultures lying therein.

The coast of Santa Barbara County (Figure 6) is considered to be the western extension of the Transverse Ranges of mountains, the only east/west mountain range in California. These ranges include the Santa Ynez, San Miguel, Santa Monica, San Gabriel, San Bernardino, Eagle and Orocopia Ranges, extending approximately 500 kilometers from their beginning in the Mojave Desert in the east and ending at San Miguel Island in the Pacific Ocean in the west. The Channel Islands of Santa Rosa, Santa Cruz and San Miguel are actually semi-submerged peaks of the Santa Monica Mountains (Jones 1991; Moratto 1984; Morris and Webb 1990). Their existence, as well as the peculiar southward orientation of the Santa Barbara Channel, has lent a protection to the coast from the prevailing winds and heavy surf not blessed to the rest of California's coastline (Glassow et al. 1988).

The Santa Barbara sub-region is characterized by varied coastal and mountainous zones, where erosion has cut massive canyons into the sediments that make up the Transverse Ranges. While the area is warmer and dryer, as well as less foggy, than the rest of the central coast region it receives sufficient rainfall necessary to support a diverse environment; from Santa Barbara south to the Mexican border, the coast averages 45 centimeters of rainfall per year (Baumhoff 1978; Moratto 1984).With the mainland coast protected by the Channel islands of Anacapa, Santa Rosa, San Miguel, and Santa Cruz (Moratto 1984:116), the coast is much less rugged than that to the north and consists of long stretches of rocky, sandy, and protected coast interspersed with rich estuaries and lagoons created during the Early Holocene. As sea levels rose between 8000-5000 B.P. California experienced what Carbone (1991:13) referred to a "heyday of estuary and lagoon development". This transition to an estuarine and lagoon environment provided the perfect habitat for marine, avian, and small terrestrial populations (Carbone 1991:12) that made the region perfect for settlement by Indigenous populations.

The Channel itself forms the northern end of what is called the Southern California Bight which, starting at San Diego to the south, extends north to Point Conception. In this section of the Bight, the coastline shifts east and there exists an area of islands, canyons, and ridges that forms a complex benthic topography (Norris and Webb 1990).

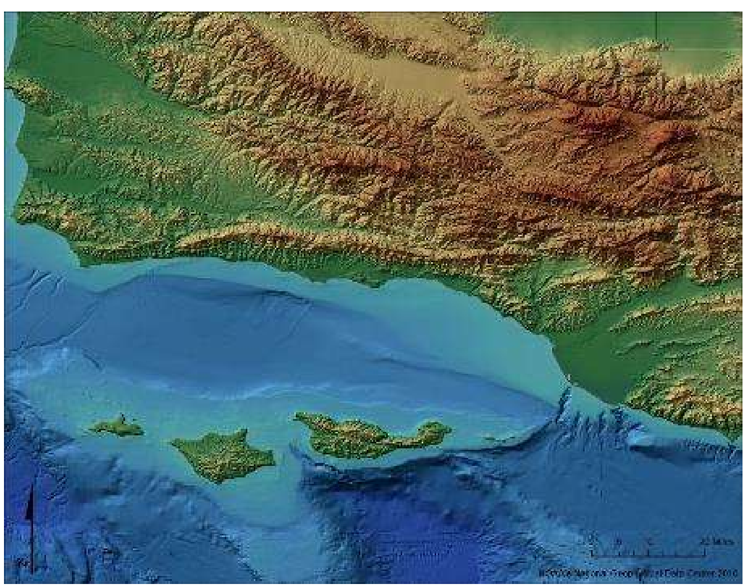

Figure 6: Elevation map of Santa Barbara Channel (Courtesy of ESRI GIS)

The Holocene (10,000 BP to the Present) California environment is best described as a sub-humid or semiarid Mediterranean climate split between two seasons; the cool/moist season and the warm/dry season that are seen today. The native vegetation of coastal southern California mirrors that found in other warm Mediterranean type climates. The wooded areas of the Santa Barbara region are Southern Oak Woodland type dominated by Coast Live Oak and Englemann Oak (Baumhoff 1978:22) with the coniferous trees existing primarily in small stands of closed-cone forest (Jones 1991:427). Grasslands in the region are rare and are primarily confined to the Channel Islands, though some are present in portions of Santa Barbara and San Luis Obispo counties. The majority of vegetation is clearly dominated by *Sclerphyllous* communities such as Coastal Sagebrush, Chaparral and Southern Oak Forest (Kuchler 1977; Jones 1991:427).

The lagoons estuaries, and riparian wetlands are few and far between in the region. Though fragile, they were ecologically important due to their high levels of resource productivity that are not proportionate to their distribution (Grewell, et al. 2007). These environments change seasonally, shrinking to the point of temporary disappearance over periods of time. In addition to being suppliers of freshwater, they maintain a much higher biodiversity than the surrounding shrub or grassland communities, which can only be compared to that available in the ocean. Throughout Southern California large herd animals were rare, although populations of elk, deer, and pronghorn antelope existed (Baumhoff 1978:16). Most of the terrestrial animals were small mammals such as rabbits.

While the intertidal zone is small, it is by far the most diverse and productive, in regard to resources, of the entire region. While it is primarily organized into rocky and sandy shores, bays and estuaries are known to form in protected coastal areas and are included in this zone. There is a wide variety of shellfish available in the intertidal region, most notably of which California mussel, various abalones, barnacles, sea urchins and Olivella. While these are primarily found in the rocky intertidal zone, there is also a diversity of shellfish available on sandy stretches, comprising of a number of clams such as Pismo clam, the California jack-knife clam, and the California Venus. While fish do exist within this region, they are usually tiny and short-lived species, though the intertidal does serve as a nursery ground for many offshore species (Cross and Allen 1993; Horn and Martin 2006). While there are some species of sharks and rays that enter the surf zone, the majority of species present are juveniles, with the exception of elasmobranchs such as the leopard shark, grey smoothhound, round stingray, and the shovelnose guitarfish (Macdonald 1976).

Similarly, the subtidal environment is also productive and diverse, with environments supporting large numbers of fish and marine mammals (Table 1). The kelp bed alone is home to over 50 different species of fish including California sheephead and various rockfish species. Inside the kelp beds, the primary species include white croaker and queenfish, along with the shiner surfperch and the white seaperch (Allen and Pondella 2006). Some flatfish species such as the California halibut are found here along with various ray species such as the thornback, the big skate, and the California skate (Allen and Pondella 2006; Cross and Allen 1993).

Table 1: Shellfish resources, their habitat, and requirements of *tomol* use.

Species	**Vernacular**	**Habitat**	**Tomol Use**
Chione spp.	California Venus	Lagoon/Intertidal	No
Saxidomus nuttallii	Washington Clam	Lagoon/Intertidal	No
Ostrea lurida	California Oyster	Lagoon/Intertidal	No
Protohaca spp.	Littleneck Clam	Lagoon/Intertidal	No
Argopecten sp.	Scallop	Lagoon/Intertidal	No
Olivella biplicata	Purple Olive	Beach/Intertidal/Subtidal	No
Macoma spp.	Macoma	Beach/Intertidal/Subtidal	No
Tivela stultorum	Pismo Clam	Beach/Intertidal/Subtidal	No
Mytilus spp.	Mussel	Rocky/Intertidal/Subtidal	No
Halitosis spp.	Abalone	Rocky/Intertidal/Subtidal	No
Balanus sp.	Barnacle	Rocky/Intertidal/Subtidal	No
Astraea undosa	Wavy Top Turban	Rocky/Intertidal/Subtidal	No
Acmaea sp.	Limpet	Rocky/Intertidal/Subtidal	No

Past the kelp beds in the open sea, there exists a wide variety of species within the offshore pelargic zone (Table 2). These pelagic species are organisms that survive within the water column as opposed to at the bottom. Of note is that many subtideal species move between the nearshore environments and pelagic environment (Cross and Allen 1993). The majority of the pelagic species are schooling fish, including the northern anchovy, Pacific sardine, Pacific pompano, chub mackerel, and jack mackerel. Larger fish species in the offshore zone include the albacore, Bluefin tuna, swordfish, and ocean sunfish (Allen and Cross 2006).

Sea mammals, such as sea lions, sea otters, seals, and dolphins, are prevalent throughout the Santa Barbara channel (Koerper 1981 Jones 1991; Baumhoff 1978, Bonnell and Dailey 1993; Schoenherr, et al. 1999). They occupy a variety of habitats and many live both on land and in the ocean, involved in multiple levels of the ecosystems (Table 3). The Santa Barbara Channel is even well known for its yearly migrations of whale populations which, while never hunted by the Chumash, was a resource used when their carcasses washed ashore. It must also be observed that seal and sea lions are rare on mainland's coast and all mating colonies are presently located on the islands (Bonnell and Dailey 1993). It should also be noted that it is possible to hunt and kill dolphins without sea going vessels but that there are no records, historic or ethnographic, that mention the Indigenous Chumash using such practices.

Table 2: Fish resources available, their habitat, and requirements of *tomol*

Species	Vernacular	Environment	Tomol Use
Amphistichus argenteus	Perch	Surf Zone	No
Rhinobatos productus	Shovelnose Guitafish	Surf Zone	No
Squatina californica	Pacific Angel Shark	Inshore	Yes
Myliobatus californianus	Bat Stingray	Inshore	Yes
Raja spp.	Skate	Inshore	Yes
Semicossyphus pulcher	California Sheephead	20-100' over rocky bottoms in kelp beds	Yes
Sebastes spp	Rockfish	180-600' over rocky bottoms	Yes
Sphyraena argentea	California Barracuda	Surface to 60'	Yes
Genyonemus lineatus	White Croaker	10-100' over sandy bottom	Yes
Paralichthys californica	California Halibut	Up to 200' over sand or mud bottoms	Yes
Sarda chiliensis	Pacific Bonito	Near surface in open ocean	Yes
Scomber jabonicus	Pacific Mackarel	Surface-150' in open ocean	Necessary
Sardinops sagax	Pacific Sardine	Open ocean and near shore	Yes
Engraulis mordax	Northern Anchovy	Open ocean and near shore	Yes
Squalus acanthias	Spiny Dogfish	Near shore and open ocean	Yes
Merluccius productus	Pacific Hake	Sub-surface in open ocean	Necessary
Seriola dorsalis	Yellowtail	Open ocean	Necessary
Euthynnus pelamus	Oceanic Skipjack	Opean ocean	Necessary
Trachurus symmetricus	Pacific Jackmackerel	Open ocean	Necessary
Xiphius gladius	Broadbill Swordfish	Open ocean	Necessary
Atractoscion nobilis	White Seabass	Open ocean	Necessary
Isurus oxyrinchus	Soupfin Shark	Open ocean	Necessary
Galeorhinus zypoterus	Soupfin Shark	Open ocean	Necessary

Table 3: Sea mammal resources available, their habitat, and requirements of *tomol*

Species	Vernacular	Habitat	Tomol Use
Arctocephalus philippii	Guadalupe Fur Seal	Rocky Coast	Yes
Callorhinus ursinus	Alaska Fur Seal	Pelagic	Yes
Delphinus delphi	Common Dolphin	Opean Sea	Necessary
Enhydra lutris	Sea Otter	Shallow Coast	Necessary
Eumatopias jubatas	Stellar Sea Lion	Pelagic/Coastal	Yes
Lagenorynchus obliguidens	Pacific Stirped Dolphin	Open Sea	Necessary
Mirounga augustirostris	Elephant Seal	Island Coasts	Yes
Phoca vitulina	Harbor Seal	Coastal	Yes
Zalophus californianus	California Sea Lion	Rocky Coast	Yes

Paleoclimates

The climate of California has changed significantly during the last 10,000 years, marked by six relatively cool/moist periods separated by five warm/dry intervals, each lasting between 400 and 1500 years (Erlandson 1985:107). Between 2900 and 1500 B.P. the climate was one of cool/moist conditions, shortly followed by a warm/dry episode between 1500-600 B.P. Between about 600 and 100 B.P. California's climates were essentially like those of the early historic period observed by the Spanish. Current data suggest that the most recent cool/moist trend, beginning around 600 B.P., reached its maximum height at approximately 200 B.P. before returning to the generally warmer/dryer conditions of today beginning AD 1860 (Moratto et al. 1978). These environmental are largely attributable to the process of sea-level fluctuations (Erlandson 1985). Data shows that between 16,000 B.P. and 6,000 B.P. the California coast saw rapid rise in sea levels, at one meter per century (Pisias 1978). One of the effects of these rising sea levels was the creation of estuaries and lagoons in coastal canyon mouths, and after about 6,000 B.P. sea levels stabilized near their present level preserving the aforementioned landscapes (Colton 1989), thereby providing the perfect environment for the development of the Chumash culture.

Pre-Historic Period

The local prehistoric chronology is divided into four distinct major periods: Paleoindian, Early Period, Middle Period, and Late Period. For the purpose of this thesis, the focus will extend from the end of the Early Period into the Historic period, as these are the periods where the maritime tradition should have the largest cultural effect and archaeological footprint. With an understanding of the changes in Chumash culture and practices throughout their existence, and their representation in the archaeological record, the determination of changes during the Historic Period will be more likely.

Paleoindian

It is generally accepted that humans entered the New World during the latter part of the Wisconsin glaciation between 40,000 and 20,000 years before present (B.P.). The earliest unquestioned evidence of human occupation in southern Santa Barbara County is dated to between 10,000 to 8,000 B.P. (Erlandson and Colton 1991). The California Indigenous people during this time had a diet that emphasized the hunting of Pleistocene megafauna, such as mammoth and bison. Various plants and other smaller animals were most likely a part of their diet during this time, as were various marine resources. When the availability of large game was reduced by climatic shifts near the end of the Pleistocene Era, the local Paleoindian subsistence strategies changed to a reliance upon these other resources.

Early

Chester King (1981, 1979, and 1974) has defined the Post-Pleistocene changes in climate and environment that are reflected in the local archaeological record at approximately 8,000 B.P. as the beginning of the Early Period. This period of the Santa Barbara Channel was originally defined by Rogers (1929), in regard to the mainland groups, who called it the “Oak Grove” Period. The primary diagnostic features of this period are the *mano* (handstone) and *metate* (grinding stone) milling stones, which were used to grind hard seeds such as chia and pinon nuts for consumption. It is toward the end of the Early Period, where evidence of sea mammal hunting to supplement the local Indigenous subsistence strategies appears (Glassow et al. 1990). This could be an example of the earliest evidence for larger, ocean going canoes, as such vessels would be needed in order to capture and kill these large sea mammals, though no clear evidence for planked canoes has ever been identified from this period.

Middle

The Middle Period, which extends from 3,350 to 800 B.P., is characterized by larger, more permanent settlements, and is related to a generally wetter environment. Materials at the sites of this period indicate a much greater reliance on marine resources, with middens including substantial amounts of marine shells, fish remains, and fishhooks. There is another major shift in diet and subsistence as well, transitions from seed gathering to acorn gathering; this is indicated by the shift away from the *manos* and *metates* of the Early Period to stone mortar and pestles. This change is a result of cooler temperatures and the growth of expansive oak woodland habitats. Terrestrial faunal resources continue to be an important aspect of Chumash subsistence which is evidenced by the continued presence of contracting-stemmed and corner-notched projectile points in these sites (Bamforth 1984). It is near the end of the Middle Period that evidence for the development of the plank canoe, is first identified by Jean Arnold (1987), which made ocean fishing and trade with the Channel Islands both safer and more efficient. As seen by the changes in the Late Period, this technology demonstrates clear importance of maritime practices to the Chumash population.

Late

850 to 200 B.P. (approximately A.D. 1150 to 1800) was a time of increased social and economic complexity that has been termed the Late Period. The increased number of permanent and semi-permanent villages clustered along the Santa Barbara Channel is evidence of this. The diversity of environmental site settings in which sites have been identified indicates a substantial increase in prehistoric population. A matching increase in villages on the Channel Islands is

indicative of consistent use of ocean going vessels, are the extensive trade networks that expanded, playing an important part in local Chumash culture, reinforcing status differences, and encouraging craft specialization (Arnold 2001; Gamble 2008). Shell beads, which have been found throughout the Early and Middle Periods, increase dramatically in number and variety, clearly related to status and social value (Arnold 1992, 2001; Gamble 2008; Jones and Klar 2007). The protohistoric culture of the Chumash was terminated by the arrival of a Spanish expedition led by Gaspar de Portolá in 1769. With the establishment of three Franciscan Missions at Santa Barbara, Santa Ynez, and La Purisima, Chumash culture changed dramatically.

Historic Period

The historic occupation of the region, like the proto-historic era, is divided into distinct settlement periods: the Mission Period (ca. A.D. 1769 – 1830), the Rancho Period (ca. A.D. 1830 -1865), and the American Period (ca. A.D. 1865 – 1915). The most extreme example of change in the region occurred during the Mission Period and can be traced to the construction of Mission San Luis Obispo in 1777, Mission Santa Barbara in 1786, Mission la Purísma Concepcíon in 1787, and Mission Santa Ynez in 1804. This permanently and unequivocally altered the physical and cultural landscape for the regions inhabitants. These missions were the center of Spanish influence in the region, affecting native patterns of settlement, culture, trade, industry, and agriculture (Erlandson 2006; Haas 2013; Geiger and Meighan 1976).

Many of the histories of this time, portray a “clean” or “white washed” view of the mission system; histories that served as propaganda for the colonialism of the Spanish. Conversely, there are the histories of the Indigenous population, which tells a story of a tidal wave of socio-economic disruption, whose epicenter are these same Spanish missions (Erlandson et al, 2006). While conversion and missionization began with the building of the first mission, the disruption of the Chumash became more extreme in 1803, with the decree that converted Indians could no longer live in their native villages, increasing the number of Chumash living in the system from 200 to 1200, and tearing apart even further the already fragile networks between populations (Erlandson et al, 2006). Furthermore, various epidemics, the destruction of the primary food sources (such as acorns) and the loss of their land, created a vortex that pushed more of the Chumash into the missions who may have felt that they had no other choice if they wanted to survive, and a total destruction of their social, political, and religious relationships. With their culture in ruins, some small relief came during the Rancho Era, as they were able to leave the missions and attempt to bring their lives back under their control.

Following the secularization of the Missions by the Mexican Government in 1821, California became part of the Republic of Mexico. The secularization of the local land and a focus on cattle raising is the mark of the Rancho Period, an era in which large land grants of Mission lands were ceded to wealthy, prominent Spanish families. The Chumash population continued to work as laborers for colonial powers and foreigners during this period, though now they were able to move from the missions to life ways reminiscent of their culture in prehistory. While in no way were the Indigenous people able to return to the level they were pre-contact, bonds with their past were able to be strengthened, allowing for much of the ethnographic knowledge we have today to be passed on.

With California reaching statehood in 1850 and the advent of the American Period, farming and more intensive land uses steadily replaced cattle stock raising, which was further curtailed by a prolonged drought in the 1860s. Since statehood, the major forces of regional change during the last 150 years, all continuing to have immense effect upon the Indigenous population, have included railroads, maritime shipping, agribusiness concerns, the oil industry, and various educational institutions.

Post-Mission Period to Present

When discussing the Chumash in the Post-Mission era, it is impossible to ignore how much of their original culture continued, particularly with regards to the island Chumash. The archaeological and ethnographic evidence clearly indicates that many of the Chumash islanders attempted, and succeeded, in creating communities reflecting their pre-historic lives (Arnold 2001). Of particular note is the possibility of watercraft construction, with the large number of canoe builders extant during the Mission Period. According to Harrington's informants, 22 of the 39 individuals who were brought to a mission from the Channel Islands after their 12th birthday were, in some way, connected to the construction of canoes. Furthermore, their significance to the Chumash is indicated in that three of the four "chiefs/captains" were said to be members of the "Brotherhood of the Tomol" and the fourth one was likely a member as well (Arnold 2001:61-62). As has been true throughout the study of the Chumash however, there has been little research dedicated to the maritime traditions and practices. What is known is that the "*Brotherhood of the Tomol*" still exists, in some form, as Chumash descendants make a crossing to Channel Island Santa Cruz every year. The fact that such traditions are still practiced indicates the importance of watercraft to the Chumash, from their early prehistory to the present.

Today the Chumash are still attempting to preserve their traditional lifeways and culture. They are organized into seven separate bands, as they were when they first encountered the Spanish. These include the Santa Ynez, Coastal, Barbareno, San Luis Obispo, Island, Purisimeno, and Ventura Chumash. Of these groups, only the Santa Ynez Band has received federal recognition from the United States government (United State Department of the Interior, Bureau of Indian Affairs [USDOI, BIA]1995: 26829). It governs a small reservation within the Santa Ynez valley that was established in 1901 from the January 12, 1891 act for the relief of the Mission Indians in the State of California (Fifty-First Congress, Session II, Chapter 65). The remaining Chumash Bands have had difficulty in gaining recognition for various reasons. The State of California has not created a formal process for recognition. For purposes of Senate Bill 18, the California Native American Heritage Center has compiled a list of Indigenous groups that meet certain criteria and with which city and county governments must consult when amending a city or county general plan. Those tribes are considered non-federally recognized tribes and California does acknowledge them, however they are not considered 'state recognized' (Martha Salazar, personal communication 2016).

Currently the Santa Ynez Chumash run various culture programs in order to keep Chumash traditions alive. They established a language course to provide students with the necessary skills to speak, read, and write in their native language. Unfortunately, there are no Chumash elder still alive that fluently speaks the language so they have had to rely upon Dr. Richard Applegate (1995), a foremost expert on their language (Santa Ynez Band of Chumash Indians 2016). Another program important to this thesis is the continuation of a traditional maritime practice related to the *tomol.* Every September, a group of descendants from various different Chumash groups embarking upon a crossing of the Santa Barbara channel for a sacred site gathering and a time for celebration. They travel from the Channel Island Harbor in Oxnard to Scorpion Bay on Santa Cruz Island in a tradition *tomol (*Gilbert Unzueta, personal communication 2016)

The Village Site of *Helo'* on Mescalitan Island

When Gaspar de Portola's land expedition into Alta California in 1769 reached the Goleta Lagoon located just north of present day Santa Barbara, his records state that this area was populated by approximately two thousand Indigenous inhabitants from five different villages. One such village was situated upon a relatively small island in the middle of the lagoon, supporting at least eight hundred individuals (Bolton 1927). It is also worth noting that Fray. Juan Crespi observed sixteen canoes that were used by the island inhabitants for fishing offshore and for traveling back and forth to the shores of the lagoon (Brown 1969; Piette 1947)

This island, of 2,425,000 square feet, was given the name Mescalitan Island by the Spanish and the village upon it has long been known as *Helo'*. The name Mescalitan came from soldiers reminded of Mescaltiran, a lagoon in Nayarit, Mexico and the name has continued to stick (Brown 1969; Johnson 1990). There has been some controversy over this appellation, with archaeologists long referring the village upon the island as *Helo'* while many Indigenous informants and consultants refer to the village as *Kwa'* (King 1975; Unzueta, personal communications 2016; Jimmy Joe, personal communication 2017). The name of the village on the island was called different things, *Mescaltitan* by soldiers, *Santa Margarita de Cortona* by Fray. Juan Crespi, and *La Isla* by others, and *Helo'* by yet more, though all names correlate to the historic village of *Kwa'* (Bolton 1927, 1930, 1931). In respect to Indigenous ownership of their history this thesis will refer to village upon Mescalitan Island by its trinomial, CA-SBA-46, *Helo',* or by *Kwa'*. *Kwa'* was first recorded by Fray. Juan Crespi, the record keeper for Gaspar de Portola in August of 1769 who wrote:

> On that island, which is very green and covered with trees, we saw a large town, in which were counted more than a hundred houses. This estuary spreads out to the west, forming many marshes and lagoons upon whose banks there are other towns,

> but we could not learn with certainty how many there were. Nevertheless, some of our soldiers said there were four, making that of the island five, the latter appearing to be the largest….[Portola] made [the Indians] presents of beads and ribbon, with which they were much pleased, and the soldiers traded with them and obtained various curios, such as baskets, feather headdresses and skins. The whole country along the road as well as the which is to be seen from the camp, is extremely delightful, abounding in pasture and covered with live oaks, willows, and other tress, giving signs of its being very fertile land, capable of producing whatever one might wish to plant…in fact [the Indians] brought to the camp so much [fish] that it was necessary to tell them not to bring any more for it would eventually have to spoil (Bolton 1927: 166-168)

While not a goal of this study, it is important for a quick overview of the chronology of *'Helo* and the presentation of this chronology in the stratigraphy of this site. While there is no clear date for first settlement, archaeologists have recovered materials consistent with Early Period habitation all the way up to the Historic Period (Gamble 1990, 2008). Ethnohistoric documents and mission records provide a distinct date, 1805, for the end of habitation at *'Helo.* While it is possible that people continued to live on the island past that point, the last baptism of a resident, a young child, was in 1805 and it is unlikely that people continued to inhabit the site after their integration into the Mission systems, especially with the 1803 decree that no converted Chumash could continue to live outside of the Missions (Johnson 1989, 1990). One would think that this would have large effects upon the more extensive or expensive maritime traditions of inhabitants of *'Helo*, yet in the large baptism surge of 1804 the mission recorded 4 "captains" from *'Helo,* and this from just one-quarter of the village's highest population.

Previous Archaeological Work

Investigation of the prehistoric Indigenous populations of Santa Barbara Channel began in the late nineteenth century, though these could at best be referred to as antiquarians or collectors and at worst, grave robbers. Almost the entirety of the work by these early students of Chumash prehistory was focused in cemeteries, due to the increased possibility of finding whole artifacts of “ritual” or “ceremonial” context. These include those headed by the Frenchman Leon de Cessac, Paul Schumacher, and H.C. Yarrow.

Yarrow, who first excavated on Mescalitan Island, called it the “Big Bonanza” due to its large amount of burial goods (Putnam, Abbott et al. 1879:35-40; Glassow, Johnson, Erlandson 1986). Sadly, their notes were poor, have be damaged or lost, and provide little to no data about their methods or the context of the materials removed. After Yarrow a number of collectors picked over the island, including the Reverend Stephen Bowers (a guide for the Yarrow expedition), Robert Phelan, and Clifford Hill.

The first investigations that could be considered archaeological in nature that occurred in the Santa Barbara Channel can be attributed to David Banks Rogers, beginning in the 1920s. Rogers surveyed almost 100 archaeological sites throughout the Chumash sphere of influence, excavating at a number of them. While he did not excavate anywhere upon Mescalitan island, his work laid the foundation for future studies. Published in 1929, Rogers’ monograph “*Prehistoric Man of the Santa Barbara Channel*” identified three distinct and different cultures that followed each other in time; the Oak Grove people, the Hunting People, and the Canalino, who he argued were the precursors to the ethnohistoric Chumash.

Concurrently, a University of California at Berkeley professor, Ronald Olson, extensively excavated a number of sites throughout the region, including Mescalitan Island. Olson excavated in a total of three cemeteries on the island and summarized his investigations in 1930, dividing the prehistoric Canalino into 3 time periods, Early, Middle, and Late which were preceded by a single and separate Archaic culture (Olson

1930). Following Olson, Richard Van Valkenburgh of the Los Angeles County Museum of Natural History, excavated a number of trenches in the same cemeteries as Olson, as well as one additional cemetery. Van Valkenburgh's results were unfortunately never published, and similar to the earlier collectors like Yarrow, his field notes are damaged, poor, and incomplete (Van Vankenburgh 1934).

While these earlier excavations touched upon the wealth of information present at *Helo'*, it was during the mid-1940's that the largest source of information about CA-SBA-46 is collected. At this time the Santa Barbara Airport was being expanded which was to result in the removal of the western half of the island as well as additional impacts. Before this destruction, Phil Orr investigated a total of eight different cemeteries and delineated three separate locus of Indigenous material culture (Figure 7) which he designated as Sites I, II, and III (Orr 1943). However, he did not excavate outside of cemetery contexts except in Site III. Only in Sites I and III were non-Indigenous materials, such as glass beads and metal, recovered which indicated that location of the village observed by Spanish explorers (Mason 1985).

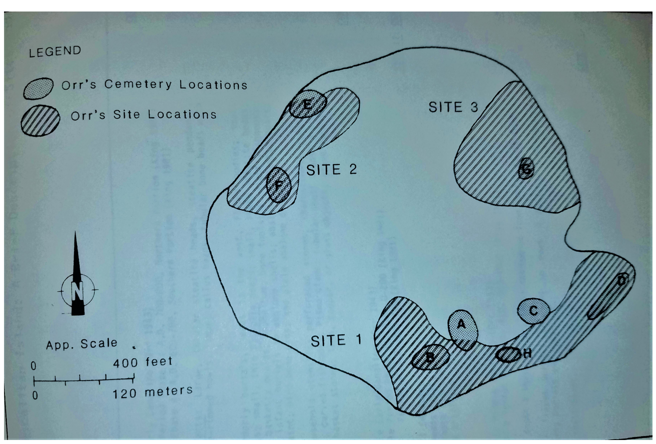

Figure 7: Map of Orr's (1944) site boundaries on Mescalitan Island

Orr's excavations in Site III were confined to delineating the boundaries of the cemetery found within it, though only fragments of human bone were ever recovered despite his extensive trenching throughout the site (Orr 1944). This meant, however, that copious amounts of materials were recovered from this site, though due to Orr's focus upon locating and identifying cemeteries, the excavated midden was not systematically screened. This must be kept in mind when analyzing Orr's (1944) report upon the site, for in that it may not represent the complete assemblage present. It does indicate however, that Site III was not a village locality, due to its lack of the range of artifacts characteristic of a village's activities (Mason 1985). This is further supported by the lack of a cemetery, though the numerous nearby cemeteries could have been used. Interestingly, a brass Catholic cross was recovered at depth of two feet, which indicates that post contact materials reached at least that depth (Orr 1944).

During the 1950s and 60s four separate Late Period coastal villages were excavated, each with pre-historic and historic component, which supplied valuable data in regard to this time period (Mason 1985). While there were four investigations undertaken at *Helo'* during the 1960s, they were poorly reported with little data of use to modern archaeologist's. In 1961 James Deetz and Donald S. Miller monitored grading at the eastern end of Orr's Site I, putting several units and recovering a total of five burials (Mason 1985). They did not put out any report of their excavations and the field notes available are incomplete. While the materials are housed at the UCSB Repository, little of it has been catalogued and no further studies have been undertaken on the collection.

Deetz and Miller were followed in 1963 by William Allen, who directed a two-day long field school, but the only information available comes from the field notes of the students. Similarly, in 1965, Roger Owen excavated five units, but no information is available about these excavations, including field notes. Another field school was run at *Helo'* as a joint effort between UCSB and UCLA, headed by Claude Warren that resulted in the excavation of 34 two-meter square units. While these units were excavated in ten centimeters levels, no material was screened in anything finer than a ¾ inch mesh. While this resulted in the recovery of over five thousand artifacts and fifteen burials, all housed at the UCSB Repository, sections of the catalogue are missing and none of the collection has been analyzed or published upon.

No further subsurface archaeological work was undertaken at Mescalitan Island until 1979 when the CRM firm Scientific Research Surveys (SRS) carried out an extended Phase II along a proposed pipeline through the northern section of the Island (Mason 1985). A total of seven units were excavated, resulting in a number of artifacts, debitage, and faunal remains that indicated that the locality was peripheral to *Helo'* (SRS 1979). This was followed by a Phase III, also undertaken by SRS, which occurred in 1985 in response to the Goleta Sanitation Districts expansion of the sewage lines.

The Phase III excavations undertaken at *'Helo* by SRS, required by city, state, and federal legislation for the expansion of the Goleta Sanitation Plant in the spring and summer of 1985, implemented data procedures necessary to collect and asses five key issues: the horizontal and vertical extent of intact cultural materials, the spatial relationships between such deposits, any diachronic patterns related to exploitation of resources at the site, site formation processes, and the structure, content and function of any features exposed (SRS 1985). These questions included the collection of other data integral to answering them, such as site chronology and the technological and functional attributes of tools. The excavation methodology can be split into three distinct phases or strategies.

Seven impact loci were first identified across the proposed development plan, of which the majority were located in the western end of the impacted area. Over 80% of what was left of Mescalitan Island were included in these loci and included large areas beyond the existing treatment plant. The primary determination forming the criteria of sampling was range of impact as opposed to cultural or environmental factors, which allowed for sampling across the entirety of the site while limiting impacts to (SRS 1985). This format emphasized data needs over statistical reliability, with interpretation of cultural behavior being the fundamental objective of all archaeological excavations, which allowed flexibility in sampling fraction within each locus dependent upon the needs of the data.

Due to the large data requirements the number of units excavated was deemed more important than the sample fraction, and so SRS used a multistage investigation program in which the data recovered from each stage affected the initiation of the subsequent stage (Peter 1983; Redman 1975; SRS 1985). Further excavations only occurred if the first stage of data recovery did not meet the need of the research questions, though further stages were also forgone if the likelihood of intact deposits was slim to none. Any additional sampling of the locus was considered on a locus by locus basis, based on the above criteria.

The sampling strategy used involved each locus to be separated into 10-meter grids, in which a systematic unaligned sampling design was overlaid, where a number of these squares were chosen to provide 1% of each locus (SRS 1985). As stated above, sampling in each locus could change dependent upon data needs. This procedure would not only ensure a sampling of the range of areas present, but it also allowed for the existing buildings and utilities to be taken into account. Each of these 10-meter boxes were further divided into 2m x 2m units, one of which was chosen through use of a random number table, before being limited to a 1m x 1m unit (SRS 1985). The sampling of Loci 5, 6, and 7 was modified as their small size and existing structures necessitated the subjective placement of their units.

In all, a total of 37 units were excavated by SRS using this strategy over the course of 3 phases, 12 of which were placed subjectively in order to gather specific data or due to previous excavations. The first phase involved the placement of 13 units across all but locus 6, with 2 of them being subjectively placed, and focused on determining the distribution of cultural deposits across the site (SRS 1985). Phase II was the most extensive of the 3, with a total of 16 units excavated of which 11 were systematically placed. Its goal was to provide data on impacts to alternative facility locations, the collection of data to create a map of the distribution of the cultural resources, and to test locus 6 which was not tested in the previous phase (SRS 1985). The final stage involved the excavation of 3 systematic units and 4 subjective units in order to refine the information on the distribution of culture materials. It also involved the excavation of 12 augers probes, placed to test potential impacts north and south of the island, as well as 3 trenches excavated to provide stratigraphic profiles of the island.

Each unit was excavated by hand through the work of 2 to 3 archaeologist, with techniques focused on strict maintenance of precise spatial control, both horizontally and vertically. This control was provided through the placement of datum points to assist in the excavation of natural or cultural stratigraphic layers within arbitrary 10 cm levels (SRS 1986). The entirety of the excavated matrix was screened through $1/16^{th}$ inch mesh, which ensured the recovery of almost all cultural materials, but was complicated by the necessity of screening the matrix as it was excavated in order to identify temporally and diagnostic artifacts in disturbed deposits.

To assist in the identification of intact, disturbed, and re-deposited deposits, efforts were made to identify and excavate individual stratum, which involved the designation and description of each new stratum by a geoarchaeologist (SRS 1985). A unit was terminated upon encountering a stratum marking the base of cultural deposits of the site, into which a small augur was used to probe further in order to insure no further cultural components existed.

All recovered materials were bagged in accordance with their class designation along with their provenience, with the bag being tagged with a unique number before being rechecked ad recorded into the lab daily. Each level was documented on a form that include a comprehensive record and map that included a summary of pertinent data including soil, recovered material, and descriptions of features (SRS 1985). Furthermore, all rocks with a dimension of more than 5cm, formed artifacts, features, significant deposits, and unique artifacts were mapped and photographed. Photographs were also taken of 2 to 4 of the unit's wall to record the sites stratigraphy.

Laboratory procedures started with checking in the bags from the field to make sure that all materials were accounted for before they were re-screened and washed due to the difficulty of completely screening all non-cultural materials through $1/16^{th}$ inch screens in the field. This led to a high level of completeness of the data recovered, particularly with regards to beads and faunal remains, with each level containing information usually only found in column samples (SRS 1985). Materials were then sorted by sized before being analyzed and all cultural materials were counted and weighed, before given a catalogue number.

Due to the massive volume of material excavated, the units were put into a hierarchy of importance in order to get a representative sample of materials at the site within the given budget. A total of seven units were chosen as "priority" units, comprised of units 1, 8, 10, 12, 13, 20, 36 (SRS 1985). These units will serve as the focus of the materials from this excavation to be studied for this thesis, as the non-priority units only catalogued formed artifacts and materials found in ¼ inch screens and above. All formed artifacts were examined for wear, on the macroscopic level, and were identified according to morphological and use-wear characteristics as well as being correlated to similar objects from nearby sites when possible, while faunal remains were speciated, and charcoal samples were dated with conventional methods (SRS 1985).

A total of seven questions, chosen from the results of SRS's literature review, were the focus of this Phase III report. They included questions about the activities present at the location, the identification of any possible cemeteries, the dates of occupation for the site, the periods of occupation at the site throughout the year, the use of non-Indigenous tools by the inhabitants, evidence of resource exploitation and temporal change in the exploitation, and the delineation of the sites boundaries while identifying the effect and amount of disturbance (Mason 1985). These questions were focused upon the materials recovered by SRS from Orr's Site III on Mescalitan Island, with no excavations undertaken in Site II due to its early removal in the airport expansion, or in Site I.

Quickly following the work of SRS, UCSB was awarded a contract of mitigation and data recovery for the Goleta Sanitary District Improvement Project in 1986. These excavations were split into two phases, one in 1986 in which the UCSB archaeologist uncovered the remains of two house floors as well as a number of other features (referred to as Phase One), and one in 1987 in order to salvage disturbed resources (referred to as Phase Two). An extensive report was published by UCSB (Gamble 1990), and Lynn Gamble expounded upon this report with her thesis in 1991.

The methods used for the UCSB excavations involved excavation of three delineated areas with some units placed outside of these areas to serve as base line units. This strategy initially involved placing units evenly across the impacted area (Gamble 1990). Each area, and the units outside the designated areas involve different techniques, different strategies, such as a mixture of trenches, units of varying sizes, and combination of these for large exposures. Excavations were focused in three areas of the site: Area 1 was determined to be the most sensitive area with the densest cultural remains, Area 2 was chosen due to the level of impact in the area and the assumption, from site distribution, that dense resources would be recovered, and Area 3 was chosen due to the soil removal planned for that section by the Improvement Project (Gamble 1990). The units located outside these areas were primarily located in a section of the Island that either contained lower resource density or were in previously disturbed areas. By completion of the project, archaeologists had excavated eight trenches, and 35 units: six 1m x 1m, twenty .5m x 1m, two .5m x 2.3m, three 1.5m x 2m, and three 2m x 2m (Gamble 1990).

A number of questions were asked by the UCSB archaeologists. The first regarded the organization of the socio-political structure at *Helo'* and how it fit in the structure of the larger Chumash culture. They also attempted to learn more about the critical period in California history between Spanish contact and abandonment in 1803, including factors that instigated changes in traditional social, political, economic, and ceremonial life of the Chumash. Additional questions regarding subsistence patterns and the cause for such changes over time, as well as similar questions upon trade practices and the changes in exchange over time. As can be seen in these previous questions, one of the most important questions related to the determination of increased temporal resolution of the materials being studied and their location within the stratigraphy of the site. Lastly a spatial analysis of the site was attempted in order to interpret the activities of the site, the formation processes at work, and the organization of the site as a whole.

Excavations were undertaken in 1986 by University of California Santa Barbara in an attempt to mitigate the proposed expansion of the Goleta Sanitary Facility. The basic plan of these excavations involved placing either 1 meter by 1 meter or 1 meter by 0.5-meter units evenly across the impacted areas. If the results of these units necessitated further excavations, additional units would be placed in order to expand from the initial units (Gamble 1991). The site was organized into three separate areas of study; Area 1, Area 2, and Area 3. Areas 1 and 3 were first to be excavated as not only were they the most culturally sensitive, but they were also the areas of greatest impact, with Area 2 excavated between them.

A total of 35 units were excavated during this project, in twenty-centimeter levels using shovels and trowels. While 8 trenches were also excavated, the contextual and level data from those units are not concrete or uniform as the units and will not be used. All material was either dry-screened through 1/8th inch mesh in the field, before being taken to the lab to be wet-screened, or they were wet-screened through 1/16th inch mesh in the field (Gamble 1991). Additional screening was undertaken in the laboratory after excavations were complete along with further procedures.

All materials were inventoried as they were brought into the lab and compared to the field inventory to ensure that everything was accounted four. Any materials that required wet-screening were washed and dried before further procedures were undertaken. All material caught in screens were then sorted through ½ inch, ¼ inch, 1/8th inch, and 1/16th inch screens. As cultural remains of different sizes vary in research value, such as small shell beads in comparison to their whole shell counterparts, these size fractions were sampled differently (Gamble 1991). Large materials were completely sorted into categories, while for the smaller sizes (1/8th inch and smaller) a uniform sample was sorted as it was not possible to sort all of the remains in these smaller meshes.

For the 1/8-inch size mesh, a 25-gram sample of the total sample was taken from each level in order to obtain a representative sample of cultural material, with 25 grams being found to be adequate to estimate the ratios between materials in each level (Gamble 1991). This did result in a lack of beads or otoliths being recovered, and so the remaining material from these levels was rough sorted and scanned for these cultural resources. This resulted in one of the largest collections of small otoliths and beads in a village site from any Chumash site, though it is likely that many otoliths and broken beads were not recovered (Gamble 1991). Sampling for the 1/16th inch was in five-gram samples, found to be more than adequate to understand the ratios within the midden materials similar to the 1/8th inch samples. Material not sorted in these samples was also scanned for beads and otoliths as done in the 1/8th inch mesh.

All catalogued material was weighed on an electronic balance to .01 or .1 gram accuracy, and in many cases were also counted, such as with beads, and flakes. This was recorded in a computer catalogue, to document weights and/or counts of bone, shell, chipped stone, asphaltum, and other categories for each level and size mesh. Materials recovered and recorded in the field were later put into this catalogue by specialists during lab work. Categories recorded are as follows: Shell, Bead Detritus (Olivella and Abalone), Fish Bone, Other Bone, Chipped Stone (Tools, Bifaces, Debitage, and Others), Asphaltum, Asphaltum Basketry, Fishhooks, Worked Bone, Steatite, Groundstone , Carbon , Beads, Pottery, Hammerstones, Miscellaneous Artifacts, Historic Artifacts, Asphalt, Gravel, Fire-altered Rock, Baked Clay, Residue/Non-cultural, Otoliths, Fish teeth, and scales (Gamble 1991).

Tomol

The Chumash *tomol* (Figure 8) has been touted as one of the most sophisticated technological creations in North America in pre-colonial times (Arnold 2007). Its innovation has been the focus of much historic and archaeological work due to the suggestion that it served as one of the primary impetus for Chumash sociopolitical evolution. *Tomol* were important property in the Chumash economy with ownership limited to Chumash elites (Arnold 1995, 2001, 2007; Arnold and Munns 1994; King 1982; Gamble 2002; Fagan 2004). These vessels were advanced and laborious to build, requiring around 500 person days of skilled labor to construct, and were of value (Arnold 2007; Gamble 2008) The *tomol* themselves were high-capacity watercraft measuring 6 to 10 m in length, and capable of carrying up to 2 tons of cargo or 12 passengers (Arnold 2007; Heizer 1938, 1940, 1941, 1970; Gamble 2008; Robinson 1942, 1943). To study the expression of cultural change within the Chumash through these vessels, it is necessary to fully understand their creation.

Figure 8: Chumash *tomol* built under the direction of Fernando Librado Kitsepawit for J. P. Harrington in 1912 (Courtesy of Santa Barbara Museum of Natural History)

Tomol Construction

The *tomol*, is a planked canoe constructed by the Chumash on the Santa Barbara Channel. This canoe is frameless, meaning that it has no internal structure made by floors, frames, or ribs, and was primarily constructed using planks split from driftwood. Redwood, [*wi'ma*] was the wood most desired for these canoes due to its light weight, strength, durability, and ease of shaping, but due to its rarity, pines and fir were also used. The primary source of this wood was driftwood as it was naturally seasoned from being stranded above the high tide mark on beaches (Hudson, Timbrook and Rempe 1978).

When the proper logs were found, they were split into planks with the use of whalebone wedges and hammerstones, before being carefully shaped in order to remove knots, cracks, and other unwanted features (Hudson and Blackburn 1986; Hudson, Timbrook, and Rempe 1978). The bone, shell, and stone tools described earlier are integral to this process, which also involves working the board into the desired shape, size, and texture. Once the boards were roughly shaped, they were further smoothed and sanded to a standard, uniform, thickness (Hudson and Blackburn 1978: 343). Even from large logs only a few planks could be produced, meaning that in resource value alone, such boards would be considered expensive. Not only were large enough logs difficult to find (particularly redwood), the additional time necessary to season them, along with the time and effort needed to create each board, made every board even more valuable within the Chumash economic system.

Once enough planks were available for use, the construction of the *tomol* could begin. At this stage, the *'altomolic* (master boat builder) would start on the bottom board, with the help of their assistants. This base for the *tomol* has been described as a long, heavy plank, which has been carved to have a hollow running down its length, similar to a dugout. Once this was completed, a supporting frame was built with the purpose of holding this base in place, to support planks as the vessel's sides were constructed, as well as to serve as the framework of the pattern for the future *tomol* (Hudson and Blackburn 1978).

The first level of planks were fit to rest directly upon the base board, but had to be shaped and bent in order to do so. In some cases, such planks could be produced by splitting them from logs that were already curved. More often, however, they were twisted into shape. This procedure involved the building of a clay-lined pit filled with water into which a board was placed. Stones would then be heated up before being placed in the pit in order to bring the water to a boil. After boiling these planks for a couple of hours, they would become pliable and be bent into the desired shape (Hudson and Blackburn 1978).

After the first round of planks was completed, the process of building the side of the *tomo/ti'at* began. Subsequent levels of planks were placed on top of the previous round of boards, with planks varied in size and shape in order to build the *tomol* desired by the *'altomolic.* Fitting the boards together was a complicated process, for while each board rested on top of each other, they were beveled so they would overlap at each end for strength. Between each round of planks, two processes would take place before moving onto the next round of boards; the first was the caulking and tarring of the boards, which required two individuals (Hudson and Blackburn 1978). They would work as a single team to apply the *yop* to each connecting edge, before repositioning the planks into their proper position in advance of the adhesive cooling and hardening. If this work was not done quickly and accurately, the vessel would likely leak and be unreliable on the open seas.

A total of six rounds of planking was the common practice of the *'altomolic* when building a *tomol*. While each board was shaped and sized according to necessity in developing the final form of the canoe, the sixth and final round was different from the rest in a one respect. These boards did not meet at the bow and stern as the other boards did, but remained separate, forming a V-shaped gap (Hudson and Blackburn 1978). This was purposely done as all fishing, harpooning, and towing lines were required to extend from the bow and stern; force on any lines off the side of the *tomol* could capsize the vessel.

Further strength was supplied by the "sewing" of each board together. By drilling pairs of holes connected by a shallow groove, boards were bound together at both ends and both sides, through several wrappings of waxed *tok* (Hudson and Blackburn 1978). Only three wrappings were usually necessary to secure the boards together, with them tightly fitting in the grooves between the holes. After each end was firmly tied in a separate knot, more *yop* was applied to seal and waterproof the holes and wrappings.

During construction some additional structures were added for varying reasons. Between the fifth and sixth round of planks, the last two, the only structural bracing was installed. This was a crossbeam, and while it looked like a thwart, this crossbeam served only as bracing (Hudson ad Blackburn 1979). The addition of "ears" to the bow and stern of the gunwales were the last piece added, and while ornamental they also served to keep the surf from washing into the canoe during launching and beaching.

Related Artifacts

Adze: Known by the Chumash as *axipe'ni* (from the *axipen* "to work wood"), the adze is a tool similar to an axe (Figure 9). It consists of a wide blade that is attached to a short wooden haft at perpendicular right angle (Hudson and Blackburn 1986: 52). Various descriptions of these tools exist, with the blade being made from "flint" or chert, abalone and Pismos clam, though in the historic period iron blades replaced these (Harrigton 1942; Hudson and Blackbun 1986: 52-54)). The handles were made of bone or a hard wood such as manzanita. These tools were described as being the principal tool for the working of *tomol* though they were considered not to be as quick as the wedge for splitting boards. According to consultants, the hand-adze was best for the work necessary to fit boards together, as well as for trimming the planks of the bow and stern (Hudson and Blackburn 1986: 52-54).

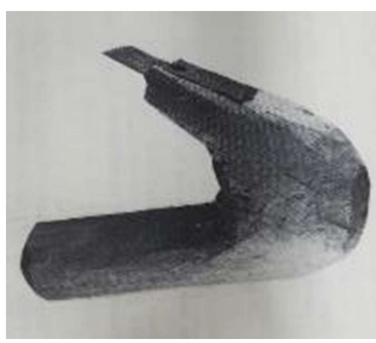

Figure 9: Hafted Adze (NA-CA-KerXX-3E-1) from Taft, CA. 14.5 cm in Length. Courtesy of the Santa Barbara Museum of Natural History (Hudson and Blackburn 1987: 54)

Axe: Called *'aca* by the Chumash, likely an acculturation of the Spanish word *hacha*, the axe did not exist prior to contact (Hudson and Blackburn 1986: 55-56). Axes, similar to adzes, are tools with a heavy wedge-shaped blade but are differentiated from the adze in that the blade is affixed parallel instead of perpendicular (Figure 10). Henshaw did not gather any information from his consultants related to the use of an axes during the Mission period, though they were undoubtedly used upon their introduction (Heizer 1955).

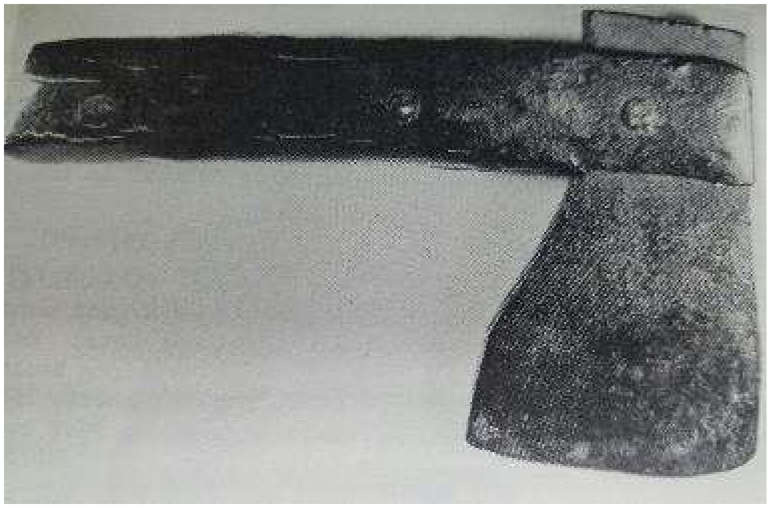

Figure 10: Hatchet blade (NA-CA-SBAXX-3J-1) with portion of handle from Santa Barbara, CA. Handle length of 21.5 cm. Courtesy of Santa Barbara Museum of Natural History (Hudson and Blackburn 1987: 56)

Wedge: Known as an *'uqali'is* from the word *usqual* meaning "to split" these tools were made from wedges of wood, bone, or horn (Harrington 1942:13; Hudson and Blackburn 1986: 57-58). These wedges averaged around 4 inches though some of them have been found as long as 6 inches (Figure 11). According to consultants, *tomol* wedges were made of deerhorn or *toyon* wood with both sides worked down to a point to a beveled edge that would be placed on what was to be split and would be hit with a hammerstone (Harrington 1942: 13; Hudson and Blackburn 1986: 57-58).

Figure 11: Deer Antler Wedge (NA-CA-SBAXX-3C-2/6) from Salisbury Canyon, CA. Length

of 14 cm. Courtesy of the Santa Barbara Museum of Natural History (Hudson and Blackburn 1987: 59)

Scrapers: There are two types of scrapers known to be used by the Chumash; stone scrapers made by napping local chert and shell scrapers made by chipping the edges (Figure 12). While there is no known name associated with stone scrapers, the shell scrapers were referred to as *qasi* (Hudson and Blackburn 1987: 68). It is possible that all scrapers were referred to by this name or that the shell scrapers were of more importance or rarity in comparison to the lithic scrapers. These tools were used to remove small quantities of material, primarily wood, by drawing it forcefully across the surface of the material to be worked. Harrington's consultants mentioned that "when they finished working a plank, they smoothed it, first using an abalone shell" (Harrington 1942:13). He also recorded a myth in which the word is used to describe a tool that is used in making a canoe; "when it dulls, it is resharpened" (Blackburn 1975:209)

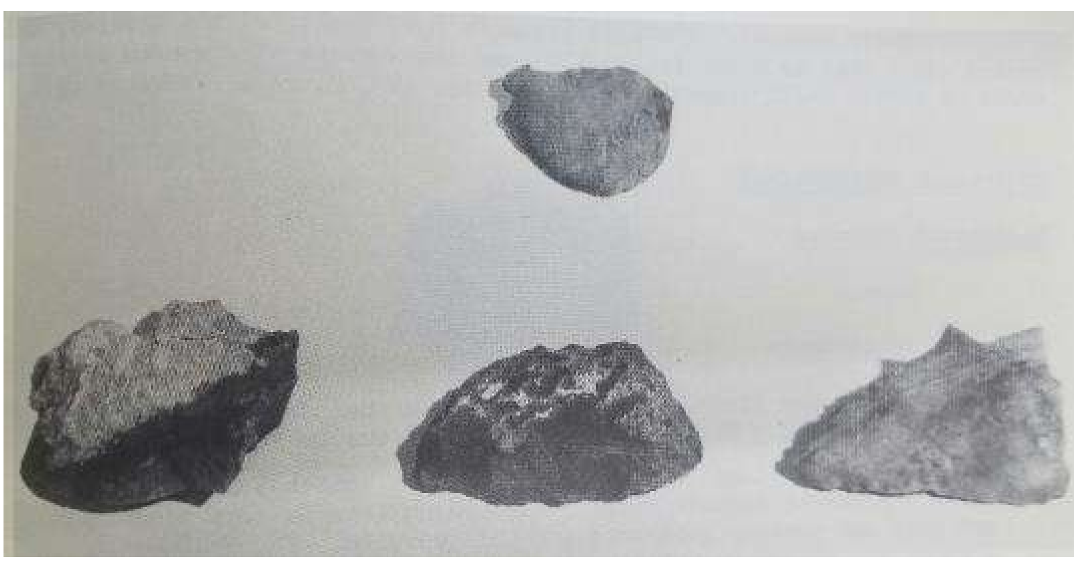

Figure 12: Four chert scrapers (NA-CA-130.1-3A-1 to -4) from Santa Cruz Island. Largest length of 6.7 cm. Courtesy of Santa Barbara Museum of Natural History (Hudson and Blackburn 1987: 67)

Tipoyoqoni': The tools used to drill the holes necessary to construct the *tomol* were called *tipoyoqoni'* (Figure 13) by the Chumash, from the word *tipoyoqoni* meaning "to twist" (Hudson and Blackburn 1986:94). According to a number of consultants, both of Harrington's and Henshaw's, lithic drills were used before the arrival of the Spanish but that soon iron tools were used to do the same work. "They say that the old people, before they acquired Christian augers, used to bore such holes into planks using flint knives" (Hudson, Timbrook and Rempe 1978: 42-43). "LY said they used an iron point; does not know what they used earlier, possibly a stone one" (Hudson and Blackburn 1986: 95)

These tools have been referred to by various names since their identification, primarily based on their function, such as "macro-drill", "canoe drill'", or "fishhook drill'" but there has been no solidly supported convention applied to this tool morphology (Arnold 1994; Arnold et al 2001; Gamble 2008; King 1990). In more recent times, an attempt to organize was undertaken, placing the *tipoyoqoni* into four morphological types; Type 1, Type 2, Type 3, and Type 4 (Arnold et al. 2001). There is also another type of macro-drill identified by Arnold as Type 5 that are thick, massive, and crudely percussion flaked but have none of the morphological traits of the other 4 type (Arnold et al. 2001: 127). It is likely that these are fairly expedient tools with no identifiable, organized use (Arnold 1994; Arnold et al 2001).

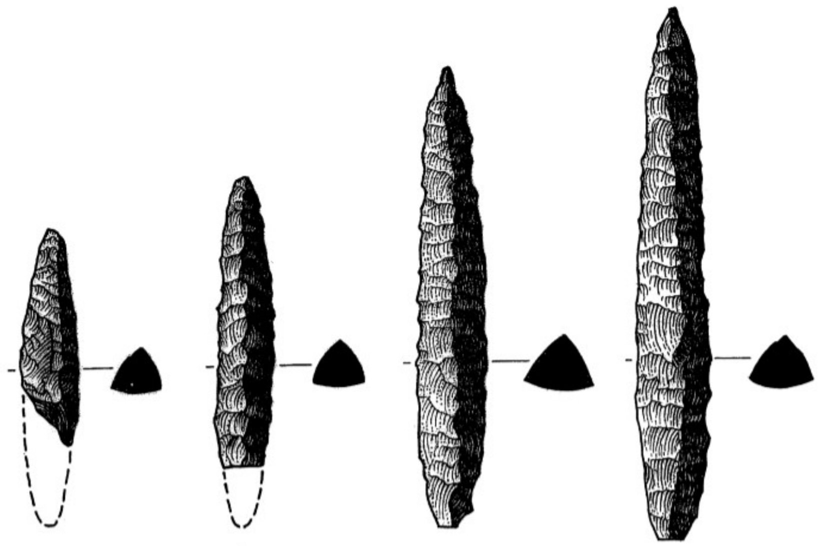

Figure 13: Canoe Drill Samples: (a) UCLA Catalog No. 565-929; (b) UCLA Catalog No.565-2523; (c) LACMNH Catalog No. L-1433-32-831; (d) LACMNH Catalog No. L1433-32-832 (Gamble 2001)

Drills that are classified as Type 1 are tools that are bulky and broad, measuring between 3 to 5 centimeters long and not less than 2 centimeters wide. They are percussion flaked and bipointed giving a diamond shaped profile, while being triangular, quadrilateral, or multifaceted in their cross section (Arnold et al. 2001: 126). The flaking on these tools seem to be expedient with no indication of standardization, with blunt tips. It is possible that these were not used as *tipoyoqoni'*, but more along the lines of reamers in order to widen holes already drilled. Arnold (2001: 126; Arnold and Graesch 2001) argues that these Type 1 drills primary use was for making large diameter holes in shell blanks in preparation for fishhook production. It is likely that these drills were handheld and not hafted due to their size and shapes.

Type 2 drills are large macro-drills, identified by a massive hand hold combined with a long, tapered, finely knapped drilling bit. This tip is triangularly shaped in cross section, primarily equilateral triangles, and is often found without the large base (Arnold et al. 2001:

126). The high amount of snapped drill bits could be indicative of regular use of these tools with significant applied force. These were obviously meant for handheld use as their bases preclude the possibility of hafting and would have formed medium sized holes (Arnold et al. 2001). Some archaeologists have hypothesized that these tools were used in construction of the *tomol* for drilling holes in redwood planks in preparation for sewing.

The third type of drill is described as the smallest and most gracile of the macro-drills, being very finely flaked and varying in length from 2.0 to 5.0 cm with diameters of 0.7 to 1.1 cm (Arnold et al. 2001: 127). They have a circular to roughly triangular shape, and were probably hafted to be of any viable use. It is clear from the fine knapping along the length of these tools that their purpose required drilling into thick materials, while the narrow profiles indicate the need for maintaining a small hole diameter in that medium (Arnold et al. 2001: 127). It is these tools that are often referred to as "canoe drill" (Gamble 2008: King 1990) but this is rarely supported by any evidence or justification (Arnold 1994).

The Type 4 drill identified by Arnold are very similar to the Type 1 drill mentioned previously, at least with regards to shape and dimensions. What separates these however, is the manner in which they are produced. Type 4 drill are modified and retouched microblade cores, and as of this thesis have only been found on the Channel Islands (Arnold et al. 2001). This is consistent with microblade technology, as those are almost exclusively produced on the Channel Islands and with chert only found on these islands (Arnold 1987; Arnold et al. 2001; Preziosi 2001). As these cores naturally taper to a point through the removal of microblades, only a little bit of retouching is necessary to produce a working drill bit.

Measurements

Important to the construction of any vessel is the measurements of the materials, and of where cuts or holes are to be made. According to ethnographic information, the Chumash measured linearly by use of their hands, such as by the thickness of single finger or the thickness of four fingers of the hand (Hudson and Blackburn 1986: 263). One consultant mentioned that it was "necessary to have one measurer, called an *'al'alcukumu* [lit. "one who measures"], for the building of a *tomol*" (Hudson, Timbrook, and Rempe 1978: 62). This same consultant also mentioned that a finger width was a basic unit of measurement for construction of a *tomol*, and that distances were often noted as being one, two, or three finger widths in length (Hudson, Timbrook, and Rempe 1977). There is also support for measurements that are marked on a rod, from words such as *wastipeyumu'*, meaning measuring stone, and *sukumusa'as*, meaning an *escuadra* (carpenter's square) defined as a measuring stick or anything used as a measuring device (Hudson and Blackburn 1986: 264).

Adhesives and Waterproofing Agents

Harrington collected a large amount of data regarding the adhesives used by the Chumash, along with their uses, as there were several kinds made with each distinguished by different terms. Hudson, Timbrook, and Rempe (1978:51) concluded that there were a total of 6 different types: *malak*, a soft tar from ocean seeps that washes onto the beach; *woqo*, a hard tar that is mined from terrestrial deposits; *yop,* a mixture of *woqo* and pine pitch that was used in the construction of canoes; a mixture of *yop* and red ocher that was used as a glue, caulking compound, and paint sealant; another form of *yop* that had increased volume of pine pitch added that coated the cordage used in the sewing of the *tomol*; and a mixture of pine pitch and red ocher that was employed as a paint sealant.

One consultant gave thorough descriptions of the creation of adhesive for canoe constructions;

> "When they pounded the *woqo* up, they only mashed it. When they finished pounding it up, they gathered all the *woqo* from the ground, taking very great care that they was not the least bit of stone in the mashed tar, for this would interfere with the sticking of the [canoe] boards. The resulting crushed tar was put into a *olla* to be boiled, when they had about as much as they were going to used. Next they pounded up pitch finely and mixed it with the *woqo*, too. They stirred it all thoroughly, to make it dissolve. When Palatino was making his *yop*, he had a big *olla* about half full of *woqo*. When it was melted, he added two double handfuls of pitch.
>
> Then he [Palatino] would stir it briskly, like one stirs *atole* [acorn gruel]. They always used more *woqo* than pitch in the mixture. Felipe used no pitch for making the tar for his canoe. He just boiled the *woqo* for a very long time so that it would be thick and suitable for sticking boards on.
>
> When they commenced to build a board canoe, they made ready the tar, pine pitch, and red ocher. They would pound up the pitch, or *cpil*, and also the tar, or *woqo*, and mix the together in the correct measures of each to create *yop*. Then they would put this mixture in a stone *olla* and bring it to a boil; it the *yop* that they used in tarring a canoe.
>
> Sometimes they mixed red ocher, *hilhill*, with the *yop*, but the correct way is to just use *yop*. Palatino is the only one FL saw add red ocher to his *yop*, and this was for making a caulking tar after his canoes were finished. He probably got the red ocher from Santa Ynez. They would mix the red ocher and the *yop* together and bring it to a boil. They also used it to paint the *tomol*, as well as some of its accessories (Hudson, Timbrook, and Rempe 1978:50-53).

Related artifacts

Crucible: These artifacts are stone containers, usually made from steatite though other stone can be used, that asphaltum is processed in. Harrington recorded two descriptions of these artifacts, along with their uses. The first description uses the word *olla*, meaning bowl, as where the Chumash would create *yop* after "...they had mashed up the dry hard tar and had added the pitch they put all of it into a *olla* and heated it up." (Hudson, Timbrook, and Rempe 1978:46). A second consultant use the word '*ontomo'y*, meaning trough or clay ladle with a handle: "This ladle had a bowl 10 inches or so long (Figure 14). They heated tar in it. They did not use this ladle to ladle with, but put it in the fire, resting on three pot rests, with the tar in it (Hudson and Blackburn 1986:168). Artifacts of both types have been recovered and identified from throughout the Chumash territories.

Figure 14: Steatite crucible and shale applicator (CIM-237) from Santa Catalina Island. Crucible length of 16 cm. Courtesy of Santa Catalina Island Museum (Hudson and Blackburn 1986:170)

Mixing dish: This was a small container used either to mix melted asphaltum and resin, or to store these materials for use later (Figure 15). The most common examples of these have been abalone shells with the holes plugged with asphaltum, though oyster shells have also been noted (Hudson and Blackburn 1986: 170-172). These were used by *tomol* builders when caulking the planks for the vessels; “A small dish was used to mix some *yop* with additional pitch. They mixed these together to make a wax-like substance used to coat the sewing string for the tying together of the planks in a board canoe.” (Hudson Timbrook, and Rempe 1978: 42).

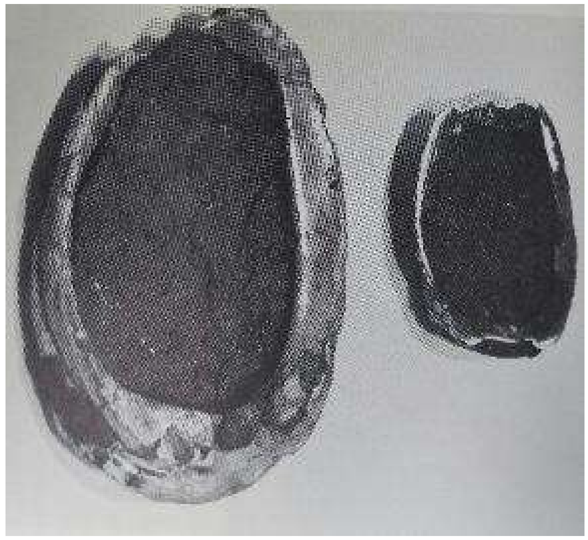

Figure 15: Abalone shell mixing dishes (NA-CA-125-4D-8 and NA-CA-156a-4D-2) from Santa Cruz Island. Courtesy of the Santa Barbara Museum of Natural History (Hudson and Blackburn 1987: 172)

Applicating brush: Consisting of a bundle of vegetable fibers attached to the end of a wooden handle, these tools were used to apply adhesives, though none have been reliably identified within the archaeological record. Only an ethnographic account records its existence;

> "When the *yop* was boiling, they made their tarring brushes. They stripped off the bark from a *saus* [willow] and ground it up, allowing it to dry. Then they rubbed the bark between their hands, holding a bunch in one hand while revolved the top of the fibers by holding them in the other hand. Then they tied the fibers, when they were soft enough, to the tip of a stick one cubit in length. Two brushes were usually made, since two men would be using them. These men would dip the brushes into the tarring pot or *olla* -- if it was a good brush, the tip would be pointed because of the *yop.* Sometimes they also used a tarring rag. This they used for applying *yop* to the seams which they had caulked." (Hudson, Timbrook, and Rempe 1978: 46).

There are some examples of sticks with asphaltum on them that may have been the handles for such tools, but no study has been undertaken to determine the validity of such artifacts.

Spatula: These tools, called scrapers or applicators by some, were referred to as *tiwekeye'es* (Figure 16) by the Chumash, from their word *wekey,* "to wipe" (Hudson and Blackburn 1986: 176). They were described as being made of bone and having "...a handle. The broad part I make

4 fingerbreadths broad and long; it is 4-cornered, and the handle comes off of the same broad part. The canoe makers scraped of superfluous tar with it, or also used it in caulking seams with red ocher and tar which had already been put in. They scrape off the tar with this tool and then smooth it." (Hudson and Blackburn 1986: 176). It is also possible that these applicators were made of stone and were a multi-use tool related to the caulkers already mentioned.

Figure 16: Stone scraping/caulking tool (NA-CA-131.60A-3A-1) from Santa Rosa Island, CA. Length of 16.5 cm. Courtesy of the Santa Barbara Museum of Natural History (Hudson and Blackburn 1987: 178)

Caulking tool: These tools have no known Chumash name, but were described by Harrington's consultants;

> "The caulking chisel was made of wood. They would work one end of a stick to form two faces which would taper down to create an edge at the tip. This instrument they used for pressing the caulking material in the cracks between the planks of a finished board canoe… sometimes they would use an iron tool, which was called a *calafate* [caulker or shipwright] in Spanish, and a hammer to pound the caulking material into the cracks." (Hudson, Timbrook, and Rempe 1978: 41-42).

While there have been no known wooden artifacts recovered that match this description, there have been tools matching this description made of bone and stone (Figure 17). These often have asphaltum stains and pieces on them indicating their use as applicators of asphaltum as well.

Further study of these artifacts is necessary, particularly their context in relation to other tools, as well as microanalysis of materials at the end of them.

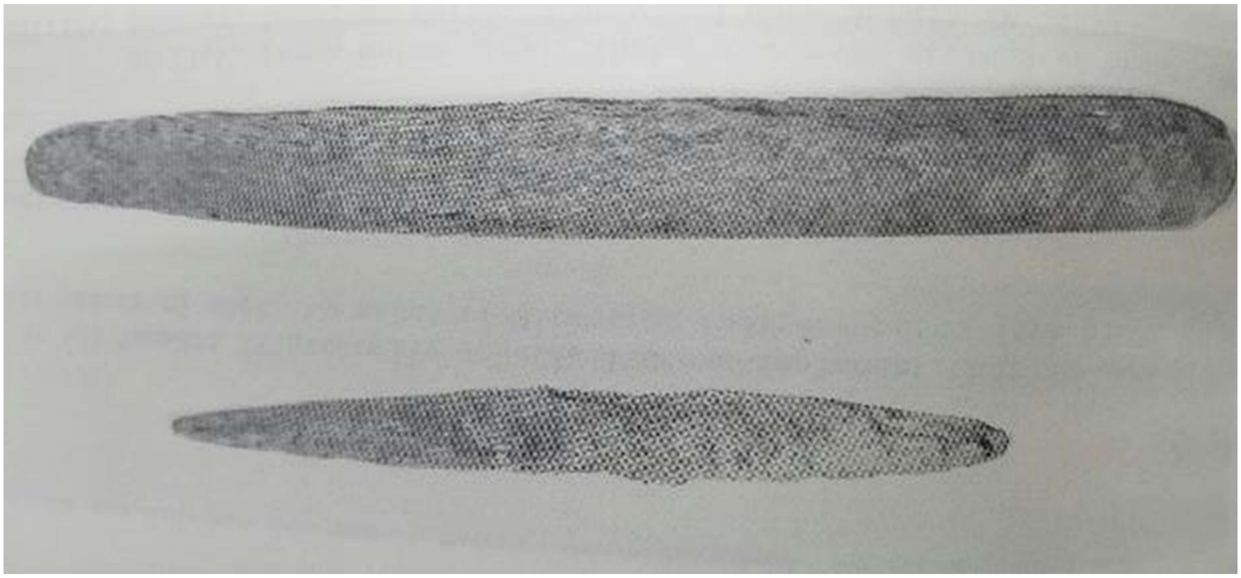

Figure 17: Bone caulking tools (NA-CA-156a-3C-2 and -4) from Santa Cruz Island, CA. Longest length of 19.8 cm. Courtesy of the Santa Barbara Natural History Museum (Hudson and Blackburn 1987: 116)

While all these artifacts can archaeologically, historically, and ethnographically be connected with *tomol,* it is unlikely that all tools and materials used in their construction will have stayed preserved over the centuries. Cultural materials that are to be expected are those made of stone such as *tiwekeye'es,* '*ontomo'y* and *ollas,* mixing dishes, *tipoyoqoni, qasi, axipe'ni,* and *'aca*, as well as other non-organic material such as asphaltum. Organic remains such as planks, *tok,* applicator brushes, and caulking tools, are rare. Indirect evidence of *tomol* construction and use that would be expected would include trade items, faunal remains of ocean mammals and fish, as well as the tools to hunt them, which would indicate access and use of resources only available through use of *tomol*. By analyzing the changes in these types of cultural resources over time, in the sites chosen for this study, it may be possible to infer the changes in the maritime culture of the Chumash population during the Historic Period.

Chapter III

Literature Review

The ocean-going vessels of the Chumash, the *tomol*, have long been a subject of mild interest to archaeologists, anthropologists, and historians. This is due to the fact that these vessels are particularly unique, unlike any other Indigenous watercraft constructed in North America, with similarities to Egyptian, Chilean, and Polynesian frameless vessels. (Rogers 1929; Heizer 1938, 1940, 1941, 1971; Kohler 1977). While there are no whole preserved examples of a historic or prehistoric *tomol*, its technology, along with its use and the related social organizations, survived into the mission period and many early missions had possession of at least one plank canoes (Hudson 1976; Hudson et al 1978). These vessels did, however, rapidly disappear from use and construction after 1850 (Fagan 2004). Due to this there is a large quantity of information about the *tomol* that is unknown, especially relating to their use and construction during the proto historic and historic periods.

These planked canoes were an important aspect of not only Chumash maritime culture but to their society as a whole. Without the creation and use of watercraft that the advancement of earlier vessels to the planked canoes of the Chumash Late Period, not only would Chumash history and culture be different, but could even be unrecognizable. As such, it is important to understand the use and effect of these vessels on the evolution of Chumash society. This literature review hopes to make clear the integration between the *tomol* and Chumash culture, in order to make the argument that the drastic changes to their society cause by missionization would be represented in the archaeology of the *tomol*.

The earliest scientific publication about these vessels was by Robert Heizer (1938) titled, "*The Plank Canoe of the Santa Barbara Region, California*" in which he attempted to synthesize the little information about the *tomol* that was available from historical accounts and fragmentary archaeological data from burial and village excavations. He even hypothesized that the Chumash *tomol* was an evolution of the tule bundle canoes, present through the majority of California, and came about due to the unique environmental situation of the Santa Barbara Channel (Heizer 1938, 221). This paper shows how the early vessels of the area evolved to create the unique *tomol* and begins to hint at why they became such an important aspect of Chumash culture.

This was followed by Heizer's (1940) article, "*The Frameless Plank Canoe of the California Coast*", that sets the tone for a large percentage of future research. In this article Heizer discusses where the *tomol* came from, attempting to determine its antecedents and what led to its unique construction. He identifies the importance of these oceangoing vessels to the large and concentrated Chumash population, as the primary source of the food supplies necessary to support them, as well as being an integral aspect of island to mainland exchange of goods and ideas (Heizer 1938, 1940, 1941). Heizer further discusses the construction of the *tomol,* particularly in regard to Hornell's 1939 "*Origin of the Planked Boat*", addressing a number of issues that separate these vessels from other planked boats. By identifying the lack of gunwales, the stitch and sew technique used to connect split boards, the liberal use of asphaltum, Heizer separates the Chumash *tomol* from any of the four origins identified by Hornell. He finally concludes that "there is no single pre-existent boat form from which the Chumash canoe can be shown to have evolved" (Heizer 1940, 88).

A sizable portion of Chumash studies has been focused upon their social organization, dating all the way back to Gifford back in the early twentieth century (Johnson 1989). While social organization has some bearing on the subject of this thesis, it is the ethnographic data used to study it, and the discussion of the *tomol* and Chumash maritime culture, that is of most interest to this study. And the source of the largest and most important corpus of ethnographic information is the work of John P. Harrington. For over a decade, from 1912 onwards, he worked extensively with Chumash individuals to gather information about their culture (Blackburn 1975; Walsh 1976; Hudson et al 1977; Mills and Brickfield 1986; Johnson 1988). Harrington's investigations resulted in over 200,000 pages of ethnography, folklore and linguistics much of which was synthesized by Hudson, Blackburn, Timbrook, and Rempe in various publications discussing ritual, ceremony, traditional history, political and social organization, along with artifact construction and use (Hudson 1978a, 1978b, 1978c, 1979a, 1979b, 1980, 1981; Hudson and Blackburn 1978, 1983a, 1983b, 1984, 1985, 1986; Hudson et al. 1977; Hudson et al. 1978).

Hudson and Blackburn's "*The Material Culture of the Chumash Interaction Sphere*" volumes 1 through 5, are a thorough and contextual description of the material culture of the Chumash, primarily from the notes of J. P. Harrington. In this five-volume series they provide exhaustive descriptions, drawings and photographs, context of use, and distribution of hundreds of artifacts related to food procurement, food preparation, rituals and ceremonial items, games, clothing, ornamentation, grooming, shelter, manufacture, trade, and transportation. Included in this are tools and materials related to the *tomol* and maritime practices. While these volumes are a valuable ethnographic resource, the archaeological data that they use is limited and unsystematic. In addition, this archaeological data is only used when the ethnohistoric information is insignificant or unavailable. These volumes do, however, provide valuable descriptions of the tools used in *tomol* construction and those used in other Chumash maritime practices.

Hudson, Timbrook, and Rempe (1978) co-authored a volume entirely on the *tomol* and its construction, including the complete construction of one with their informant Fernando Librando. "*Tomol: Chumash Watercraft as Described in the Ethnographic Notes of John P. Harrington*" is a thorough consolidation of the ethnographic data gathered by Harrington. Fernando Librado was the primary informant that Harrington used to discuss the *tomol* and he not only provided valuable information about the resources and processes necessary but was a source for a number of stories about these vessels. Hudson, Timbrook, and Rempe organized more than 500 pages of Harrington's notes into this single book and used the data collected to build a *tomol* named the *Helek.* This volume is a valuable source of information for any research regarding the *tomol* and forms the basis for our understanding of these vessels and their use.

In addition to the above work, Dee Travis Hudson (1976) published a paper discussing the use of the *tomol,* from Mission Santa Barbara, in the well documented Chumash Revolt of 1824. In this publication he addresses the *'altomolich,* the "maker of canoes", in relation to the Franciscan Missions and their use of the *tomol*. Records show that each Mission in the Chumash territory owned at least one of these vessels built by an *'altomolich* (referred as a *tolomero* by the Spanish), for use by the Mission for a number of different reasons (Hudson 1976). Primary of these was their use for procuring food during periods of poor harvest and, perhaps even more important, the illegal fur trade which supplied ten thousand pesos to Mission La Purisma between 1805-1810 (Bancroft 1965). There are even records of Mission San Luis Obispo having a *tomol*, a region where such vessels were previously unknown (Heizer and Massey 1953; Hudson 1976).

Hudson identified the location where Mission Santa Barbara had its *tomol* built, Mescaltitlan home to the village *Helo'*, as well as the men associated with their construction

(Hudson 1976). In his search through Harrington's notes he was even able to collect descriptions of the canoes, which hold some interesting information. While described as being built in the traditional Chumash way, though with iron tools and *tipoyoqoni'*, they were also built with ribs, a notable deviation from the Indigenous *tomol* (Hudson 1976). This clearly shows an evolution of construction of these vessels, with the introduction of European methods and design.

When conflict broke out during the 1824 revolt, the Chumash of the Santa Barbara mission fled the mission, 50 of which used *tomol* to reach Santa Cruz Island. Using a letter written by Father Ripolli, Hudson argues that the fleeing Chumash used the two canoes owned by Mission Santa Barbara to reach Santa Cruz Island. This is an important document related to this thesis as it directly addresses *tomol* useage by the Indigenous population after being subsumed into the mission system. It also has hidden within its text valuable information about Indigenous control of their material culture that has so far been unmentioned.

Thomas Blackburn also explored the social and political institutions separate from Hudson, drawing from Harrington's papers to identify the existence of an elite group or cult that were the caretakers of esoteric knowledge and formed something similar to a council of politically important people (Johnson 1988; Blackburn 1976). He argued that the Chumash population participated in a supra-village community that was overseen and interconnected by the individuals of this overarching organization, the *'antap*. Furthermore, the members of this organization were members of "other *gremios* or brotherhoods of other occupational specialists (such as canoemen" creating an integrative mechanism that "cross-cut localized and residential affiliations" (Blackburn 1976: 237). While not directly saying so, this indicates the importance of those building and creating the *tomol* a point that is further supported by Linda King (1982).

A number of different hypotheses related to the social and economic mechanism that affected or controlled trade through the Chumash sphere of influence were tested by Linda King in her doctoral dissertation (King 1982; Johnson 1988). She analyzed mortuary practices to try and determine a social meaning behind the patterns observed at Medea Creek by examining the hypotheses related to warfare, status, and exchange in order to further understand Chumash social complexity. In her study it became clear that many of the status and exchange goods present came from the offshore Channel Islands, which led her to regard *tomol* owners and builders as being an important aspect of the differential distribution of wealth she observed in Chumash burial practices (Johnson 1988). She further argues that chiefly families controlled the island trade which was the basis of the wealth inequality present, a trade that was built around the *tomol*, itself limiting, due to the complex maritime knowledge necessary for the construction and use of these vessels (King 1982).

When discussing modern research relating to the ethnohistory of the Chumash as well as the effects of colonization and missionization on this Indigenous population, John Johnson (1988) stands at the pinnacle of the scholars on this subject. Beginning with his dissertation, "*Chumash Social Organization: an ethnohistoric perspective*" Johnson uses ethnographic notes, baptismal and marriage records, and historic documents from the missions, in order to craft an accurate representation of Chumash society and culture. While direct discussion of the *tomol* is not explored in his literature, it does provide valuable insight into Chumash cultural change and adaptation, useful in expanding upon how such change could be represented in their maritime adaptations. Furthermore, it explores the identity of the individuals that build and own the *tomol* at the time of missionization.

Many of Johnson's publications have used mission registers in order to study kinship relations, and then to infer political and socio-economic positions of individual villages in the broad intervillage community. He provides an analysis of *Helo'* in a chapter of the 1990 report by UCSB "*Archaeological Investigations at Helo on Mescalitan Island*" arguing that its population including four separate chiefs ranked it alongside the more politically powerful villages like its neighbor *S'axpilil*. It is also worthy to note that the rate of conversion of *Helo'* moved at a much slower pace than the other villages, perhaps insulating its population from some of the effects of colonization affecting the rest of the Chumash (Gamble et al 1990).

Johnson identified three phases in the conversion process of the village: during the first three years after the establishment of Mission Santa Barbara, 41 people from *Helo'* were baptized. During the next twelve years, 1790-1802, only 29 people were baptized, an average of less than three a year. During this second phase, a population census was taken revealing that 101 people were living at *Helo'* (Brown 1969:33). It is interesting to note that 102 people from *Helo'* were baptized after the census, which indicates that (1) all of the residents of *Helo'* were eventually converted and (2) the population remained fairly steady from 1796 onward (Johnson 1988:115).

The third phase of this baptismal pattern began in 1803. In that year, nearly all of the remaining *Helo'* population, 80 in number, were baptized in a sudden recruitment effort involving virtually the entire Chumash population remaining in coastal mainland villages (Johnson 1989:368-369). There are even records of the specific days on which most of the population of *Helo'* were baptized: May 18 and 19, 1803 when 60 residents from the village were listed in the mission registers. Ethnohistoric research provides important insight into Chumash culture, political organization, population and kinship, and in some cases traditional lifeways, but it also allows for a look into the effects of missionization and the responses by the Indigenous population.

Larson, Michaelson and Johnson (1994) argues that the increasing Chumash population required an increased dependence upon inter-village trade and social interaction in order to survive. In the difficult period between 1780 and 1830, where epidemics, forced repopulation, and many environmental problems put additional strain on the Chumash population, this interdependence would have been even more important to their continued survival. When the social and political organization that connected villages fell apart however, that interdependence was pivotal to the future of the Chumash people. Faced with the catastrophes mounting around them, the Chumash decision to relocate into the mission system was an expression of risk minimization (Larson et al 1994).

Further analysis of the Chumash population, alongside baptismal records, indicates an estimated 70% - 80% of the Chumash population were removed from their normal adaptive strategies, through migration and death (Larson et al 1994). Additionally, a disproportionate number of the early migrations into the mission systems were of young men, a group of the population that provided the labor needed for fishing and hunting, whose removal from the general population increased subsistence risk for the Chumash (Hollimon 1990; Walker and Johnson 1992; Larson et all 1994). This early stage of missionization severely impacted Chumash socio-economics and political organization; as the demographic necessary for its upkeep, healthy young men, moved into the mission system, the traditional of interdependence between villages no longer was able to properly minimize risk. Due to how interwoven this intervillage dependence was to Chumash culture, when it no longer was able to serve its purpose, Chumash society began to collapse (Larson et al. 1994).

Important to the subject of Chumash maritime practices is the swordfish (*xiphas gladius*) due to its accessibility only through use of a *tomol,* its value as a food source, and the mythological and ceremonial place it held for the Chumash. A 1993 publication titled "*The Chumash and the Swordfish*" synthesized linguistic, ethnographic, historic, and archaeological evidence to support the importance that the swordfish held for the Chumash. There are a number of recorded Chumash stories about the swordfish, called *'elye'wun*, describing their home on the bottom of the sea and them as people as well as emphasizing the veneration held for them (Blackburn 1975: 192-193). The authors astutely point out that archaeological evidence for hunting or use of the swordfish is non-existent before the Middle Period, approximately 2000 BP, and that their hunting can likely be correlated to the advent of the *tomol* at this time, an argument that is further supported by evidence of bone harpoon barb in the archaeological record at the same time (Davenport et al. 1993).

A more complete archaeological study of the relation between the *tomol* and pelagic fishing comes from Julienne Bernard and her article "*The Origin of Large-Species Fishing among the Chumash*" (Arnold 2004: 25- 51). Bernard argues that the creation of these vessels by the Chumash was stimulated through the need or desire to expand their available fishing resources. She identifies seven different species of fish as "tomol-acquired species" due to their size, ferocity, and habitat and then assesses the timing and frequency of these species in the archaeological record (Benard 2004). This required clear and quantifiable faunal remains that had been systematically excavated with proper stratigraphic and/or temporal provenience.

In her analysis of over 90 collections from throughout Chumash territory, Bernard determines that her "tomol-acquired species" begin to appear in the archaeological record with any level of frequency starting around 500 AD and increasing until the end of the *tomol* use

(Bernard 2004). Furthermore, she was able to identify substantial increases in acquisition of these species at three different points in time; AD 700-800, AD 1200-1300, and after AD 1700 (Bernard 2004). While this increases our understanding of Chumash fishing practices, it is of particular value to the subject of this thesis due to its use of stratigraphy to identify temporal changes in faunal remains directly related to use of the *tomol*.

It is unfortunate that the majority of more recent research regarding the maritime vessels of the Chumash has been focused on two particular points; the relationship of the *tomol* with the emergence of social complexity within the Chumash and the date of inception for these vessels. Because of this focus, there is a bias on what is considered important, as well as a lack of study on other maritime tradition of the Chumash. Additionally, in regard to the focus on the inception of the *tomol*, its emphasis is primarily due to questions only about the emergence of social complexity. While this has led researchers to ignore other promising lines of inquiry that could be explored related to *tomol,* it has had the benefit of providing a decent amount of literature around the vessels themselves.

Lynn Gamble first published literature identifying the tools necessary for the construction of the *tomol*, primarily to determine the earliest date for its invention (Gamble 2002). Along with other archaeologists, Gamble views the innovation of the *tomol* as being of particular significance in the emergence of social complexity among the Chumash (Gamble et al 2001; Gamble 2002). In her publication "*Archaeological Evidence for the Origin of the Plank Canoe in North America*" Gamble (2002) overviews available research relating maritime innovation to social complexity, the prehistoric maritime vessels of North America, ethnographic and historic evidence for the *tomol* and touches upon their use in trade.

More importantly, she identifies the different archaeological evidence that can arguably be used to identify the presence of these maritime vessels. This includes planks from the *tomol* that have been recovered from a number of different sites both on the Channel Islands and the mainland coast (Gamble 2002). Since wood does not preserve well in the costal Californian climate, Gamble included other evidence such as asphaltum caulking, canoe effigies, and other associated maritime artifacts, with a particular emphasis on lithic drills.

Gamble argues that the *tipoyoqoni'* necessary for working the *tomol* planks are identifiable and standardized in form (Gamble 2002). Designated "canoe drills" by Gamble, these are distinctly different from other drills observe in Chumash territory with their uniform, bipointed, trifacial cross-sections. In an analysis of 42 "canoe drills" a total of 19 showed signs of use-wear polish consistent with a drilling or reaming action, with wood polish identified on 15 of them (Gamble 2002). The thickness of these *tipoyoqoni'* also matched the size of the asphaltum plugs used to seal canoes, and the length of the observed polish also correlated to the thickness of the planks. Unfortunately, the majority of the *tipoyoqoni'* in her study were either recorded poorly or were from sites with inadequate chronological data, requiring them to be placed into general time periods.

Jeanne Arnold has long debated Chumash social complexity, arguing that the *tomol* was integral to these changes (Arnold 1992, 1995, 2001, 2004, 2007). While agreeing about the importance of these vessels to the Chumash, she disagrees with Lynn Gamble on a number of different points regarding evidence for their presence. In particular, Arnold argues against the use of "canoe drills", calling for the removal of such a designation due to research identifying the use of these macro-drills on shell and stone instead of wood (Arnold et al 2001; Arnold and Graesch 2001; Arnold and Bernard 2005; Arnold 2007). Putting the date for the invention of the *tomol* at 500 C.E., Arnold stresses changes in trade items, and faunal analysis related to the type and size of pelagic fish in assemblages as evidence for the use, and therefore creation of, these oceangoing vessels (Arnold 2001: Arnold and Bernard 2005).

Outside of evidence for the *tomol* and its invention Arnold discusses its significance to the Indigenous culture of the Chumash. There are a number of practical advantages to the construction and use of these vessels, which she argues plays an important aspect in their effects on the Chumash. Simple efficiency in transportation of people and their capacity for trade goods or food would provide immense labor savings to their owners which can then be translated towards other desires (Arnold 1995). Correlated to their capacity for trade goods would be their ability to allow for trading of bulk goods. Only through these vessels were substantial yields of foods such as acorn meal, seeds, and meat, or crafted goods such as wooden bowls, large baskets, tools, and large soapstone ollas, able be moved across the channel and among the islands in bulk, decreasing the trips necessary and possible loss of goods and sailors (Arnold 2001, 2001; Arnold and Bernard 2005).

Such practical advantages can be directly translated into sociopolitical advantages for individuals as well as the culture as whole. By increasing efficiency and product movement while decreasing risk, the *tomol* would allow for massive accrual of wealth, and with that an increase in social complexity. This made ownership lucrative, especially when placed in the context of the Transitional and Late periods when the Island Chumash were exclusively making the beads that served as currency in the region (Arnold 1995, 2001, 2004; Arnold and Bernard 2005). With the mainland Chumash dependent upon the island Chumash for shell-beads, and those on the island dependent upon the mainland for a number of plant resources, and asphaltum among other items there would be a steady demand for vessels capable of travel.

As for what was the impetus for the invention of the *tomol*, Arnold identifies climatic stresses such as drought and shifting sea temperatures as being a possible cause (Arnold 2001a,). This would have put stresses on the subsistence practices of the Indigenous population requiring either an expansion in subsistence capabilities or in trading capabilities for subsistence (Arnold 1995). Additionally, this could have initiated control over raw materials (Arnold et al 2001), which further led to the intensification of craft activities (Arnold 1987, 1996; Arnold and Graesch 2001). Emerging chiefdoms were strengthened through active cross-channel trade, intensive craft specializations, and a broadly based ceremonial system, all only possible with the advent of the *tomol* (Arnold 2001b).

Brian Fagan also attempts to determine the date for the invention of the *tomol* following in the steps of Heizer and opposing Hudson in determining the antecedent to likely be the tule bundle canoe and not the dugout (Fagan 2004). However, unlike most other scholars of these vessels, Fagan argues that it was rising sea-levels that served as the catalyst for the construction of the *tomol* pushing their possible date of invention to 4500 B.P (Fagan 2004). And while he agrees with Gamble in her identification of "canoe drills" he also argues that they could represent later tools and that earlier *'altomolich* used simpler tools to construct these vessels or their simpler planked precedents (Fagan 2004). This is important to this thesis discussion on the use of *tipiyoqoni'* in *tomol* construction and other possible maritime practices.

When looking back over the breadth of research on the Chumash as a whole, it is hard to believe that so little has been focused directly on the *tomol*. Not a single publication exists that attempts to study the effect of missionization on these vessels, despite the clear belief that they were an integral part of the development of Chumash complexity and society. This literature review serves as an overview of the evolution of watercraft in the Santa Barbara Channel leading to the *tomol* and why the tools identified in this thesis serve as valuable data in studying these vessels. Furthermore, these authors and publications makes it clear that the *tomol* were essential to Chumash culture and as such the drastic changes initiated by Spanish colonization of the region should be represented in these unique watercraft.

Chapter 4

Methods

There are two ways to analyze *tomol,* and changes in their use or construction. The first is with artefactual evidence, such as tools and materials associated with their use and construction. As stated earlier, such evidence consists of asphaltum, caulking, and tipoyoqoni' (Gamble 2001; King 1990). In addition to this there is the inferential approach that uses changes in trade goods across the Santa Barbara Channel, and changes in pelagic fish and sea mammal remains (Arnold 1987, 1992, 1995; Johnson 1982, 2000). The methods used in this thesis is a combination of both analysis, placed in the framework of stratigraphy and temporal context. This is similar to Bernard's (2001) study of faunal remains throughout the Chumash territory in order to determine *tomol* fishing use, and Rose's (2000) study of SBA-52 to identify their construction in the archaeological record.

By placing the correlation between asphaltum, asphaltum stained stones, *tipoyoqoni'*, and other artifacts in the stratigraphic framework available at the site it is possible to determine changes in vessel constructions over time, as well as changes in the volume of *tomol* built. While Dr. Gamble (2002) has argued for specific drills to be used in *tomol* construction, a point also supported by Dr. Glassow (1982) and Chester King (1954), with these tools having a triangular or quadrilateral cross-section and being 5-10 cm in length, all large drills identified in the analyzed collections will be included. This is due to the bi-conical drilled holes identified in all analyzed *tomol* planks and the ethnohistoric record indicating that holes were drilled from both sides of the planks. The average thickness of each plank would only require a drill of relative short length if drilled from both sides, opening up numerous *tipoyoqoni'* that might otherwise be overlooked. The only qualifier is the width of these tools having to match with the width of the holes, determined through measurements of asphaltum plugs (Gamble 2001; King 1954; Arnold, 1992).

The geological stratigraphy, supported by the presence and percentage of historic materials in the levels will form the temporal framework that such data will be placed in. The primary determination of historic levels will be glass beads and iron tools within the cultural remains, with the principles of stratigraphy holding that levels closer to the surface are more recent then those below.

The present-day site of Mescalitan Island no longer lends itself to excavations, due to construction related to expansion of the Santa Barbara Airport, as well as the building and expansion of the Goleta Sanitation plant. As such, a heavy reliance on previous research and field work was necessary in order to address the questions posed by this thesis. While *'Helo* has been the site of many excavations dating back to the early twentieth century, the majority of that data cannot be used in this study due to poor documentation, record keeping, or field techniques which do not meet the requirements necessary for this temporal and stratigraphic study. There are, however, two excavations that do meet these requirements completely and a third which, while poorly documented as a whole, does have well recorded level provenience along with uniform sorting techniques. These three collections will serve the basis of research for this thesis: the SRS Phase III, the UCSB data recover project, and Warrens field school excavations.

While the final collection, Warrens' field school excavations, was not well documented with regards to field and excavation techniques, this collection has stratigraphic data correlated to the cultural resources recovered. These include faunal data by genus, along with shellfish and asphaltum, excavated in 20cm levels and all sorted through 1/8th inch mesh before being weighed. This collection will primarily be used to support the data from the two previous, more extensive, excavations.

All three collections are housed at the UCSB repository and were studied on site between December of 2015 and June 2017. First, the materials to be studied from each collection had to be identified: asphaltum, asphaltum stained rocks, drill, reamers, and gravers. Any asphaltum identified in the collections was pulled, analyzed for basketry impressions, and weighed, as were asphaltum stained rocks. Drills, reamers, and gravers were pulled and separated for further study.

Each artifact recorded as drill, reamer, or graver, or that met the morphological description of such artifacts was measured: the length, the max width, and minimum width. Following this the material they are made from was recorded. Artifacts were then studied for use-wear to identify the motion use, the amount of use, and the material the tool was used on, i.e., shell, wood, stone, bone, etc. Microscopic analysis of use-wear was undertaken at the UCSB Repository using an eBoTrade Digital Microscope with a 0.3 CMOS image sensor, with a maximum magnification of 800x. Observations were made regarding polish and flaking at 100x magnification while the final interpretations were made with magnification at 200x, 400x, and 600x magnifications. Using Preziosi (1995, 2001) as a framework, characteristics recorded for analysis included polishes, micropolishes, striations, and edge damage.

Polish and micropolish were of most interest during this study as they are able to supply the most data about the materials *tipiyoqoni* were used on, as well as information on how much use each artifact had undergone. Polish from minimal use (Figure 18) has been described as a "generic weak polish" that has a flat and dull appearance with no identifying marks to attribute to any particular material (Vaughan 1985; Preziosi 2001). As the artifact is continually used, a smooth pitted polish forms before producing characteristics unique to each type of material being worked. Vaughan (1985) described both wood and shell polish, with wood polish (Figure 19) being domed and bright with an undulating or rough texture, while shell polish (Figure 20) is described as bright and smooth in well-defined patches that have a smeared appearance containing linear cracking and small bubbles through them. He also mentions a “mother of pearl” quality to the appearance of shell polish. Striations are important in determining the use of a tool and the hardness of the material being worked by the artifact, which are important in determining a tools function.

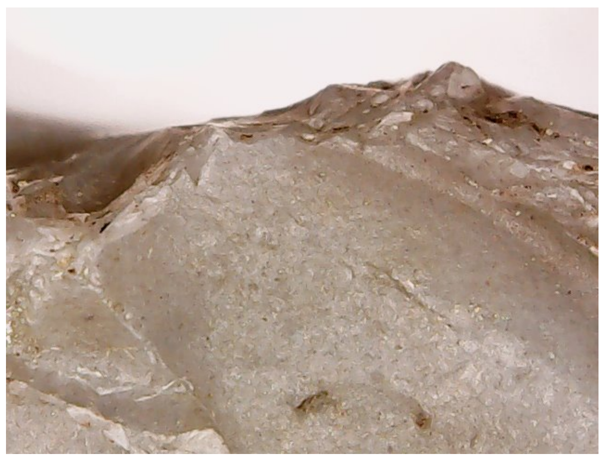

Figure 18: Magnification of drill (177-4935) exhibiting a generic polish. Courtesy of UCSB

Figure 19: Magnification of drill (177-2200) exhibiting wood polish. Courtesy of UCSB

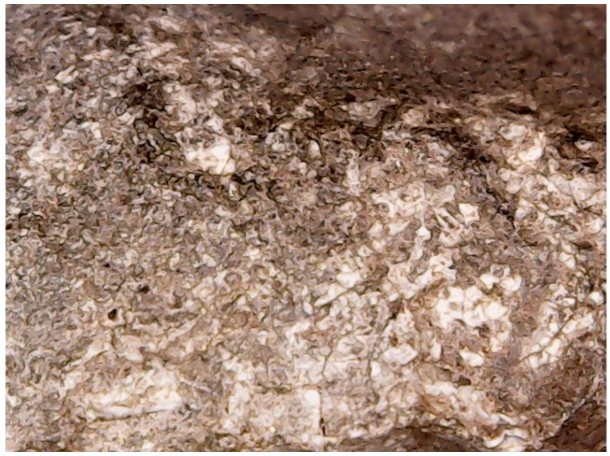

Figure 20: Magnification of drill (177-4205) exhibiting shell polish. Courtesy of UCSB

All asphaltum and asphaltum stained rocks were organized into their stratigraphic layers before further analysis. Microscopic analysis of the asphaltum, both the whole materials and the material on the rocks, was undertaken at 800x magnification in order to determine if there are any differences that can be observed. Asphaltum stained rocks were separated into morphological functions, applicator vs tarring pebble, before being separated into their respective levels along with the total weight of asphaltum. This allows for the observation of changes in the amount of asphaltum used, as well as their correlation to waterproofing baskets or caulking the *tomol*.

Stratigraphy is a key concept to modern archaeology that posits sedimentation and deposition occurs under uniform principles, and there are four distinct laws in play; the principle of superposition, the principle of original horizontality, the principle of lateral continuity, and the principle of stratigraphic succession. Superposition establishes that in a series of deposits, those closer to the surface, if original, are younger than those that lie below them as each layer can only be deposited upon a pre-existing layer. The axiom of original horizontality is that all unconsolidated depositions will trend horizontally, and any tilted deposits were laid so originally in conformity with the preexisting depositions. The principle of lateral continuity states that any deposit will either be bound by the edge of the basin of its deposition or will thin as it extends towards its edge. Stratigraphic succession is the principle that any unit of stratification exists within the sequence from its position between the top of all lower units and the bottom of all higher units with which it has physical contact.

Within the framework of this study, the principles of superposition and stratigraphic succession are of most significance. There is a clear date of contact, 1769, with the Chumash of *'Helo* as well as an established date of last occupation, 1804, and it is possible to identify these dates with the archaeological materials present at the site. Use of Chester Kings chronology of glass and shell beads, from both the SRS and UCSB excavations, combined with these two principles of stratigraphy, allow for observation of change at the site of *'Helo* that support the other archaeological data. While any changes could be a result in shifts in the number of population at the site, such population changes should be represented in the faunal remains and, if identified, would be accounted for.

Chapter V

Analysis

It is well recorded in the historic record that the population of *'Helo* had *tomol* present at contact with the Spanish. While it is not known that such vessels were built at this site, this studies analysis of materials from excavations undertaken indicate that they were. The primary identifiers of this at the site are the macro-drills, also known as "canoe drills", along with the presence of large amounts of asphaltum. This data is further supported by ethnohistoric records from the Missions as well as from interviews with Chumash individuals in the late 1800s and later, along with data from the faunal assemblages. The issue is whether or not the data available allows for the answering of the questions posed by this study.

The archaeological record of *'Helo* can paint a picture of how the progression of colonization impacted the *tomol* and its associated traditions. To determine if such effects occurred it is necessary to determine the chronology of the site, and focus assemblages present during the historic period. The SRS excavations involved radiocarbon dating of a number of shell samples between 4 units: 6, 10, 13, and 32. These samples were taken from varying levels, between 244cm to 25cm levels, and indicate that Late period habitation begins around the 70-80cm level, with Historic period habitation starting around the 30-40cm level (Figure 21). This is supported by the bead type diagnostic, with the majority of Late period present in levels 40-50cm, and 50-60cm. A total of 5 glass beads were recovered, with 4 of the five present in levels above 70-80cm. These diagnostics would indicate that historic habitation was present in levels above 80cm.

Table 4: Radiocarbon dates from SRS excavations (SRS 1985)

Unit	Depth (Cm)	Unadjusted C-14 Date (BP)	Adjusted C-14 Date (BCE-CE)
6	189	9170 +/- 100	7980 - 6460 BCE
6	196	2000 +/- 760	150 BCE - 50 CE
10	25	no date (modern)	N/A
10	43	250 +/- 80	1620 - 1780 CE
10	44	250 +/- 100	1600 - 1800 CE
10	55	700 +/- 100	1150 - 1350 CE
10	88	290 +/- 290	1370 - 1950 CE
13	66	670 +/- 80	1300 - 1460 CE
13	70	770 +/- 70	1110 - 1250 CE
13	105	450 +/- 70	1430 - 1670 CE
13	114	< 200 yrs	1750 CE - Present
32	244	2650 +/- 130	830 - 570 BCE

ACC 367 has a much larger assemblage of beads that were analyzed, a total of three thousand two hundred five beads including sixty glass beads. All but one of the glass beads were recovered from levels above 100cm. Of the remaining fifty-nine glass beads, 13 were recovered from level 0-20cm, fifteen from 20-40cm, fourteen from 40-60cm, and 3 from the 60-80cm level. The entire assemblage was analyzed by Chester King (Gamble 1991), who created a chronology (Table 4) of the stratigraphic layers. King's analysis determined that unit levels above 80cm were representative of habitation after 1770, with the majority of units supporting data indicating that such habitation was focused on levels between 0-40cm. This data agrees with the ACC 177 collection, allowing for the focus of this study to be on levels 0-100cm, as these are those that correlate with the period directly before colonization and during colonization.

Table 5. Chronology of *'Helo* from Chester Kings analysis of beads (Gamble 1991)

Unit	Level	Time Period
54	45-80	1770-1782
54	80-100	Transistion
54	100-160	Prehistoric
51	40-80	1770-1782
51	80-100	Transistion
51	100-140	Prehistoric
57	47-80	1770-1782
57	80-100	Transistion
57	100-160	Prehistoric
58	0-40	1770-1782
58	40-60	Transistion
58	60-120	Prehistoric
66	0-40	1770-1782
66	40-60	Transistion
66	60-120	Prehistoric
67	0-40	1770-1782
67	40-60	Transistion
67	60-120	Prehistoric
68	20-60	1770-1782
68	60-80	Transistion
68	80-130	Prehistoric
69	0-40	1770-1782
69	40-60	Transistion
69	60-120	Prehistoric
70	20-60	1770-1782
70	60-80	Transistion
70	80-130	Prehistoric
71	20-60	1770-1782
71	60-80	Transistion
71	80-130	Prehistoric
83	20-60	1770-1782
83	60-80	Transistion
83	80-130	Prehistoric
85	0-30	1782-1804
Trech 12N	0-70	1782-1804
73	0-40	1782-1804
53	20-80	1782-1804

Tool Assemblage

The simplest indicator of *tomol/tiat* construction is the remains of the vessels themselves. Such remnants are rare, and unfortunately, no such remains were identified within the collection analyzed during this project. The second easily observable indicator of these vessels are fragments of asphaltum caulking and plugs which, while more commonly recovered than planks, are still recovered relatively rarely during excavations. Like the planks, such cultural remains were not recovered during the excavation of the collections studied in this thesis. After these identifiers are removed from the equation, the direct indications of *tomol* construction that remain are the tools and remains of the asphaltum that were used to construct the vessels, of which the most easily identifiable are the stone *tipoyoqoni*' that were used to drill holes through planks which were then sewn together with *tok* and caulked with *yop*.

Between the 3 collections that are the focus of this study, a total of 46 tools that met the morphological design of *tipoyoqoni'* or drill fragments that could have been used in the construction of a *tomol* were recovered from the stratigraphic layers identified as containing historic materials. With a quick organization of these tools by level, a general framework of their use begins to take shape. Starting at a baseline of four *tipoyoqoni'* recovered from the lowest level of 90-100 cm there is a steady increase to a maximum of seven drills at the 30-40 cm level, before their presence steadily decreases to five *tipoyoqoni'* at the surface level 0-10. While this sheds some light on the time range of the use of these *tipoyoqoni'*, as the battleship curve of this frequency seriation indicates the peak usage of the *tipoyoqoni'* occurred during the time period represented by 30-40cm level, it tells us very little about what these *tipoyoqoni'* were used for. The correlation between these *tipoyoqoni'* and other supporting evidence will be discussed later, but first it is necessary to address the use wear present on these artifacts.

Each *tipoyoqoni'* of this study was analyzed under high and low magnification to determine both the amount of use, and the primary material on which it was used. Of first importance was to determine whether each tool was in fact used with a drilling action. This involved the use of magnification at 50X, 200X 400X and 600X power to analyze the microwear of the tools, such as polish, microflaking, and striations. Striations and microflaking are strong indicators of the direction and mode of use for a tool, while other damage to the tools, such as edge rounding, can further identify the motion of use in addition to the hardness of the material on which the tool was used. All *tipoyoqoni'* analyzed in this study exhibited striations and microflaking consistent with use-wear that is correlated with a rotational drilling motion, with one of these tools also exhibiting use-wear consistent with that of a longitudinal scraping motion.

Once these tools were objectively identified as being *tipoyoqoni'*, further analysis of the microwear was undertaken in order to determine the material upon which they were used upon. Polishes, both macro and micro, are dependent upon the amount of use a tool has undergone and the material. Commonly forming along the tips, ridges, and other high spots of a tool, polish can grow to cover the entirety of the tool if used heavily enough and can be consistently correlated to a particular material. While there are several different materials on which these *tipoyoqoni'* could have been used upon, shell and wood are the primary materials that were identified. Shell polish is described as being bright and smooth, with a "mother of pearl" quality, present in well-defined patches that appeared smeared, along with linearly distributed cracks and bubbles (Yerkes 1983). In comparison, wood polish is domed and bright, accompanied with a rough or undulating texture. Tools that have only been lightly used exhibit a generic weak polish, which a number of the analyzed *tipoyoqoni'* show and are difficult to ascribe to any particular material (Vaughn 198).

Of these 46 tools, 25 exhibited use-wear clearly consistent with being used on wood materials, 8 correlated with a shell material, 8 exhibited polish consistent with use on both wood and shell, with 7 *tipoyoqoni'* having generic use-wear matching light use and not attributable to any single material (Table 5 and Appendix). Such data is consistent with Lynn Gambles (2001) assertion that these *tipoyoqoni'* can be directly connected to *tomol* construction, and their distribution further supports this. Of the eight *tipoyoqoni'* that show use-wear consistent with drilling shell, only two of them were recovered from levels 30-40 and above. A similar distribution occurs with the *tipoyoqoni'* exhibiting both wood and shell polish, where only three were recovered from levels 30-40 and above. The remaining *tipoyoqoni'* are distributed as expected, with the majority of *tipoyoqoni'* presenting only wood polish recovered from levels 30-40 and above, and those exhibiting generic polish distributed evenly across the levels.

This data would indicate that the *tipoyoqoni'* were used as a multi-purpose tool before the Historic period. The Indigenous Chumash used the macro-drills for making fish hooks, pendants, *tomol* construction, and a number of other purposes. As time progressed, however, these multi-function tools began to be specialized. Their use shifted away from shell tool and ornament manufacture to drilling wood, until that was their primary use. This is most apparent in the stratigraphic levels associated with the Historic period, indicating that interactions with Spanish colonists, may not have had any effect on tools used for *tomol* construction.

Table 6: *Tipoyoqoni'* analyzed in this thesis

Artifact	Level	Usewear	Formalized
177-61	000-010	Wood	yes
177-1081	000-010	Both	no
177-207	000-010	Wood	no
177-4269	0-10	Wood	yes
177-1081	0-10	Wood	no
177-93	010-020	Wood	yes
177-4348	20-30	Wood	yes
177-3680	20-30	Wood	yes
177-354	20-30	Shell	yes
177-4549	20-30	Wood	yes
177-4348	20-30	Wood	no
177-1500	30-40	Wood	yes
177-1110	30-40	Wood	yes
177-2681	30-40	Both	no
177-1340	30-40	Wood	no
177-2672	30-40	Wood	yes
177-4205	30-40	Shell	yes
177-4656	30-40	Both	yes
177-4629	40-50	Wood	yes
177-4628	40-50	Wood	no
177-5066	40-50	Both	No
177-5220	40-50	Wood	yes
351-1240	40-50	Wood	yes
351-3923	40-50	Both	no
177-2687	50-60	Shell	no
177-2696	50-60	Shell	no
177-2199	50-60	Wood	yes
177-2200	50-60	Wood	no
177-3486	60-70	Shell	yes
177-5354	60-70	Wood	yes
177-3491C1	60-70	Unknown	yes
351-3964	70-80	Unknown	no
177-4949	70-80	Wood	yes
177-2896	80-90	Unknown	no
177-3284	80-90	Shell	no
177-3547	90-100	Wood	yes
351-1225	90-100	Shell	no
177-4935	90-100	Unknown	no
351-6068	90-100	Unknown	no
367-20600621	80-100	Shell	yes
367-20600604	60-80	Wood	no
367-201600613	40-60	Unknown	yes
367-2016000623	0-20	Unknown	no
367-201600626	20-40	Wood	no
367-201600635	20-40	Wood	yes
367-201300292	40-60	Both	no

Furthermore, when the *tipoyoqoni'* recovered are organized into their respective types (Arnold, Preziosi, and Shattuck 2001), another pattern emerges (Figure 22). Slightly more than half of these *tipoyoqoni'* would fall into the Type 3 macro-drills, or "canoe drills", while the remaining tools would fall into Type 1. Of the Type 3 macro-drills, 17 of them show use-wear specific to wood, four exhibit shell use-wear, one shows use-wear consistent with shell and wood, and two had unidentifiable use-wear. Four of the Type 1 macro-drills exhibit use-wear that correlates to being used on shell material and four cannot be connected with any specific material. When the artifacts are further delineated by the stratigraphic level they were recovered from, the majority of the Type 3 drills were found in levels 40-50cm and above, while the majority of Type 1 drills were recovered from 50-60cm and below (Figure 23 and Figure 24).

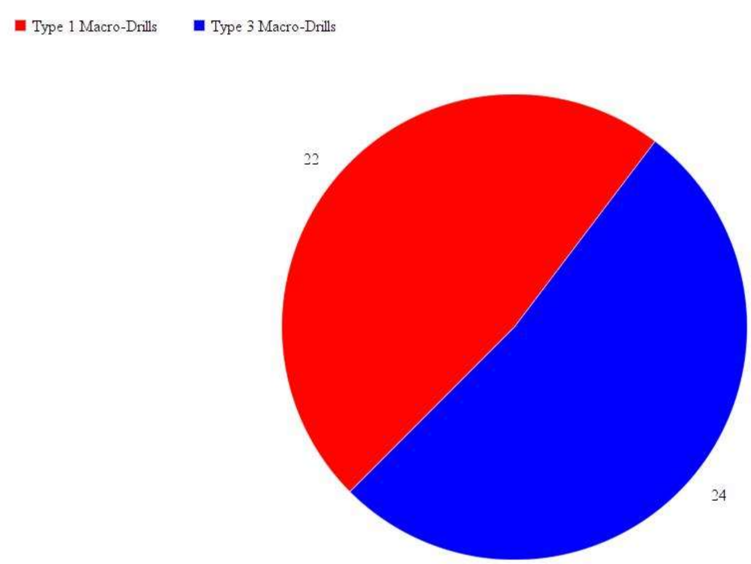

Figure 21: Distribution of Drills between formalized type 3 drills and Type 1 drills in all assemblages.

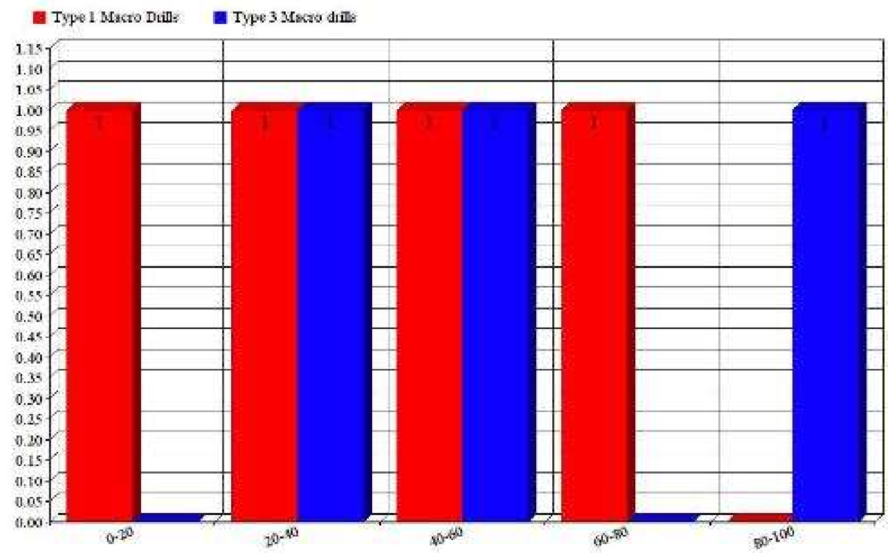

Figure 22: Stratigraphic distribution of drills from ACC 367 assemblage.

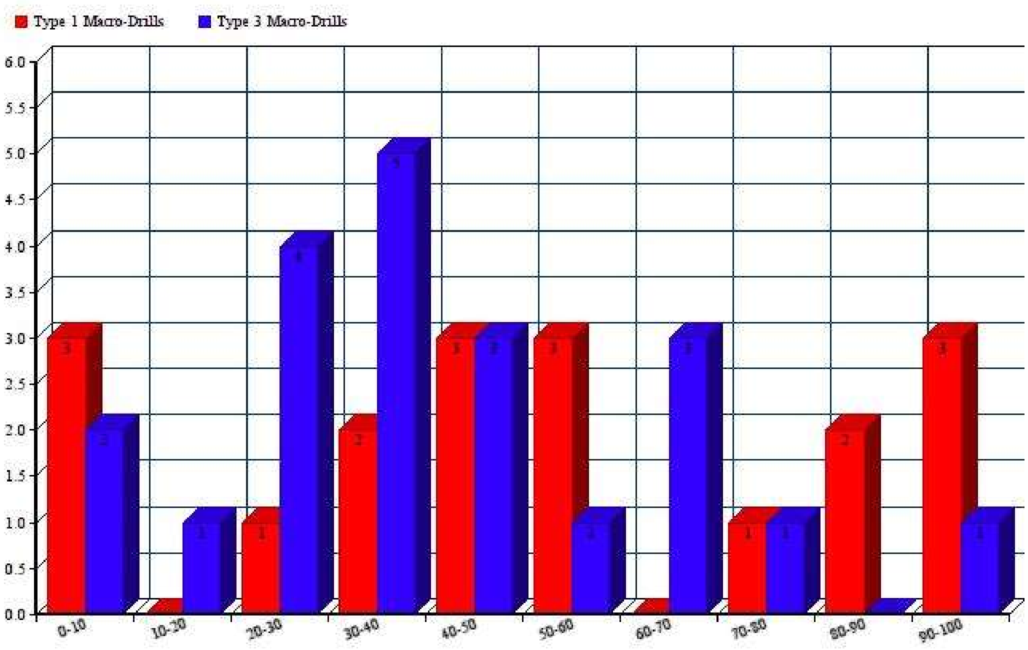

Figure 23: Stratigraphic distribution of drills from the ACC 177 assemblage.

As time progressed, the population at *Helo'* began to formalize their tools to into the clean and well-shaped Type 3 macro-drills, or “canoe drills”. Furthermore, 17 of the 24 Type 3 macro-drills are show use-wear consistent with being used only on wood. In comparison only eight of the 22 Type 1 macro-drills can be clearly identified as being only used on wood. The data shows a clear shift in the use of the *tipoyoqoni'* over time, in both their shape and use. What isn’t observable in this data is any shift that could represent the effect of Spanish colonization. In fact, the data seems to indicate that during the Historic period, the Chumash of *Helo'* began to specialize the lithic tools necessary for *tomol* construction. While the 0-10 cm stratigraphic level shows a shift back, this is the level representing the latest time period just before abandonment of the site.

Asphaltum is another source of data that can be used to determine changes in *tomol* construction. Simply charting changes in the amount of asphaltum present within the archaeological context can shed light on its amount of use. In the case of *'Helo* each of the three data sets matches with that of the *tipoyoqoni'*. A steady increase in asphaltum recovered from the site with a maximum recovered from the 30-40cm level, before a steady decrease towards the surface. ACC 177, the Warren project, recovered the most asphaltum during their excavations, a total of 10513.25g from all units to a depth of one meter. Weights started at 395.4g of asphaltum from levels 90-100 which rose to 2678.0g at the 30-40cm level before dropping down to nine hundred fifty-five and two grams in the 0-10cm levels (Figure 25). The UCSB excavation, ACC 367, recovered a total of 1975.3g from all units to a depth of one meter. Starting at 128.3g in levels 80-100cm, it rose to max of 643.83g in the 20-40 levels, before dropping down to 409.4g in the 0-20 cm level (Figure 26) The SRS CRM project recovered a total of 290.3g of asphaltum from all units to a depth of 1 meter. They hold the single outlier in that the majority of their asphaltum, 101.5g, was recovered from levels 60-70. It then dropped to 23.0g and eight grams in the 50-60cm levels, rose to 48.0g and six grams in the 30-40 levels before dropping to nothing in the 0-10 levels (Figure 27).

What this could indicate is that *tomol* construction increased over the studied time period, even during the Historic period. It was only at the very end of the sites occupation that any sort of decrease was observed. If Spanish colonization was having a negative effect on the construction of these watercraft, a decrease in asphaltum should have been represented within the archaeological context. Instead the asphaltum data indicates that *tomol* construction or repair continued at a constant pace from the Late Period through the Historic period and may have actually increased.

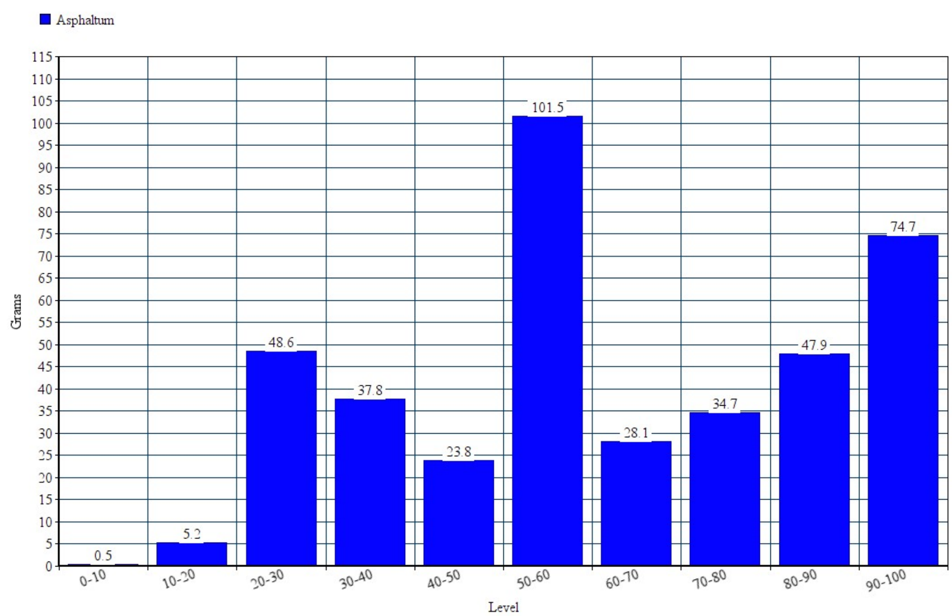

Figure 24: Stratigraphic distribution of asphaltum in ACC 177 assemblage

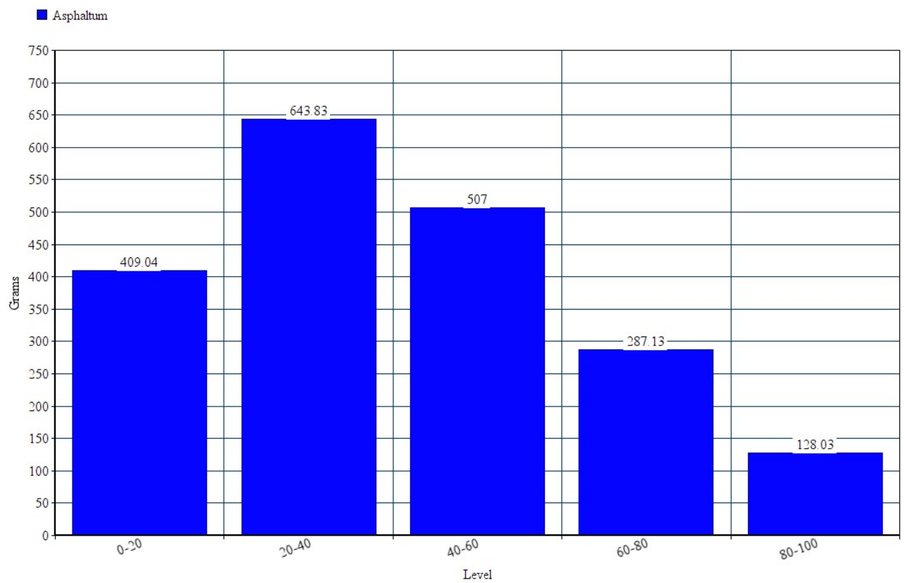

Figure 25: Stratigraphic distribution of asphaltum in ACC 367 assemblage

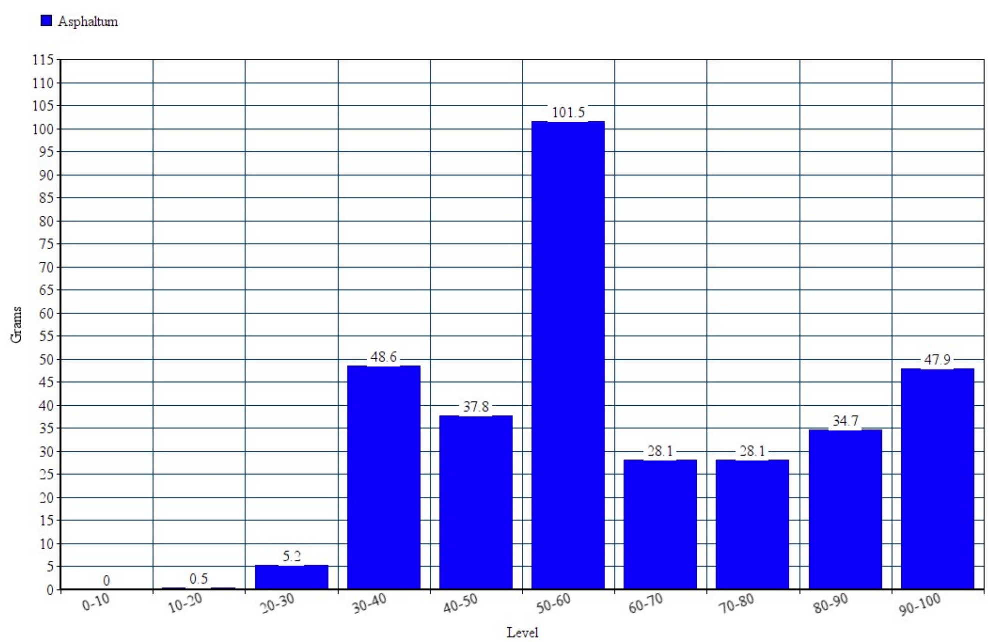

Figure 26: Stratigraphic distribution of asphaltum in ACC 351 assemblage

Of course, asphaltum was used for several different purposes other than *tomol* caulking, including attaching arrowheads and harpoon barbs, repairing bowls, and waterproofing baskets (Bennyhoff 1987; Bamforth 1993: Hudson, Timbrook, and Rempe 1987). Such uses can often be determined by the tools used to apply the asphaltum; tarring pebbles are used to waterproof, while applicators would have been primarily used for caulking. Within the assemblages studied, ACC 177 has the largest number of tarring pebbles and applicators of the three collections, followed by ACC 367 (Figure 28).

ACC 351 only has 3 in their collection, though more may have been present in the residue from their sorting process. When looking at the stratigraphic distribution of these artifacts from ACC 177 (Figure 29), tarring pebbles stay relatively constant throughout the levels, though there is a large jump in their number in the 30-40 levels. Applicators on the other hand drastically increase in the 50-60cm levels, before a general decrease beginning in the 20-30cm level.

This decrease could be a representation of a number of different things, but either a decrease in the number of *tomol* built or a shift to a different application tool are the most likely reason. Considering that asphaltum and *tipoyoqoni'* data seem to indicate no such decrease in watercraft construction it is likely that the introduction of a new tool is the cause for this shift. No such tools were identified from these collections, though this may be a matter of a failure in excavation or analysis techniques from the original excavations or poor preservation.

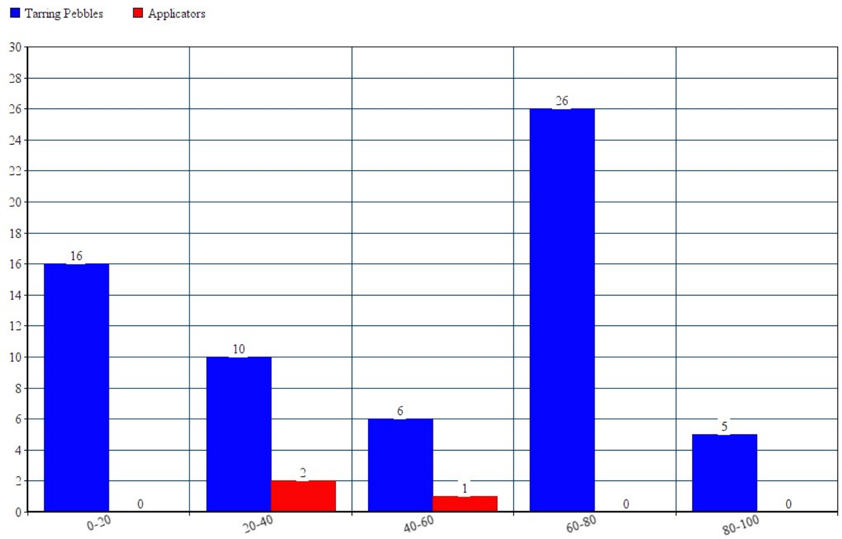

Figure 27: Stratigraphic distribution of tarring pebbles and applicators from ACC 367 assemblage

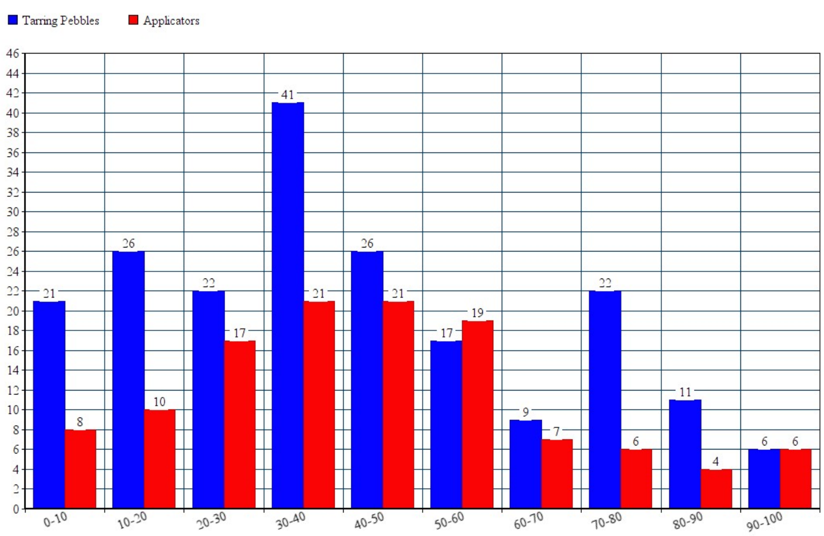

Figure 28: Stratigraphic distribution of tarring pebbles and applicators from ACC 177 assemblage

Overall, there seems to be little observable shifts in the specific types of tools related to the construction of the *tomol* within the archaeological record of *'Helo*. New or different tools connected to the maritime traditions of the Chumash have not been recovered from the excavations used for this study. This could be due to any number of reasons; it is possible that previous excavations collected, destroyed, or moved these materials. It is possible that such items have not been recognized, or that they have decayed beyond recognition; rusted or corroded metal is often recovered but is not identified any further. The one exception to this is with the *tipoyoqoni'*.

There is steady increase in the number well-shaped formal macro-drills called "canoe drills" or Type 3 macro-drills is observable in comparison to less formal Type 1 macro-drills. It is possible that this indicates further specialization of *tomol* construction during the Historic period, perhaps through acts of *"*The Brotherhood of the Tomol*"* at *Helo'.* Another possibility is that with the introduction of other Spanish materials into the maritime culture of the Chumash, the *tipoyoqoni'* were no longer multi-purpose tools and as such could be formalized into a form specific to *tomol* construction.

In addition to their stratigraphic distribution, there is an observable shift in the use-wear on the recovered *tipoyoqoni'*. Whereas many of the earlier *tipoyoqoni'* show signs of both shell and wood wear, the artifacts from the later historic period have use-wear that primarily correlate with working wood. While distribution indicates a slight decrease in the number of such tools used, particularly in the later Historic period, this shift in what these *tipoyoqoni'* were used on is important. It further delineates a shift towards a specialization of these tools during the Historic period. With both more standardization and clearer evidence of only being used on wood, it is clear that some sort of shift occurred related to the building of the planked canoe.

While a number of fishing implements were recovered from all three excavations, they are in such small numbers that little can be extrapolated. Their distribution from ACC 177 appears to be distributed evenly (Figure 30), while in ACC 367 fishhooks are more common in and on either side of level 40-60cm while barbs are primarily found in the 20-40cm level (Figure 31). This directly contrasts the high amount of fish remains present at the site. Archaeological data at other sites, along with ethnohistoric records indicate that there was a shift from bone and shell fishing implements towards metal implements, which may account for this contradiction in the archaeological record of ‘*Helo* (Bamforth 1984; Bickford 1982).

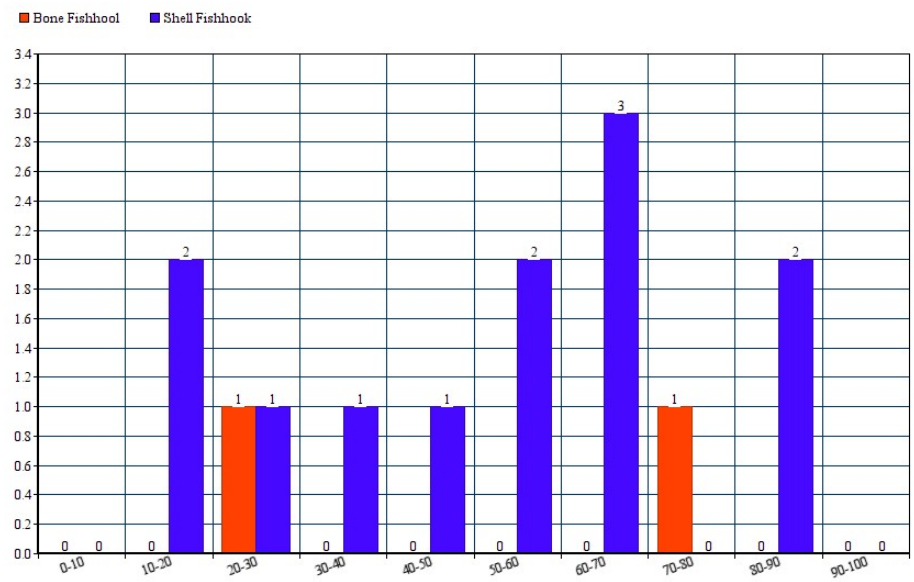

Figure 29: Stratigraphic fishhook distribution from ACC 177 Assemblage

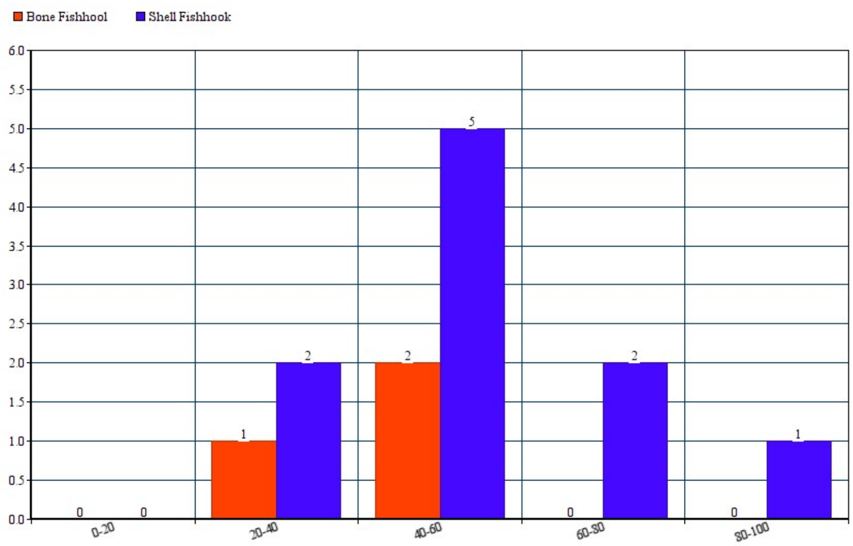

Figure 30: Stratigraphic fishhook distribution from ACC 367 assemblage

Ethnohistoric Data

There is little discussion in the historic record of the construction of the *tomol*, be it from explorers, travelers or missionaries. Almost the entirety of our knowledge about the construction of these vessels comes from the notes of J.P. Harrington and his Chumash consultant Fernando Librado. In Harrington's notes Fernando stated that the *tomol* did not have ribs as their canoes were "strong and stiff" as well as pointing out that ribs were "not necessary, nor would they be easy to build in as the canoe's sides bulged outward" (Hudson Timbrook Rempe 1978: 101). This matches up with descriptions of other earlier explorers and colonists that specifically noted the distinct lack of ribs in the vessels that they observed. The Spanish explorer Constanso wrote:

> "The expertness and skill of these Indians is unsurpassed in the construction of their canoes of pine boards. They are from eight to ten yards in length, from stem to stem post, and one yard and a half in breadth. No iron whatever enters into their construction, and they know little of its use. But they fasten the boards firmly together, making holes at equal distances apart, one inch

> from the edge, matching each other in the upper and lower boards, and through these holes they pass stout thongs of deer sinews. They pitch and calk the seams, and paint the whole with bright colors" [Rogers 1929: 6-7].

Such records and descriptions, however, contradict other statements by Fernando where he speaks of other *tomol* that did contain ribs, specifically mentioning a total of 5 vessels containing ribs, and giving a description of how they were placed. (Hudson Timbrook and Rempe 1978). In one interview, Fernando describes how after finishing the construction of these *tomol*, Palatino, a baptized Chumash that built canoes for Mission Buena Ventura, would have the ribs of *iriris* wood bent and laid in after their bark had been removed. Then a blacksmith would come with a drill and small nails to fasten the ribs to the vessel (Hudson Timbrook and Rempe 1978: 102). Holes were also made close to where the ribs were to be located in order to further tie these ribs into place. If this was common practice for the placement of such ribs, there are a few identifiers that would be recognizable in the archaeological record.

The first such identifier would be an increase in small iron nails in layers dated to the historic period. If the average of the ribs in the five *tomol* is 2.8 ribs, then it can be argued that each vessel would contain an average of 44 nails. This number comes from the number of holes needed to connect the ends of boards together, a minimum of two, being used as the number of nails necessary to connect to each board. It is possible that only one nail was necessary for each board, in which case there would be an average of 22 nails per *tomol*. Only three metal fragments identified as nails were recovered from the UCSB excavations, and none from the SRS excavations. While such a small number of nails necessary to begin with would limit the amount discarded or lost during the building process, if this was a widespread practice, one would think that more nails would be recovered during excavations. It is possible that these materials could have been reused or repurposed, but there is no evidence of that at *Helo'*.

The second identifier would be found on the plank remains of any *tomol* recovered in the field. If ribs were placed in these vessels the way Fernando describes them, then planks would show signs of this. Additional holes from the nails for the ribs, as well as those needed for the tying of those ribs to the planks, would be easily identified by their placement near the center of those planks. Such additional holes near the edges would weaken those areas of the plank as well as the *yop* caulking that would have already been placed. Furthermore, the iron nails used would stain the wood, a clear mark of their use in this process. No such identifiers have been observed in the archaeological remains of the *tomol* presently accounted for at *Helo'*.

There could be a number of reasons to account for this. Only a few broken remains of planks have ever been recovered and never has a complete *tomol* been located, so it is possible that the fragments of planks available for study simply were not those where ribs were attached. Another possible reason could be that the planks recovered so far come from before the historic period and the advent of ribs or nails in the building process. The final possibility is that such practices, possibly only present during the historic period, were never common. Considering that Fernando's statements mentions *tomol* both with and without ribs, combined with early historical descriptions by Spanish explorers, it is also simply possible that some canoes had ribs while others did not.

Other important ethnohistoric data is present regarding the numbers and use of the *tomol* during the historic period, particularly in relation to mission use of the vessels. In addition to providing food to the missions during periods of poor harvest, they also took advantage of the skill of the Chumash in hunting sea otters, turning it towards foreign trading enterprise (Hudson 1976; Ogden 1941:15-25). During the first two decades of the nineteenth century, records show that the missions were making quite a profit from the use of the *tomol*, as they were the only vessels capable of hunting sea otters from. Mission San Buenaventura, reported yearly totals of one hundred to one hundred sixty pelts (Simpson 1962:64), while Mission La Purisima was receiving an annual cash benefit of $10,000.00 dollars from the pelts (Bancroft 1885:124). Most of these pelts made their way, illegally, into non-Spanish hands, such as William Shaler of the *Lelia Byrd* or John T. Hudson and the *Tamana*, spending almost half the year trading with the Spanish Missions, leaving upwards of $25,000.00 each year (Hudson 1976; Bancroft 1885; Simpson 1926). It is possible that this may account for the continuation of *tomol* construction and use by the Indigenous population after the collapse of many of their prehistoric lifeways.

Fernando told Harrington a story of how Father Jose Senan ordered a captain of the Chumash, *Timiyaqaut*, to take 30 canoes in order to bring back those living on San Miguel Island (Hudson Timbrook and Rempe 1978). Jose Senan was president of the California Mission between 1812, when many of those living on the islands were removed, and 1815 when he has been reported to have sent 24 Chumash to visit the islands (Simpson 1962). Fernando stated that the Chumash ordered by Jose Senan were La Purisma Chumash, which would mean that between 1812 and 1815 the Indigenous population of the La Purisma Mission owned at least thirty *tomol.*

Another document from Father Antonio Ripoll speaks more directly to the *'Helo* site that is the emphasis of this study, as that is the location related to the *tomol* in the document. After the Chumash Revolt of 1824, he wrote of his feelings regarding the occurrence:

> "Finally this narrative would be endless were I to recount the feelings I have experienced and the sufferings I have undergone during this period. They have been of such intensity that I have been tempted to flee to the island in a canoe where fifty of the neophytes from here are who on the day of the uprising embarked during the night at Mescaltitan. We **have** only two canoes but I am certain that if we had twenty or thirty we could take the two hundred people whom I have reunited with me and I would have gone along with them…" [Geiger 1970:357; emphasis added].

Hudson (1976) uses this same section from Father Ripoll in *Chumash Canoes of Mission Santa Bárbara: the Revolt of 1824*, as mentioned in an earlier chapter. In that article, Hudson attempts to recreate the events of the night mentioned by Father Ripoll, missing important information and making assumptions that did not take certain issues into account.

Hudson argues that the fifty Chumash that fled to the islands that night used the two canoes owned by the mission to travel, which does not corroborate with Father Ripoll's account. In the letter, Father Ripoll takes note that the Chumash only took a little bit of clothing and some money from the Santa Barbara Mission, showing much respect for Mission property (Giger 1970: 6). They then proceeding to take the *tomol* that were paid for and owned by the Santa Barbara Mission does not seem likely, though it is not out of the realm of possibility. It becomes impossible, however, when Father Ripoll states that "We **have** only two canoes" indicating that the mission still possessed those two vessels.

It is further unlikely that 50 individuals were able to fit into only two *tomol*. While Hudson rightly points out, along with others (Hudson 1976; Gamble 2001; Arnold 1987, 1992, 1995; Arnold and Bernard 2005), these vessels were capable of carrying large amounts of weight. This overlooks a few important aspects of any seagoing vessel: the actual space available and the stability of a loaded craft. An individual takes up quite a bit of space, and distributes their weight vertically. Twenty-five people in a single six or ten meter long *tomol* is likely to make it very unstable and unlikely to survive a crossing to the islands. Even in today's crossing in *tomol* there are only four to six individuals, and historical documents never mention more than 10 Chumash in a vessel at any time.

This matches up with Father Ripoll's wish for "twenty or thirty" so as to take the "two hundred people with which I have reunited" (Geiger 1970: 370). Taking the more likely estimate of 10 people per vessel, then those fifty Chumash would have required at least 5 *tomol* at Mescalitan, also known as *'Helo*, in order to make it safely across the channel. Along with the earlier mention of the 30 canoes owned by the La Purisma Chumash, this tells us that the Indigenous inhabitants of the Santa Barbara Channel continued to make and, importantly, own *tomol* while living in the mission system.

These ethnohistoric records show a very different view of the Chumash maritime practices, then would be expected considering the numerous different adaptations the Indigenous population underwent during the Historic period. Where other lifeways adapted to the effects of missionization, were destroyed, or were practiced in secret, the maritime practices did not seem to shift. Chumash people, regardless of their settlement inside or outside the missions, continued to build and own *tomol.* Additionally, they continued to construct them in their traditional ways and the only record of differences are in those purchased specifically by the missions.

Chapter VI

Conclusions

The introduction of the Spanish into what is now California had large and far reaching effects upon the Indigenous Chumash. From colonization to missionization and everything in between, the Chumash were forced to make choices and adapt to the new world they lived in. Some chose to leave the localities with a Spanish presence, others to stay in their homes, and yet others chose to more closely tie themselves with the colonizing people, but all fought to keep their traditions alive while adjusting their worldview with new information. The *tomol* was one of those traditions, regardless of whether the members of a village chose to stay or join the mission system. It continued to be a valuable and vital part of their culture, and one that continued to be worth the expending of large amounts of time and resources to continue, despite the chaos now permeating the Chumash territory.

A great number of things can be learned through the study of the tools used in the construction of watercraft, from insights into building practices to broader effects in the culture. Data such as shifts in the number of tools recovered from the site, between chronological and/or stratigraphic periods, is the simplest area to start at. In the context of this study, the shifts analyzed start roughly around 1500 CE +/- 100 and continue to the last known settlement of the site in 1804. These dates are represented stratigraphically from 100 cmbs to surface, and observable changes can be observed between each 10 cm level. The Historic period is represented by the levels 0 – 80 cm, particularly the date range between 1770 CE and 1804 CE, as determined by King (Table 5).

Increasing numbers of tools related to the construction of watercraft between chronological or stratigraphic periods may be an indicator of more individuals that are involved in the building process, or an increase in the number of vessels being constructed. Likewise, decreasing numbers might indicate a decrease in individuals involved, or *tomol* built. Either one of those cases could be indicative of the general number of vessels being constructed. Of course, there could be other reasons for such changes, such as the location where the *tomol* are being constructed moving, but in the case of the limited space on the island as a whole such changes would force the shifts in other loci, such as butchering, ritual, or bead manufacturing. Additionally, such changes could symbolize broad cultural changes regarding the practices requiring such vessels, such as fishing and trade.

The introduction of new tools into the archaeological record provides other information. New tools may symbolize changes in the construction of watercraft, either in processes used to build them, or in the design of the vessels themselves. This could also indicate the introduction of culture or technology from new outside sources, either from trade or other less peaceful interactions or internal technological advances. This is especially relevant in regards to the Chumash as areas nearby their villages were often chosen as sites for the missions and so exchange of goods, materials, and culture were likely to occur at a high frequency.

For more detailed information, analysis of the use-wear on these tools provides valuable information related to their use. Such analysis can illuminate how each tool was used, as well as important information regarding the materials upon which they were used. It can also indicate varying amounts of use tools undergo, which could be a sign of cultural practices related to the passage of tools between individuals, among other more mundane practices such as resharpening rates. In relation to this thesis, the use-wear observed on *tipoyoqoni'* was invaluable in determining shifts in their usage, particularly in regards to the materials they were used on.

Varying degrees of impact can be identified within the ethno-historic and archaeological record of *'Helo.* The enthnohistoric records, primarily from Fernando Librado, make some mention regarding changes in tools necessary for the construction of the *tomol*. He discusses the use of iron tools, though they are limited and mentioned in passing, and only in regard to replacing the same Indigenous tool. Fernando speaks to the use of an iron *calfata* as the replacement for the wooden caulking tool, iron hand adzes to replace the shell adze, and the use of iron blades to replace lithic knives (Hudson Rempe and Timbrook 1978). Interestingly, there is no mention of the use of handsaws in *tomol* construction, despite their known availability (Hudson Rempe and Timbrook 1978; Simpson 1996). In some cases, nails were used to connect the likely historically introduced rib, to the strakes of the vessel. While there is no mention of metal drills being used by the Chumash in building the *tomol* their use is known in other sections of woodworking by the Indigenous population and one would think that they were used in canoe construction as well, especially as they were imported by the Missions in the dozens (Sloan 1984; Hudson Rempe and Timbrook 1978; Simpson 1996).

The archaeological record conflicts with this however, with no metal drills recovered from the site of *'Helo* and instead a continued increase in lithic drills can be observed until abandonment of the site. Furthermore, other noticeable shifts regarding these tools and their continued use in Indigenous culture can be observed. The uses of these *tipoyoqoni'* at the site changed over time, to specialize further in relation to the construction of the *tomol.* Additionally, there is an observable rise and fall in the number of these tools recovered between stratigraphic levels and chronological periods. This can, of course, be attributed to a number of different reasons, and only one of those is a concurrent increase in the creation and repair of Indigenous watercraft, but it is the opinion of this thesis that it is the most probable cause. Another likely possibility is that these tools are used for a number of different purposes, such as shell fishhook or shell pendant manufacture, of which *tomol* construction is only one small part, but the data available from the use-wear analysis is at odds with this explanation.

All the *tipoyoqoni'* that could be used in the drilling through the redwood planks of the Chumash planked canoe to a depth of 100cm were analyzed in order to determine the material on which they were used. This 100cm range was determined to contain material from before contact through the Historic period and to abandonment of the site, through previous analysis of bead typologies along with the presence of historic materials (Gamble 1990 and 1991). A pattern emerged that indicates that where these *tipoyoqoni'* were more often used with shell, or with both wood and shell materials in the lower levels (earlier in the chronology), these same drill types began to be used almost exclusively on wood materials in the upper levels (later in the chronology).

As the number of wooden implements that the Chumash worked with *tipoyoqoni'* was limited almost exclusively to *tomols* this would mean that as time progressed, these tools progressed from being used for a number of purposes to just construction of planked canoes. In other words, the multipurpose *tipoyoqoni'* shifted to being used only for woodworking and as such activities requiring drilling was limited it is likely that such tools were used specifically for drilling *tomol* planks. Of particular interest is that this shift occurred primarily within the stratigraphic contexts connected to the Historic period, when the Indigenous population was being most affected by Spanish missionization.

In regard to other tools, there are ethnographic records of shifts away from shell and bone fishhooks to iron ones. There are also similar shifts towards iron harpoon barbs or heads, with the specific mention of a baptized Chumash blacksmith named *Aniceto* who was noted for the fineness of his iron harpoon points (Hudson Rempe and Timbrook 1978). Such adaptation to the materials available is well known among the Chumash, with the clearest example being their use of needles for bead manufacturing. It is interesting that the data from *Helo'* indicates no such change in the construction of the *tomol*.

The changes in use-wear on the recovered *tipoyoqoni'* further supports the shift to iron fishing implements. It is likely that such macro *tipoyoqoni'* were originally a multipurpose tool used on a variety of materials in order to make other items. One such item would be the shell fishhooks used by the Chumash, supported by the shell polish observed on a number of the earlier *tipoyoqoni'*. With the introduction of iron fishhooks, there was likely a decrease in the number of shell fishhooks made, which is represented by the decrease of macro *tipoyoqoni'* with shell polish present.

An important impact of this study regarding the *tipoyoqoni'* related to *tomol* construction has to do with the overall lack of a real typology. The Type 1-4 typology put forward by Arnold (2002) only helps organize these *tipoyoqoni'* into morphological boxes but tell us little about their use or chronology. The "canoe drills" and "fishhook drills" of Gamble (2001) and King (1985) have little support for that level of specialization, and overly focus on formalized *tipoyoqoni'*. This study instead posits that both the formalized "canoe drill" or Type 3 *tipoyoqoni'* and the more amorphous Type 1 macro-drill, along with members of the other typologies, were used for a number of different purposes. Such purposes can be determined through measurement of the width and length of these tools combined with the observable use-wear regarding the materials they were used on (Table 5 and Table 6).

Relating specifically to the *tomol*, the length of these *tipoyoqoni'* has been one of the primary factors in the determination of *tipoyoqoni'* used for this purpose. Gamble argues that the standardized trifacial drills that average between 19mm and 20mm in length are prime examples of "canoe drills" as this matches up with the average width of canoe planks which are 20mm. There are two issues with limiting *tipoyoqoni'* that meet this description. First is that a drill that is the same length as the width of the material it is being used to drill through cannot, in point of fact, be used to drill directly through. This ties into the second point: ethnohistoric documentation states that the holes for the *tomol* planks were bi-directionally drilled, meaning that a drill only needed a working bit of 10.00mm in order to successfully pierce through a plank. This is also supported archaeologically through the shape of the aspaltum plugs, which are bi-conical in shape, and in the holes in recovered planks, which are conical on both sides.

Table 7: Measurements of *tipoyoqoni'* in this thesis

Artifact	Level	Max Width in mm	Length in mm	Min Width in mm
177-61	0-10			
177-1081	0-10	9	36	3.5
177-207	0-10	9	32	3
177-4269	0-10			
177-1081	0-10			
177-93	010-20	9	49	6
177-4348	20-30	8	39	3
177-4549	20-30	18	54	7
177-3680	20-30	11	41	4
177-354	20-30	8.5	21	3
177-4348	20-30	8	39	3
177-1500	30-40			
177-1110	30-40			
177-2681	30-40			
177-1340	30-40			
177-2672	30-40	9	65	4
177-4205	30-40	10	40	3
177-4656	30-40	9	24	5
177-4629	40-50	7	26	2
177-4628	40-50	20	59	7
177-5066	40-50	10	37	5
177-5220	40-50	10	27	3
351-1240	40-50	6	25	3
351-3923	40-50	7	19	3
177-2199	50-60	11	35	5
177-2687	50-60	12	38	4
177-2696	50-60			
177-2200	50-60	8	19	4
177-5354	60-70	7	23	2
177-3486	60-70	10	43	4
177-5354	60-70	7	23	2
177-3491C1	60-70	7	15	4
351-3964	70-80	7	20	2
177-4949	70-80	7	15	4
177-2896	80-90	11	25	4
177-3284	80-90	7	24	5
177-3547	90-100	11	41	4
351-1225	90-100	10	32	4
177-4935	90-100			
351-6068	90-100	12	37	3
367-20600621	80-100	8	30	3
367-20600604	60-80	10	13	2
367-201600613	40-60	12	43	3
367-2016000623	0-20	11	35	2
367-201600635	20-40	6	11	2
367-201300292	40-60			

Removing the standardization and length requirements proposed by Gamble's studies, opens up a much larger range of possible *tipoyoqoni'* used for *tomol* construction. Additionally, the maximum width is not quite as important either if the *tipoyoqoni'* are long enough, as the bi-directional drilling means that only the 10mm working edge of these tools have to be equal to the width of the holes. Even *tipoyoqoni'* that are larger by a few millimeters are still acceptable as the conical shape of the holes and asphaltum plugs would indicate that the width of the *tipoyoqoni'* used were in fact larger than the holes themselves.

Data from the site of *'Helo,* indicates that tools used in the construction of *tomol* did not change. There are no examples of the invention of new tools by the Chumash, though there may have been the introduction of some European tools into their tool box. Currently these introductions are only recorded in the ethnohistoric record, though other sites and other excavations have recovered such tools, such as iron axe heads and knives, which could have been used in the construction of these vessels. Usage of Indigenous tools used in building *tomol,* however, are shown to express shifts over time, specifically the stone drills identified as being used to drill holes in the canoe planks. As discussed earlier, *tipoyoqoni'* shifted from being equally used on shell and wood to being almost exclusively used on wood.

It is clear that items related to maritime traditions did change, with a shift away from shell and bone hooks and harpoons, to those made of iron. This is obvious in both the ethnohistoric and archaeological records, with fewer shell fishhooks recovered from later levels. A change in the types of fishhooks used by the Chumash would also affect the tools used to make those fishhooks. As the data at *'Helo* has indicated, many of the *tipoyoqoni'* that could have been used for constructing the *tomol* in the earlier levels showed use-wear consistent with shell as well as wood, along with a larger number of *tipoyoqoni'* showing wear in line with use on only shell.

As time proceeded, these *tipoyoqoni'* began to be used more and more on wood alone, perhaps indicating that fewer shell fishhooks were being made. As faunal remains show, however, fish continued to be a large portion of the Chumash diet indicating no decrease in the number of fishhooks used. This may represent a steady movement towards the use of iron fishhooks, over shell or bone fishhooks. Instead, the shift in use-wear is likely symbolic of a decrease in the number of possible usages for these *tipoyoqoni'*, from multipurpose tool, to primarily construction of the *tomol.*

Similarly, to the lack of the invention or addition of new Indigenous tools over time, the materials recovered from *'Helo* do not show much of a shift in the materials used to create their tools. Throughout time, the majority of *tipoyoqoni'* are made from readily available Monterey chert. There are some examples from the assemblages that use quartzite, mud- or silt-stone, and Franciscan chert. The distribution of these outliers, however, show no observable chronological pattern and are spread throughout the levels. There is, however, a shift in the *tipoyoqoni'* recovered from the archaeological excavations that are indicative of changes in production. Material does not change, but there are minor shifts in morphology.

Though miniscule, there seems to be general movement away from the rougher tools in the earlier levels towards the more formalized "canoe drills" labeled by Gamble. It is unlikely that this is indicative of any changes to construction in watercraft, though it may be symbolic of more time spent on making these tools, or of an increased consolidation of construction techniques in the formalized "*Brotherhood of the Tomol*." Another possible conclusion is the shift away from their multipurpose use with fishhooks due to the introduction of iron fishhooks, led to a specialization of these tools for *tomol* construction involving a higher level of standardization.

Over all, the archaeological record shows a steady growth in the amount of archaeological data pointing to increase in construction of the *tomol* at the village site of *'Helo*. Increases in tools, such as *tipoyoqoni'* and applicators, along with materials such as asphaltum, all point to an increase in the construction of the *tomol*. The increase in faunal remains of species that require these vessels to access, signify a matching increase in the use of the *tomol.* While it is impossible to identify the exact number of these vessels built at any one time from the archaeological record, it is possible to determine shifts, such as increases or decreases in their general number. Despite the massive reductions in population, both from disease and migration, the inhabitants of *'Helo* continued to spend valuable time and resources on constructing *tomol* until abandonment of the site and perhaps even past that point.

Ethnohistoric records support this, starting from the very first mention of *'Helo* by Portola's expedition. Both Portola and Crespi mention *Helo'* as having 16 planked canoes in 1770, around the height of its population. Almost every Spanish Mission in Chumash territory recorded the purchase of one or more *tomol* for use in gathering food and otter pelts, from local Chumash villages, though Mission San Luis Obispo has records indicating that they purchased one vessel from Mission Santa Ynez. Mission Santa Barbara specifically, purchased 2 such vessels, one of which is known to have been built at Mescalitan (Hudson, Timbrook, and Rempe 1978). Even in 1824, almost twenty years after the abandonment of *'Helo* by what remained of its population, at least 10 *tomol* were still present at Mescalitan and in good enough repair for fifty Chumash to take to the islands during the revolt. Throughout the history of Chumash, even to the present day, they continued to control and access the ocean through the construction of the *tomol* that were so integral to their society.

The primary question explored with this study was how exploration, colonization, and missionization had on the construction and use of the *tomol* of the Indigenous Chumash living at the village site of *Helo'.* As can be concluded from the data throughout this thesis, missionization seems to have had little effect on the construction and use of these vessels until the majority of the Chumash population had shifted to the missions; as village populations were drained to the missions, the important links of trade through the Chumash sphere of influence were shattered and the technology used, the *tomol,* was no longer used for trade.

This is not to say that the importance or value of these vessels decreased but could even be said to have increased. As stress upon the Chumash region increased with colonization and missionization, the availability long relied upon terrestrial resources decreased. This lead to an increased reliance upon the maritime environment and the technology necessary to access it. The faunal assemblage at *Helo'* supports this, as does the increase in numbers of *tipoyoqoni'* and the shift in their use-wear indicating a primary use on wood.

The Chumash from the *Helo',* and likely the surrounding villages, continued to build and use these vessels to navigate the currents of the world they found themselves in. While the *tomol* had always been used for fishing and sea mammal hunting, with missionization this became its primary use, overshadowing their value as trading vessels. These watercraft even gave the Indigenous population a strong bargaining power with the missions as the resources, only accessible to the Chumash, was just as necessary for the survival of the Spanish as it was for the Indigenous population. This is even more apparent with the trading of otter pelts by the missions as, once again, it was only the skilled Chumash hunters that were able to capture the animals.

There are of course several limitations and issues that come with this study. First and foremost is that the data used was collected through 3 separate projects by a number of different archaeologists. This resulted in different methodologies, field techniques, lab techniques, and analysis being used to gather data and answer different questions. This is overcome by narrowing the scope of this study to specific data points, i.e. lithic tools and asphaltum, as well as focusing on a smaller section of the excavation to the depth of 100cm. It has often been the practice that assemblages from previous excavations undertaken by earlier archaeologists are to be used hesitantly. This study hopes to overcome that bias by demonstrating that, despite the aforementioned issues, previous data from other excavation can continue to provide valuable information to archaeologists.

Along with the above limitation, is that this study is focused on one site and one period of time for that site. This limits the applicability of conclusion of the thesis only to *'Helo* as well as only to the period of time directly before and during the Historic Period. Because of this, broader conclusions cannot be made about *tomol* as a cultural phenomenon. Instead, this focus does allow for the creation of a framework that can be applied to other sites as well as to other times. By demonstrating that distinctions can be made about planked canoe construction, as well as other maritime traditions, at one point in space and time supports further analysis of other sites and broader swaths of time.

Another large issue is the stratigraphy of the site, as the geological morphology has drastically changed. Before the excavations that make up the assemblages used in this thesis were undertaken, much of the site had been used for farming, construction fill, and had been built upon. This had severe effects on the site surface and upper levels. Additionally, poor records and field techniques by earlier archaeologists who undertook large and extensive excavations further damaged the stratigraphy and the cultural resources present at the site. Fortunately, the later excavations used for this study were diligent in their stratigraphic analysis, addressing these issues to the best of their abilities with advanced field techniques and recordation. Additional issues can come from the bio-turbation common to Southern California from varying types of burrowing mammals, which has been known to transport materials vertically through the local stratigraphy.

A separate limitation, is the lack of spatial analysis within the boundaries of this thesis. With known specialization throughout the Indigenous Chumash culture, the "*Brotherhood of the Tomol"* bening of particular note in regard to this study, loci of work could be identified. While this thesis looked at the vertical or temporal aspect, there was no placement of that within a horizontal space, and so such loci were not identified. Luckily this is a limitation that can be easily addressed, hopefully within the near future by this author or other archaeologists with interest into colonial interaction with Indigenous. There is valuable information to be drawn from the horizontal spatial distribution of the data points identified within this report, especially when combined with the temporal distribution identified at *Helo'*.

Additionally, the sample size of of *tipiyoqoni'* is not particularly large with only 46 such tools studied in this thesis. When placed alongside the lack of horizontal control, there is the risk of the data being skewed by unidentified loci. These include use/discard loci being under or over represented, a single habitation site providing the majority of the tools studied, or the excavation of a cache. Again this is an issue that is simple to solve, and perhaps can provide even further data regarding the maritime practices of the Indigenous Chumash.

Despite these limitations, and perhaps even because of them, there is opportunity to expand upon this thesis and open up more areas of study. By applying the methodology used, or similar ones, to other Chumash sites, it is possible to create a much larger understanding of the maritime traditions of the region. This opens up possibilities of observing differences between villages, canoe construction specialization, and the effects of local seascapes on Chumash maritime practices. Of particular interest would be differences between mainland sites and island sites. Due to the specialization of shell bead work on the islands and the complex trade mechanisms that were created because of that, it is possible that *tomol* construction, ownership, and use, were different on the islands. Furthermore, as mainland sites became more heavily affected by the Spanish Missions, there may be signs of trade stress on the island populations, who were dependent upon many mainland goods. Other maritime traditions could also be affected, and it would be interesting to see the similarity or differences in maritime practices, such as the use of iron tools or shifts in resource use.

Even more, this thesis has effects on the study of maritime construction that extend far beyond that of the Chumash. By demonstrating that conclusions can be drawn about maritime traditions from the analysis of tools used to construct maritime vessels within the Chumash, it is possible to do so outside of them. One such example is the habitation of Crete in the Mediterranean where seagoing vessels would have been necessary for humans to make it to the island. Another example from the Mediterranean is the Athenian trireme of which, like the *tomol*, there are no physical remains ever recovered. In this case, it is even easier to use the tools for such analysis, as clear boat building and ship storing spaces have been identified in the archaeological record. By studying the tools present in these areas, morphologically and through their use-wear, new conclusions about these vessels can be drawn.

Regardless of where future studies go, the tools and materials used to construct maritime vessels are an important section of maritime studies, archaeology, and history. They have long been relegated to the edges of these fields to languish, despite the vast amounts of information they have to share. It is hoped that this study and its conclusions have shown that valuable data can be retrieved and used to support important hypotheses regarding maritime traditions and practices. Additionally, it is clear that more studies have become dedicated to learning more about Indigenous responses during colonization, and that archaeological studies are still invaluable to discerning important information about the past, even with the presence of numerous historical documents.

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Appendix

Magnified photos of *Tipiyoqoni'* studied in this thesis

I. Artifact 177-2200 Photo 1

II. Artifact 177-2200 Photo 2

III. Artifact 177-2200 Photo 3

IV. Artifact 177-2200 Photo 4

V. Artifact 177-2200 Photo 5

VI. Artifact 177-2200 Photo 6

VII. Artifact 177-2200 Photo 7

VIII. Artifact 177-2200 Photo 8

IX. Artifact 177-2200 Photo 9

X. Artifact 177-3284 Photo 1

XI. Artifact 177-3284 Photo 2

XII. Artifact 177-3284 Photo 3

XIII. Artifact 177-3284 Photo 4

XIV. Artifact 177-3284 Photo 5

XV. Artifact 177-3284 Photo 6

XVI. Artifact 177-3284 Photo 7

XVII. Artifact 177-3284 Photo 8

XVIII. Artifact 177-3284 Photo 9

XIX. Artifact 177-61 Photo 1

XX. Artifact 177-61 Photo 2

XXI. Artifact 177-61 Photo 3

XXII. Artifact 177-61 Photo 4

XXIII. Artifact 177-61 Photo 5

XXIV. Artifact 177-61 Photo 6

XXV. Artifact 177-61 Photo 7

XXVI. Artifact 177-61 Photo 8

XXVII. Artifact 177-61 Photo 9

XXVIII. Artifact 177-93 Photo 1

XXIX. Artifact 177-93 Photo 2

XXX. Artifact 177-93 Photo 3

XXXI. Artifact 177-93 Photo 4

XXXII. Artifact 177-93 Photo 5

XXXIII. Artifact 177-93 Photo 6

XXXIV. Artifact 177-93 Photo 7

XXXV. Artifact 177-93 Photo 8

XXXVI. Artifact 177-93 Photo 9

XXXVII. Artifact 177-93 Photo 10

XXXVIII. Artifact 177-93 Photo 11

XXXIX. Artifact 177-93 Photo 12

XL. Artifact 177-354 Photo 1

XLI. Artifact 177-354 Photo 2

XLII. Artifact 177-354 Photo 3

XLIII. Artifact 177-354 Photo 4

XLIV. Artifact 177-354 Photo 5

XLV. Artifact 177-354 Photo 6

XLVI. Artifact 177-354 Photo 7

XLVII. Artifact 177-354 Photo 8

XLVIII. Artifact 177-354 Photo 9

XLIX. Artifact 177-2199 Photo 1

L. Artifact 177-2199 Photo 2

LI. Artifact 177-2199 Photo 3

LII. Artifact 177-2199 Photo 4

LIII. Artifact 177-2199 Photo 5

LIV. Artifact 177-2199 Photo 6

LV. Artifact 177-2199 Photo 7

LVI. Artifact 177-2199 Photo 8

LVII. Artifact 177-2672 Photo 1

LVIII. Artifact 177-2672 Photo 2

LIX. Artifact 177-2672 Photo 3

LX. Artifact 177-2672 Photo 4

LXI. Artifact 177-2672 Photo 5

LXII. Artifact 177-2672 Photo 6

LXIII. Artifact 177-2672 Photo 7

LXIV. Artifact 177-2672 Photo 8

LXV. Artifact 177-2672 Photo 9

LXVI. Artifact 177-2672 Photo 10

LXVII. Artifact 177-2672 Photo 11

LXVIII. Artifact 177-2672 Photo 12

LXIX. Artifact 177-2672 Photo 13

LXX. Artifact 177-2672 Photo 14

LXXI. Artifact 177-2672
Photo 15

LXXII. Artifact 177-2672
Photo 16

LXXIII. Artifact 177-2672
Photo 17

LXXIV. Artifact 177-2896
Photo 1

LXXV. Artifact 177-2896
Photo 2

LXXVI. Artifact 177-2896
Photo 3

LXXVII. Artifact 177-2896
Photo 4

LXXVIII. Artifact 177-2896
Photo 5

LXXIX. Artifact 177-2951
Photo 1

LXXX. Artifact 177-2951
Photo 2

LXXXI. Artifact 177-2951
Photo 3

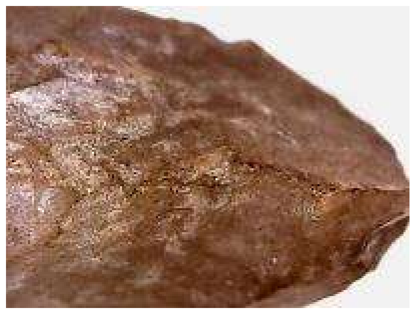
LXXXII. Artifact 177-2951
Photo 4

LXXXIII. Artifact 177-2951 Photo 5

LXXXVII. Artifact 177-3486 Photo 3

XCI. Artifact 177-3486 Photo 7

LXXXIV. Artifact 177-2951 Photo 6



LXXXVIII. Artifact 177-3486 Photo 4

XCII. Artifact 177-3486 Photo 8

LXXXV. Artifact 177-3486 Photo 1

LXXXIX. Artifact 177-3486 Photo 5

XCIII. Artifact 177-3486 Photo 9

LXXXVI. Artifact 177-3486 Photo 2

XC. Artifact 177-3486 Photo 6

XCIV. Artifact 177-3486 Photo 10

XCV. Artifact 177-3486 Photo 11

XCVI. Artifact 177-3486 Photo 12

XCVII. Artifact 177-3491C1 Photo 1

XCVIII. Artifact 177-3491C1 Photo 2

XCIX. Artifact 177-3491C1 Photo 3

C. Artifact 177-3491C1 Photo 4

CI. Artifact 177-3491C1 Photo 5

CII. Artifact 177-3491C1 Photo 6

CIII. Artifact 177-3547 Photo 1

CIV. Artifact 177-3547 Photo 2

CV. Artifact 177-3547 Photo 3

CVI. Artifact 177-3547 Photo 4

CVII. Artifact 177-3547 Photo 5

CVIII. Artifact 177-3547 Photo 6

CIX. Artifact 177-3547 Photo 7

CX. Artifact 177-3547 Photo 8

CXI. Artifact 177-3547 Photo 9

CXII. Artifact 177-3547 Photo 10

CXIII. Artifact 177-3547 Photo 11

CXIV. Artifact 177-3547 Photo 12

CXV. Artifact 177-3680 Photo 1

CXVI. Artifact 177-3680 Photo 2

CXVII. Artifact 177-3680 Photo 3

CXVIII. Artifact 177-3680 Photo 4

CXIX. Artifact 177-3680 Photo 5

CXX. Artifact 177-3680 Photo 6

CXXI. Artifact 177-3680 Photo 7

CXXII. Artifact 177-3680 Photo 8

CXXIII. Artifact 177-3680 Photo 9

CXXIV. Artifact 177-3680 Photo 10

CXXV. Artifact 177-3680 Photo 11

CXXVI. Artifact 177-3680 Photo 12

CXXVII. Artifact 177-4205 Photo 1

CXXVIII. Artifact 177-4205 Photo 2

CXXIX. Artifact 177-4205 Photo 3

CXXX. Artifact 177-4205 Photo 4

CXXXI. Artifact 177-4205 Photo 5

CXXXII. Artifact 177-4205 Photo 6

CXXXIII. Artifact 177-4205 Photo 7

CXXXIV. Artifact 177-4205 Photo 8

CXXXV. Artifact 177-4205 Photo 9

CXXXVI. Artifact 177-4205 Photo 10

CXXXVII. Artifact 177-4656 Photo 1

CXXXVIII. Artifact 177-4656 Photo 2

CXXXIX. Artifact 177-4656 Photo 3

CXL. Artifact 177-4656 Photo 4

CXLI. Artifact 177-4656 Photo 5

CXLII. Artifact 177-4656 Photo 6

CXLIII. Artifact 177-4656 Photo 7

CXLIV. Artifact 177-4656 Photo 8

CXLV. Artifact 177-4656 Photo 9

CXLVI. Artifact 177-4949 Photo 1

CXLVII. Artifact 177-4949 Photo 2

CXLVIII. Artifact 177-4949 Photo 3

CXLIX. Artifact 177-4949 Photo 4

CL. Artifact 177-4949 Photo 5

CLI. Artifact 177-4949 Photo 6

CLII. Artifact 177-5066 Photo 1

CLIII. Artifact 177-5066 Photo 2

CLIV. Artifact 177-5066 Photo 3

CLV. Artifact 177-5066 Photo 4

CLVI. Artifact 177-5066 Photo 5

CLVII. Artifact 177-5066 Photo 6

CLVIII. Artifact 177-5066 Photo 7

CLIX. Artifact 177-5066 Photo 8

CLX. Artifact 177-5066 Photo 9

CLXI. Artifact 177-5220 Photo 1

CLXII. Artifact 177-5220 Photo 2

CLXIII. Artifact 177-5220 Photo 3

CLXIV. Artifact 177-5220 Photo 4

CLXV. Artifact 177-5220 Photo 5

CLXVI. Artifact 177-5220 Photo 6

CLXVII. Artifact 177-5220
Photo 7

CLXXI. Artifact 177-5354
Photo 2

CLXXV. Artifact 177-5354
Photo 6

CLXVIII. Artifact 177-5220
Photo 8

CLXXII. Artifact 177-5354
Photo 3

CLXXVI. Artifact 177-5354
Photo 7

CLXIX. Artifact 177-5220
Photo 9

CLXXIII. Artifact 177-5354
Photo 4

CLXXVII. Artifact 351-1225
Photo 1

CLXX. Artifact 177-5354
Photo 1

CLXXIV. Artifact 177-5354
Photo 5

CLXXVIII. Artifact 351-1225
Photo 2

CLXXIX. Artifact 351-1225 Photo 3

CLXXXIII. Artifact 351-1225 Photo 7

CLXXXVII. Artifact 351-1240 Photo 3

CLXXX. Artifact 351-1225 Photo 4

CLXXXIV. Artifact 351-1225 Photo 8

CLXXXVIII. Artifact 351-1240 Photo 4

CLXXXI. Artifact 351-1225 Photo 5

CLXXXV. Artifact 351-1240 Photo 1

CLXXXIX. Artifact 351-1240 Photo 5

CLXXXII. Artifact 351-1225 Photo 6

CLXXXVI. Artifact 351-1240 Photo 2

CXC. Artifact 351-1240 Photo 6

CXCI. Artifact 351-1240 Photo 7

CXCII. Artifact 351-3923 Photo 1

CXCIII. Artifact 351-3923 Photo 2

CXCIV. Artifact 351-3964 Photo 1

CXCV. Artifact 351-3964 Photo 2

CXCVI. Artifact 351-4371 Photo 1

CXCVII. Artifact 351-4371 Photo 2

CXCVIII. Artifact 351-4371 Photo 3

CXCIX. Artifact 351-4371 Photo 4

CC. Artifact 351-6068 Photo 1

CCI. Artifact 351-6068 Photo 2

CCII. Artifact 351-6068 Photo 3

CCIII. Artifact 351-6068 Photo 4

CCIV. Artifact 351-6068 Photo 5

CCV. Artifact 351-6068 Photo 6

CCVI. Artifact 351-6068 Photo 7

CCVII. Artifact 351-6068 Photo 8

CCVIII. Artifact 351-6068 Photo 9

CCIX. Artifact 351-6068 Photo 10

CCX. Artifact 361-21600621 Photo 1

CCXI. Artifact 361-21600621 Photo 2

CCXII. Artifact 361-21600621 Photo 3

CCXIII. Artifact 361-21600621 Photo 4

CCXIV. Artifact 361-21600621 Photo 5

CCXV. Artifact 361-21600621 Photo 6

CCXVI. Artifact 361-21600621 Photo 7

CCXVII. Artifact 361-21600621 Photo 8

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CCXIX. Artifact 361-21600621 Photo 10

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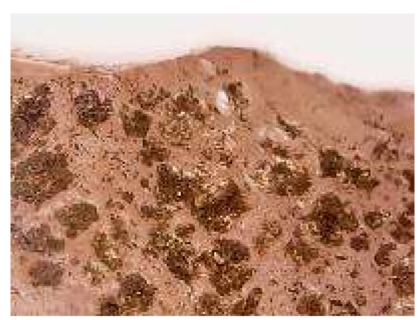

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