A Bead Analysis of
Northern Chumash Village Site, Tstyìwi:
CA-SLO-51/H

By:
Kaya Wiggins

Advised by
Dr. Terry Jones

Ant 461, 462
Senior Project
Social Sciences Department
College of Liberal Arts

California Polytechnic State University, San Luis Obispo
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INTRODUCTION

In the Spring of 2015, Cal Poly San Luis Obispo conducted a field methods class at the archaeological site CA-SLO-51/H, located on the Pecho Coast of San Luis Obispo County. The data recovered was sent to a lab located at Cal Poly San Luis Obispo, where the collected materials were analyzed by the subsequent Cal Poly lab methods classes. It was later revealed that CA-SLO-51/H is the site of the former Chumash Village, Tstyiwi (Jones, personal communication 2015; Greenwood 1972).

A large portion of the recovered materials found at CA-SLO-51/H consisted of beads made from various materials. Over 35% of the materials obtained from CA-SLO-51/H were beads and of those, over 81% were manufactured from the purple olive shell.

For decades, the purple olive shell has been scientifically known as *Olivella biplicata*, or simply *Olivella*. Recently, the scientific name has been updated by biologists and is now referred to as *Callianax biplicata*. However, the shell species still resides within the Olivellidae family and archaeologists continue to use the term *Olivella* in literature so I will do the same.

Based on the abundance and various types of *Olivella* beads recovered from CA-SLO-51/H a thorough analysis is warranted in order to better understand the activities and span of occupation of the site. Included in this paper is an overview of the non-*Olivella* beads found at CA-SLO-51/H. By combining the extensive analysis of the *Olivella* shell beads with the brief overview of the non-*Olivella* beads a more complete interpretation of the activities should
emerge. The focus of this paper is to identify the different types of *Olivella* shell beads and non-*Olivella* beads, determine the time of their manufacturing, and interpret any patterns that become apparent during the process.

Limitations to the analysis include the fact that the site was heavily disturbed by decades of farming activities. Any stratigraphic integrity has been damaged to the point that depth provenience is meaningless. Also, due to time constraints, 5.22 cubic meters were dug. The meager excavation produced abundant data, however, the sample size is considerably smaller in proportion to previous studies (Greenwood 1972).

**BACKGROUND**

Studies on shell beads and their effects on cultures in California are largely associated with two types. Those bead types are clam shell disk beads and *Olivella* shell beads. In southern California, including San Luis Obispo County, *Olivella* shell beads were the type most utilized by native groups. Their prominence in the archaeological record has encouraged numerous studies and efforts to classify the different types of beads in search for any temporal indications and further patterns in prehistory and history. Furthermore, those patterns illustrate a very complex history of *Olivella* shell utilization, originating in the Santa Barbara Channel and producing increased social complexity, unlike any other area of California. Some of the issues that have developed after considering the prominence of *Olivella* shell beads in the archaeological record include: Trade implications; possible *Olivella* bead manufacturing outside of the Channel Islands; environmental impacts on the *Olivella* shell bead industry; the
relationship between *Olivella* shell beads and Chumash social complexity; the effects of European colonization on the *Olivella* shell bead industry.

One of the first looks at North American beads, if not *the* first, was done by Orchard (1929). His scope of work included beads made of all materials and throughout the North American continent; the bulk of his research geared towards the analysis of glass beads. However, he did research California’s *Olivella* shell beads and briefly summarized their distribution and abundance in the archaeological record. Orchard did not establish any diagnostic indications and declared that due to their large quantities in grave lots and their being haphazardly strewn about in archaeological sites, distinguishing their purpose would be impossible (Orchard 1929: 20).

Efforts to classify *Olivella* shell beads occurred once archaeologists noticed that the different *Olivella* beads likely had temporal importance. However, a standardization of an *Olivella* bead classification and chronology would take decades to develop and refine. The first attempt at creating a typology for *Olivella* shell beads came from Lillard, Heizer, and Fenenga (1939), while developing the chronology of horizons in California (Milliken and Schwitalla 2012). They looked at the stratigraphy of archaeological sites in the Sacramento-San Joaquin Delta and recognized that the artifact assemblages indicated temporal components. The artifacts they looked at for temporal indications included *Olivella* shell beads. They also discovered that two bead types were present during each horizon, Type 1a and 1b, and concluded that they had no temporal significance (Groza 2002).

Their *Olivella* typology was referenced for over a decade but their work was incomplete. Gifford (1947) elaborated on their work by producing quantified metrics and bead descriptions of the different bead types (Milliken and Schwitalla 2012). Unfortunately, Gifford’s criteria for
classifying many of the beads were inconsistent with others, especially Bennyhoff and Heizer, and his work has been infrequently referenced (Groza 2002).

Bennyhoff and Heizer (1958) made an important contribution to *Olivella* bead dating. They recognized that *Olivella* shell beads from California could be cross-dated with assemblages from the Great Basin area to establish the timing of components within archaeological sites. The also included radiocarbon dates with their findings. It was during this time that Bennyhoff and Heizer became interested in the subtle changes over time in *Olivella* shell beads that indicate changes in behavior. They also addressed the ongoing issue with bead classification, that there is variation among bead types. Determination of a bead being, “intermediate between recognized types because of normal variation, local manufacture or the fact that a number of types represent different stages of a single evolving tradition,” is an issue that continues to plague bead analysts (Bennyhoff and Heizer 1958: 78 cited in Groza 2002: 23).

James A. Bennyhoff devoted much work to *Olivella* shell bead research and classification. He, along with Richard Hughes, made arguably the most important contribution to *Olivella* shell bead classification with their 1987 publication, *Shell Bead and Ornament Exchange Networks Between California and the Western Great Basin*. Their paper became the standard reference for typing beads and still is today. Bennyhoff borrowed from Lillard et al (1939) but used letters as opposed to numbers for typing *Olivella* shell beads. Bennyhoff and Hughes (1987) categorized bead types by class and subclass and included descriptions and metrics, sources, temporal significance, and amount of Great Basin occurrences. They also included illustrations with bead variation and scale, for reference. Their conclusions were based on their analysis of thousands of beads, numerous archaeological site records, and previous radiocarbon dates. The radiocarbon results prompted Bennyhoff to establish a new dating scheme
for California, scheme B1, which was also included in the Bennyhoff and Hughes (1987) publication. Their publication gave archaeologists and academics a much more comprehensive and useful tool to date archaeological sites containing *Olivella* shell beads and improved the accuracy of dating different patterns throughout prehistory and history. Scheme B1 went unquestioned until 2002 by Randall Groza (Groza 2002).

In her Master’s thesis, Groza identified some issues with Bennyhoff and Hughes (1987). Bennyhoff and Hughes’ radiocarbon dates came from burials and features, which included charcoal, shell, and bone collagen. One issue is that their dates didn’t take into account that different materials must be individually corrected, according to material. (For a further understanding of correcting radiocarbon dates and calibration see Groza 2002). Another issue is that their chronology didn’t conform to subsequent data found in the Santa Barbara Channel, the source of *Olivella* shell bead production. Lastly, Bennyhoff and Hughes’ results weren’t from beads and therefore context discrepancies are problematic. Groza sought to remedy these issues in his thesis and later in his published 2011 paper with Rosenthal, Southen, and Milliken. In her thesis, Groza dated beads from the Bennyhoff and Hughes (1987) sample but used the less destructive and more accurate method of dating, Accelerator Mass Spectrometry (AMS). Groza et al. (2011) also used AMS dating on beads in the Santa Barbara Channel. With new data, a new scheme was developed by Groza et al. (2011) that more accurately dated *Olivella* shell beads and therefore, patterns throughout prehistory and history.

Bennyhoff’s work was built upon again in a 2012 bead manual, by Randy Milliken and Al Schwitalla, *California and Great Basin Olivella Shell Bead Guide: A Diagnostic Type Guide in Memory of James A. Bennyhoff*. The purpose of their guide was to create a more “user-friendly” experience with high-quality photographs along with 3-D representations.
Some of the most notable publications related to beads in Chumash territory subsequent to Bennyhoff came from one of his students, Chester King. In his 1981 Ph.D. dissertation, King produced an artifact chronology and arguably the most thorough bead analysis for the Santa Barbara Channel area. King distinguished himself from his predecessors by developing his own *Olivella* typology (for better or worse) by using descriptive names for the different types, as opposed to letters. For example, Bennyhoff calls the small cupped beads, made from the callus of the *Olivella* shell, Class K, while King has categorized them as Cupped. He organizes all beads according to their temporal significance, then by species or material. Whereas, others before him organized their beads arbitrarily with numbers or letters. In the opinion of this writer, his bead typology is less quantitative than Bennyhoff’s and more qualitative in approach at describing beads types. King’s purpose seems more towards the interpretation of beads in their function and association as well as their timing and distribution. King’s approach is arguably less comprehensive, however, that is not to say it’s not profoundly important to California bead research. One cannot consider producing a bead analysis in southern California without consulting a number of King’s publications.

Creating bead typologies or dating schemes is not the only important information archaeologists have to offer in regard to *Olivella* shell beads. Other researchers have chosen to interpret their meaning and effects on Native Californian cultures. During the Early and Middle Periods in California, *Olivella* shell beads were used for adorning individuals and exhibited status (Gamble 2008; Bettinger 2015). They had value and were traded but not in a monetary sense. It was during the Middle-Late Transition that a specific type of *Olivella* bead became, what many would argue, a standardized currency (Arnold 1992; Arnold and Walsh 2010; Chagnon 1970; Gamble 2008). It is during this time that bead production of *Olivella* cupped
beads, Class K, becomes exclusively manufactured on the Northern Channel Islands by specialized craftsmen. Also, likely at this time, the Chumash in the Santa Barbara Channel reached a chiefdom level society, with hereditary leaders (Arnold 1992; Arnold and Walsh 2010).

Jean Arnold has asserted that during the Middle-Late Transition environmental fluctuations put stress on Native populations in the Channel. Arnold (1992) attributed the environmental flux to a period of El Nino/Southern Oscillations (ENSO). The conditions during that time would have been much warmer than previously, but most importantly, upwelling that normally would occur wouldn’t. Upwelling in the ocean brings cool water and nutrients to marine environments. When upwelling doesn’t occur marine populations suffer and thus, Chumash populations dependent upon marine life for food would also suffer. As a consequence, opportunistic chiefs began to exercise their power on the masses, forcing them into craft specialization. The elites were able to create a surplus of wealth goods by intensifying and controlling the means of production and it elevated their status. With a surplus wealth, chiefs were able to acquire commodities for their people and a shell bead economy emerged. The economy had profound effects on Chumash culture, which became a complex chiefdom, governed by those with inherited political power (Arnold 1992; Arnold and Walsh 2010).

Arnold’s environmental hypothesis, being the driving force for emergent sociopolitical complexity, was a thoughtful explanation. However, it wasn’t accepted by all. Kennett and Kennett (2000) published a paper in response to Arnold (1992) that utterly contradicted her ENSO hypothesis. In their paper they agreed that environmental instability ultimately caused Chumash culture to increase in social complexity, however it wasn’t because of ENSO. They studied oxygen isotope data from mussel shells (*Mytilus californianus*) and saw something critically different from Arnold’s prediction. Between A.D. 450 and 1300, conditions were drier
and cooler in the Santa Barbara Channel and marine populations flourished, while terrestrial resources were stressed. The shortage of water and other resources created competition and violence and simultaneously, cooperation amongst related and unrelated Chumash peoples. This sort of behavior, compounded by the environmental instability, was the catalyst for decreased mobility and intensification of resources. Only after that long process, around A.D. 1300, did the environment become more stable allowing populations to increase as well as the socio-complexity of the Chumash people to emerge.

Another interpretation of how the shell bead economy propelled Chumash culture into the Chiefdom level it was in the Late Period comes from Bettinger (2015). His take isn’t environmental but cultural. He disagrees with Arnold’s emergent social complexity model, which she attributes to elites creating immense wealth and control over their subjects. Bettinger proposes that the increased social complexity of the Late Period Chumash was a, “grassroots innovation” influenced by those at the bottom of the hierarchy. He explains that money came about because it was those without wealth that were in demand of a “third-party” in order to acquire commodities. That third-party was money. The medium chosen for currency was the *Olivella* cupped or K beads. K beads are hard enough to manufacture to make them valuable but not so much that they cannot be manufactured in abundance. This perspective is practical. Those without status couldn’t acquire wealth items like white deer skins, obsidian blades, or sewn-plank canoes known as *tomolos*. They were the ones to benefit from having money, not the elite. Having money shrunk the wealth gap, not widened it. The poor created a means to acquire commodities because they participated in and encouraged the shell bead economy (Bettinger 2015).
There are various explanations of how or why Chumash sociopolitical complexity increased around A.D. 1300. To list them all is outside of the scope of this bead analysis. What we do know is that the Chumash shell bead economy had profound effects on the culture. Nowhere else in California had there been a culture so complex, socially and politically. Their culture was on the brink of becoming a capitalist, market economy (Gamble 2008). However, at the time of contact, we know that their economy plummeted with the introduction of Venetian glass trade beads, brought primarily by the Spanish. *Olivella* shell beads subsequently became less valuable, and cupped beads ceased to be manufactured entirely (King 1981; 2011).

Unfortunately, much of what we know about *Olivella* shell beads comes from the Santa Barbara Channel. Bead information from San Luis Obispo County is rare and even more so for the Pecho Coast (Gibson 1988; Greenwood 1972). The Indians that lived on the Pecho Coast were from the Obispeño branch of Northern Chumash, however, they refer to themselves as the *tit'u tit'u* (Klar 1975 cited in Jones 2013). What we do know (beyond beads) is that the Indians occupying the Central Coast were distinct from those in the Santa Barbara Channel, though related. Jones and Waugh (1995) developed a separate chronology, The Central Coast Sequence, for the area. In the results section of this paper, I will be indicate time periods per bead type, however those are based on beads found mostly outside of the Central Coast. It is unknown how the Bennyhoff and Hughes (1987) and the Groza et al. (2011) schemes can be applied to the beads found on the Central Coast. Future bead research is needed in the area in order to determine how comparable conclusions derived in the Santa Barbara Channel are for the Northern Chumash.
Figure 1. Dating schemes proposed for beads and for the Central Coast.
METHODS

LABORATORY METHODS

All of the materials that were obtained from CA-SLO-51/H, including the beads, were brought to Cal Poly’s lab for student analysis in the fall, winter, and spring quarters of 2015 and 2016. The shell beads were washed and bagged in individual 2” x 3”, 2 mm plastic bags with their provenience information and later their catalogue information written on acid-free paper labels.

Spire-lopped and whole shell *Olivella* beads required measurements for maximum diameter, maximum length, and maximum diameter of each perforation. Round and tube beads required measurements for maximum diameter or maximum length and width, maximum perforation diameter or length and width, thickness, and curvature (for the *Olivella* beads). Any anomalous characteristics were also noted, such as existing pigment, fibers wrapped around a bead, any incising, or if a bead was burnt or broken. Measurements were taken with digital calipers in millimeters and all specimens were weighed in grams.

Bead information was entered into two Excel spreadsheets, one for the master catalogue of the entire site and one specifically for beads. The variables that were accounted for in the bead catalogue were: unit number; catalogue number; depth found; mesh size used while sorting; class of artifact; material; count; weight; description; comments; maximum diameter of the bead; perforation size; thickness; bead curvature; length, if necessary; width, if necessary; any other perforation measurements if applicable; and bead type.
OLIVELLA BEAD CLASSIFICATION

The *Olivella* beads from CA-SLO-51/H were classified using the Bennyhoff & Hughes (1987) classification in combination with the shell bead guide and reference collection developed by Milliken and Schwitalla (2012). The Bennyhoff & Hughes classification method is comprehensive and is a well-established method for typing *Olivella* shell beads that many archaeologists and academics are familiar with.

The Milliken and Schwitalla bead guide and reference collection helped to identify many of the beads exhibiting perceived anomalous characteristics. I was able to compare the beads of CA-SLO-51/H with replicas and based on morphological traits, instead of metrics alone, I was able to classify the abnormal beads.
Figure 2. Diagram of where beads originate on olivella shell (Bennyhoff and Hughes 1987).
NON-OLIVELLA BEADS

Non-Olivella beads were classified to a much lesser extent than the Olivella shell beads. The information used to classify all other beads primarily came from Chester King’s Ph.D. dissertation (1981) and his report for The National Park Service, *Overview of the History of American Indians in the Santa Monica Mountains* (2011). In these documents, King’s focus is on the cultural resources obtained from Chumash sites in the Santa Barbara Channel and Santa Monica Mountains, however, considering the lack of available bead data from Northern Chumash areas and that artifact assemblages in San Luis Obispo County are most consistent with other Santa Barbara Channel assemblages, King’s documents are sufficient resources for the brief classification of non-Olivella beads that follows.

For the polished stone beads found at CA-SLO-51/H, Kings (1990; 2011) interpretations were utilized but were not entirely sufficient for this analysis. King includes beads made of a talc schist and chlorite schist in the same category of polished stone beads. The polished stone beads of CA-SLO-51/H have been treated the same considering that the stone material hasn’t been determined with certainty but looks to be made of a talc schist, or steatite. However, there were multiple distinct polished stone beads when considering shape and metrics. Therefore, the report written by Mikkelsen, Hildebrandt, and Jones (2000), “Adaptations on the Shores of Morro Bay Estuary: Excavations at Site CA-SLO-165, Morro Bay, California,” was referenced when developing a classification scheme for the polished stone beads. Mikkelsen et al. (2000) scheme was adopted and modified to best represent the variability of polished stone beads found at CA-SLO-51/H.
RESULTS

A total of 349 potential beads and *Olivella* shell specimens was recovered during the excavations and surface collection at CA-SLO-51/H. Of the 349 specimens, 302 beads were identified and classified. The rest of the materials were either categorized as being *Olivella* detritus, whole *Olivella* shells, bead fragments, bead blanks, or not being bead-related.

Based on the distribution of the control units and the bead types and amounts, two temporal components were identified from the excavation materials at the site. The first component included Control Units 1-4 and was dominated by Late Period beads. Component 2 consisted of control Units 5 and 6 and the column sample from Unit 6. The beads found within Component 2 contained the majority of post-contact beads. The surface collection finds were considered a separate Component 3. From Units 1-4, 70 beads were recovered. Units 5 and 6 produced 188, including from the column sample of Unit 6. Lastly, 44 beads were recovered from the surface collection.

Fortunately, because there were so many different bead types indicative of periods ranging from Early to Historic and found in association with each other, we were able to conclude that the integrity of the site had been compromised to a significant degree. Component 1 was established within the agricultural field, bordering Pecho Creek, and was far less intact than Component 2, located outside of the agricultural field. Due to the disturbed nature of the site, any correlation between depth and bead types cannot be identified and therefore is not indicated in the following results.
OLIVELLA SHELL BEADS (n = 247)

A total of 247 classifiable *Olivella bипlicata* shell beads (Table 1) was recovered from CA-SLO-51/H. Component 1 produced 54 *Olivella* shell beads, component 2 produced 152 *Olivella* beads, and component 3 (surface) produced 41 *Olivella* beads.

The following classification of *Olivella* shell beads from CA-SLO-51/H is derived from the standardized classification scheme developed by Bennyhoff and Hughes (1987).

Table 1. *Olivella* bead types and amounts per component.

<table>
<thead>
<tr>
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<th>Comp 2</th>
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<td>O4</td>
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<td>0</td>
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</tr>
<tr>
<td>total</td>
<td>54</td>
<td>152*</td>
<td>41</td>
<td>247*</td>
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*one H with no subtype included in sums

Spire-lopped, Class A (n = 45)
Spire-lopped beads are nearly complete *Olivella* shells except that the top of the shell, called the spire, has been removed. Removing the spire can be accomplished by breaking, grinding or by natural processes. Given the context of CA-SLO-51/H, we can only assume that all of the *Olivella* shells missing spires were created with the purpose of producing a bead.

There are three size distinctions of Class A beads based on the maximum diameter of the shell. Small: 3.0-6.5 mm; Medium: 6.51-9.5 mm; Large: 9.51-14.0. Within Class A, there are 6 subdivisions. At CA-SLO-51/H specimens representing A1, A4, and A5 were recovered (Figure 3).

*A1 Simple Spire-lopped.*

Attributes: Simple spire-lopped, or A1, beads are characterized by a missing spire.

Distribution: There were 40 A1 beads found at CA-SLO-51/H. Each of the units produced A1 beads ranging from small to large with the exception of Units 3 and 4 which did not produce A1a (small) or A1c (large) types. From the surface collection, 2 A1b (medium) beads were recovered as well as 22 A1c beads.

Temporal Significance: A1 beads can occur in any time period.
A4 Punched Spire-lopped

Attributes: A4 beads are spire-lopped *Olivella* beads and have a perforation in the body of the shell that is not drilled, but punched.

Distribution: There were four A4 beads found in Units 3-6. All of the specimens were A4c beads, or large A4 beads. None were recovered in the surface collection or column sample.

Temporal Significance: uncertain.

A5 Applique Spire-lopped

Attributes: A5, or applique spire-lopped, beads are spire-lopped beads with the side of the body ground flat and diagonally to the shell axis.

Distribution: Only one A5c (Figure 3, Specimen 5-116) bead was recovered from Unit 5.

Figure 3. Class A beads. From left to right A1 simple spire-lopped, A4 punched spire-lopped, and A5 applique spire-lopped.
Temporal Significance: A5 beads are likely markers for the Protohistoric and Historic Periods in San Luis Obispo County.

End Ground, Class B (n = 1)

B3 Barrel

Attributes: Barrel/B3 (Figure 4) beads are from Class B, or end-ground. B beads lack a spire and parts of the aperture have been removed. Class B beads have the same categorical sizes as Class A beads. B3 types are characterized by excessive grinding at the base of the shell, giving the bead its maximum diameter towards the middle of the shell.

Distribution: One barrel (Figure 4. Specimen 5-115) bead was found at CA-SLO-51/H, in Unit 5.

Temporal Significance: These beads are not good temporal indicators.
Split, Class C (n = 1)

C2 Split Drilled

Attributes: These are half-shell beads sometimes with a shelf and the all of the edges are ground. The bead found at CA-SLO-51/H that most resembles a C bead is round and has shelf remnants. The bead, Specimen 5-25, is indistinguishable between a C1, beveled, or a C2, split drilled bead because of measurement overlap and morphological inconsistencies. Initially, this bead was thought to be from the E class but after consulting with Brian Barbier, of UCSB, he was able to confirm that it is in fact a C, and mostly resembled the C2 type.

Distribution: A single split bead was found in Unit 5.

Temporal Significance: C beads are markers for the Middle Period. C1 indicates Early/Middle Transition, while C2 is a marker for the early Middle Period in the San Francisco Bay area and terminal Middle Period in the Delta area.

Lipped, Class E (n = 34)

Class E beads are oval to round beads produced from the upper callus of the Olivella shell and portions of the body whorl. The upper callus is also referred to the inner lip, hence the name of the class. Class E beads developed later from cupped beads, Class K. There are three subdivisions of Class E beads (Figure 5) and further subdivisions within those subclasses exist.

E1 Thin Lipped

Attributes: Class E1 beads are thin lipped and can be round or oval in shape.
Distribution: Seventeen E1 beads were found in the units and on the surface during the surface collection of the field: one each in Units 1, 2, and 4; two in both Units 3 and 6; six in Unit 5; and four from the surface collection; no E1 beads were found in the column sample.

Temporal Significance: E1 beads are markers of Phase 2 of the Late Period.

E2 Thick Lipped

Attributes: E2 beads are thick lipped but there are lipless and shelved varieties within the type.

Distribution: There were 13 E2 beads found in total; five from Unit 5; five found in Unit 6, not including the column sample; three were found on the surface.

Temporal Significance: E2 beads represent Phase 2 of the Late Period, except E2a4 (full lipped and shelved) and E2b (deep lipped) beads persist into the Historic Period.
**E3 Large Lipped**

Attributes: E3 beads are large lipped and oval in shape. The modal size of E3s are larger than E1 and E2 types. The modal size of class E beads increased over time.

Distribution: Four E3 beads were recovered; one each from Unit 5 and on the surface; two were found in Unit 6; no E3 beads were found in the column sample.

Temporal Significance: E3 beads are most common during the Historic Period.

**Saucer, Class G (n = 57)**

Saucers are shallow, circular beads with slight curvature and made from the shell wall. Saucers edges are ground. There are 6 types of Class G beads, based on their diameters and perforation sizes.

**G1 Tiny Saucer**

Attributes: G1 types (Figure 6. Specimen 2-45) are tiny saucers. These beads are small, their diameters ranging between 2.0 and 5.0 mm, and are nearly flat.

Distribution: G1 beads were the most commonly recovered bead at the site. There were 53 found in total: three in Unit 1; two each in Unit 2 and Unit 3; one in Unit 4, ten in Unit 5, thirty in Unit 6; three in the column sample; two were found during the surface collection. All beads recovered from the column sample were G1 beads.
Temporal Significance: G1 types can occur during any period of time.

\[ \text{G2 Normal Saucer} \]

Attributes: The G2 type (Figure 6. Specimen 5-37) is a normal saucer. Their diameters are nearly uniform, between 5.0 and 10.0 mm, and were ground by stringing multiple beads and rolling them on a surface.

Distribution: There were three G2 beads recovered from the site: one in Unit 5; one in Unit 6; and one during the surface collection.

Temporal Significance: G2s are markers of the Middle Period with an emphasis in the early phases of that period (Groza et al. 2011).

\[ \text{G3 Ring} \]

Attributes: G3 (Figure 6. Specimen 6-16), or rings, are distinct from other G types because of their large perforation size; the mode being 3 mm, whereas other G type perforations are \(~2\) mm.
Distribution: Only one G3 type was found, in Unit 6.

Temporal Significance: G3 beads are markers of the Middle Period with an emphasis in the early phases of that period (Groza et al. 2011).

Disk, Class H (n = 8)

Disks are shallow, circular beads made from the shell wall. They have distinctly small perforations from their being made from metal needle drills as opposed to stone. There is a correlation between increases in size with grinding to chipping over time.

Eight total beads were identified from the units, however one bead from Unit 6 broke while taking metrics. The bead had experienced a degree of burning and therefore was prone to breakage. It was determined to be an H based on the appearance of the perforation size before it broke. The bead’s edges were degraded but as to whether or not this occurred during the time it was manufactured or when it was burned is unknown. I’ve simply indicated that the bead is an H type and it is not included below.

H1 Ground Disk
Attributes: H1 types (Figure 7. Specimen 3-45) have either ground or semi-ground edges.

Distribution: One H1 bead was found in Unit 2 as well as in Unit 3; two each were found in Units 5 and 6.

Temporal Significance: H1 beads occur during the Mission Period.

_H2 Rough Disk_

Attributes: H2 beads (Figure 7. Specimen 5-137) have rough edges that have been chipped.

Distribution: Only one H2 bead was found in Unit 6.

Temporal Significance: H2 beads occur during the Mission Period.

_Callus, Class K (n = 100)_

Cupped beads are small, thick, circular beads made from the upper callus of the _Olivella_ shell. They are ancestral to the E class. Examples of K beads are shown in Figure 8.

Figure 8. Class K beads. From left to right a K1 cupped bead, two K2 bushings, and two K3 cylinders.
**K1 Cupped**

Attributes: K1 beads are thick and cupped. They are the largest Class of K, their diameters being between 3.0 and 7.0 mm. Occasionally, these beads are found incised with hatching or cross-hatching marks.

Distribution: 43 K1 beads were recovered from all of the units and on the surface, but none from the column sample. Five were from Unit 1; two were from Unit 2; nine from Unit 3; two from Unit 4; eight from Unit 5, fifteen from Unit 6; two came from the surface collection.

Temporal Significance: K1 beads are markers for Phases 1 and 2 of the Late Period.

**K2 Bushing**

Attributes: K2, or bushings, are thin. They were strung as beads and as bushings in between other beads. Their diameter range is between 3.0 and 4.0 mm.

Distribution: 42 K2 beads were recovered at CA-SLO-51/H. There were four from unit 2; three from Unit 4; fourteen from Unit 5; eighteen from Unit 6; three came from the surface collection.

Temporal Significance: K2 beads are markers for Phases 1 and 2 of the Late Period.

**K3 Cylinder**

Attributes: K3/Cylinder beads are thick and smaller in diameter than K1 and K2 types, between 2.0 and 3.0 mm. The cylindrical perforations are also larger than the others which makes K3 bead walls thinner than K1 and K2. K3 beads are sometimes incised with hatching or cross hatching.
Distribution: 15 K3 beads were identified four of the units. Units 2 and 5 both had three; Unit 6 had eight; during the surface collection only 1 K3 was recovered.

Temporal Significance: K3 beads are markers for Phases 1 and 2 of the Late Period.

Whole Shell, Class O (n = 1)

Figure 9. A double-punched whole shell.

O4 Double-Punched Whole Shell

Attributes: O beads are whole *Olivella* shells that have been perforated, commonly in the body whorl of the shell. Double-punched whole shell beads, or O4 beads, have two
perforations on opposite sides of the body whorl. There are three size distinctions which are the same as Class A beads.

Distribution: One O4c bead (Figure 9. Specimen S-42) was found during the surface collection.

Temporal Significance: O4 beads represent the Early Period on SCrI-3.

Olivella Whole Shells and Detritus

Each of the control units, the column sample and the field surface produced amounts of *Olivella* whole shells and detritus. There were specimens with missing spires that were indeterminable as beads and were not included within the Spire-lopped, Class A beads. These specimens are fragmented and their morphology is not clearly representative of an *Olivella* bead type, as it was indeterminate whether their missing spires were anthropogenic or the result of natural processes.

*Whole Shells* Twelve whole *Olivella* shells were recovered from CA-SLO-51/H. Two each came from the Units 1, 3, and 4; one came from Unit 5; five came from Unit 6.

*Detritus* All of the detritus, except for one specimen, was collected from Components 1 and 3 of the site (Units 1-4 and the surface collection). The single specimen, 6-104, is a possible bead and not detritus, at all. It’s missing its’ spire and part of the penultimate whorl. If the specimen is in fact a bead it would be an A1a type. It’s possible that the lack of any detritus within Component 2, where there is an abundance of many other beads and types, simply accounts for that area not being subject to plowing.
NON-OLIVELLA SHELL BEADS

Thirty-four faunal beads, not belonging to the olivellidae family have been identified from CA-SLO-51/H. What follows is a description of those beads according to their species, amounts, and any temporal information that applies. Included are two beads, of an undetermined faunal material.

Clam Beads (n=4)

Four beads made of clam shell of undetermined species were obtained from CA-SLO-51/H. All four were disks. Previous efforts for classifying clam shell disk beads are meager. Many have noted metrics for clam disk beads and avoided any attempt at classifying the beads. However, Von Der Porten et al. (2014) sought to remedy the issue of clam shell classification and dating. According to them, clam shell disk beads (CSDB) can be classified into three types based on face diameter: A1 diameters measure between 3 and 8 mm; A2, between 9 and 16 mm; A3, >16 mm face diameter.
For the purposes of this paper and because three of the four beads are nearly uniform in size and distinct from the fourth bead, Von Der Porten et al.’s (2014) classification method has been applied. Specimens 2-44 (Figure 10), from Unit 2, and 4-13 and 4-67, from Unit 4, can be categorized as type A1 CSDB. Specimen CS-1 (Figure 10) is an A2 CSDB. Von Der Porten et al. assign CDSB types A1 and A2 to the Late Period. Specifically A1 is associated with phase 2a and A2 with phase 2b of the Late Period.

King (1981; 2011) places Chumash clam disk beads within two periods, the early and late.

Clam disc and cylinder beads were not used in the Santa Barbara Channel during the Middle Period following Phase M1. They were again made and used during the Late Period. Clam disc and cylinder beads were made by chipping out disc or cylinder shaped pieces, where the surfaces to be drilled in were the naturally flat ventral and dorsal faces of the clam shell. These were drilled and the circumferences were then smoothed by grinding (Figure 7.44). Clam cylinder and tube beads were made from Pismo Clam (Tivela stultorum) shells; some thinner disc beads may have been made from shells of other species (King 2011:222).

Associated with Specimen 2-44 (Figure 10) was a fibrous material that wraps around a portion of the bead wall. Specimen 4-13 is burnt and black in color.

**Limpet Rings (n = 13)**

Thirteen limpet rings were recovered from all of the units and from the surface collection. A single limpet ring was found in Unit 1; three were recovered from Unit 2; a limpet ring was found in Units 3, 4, and 5; three limpet rings each were recovered from both Unit 6 and the surface collection.
The maximum lengths of the limpet rings ranged from 9.6 mm and 15.05 mm, with an average of 11.85 mm. The maximum widths ranged from 5.9 mm to 12.78 mm, with an average of 8.5 mm. The maximum lengths of the perforations ranged from 4.64 mm to 7.32 mm and averaged 5.36 mm. The maximum widths for the perforations were between 1.91 mm and 3.99 mm and 2.89 mm was the average.

Limpet rings (*Megathura crenulata* and *Fisurella volcano*) occur during the Middle and Late Periods but are most common during the late phases of the Middle Period (King 1981; 2011).

**Abalone Disks (n = 11)**

*Epidermis Disks (n = 10)*  All ten abalone epidermis beads (Figure 11) that were recovered from CA-SLO-51/H came from Component 2: two from Unit 5 and seven from Unit 6.

![Figure 11. Abalone epidermis disk bead.](image)

All of the epidermis beads are from the red abalone species, *Haliotis rufescens*, as indicated by the color of the beads. Red abalone epidermis disk beads are more common than those from black abalone, *Haliotis cracherodii*, which are greenish in color. Abalone epidermis disk beads were often used in necklaces and in combination with other bead types including:
Olivella cupped, cylinder, and disk beads; columella beads; clam disk beads; and other abalone ornaments. Furthermore, abalone epidermis disk beads were the only beads, outside of other Olivella callus and columella beads, that were strung with Olivella cupped beads (King 1981; 2011). It is suggested by the burial patterns at the Medea Creek cemetery (CA-LAN-243) that abalone epidermis beads were worn by those that inherited political power (King 2011: 220).

Epidermis beads are frequently found in Late Period sites and are most commonly associated with phases 2 and 3 of the Late Period.

Nacre Disks (n = 1) Small disk beads made from the nacre (Figure 12), sometimes referred to as mother of pearl, of the abalone shell and lacking any epidermis, such as the one found in Unit 3, are infrequently recovered from Chumash sites in the Santa Barbara channel. According to King (2011) abalone nacre are most commonly associated with phases M1 and M2 of the Middle Period and become less common and ceasing before phase M5.

![Figure 12. Abalone nacre disk bead.](image)

Dentalium (n = 4)

Four fragmented/modified Dentalium shells were extracted during the sorting process. A single Dentalium fragment came from Unit 4 and the remaining three came from Unit 6. Judging
by the lack of ridges that are characteristic to *Dentalium neohexagonum*, the specimens are likely of the *Dentalium pretiosum* species.

*D. pretiosum* beads were most widely utilized during the Early Period and into phase M1 of the Middle Period of King’s (1981) chronology. These shells were used as currency during historic times from northwest California to Alaska. *D. pretiosum* were smaller and rarer further south on the coast of California and were infrequently used as beads in the Santa Barbara Channel though they occasionally occur in the archaeological record associated with the Late Period and into the Historic Period (King 1981; 2011).

**Indeterminate Beads**

Two beads of unknown material were recovered from Unit 6. Specimen 6-168 is small, measuring 3.67 mm in diameter. The bead is 3.41mm at its thickest and thins to 2.59 mm at the thinnest portion. The perforation is central, thin walls, and it appears to be biconically drilled. The color is tan. It is unknown as to what material this bead is manufactured from.

Specimen 6-197 is a small bead of similar size to 6-168 but the material is different. The diameter is 3.07 mm. The thickest portion of the bead is 2.92 mm and the thinnest measures 2.55 mm. The perforation is off-centered and it’s been biconically drilled. The color is greyish. The bead appears to be made of shell, possibly mussel. There is visible layering on the outer bead walls indicative of shell.

**Shell Bead Blanks.**
Three specimens, and possibly a fourth, were recovered from Control Unit 6 that indicate shell bead manufacturing at CA-SLO-51/H. Whether or not CS-54 is either a broken bead or one that broke during the process of its creation is indeterminable. Specimen 6-219 (Figure 13) is a made of mussel, *Mytilus californianus*, while the other three specimens are of red abalone, *Haliotis rufescens*. Both species would have been locally available at the site.

According to King (2011), Mussel disks were made during the Middle and Late Periods. They were commonly strung together with *Olivella* wall beads, likely because of the contrast effect. At Madea Creek, Mussel beads were thought to be associated with those who inherited political power, not unlike red abalone epidermis beads (King 1981; 2011).
POLISHED STONE BEADS (n = 12)

Twelve polished stone beads (Figure 14), likely made of chlorite or talc schists, were recovered from CA-SLO-51/H. King (1981; 2011) considers beads made of chlorite schists and talc schists similar in appearance and context and we have done the same here. It is not known for certain as to which mineral material the beads are made of, but the beads were initially identified as steatite and that identification has remained in place based on steatite beads from similar assemblages. Steatite, sometimes referred to as soapstone, is a soft metamorphic rock composed of a talc schist. Polished stone beads can occur during any time, however chlorite schist and talc schist beads are mostly associated with the Middle and Late Periods; their sizes decreasing in time as other bead types became more popular. The colors of the polished stone beads of CA-SLO-51/H, range from black to grey. The beads have been categorized by shape and size, based on an adaptation of the categorization provided by Mikkelsen et al. (2000).
Shape/Type:

Disk \(< 0.65 \text{ mm thickness/diameter ratio}

Barrel \(0.65-1.45 \text{ mm thickness/diameter ratio}

Globular bead with rounded edges and no flat surfaces

Size:

Small \(0-5 \text{ mm diameter}

Medium \(5-9 \text{ mm diameter}

Large \(> 9 \text{ mm diameter}

Disk (n= 9)

Small Seven of the nine disks were small: one from Unit 3; two from Unit 5; and four from Unit 6.

Medium One medium disk was recovered from Unit 6.

Large One large disk was found in Unit 1.

Barrel (n= 2)

Two small barrel beads were recovered from Units 3 and 6.

Globular (n= 1)
One large globular bead was found in Unit 5.

GLASS BEADS (n = 9)

A total of nine glass beads was found at CA-SLO-51/H: two from Unit 3 and the rest from Unit 6. Glass beads were brought to California largely by Spanish colonizers. They were widely used by the Chumash between the years 1770 and 1800. Glass beads quickly became a dominant form of currency throughout California. Their introduction, compounded by the termination of cupped *Olivella* beads, had disastrous effects on the shell bead manufacturing industry in the Santa Barbara Channel (King 1981, 2011; Gamble 2008). Glass bead value decreased over time as their abundance increased into the Mission Period. After ~1800, when the missions had obtained considerable social control over native populations, the use of glass beads began to decline while shell beads began to dominate once again (King 1981; 2011).

SUMMARY AND CONCLUSIONS

SITE INTEGRITY

Unfortunately, because of the processes of deflation on the portion of the site located within the agricultural field, much of the vertical stratigraphic integrity was lost at Component 1. The excavation volume at Component 1 was 4 m$^3$, whereas, 1.22 m$^3$ was excavated from the second component. Despite the difference in the volume excavated, Component 1 contained 118 less beads recovered than Component 2. This tells us that a whole lot of data was likely
destroyed and that Component 2 has been better preserved, considering the amount of data pulled from this modest volume of excavated dirt. We cannot know the original deposition and association of the beads. They appear chaotically strewn and mixed throughout all of the components. Were they once associated with burials? There is no evidence to support that conclusion. No burials were identified during the Cal Poly Field School excavations and Greenwood (1972) identified only one. However, that is not to say they don’t exist. Greenwood’s burial was discovered below 50 cm and units were purposefully dug to 50 cm depths during the Cal Poly field investigations to avoid any potential burials.

**OCCUPATION**

In addition to the beads, the rest of the recovered materials from the site appear to represent a Chumash village site, specifically the village of *Tstywi*. The 2015 excavation performed at CA-SLO51/H was a modest one, especially when compared to other nearby excavations. For example, 216.5 m³ were excavated from 8 sites during the Los Osos Sewer Project, about 15 kilometers away. Only 5.22 m³ were excavated from CA-SLO-51/H. Yet the amount of beads recovered during the Los Osos Sewer Project was 199 and included 17 types of beads, spanning an occupation from the Early though the Late Period (Gibson 2013). That means the Los Osos Sewer Project produced less than one bead per cubic meter, but at CA-SLO-51/H, 57.85 beads were recovered per cubic meter which included at least 27 bead types, representing time periods that ranged from the Early and Early/Middle Transition to post-contact. This could suggest that CA-SLO-51/H was a more intensely occupied site than the other sites in the nearby vicinity. This is supported by the ethnographic accounts of the location of *Tstywi* and linguistic evidence. *Tstywi* literally translates to breast, as does the Spanish word *pecho*, which
is the name of the rancho where CA-SLO-51/H is situated (Greenwood 1972; Jones, personal communication 2015).

The bead data from CA-SLO-51/H gives us an indication about the span of activities there (Table 2). The Bead assemblage from CA-SLO-51/H indicates an occupation spanning from the Early Period to post-contact. However, only one bead (Figure 9) is diagnostic of the Early Period and Early/Middle Transition and a few examples could be indicative of the Middle Period. Beads from the Late Period through to post-contact dominate the site and there is an emphasis of peak occupation during the Late Period (Jones and Waugh 1995).

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There is a possibility that CA-SLO-51/H has a Millingstone component and even an Early Holocene/Paleocoastal component. However, beads diagnostic of those periods of time have yet to be identified.
The only diagnostic Early and Early/Middle Transition bead recovered was the O4 bead found during the surface collection of the site. As previously explained, Component 3 was arbitrarily assigned and consisted of items found during the surface collection. The rest of the beads recovered from the 3rd component have not been included in the following conclusions because the archaeology is biased towards large, visible beads and does not accurately illustrate patterns in the archaeological record. The five clam shell disk beads (CSDB) could indicate the Early Period and Early/Middle Transition (for the Central Coast), however their condition implies a more recent manufacturing and, supported by the Von der Porten et al. (2014) typology for CDSB, I conclude that they were manufactured during the Late Period.

Middle Period beads were found at CA-SLO-51/H. Determining the number of those beads manufactured during that time is problematic given that limpet rings and steatite beads occur in both the Middle and Late Periods. Due to this fact, their counts from the total Middle Period beads and Late Period beads were omitted, as well as from the total number of beads from Components 1 and 2 so that more accurate figures can be established. The percent of Middle Period beads at CA-SLO-51/H was 3.18%. Thus, Middle Period beads are represented at CA-SLO-51/H, but represent less than 5% of the diagnostic bead assemblage.

Late Period beads dominate CA-SLO-51/H, and make up 83.85% of the total diagnostic beads from both components. At the least, this tells us that many of the beads were manufactured during the Late Period and represent a period of time when the village of Tstyiwí was at its peak of cultural complexity.

The post-contact beads found at the site largely came from Component 2. Of the diagnostic beads from Component 2, 14.78% were historic, while 9.52% from Component 1 were historic. Because there was a higher percentage of historic beads at Component 2 and a
higher percentage of Late Period beads at Component 1, it was possible to make a distinction between the two components. Component 1 had a higher frequency of Late Period beads and a lower frequency of post-contact beads. Therefore Component 1 indicates a more intensified Late Period occupation and Component 2 indicates more post-contact activity. Evidence for that is supported by the massive amounts of fish bone recovered from Component 2, signifying an intensification of marine resources at the site in response to seeking isolated refuge from invading foreigners (Jones, personal communication 2015).

**BEAD MANUFACTURING**

*Olivella* detritus was recovered from Component 1 and from the surface collection. Two specimens were found in Component 2, but those specimens appear more to be broken *Olivella* shell beads, with spires removed and bottom halves broken off. They were not included in the results section of this paper because it is indeterminable whether or not they were end-ground or Class A beads. Given that there is *Olivella* shell detritus in Component 1 and on the surface, this could mean at least two things: The shells could have been fragmented due to the plowing activities at the site and/or there was *Olivella* shell manufacturing taking place at CA-SLO-51/H. The first explanation is favored for this paper. Supporting that explanation is the lack of any detritus found at Component 2 because it is situated outside of the agricultural field. I speculate that if there was *Olivella* shell bead manufacturing going on, it would have been during the Late Period, when K beads were valued as currency, and are the most plentiful type found at the site. However this is controversial because many assert that nearly all of the *Olivella* shell beads made after 650 B.P. were manufactured on the Northern Channel Islands (Arnold and Walsh 2010).
One supporting line of evidence supporting on-site bead manufacturing is the presence of bead drills. Greenwood (1972) noted 9 chert drills at CA-SLO-51/H, however, she didn’t indicate what they were used for. Edgeware analysis was conducted on three bead drills found during Cal Poly’s 2015 excavations which indicated that two were in fact used on shell. Drills, therefore, are present at CA-SLO-51/H, yet whether or not the drills were for the purpose of making *Olivella* shell bead money is not known.

We can tell that the Indians did manufacture their own abalone (*Haliotis rufescens*) epidermis beads and mussel (*Mytilus californianus*) beads. We know this from the two, and possibly a third, abalone epidermis bead blanks and one mussel bead blank, all recovered from Unit 6. King (1981; 2011) concludes that, in the Santa Barbara Channel, mussel disks are indicative of the Middle and Late Periods and red abalone epidermis beads were produced during the Late Period. He noticed that graves containing mussel and red abalone epidermis beads were associated with those who had inherited power. It is proposed here that we are seeing a different pattern at CA-SLO-51/H. Because Component 2 contains 17 (80.9%) of the 21 beads diagnostic of the Historic Period, and because no other mussel disks, abalone epidermis beads or blanks were recovered from the Late Period component (Component 1), it is proposed here that the beads and blanks are post-contact. It is further proposed that the epidermis beads and blanks found at CA-SLO-51/H are the result of the Pecho Coast Chumash being isolated to that area, thus being forced to exploit local resources to manufacture their beads. Who those beads were made for is unknown, however, this interpretation suggests that the abalone epidermis beads and blanks represent a time when the villagers of *Tștyiwí* were resisting subjugation and the oppression of their culture brought about by the Mission system as opposed to representing a period of time when the Chumash were at a cultural peak, during the Late Period.
RECOMMENDATIONS FOR FUTURE RESEARCH

CA-SLO-51/H reached its highest cultural complexity during the Late Period as evidenced by the increase of cultural materials, including beads, present at the site. This pattern is consistent with the Santa Barbara Channel (Arnold 1992; Arnold and Walsh 2010; Bettinger 2015; Gamble 2008; Kennet and Kennet 2000). However, during the Protohistoric Period on the Central Coast, differences with the Channel emerge when interpreting the red abalone epidermis and mussel beads. The information granted by specific bead types and fish bone data (Jones, personal communication 2015) represents a shift in behavior as a result of coping with Europeans threatening the lifeways for the Indians at Tstyiwi. Those on the Pecho Coast were less numerous and presumably less socially and politically complex than their southern relatives. It would be illuminating to know how related they groups were from one another, given that the Northern Chumash are lumped in with those in the Santa Barbara Channel. Separate dating schemes are applied to both areas (Jones and Waugh 1995; King 1981, 2011) and perhaps further indication of differences can be gleaned from the assemblage of bead types of the two places. Future research is needed in order to answer that complex question. A possibly fruitful avenue of inquiry could be future bead analyses and the reexamination of assemblages from nearby sites to look for any patterns that exist that would link red abalone epidermis beads as well as mussel disk beads with the Protohistoric Period.
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