

Trauma and the Meganos Aspect at CA-ALA-343

M.A. Thesis Proposal

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ABSTRACT

The purpose of my study is to determine if rates of trauma are higher for archaeological sites with Meganos cultural material in the San Francisco Bay Area Sites than what is normally seen in Middle period sites. During the Middle Period (500 BC to 1000AD), two different cultural groups inhabited the San Francisco Bay Area, the ancestral Ohlone and the Meganos. How these two peoples interacted together is unknown. The primary goal of this study is to make inferences about how these two different cultural groups interacted while under the stress of occupying the same geographical area during the same time period. This will be accomplished by comparing rates of traumatic injury between a Middle Period archaeological site from the southern San Francisco Bay Area that has Meganos cultural material (CA-ALA-343) to Middle Period San Francisco Bay Area archaeological sites that do not have this cultural pattern.

Previous research on what is termed the "Meganos Intrusion" into the San Francisco Bay Area is limited. Several archaeological sites in the southern San Francisco Bay Area that have Meganos cultural material have been excavated (CA-ALA-343, CA-ALA-453, CA-CCO-141, CA-CCO-19, CA-CCO-20, CA-CCO-31). The research conducted has been geared toward defining the "Meganos Aspect" of the site, rather than making any inferences about the conditions under which the Meganos were living or their relationship with their neighbors.

Excavations at CA-ALA-343 were carried out in the past (Wildesen 1968; Hall 1985; Hall, Jurmain, and Nelson 1985; Wiberg 1990; Roop 1998; Marshall 2002). The excavations consisted of archaeological testing and salvage programs and did not seek to answer research questions about the nature of the site or its inhabitants beyond a description of the site itself. My study is significant because it will further our knowledge of the Meganos, as well as the ancestral Ohlone people, shed light on how social stress effects prehistoric populations, and a synthesis of the available data will also increase our knowledge of the origin and nature of CA-ALA-343.

INTRODUCTION

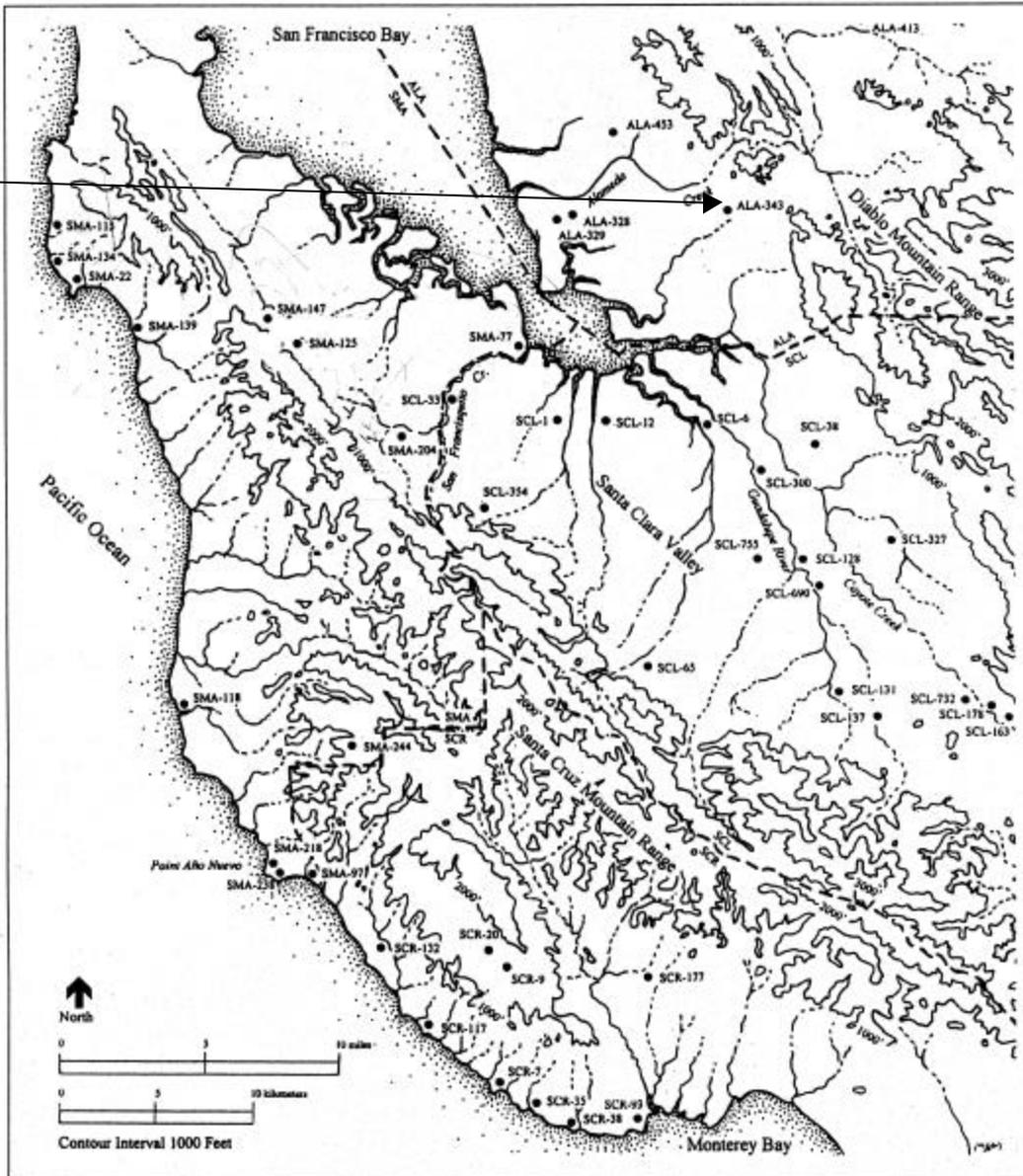
During the Middle period (500 BC - AD 1000), there were two cultural groups in the San Francisco Bay Area and San Joaquin Delta. The people with a Berkeley Pattern gathered around the San Francisco Bay and spread inland to the Livermore and Diablo Valleys and south to the drainage of the Carmel River. Berkeley Pattern cultural traits include flexed burial position (fetal), sparse or absent grave goods, and burials occurring within the village midden. The ancestral Ohlone were the bearers of the Berkeley Pattern (Bennyhoff and Frederickson 1994: 83). The other group of people who exhibited the Windmill Pattern, the Meganos, lived in the San Joaquin Delta, and up beyond Sacramento. Characteristics of the Windmill pattern included extended burial position with northern orientation, grave goods including ground stone implements, shell and stone beads, and bone artifacts (Bennyhoff and Frederickson 1994: 81). At the beginning of the Middle period (500 BC – AD 100), the Windmill Pattern spread into what are now the Diablo and Livermore Valleys and southward into Santa Clara Valley. The bearers of the Windmill cultural pattern have been named the Meganos by Bennyhoff, Spanish for "sand hill people" in reference to their use of sand hills in the Delta as burial mounds (Bennyhoff and Frederickson 1994).

CA-ALA-343, also known as Stiver's and Tyson's Lagoon, is an archaeological site located in Fremont, CA. CA-ALA-343 presents unique research opportunities as it exhibits the characteristic artifacts and burial customs of the Meganos Aspect, as well as, those of the ancestral Ohlone who were living in the area. The Meganos Aspect or Intrusion is characterized

by artifact and burial customs that resemble the earlier Windmill Pattern, but also have some Berkeley Pattern traits (Wiberg 1984, Bennyhoff and Frederickson 1994).

The major goals of my research are to test the hypothesis that during the Meganos Intrusion into the east and southern San Francisco Bay Area (500BC - AD700), the rates of trauma, specifically intentional trauma, were high due to population stress. To address this research problem, I will synthesize all available burial and burial associated artifact data on CA-ALA-343, compare the rates of traumatic injury from CA-ALA-343 to other contemporaneous archaeological populations for the Bay Area, and explore ideas of population pressure brought on by two cultures occupying the same geographical area as a catalyst for higher rates of interpersonal trauma.

In order to test the hypothesis that rates of trauma and interpersonal violence increased as a result of the Meganos Intrusion, I propose to compare sites that have evidence of the presence of Meganos material culture (CA-ALA 343) (Map 1) with other contemporaneous sites in which the Meganos Aspect is absent (CA-SCL-674 and CA-SCL-137). In order to determine the cultural pattern to which each individual belongs, I will differentiate between burial positions and artifact types. An extended burial position is indicative of the Windmill Pattern, while a flexed burial position indicates the Berkeley Pattern. The formal burial associated artifacts will be separated into Berkeley and Windmill Pattern categories. I expect to find rates of interpersonal violence higher at CA-ALA-343 than other contemporaneous sites in the area that do not show evidence of the Meganos aspect due to the occupation of two cultural groups in the same geographic area at the same time.



Selected Bay Area Archaeological Sites (From Hylkema 2002)

A study of this type will be valuable for many reasons. It will further our knowledge of Meganos, as well as the ancestral Ohlone people and shed light on how social stress effects prehistoric populations. A synthesis of the available data will also increase our knowledge of the origin and nature of CA-ALA-343.

BACKGROUND

Chronology

In order to understand the cultural patterns that affect this study, a brief overview of San Francisco Bay Area archaeology is required since the identifying cultural traditions used to delineate the skeletal populations are dependant on archaeological evidence. Robert Beardsley devised the Central California Taxonomic System (CCTS), to differentiate between cultural groups in California, here after the CCTS (Beardsley 1948:4-9). The system uses stylistic changes in artifacts, changes in mortuary treatment, and site formation or use to delineate cultural phases of a particular culture, or in this case the advent of an entirely different cultural tradition, within a geographic area. Sites were categorized into Early, Middle, and Late periods and over the years these were subdivided into phases to attempt to encompass the widely varying cultures and cultural traditions in central California.

TABLE 1. Chronology for the Prehistoric San Francisco Bay Area.

CCTS	Dating Scheme B1 After Bennyhoff and Hughes 1987 p149	Temporal Categories used in this Thesis After Bennyhoff and Milliken 1993
Historic period	1800 AD	Late Period Phase 2
Late period Phase 2-B	1700 AD	
Late period Phase 2-A	1500 AD	
Late period Phase 1-C	1300 AD	Late Period Phase 1
Late period Phase 1-B	1100 AD	
Late period Phase 1-A	900 AD	Middle to Late Transition
Middle to Late Period Transition	700 AD	
Middle Period Terminal Phase	500 AD	Upper Middle Period
Middle Period Late Phase	300 AD	
Middle Period Intermediate Phase	100 AD	Lower Middle Period
Middle Period Early Phase	200 BC	
Early to Middle Period Transition	500 BC	Early Middle Period
Early Period	3000 BC	

Over the intervening years the use of CCTS has come to be thought of as too rigid and confusing. There have been other attempts to replace the CCTS or revise the existing system (Bennyhoff and Frederikson 1969). The chronological scheme used within this thesis will be derived from Bennyhoff and Milliken's study of temporal change in bead style in Central California (Milliken and Bennyhoff 1993) for ease of use and current popularity. Chronological information cited from other authors will be converted into this dating scheme (in *italics*) if the information is not already within this framework.

The Meganos

The Meganos inhabited the large area from San Joaquin Delta down to Santa Clara County during the Middle Period in California's prehistory (500 BC to AD 1000)(Bennyhoff in Bennyhoff and Frederickson 1994). Archaeologically, the Meganos were first identified by Heizer in 1938, when he noticed an "atypical horizon" at the Orowood site (CA-CCO-141) characterized by ventral extension as a dominant burial mode (Bennyhoff, in Bennyhoff and Frederickson 1994). Bennyhoff lists several sites in ancestral Ohlone territory that contain components that exhibit the same Windmill Pattern mortuary practice with some Berkeley Pattern traits. He came to classify these sites as evident of the Meganos Aspect. Since that time, several more have been discovered: CA-ALA-343, CA-ALA 453, and CA-SCL-237 to name a few.

TABLE 2. Archaeological sites in Alameda and Contra Costa Counties with Components attributable to the Meganos Aspect. (adapted From Bennyhoff and Frederickson 1994)

Site	Type Of Excavation
CA-ALA-413	Salvage or small test excavation
CA-CCO-2 (Bernardo)	Salvage or small test excavation
CA-CCO-3	Salvage or small test excavation
CA-CCO-18 (Marsh)	Salvage or small test excavation
CA-CCO-19	Salvage or small test excavation
CA-CCO-20 (Dal Porto)	Salvage or small test excavation
CA-CCO-31 (Hall Ranch)	Salvage or small test excavation
CA-CCO-139 (Simone)	Excavated
CA-CCO-141 (Orowood)	Excavated
CA-CCO-146	Salvage or small test excavation
CA-CCO-147	Salvage or small test excavation
CA-CCO-148	Salvage or small test excavation
CA-CCO-151 (El Sobrante)	Excavated
CA-CCO-311	Salvage or small test excavation

Archaeological evidence suggests that as the Meganos moved south and west during the middle period (Maps 2-4), the ancestral Ohlone were displaced from their former territory. Bennyhoff surmises that they retreated back into the San Joaquin Delta and were culturally absorbed ancestors of the Valley Yokuts by the end of the Middle period (Map 5) (Bennyhoff, in Bennyhoff and Frederickson 1994).

The Ohlone

The Ohlone, also called the Costanoans by the Spanish, lived in the San Francisco Bay Area at the time of Euro-American contact (circa 1770) from the Carquinez straits to the drainage for the Carmel, Sur and Salinas rivers in the south. The Ohlone had no unified political organization. The basic political unit was the "tribelet". Each tribelet consisted of one or more villages and several camps within a given territory. There were approximately fifty such Ohlone tribelets at the time of contact. Within a tribelet there was a headman, although individuals were not necessarily bound to his decisions. This type of political structure is thought to be the dominant type in California prehistory. (Kroeber 1962, Levy in Heizer 1978).

We know from the few ethnographic sources that are available that warfare among the Ohlone was fought by ambush or by prearranged meeting (Heizer 1978, Kroeber 1965:298). In prearranged battles, the duration was short; when one or two people were injured or killed the others left the field (Broadbent 1972). Of course, this information comes from contact period peoples, the Ohlone, and may have varied widely in pre-contact times among what are possibly the ancestral Ohlone people. Data regarding the specifics of warfare for the Meganos culture do not exist since the Meganos ceased to be a separate cultural entity long before contact based on the archaeological evidence. Any information about social tension or outright warfare at CA-ALA-343 will stem from bioarchaeological inquiry rather than ethnographic accounts.

The Study of Conflict

There has been an increase in interest in the study of pre-state warfare in recent years (Bamforth 1994, Jantz and Owsley 1994, Milner 1991). Due to the effects of colonialism in the 19th and 20th centuries, most pre-state societies are under the military control of a state and either cannot or will not engage in these kinds of activities as they would have during prehistory (Robarchek 1994). The study of war in general has undergone some changes in the last 50 years, vacillating back and forth between a purely biological or genetic predisposition to warfare in general to a culture specific explanation during the 1970's and 1980's. The resulting debate continues. Much data regarding warfare and inter-group conflict comes from Amazonia or New Guinea. North America has been largely left out of the discussion until recently (Robarchek 1994).

Previous Research

CA-ALA-343 was reported to be a Middle Period (500 BC - AD 1000) site with at least 2 occupations in evidence. T.F. King registered the site in 1968. He reported a midden that had been scattered over a wide area due to farming activities, and human remains were present. Although several testing programs and excavations were carried out on the site, no in-depth report has yet been written. The following is a table listing excavations carried out at CA-ALA-343.

TABLE 3. Previous Excavations at CA- ALA-343

Researcher and affiliated institution or company	Excavation type	Date of excavation
Wildesen, Leslie San Francisco State University	Test units	1968
Roop and Flynn, Archaeological Resource Service	Auger testing	1981
Hall, Jeffrey San Jose State University	Test units	1985
Hall, J, Jurmain .R, Nelson J San Jose State University	Burial recovery	1985
Wiberg, Randy Holman and Associates	Backhoe test trenching	1990
Thompson, Richard Archaeor	Burial recovery	2000

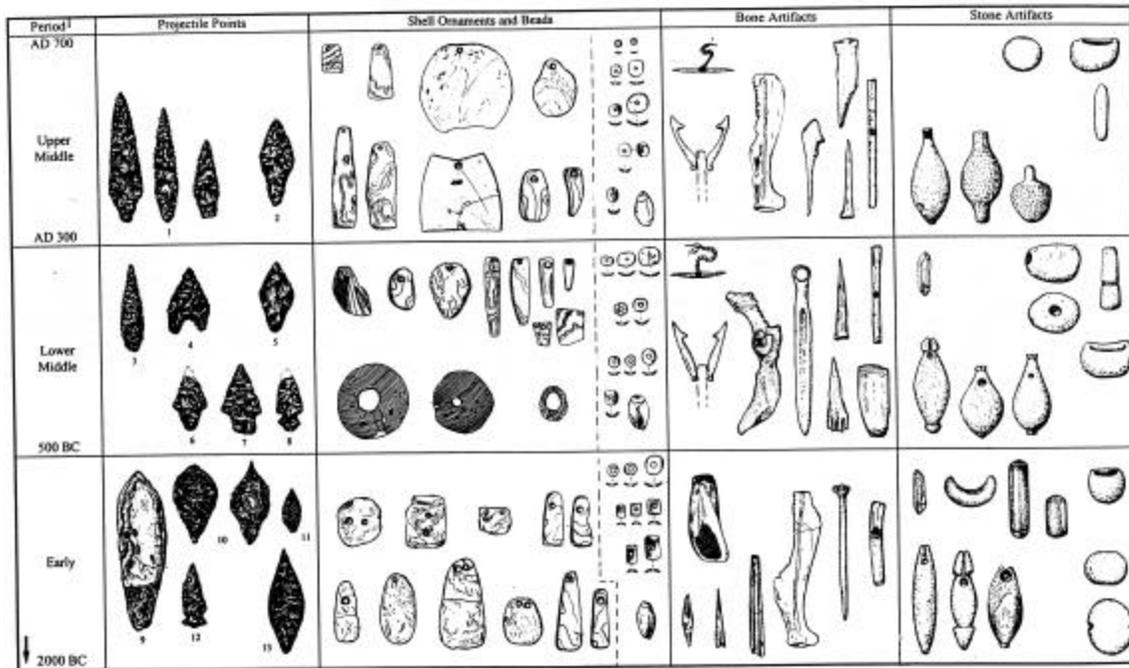
Existing documentation includes a preliminary report by Wildesen on the San Francisco State College (SFSU) excavation in 1968, two reports on a testing programs carried out by Archaeological Resource Services (ARS) in 1981 and 1994, preliminary reports on testing and burial excavation performed by San Jose State University (SJSU) in 1985 and 1988, and a report on the results of a testing program done by Holman and Associates in 1990. Other unpublished data includes excavation and burial data from the 1988 SJSU excavation (Hall 1988 unpublished notes) and an unpublished analysis of the burials excavated in 2000 from Archaeor (Marshall 2002).

METHODS

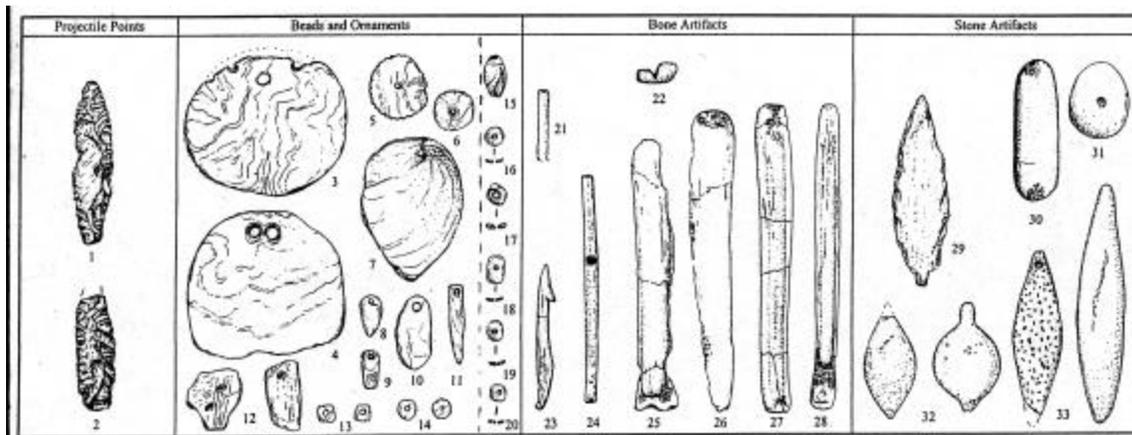
The goal of this study is to assess the variability of intentional trauma between sites that have Meganos (Windmill pattern) cultural material and ones that display strictly ancestral Ohlone (Berkeley pattern) material. The methodology then, will be divided into osteological and archaeological sections.

Archaeological Methods

The archaeological methods of this study will be based on existing collections. No further excavation will be conducted. In order to clearly define how and when the site was being used, and by which cultural group, a careful examination of all available site data will be required. I will synthesize all available literature and inventory, or re-inventory, all available collections of human remains and associated formal artifacts from CA-ALA-343 into one comprehensive report. My report will include an updated chronology of the site, as well as, an overall map of features, test units, and burials and formal artifacts. An overall understanding of the site will not only add to the body of knowledge concerning Bay Area prehistory, but also makes a case for positive or negative evidence of unusually high trauma rates at the site stronger. In order to determine the cultural pattern each to which each individual belongs, I will correlate the burial position (extended for Windmill pattern vs. flexed for Berkeley pattern) and determine whether the associated artifacts fit either the Berkeley or Windmill Pattern categories.



Berkeley (ancestral Ohlone) Pattern Artifacts from Hylkema 2002



Windmill Pattern (Meganos) Artifacts from CA-ALA-343 from Hylkema 2002

Osteological Methods

Close to 400 burials were removed from the site during three of the excavations at ALA-343. I will examine over 20 individuals from CA-ALA-343 currently housed in the San Francisco State Native American Graves Protection and Repatriation Act (NAGPRA) collection. The burial data from this excavation will then be added to the other available osteological data from the site. Some of the methods that follow for the study of the SFSU collection have been adopted from other studies done on material from CA-ALA-343 in order to keep the data comparable (Hall et al 1985, Marshall 2002). Although inter-observer error is of some concern when data collected by one researcher is compared to another's, the overall benefits outweigh the biases. Other osteological methods have been used to differentiate between populations within a given geographic area. Marshall (2002) compared stature between extended and flexed burials at CA-ALA-343. Unfortunately, the differences were not statistically meaningful (Marshall 2002). Sex and age estimates are important to this study because they will directly influence the interpretation of any traumatic injuries.

Age Estimation

Determining the exact age at death of an individual is difficult. Skeletal populations are generally categorized into age ranges. Individuals seventeen years or younger will be labeled sub adults, and individuals eighteen and older will be termed adults. Age ranges for this study were established by Marshall (Marshall 2002 after Boylston and Roberts 1996) and are used within this study to maintain continuity. According to Schwartz (1995), epiphyseal fusion and the unification of the os-coxae are the most accurate way to determine the age of a sub adult, however dental formation and eruption are also reliable.

Age in sub adults will be based upon dental development (Moore et al 1963), dental eruption (Ubelaker 1989), and epiphyseal fusion (Schwartz 1995, and Buikstra and Ubelaker 1994). In adults, the auricular surface will be examined to determine age at death (Lovejoy et al 1985). This method also has the advantage of using a portion of the pelvic girdle that survives well archaeologically. Todd's method, as refined by Suchey and Brooks, for the pubic symphysis will also be employed to establish age at death (Todd 1921, Suchey and Brooks 1988 in Griffin 2000).

Although assessments of age are subjective, some of the changes that the cranium undergoes throughout life are more predictable. The age at death for the cranium of a sub adult will be determined by the fontanelle closure described by Schwartz (Schwartz 1995). Cranial age at death for adults will be determined by using the dental eruption method proposed by Ubelaker (Ubelaker 1989) as well as the basilar synchondrosis fusion and cranial suture closure methods in *Standard for Data Collection from Human Skeletal Remains* (Buikstra and Ubelaker 1994).

Sex Estimation

Sub adults will not be sexed in this study due to a lack of diagnostic criteria. Adults will be sexed using the Phenice method (Phenice 1969), which focuses on sexually asymmetrical differences in the sub-pubic region. This method is generally held to be the easiest most reliable method for establishing sex from the post cranial skeleton.

Certain traits are considered stereotypically male. Males have a more robust, rough skull as well as squarer orbits and retreating foreheads. Other traits are considered "female". Females, generally, have smoother, more gracile skull structures and rounder orbits with a more

vertical forehead. The differences are caused by differences in testosterone levels during puberty, as well as, genetic factors and environment. (Griffin 2000, White and Folkens 2000)

Adult crania will be sexed using methods described by Wolfe and others (in Griffin 2000) as well as the methods described by Buikstra and Ubelaker (Buikstra and Ubelaker 1994). These methods depend on the observations of sexual asymmetry that manifest during puberty and assign them a weighted score.

Trauma

Main Entry: **trau·ma**

Pronunciation: 'tro-m&, 'trau-

Function: *noun*

Inflected Form(s): *plural traumas also trau·ma·ta* /-m&t- &/

1 a : an injury (as a wound) to living tissue caused by an extrinsic agent <surgical *trauma*> <the intra-abdominal organs at greatest risk to athletic *trauma* are the spleen, pancreas, and kidney -- M. R. Eichelberger> **b** : a disordered psychic or behavioral state resulting from mental or emotional stress or physical injury

2 : an agent, force, or mechanism that causes trauma

Merriam-Webster Medical Dictionary, 2003

The study of trauma has had a long history. Early reports on traumatic injury were usually focused on specific and extraordinary examples of trauma (see Courville 1948, Hamperil and Laughlin 1959, and Wilson 1901). Today studies are more wide ranging, focusing on the interpretation of injuries within the context of “their relationship to biological variables such as sex and age, that may have social or cultural relevance and their temporal or special variation” (Lovell 1997:139).

Modern studies of traumatic injury may approach the topic by looking at patterns of traumatic injury within a population (Judd and Roberts 1999, Glencross and Stuart-Macadam 2000, Judd 2002, Alvrus 1999, and Jurmain 2001). Studies of this kind may also seek to use patterns of trauma to differentiate between possible etiologies (Standen and Arriza 2000), or to make inferences about the social or ecological climates that the population existed in (Blakely

and Mathews 1990, Milner et al 1991, Lessa and De Sousa 2004). Alternatively, they may focus on a particular type of traumatic injury, such as interpersonal violence (Jurmain 1991, Walker 1989, Herschkovitz et. al. 1996).

For the purposes of my study, trauma will be defined as skeletal lesions sustained as a result of stress, whether it be acute or repetitive. Traumas will be put into four general categories: dislocations, fractures, trauma from edged instruments, and artificially induced shape and contour abnormalities. The four categories of trauma will be divided into deliberate and non-deliberate categories, and further subdivided into cases of peri-mortem or ante-mortem trauma (Marshall 2002, Roberts and Manchester 1999, Merbs 1989, Ortner and Putschar 1981).

As this study focuses on interpersonal violence specifically, differentiating between deliberate and non-deliberate trauma shall be of great importance. Of no less importance will be differentiating between trauma and other taphonomic processes that may mimic trauma when examining dry bone (White 1992, Ubelaker 1989). White proposes an elegant system for recording traumatic lesions on fragmentary bone. In the interests of time, fragments will be reassembled into skeletal elements as thoroughly as the collection allows (Lambert et. al. 2000) and then examined for trauma. Any traumatic lesions will then be recorded using a minimal list of White's recommended observations (White 1992).

Inter-Intra Observer Error

As this study builds upon the work of others inter-observer error is of concern. Not only is it important to any study that uses another researchers data in terms of reliability, but also with the potential to lose access to a collection due to reburial. Ideally, a sub sample randomly selected and of appropriate size should be re-scored by another researcher and the results compared statistically. According to Buikstra and Ubelaker (1994) continuous data, such as

osteometrics, should be analyzed for error using paired T tests, while discontinuous data, such as degree of expression, should be separated into discrete categories and tested using the phi coefficient (Buikstra and Ubelaker 1994). A pilot study should be carried out during the course of this study if an appropriate sample can be obtained. The feasibility of such a study is currently being explored.

Once gross prevalence rates for traumatic injury have been established for each element within the CA-ALA-343 population, they will be statistically compared to other sites in the area from the same time period to determine if there is a statistically significant variation of the levels traumatic injury between each population. This operation will be carried out for each of the four types of trauma as outlined above.

EXPECTED FINDINGS

I expect to find gross prevalence rates of trauma to be higher for ALA-343 due to the presence of the Meganos and the inferred population pressure brought on by having two cultural traditions occupying the same area at the same time. I expect to find rates of interpersonal violence higher at CA-ALA-343 than other contemporaneous sites in the area that do not show evidence of the Meganos aspect. It is entirely possible that I will find that rates of trauma at CA-ALA-343 are not statistically different from other contemporaneous sites in the area or lower.

SCHEDULE

I expect that the data collection for this thesis to be completed by 12-31-2004. I expect my first draft of my thesis to be done by February 2005. I hope to complete this project in time for Spring 2005 graduation.

COMMITTEE

Dr. Mark Griffin

Dr. Gary Pahl

Dr. Jeffrey Fentress

LITERATURE CITED

- Alvrus, Annalisa
1999 Fracture Patterns Among the Nubians of Semna South, Sudanese Nubia. *International Journal of Osteology* 9:417-429.
- Bennyhoff, J. A. and David A Frederickson
1994 *Towards a New Taxonomic Framework for Central California Archaeology: Essays by James A. Bennyhoff and David A. Fredrickson*, edited by R. E. Hughes, Number 52: Contributions of the University of California Archaeological Research Facility, Berkeley.
- Blakely, Robert L. and David S. Mathews
1990 Bioarchaeological Evidence for a Spanish-Native Conflict in the Sixteenth Century Southeast. *American Antiquity* 55(4):718-744.
- Buikstra, J. E. and D. H. Ubelaker
1994 *Standards for Data Collection from Human Skeletal Remains*. Proceedings of a Seminar at The Field Museum of Natural History. Arkansas Archaeological Survey Research Series No. 44., Fayetteville.
- Galloway, Allison
1999 *Broken Bones: Anthropological Analysis of Blunt Force Trauma*. Charles C. Thomas Publishing. Springfield: Illinois.
- Glencross, B. and P. Stuart-Macadam
2000 Childhood Trauma in the Archaeological Record. *International Journal of Osteology* 10: 198-209.
- Grady, Diane, Kate A Latham and Valerie A. Andruschko
2001 *Archaeological Investigations at CA - SCL- 674, The Rubino Site, San Jose, Santa Clara County, California. Vol. 2 The Human Skeletal Biology of CA- SCL- 674*. Archives of California Prehistory No.50. Coyote Press, Salinas: California.
- Griffin, Mark C. and Randall R. Skelton
2000 *Laboratory Manual for Human Osteology and Forensic Anthropology*. San Francisco State University. California: San Francisco.
- Hall, J. T., Robert Jurmain. and J. S. Nelson
1988 Preliminary Description of Cemetery Complex of CA-ALA-343. In *Proceedings of the Society for California Archaeology, Volume 1: Papers Presented at the Annual Meetings of the Society for California Archaeology*, edited by S. M. Hector, L. E. Christenson, G. T. Gross and M. D. Rosen, pp. 321-333. Society for California Archaeology, San Diego.
- Hamperl, H.
1967 The Osteological Consequences of Scalping. In *Disease in Antiquity: A Survey of the Disease, Injuries and Surgery of Early Populations*, edited by D. Brothwell and A. T. Sandison, pp. 630-634. Charles C. Thomas, Springfield, Illinois.
- Hylkema, Mark G.
2002 Tidal Marsh, Oak Woodlands and Cultural Fluorescence in the southern San Francisco Bay Region. Chapter 13 in *Catalysts to Complexity, Late Holocene Societies of the California Coast*. Edited by J.M. Erlandson and T.L. Jones. *Perspectives in California Archaeology*, vol. 6, Costen Institute of Archaeology University of California Los Angeles, Los Angeles: California.

- Levy, R
1978 Costanoan. In *California*, edited by R.F. Heizer, pp 485-495. Handbook of North American Indians, Vol. 8. William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.
- Hall, Jeffery T.
1985 *Results of an Archaeological Subsurface Testing Program at CA-ALA-343*. Center for Anthropological Research, San Jose State University. San Jose: California.
- Hall, Jeffery T., Robert Jurmain and James S. Nelson
1988 Preliminary Description of Cemetery Complex at CA- ALA - 343. *Proceedings of the Society for California Archaeology*, pp. 321-334. Society for California Archaeology, San Diego.
- Hershkovitz, I., L. Bedford, L.M. Jellema, and B. Latimer
1996 Injuries to the Skeleton due to Prolonged Activity in Hand-to-Hand Combat. *International Journal of Osteology* 6: 167-178.
- Hollimon, S. A. and D. W. Owsley
1994 Osteology of the Fay Tolton site: implications for warfare during the Initial Middle Missouri Variant. In *Skeletal Biology in the Great Plains: Migration, Warfare, Health, and Subsistence*. pp. 345-353. Smithsonian Institution Press, Washington D.C. edited by D. W. Owsley and R. L. Jantz
- Judd, M.
2004 Trauma in the City of Kerma: Ancient versus Modern Injury Patterns. *International Journal of Osteology* 14: 34-51.
- Judd, Margaret A. and Charlotte A. Roberts
1999 Fracture Trauma in a Medieval British Farming Village. *American Journal of Physical Anthropology* 109:229-243.
- Judd, Margaret
2002 Ancient Injury Recidivism: an Example from the Kerma Period of Ancient Nubia. *International Journal of Osteology* 12:89-106.
- Jurmain, Robert
2001 Paleoepidemiology of Trauma in a Prehistoric Central California Population. In *Human Paleopathology: Current Syntheses and Future Options*, edited by D. J. Ortner and A. C. Aufderheide, pp. 241-248. Smithsonian Institution Press, Washington D.C.
- Jurmain, Robert and V. I. Bellifemine
1997 Patterns of cranial trauma in a prehistoric population from central California. *International Journal of Osteoarchaeology* 7: 43-50.
- Katz, D. and J. M. Suchey
1986 Age determination of the male Os Pubis. *American Journal of Physical Anthropology* 69: 427-435.
- Lambert, P.M.
1994 *War and Peace on the Western Front: A Study of Violent Conflict and its Correlates in Prehistoric Hunter-Gatherer Societies of Coastal Southern California*. University of California Santa Barbara. Doctoral dissertation.
- Lambert, P.M., Brian R Billman, and Banks Leonard
2000 Explaining Variability in Mutilated Human Bone Assemblages from the American South West: A Case Study from the Southern Piedmont of Sleeping Ute Mountain, Colorado. *International Journal of Osteoarchaeology* 10: 49-64.

- Lessa, A. and S. Mendonca de Souza
 2004 Violence in the Atacama Desert during the Tiwanku Period: Social Tension? *International Journal of Osteology* (in press).
- Lovejoy, C. O., R. S Meindl, T. R Pryzbeck, and R. P. Mensforth
 1985 Chronological metamorphosis of the auricular surface of the ilium: a new method for the determination of adult skeletal age at death. *American Journal of Physical Anthropology* 68: 15-28.
- Lovel, N
 1997 Trauma Analysis in Paleopathology. *Yearbook of Physical Anthropology* 40:139-170.
- Marshall, C.E.
 2002 *Osteology of CA-ALA-343*. Unpublished Manuscript.
- Merriam Webster Medical Dictionary
 2002 www.intellihealth.com, Last accessed November 14, 2004.
- Milliken, Randall, T and James A. Bennyhoff
 1993 Temporal Bead Changes as Prehistoric California Grave Goods. In *There Grows a Green Tree: Papers in Honor of David A Frererickson*. M Basgall, W. Hildebrandt, P. Mikkelsen and G. White, editors. Center For Archaeological Research at Davis Publication No.1:381-395
- Milner, G.R., E. Anderson and V. G. Smith
 1991 Warfare in Late Prehistoric West Central Illinois. *American Antiquity*. 56:4 pp581-603.
- Merbs, C. F.
 1989 Trauma. In *Reconstruction of Life from the Skeleton*, edited by M. Y. Iscan and K. A. R. Kennedy, pp. 161-189. Alan R. Liss, Inc., New York.
- Moorees, C. F., E. A Fanning. and E. E Hunt
 1963 Age variation of formation stages for ten permanent teeth. *Journal of Dental Research* 42: 1490-1502.
- Ortner, Don and Walter G.J Putchar
 1981 *Identification of Pathological Conditions in Human Skeletal Remains*. Smithsonian Institution Press. Washington D.C.
- Phenice, T. W.
 1969 A newly developed visual method of sexing the Os Pubis. *American Journal of Physical Anthropology* 30: 297-302.
- Powers, Stephen
 1877 *Tribes of California*. University of California Press Berkley, California
- Robarchek, Clayton
 1994 Plains Warfare and The anthropology of War. In *Skeletal Biology in the Great Plains: Migration, Warfare, Health, and Subsistence*, edited by D. W. Owsley and R. L. Jantz, pp. 355-362. Smithsonian Institution Press, Washington D.C.
- Roberts, C. and K. Manchester
 1999 *The Archaeology of Disease*, 2nd Edition. Cornell University Press, Ithaca.

- Roop, William
1998 A Cultural Resources Evaluation of the Civic Center Apartments Project, Fremont, Alameda County, California. Archaeological Resource Service. Petaluma: California.
- Schwartz, J. H.
1995 *Skeleton Keys: An Introduction to Human Skeletal Morphology, Development, and Analysis*. Oxford University Press, New York.
- Standen, V. G. and B. T. Arriaza
2000 *Trauma in the Preceramic coastal Populations of Northern Chile: Violence or Occupational Hazard?* *American Journal of Physical Anthropology*. 112:239-249
- Todd, T. W.
1921 Age changes in the pubic bone. I: The male white pubis. *American Journal of Physical Anthropology* 3: 285-334.
- Todd, T. W.
1921 Age changes in the pubic bone. III: The pubis of the white female. IV: The pubis of the female white-negro hybrid. *American Journal of Physical Anthropology* 4: 1-70.
- Todd, T. W. and Lyon Jr., D. W.
1925 Endocranial suture closure, its progress and age relationship. Part I: Adult males of white stock. *American Journal of Physical Anthropology* 7: 325-384.
- Ubelaker, D. H.
1989 *Human Skeletal Remains: Excavation, Analysis, Interpretation*, Second Edition. Taraxacum, Washington D.C.
- Walker, P
1989 Cranial Injuries As Evidence Of Violence In Prehistoric Southern California. *American Journal of Physical Anthropology* 80:313-323
- Wiberg, Randall, S
1990 Report of Archaeological Mechanical Testing for the Proposed Central Park Development, Fremont, Alameda County. Holman And Associates, San Francisco.
1984 The Santa Rita Village Mortuary Complex: Evidence and Implications of a Meganos Intrusion. Masters Thesis. San Francisco State University, San Francisco.
- White, T.M.
1992 *Prehistoric Cannibalism at Mancos 5MTUMR-2346*. Princeton University Press, Princeton: New Jersey.
- White, T. M. and P. A. Folkens
1991 *Human Osteology*. Academic Press, Inc., San Diego.
- Wildeson, L.
1968 *Preliminary Report of Archaeological Investigations at CA-ALA-343*. San Francisco State College, San Francisco: California.