EXPLORING CLAM BED TENDING AT CA-MRN-202: SELECTIVE HARVESTING OF PACIFIC GAPER CLAM (*TRESUS NUTTALLII*) FROM THE TOMS POINT TRADING POST, IN TOMALES BAY, CALIFORNIA

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Hinterland sites have recently been the focus for analyzing Native Californian use of wild foods during the colonial period. Toms Point offers unique insight to examine the trialectic of traditional ecological knowledge (TEK), the concept of indigenous landscapes, and intertidal environments. Furthermore, most research on traditional resource management has largely focused on terrestrial and riverine habitats, overlooking the interplay between long-term management practices along shorelines and food production. This study uses ethnographic, archaeological, and morphometric approaches to examine the possibility of clam bed tending by Coast Miwok who used Toms Point as a space to work, trade, and procure wild foods in a place of persistence. By modeling intertidal TEK practices of Coast Miwok at Toms Point with this methodological trio, the evidences from radiocarbon assays, regression-based estimations of clamshell umbones, and ethnographic data generally support the idea that Coast Miwok may have employed selective harvesting of Pacific Gaper clam (Tresus nuttallii) throughout the colonial period.

Introduction

"Toms Point" is a mission-and post-mission period (1767–1857) hinterland trading post on the dry and grassy northeastern shore of Tomales Bay in Marin County where Coast Miwok lived, worked, and gathered wild foods (Schneider et al., 2018). The site is situated on a sandy peninsula bluff that gives sweeping vantage of the surrounding landscape, including the mouth of the bay and its long, linear body running atop the San Andreas Faultline. The study of "hinterland" sites and the archaeology of colonialism from an "outside-in" perspective can address questions about how indigenous people on the Marin peninsula resisted colonial pressures by maintaining their connections to important resources from ancestral landscapes (Lightfoot 2005, 2013; Panich and Schneider 2015; Schneider 2015, 2018; Schneider and Panich 2014). In addition, the resources from extraneous hinterland environments have been noted to have supplemented less-resilient agriculture food systems within the missions (Farris, 2014), and also provided neophytes living within the mission with material culture, preferred foods and tastes, and raw materials which reaffirm connections to ancestral lands and traditional knowledge (Popper, 2016; Panich et al. 2018a). This paper will focus on the methodological component of the study, please refer to the archaeological findings for more to-date background on Toms Point (CA-MRN-202; Panich et al., 2018b; Schneider et al. 2018).

Recently published morphometric approaches to fragmented archaeological shell suggests quantified assemblages can serve as accurate proxies for discussing environmental change, harvesting strategies, and residential seasonality (Campbell and Braje 2015; Singh and McKechnie 2015). This project mobilizes similar predictive morphometric modeling of shell in combination with ethnographic, and radiometric datasets to ask if Coast Miwok may have been employing selective harvesting practices of TEK to increase clam bed productivity during their stint on Toms Point. The author hopes to make an initial step towards a future integrative historical ecology project that involves the diachronic study of shellfish management throughout the Late Holocene and into historical times of Tomales Bay intertidal zones. A study of this nature can open an opportunity for further research partnerships between the Federated Indians of Graton Rancheria, private and public land managers, and researchers who seek to integrate TEK of shellfishing to better manage struggling intertidal resources.

BACKGROUND

This paper represents the findings from an honors thesis based on the shellfish assemblage that resulted from two seasons (2015, 2016) of fieldwork on Toms Point led by co-directors Drs. Tsim Schneider (University of California Santa Cruz [UCSC]) and Lee Panich (Santa Clara University [SCU]) in effort to investigate native persistence and autonomy on the Marin Peninsula. This collaborative project brought together students from UCSC and SCU to conduct fieldwork in cooperation with descendant stakeholders of the Federated Indians of Graton Rancheria (FIGR) and land managers of Audubon Canyon Ranch (ACR). Remote sensing, intensive pedestrian surveys, and auger tests helped define several site boundaries on the Point. Also, surface collecting, excavation units, and total station mapping were also used to study the ancient archaeological landscape encompassing MRN-202, and the site characteristics as well.

Toms Point (Figure 1) is a promontory bluff studded with coastal scrub and outlined by marshes and sand dunes. The eastern shoreline of Tomales Bay is best characterized as dry and grassy, while the western shore is lush and forested with Bishop Pine (*Pinus muricata*) and Douglas Fir (*Pseudotsuga menzeisii*; Avery 2009). In the shelly dirt and sandy dunes of Toms Point, one may find an abundance of Coyote Brush (*Baccharis pilularis)*, Rushes (Juncaceae), Sedges (Cyperaceae), Tree Lupine (*Lupinus arboreus*) and Deergrass (*Muhlenbergia rigens*). In short, Toms Point is situated along a geophysically dynamic rift valley that is home to abundant flora, waterfowl, wildlife, recreational activity, commercial dairy and fishery industries still visible today.

Site MRN-202 is a mostly intact, post-mission (after 1830) sheet midden deposit with abundant clamshells and a diverse set of artifacts at the lowest point north of a sandy bluff. One of the clearest reasons to scrutinize the shellfishing practices at the site in question is the superseding abundance of shellfish remains, *by weight*, at a site historically purported as a hide and tallow station and was occupied fairly late during the colonial period (Schneider et al. 2018). Overall, this project helped investigate the persistence of traditional resource collection by foregrounding the efficacy of archaeological shellfish remains as identifiers for continuity and change in traditional ecological management techniques. An honors undergraduate thesis study also discusses the relevance of these data for future habitat restoration projects that aim to integrate Traditional Ecological Knowledge (TEK) and collaborate with indigenous communities to create local solutions to anthropogenic environmental change (Apodaca 2017).

METHODS AND MATERIALS

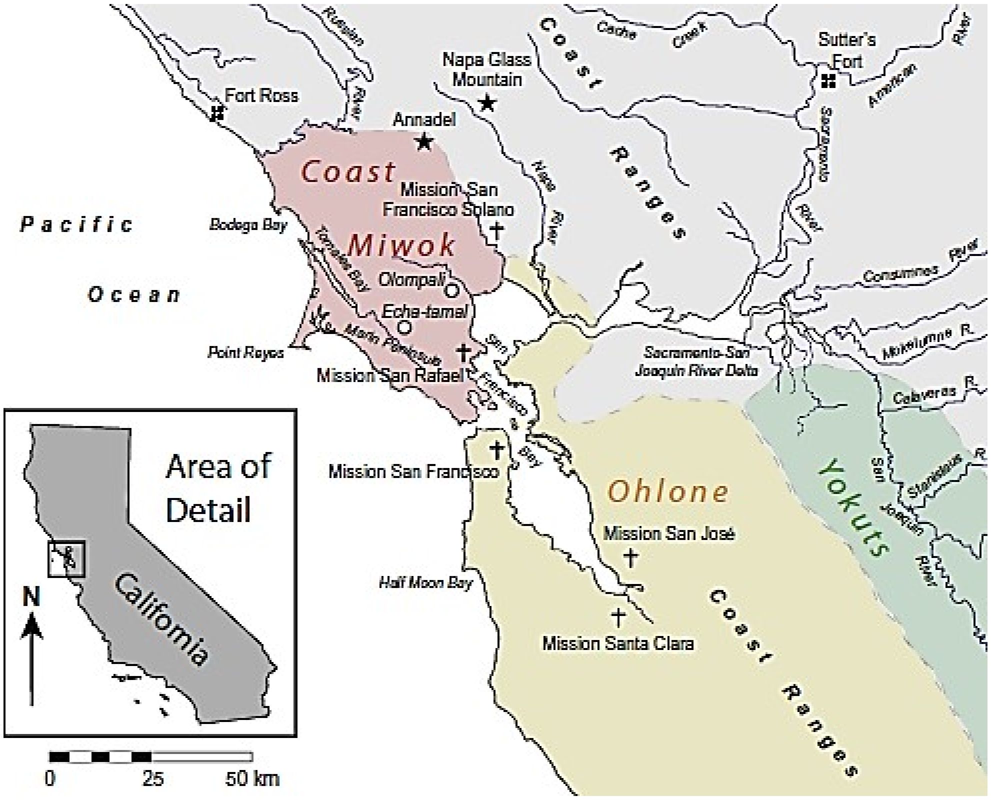
Theoretical Framing

To model for aquacultural management practices, I used recent lessons from clam garden studies in the Pacific Northwest (Lepofsky et al., 2015) and the general ideas from of landscape management systems of indigenous coastal California peoples (Lightfoot et al. 2013).

Ethnographic and Historical Ecology Materials

Findings from Cannon and Burchell (2008), Lepofsky and Caldwell (2013), Groesbeck et al. (2014), Lepofsky et al. (2015) are used as a TEK comparison in the Pacific Northwest. Although the House societies of the Pacific Northwest are structurally different from the tribelets of the Central Coast, it serves as a baseline for what protoaquacultral manifestations in North America can look like.

To situate the documented coastal traditional knowledge of Coast Miwok, ethnographic field notes published by Isabel Kelly (1978; edited by Collier and Thalman, 1996) were referenced for three reasons: (1) to target ethnographically important clam species, (2) to highlight intertidal resource TEK and (3), to interpret the social structures in place that governed the procurement and access to intertidal resource locales. Ethnoecological backgrounds were pulled from Anderson (2005) and Lightfoot and Parrish (2009). Finally, Avery (2009) and most specifically, Baker (1992) provide the historical environmental



The project location was omitted from this map. This map was adapted from Milliken (1995) and recreated by Schneider (2015). Permission by Tsim Schneider.

Figure 1. Project Vicinity Depicting Ethnolinguistic Groups and Colonial Establishments near the San Francisco Bay Area.

descriptions that are key evidences for illustrating Tomales Bay once contained abundant, stable, and biodiverse intertidal zones when Coast Miwok were regularly tending shorelines.

Morphometrics

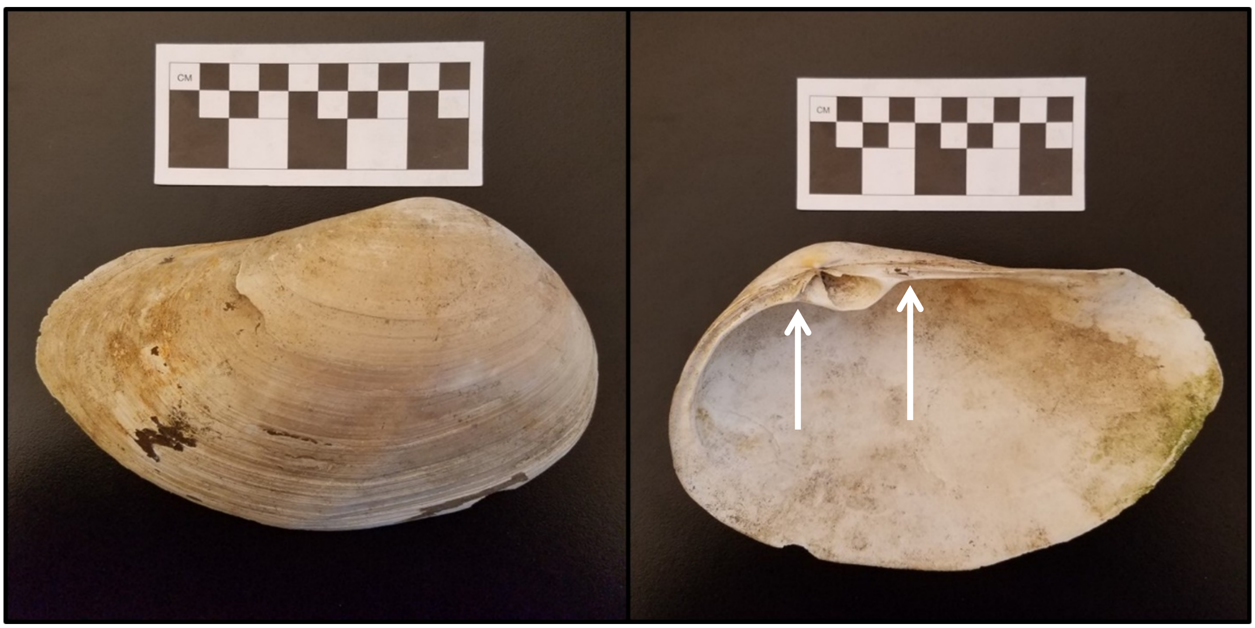
Following the lead of recently published research on California mussel (*Mytilus californianus*; Campbell and Braje, 2015; Singh and McKechnie, 2015, Singh et al., 2015), a robust sample of *modern* Gaper clam (*Tresus nuttallii*; n=110) shells were collected from Elkhorn Slough National Estuarine Research Reserve in the Monterey Bay to produce bivariate regression formulae based on the allometric relationship between the umbo and total valve (shell) length. Using Microsoft Excel, a pilot study (n=30) of *modern* shell confirmed that *umbo length is more reliable* than umbo width, and umbo height for estimating total valve size (Apodaca 2017). Experimental regressions were applied to archaeological umbo remains (n=27) from two test pits at MRN-202 (see Figure 2). Due to the relatively low number of umbones with intact morphological landmarks reliable enough to obtain consistent measurements, left or right hinges were not differentiated and limited only to Pacific Gaper clams. In sum, the purpose of constructing an allometric regression on clamshell is to make use of the abundance of Gaper clam unbones at MRN-202; the most robust morphological feature of bivalves which preserve remarkably well in archaeological records (Campbell and Braje 2015; Singh and McKechnie 2015; Apodaca 2017).

The molluscan genus *Tresus* have distinct "chondrophore" (shelly projection), and posterior and anterior lateral teeth on the inside of the hinge plate (Figure 3). To obtain umbo "length" in regard to the long axis of clam (posterior to anterior), calipers were placed at end of each lateral tooth, before the start of

This image was redacted at the request of Graton Rancheria citizen Tsim Scheider. To request access to this data, please contact the SCA Business Office at office@scahome.org

These excavations were conducted in 2015. View looking West.

Figure 2. Two Test Pits where Clamshells were Sampled.



Ventral view shows condrophore-bearing umbo at center of hinge plate. Digital calipers were used to target specific features shown by the arrows above.

Figure 3. Dorsal (left) and Ventral (right) View of Pacific Gaper Clam (Tresus nuttallii) Valves.

the "plate." "Width" was measured along the margin/umbo axis by placing calipers at the apex of umbo and the outermost lip of chondrophore. Umbo height was negotiated by placing an arbitrary 10-millimeter mark with colored pencil vertically from umbo apex (along outside of shell). Umbo was then placed ventral side down on flat surface and measured from the arbitrary 10-millimeter mark to where umbo makes contact with surface. The intricacies involved with working with mussel umbo height has been shown to lower R-values during statistical analysis (Campbell and Braje 2015). Modern umbo dimensions (L, W, H) were fitted to total lengths to create y-intercept equations which were then appended to archaeological umbo measurements. Shellfish identifications were determined based on a locally made comparative collection using Keen and Coan (1974) and archaeological shellfish quantifications were informed by Claassen (1998).

Radiometric Assays

All archaeological shell samples were photographed, weighed and packaged by the author and under the supervision of Dr. Schneider. Bowman (1990) was reviewed as a general synthesis for the benefits, limitations, and problems with using radiocarbon dating to interpret archaeological data. ^{14}C measurements were taken from units "E5" from 30–40 and 40–50-centimeter depths; and from "E3" from depths 30–40, 40–50, and 60–70 centimeters. The samples were measured by DirectAMS with a NEC Pelletron 500 kV Accelerator Mass Spectrometer with chemically treated carbonate samples weighing more than 40 milligrams. Uncalibrated radiocarbon ages were adjusted using the three closest known marine carbon reservoir rates conducted by Robinson and Thompson (1981) and Ingram and Southon (1996) which were then calibrated using calib.org/marine calibration software using "MARINE13" curve selection for marine shell and "IntCal13" for terrestrial bone and carbonized botanical remains. Recently, Panich et al., (2018b) published radiocarbon corrections for Tomales Bay, but these data have not been integrated in this article yet.

FINDINGS AND DISCUSSION

Ethnographic Review

Several shellfish species are still gathered and managed by Native Americans today (Lepofsky et al. 2015; Lightfoot and Parrish 2009). Gathering was done all year and at low tide by both men and women with conical burden baskets (Collier and Thalman 1996). A "special stick" was used to both as a subsurface probe and digging bar for *Tresus nuttallii* clams. Clams were roasted, boiled, or eaten fresh. Shellfish was often sun dried and stored for winter. Dried shellfish meat was rehydrated with water and recooked before being eaten (Collier and Thalman 1996). According to Kelly (1978), only Gaper clams were privately owned, while abalone, mussel and Washington clam beds were commonly accessed. She further notes that clam beds were "never sold" but temporary rights were given to other individuals. Clam bed ownership was signaled by placing two large sticks roughly 100 meters apart (Lightfoot and Parrish 2009).

The thick shells of Washington clams (*Saxidomus nuttalli)* were highly valued as clam bead money. Clam beads were made by grinding, chipping, and drilling shell bead blanks: a labor-intensive process that produced the disk beads that ultimately fueled a robust regional currency used to buy magnesite, obsidian, deer meat, and geophytes from inland groups (Collier and Thalman 1996; Lightfoot and Parrish 2009). For Coast Miwok tribelets, clam beads were used to purchase ceremonial instruction, compensate dancers, and even resolve conflict. Although shellfish resources provided plant-based hunter-gatherer economies with a seasonally reliable protein staple (Erlandson 1988), clams transcended dietary importance: it facilitated important social obligations; it was a material that influenced inter-and intraregional interaction; it was linked to social status, power and politics; it was a resource that was highly valued.

Limitations to testing hypotheses with ethnographic texts are addressed in Moss (1993). Isabel Kelly, one of the first anthropologists to conduct fieldwork with the Coast Miwok in the early nineteenth century was a student of Kroeberian "salvage ethnography." It very well may be the case that "observing" intertidal management strategies were overlooked in regard to the intellectual interests of the time and focused on other aspect of data collecting. However, a handful of recent studies in the Pacific Northwest has shown that selective harvesting, ownership, tool gauge size, transplanting, habitat construction and harvest timing were all ethnographically observed techniques during ancient and historical times (Cannon and Burchell, 2008; Lepofsky et al., 2015; Lepofsky and Caldwell, 2013). Furthermore, Langdon (2006:36–39) demonstrates that in the Pacific Northwest, intertidal resource management devices were constructed with many materials ranging from stone, wood, and fiber nets situated along strategic points along in intertidal maximum zone. It may be the case that here in Tomales Bay, depositional and ecological conditions have rendered the toolkits of tideland managers difficult or impossible to recognize in the archaeological record. Although the ethnographic evidence available for Coast Miwok shellfishing strategies is very limited in answering the research questions posited in this study, using the strong corpus of ancient maricutural studies in the Pacific Northwest can provide a viable framework for future fieldwork and research designs for studying how, and if aquaculture traditions are plausible for coastal California as well.

Arguably, one of the most compelling lines of evidence pertaining to incipient aquaculture on Tomales Bay shorelines comes from Baker (1992) and Avery (2009). It is important to note here that Avery (2009:26,54) charges that Coast Miwok continued to access tideland resources in Tomales Bay to participate in a new emerging regional economy while also selecting traditional trade and foodstuffs even after the 1848 Treaty of Guadalupe Hidalgo. Interestingly, the intertidal and estuarine zones that Coast Miwok were highly acclimated to remained outside the purview of the wholesale land grabbing that initiated the American period in California. According to Baker (1992) and almost a century later, Tomales Bay's "clam gardens" were the focus of the state's earliest attempts at "conservation" in the 1930s by severely limiting the catch limit that a family can harvest per day in hopes to keep habitats "pristine." Baker (1992) points out that this may have only compounded increasing pressure for Coast Miwok families to seek livelihood elsewhere, by stifling the persistent culling of worthwhile clams and subsequent eviction during wartime (Avery 2009).

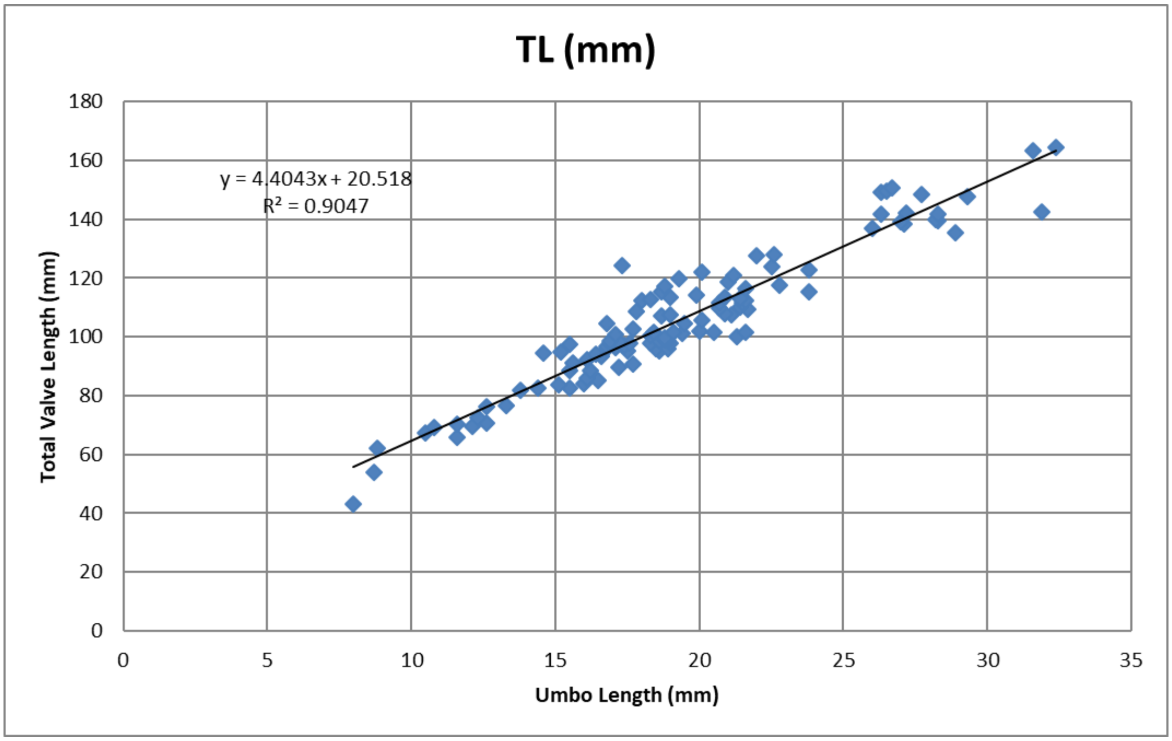
Although further research is warranted, linking the removal of indigenous land-use practices along the shorelines of Tomales Bay to the extirpation of native clam varieties in the very same sands is not hard to envision. Baker's (1992) central position is a combination of heavy prohibitions on clam harvesting, and the removal of indigenous people and their clam tending practices as the culprit to the proposed destabilization of native bivalve biodiversity of Tomales Bay:

> By limiting the number of clams that could be harvested, they (the State) sought to conserve the clambeds of areas like Tomales Bay in Marin County. Fifty years later, Tomales Bay has yet to recover from the good intentions. Of the three clam varieties that crowded its beaches in 1935, two were extinct by 1945 (including the prized but tough horseneck) and the third was barely hanging on…Yet such limitations clearly did not work at Tomales Bay, just as the Coast Miwok people who managed the bay's 23 fertile beds for thousands of years predicted…It was the act of harvesting, they insisted, that was keeping the clambeds healthy…When they (Coast Miwok) stopped digging the way they used to, there was really a good bit of loss because the young clams had no room to grow [Baker 1992:28–29].

Although ecological implications are not thoroughly discussed by Baker (1992), Avery (2009) creates a historical ecology picture that shows Tomales Bay as a dramatically altered tidescape by dairy runoff, siltation and effluent as direct and measurable effects that deteriorated the health of shellfish beds in Tomales Bay.

Morphometric Studies

Figure 4 and Table 1 show the results of the regression analysis to estimate the relationship between clam umbo and total valve length, based on recently collected modern Gaper clamshells. The



This analysis demonstrates a statistical significance between the relation of clam shell umbo and total shell size.

Figure 4. Using Excel Data Analysis Tool, a Basic Bivariate Regression was Built Using Two Modern Shell Data Groups: Umbo Length and Valve Length.

Table 1. Values from the Bivariate Regression Analysis of Modern Gaper Clam.

Regression Statistics	
Correlation Co-Efficient	0.95115
R Square	0.90469
P Value	<0.05
Standard Error	7.17005
Observations	110

Please note an arguably strong Correlation Co-Efficient value for this experimental approach based on obtaining allometric growth relationship between clamshell umbo and total shell size. See Table 2 for results of experimental regression formula applied to sampled archaeological umbones from MRN-202.

Table 2. Results of Experimental Regression Formula Applied to Estimate the Total and Complete Size of Shell Valves from Fragmented Archaeological Clamshell Material.

Groups	Count	Average	Variance
Umbo	27	23.16284	159.7443
Valve	27	122.504	3,096.868

experimental results were applied to archaeological remains suitable for the morphometric criteria outlined in the "Methods and Materials" section of this paper.

The following equation was produced from experimental regression on modern clamshell umbo and total shell length (see Figure 4 and Table 1) and applied to archaeological umbo samples from MRN-202 (see Table 2):

$$y = 4.4043x + 20.518$$

Ecological literature on Pacific Gaper clam from Tomales Bay suggest that juveniles grow up to 30 millimeters while adults can range between 60 and 130 millimeters (Pholo 1964). Based on the findings shown in Table 2, the estimated mean size of harvested clamshell remains at MRN-202 is 122.5 millimeters. In summation, the results of the sampled materials suggest a general lack of juvenile clams in the archaeological record at MRN-202, which coincides with the ethnographic findings of selective harvesting practices of choosing largest, adult individuals to promote more nutrient flow and space for juvenile clams to prosper. The future steps not addressed in this paper will study thin sections of viable clamshell to count growth rings (sclerochronology) to quantify the non-linear relationship between total size and age of a clam.

As hinted above, morphometric analysis can be limited due to complex variability in metastable growth environments in estuarine bays. Some of the earliest attempts at archaeological shell size estimation was based on external growth band features (Cerreto 1988), but these studies have been criticized on the for biological inconsistencies in external "annual growth band" counting. Temperature, salinity, oceanography, climate, predation, and water quality play important factors for determining growth rates and can obfuscate size-age based approaches (Singh and McKechnie 2015). The next step to correct these issues is develop a historical ecological framework through the use of stable isotopic ratios, sediment core samples to examine clam substrates, and robust biological survey data on clam densities and age dynamics. This rigorous paleoecological methods can help strengthen interpretations of "clam gardening" and model future hypotheses testing that span longer time periods "across a spectrum of climatic conditions and ecological settings" (Singh and McKechnie 2015:180).

Radiocarbon Studies

The following results represent 4 AMS determinations for carbonate marine shells, 4 terrestrial mammal bones, and 1 charcoal sample(s) measured from Toms Point (MRN-202; Table 3). All results have been corrected for isotopic fractionation (performed by DirectAMS) and calibrated with local ΔR rates near Tomales Bay, California. Calendric ages and ranges are rounded to the nearest year:

The radiocarbon analysis conducted here uses archaeological clamshell, mammalian bone, and carbonized plant remains to provide temporal context to the analyzed datasets. These dates for the shell were initially designed to recognize changes in clamshell size through time, which in turn can operate as a technical proxy for clam bed management. Uncalibrated radio-carbon ages were adjusted using an average of three localized carbon reservoir correction (Delta-R) rates for Bolinas Bay (Robinson and Thompson 1981) and Stinson Beach (Ingram and Southon 1996), California found in a global Marine Reservoir Correction Database. Although Bowman (1990) warns of the localized variability of carbon reservoir effect, Bolinas Bay and Stinson Beach were the closest known rates to use for radiocarbon dating carbonate samples from Tomales Bay at the time of this study. Recently, Panich et al. (2018b) published radiocarbon corrections for Tomales Bay but are not integrated in this study yet.

CONCLUSION

The central assertion of this study is that Coast Miwok intertidal management practices can be recognizable in colonial period coastal archaeological sites through an integrative historical ecology approach. The data at large supports the idea of TEK selective harvesting of Gaper clams by Coast Miwok at Toms Point. Clam gardening practices are plausible when compared to the TEK and mechanics of geophytpe bulb tending. After discovering that umbo length provided the most statistically reliable estimator for total shell size, Gaper clam (*Tresus nuttallii*) umbones reflect an overall lack of juvenile

Table 3. AMS Radiocarbon Dates from CA-MRN-202, Units E3 and E5.

SAMPLE ID	MATERIAL	UNIT	DEPTH BELOW DATUM (CM)	^{14}C AGE (BP)	2Σ (95.4%) CAL AGE RANGES[2]
#202-05	Bone[3]	E5	30–40	171 ± 25	cal AD 1767 (cal BP 183)[4]
#202-04	Charcoal[3]	E5	40	121 ± 24	cal AD 1834 (cal BP 116)[4]
#202-06	Shell[1]	E5	40–50	902 ± 20	cal AD 1532–1808 (cal BP 142–418)
#202-10	Bone[3]	E3	30–40	73 ± 32	cal AD 1847 (cal BP 103)[4]
#202-07	Shell[1]	E3	30–40	814 ± 19	cal AD 1661–1902 (cal BP 0–22, 48–289)
#202-08	Shell[1]	E3	40–50	968 ± 20	cal AD 1491–1685 (cal BP 265–459)
#202-11	Bone[3]	E3	40–50	156 ± 57	cal AD 1793 (cal BP 157)[4]
#202-09	Shell[1]	E3	50–60	780 ± 18	cal AD 1692–1910 (cal BP 40–258)
#202-12	Bone[3]	E3	60–70	109 ± 25	cal AD 1837 (cal BP 113)[4]

[1] ΔR value of 259 ± 48 applied to age ranges to correct for carbon reservoir effect.

[2] 14CHRONO Marine Reservoir Database, Calib 7.10. http://calib.org/marine. Accessed May 22, 2017.

[3] Schneider (2018).

[4] Indicates mean probabilities due to multiple age ranges in calib.org software.

clams in the archaeological units sampled from MRN-202. Although devoid of specific Coast Miwok maricultural techniques, the reviewed ethnographic data identifies important social mechanisms such as private ownership, tending, and trade that lends support to envision intentional management practices that increased shellfish biodiversity and productivity as part of a larger ethnomalacological system of knowledge. The radiocarbon data show that clams were indeed being harvested throughout the colonial period at Toms Point. Altogether, the datasets support the general idea that Coast Miwok at Toms Point administrated a degree of intertidal resource management—that is, intentional enhancements through selective harvesting—by picking adult clams while leaving juveniles to breed and grow for future sustainability. More importantly, these results should activate Californianists to investigate historic-period “hinterland” sites of refuge and resistance to assess the persistence of TEK methods of land management with terrestrial, marine, and amphibious contexts in mind.

Saxidomus or *Tresus* clam beds may have been subjected to parallel harvesting regimes seen in geophyte crop beds. A variety of underground edible and useful bulbs, corms, taproots, tubers and rhizomes supplied Coast Miwok and many other Californian Indigenous groups with excellent nutritional value, a storable crop, a fallback resource, raw material for basketry, poisons and even as a commodity for regional trade (Anderson 2005). Moreover, geophyte “digging” is noted to be equivalent to “tilling”, which is done in effort to aerate soils and is a hallmark horticultural activity that, as Anderson (2005) charges, exerts influence on the population dynamics and productivity of subterranean food crops. Geophyte tending was also noted in accordance with conservation strategies, leaving the small bulblets behind while only harvesting the largest bulbs. Lepofsky et al. (2015:241–242) follows similar lines of inquiry that shows ancient maricultural techniques of clam gardening were incumbent upon constant “digging” or tilling, which makes substrates softer, easier to dig, and desirable for young and active clams. In addition, the selective harvesting of adult clams, maintaining litter-free beds, and the addition of “shell hash,” or pulverized barnacle shell that functioned as a substrate for clam larvae, all were part of a broader umbrella of intertidal resource management (Lepofsky et al., 2015:243, 245).

Broader Impacts

It is important to align archaeological research with the interest of the cultural affiliates in question: The Federated Indians of Graton Rancheria (FIGR), the federally recognized and sovereign tribe of Coast Miwok and Southern Pomo-speaking peoples whose ancestral lands include all of present-day Marin and southern Sonoma counties. To this end, my research and analysis could provide useful eco-archaeological information to help FIGR Citizens relearn indigenous shellfishing knowledge, revive intertidal management, and apply these practices to help encourage sense of place among youth and combat modern ecological and health issues. Many scholars (Atalay 2006; Nicholas 2006; Spector 1993) have already noted that western-oriented archaeological scientific frameworks can unfairly position native cultural sites and materials as objective "data" with little relevance for tribal descendants. As demonstrated elsewhere by community-oriented research by Lepofsky and Caldwell (2013), intertidal zones can be especially fruitful spaces to reconnect Native communities to natural and cultural resources. In a similar way, researching archaeological shellfish remains and shellfishing practices at Tomales Bay may better connect FIGR Citizens to local plant and animal communities, which have offered dietary and economic value to Coast Miwok people since time immemorial.

This work can also offer timely information to present-day landowners and fishery managers (Sign and McKechnie 2015:181). For example, Tomales Bay was historically an economically important body of water at one point supplying up to 30% of the state's commercial demand for multi-million-dollar oyster industry (Avery 2009:80–83). However, continued changes to the shoreline, water chemistry, the introduction of exotic predators, and what Avery (2009:18) and Baker (1992:28–29) have described as the wholesale removal of Coast Miwok resource use regimes, may have resulted in significant changes in the composition and abundance of native resources. Furthermore, the National Oceanic and Atmospheric Association (NOAA 2015) specifically identified the use and study of shellfish to address biological productivity and mitigate sea-level rise in sensitive areas. By rejuvenating Tomales Bay shellfisheries and arming FIGR Citizens, managers, and landowners with Traditional Ecological Knowledge (TEK) to help address health, economic, and environmental problems (Brown 2006:40,50–51,68), we may begin to arrest and possibly reverse the degradation to Tomales Bay and shoreline habitat.

Next Steps and Final Thoughts

Applying the framework established by this study to other sites on Toms Point (e.g., MRN-201 and MRN-363) can generate interesting research questions related to the sustained long-term landscape and shoreline use of Toms Point, the distribution and abundances of shellfish species, and a fine-grained historical ecology analysis of long-term landscape changes into the colonial period, Avery (2009:18) has indicated an "unclear" period of time regarding exactly how landscapes changed and what that change actually looked like in Tomales Bay. Moreover, Allen (2010) argues that although dramatic environmental change would have taken place in mission-period landscapes, each *mission* itself must be looked at as a unique context of local ecological and social process. How does landscape change in mission lands match up to hinterlands?

Working with more recent radiocarbon samples yielded inconsistencies between AMS determinations from shell versus charcoal/bone from similar depths. This might be the result of applying a ΔR value derived from shell specimens collected from the Pacific Coast and not using a ΔR value specific to Tomales Bay, which does not exist yet. However, other evidentiary lines unique to Toms Point such as ceramic types, glass artifacts, livestock remains, and associated artifacts tethered to the *Oxford* shipwreck of 1852 lend support to the view that MRN-202 was occupied during the mid to late-1800s. Minimally, the AMS data support the argument that clams were harvested and consumed by the occupants of Toms Point, possibly even by Native people simultaneously engaged in a new regional economy while drawing on TEK of coastal resources.

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