# What Do All These Bones Really Mean?: Zooarchaeological Method at the Presidio of San Francisco

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*Faunal remains on historic sites do not always represent diet alone, and it is important that we consider the possibilities of non-food uses of animals. Much of this information can be gleamed from the documentary record, as well as the bones themselves. Even if archaeological fauna point towards the remains of a meal, we can do more than offer laundry lists of species and instead focus on what is called culinary processing to better understand the processes and peoples involved. Preliminary faunal analysis from excavations at the Presidio of San Francisco will be discussed.*

In 1776 approximately 200 people arrived from Mexico at the spot that would become El Presidio de San Francisco (Langelier and Rosen 1992). El Presidio consisted of a multiethnic, gendered, and socially stratified society (Voss 2002). *Criollos* (Spaniards born in New Spain), *mestizos*, *mulattos*, Mesoamerican *indios*, and Native Californians made up the population, with multi-ethnic peoples composing the majority (Langelier and Rosen 1992; Voss 2002). The majority of this diverse population were not military soldiers or officers—they were families, struggling to create a new life for themselves in California. Thus while established as a military fort, in reality, El Presidio resembled more a military village.

The archaeology at El Presidio is very rich. In this paper, I will discuss some preliminary results of zooarchaeological analysis from excavations undertaken in 1999 and 2000 by Barbara Voss and Amy Ramsay through UC-Berkeley. The faunal collection represents over 100,000 fragments of bone, and only a small percentage has been analyzed to this day. While the observations presented in this paper address an historic midden that dates between 1776 and 1815, my purpose is to offer some suggestions for how continued and future zooarchaeological analysis should take place on historic sites in general. Approximately 7,000 fragments of bone from the midden have been analyzed thus far; this comprises 27 percent of the total bone recovered from the feature.

## Is It Really Food?

I must first stress that archaeological animal bones do not always represent the remains of a meal. Often, man's relationship to animals is more complex than the food chain, and such was the case for El Presidio. Bone accounts for 54 percent by weight and 59 percent by count of the total artifacts in the midden, and all skeletal elements are fairly equally represented. Historically, we know that residents at El Presidio participated in the hide and tallow trade both at the *rancho del rey* (later, *de la nación*) and likely at the fort itself (Langelier and Rosen 1992). This business in "leather dollars" drove economic ventures in early California (Davis 1967 [1889]). Sherri Gust (1982) suggests a *matanza* site (mass cattle slaughter site for acquiring hides and tallow) would be represented by whole or partially articulated carcasses in an area away from the main settlement and with few other artifacts. Although not far, this midden was separate from the settlement, and it is clear that whole carcasses of animals dominated deposition. Food may have been a secondary consideration, if at all, as accounts of the *matanza* season reveal they commonly selected only the choicest meats for consumption, leaving the rest to waste (Davis 1967 [1889]). Assuming that this midden represents only food remains too readily ignores the fact that the fort was involved in other activities such as hide procurement.

Other non-food uses of animals can explain assemblage formations. A large percentage of the faunal remains in the midden is heavily fragmented and carbonized or calcined. This might reflect secondary use of animal bones for processing lime. Given the shortage of timber throughout the Spanish-colonial period (Langelier and Rosen 1992), it is also possible that burning of bones served as a means of fuel.

It is also possible that faunal assemblages represent the unconsumed remains of a feast. While this may seem wasteful, the documentary record does tell of such times of surplus that soldiers were ordered to kill thousands of cattle for lack of grazing space. Accounts

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also indicate that soldiers held bull and bear fights for entertainment (Langelier and Rosen 1992); in fact, in addition to the numerous bulls, I have also identified a fragment of a bear's claw in the midden deposit. All of these possibilities require that we balance the various lines of evidence. As Diane Gifford-Gonzalez (1991) warns: bones are not enough! Animals that were processed for reasons other than food may look very different archaeologically, and it's important that we distinguish between these uses.

## DIET VERSUS FOODWAYS

Let's assume the midden deposit is food remains; when it comes to interpretation, the minimum a zooarchaeologist can do is produce a "laundry list" of species and provide numbers to fit acronyms like NISP and MNI. But what are these data really telling us? This kind of analysis in zooarchaeology only views the final product and not the processes through which bones undergo to become food, as Gifford-Gonzalez (2004) terms *culinary processing*.

Culinary processing involves those decisions, actions, and actors that take raw meat and convert it into consumable forms. It is more than just dividing up a carcass, preparing, and cooking it; culinary processing is also inherently social for it involves different actors and tasks and requires the social division of food obtained by others (Gifford-Gonzalez 1993, 2004). Most zooarchaeological work has focused on recovery, analysis, and taphonomy of *uncooked* bones. But if we think about process, then we can ask questions about each of the stages of foodways: acquisition, preparation, consumption, and disposal. We as archaeologists want to learn about *behavior* in the past; **food** is static, but **foodways** is dynamic—it is *behavior in action*. Why should we stop our analyses at diet?

If zooarchaeologists continue to stop analysis at acquisition and preliminary butchering and/or preparation, we are not seeing the whole picture of foodways in its varied social contexts. Moreover, researchers may be ignoring or misinterpreting taphonomic traces left on bones from culinary processing, such as fragmentation caused by burning. A focus on each of the stages of foodways also allows us to see different actors interacting and affecting faunal assemblage patterns. We move from focusing on the hunters/procurers solely, and consider the processors, the cooks, the persons in charge of carcass distribution and disposal—a whole array of social actors and behaviors. These different actors invest a great deal of time and labor in these subsequent stages *after* acquisition of a carcass, and their role in foodways is just as important.

Culinary processing can be categorized into four main activities (which are performed by a variety of different peoples) which indicate: (1) the ways in which food is cooked or processed for consumption, (2) how food is served and consumed, (3) the ways in which food is preserved, and (4) how food remains are disposed. It is important that zooarchaeologists focus on all of these actions, as even the ways in which food is disposed of can greatly affect archaeological assemblages. All four of these actions reflect an *end product goal*. In each of these four categories, I will outline the techniques and technologies available at different times for achieving them, potential bone modifications observed in the archaeological record for each stage, additional contextual evidence of activities, and the effects these actions have on bones, specifically in regards to nutrition, taste/attractiveness to human and nonhuman consumers, and social relations.

## COOKING AND PROCESSING

From the discovery of how to control fire to modern gas and electric stoves, humans have learned to manipulate the physical and chemical properties of foods with heat using a variety of methods. In addition to improving taste, the alteration of temperature, moisture, and pH levels in foods aids in digestion, reduces the risk of illness, and increases the storage life (Wandsnider 1997). Cooking techniques over time have involved either moist heat or dry heat methods like roasting, pit roasting, boiling, and smoking (Gifford-Gonzalez 2004; Wandsnider 1997). Yet the use of heat is not the only way to "cook" foods. Mincing, pulverizing, and pounding of muscle tissue in foods as well as slicing and cutting of tissues can make food more digestible, even without fire (Gifford-Gonzalez 2004).

How can we observe cooking and preparation at El Presidio? Bone modifications of different cooking techniques are usually indicated by different stages of burning and discolorations thereof. When attempting to distinguish human-induced burning from natural burning, one must assess the locations of burning and whether or not those areas make culinary sense. In addition, analysis of the structural composition of bone reveals that heating does in fact alter collagen and affect breakage and thus bones can be examined structurally for evidence of cooking. In fact, most normal cooking temperatures do not cause bone to become carbonized or calcined, except on the ends of bone that may have

become exposed as meat tissue shrank. Low intensity heat, however, may turn bones a slight brown and produce a shiny texture or flaking on the surface (Gifford-Gonzalez 1993, 2004).

Boiled bones may show signs of pot-polishing from hitting interior surfaces of containers (White 1992); they are also more likely to decompose faster. Bones processed for marrow and bone grease are recognizable based on element representation, fragmentation, and impact marks (Binford 1981; Gifford-Gonzalez 2004). Butchering was likely done in accordance with cooking goals—how meat was to be cooked, how big the pots were (i.e. pot-sizing of bones (White 1992)), and who was going to get what portions. While these may not be marks of cooking per se, they are marks of culinary processing because the decisions likely reflect the end product goal.

Other contextual evidence allows us to interpret faunal assemblages for particular cooking methods. Since the choice of how to cook certain foods was dictated by energy sources, containers, goals of consumption or storage, and the number of people, we can look to material culture, demographic information, and the environment for other lines of evidence (Wandsnider 1997). In the historic period, textual and pictoral information may also aid in understanding and identifying different cooking techniques. It is also important to consider the different food locales in which faunal remains are recovered—residential site, acquisition site, and snack site—in interpreting the cooking methods used because some of these sites may be limited in the amount/type of processing that could be accomplished there (Gifford-Gonzalez 2004; Lupo 1995).

Cooking food alters its composition and increases the level of nutrition available for consumption (Gifford-Gonzalez 2004; Wandsnider 1997). In fact, certain cooking methods allow for more nutritional exploitation than other methods in some foods (Wandsnider 1997). Obviously, cooking food increases its desirability for human consumers in terms of taste, and moist, fat-rich foods attract nonhuman consumers, who are drawn in by the strong smells of cooking food. Cooking food also becomes important in social relations, as the choicest meats may be reserved for certain members of society. Moreover, the cooking of food is often labor-intensive, requiring coordination of multiple tasks among multiple actors. This "handling time" must produce benefits that outweigh the costs, and those managing cooking must have a keen awareness of how social relations will accomplish the goals of cooking and processing (Gifford-Gonzalez 1993, 2004; Wandsnider 1997).

Over time, very few of the soldiers and officers were regularly stationed at El Presidio, but their families still resided there. Moreover, we know the fort used native prisoners for labor, and at times this involved tending to livestock (Langelier and Rosen 1992). It is quite probable that natives and families of the enlisted all participated in cooking, and it is very likely they were also involved in slaughtering, carcass division, distribution of meals, and disposal. By thinking about culinary processing, we see new faces in the archaeological record, particularly native Californians, and women, children, and the elderly.

## Serving and Consumption

Culinary processing should not be thought of as just cooking and preparing food. Since much of how food is cooked is based on pre-set goals about its end consumption, it is important to consider how food is served and consumed in societies and how actual consumption in turn can be read in the archaeological record. For example, meat can be cut into individual portions, household portions, or processed for communal stews. While food may or may not be cooked in containers of some sort, it might not be served and consumed from that same container. Depending on the culture's technology and available material culture, food may be consumed on plates, boards, leaves, in bowls, or with the hands. The more complex the society, the more complex serving and consumption wares become. All of these options will affect how foods are processed before and after cooking.

Bone modifications that reflect serving and consumption of food would point towards the sizes of portions that yield a relative amount of meat and how many people that might feed. Fragmentation sizes point to container size for cooking, as well as container size for consumption. For feasting among communal groups, some research has identified patterns of low-processed, largely intact (almost wasteful) assemblages (see Nerissa Russell's work at Catalhoyuk, Turkey). Ethnographic research demonstrates that some fatty meats meant to serve large numbers of people are often pit-processed (Wandsnider 1997). Ideally, we might someday be able to identify tooth marks made by humans on bones as well, and even possibly different individuals!

At El Presidio, inhabitants likely consumed meals using tortillas as a form of plate/scoop and small bowls to hold liquids (Langelier and Rosen 1992; Voss 2002). This kind of eating would require stripping bone of its meat before cooking. An analysis of serving and consumption material culture would indicate possible

requirements for food preparation consumption. What kinds of containers are available—stone pots, rocks, baskets, ceramics, metal—and how would food be eaten (utensils, by hand)? How does the shape, size, and quality of these things affect how food can be served and consumed?

Additional contextual data of food serving and consumption can reveal more information about how to recognize these activities. The ease of distributing food among members of society may also affect how it is processed after acquisition; for example, a number of cooking locales may be created to divide up the carcass as opposed to one main locale, thus making both cooking and serving easier in such smaller groups. Multiple mini-locales versus one main locale could be demonstrated archaeologically.

The distinction made here between the effects of cooking and the effects of consumption on bones is intentionally blurred. The two overlap in many ways, but it is important not to move from cooking directly to preservation and disposal without first addressing the stage in the middle—how food is eaten. In terms of nutrition and attractiveness, the choices made about serving and consumption are largely dependent on cooking employed. But it is apparent that higher-valued cuts will be served to particular individuals or locales in some societies, and in others, there is a more balanced distribution (Gifford-Gonzalez 2004). Serving and consumption is often dictated by social relations.

## PRESERVATION AND STORAGE

Preservation and storage are additional activities associated with culinary processing. While food that is immediately processed is often intended for immediate consumption, much food is processed for later consumption, typically for reasons of seasonal supply (Bowen 1988; Gifford-Gonzalez 2004). Food can be preserved with a variety of methods: drying and smoking to promote dehydration, fermentation and coagulation, burning (e.g. nuts), freezing in ice, salting, and pickling. Generally, the goal of preservation is to retard decomposition and spoilage so food will last until needed (Binford 1978; Bowen 1988; Gifford-Gonzalez 2004). Archaeological caches have often been recovered. Historic assemblages also demonstrate preservation technology, such as the Hoff Store site in Gold Rush era California, in which excavators unearthed a number of packed pork barrels, contents intact (Pastron and Hattori 1988).

There are a number of possible bone modifications that could point to preservation. Historic accounts of the *matanza* indicate the choicest parts were preserved by drying (Davis 1967 [1889]). Bones associated with these parts might exhibit more numerous cutmarks from being heavily stripped of meat for preserving. This too would explain some larger size proportions in the Presidio assemblages; if meat was removed before cooking, then there was no need to break the carcass segments into smaller consumable units. Of course, these could also be typical processing effects for non-preserved food. For preservation, bones that do remain attached to the meat are likely to be small fragments, as dehydration over a smaller surface area is more efficient. Bone that was intentionally smoked for preservation may show signs of burning (probably light since it is dry heat), especially on the exposed ends of bone (Gifford-Gonzalez 2004).

Context is key to identifying preservation in the archaeological record. Often, storage caches would be buried under something, such as rock piles, ice, or soil to prevent nonhuman carnivores from stealing them, such as Lewis Binford observed among the Nunamiut (Binford 1978). In addition, we must consider the whole range of fauna recovered and balance the seasonality of what we find. In other words, are fauna recovered in the same contexts but from different seasons, indicating some animals were stored and consumed at a later time? In eighteenth century Connecticut, Joanne Bowen discovered the presence of pork with other spring animals, but pork was fresh in the fall. In conjunction with documentary support, she concluded that pork preservation was a critical activity for this community for those months when fresh meat was low (Bowen 1988). Archaeologists can also look for different types of storage containers that would allow for long-term storage of animal products through seasons.

As others have noted, it is important to consider the physical and chemical properties of specific meats (meat science) and how certain meats would be more conducive and attractive if preserved by certain methods (Bowen 1988; Wandsnider 1997). In turn, these different methods will affect the amount of nutrients available. As Gifford-Gonzalez notes, carnivores are less interested in non-fresh meat, and thus preservation techniques can help to ward off scavengers (Gifford-Gonzalez 2004). Indeed, there are accounts at El Presidio of jackals (i.e. probably coyotes) and vultures loitering about the main quadrangle in search of discarded food remains (Langelier and Rosen 1992). Interestingly though, no gnawing marks have been observed so far, indicating this deposit was likely undisturbed by these predators, perhaps because most meat had already been removed for preservation.

## Disposal

The last phase of culinary processing involves disposal of food remains. At first glance, disposal of food might not seem all that important, but there are different ways in which some cultures deal with trash and that in turn can affect archaeological patterning. Throughout time, humans have disposed of food remains in a number of ways: simply tossing on open ground; deposition and/or burial in individual, family, or communal pits; dumping in structures (for example, abandoned buildings, privies); and incinerating food remains. Some cultures have very different conceptions of cleanliness and order and this can be reflected in the spatial distribution of household debris; in nineteenth century Fort Ross, California, different ethnic groups disposed of their household debris in different locations—some inside the home, some outside the home—based on different cultural ideas about cleanliness (Lightfoot, Martinez, and Schiff 1998). Karen Lupo notes that the Hadza routinely burn food debris remains (Lupo 1991).

In terms of bone modification caused by disposal of food remains, first and foremost we could see post-cooking/consumption breakage of bones as they are disposed (perhaps from tossing, hitting against substrate or other bones). In cases of large middens, bones at the bottom may be more heavily fragmented from sheer weight of materials on top, and thus less identifiable. Pseudo cutmarks are also possible in such contexts, and it is important that we consider the nature of a trash deposit before interpreting cutmarks. Also, bones disposed of by burning tend to be heavily carbonized and calcined, as in the case of the Hadza (Lupo 1991). The more intensive the heat, the more unlikely identifiable bones will survive. Moreover, depending on whether or not trash deposits (pits or otherwise) were left in the open for any period of time, the bones could be subjected to carnivore damage, domestic dog gnawing, and/or rodents.

As for the attractiveness of other consumers to faunal trash, that seems a given. Any deposit left in the open or exposed, even overnight, is likely subject to some form of carnivore intrusion, unless heavily burnt and thus no longer as desirable (Lupo 1991). Countless archaeologists have encountered rodent intrusions while excavating; these little critters easily find buried trash locales. In terms of social relations, disposal of food remains in community middens may be the result of multi-task/multi-scale operations, such as feasts or manufacturing sites. All of these issues are important in the study of culinary processing.

Much of the midden deposit at El Presidio is heavily fragmented. Yet the fragment edges do not indicate modern or post-depositional fracture. Instead, they indicate breakage during butchery processing or at the time of deposition. This complicates matters because it is unclear if the fragmentation is due to the compression of bones in the deposit or to some other activity, such as glue processing. The bones do, however, exhibit varying stages of weathering. The lack of carnivore and rodent damage suggests that the deposit was sealed relatively quickly after deposition, but that the effects of other pre-deposition activities as well as the soil content may have affected the rate of decomposition.

A series of questions could be posed about the nature of contextual evidence of food disposal. What is environment like? Do people need to dispose of their food in certain ways because of carnivores, weather, or environment? What is technology of trash disposal like? We should pay attention to spatial distribution—are foods disposed of near to where consumed? Are trash deposits intended to feed roaming animals (i.e. domestic dogs, in Crabtree 1990)? What does the deposit itself look like—small accumulation of events or single event dumping? How will each of these pieces of evidence affect our interpretations of patterns?

## Conclusion

The real question is: why aren't we thinking about food in terms of culinary processing? We should consider that end product goals might structure *all* stages of processing. To return to the beginning of this essay, Gifford-Gonzalez (2004) posits a number of thoughtful reasons as to why culinary processing has been so understudied. For one, much of early zooarchaeology focused on hominids without the use of fire, and thus cooking with heat was obviously not considered as an interesting taphonomic issue. Yet, as she points out, a great deal of zooarchaeology has been accomplished with fire-using peoples…but still with no discussion of culinary processing. In addition, a number of studies focused on mass-kill sites and approached some of the aspects of culinary processing, but only what took place at the kill-site (Gifford-Gonzalez 2004). There was no consideration that possible cooking goals could have structured the initial processing at the kill-site. Yet problematic with using a culinary processing approach is that it is not always observable and often creates problems of equifinality.

Faunal remains have not moved from slaughter-site to archaeological deposit instantaneously; each

bone has gone through a series of possible transitions, whether cooking, consumption, or preservation, before it is disposed. And even with disposal, bones may undergo additional taphonomic processes. If we focus only on the food itself, we are not seeing the whole picture.

An animal may be processed in a particular way for many different reasons. Some argue that butchery is cultural, for example, that Spanish colonists use axes and knives to butcher a carcass, but this is not necessarily true. We should first consider that faunal remains might not represent food remains, particularly in a time when hides and other animal products were prominent forms of currency. These non-food uses dictate how an animal is butchered and may not be cultural. Moreover, while at times El Presidio was thriving, at other times, it suffered from lack of supplies (Langelier and Rosen 1992). Much was dependent upon access and availability to goods over time and had very little to do with cultural practices. In addition, we should not assume that those in "control"—military, social, or otherwise—were also in control of how food was processed. And especially, at El Presidio, how can we assume Spanish-colonial food practices should be expected—in such an ethnically diverse population? We should not readily equate cultural groups with specific practices, because there are too many factors that affect how something is performed. It is only with multiple lines of evidence that we can observe a pattern, and even that is not foolproof, for as we all know—individuals don't always do what they are "supposed to do."

In the end, it is more interesting to talk about how people at El Presidio interacted with animals on a daily basis. How cattle went from rancho to table to midden, how the everyday activities of life continued to go on. It is not enough to merely ask, "what's for dinner?" We should begin to think about how animals are processed? For what end goals? Who performs which tasks? And why are they performed in certain ways? An approach that considers first non-food uses of animals and then the various stages of culinary processing allows us to address these kinds of questions.

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