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Why clam? Why clams? Shell Mound construction in Southern Brazil

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ABSTRACT

Bivalve shells comprise a significant portion of shell mounds, so mollusks have always been seen as fundamental to shell mound societies. The importance of these animal resources to shell mound societies in Brazil has been intrinsically connected to diet and subsistence since research began in the 19th century. For nearly 150 years, researchers have considered the faunal assemblages from shell sites as a direct reflection of their builders' meals. Alternate explanations for the presence of mollusks at the mounds were usually disregarded, but results of isotope analyses from human bones are changing the scenario. Incongruences between the assemblages and isotopic analyses compel researchers to rethink the role of the faunal remains deposited in shell sites.

1. Introduction

Mollusks are a fundamental part of shell mound archaeology, after all these sites are basically composed by bivalve, and in less number, gastropod shells. The origin of the Brazilian term for this type of site: *sambaqui*, derives from the native Tupi language word for clam, *Tamba*. The importance of these animals for hunter-gatherer-fisher societies was seen solely in dietary terms since the beginning of research in these sites during the 19th century. However, theoretical and methodological changes brought about in the last decades elicit evidence about alternative positions clams and other aquatic resources had for these societies.

The series of advances in Brazilian shell mound archaeology transformed the research field, mainly regarding site construction, settlement patterns, funerary ritual, and the diet of these societies (DeBlasis et al., 2007; Gaspar et al., 2014; Scheel-Ybert, 2013; Villagran, 2014). None of these advances could have been made without the contribution of zooarchaeology. Among the questions recently discussed, results from coastal mound builders isotopic data (Colonese et al., 2014; De Masi, 1999, 2009; Klokler, 2008, 2014; Villagran et al., 2011) bring new issues to scholars interested in studying the relationships between animals and hunter-gatherer-fisher societies.

Debate concerning the subsistence of shell mound populations was always central in Brazilian archaeological literature (Gaspar, 2000; Klokler, 2017a). Studies were largely based on faunal remains recovered from small-scale excavations, trenches and/or profile analyses, and the main distinctions among researchers results are connected to theoretical perspectives and, by extension, the methods employed in the field or at the lab. But scholars are mostly united by the normative view that archaeologists have in relation to faunal materials (Gaspar et al., 2014; Klokler, 2014, 2017b).

The dominant normative view is strongly inspired by processual perspectives that frame faunal remains as reflecting the diet of past communities (Claassen, 1991; Waselkov, 1987). However, social zooarchaeology and isotopic studies simultaneously raised and shed light about issues connected to diet and funerary rituals performed in regions of the southern coast of Brazil.

2. Mollusk gatherers, or also fishers?

For most of the history of shell mound archaeology researchers explained the accumulations of shells that characterize mounds as arising from the consumption of clams or mussels by populations of coastal shellfish collectors. Following the traditional view, studies based on faunal remains invariably treated the deposits' components as dietary remnants of the sites' builders. The major point of contention was whether the groups' diets were based on mollusks or on a mix of shellfish and fish. Authors usually consider the second as a later development of the first.

Fisher-hunter-gatherers occupation along the Brazilian coast began at least 7000 years ago, potentially earlier since older sites may be submerged. At approximately 4000 BP in Santa Catarina state (where we find the largest concentration of monumental sites and consequently the largest amount of archaeological data), site construction increases progressively. Mounds grew larger in size and number forming clusters. After this spur, the coastal landscape (or seascape) in southern Brazil

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Fig. 1. View of Espinheiros II site (note the house on the top left) (Photo by Paulo DeBlasis).

Fig. 2. West Indian pointed venus collected in Florianópolis - Santa Catarina.
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was noticeably altered with structures that were conspicuous in the mostly flat terrain (Fig. 1).

West Indian pointed venus (*Anomalocardia flexuosa*) (Fig. 2), dominate the matrix of the major part of Brazilian sites, particularly the largest mounds located on the southern shores of the country. It is in fact a very common species found in mollusk beds along most of the coastal estuaries. Along with the practicality of the selection of an easily obtainable clam, the West Indian clam is attractive to gatherers since it reproduces at a young age, can sustain changes in water salinity and temperature and undergo heavy exploitation without lowering its population numbers (Pezzuto et al., 2010; Rodrigues et al., 2010). In today's commercially driven clam and mussel fisheries, the extraction of West Indian beds in Florianópolis has not yet been able to dramatically affect the stock's density and fertility rates (Pezzuto et al., 2010).

In nutritional terms, West Indian clams are a reliable source of protein and essential minerals but provide few calories and lipids (Pedrosa and Cozzolino, 2001) so it would not be a good option as a diet staple for hunter-gatherer-fishers groups. In many traditional coastal communities, families collect West Indian clams to sell at markets (Gaspar et al., 2011). The meat sold is generally used as complement in dishes, filling for diverse pastries, and sauces (and largely added whole – with shells - to miso soups). And the remaining shell valves are used as filling in roadwork and in small backyard earthworks. The collectors also commonly use the leftover shells for paving (Gaspar et al., 2011). Such attitudes towards West Indian shell valves attest to their suitability as raw materials for construction and the continuity in the perception of valves not as leftover or refuse but as valuable supplies and resources.

The sheer quantity of shells necessary to build the structures influenced the hypothesis that shell mound groups overexploited the mollusk beds and with this explanation justified changes identified in many sites in which the last occupation or construction phases had fewer quantities of West Indian shell valves and more fish bones. Measurements of shells from three sites (including a monumental mound) indicate that the average size of valves did not decrease with time, instead it remained largely stable (Oliveira, 2015). Notably, at the site Garopaba do Sul, approximately 20 m of mound construction layers contained similar sized West Indian clam specimens.

Based primarily on the proportion of shells versus fish bones researchers defended the idea of a coastal lifeway based solely on the consumption of mollusks, later substituted by the consumption of fish. More recently, with use of conversion rates to estimate biomass of shellfish and fish resources, diversity, and equitability indexes it is clear that mollusks were never the main staple for these fisher-hunter-gatherer groups and estuarine fishes were the most sought-after foods (Figuti, 2008; Klokler, 2008). In an effort to verify the reliability of these results I present here another line of data that is a better indicator of actual individual human diet to shed light on the debate around the consumption of shellfish by the Brazilian shell mound builders.

3. Materials and methods

Analyses of stable isotopes from human collagen have been broadly used in archaeological research to infer diet in pre-colonial times. Carbon and Nitrogen isotopes are especially useful in the determination of the relative contribution of marine and terrestrial resources to the diet of prehistoric populations (Richards and Hedges, 1999; Richards et al., 2005), and also particularly helpful at establishing a distinction between the use of C_3 and C_4 plants (Tykot, 2002), and in this way detecting the possible consumption of maize. The proportion between Carbon and Nitrogen can verify the importance of distinct consumed resources based on the enrichment or decrease in isotopes (Reitz and Wing, 1999).

Carbon is the most common isotope used in diet studies. As carbon passes through the food chain the fractioning of $\delta^{13}C$ changes, facilitating the distinction between plants and animals (Reitz and Wing, 1999). Additionally, it is also possible to distinguish marine and terrestrial diets since carbon has only two sources (marine and terrestrial) and due to the CO2 intake in the ocean, maritime organisms contain more 13C (Jelsma, 2000; Richards et al. 2001:718). Therefore, δ^{13} C values close to $-12‰$ indicate diets that are not exclusively terrestrial. Additionally, the higher the trophic level of the item, the heavier the δ^{13} C in the samples, albeit the variation due to climate and other factors also can influence the δ^{13} C values (Richards and Hedges, 1999).

Protein is the only significant source of nitrogen for living organisms. The nitrogen concentration level increases along the food web from plants to herbivores and then carnivores. Due to that, the δ^{15} N levels are more influenced by the diet's trophic level, however they are