EVALUATING MOBILITY, MONUMENTALITY, AND FEASTING AT THE SAPELO ISLAND SHELL RING COMPLEX

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*Two of the most salient anthropological questions regarding southeastern shell ring sites are related to the season(s) that they were occupied and whether or not the deposits represent monumental constructions and/or feasting remains. This paper addresses these questions through the analysis of growth band of clams (*Mercenaria *spp.) (*N = *620) and stable oxygen isotope ratios of clam and oyster shells (*Crassostrea virginica*) (*N = *58) at the Sapelo Island Shell Ring complex located on the Georgia coast, USA. The season of death and the samples' position in the shell matrix at Sapelo provide important information on the rate of shell deposition and the season(s) the site was occupied. These data support the view that at least some portion of the human population at Sapelo occupied the site year-round. Additionally, while it appears that two shell rings at the site formed through the gradual deposition and accumulation of daily subsistence, other areas evidence short term, large-scale, shellfish processing and may lend credence to the view that at some point shell rings become monuments, commemorating rituals and gatherings.*

*Dos de las preguntas más importantes sobre los concheros en forma de anillo en el sureste de Estados Unidos de América se refieren a la(s) estación(es) en las cual(es) fueron ocupados y acerca de si los depósitos de conchas representan construcciones monumentales y/o restos de festines. Este articulo aborda estas preguntas a través del análisis de las bandas de crecimiento de las almejas (*Mercenaria *spp.) (*N = *620) y la relación de isótopos estables de oxigeno en las conchas de almejas y ostras (*Crassostrea virginica*) (*N = *58) en el complejo de concheros en forma de anillo de la Isla de Sapelo localizada en la costa del estado de Georgia, EEUU. La estación en que ocurrió la muerte de los especimenes individuales de conchas y su posición en la matriz del conchero en Sapelo proporciona información muy importante sobre la tasa de deposición de las conchas y la(s) estación(es) en la cual(es) el sitio fue ocupado. Estos datos indican que por lo menos una porción de la población en Sapelo ocupaba el sitio durante todo el año. Asimismo, mientras que parece que dos anillos de concha en el sitio se formaron a través de la deposición gradual y acumulación de los desechos de la subsistencia cotidiana, otras áreas evidencian actividades de festines y pueden respaldar el punto de vista de que en algún momento los anillos se volvieron monumentos para conmemorar rituales y reuniones.*

Large archaeological features (e.g., large shell deposits, tells, etc.) often present a quandary to researchers interested in the construction of the built environment. Specifically, for archaeologists interested in the issue of monumentality, it is sometimes difficult to determine whether or not dramatic site features qualify as monuments, especially if they are composed of refuse, and often debates arise as a result (e.g., Cameron 2002; Claassen 1992; Milner and Jefferies 1998; Wills 2001). What is instructive about such debates is that the overriding issue is a need to understand the various actions that resulted in these sites and their concomitant meanings to people through time. There are several examples from both Old and New world contexts that suggest the meaning and function of places and/or structures is by no mean monolithic in time and among people. For example, Bradley (1998, 2003) suggests the dominant function of some Neolithic sites in Europe shifted from a domestic to a more ritual function. Schwartz and Raymond (1996) argue for similar shifts in function for Valdivian sites in Ecuador. In another study, Siegel (1995:60–61) suggests that the mounded/middens in ring settlements in Puerto Rico served dual functions and are the product of

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multiple disposal processes. These features were at once places for the disposal of quotidian debris, but also the loci of offertory caches (Siegel 1995:60). Such behaviors are not limited to sedentary agriculturalists. As archaeologists document more and more examples of hunter-gatherer monument construction (e.g., Saunders et al. 2005), such a critical view and more nuanced perspective must be extended to groups following these economies.

In the recent archaeological literature concerning hunter-gatherers, no three issues receive greater attention than mobility, feasting behavior, and monumentality (e.g., Hayden 1995, 2000, 2001; Kelly 1998; Kidder 2002; Sassaman 2004a; Sassaman and Heckenberger 2004a, 2004b; J. Saunders 2004; Saunders et al. 2005). All three of these subjects are linked to a larger body of literature that addresses complex social and economic formations among hunter-gatherers (Arnold 1996; Crothers 2004; Gibson and Carr 2004; Price and Brown 1985; Sassaman 2004a). These issues are important to the literature on "complex" hunter-gatherers because archaeologists either view them as indicators of these groups or as mechanisms of transformation and change.

Shell-bearing sites, also known as shell middens or shell mounds, are one of the key site types where archaeologists address questions related to "complex" hunter-gatherers. Located worldwide and dating back as far as 130,000 years (see Bailey 1975; Binford 1984; Claassen 1998; Erlandson 2001; Meehan 1982; Stein 1992; Waselkov 1987), research on these sites plays a key role in the development of method and theory related to the archaeology of hunter-gatherers, as well as issues linked to social evolution as a whole.

Like other areas of the world, shell-bearing site research is a central theme in southeastern archaeology and archaeologists working in this area regularly contribute to the knowledge base on this subject (e.g., Jefferies 2008; Jones et al 2005; Keene 2004; Marquardt and Watson 2005; Milner 2004; Milner and Jefferies 1998; Quitmyer and Reitz 2006; Reitz 1988; Russo 1996; Sassaman 2004a; Sassaman et al. 2006). These sites exhibit many different forms and are found in a number of environments, from riverine locales to various coastal settings across the region.

Along the Gulf of Mexico and Atlantic coasts of the southeastern United States, many shell-bearing sites take on complex spatial layouts and are often associated with the earliest pottery in North America (i.e., Stallings/St. Simons wares [Sassaman 1993, 2004b]). Located mainly in Florida, Georgia, and South Carolina, the shell deposits at these sites form circular and semi-circular shapes (see Anderson 2002; Russo and Heide 2001) (Figure 1). Termed shell rings, these sites date primarily to the Late Archaic period (ca. 4500 to 3000 B.P.). While some Woodland period shell deposits take on a similar shape, rarely do any of these later "rings" reach the size and stratigraphic complexity of the Archaic period ones (Russo et al. 2006:67).

Shell-ring sites are variously interpreted as seasonal macroband camps, feasting locales, egalitarian sedentary villages, transegalitarian sedentary villages, monuments, as well as different combinations of these models (Anderson 2002; Cable 1997; DePratter 1979; Russo 2004; Russo and Heide 2003; Sassaman 1993; R. Saunders 2004a, 2004b; Thompson 2006, 2007; Trinkley 1980, 1985; Thompson et al. 2004; Waring 1968; Waring and Larson 1968). Intertwined with these varying interpretations are issues related to mobility, feasting, and monument construction. As such, research at these sites has the potential to provide key information related to these issues as they apply to hunter-gatherer groups.

The purpose of this paper is to provide new information on the Sapelo Shell Ring complex. In doing this, we evaluate the applicability of previous interpretations of shell rings as they relate to this site. Specifically, we present the results of our geochemical and growth band analysis on clams and oysters, new radiocarbon data, and summarize the excavation and shallow geophysical data. While we provide a variety of different data sets, we underscore the importance of the geochemical analysis as a way to address questions related to the archaeology of shell rings. We argue that these sites are best interpreted as the result of multiple processes and behaviors over time. These data support the view that at least some portion of the population at Sapelo occupied the site year-round. Additionally, while it appears that two shell rings at the site formed through the gradual deposition and accumulation of daily subsistence, other areas comparatively evidence shorter-term, larger-scale

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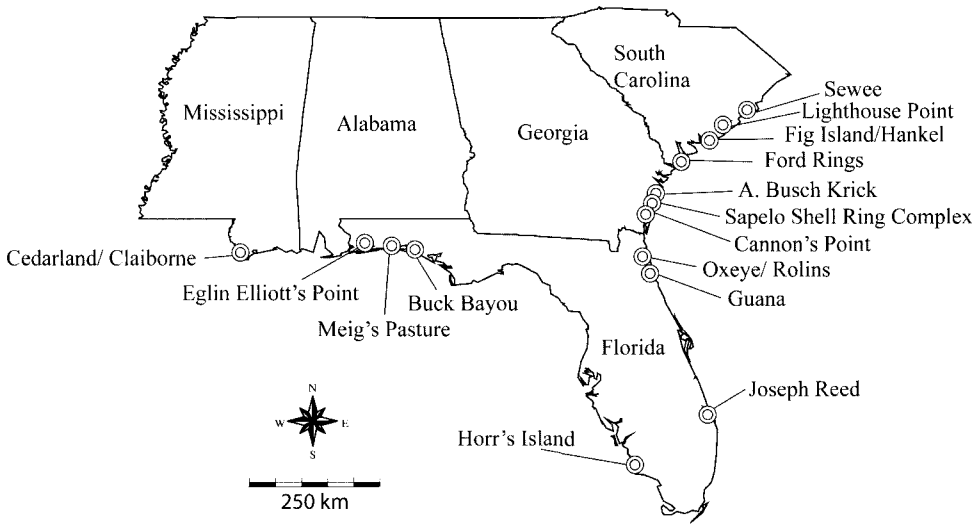


Figure 1. Shell Ring sites located in the southeastern United States.

processing of shellfish and *may* lend credence to the view that at some point shell rings become monuments, commemorating rituals and gatherings.

Archaeological Perspectives on Shell Rings

The various explanatory models of shell rings imply different degrees of mobility of shell-ring occupants, whether or not feasting occurred at the sites, and if shell rings did indeed represent monument constructions. Our intention in this section of the paper is to breakdown the various models of shell-ring function with regards to these issues. We do this in order to clearly evaluate these interpretations vis-à-vis the archaeological data.

Mobility

In the literature concerning complex hunter-gatherers, mobility is by far the most intensively studied by archaeologists of the issues considered here. The reason that archaeologists have concentrated on mobility is that the process of decreasing mobility is seen as a catalyst for other aspects of complexity (Kelly 1991, 1992, 1995). Kelly (1992:57) states "changes in logistical, residential, and long-term mobility strongly affect sociopolitical organization, trade, territoriality, demography, and enculturative processes." Thus, mobility patterns are multidimensional and are much more complex than a simple dichotomy between highly mobile and sedentary groups. As such, the multidimensional nature of mobility makes it difficult to archaeologically document the ranges of various degrees of mobility from constant movement to completely sedentary (see Kelly 1992: 54, 60).

The key question related to the topic of mobility in shell-ring research is if sedentary hunter-gatherers occupied shell rings year-round. While this is perhaps one of the most important research questions for these sites, few have investigated this through empirical testing. DePratter (1979:35) argues that shell-ring settlements are "relatively permanent." However, this idea is based mainly on the proposal that the coast is a resource rich environment that could have supported sedentary populations. Trinkley (1980:143) takes stock of the abundance of coastal resources showing that, at the very least, the coastal zone was not a marginal area and contained all the necessary resources to support a stable population. While these studies are instructive, archaeological evidence of year-round occupation requires measures that are more direct (see Kelly 1992:54–55 for a discussion of measuring resource abundance).

Perhaps one of the most effective ways for archaeologists to evaluate if people occupied shell rings year-round is through the analysis of faunal and flora remains. Such studies involve assessing the season of collection or availability of subsistence resources and determining their presence or absence at a site. Several archaeologists have undertaken such studies at shell-ring sites (Marrinan

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1975; Russo 1998; Thompson 2006; Trinkley 1980:175, 478; Quitmyer et al. 1985; 1997). Trinkley (1980:175, 478) argues that based on the presence of certain species (bird and turtles) as well as both shed and unshed antlers, there is "slight" evidence of year-round occupation at the Lighthouse Point Shell Ring in South Carolina. Similarly, Marrinan (1975:99) suggests, based on both the flora and faunal samples from Cannon's Point in Georgia, a spring-to-fall occupation for the site and that evidence for winter occupation is tenuous (Marrinan 1975:99). Finally, using multiple faunal indicators (e.g., catfish, modal growth increments on clams, as well as other indicators), Russo (1998:159) concludes for Horr's Island in Florida that at least a portion of the population occupied the site year-round.

Despite the previously mentioned studies, some archaeologists still interpret shell rings as seasonally/temporarily occupied sites (Michie 1979; R. Saunders 2002:158, 2004a:42, 61, 2004b:265). Saunders (2004a:61) views shell rings as "locations for macrobands or tribes to gather at certain times throughout the year for ceremony, feasting, information exchange, mate selection, and other social activities." This interpretation is based on the idea that shell rings have a specific site function—namely aggregation sites. Saunders' (2004a:61) main argument for this is the idea that ceramic vessel assemblages at ring sites are more elaborate or "formally distinct" from other non-ring sites reflecting the special purpose of shell rings. This position is tentatively supported by her work at the Rollins Shell Ring (cf. Thompson et al. 2008).

One of the great difficulties in evaluating if sedentary hunter-gatherers occupied shell rings year-round is our limited ability to determine timing of site occupation, beyond a broad time frame (i.e., a specific season). With only season of occupation data available, archaeologists grapple with interpreting sites that evidence more than one season of occupation. If aggregation occurs during each season, or if one band or more returns to a site during each season, then it might appear that these sites represent year-round settlements. Multi-season aggregation at shell rings, however, is unlikely as large aggregates of hunter-gatherers usually coincide with the most productive times for specific resources (Ingold 1999:402). However, the latter possibility that small bands may reoccupy a site throughout the year is a real concern for archaeologists attempting to discern between permanent settlement and seasonal reoccupation at shell-ring sites.

As illustrated by the preceding discussion, the issue of mobility is deeply embedded in models of shell-ring function. It also appears that the issue of mobility is intertwined with a number of other concepts in shell-ring research such as duration of occupation, timing of occupation, and the composition of the group that occupied these sites. For the purposes of the research presented in this paper, we focus on the question of season of occupation, as this is the issue that our data allow us to directly address. However, these data have implications for the other issues noted in these models, which we will discuss in relation to our study in the concluding section of this paper.

Monumentality and Feasting

Archaeologists view monuments as one of the key attributes of many "complex" societies (Trigger 1990:119). Therefore, the identification that hunter-gatherers construct such architecture challenges many of the previous assumptions associated with groups following a hunter-gatherer economy. Since the publication of Price and Brown's (1985) seminal book, *Prehistoric Hunter-Gatherers: The Emergence of Cultural Complexity*, archaeologists have overturned many of the long-held notions that all hunter-gatherer groups were small, wandering, egalitarian, family bands (see Lee and Devore 1968). Not explicitly addressed, until recently, is hunter-gatherer monument construction. Southeastern archaeologists, along with South American (e.g., Aldenderfer 1990, 1993) and Japanese scholars (e.g., Habu 2004), perhaps have contributed the majority of research on this topic, especially since the relatively recent recognition of early mound-building in the lower Mississippi River Valley (e.g., Saunders et al. 2005).

For models of shell rings, the issues of monumentality and feasting are closely interrelated. Dietler and Hayden (2001:1) argue that the concept of feasting is an "important point of departure for understanding culture and social life." They are quick to point out that archaeologists must be critical when studying this phenomenon, considering the categories, functions, types, purposes, benefits, and archaeological signatures of feasts (see Dietler

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and Hayden 2001; Hayden 2001). Before moving on to discuss these issues, we must define explicitly what we mean by the terms "feasting" and "monument."

Monumental architecture can be defined broadly as structures that are grand or large in *scale* and/or in *quality*. While energetic definitions focus the amount of effort in construction (e.g., Trigger 1990), we opt for a broader definition. While we recognize that monumental architecture usually requires effort above that of everyday structures, we also recognize that monumentality is also about "building collective memories and group identities into the landscape" (Pauketat 2007:199). This broader definition that focuses not just on scale but also on quality, in the sense of both attributes and/or material properties, then allows for a more nuanced approach to not only the identification of monuments in the archaeological record but also allows us to speak about the act of monumentality. That is, the creation of monuments. Such a view is necessary when we are interested in the first monuments in a given area, as we should not expect these to be readily encapsulated by definitions built upon data from later time frames where monument construction is obviously based on energetic definitions.

We define feasting similarly as any communal consumption of comestibles (including drink) that are grand in *scale* and/or *quality*. This definition shares similarities with Dietler (2001:67), Hayden's (2001:28), and Kirch's (2001:169) ideas regarding feasts. However, it differs in that there are not restrictions on the number of people (cf. Kirch 2001) and that comestibles can include quotidian fare (cf. Hayden 2001). Like Dietler we do think that feasts are inherently ritual and political, but we choose to emphasize the feast itself as it provides the basis to evaluate it archaeologically. That is, to identify feasts, researchers must also provide evidence that the deposit in question somehow departs from normal quotidian meals in either or both scale and quality (see discussions by Hayden 2001:46–49; Wiessner 2001:116–117). While there are a number of political, ritual, and social components to feasting that are expounded upon in Dietler and Hayden's (2001) seminal book on feasts, we leave these for now and discuss how the two concepts of monumentality and feasting are intertwined in ideas regarding the function of shell rings.

Several recent interpretations suggest that shell rings are monumental ceremonial feasting sites (Russo 2004; Russo and Heide 2003; R. Saunders 2004a; 2004b). The primary evidence for this interpretation is the large undifferentiated shell deposits found in many shell rings, what are often described as "clean" shell deposits (Russo 2004:43; Sassaman 2008:7). These deposits are taken as evidence of intentional mounding of feasting remains (Russo 2004:43; Russo and Heide 2003; R. Saunders 2004a; 2004b). The rationale for this interpretation is that these deposits should not evidence "crushing, wind-borne sand, surface fires, artifacts, fauna drawn to exposed shell (e.g., land snails; see Russo 1991), and other subaerial indicators of human or natural activity" (Russo 2004:43). Russo (2004:43) also notes that these deposits should appear as mounded or level strata. A counterpoint to this idea is that rings are comprised of shell-filled pits that are the remains of daily meals (Trinkley 1985:112). Such shell-filled pits are observed under the rings and in the plazas (e.g., Calmes 1967:9–10; Flannery 1943:150; Russo 1991:271; Waring and Larson 1968:271); however, few are documented within the large, aboveground, shell-ring deposits (e.g. cf. Russo and Heide 2003:41; Waring and Larson 1968:271). Trinkley (1985:112; see also Waring and Larson 1968:271) suggests that these pits blend into the shell deposits and are difficult to recognize in the upper layers of shell rings.

Central to arguments of both ceremonial feasting/mounding and the interpretation that shell rings represent midden accumulation of households is the rapidity of deposition. As Russo and Heide (2003:43) note, feasting deposits should indicate relatively rapid accumulation. In contrast, gradual accumulation of daily refuse is taken as signifying daily habitation (e.g., Trinkley 1985). Most researchers agree that at least some degree of daily activities occur at shell-ring sites as evidenced by the many domestic artifacts and features found at these sites (DePratter 1979; Russo 2004; Thompson 2007; Trinkley 1985; Waring and Larson 1968). However, daily habitation does not preclude ceremonial feasting. The key to identifying feasting deposits as well as assessing the scale of such behaviors is methods that allow the archaeologist to evaluate the timing and rapidity of deposition (see Russo and Heide 2003:43 for a discussion).

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What is conspicuously absent from the above models is any discussion regarding how storage behavior might impact what we see in the archaeological record at shell-ring sites. There is, of course, ethnohistoric evidence of storage of shellfish meat for Eastern North American groups (Waselkov 1987:108). Indeed, *possible* storage pits are identified at several southeastern shell-ring sites (Thompson 2006; Trinkley 1985:32–33; Waring and Larson 1968); however, it is unlikely that shellfish meat was stored in these pits. Shells, however, do sometimes form the contents of such features after they fall into disuse. More importantly, however, is the impact that large-scale processing of shellfish for storage may have for what archaeologists call feasting deposits.

Again, the large, "clean," shell deposits are taken to represent feasting. What we do not know, however, is if the oyster meat was consumed immediately after processing. If so, then such deposits may indeed represent feasting behavior. However, if there was considerable delay between processing and consumption, a strategy that we might expect with less mobile hunter-gatherers (see Crothers and Bernbeck 2004; Woodburn 1980), then the evidence for such deposits representing feasting remains becomes more tenuous. As Waselkov (1987:109) states, the shell deposits at a site "indicate only the amount of food processed there; determining whether the meat was eaten immediately or preserved depends upon a thorough understanding of the subsistence and settlement strategies."

As illustrated in the above discussion, there are competing ideas as to exactly what shell rings represent. Despite the tensions inherent in many of the models of shell rings, archaeologists are now beginning to incorporate multiple behaviors into these models (e.g., Russo 2004; Thompson 2007, 2010). Recently, one of us (Thompson 2007) in an article in *Southeastern Archaeology* outlined a developmental model of shell-ring function. The developmental model offers a point of departure to discuss the palimpsestic nature of shell-ring function, formation, and meaning. In simplest terms, the developmental model views shell rings as shifting between dominant functions during their life history. For example, Thompson (2007:91–92) suggests that rings may start out as the result of daily habitation, which would include large-scale processing for storage. Certain rings may take on a more ceremonial function at some point in time. At first glance, such a perspective seems to be offering a unilineal model of the evolution of place. However, Thompson cautions:

> Finally, it should be noted that ring function may alternate between these different phases. Therefore, this model should not be viewed as a unilineal development of ring function or that all shell rings develop as I have described. Each site must be tested independently to determine the history of activities [Thompson 2007:92–93].

Implicit in these statements is the idea that shell-ring sites may not all begin as habitation sites. Quite the contrary, some of these sites may start out as principally ceremonial places. Additionally, it is naïve to think that after rings cease to serve as habitation sites that they automatically become ceremonial. In such cases, it is possible that such rings then serve as secondary disposal areas, similar to abandoned houses (see LaMotta and Schiffer 1999), where people living at adjacent rings piled their refuse. In such cases, we would expect rings to gain considerable height and become more amorphous and less ring-like. Ring I at the Fig Island Ring complex, a series of three adjacent rings similar to the Sapelo Ring complex, may be a candidate for such an explanation (see R. Saunders 2002 for a description of the Fig Island Ring complex).

Ultimately, the point of the developmental model, and this discussion, is to suggest that these sites are complex palimpsests, and to understand their role (in time and space) we must have a firm grasp of a site's depositional history to understand its social history. To assign a singular function (i.e., ceremonial site) denies complex behaviors, intentional actions, and multiple interpretations of past agents who viewed and lived at these places on the landscape. Therefore, we must develop ways to test our assumptions that allow us to empirically tease apart such histories.

Research Questions

Based on the above discussion, there are several questions that directly relate to the varying interpretations of shell rings. One of the keys to evaluating competing models of shell-ring formation and function is an understanding of the timing of

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the different deposits and overall site-formation processes. To these ends, we pose the following questions for our research at the Sapelo Shell Ring complex.

1. Is there evidence for year-round habitation at the site? In order to address this question we conducted stable isotope analysis on clams (*Mercenaria* spp.) and oysters (*Crassostrea virginica*) from the site as well as growth band analysis on clams. Both of these methods lend insight into the season of collection for these species and can be used to determine what season(s) a given site is occupied. Based on our results, we argue in this paper that some portion of the population, throughout the year, occupies the site.

2. Is there evidence for rapid accumulation of shells due to large-scale shellfish processing, which may indicate monumental piling of feasting debris or activities associated with storage at the site? In order to address this question, we again used stable isotope analysis on clams and oysters samples from various shell deposits at the site. Our assumption underlying this analysis is that deposits that form due to large-scale shellfish processing should accumulate quickly and thus most of the shellfish in such deposits should evidence the same season of collection (e.g., fall). Based on our results, we argue that at least two shell rings at the site evidence gradually accumulating deposits, while deposits in another ring suggest more rapid deposition.

In the following sections, we provide a brief history of the previous research at the Sapelo Shell Ring complex, which includes the radiocarbon data, a description of the geophysical survey, as well as past and recent excavations (see also Thompson 2006, 2007 and Thompson et al. 2004 for additional information). These data provide a backdrop and corroborative evidence to the stable isotope and growth band analysis. Following this, we describe the methods used in the isotope and growth band analysis and our sampling approach. Finally, we offer our interpretations and contextualize these ideas within the broader framework of hunter-gatherer studies and shell midden archaeology.

Previous Research at the Sapelo Shell Ring Complex

The Sapelo Shell Ring complex (9MC23) is located in McIntosh County, on Sapelo Island along the Georgia coast of the United States (Figure 2). Three large shell rings and an unknown number of amorphous shell piles surrounding the rings, along with shell-free cultural deposits, comprise the site (Thompson 2006, 2007; Thompson et al. 2004). The three rings are varying sizes with the largest, Ring I, measuring ca. 95 meters in maximum diameter and reaching a maximum height of ca. 3 meters over the original ground surface. Rings II and III, in contrast, have little topographic relief and are comprised mostly of subsurface shell deposits. These two rings are ca. 90 and ca. 54 meters in diameter respectively. The primary occupation of the three rings, along with some of the cultural deposits located outside the rings, dates to the Late Archaic period (4400–3000 cal B.P.). However, the amorphous shell piles surrounding the rings date to the Late Prehistoric/Contact Period materials (cal A.D. 1350–1700) (Jefferies and Thompson 2006; Thompson 2006). Further, the small Late Archaic deposits located by Simpkins (1975) outside the ring complex are found to postdate or predate ring construction (see Thompson 2006, 2007).

Interest in the Sapelo Shell Ring complex has waxed and waned for over 100 years. William McKinley (1873:422–423) was the first to describe the site and its three rings and hundreds of shell middens. C. B. Moore (1897) subsequently excavated at the site. Although the exact location of his excavations remains unknown, he did establish the idea that it (the largest ring) was indeed an aboriginal construction. Waring and Larson (1968) conducted the first scientific work at the Sapelo Shell Ring complex. In their report, they describe the excavations in the largest ring (Ring I), which was a long trench that extended from the exterior of the ring into the interior of the central plaza.

The Waring and Larson excavations are particularly interesting and informative from the perspective of varying shell-ring models. In their report they conclude that the ring is composed of primarily occupational midden (Waring and Larson 1968: 273). However, in a seemingly contradictory statement Waring (1968: 243, 246) refers to the ring as a monument. Thus, it appears that since the 1950s

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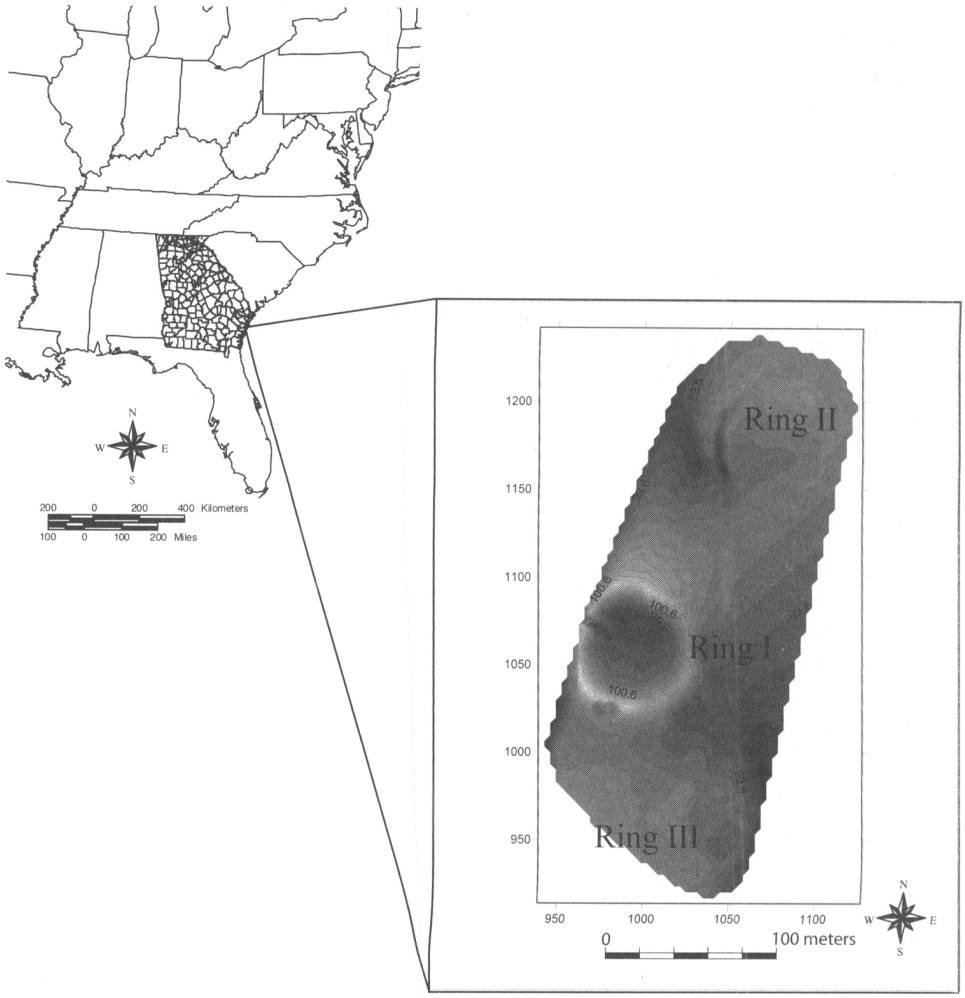


Figure 2. Location and topographic map of the Sapelo Shell Ring Complex, Sapelo Island, Georgia.

there has been speculation and confusion as to monumental nature of shell-ring sites. In their trench, Waring and Larson (1968: 271) noted alternating bands of loose, pure shell or what others have called "clean"[1] whole shell layers (see our previous discussion). Other layers in the trench contain more soil than shell. These layers often contain more crushed shell along with higher artifact densities, which can be observed in the open profile today (Figure 3). The dense layers of "clean" shell are one of the main lines of evidence that archaeologists point to as evidence in support of the idea of shell rings as monumental feasting remains (e.g., R. Saunders 2004a, 2004b). In addition to the alternating layers, Waring and Larson (1968: 271) observed shell-filled pits underneath the ring and along the inside interior of the ring, which may have functioned as steaming and roasting pits as they are similar to the ones noted by Trinkley (1985:117) in his excavations at Lighthouse Point. We will return to our discussion of the dense shell deposits from Ring I later in the paper, as these deposits are one of our sampling areas for the isotope analysis of oysters.

Since the time that McKinley first described the Sapelo Shell Ring complex, it has undergone considerable change. The site was in agricultural fields in the 1870s, hit by hurricanes in the 1890s, and then it was left to revegetate as part of a wildlife refuge (see Sullivan 1997 for a history of Sapelo

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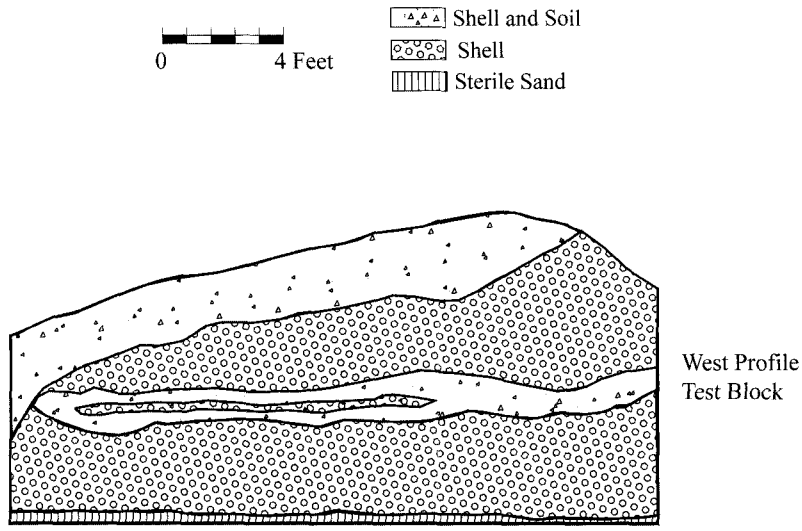


Figure 3. Waring and Larson's Unit 4 from Ring I at the Sapelo Island Shell Ring. Note that the shell layers illustrated in this profile are the dense "clean" layers of shell held by some to represent feasting/mounding episodes (adapted from Waring and Larson 1968: figure 91).

Island). As such, the two topographically smaller shell rings became less visible to the extent that archaeologists began to doubt the original description (Larson 1998:30). In the 1970s, Larson once again conducted excavations at the site to locate the other two rings; however, while Archaic period deposits were encountered, the exact location of the other two rings could not be identified (see Simpkins 1975:24–25).

The University of Kentucky began research at the Sapelo Shell Ring complex to locate the other two rings and address questions related to shell-ring function and formation. This research was carried out as part of the first author's dissertation and ongoing research. To meet these goals, both a geophysical survey and excavation program were carried out during the summers of 2002, 2003, and 2006.

For the geophysical survey, a number of techniques were used including ground-penetrating radar, resistance survey, and magnetometry. The results of the survey are summarized in various papers and reports (Reynolds and Thompson 2006; Thompson 2006, 2007; Thompson et al. 2004). Rather than discuss each of these techniques here, we focus solely on the results of the resistance survey as it was this method that lends the most information to the various models of shell rings.

We conducted two different resistance surveys at the Sapelo Shell Ring complex. The first was an exploratory survey using a RM-15 advanced resistance meter to locate the other two rings. Our assumption was that shell deposits would be highly resistant as compared to the surrounding sand matrix. This survey along with a detailed microtopographic survey both located and defined the location of the other two rings[2] (see Clark 1990 and Thompson et al. 2004 for a more in-depth description of the survey and the device) (Figure 4). These results indicated that the Ring III, the smallest of the rings, shell deposits are discontinuous. In order to examine this further, we (Reynolds and Thompson 2006) conducted a high-resolution resistance profiling study using a Syscal Kid resistance meter. Similar to the RM-15, the spacing of the probes is directly related to the peak sensitivity of the measurement. For example, if one sets the probes one meter apart then the peak reading is one meter below the surface. By varying the probes separation over the same area, a vertical "pseudo" profile of the resistance values is created. Resistance profiling provides information on the horizontal and vertical distributions of archaeological deposits.

The shallow geophysical resistance profiling of Ring III revealed varying areas of high resistance

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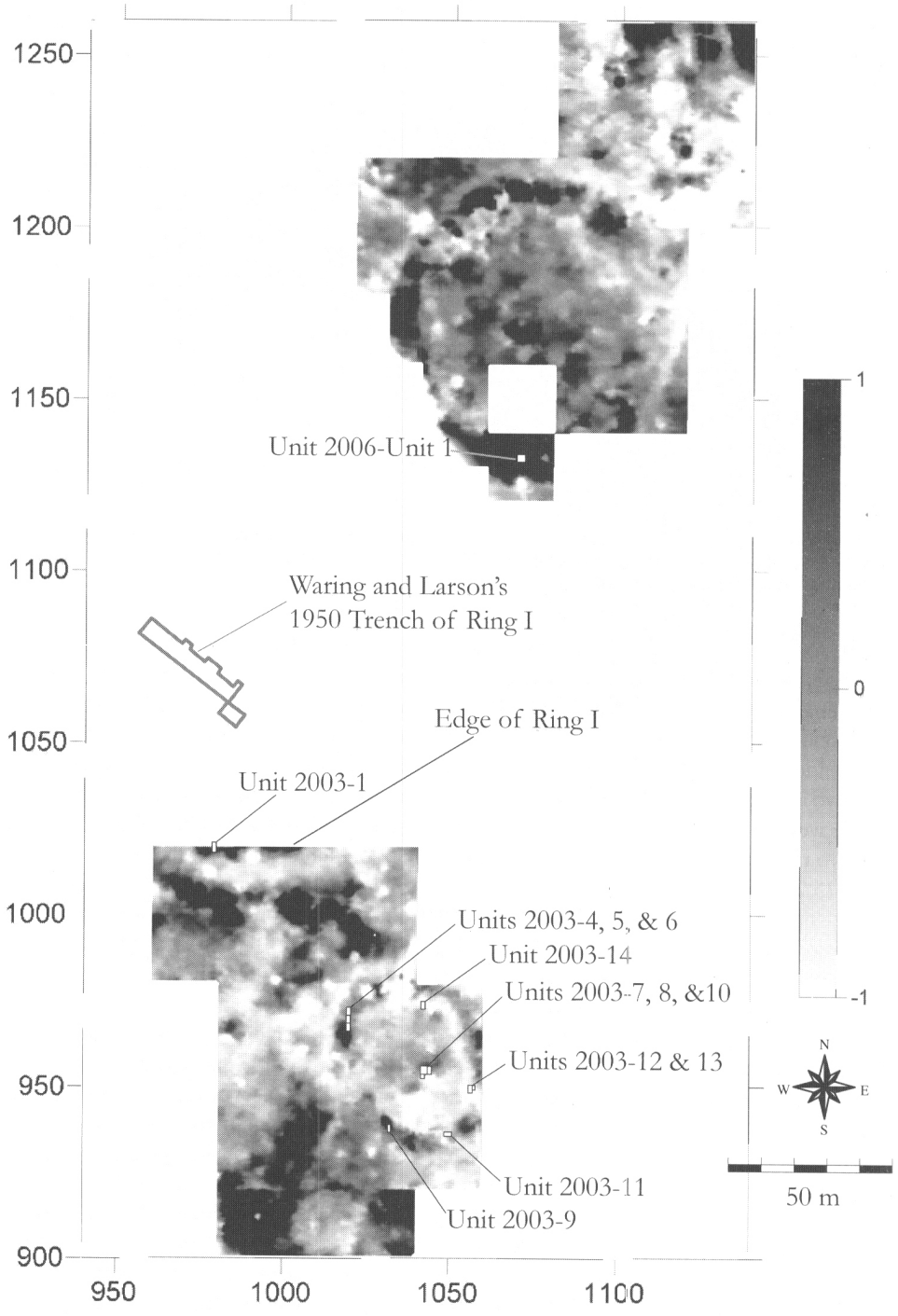


Figure 4. Composite resistance survey of the Sapelo Island Shell Ring complex showing the location of Ring II and Ring III and the associated excavation units. Darker areas represent high resistance values, while low values are lighter (adapted from Thompson 2007: figure 4).

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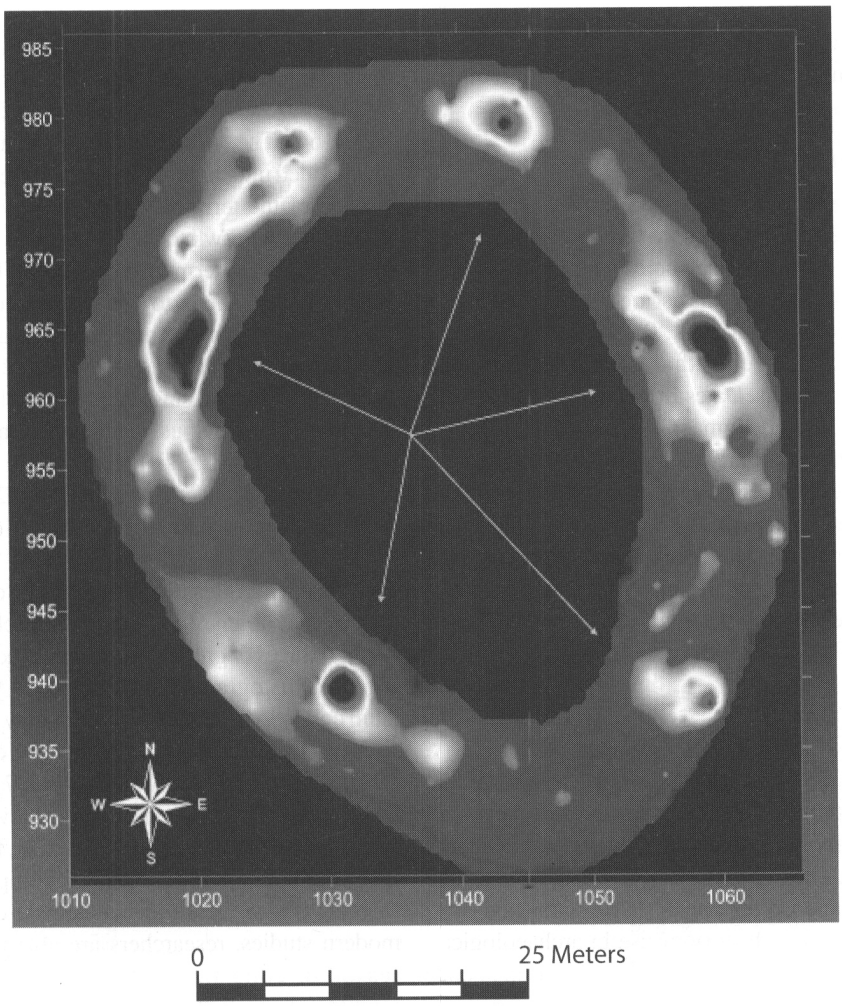


Figure 5. Resistance profiling study time slice model of Ring III. Arrows point to areas of high resistivity (ca. above 1825 ohm m) and are identified as dense shell deposit (figure by Matthew D. Reynolds).

that are approximately equally spaced at 26 ± 2.75 m around the circumference of the ring (Figure 5). Testing of the high resistance areas revealed dense concentrations of shell and other faunal remains, while the areas between these deposits contained black midden soil with few shells (Thompson 2007:100). Interestingly, pottery is most abundant in the deposits between the high-density shell deposits along the ring, as opposed to other areas of the site (e.g., inside and outside the ring) supporting the interpretation that these areas were habitation locales (Reynolds and Thompson 2006; Thompson 2006, 2007). This work suggests that the behaviors associated with the formation of Ring III (e.g., shellfish piling and dumping) were not homogenous across the ring.[3] Thus, Ring III did not start out as a contiguous ring of shell, but rather as dense and separate shell deposits arranged around a central plaza.

Despite the evidence that Ring III seemingly formed as a result of habitation, these data do not preclude ceremonial feasting at the ring. Indeed, some of the dense shell deposits, like those in Ring I, are large deposits of what some call "clean" shell like those used to infer feasting behavior. Similarly, excavation of a 2 m x 2 m test unit in Ring II during our 2006 field season revealed large deposits of dense shell as well. Like Ring I, these areas of dense shell in Rings II and III are locations where we collected samples of clams and oysters for the

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analysis described in this paper (see Figure 4). Again, we will return to these areas and describe them in more detail in the sampling section of this paper.

Radiocarbon Dating

Before moving on to the analysis, we must first address the chronology of the rings. Many of these dates are reported elsewhere (Thompson 2007); however, included in this list are unpublished radiocarbon dates from Ring II. Based on the radiocarbon dates, it seems that all three rings are contemporaneous. Dates from all three rings overlap at the second sigma. Of course, this does not rule out the possibility that one ring is abandoned and another ring begins; however, at least one radiocarbon date from each of the three rings have values that are essentially indistinguishable from one another and lend to the interpretation that these rings were possibly occupied and/or used in some way simultaneously (Table 1).

Methods and Materials

Based on the above discussion, we argue that the Sapelo Island Shell Ring complex is an ideal research laboratory to address our previously stated questions. The two methods, growth band analysis on clams and isotopic analysis on clams and oysters, have a long history of use in archaeological studies to determine season of death/season of collection of these species (e.g., Andrus and Crowe 2000; Andrus et al. 2002; Bailey et al. 1983; Claassen 1998; Clark 1979; Keene 2004; Milner 2000; Quitmyer et al. 1985, 1997; Russo 1998; Surge et al. 2001).

The Growth Band Analysis

We conducted the growth band analysis on clam shells from the site following the procedure outlined in Quitmyer et al.'s (1985; see also Quitmyer et al. 1997) seminal article on the methodology working with clams from the Georgia coast. Shell incremental growth structure analysis of clams involves measuring the light and dark incremental growth rings, which in clams can be observed once the shell is bisected through the umbo to the shell edge along the axis of maximum growth (Figure 6). Each band was examined under reflected light, measured using digital calipers, and entered into a spreadsheet. The light and dark bands correspond to seasonal changes in growth. This technique divides the shellfish into categories of fast (opaque or O) and slow (translucent or T) growth (Claassen 1998:164). The two stages of growth are then further divided into three subdivisions based on a comparison of the terminal stage of growth with the same stage of growth from the previous year. These subdivisions are termed O1, O2, O3, T1, T2, and T3. Assigning shells to one of these divisions is based on comparing terminal stage of growth (i.e., fast or slow) to the same stage from the previous year. If the terminal stage of growth is less than 50 percent of the previous year's same stage growth, then the shellfish is assigned to a O1 or T1 reading respectively, if 50–99 percent O2 or T2, if greater than 100 percent O3 or T3 (Quitmyer et al. 1985, 1997).

In order to interpret the resulting data, a frequency histogram of individuals in each of the six defined stages of growth was created and then compared to histograms from a modern year-round clam collection study of the King's Bay locale, just south of the Sapelo Island (Quitmyer et al. 1985, 1997: Figure 5). Quitmyer et al. (1997) have produced histograms on modern clams for various seasons of collection (e.g., spring, summer, fall, winter, and year-round collection). By comparing histograms derived from archaeological clams with modern studies, researchers are able to assign a season of collection(s) for the archaeological sample.

In addition to the O/T technique, we also assigned clams by Fast/Slow (F/S) growth. This technique, as described by Claassen (1998), simply involves recording if the terminal growth is either in a fast (F) or slow (S) stage of growth. Claassen (1998:168) states that while this technique is not particularly robust, it can be done quickly on a larger number of shells and should be used in tandem with other techniques.

We sampled a total of 620 clams from five 1 m x 2 m test excavation units from Ring III and one 2 m x 2 m test excavation unit from Ring II. We did not conduct growth band analysis on clams from Ring I. This was due to the low number of clams found in the excavations as well as the small size of the excavations in Ring I. Only one 1 m x 2 m test excavation unit was located in Ring I deposits during the 2003 excavations (see Figure

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Table 1. Sapelo Island Shell Ring Complex AMS Radiocarbon Dates.

Sample Name	Lab #	$^{14}C \pm \sigma$ Yrs B.P.	$^{14}C \pm \sigma$ Yrs B.P. $\delta\,^{13}C$ Corrected	$\delta\,^{13}C$	Material	Cal B.P. Yrs $\pm$ 2σ	Source
* Shell Ring II: Unit1-2006, NW quad, Level 5	UGA01423	2,840 ± 60	3,180 ± 60	-4.08	Shell *(Mercenaria)*	2971 - 3334	This publication
Shell Ring III: Unit 9, Level 4	UGA15082	3,600 ± 50	3,560 ± 50	-27.52 (-40)	charcoal	3690 - 3989 (p = .98)	Thompson 2007
Shell Ring III: Unit 9, Level 7	UGA15083	3,740 ± 60	3,730 ± 60	-25.46 (-7)	charcoal	3897 - 4249 (p = .996)	Thompson 2007
Shell Ring I: Unit 1, Level 2	UGA15084	3,480 ± 50	3,610 ± 50	-17.04 (+129)	sooted sherd	3826 - 4084 (p = .97)	Thompson 2007
Shell Ring I: Unit 1, Level 2	UGA15085	3,630 ± 60	3,730 ± 60	-18.94 (+98)	sooted sherd	3897 - 4249 (p = .996)	Thompson 2007
Shell Ring III: Unit 11, Level 4	UGA15086	3,740 ± 50	3,730 ± 50	-25.57 (-9)	charcoal	3962 - 4237 (p = .98)	Thompson 2007
Shell Ring II: Unit1-2006, NW quad, Level 5	UGA01424	3,750 ± 70	3,730 ± 70	-26.16	charcoal	3880 - 4295 (p = .994)	This publication
Shell Ring II: Unit1-2006, NE quad, Level 5	UGA01425	3,900 ± 60	3,890 ± 60	-25.87	charcoal attached to sherd	4148 - 4443 (p = .97)	This publication

Note: All calibration by Calib Rev 5.0.1 using the IntCal04 curve (Reimer et al. 2004; Stuiver and Reimer, 1993) except for the *shell sample UGA01423, which was calibrated using the Marine04 curve to take into account the global ocean effects (Hughen et al. 2004). To account for local effects we used the delta R (-134 ± 26) derived by Thomas (2008:359) for St. Catherines Island, Georgia. We do note, however, that this date is considerably younger than the carbon sample it was paired with (UGA01424) in our analysis. Therefore, we advise caution in considering this date as reservoir corrections may vary in time.

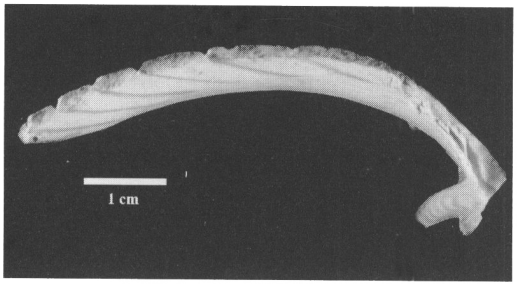


Figure 6. Thick section of hard clam showing light and dark incremental growth bands.

4). This unit was placed in an area that had been mined for shell, and intact deposits were thin. Sampling from the Waring and Larson trench did not produce enough clams to include in this analysis, as almost none were observable in the profile.

The Isotopic Analysis

In order to complement the incremental growth analysis, both clam and oyster shells were subjected to high spatial resolution oxygen isotope analysis to determine season of capture and thus season(s) of site occupation (Andrus and Crowe 2000; Kirby et al. 1998; Surge et al. 2001). This analytical strategy involves measuring the ratio of ^{18}O to ^{16}O (expressed as $\delta^{18}O$) in sequential samples that follow the growth of the shell to produce a time-sequence data profile. The distribution of oxygen isotope ratios in these taxa are a function of the temperature and $\delta^{18}O$ value of the water in which they grow (Andrus et al. 2000; Jones and Quitmyer 1996; Surge et al. 2001). There is an inverse relationship between shell $\delta^{18}O$ and water temperature. The $\delta^{18}O$ of water co-varies with salinity.

Water temperature oscillates over a wide seasonal range (~20 °C) in the estuaries and rivers near Sapelo Island. Salinity is also highly variable (often ranging between ~5 and ~35 ppt) both spatially and temporally, but not in a regular seasonal cycle (Marsh Landing, Sapelo Island water data derived from http://cdmo.baruch.sc.edu/ for the years 1995–1998, and 2002–2004). Salinity varies over tidal cycles, but lower frequency oscillations are less predictable. Based on measured water temperature and salinity data, coupled with water $\delta^{18}O$ values from nearby St. Catherine's Island (Andrus and Crowe 2008), temperature alone can account for up to approximately 5‰ of variation in shell $\delta^{18}O$ (based on Grossman and Ku 1986 and assuming year-round growth), while water $\delta^{18}O$ alone (proxied by salinity) can account for ~2‰. Furthermore, previous isotopic analysis of clams from nearby St. Catherine's Island demonstrate that $\delta^{18}O$ values are more strongly controlled by temperature than salinity over seasonal time scales (Andrus and Crowe 2008). It should be noted, however, that absolute water temperature cannot be calculated in estuarine regions such as around Sapelo Island due to unknown past variation in water $\delta^{18}O$ value.

In summary, oscillations in $\delta^{18}O$ measured over the life of a shell prior to capture are largely a function of seasonal water temperature variation. Thus, similar to the incremental growth band analysis, by measuring $\delta^{18}O$ values across multiple growth bands to the terminal stage of growth, one can then determine the season of death of the specimen and therefore what season a particular archaeological site was occupied.

Isotopic analysis of oysters and clams requires a relatively complete shell that is not brittle. It is especially important that the terminal stage of growth of the animal (the outer edge of the shell) is intact. Furthermore, the interior of the shell must show no sign of epibiont growth. If epibiont growth is present, the oyster or clam was likely collected after its death. Size was important in the selection process of oysters and clams in order to obtain a range of ages, yet avoid ontogenetically old samples that may have entered a geriatric growth phase that alters typical growth patterns (Andrus and Crowe 2008). Such samples were identified by their characteristic inward curvature of growth near the margin of the shell.

Based on the selection criteria, the authors sampled a total of 58 specimens consisting of clams (n = 41) and oysters (n = 17). The samples were collected from five 1 m x 2 m test excavation units from Ring III, one 2 m x 2 m test excavation unit from Ring II, and from Waring and Larson's 1950 exposed west profile wall. Of these areas, one collection area from each ring represents possible feasting deposits as defined by a large concentration of dense "clean" shell. These areas are the west profile collection area of Ring I, Ring II Unit 2006-1, and Ring III Unit 2003-9 (see Figure 4). The reader should note that Ring III is much smaller with little topographic relief compared to Ring I. Similarly, Ring II has little topographic relief; how-

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ever, the vicinity of Ring II, where our sample comes from, is visibly higher than the surrounding areas. It is likely that depositional processes (e.g., aeolian sediments) have buried portions of the Rings II and III that were once much higher piles relative to the original ground surface. However, it is possible that at least some of the samples from the lower levels came from shell-filled pits from the bottom layers at the base of the ring deposits that were not discernable, due to the shell matrix and small size of the excavations. While the lower portion of Ring I is buried as well, all our samples come from the upper levels of this ring. In order to evaluate if the shell deposits represent discreet or multiple disposal events from these various contexts, clam and oyster were evaluated from each excavated level from Ring III, Unit-9, Ring II 2006-Unit 1, and the west profile wall of Waring and Larson's trench (Figure 7). For Rings II and III we sampled shells from every ten centimeters from these two units.

To prepare the shells for analysis, left oyster valves were bisected along the chondrophore. Clams were prepared by removing a section of the valve perpendicular to the last several growth bands along the axis of maximum growth. None of the clam valves were paired, thus, each was from a unique individual. These cuts were made using a Dremmel saw. Each sample was cut a second time using a slow-speed diamond wafering saw to produce a thick section (>1 mm). The thick section of shell was attached to a glass slide using an adhesive. Contiguous and approximately equidistant samples were milled in ca. 500 micron long transects, using a New Wave/Merchantek computer-controlled micromill. The number of micro-samples taken per shell and the average distance between transects varied between individual shells according to their growth rate. The goal for sampling each shell was to measure variation over at least the last light-dark couplet to attempt to measure at least one annual cycle. Powdered samples were then weighed and placed in 4.5 ml borosilicate glass sample vials. Samples were analyzed via continuous flow techniques on a Thermo Gasbench II. Samples analyzed at the Savannah River Ecology Laboratory were measured on a Thermo Delta Plus XP isotope ratio mass spectrometer (IRMS), while those analyzed at the University of Alabama were measured on a Thermo Delta Plus IRMS. Precision for individual

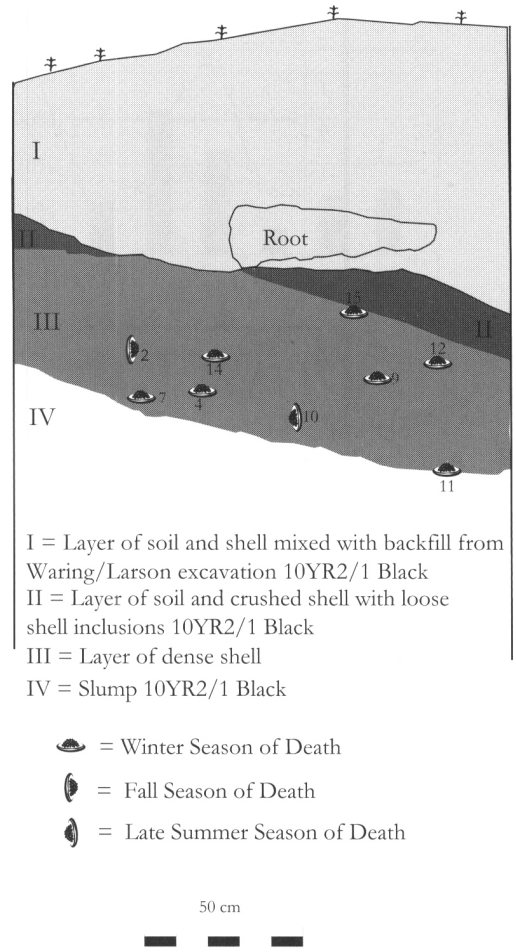


Figure 7. Profile drawing of Waring and Larson's west profile of Ring I and showing the location of specimens used in the isotope analysis (numbers on profile denote shell sample).

runs ranged from .09‰ to .28‰. Average precision of all sample runs was .19 ‰ (1σ) as calculated based on repeat analyses of the standard NBS–19. The data are reported relative to the VPDB standard. No acid-fractination corrections were applied to the $\delta^{18}O$ values of the aragonite samples.

Season of death was assigned, using a modified version of the method employed by Andrus and Crowe (2008), using modern and archaeological clams from nearby St. Catherine's Island. The range in $\delta^{18}O$ values measured in the last seasonal oscillation prior to death was divided into three equal parts. If the $\delta^{18}O$ value of the sample from the edge of the shell was in the upper third of the seasonal oscillation range, it was considered to

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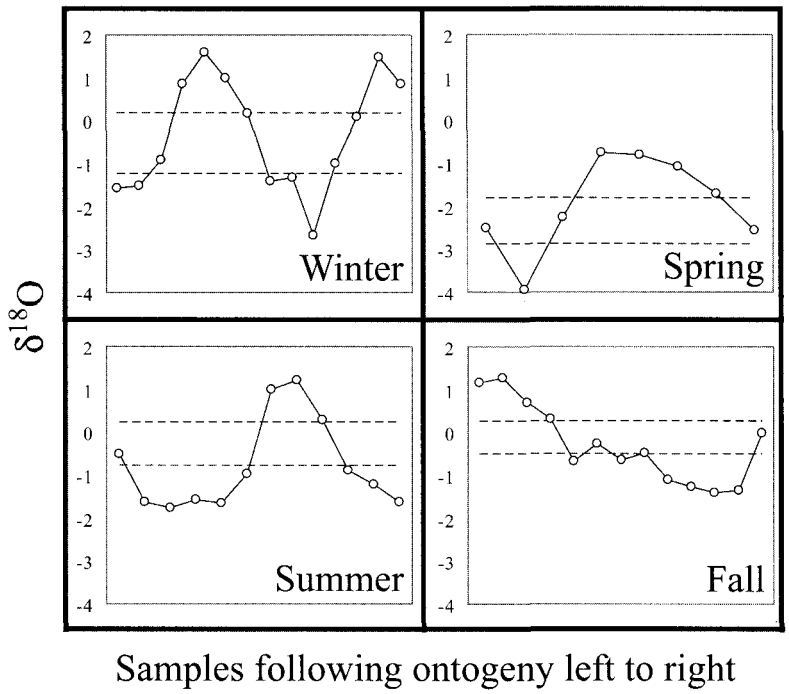


Figure 8. Examples of $\delta^{18}O$ profiles measured in clams (Winter – OLTS11, Spring – C3, Summer – C10A, Fall – CLTS2) from the Sapelo Shell Ring complex used to determine season of capture as described in the text. $\delta^{18}O$ values (y-axis) are relative to VPDB in parts per mil (‰). The data sequence (x-axis) follows ontogeny depicting equidistant sampling. The dashed lines denote the values that divide the sample range for each profile into equal thirds (see Methods and Materials). The data used to generate these and all other profiles used in this study is presented in Table 3.

have been captured in winter. Conversely, if the edge $\delta^{18}O$ value was in the lower third of the previous seasonal $\delta^{18}O$ oscillation it was considered to have been collected in summer. Edge values within the middle third of the seasonal $\delta^{18}O$ oscillation were considered in either spring or fall. If values were trending positive prior to death, it was considered fall, and if values were trending negative, it was considered spring. Examples of each season of collection determination are provided graphically (Figure 8). If a sample's $\delta^{18}O$ profile did not oscillate beyond expected minimum seasonal values based on measured modern water temperatures (http://cdmo.baruch.sc.edu/), or did not oscillate at all, no season of capture estimate was made.

It is important to note these season of capture estimates are not meant to reflect a rigid calendrical definition of season but rather a distribution of water temperatures that loosely follows the seasons, yet varies from year to year. For example, the exact timing of springtime water temperature increases will vary with weather conditions and may differ by several weeks between years. For a more detailed exploration of this and related issues of seasonal growth see Ansell (1968), Henry and Cerrato (2007), and Jones et al. (1989).

Results

Growth Band Analysis

Of the 620 valves analyzed, only 389 were readable for the F/S (Fast/Slow) technique and only 280 were readable for the T/O (Transparent/Opaque) technique. The Ring III F/S reading consists of 31 percent (N = 40) of the clams in a fast (F) stage of growth, while 69 percent (N = 88) indicated a slow (S) incremental growth stage. Similarly, the Ring II F/S reading consists of 39 percent (N = 103) of the clams in a fast (F) stage of growth, while 61 percent (N = 158) indicated a slow (S) incremental growth stage. Thus, there appears to be a slight tendency for clams to be collected during the winter-

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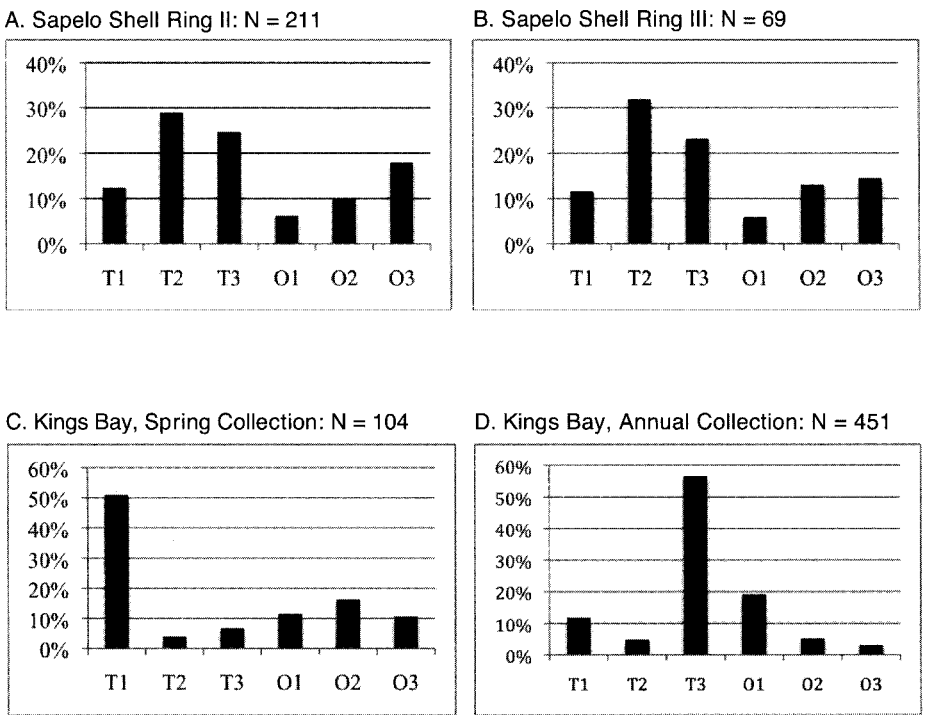


Figure 9. A-B: Growth frequency profiles of incremental shell growth observed in hard clams collected from rings II and III at the Sapelo Shell Ring Complex. C-D: Growth frequency profiles of incremental shell growth observed in hard clams that denote a Spring and annual collection from the King's Bay locality (adapted from Quitmyer et al. 1997: Figure 5).

spring months; however, summer-fall collection is well represented in the sample as well.

The O/T technique corroborates the findings of the F/S technique. The O/T indicates two peaks in the data for both rings II and III (Figure 9). The T2 and T3 stages of incremental growth have the highest frequency in the assemblage followed by the O3 stage. The other stages of growth are relatively equally (within 7 percent of one another) represented in the assemblage. Comparison of the archaeological growth band results with those of modern collection studies near King's Bay, Georgia indicates that the peak intensity of collection is between late spring and summer (cf. Quitmyer et al. 1997:Figure 4 and 5).

Isotopic Analysis

Of the 58 clams and oysters sampled, 45 produced readable profiles to determine season of capture. Eleven samples did not display an oscillating pattern. The results indicate that of the animals sampled, 25 (13 clams and 12 oysters) were collected during the winter, two were collected during spring (2 clams), 15 were collected during summer (14 clams and 1 oyster), and 3 were collected during the fall (2 clams and 1 oysters) (Table 2 and Table 3). Thus, all four seasons are represented in samples from the site as a whole. Regarding the rings by themselves: three seasons (winter, summer, and fall) are represented in the Ring I assemblage. Two seasons (winter and summer) are represented in the Ring II assemblage. And finally, all four seasons are represented in the Ring III assemblage (Figure 10; see Table 2).

The three areas of the site sampled to examine feasting and monument construction produced varying results (Figure 10; see Table 2). The large dense shell deposits from Ring III, Unit 9 evidence two different alternating seasons of deposition. The first 20 cm of the deposit contained one oyster collected during the winter, with the next 30 cm containing two clams collected during the spring and two collected during the winter. The final 20 cm of the deposit contained two clams col-

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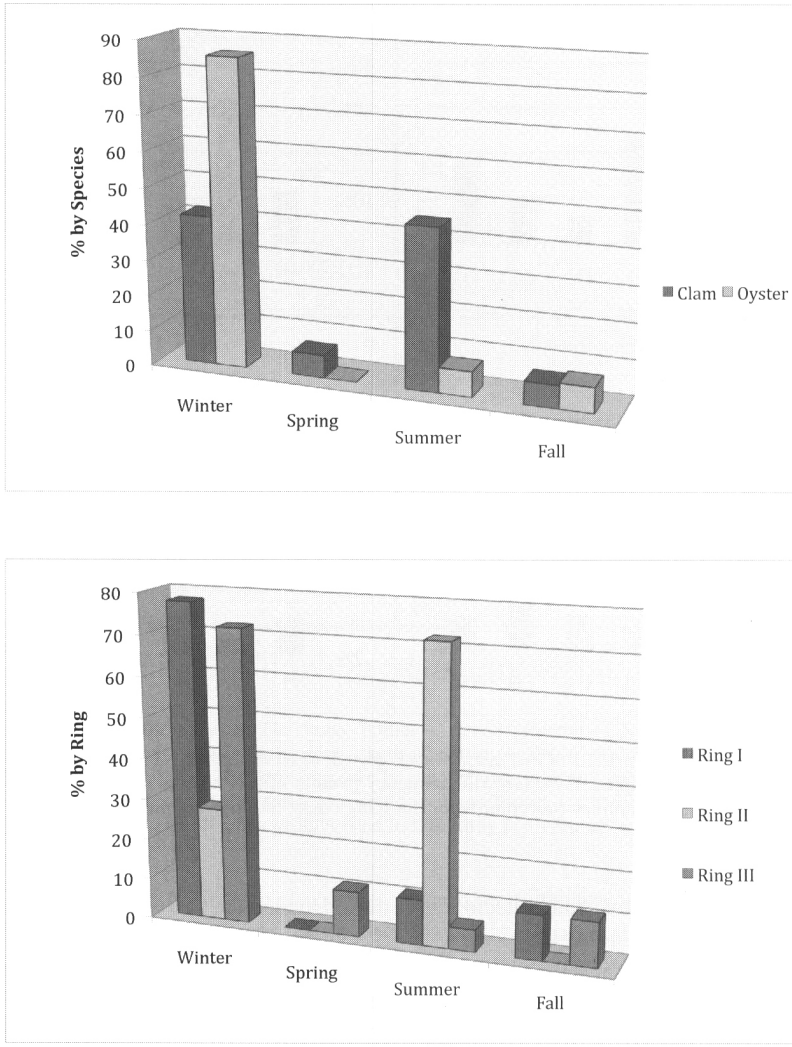


Figure 10. Histograms showing the percentage by ring and species of season of collection for the Sapelo Shell Ring complex. The top chart shows the percentage of clams and oysters in each season of collection category (e.g., winter, spring, summer, fall) as a function of the number sample for each individual species (clams, $N = 31$ and oysters, $N = 14$). The bottom chart shows the percentage of clams and oysters in each season of collection category as a function of the total number of both clams and oysters sampled from each ring (Ring I [$N = 9$], Ring II [$N = 18$], and Ring III [$N = 18$]).

lected during the winter. Finally, as an additional and complimentary dataset, faunal analysis by Compton (2004) on catfish otoliths indicates a third season of collection for this unit (late Summer/Fall).

For Ring II, two seasons (winter and summer) were represented in the deposits that were hypothesized to denote feasting deposits. In fact, the first 20 cm of the deposit contains clams that evidence both a winter and summer season of collection. Throughout the rest of the shell deposits, we again find clams collected during winter and summer with some individual levels containing these two opposing seasons.

The area sampled from Ring I for evidence of feasting represents a different context than that for Rings II and III. This area was the only sampling context that extended above the present-day topography (see Figure 7). Interestingly, most of the shellfish (see Figure 7 and Table 2) sampled from this ring appears to be collected during the colder months. Of the nine sampled, seven evidence a

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Table 2. Frequency of clam and oyster by season of collection in the various locations sampled at the Sapelo Shell Ring Complex.

Ring	Excavation Unit	Level	Winter (Clam/ Oyster)	Spring (Clam/ Oyster)	Summer (Clam/ Oyster)	Fall (Clam/ Oyster)
I	1950 Trench	2	0 / 1	--	--	--
I	1950 Trench	3	2 / 3*	--	0 / 1	1 / 0
I	1950 Trench	4	0 / 1	--	--	--
II	Unit 1	1	2 / 0	--	--	--
II	Unit 1	2	1 / 0	--	3 / 0	--
II	Unit 1	3	1 / 0	--	1 / 0	--
II	Unit 1	4	--	--	3 / 0	--
II	Unit 1	5	--	--	2 / 0	--
II	Unit 1	6	--	--	3 / 0	--
II	Unit 1	7	1 / 0	--	1 / 0	--
III	Unit 9	2	0 / 1	--	--	--
III	Unit 9	4	1 / 0	--	--	--
III	Unit 9	5	1 / 0	1 / 0	--	--
III	Unit 9	6	--	1 / 0	--	--
III	Unit 9	7	1 / 0	--	--	--
III	Unit 9	8	1 / 0	--	--	--
III	Unit 6	2	0 / 2	--	--	--
III	Unit 6	5	--	--	--	--
III	Unit 6	6	0 / 2	--	--	--
III	Unit 4	3	1 / 0	--	1 / 0	0 / 1
III	Unit 4	4	0 / 1	--	--	--
III	Unit 5	3	1 / 0	--	--	1 / 0
III	Unit 11	3	0 / 1	--	--	--

*Denotes the cluster of shellfish that evidence a winter season of collection for Ring I. We suggest that this cluster represents the best evidence at the site for large scale short term processing and/or consumption.

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Table 3. Shell $\delta^{18}O$ Data Sequences.

Shell	$\delta^{18}O$ samples in sequence from growing edge (left) toward earlier in ontogeny (towards the right)													
Winter														
C2	1.35	.94	.03	.42	-.15	-.74	-1.25	-1.37	-1.54	-1.50	-2.50	-2.34		
C4	-.94	-2.27	-3.66	-3.36	-3.05	-2.44	-3.81	-1.64	-2.69					
C6	-.88	-.68	-1.75	-2.05	-2.38	-2.11	-2.91	-3.13	-2.89					
C7A	-.03	-.78	-1.95	-2.29	-1.78	-1.51	-1.81	-2.18	-1.26	-1.03	-.78	-.27		
C8	-1.65	-1.80	-2.71	-2.56	-2.72	-2.17	-2.28	-2.85	-3.17	-4.56	-2.52	-2.57		
C9	-1.78	-2.03	-2.24	-2.49	-3.15	-1.67	-2.87	-2.25						
C11	-1.00	-.33	-1.41	-1.93	-2.13	-2.87	-3.00	-2.88	-1.82	-2.19	-1.88			
C16A	.97	-.60	-1.70	-1.94	-.98	-1.98	-1.10	-.54	-.03	.28	.56	.86		
C17A	-.61	.38	-1.83	-1.78	-2.65	-.83	-.63	.36	.39	-2.60	-1.30	-1.30		
C26A	.42	.64	.64	-.31	-.68	-.75	-1.51	-1.41	-1.92	-1.63	-1.53	-1.27		
CLTS4	.39	.40	.61	1.51	1.34	.43	-2.05	-1.66	-2.39					
CLTS7	.18	.47	1.10	-1.35	-3.01	-2.00	-.80	-.62	-1.74	-1.88	-2.11			
O3	.24	.79	.99	.72	.50	.62	-.10	-.73	-.91	-1.23	-1.34	-1.60	-1.27	-1.73
O5	.67	.71	-.77	-2.50	-2.86	-2.78	-2.15	-2.88	-2.99	-2.29	-2.14	-2.20	-2.16	
O8	.85	-.07	-1.02	-1.64	-2.10	-2.29	-2.50	-2.18	-3.14	-2.50				
O9	.81	.58	-2.42	-2.41	-3.76	-3.70	-3.03	-3.15	-3.62	-2.99	-2.46	-1.84		
O13	-.76	-1.08	-1.84	-3.13	-3.47	-4.54	-3.88	-2.88	-2.67	-2.15				
O14	-.20	-.53	-2.53	-1.51	-1.37	-1.20	-3.05	-3.13	-.58	-2.51	-.97	-2.05	-3.50	
O15	-1.59	-1.82	-2.46	-2.95	-2.90	-2.69	-2.34	-3.14	-4.16	-3.33				
OLTS9	.20	.94	1.64	.36	-.91	-1.87	-2.75	-3.00						
OLTS11	.85	1.49	.10	-.99	-2.66	-1.33	-1.40	.16	.98	1.60	.86	-.91	-1.51	-1.58
OLTS12	1.14	.72	.07	.31	.33	-.24	-.39	-.75	-.44	-1.52	-1.42	-2.28		
OLTS14	.77	.74	.98	1.15	.41	-.27	-.27	-.97	-.83	-1.51	-1.16			
OLTS15	.01	-.14	-.62	-.76	-1.49	-1.25	-1.36	-.95	-.14	.40				
Spring														
C3	-2.54	-1.72	-1.07	-.80	-.75	-2.26	-3.95	-2.49						
C10	-1.42	-.97	-.97	.02	.36	-.21	-.28	-2.09	-.78	-3.04	-2.45			
Summer														
C1	-4.07	-3.33	-3.41	-2.75	-2.25	-2.05	-2.65	-2.55	-2.93	-2.86	-2.88	-2.39	-1.99	-2.29
C3A	-2.38	-1.97	-1.73	-1.42	-1.44	-.77	-1.65	-.73	-1.68	-1.62	-.15	-1.45		
C4A	-1.98	-2.01	-1.65	-1.17	.46	-.77	-2.01	-2.12	-2.48	-2.28	-2.39			
C6A	-2.69	-1.76	-1.91	-1.66	-.45	-1.77	-2.88	-2.44	-3.23	-2.82	-2.86	-2.68		
C9A	-2.17	-1.74	.07	error	-.18	-.56	-1.76	-1.93	-2.13	-2.17	-2.03	-1.87		
C10A	-1.64	-1.21	-.88	.27	1.22	.98	-.98	-1.66	-1.58	-1.77	-1.62	-.50		
C12A	-1.84	-2.44	-1.94	-1.54	-2.00	-1.51	-1.43	-1.49	-.56	-.23	.01			
C14A	-1.31	-1.98	-1.73	-1.94	-1.62	-1.70	-1.12	-1.24	-1.43	-.98	-.70	.08	.49	
C15A	-1.40	-1.15	-.93	-.68	-.21	.96	.78	1.60	.23	-1.63	-1.74	-1.55		
C18A	-1.54	-.93	-1.01	.38	-.92	-1.79	-.30	-1.44	-.52	.60	-1.50	-2.26		
C19A	-1.81	-1.59	-1.62	-1.57	-1.09	-.26	-.13	.37	.28	.61	1.29	1.16		
C20A	-2.36	-2.89	-1.09	-.65	.25	1.00	.53	.06	-1.85	-1.76	-1.58	-1.92		
C21A	-1.84	-1.62	-1.57	-1.39	-1.34	-.95	-.32	.06	1.32	.77	-1.15	-1.92		
C22A	-2.11	-1.81	-1.89	-1.26	-.86	-.52	-.03	.45	-1.31	-1.90	-1.55	-1.93		
C24A	-1.76	-1.79	-1.76	-.32	-.14	-1.77	-2.08	-.64	.27	-1.38	-.79	-1.05	-1.41	
OLTS10	-2.10	-2.71	-2.90	-2.05	-.76	.43	1.22	.22	-1.71	-1.42	-1.68	-1.63	-1.83	
Fall														
C5	-1.81	-2.86	-3.69	-2.18	-2.63	-1.97	-.86	-3.33	-2.76					
CLTS2	-.01	-1.35	-1.41	-1.27	-1.12	-.47	-.65	-.28	-.67	.30	.68	1.28	1.16	
O10	-1.41	-1.61	-2.34	-2.90	-3.09	-2.74	-1.91	-1.45	-.28					
Undetermined														
C1A	-.83	-1.88	-2.16	-2.30	-1.67	-1.90	-1.79	-2.19	-2.44	-1.98	-2.13	-2.02		
C2A	-1.67	-1.81	-1.83	-1.57	-1.61	-1.84	-1.77	error	-1.30	-1.40	-.95	-.92		
C5A	-1.73	-2.12	-2.39	-2.18	-2.18	-1.79	-1.92	-1.83	-1.96	-1.72	-2.19	-1.90		
C7	-2.46	-2.47	-2.60	-2.05	-2.04	-3.12	-1.42	-3.04	-2.07	-3.09				
C8A	-.66	.46	-.87	-.26	.65	1.26	-1.56	-1.07	-1.59	-1.10	-1.01	-.51		
C11A	-1.18	-.82	-2.08	-1.56	-1.59	-1.18	-1.09	.41	.67	.19	-1.79	-2.57		
C13A	-.29	-.22	-1.12	-.53	-1.60	-1.26	-2.16	.17	-.41	-1.11	-2.20	.11		
C23A	-.95	-.56	-.64	-1.34	-1.47	-.62	-.26	-1.57	-.44	.53	.63	-.10		
C25A	-1.19	-1.47	-.82	-2.09	-1.74	-1.87	-1.92	-1.67	error	-1.02	-1.19	-1.30		
CLTS6	-.52	-1.54	-1.29	-.46	.12	-1.86	-1.72	-1.68	-1.01	-1.24	-.09	.47		
O4	-.17	-2.93	-2.89	-3.04	-1.27	-1.64	-1.01	-2.47	-2.42	-2.42	-2.37			
O7	-.99	-1.32	-1.42	error	-4.05	-5.26	-4.95	-5.17	-5.01	-4.84	-4.87	-5.57		
OLTS3	error	-2.95	2.49	2.03	.96	.02	-.68	-1.03	-2.45	-2.13	-2.03			

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winter collection and another is interpreted as being fall (OLTS10). In the same level, but somewhat removed from the two clusters that evidence cold month collection, is one oyster (OLTS10) that seems to indicate a late summer/early fall collection. Thus, when compared to the other rings, Ring I seems to have a pattern that is divergent. While the other rings have specimens with an opposing season of death (e.g., winter and summer) in relatively close proximity (< 20 cm), Ring I deposits do not.

Summary Points

As with any paleo season of death estimation technique, caution is required in interpreting these data. Several factors can contribute to misleading results for both the incremental and isotopic analyses. Mollusk shells, particularly ontogentietically old ones, may not grow throughout the year (see Andrus and Crowe 2008 for examples). Surge et al. (2001) note that oysters from southern Florida cease growing above ~28°C, which may suggest limited growth in parts of mid-summer if past temperatures near Sapelo Island were similar to today. Other seasons of the year may also contain periods of growth diminishment or cessation due to cold, spawning, disease, oxygen availability, and other factors. Additional ambiguity can be introduced by changes in salinity and micro-environmental variability. For example, although temperature may be the principle factor controlling shell $\delta^{18}O$, variation in salinity could cause seasonal amplitude in $\delta^{18}O$ to be significantly amplified or attenuated.

Growth patterns in clams vary with latitude (Jones and Quitmyer 1996), and the Georgia coast seems to be in a transitional region where seasonal growth rate may differ significantly between individual shells (Andrus and Crowe 2008). In one habitat of St. Catherine's Island, for example, clams displaying opaque and translucent growth were found in each month of the year in a modern control sample (Andrus and Crowe 2008). This St. Catherine's collection was biased toward geriatric clams so it may not be broadly representative, but nevertheless this variation introduces at least some error into incremental analysis of season of capture. Recent research also indicates that growth-banding patterns can vary over time in a single location, possibly in response to environmental change (Henry and Cerrato 2007).

Efforts were made to avoid these sources of error and bias. The shells in the Sapelo middens were not as ontogenetically old as those of the aforementioned modern St. Catherine's Island study. Shells that did not contain a $\delta^{18}O$ oscillation or trend were discounted from our interpretation. Likewise, shells with evidence of obvious growth breaks earlier in ontogeny were also removed from our $\delta^{18}O$ analysis. If a shell did not have a complete oscillation prior to the time of capture, the most conservative possible seasonal interpretation was offered. By sampling a comparatively large number of shells and utilizing multiple analytical methods we hope to minimize the impact of anomalous growth patterns. Since each of the methods used during this research have largely independent sources of error, yet corroborate and converge on a single interpretation, we argue the conclusions are trustworthy.

Based on our results we can evaluate the two research questions posed at the beginning of this paper. Our study indicates that (1) shellfish deposition occurred at the site during all four seasons of the year, and (2) the rate of deposition was variable among the different rings. While Rings II and III seem to have accumulated gradually, Ring I deposits are comprised of a cluster of shellfish primarily collected during one season. We offer our interpretations and explore the implications of these findings below.

Evaluating Mobility, Monumentality, and Feasting

We argue that at least some portion of the inhabitants of the Sapelo Shell Ring complex occupied it year-round based on the isotopic, growth band, and faunal analysis (Figure 11). The interpretation of year-round occupation for the site as a whole is directly relevant to models of shell-ring formation and use. This suggests that at least one function of ring sites was daily habitation, an idea put forth by many shell ring researchers (e.g., DePratter 1979; Russo 2004; Trinkley 1985; Waring and Larson 1968).

That Sapelo evidences year-round occupation should come as no surprise. Marrinan's (1975) study of the Cannon's Point shell ring site found evidence for all seasons except winter. This site is located on the next island (St. Simons) south of Sapelo. Subsequent analyses of clams from the site

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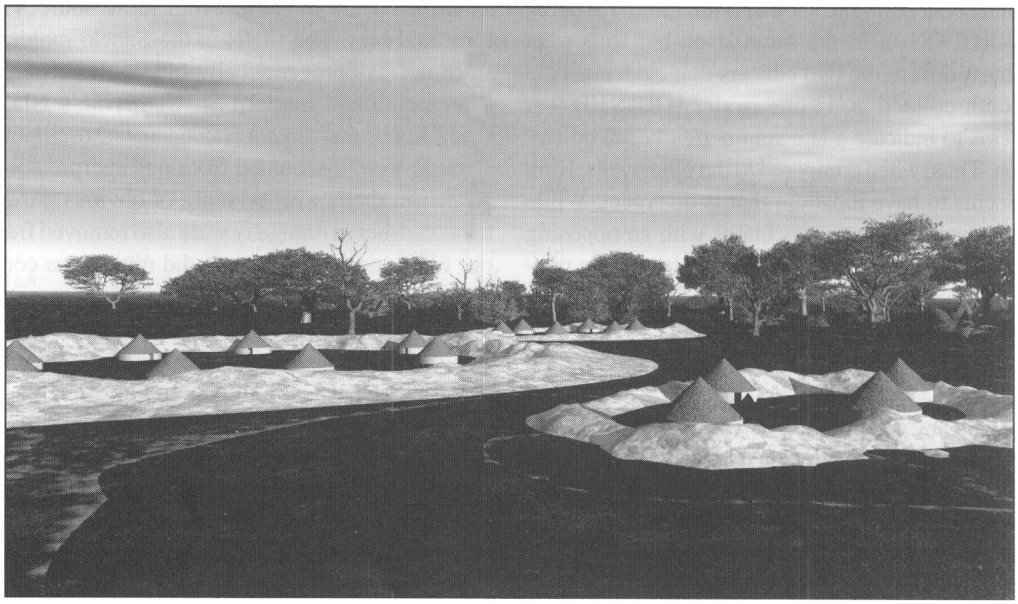


Figure 11. Artist reconstruction of the Sapelo Island Shell Ring complex as a village site. While no definitive house structures have been located on the immediate interior of the shell rings at Sapelo, several pit features and posts are located in this area and Thompson (2006, 2007) has argued, based on ceramic distributions, that these represent domestic locations. In addition, at other ring sites in Florida, Russo (1994:97) has identified houses just on the interior of the rings (graphic design by Gary Daniels).

by Quitmyer et al. (1985:34) indicates that the most intense period of clam collection occurred during the spring months; however, the collection profile also indicates late winter collection occurred as well. In southwestern Florida, Russo (1991, 1998) suggests year-round occupation for Horr's Island, a pre-ceramic shell ring. The mounting data suggests that, for the Late Archaic landscape, shell rings were places that were occupied throughout the year. To be sure, the mobility patterns of Late Archaic peoples along the Georgia coast most likely included a number of different strategies; however, these data provide insight into at least one aspect of these patterns. That is, the importance these sites played throughout the year to a least some portion of the population.

In addition to mobility patterns and importance of place, the results presented in this paper also lend insight into the behaviors associated with, and possibly the changing function of, shell rings. At Sapelo, isotopic data from Ring II and III indicate that the areas sampled accumulated gradually over multiple seasons. The area sampled from Ring I; however, indicates, *relative to the other two rings*, a rapid accumulation where the season of death results suggest most of the animals were collected and deposited over a shorter time interval (during the colder months). We caution here that oysters comprised the majority of shellfish sampled from this area, and their dominant season of collection is winter for the site as a whole; however, a minority of other seasons are represented. Therefore, it is possible that what we are dealing with is a deposit of oysters collected over several winters, or over the course of one winter, and not a single episode. However, there are two reasons that lend support to the idea that at least parts of these deposits represent larger scale episodes or events compared to the other two rings. First, we do know that oysters were collected by later inhabitants throughout the year based on Keene's (2004) isotopic studies of oysters from the Groves' Creek site along the Georgia coast. Therefore, we should expect oysters to evidence multiple seasons of collection. Second, the deposit, at least in terms of a macroscopic view of the profile, is comprised of a large quantity of oyster and very little clam. This lower frequency of clam compared to oyster in the profile suggests the targeting of a specific resource; however, we offer this as a tentative observation, since the

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deposits could only be viewed in profile. Despite all of this, it is still possible that these deposits accumulated gradually; however, based on the available evidence, we argue that at least some of these deposits do indeed represent a short-term, large-scale, processing episode.

These data on season of deposition are directly relevant to the evaluation of models of shell rings. Data from Rings II and III, which indicate multiple seasons of deposition, do not support the view that these rings were intentionally constructed mounds, nor do they evidence large-scale feasting. While feasts probably occurred at shell-ring sites, Rings II and III seem to be composed primarily of quotidian subsistence remains, such as those that might have been discarded by the occupants as they went about their daily lives. This interpretation corresponds with what others have said for pre-ring deposits (e.g., Russo and Heide 2003; Trinkley 1980); therefore, Ring III may be interpreted as a developing ring. Ring II seemingly represents the contiguous shell deposits that are normally associated with shell rings; however, the season of collection data indicates a similar function as Ring III (i.e., habitation). Thompson (2006, 2007) has argued elsewhere for a domestic function for Ring III with habitations located just on the interior and/or beside shell deposits. The isotope data seem to corroborate these findings. It is also interesting to consider the regular spacing noted for the shell deposits around the circumference of the ring (see the earlier discussion). This perhaps relates to the formal use of space and notions of social distance between domestic units around the ring; however, for now this is speculation.

Despite the fact that Rings II and III from Sapelo evidence gradual accumulation, we should not take this to mean that all rings form in this way. After all, there is compelling evidence that at least some groups constructed mounds during the Late Archaic in the Southeast (e.g., Russo 1994; Saunders et al. 2005). Thompson (2007) argues for the possibility that the dominant function of shell rings changed through time as well as the concomitant depositional processes. This suggests the possibility that some of these sites began initially as habitation sites. Note this does not preclude the absence of ritual and/or feasts at these places. In contrast to Rings II and III, the deposits from Ring I seemingly indicate different depositional processes or a divergent pattern. We argue in this paper that at least part of these deposits are the result of short-term, large-scale, processing and, therefore, are the product of distinctly different behaviors than those deposits tested for Rings II and III. We suggest that the cluster of shellfish in Ring I, which we identify as being collected mostly during the colder months, represents possible feasting remains.

Returning to our definition of feasting as conspicuous consumption of comestibles that are grand in scale or quality, we suggest that Ring I deposits fit our criteria. As noted earlier, one of the keys to identifying feasting remains is that feasting deposits should be divergent from quotidian meals in scale and quality. The deposits in Ring I do indicate a divergent pattern than the ones identified in Rings II and III, which are interpreted as shellfish consumption associated with habitation. Further, the deposits associated with Ring I are in a different context, as these deposits are found in the largest ring at the site, well above the modern ground surface. Thus, they have a different quality in that they are highly visible; and, as we point out earlier, these deposits reach a height of around three meters.

Despite the above points, at present, we have no way of evaluating if shellfish were consumed immediately after processing, and it is therefore possible that these deposits represent intensive shellfish processing for storage. The reader is directed to Waselkov (1987) for ethnohistoric descriptions of shellfish processing for storage and/or trade in eastern North America. In either case, these deposits may have perhaps meant something different to the individuals that participated in the production. The large deposits may have served as a reminder of the stability of the community (e.g., life is good) or they may have invoked memories of ceremonies past. While such statements are speculative at best, they are nonetheless important ideas to consider here.

Currently, the available data do not allow us to speak to the dominate function of Ring I vis-à-vis Rings II and III; however, we do note that the size of the ring is much larger and suggest that at least a portion of its dense shell deposits accumulated quickly suggesting that Ring I may have served a different function than the other two rings. Do any of the deposits in Ring I evidence gradual accumulation suggesting multiple depositional processes? We suspect that the majority of the

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deposits in Ring I did emerge by gradual accumulation as a direct result of habitation; however, it is beyond the scope of the data here for us to evaluate this hypothesis. If Ring I did form in this fashion, then a case could be made that it does indeed represent a case where a habitation area takes on a role of monument—thus, again coming back to the two variables of scale and quality.* Certainly, the scale of the deposits of Ring I changed over time, but large-scale deposits alone are not enough to suggest that such structures did indeed become monuments. The question then becomes tied to the other dimension in our definition of monument—quality. Again, the nature of our study suggests at least some of the deposits represent a different kind of behavior than those associated with the other two rings, which we tentatively identify as feasting. If this is the case then Ring I fits with our definition. For now such an interpretation is tentative; however, we argue that by following the method outlined in this paper, this question certainly can be addressed.

One of the problems that plague the study of shell rings/mounds and middens is the issue of ritual intentionality. Did inhabitants intentionally construct rings and other large shell piles as part of some ritual or to serve some ceremonial function? To assign or privilege a ceremonial or domestic function over one another obscures the diversity of behaviors and denies agency to the people who actually created these archaeological sites. One may legitimately ask if there is ever a separation between domestic and ritual behavior (see Bradley 2003). The question we must ask is, how are certain activities differentially expressed over time? For example, how does the consumption and disposal of shellfish change through time? At shell-bearing sites, where the very material (i.e., shell) can obscure variability in behavior, we must develop rigorous methodological techniques to examine these issues. We have described in this paper one approach, season of capture studies, that represents a step in this direction. In this paper, we focus on timing of collection and deposition as a way to access shell-ring formation processes as well as to examine the mobility strategies of the people who occupied these sites. Clearly, we now need to focus on how and if these behaviors changed through time. Season of capture studies represent a way these issues can be addressed. The analysis presented here is a first step in understanding the complex behaviors and social histories that these sites represent.

Concluding Thoughts

The southeastern United States is emerging as a key study area for the investigation of monument construction among hunter-gatherer groups (Gibson and Carr 2004; Thompson 2010). Many of the sites that are contributing key information on this issue are located in the coastal areas of the Southeast. In some of these areas, hunter-gatherer economies supported these activities up to historic contact (Thompson and Worth 2011). Thus, the Southeast is proving to be of critical importance for the evaluation of not only the beginning of these traditions, but their long-term trajectories as well. Our study here adds to the mounting evidence that the Late Archaic period included, not only shifts in mobility strategies, but also the very beginnings of the built environment. To some extent, southeastern archaeologists have been aware of hunter-gatherer monument construction and early sociopolitical complexity at places such as Poverty Point (Gibson 1996). However, the picture that is emerging is that such traditions were much more widespread and operated at multiple scales and in more diverse environments than previously thought (see Sassaman 2008).

This new picture of the Archaic, however, would not be possible if southeastern archaeologists had not begun to rethink some of the critical issues associated with Archaic period complexity on both a theoretical and methodological basis (see Sassaman 2008). Our study presented herein adds to this by reconsidering the ways in which we think about how sites like shell rings took on diverse meanings over time. This is important for not only the southeastern United States, but for archaeologists in other areas that are concerned with the study of the emergence of phenomena. Following Joyce (2004), we argue that to understand the roots of monumentality we must look to the daily life of peoples, their actions, and both the intended and unintended results of those actions. Thus, we must problematize monuments, and as we have shown in our analysis, habitation sites as well, and not look at them as simply a single entity, but rather as the product of numerous actions and intentions that

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deliberately work to define peoples' places within society (e.g., Pauketat 2007:42; see also Joyce 2004). We should not expect the earliest monuments within a region to be as easily identified as those of later time frames in the same area. Energetic arguments regarding monuments, while useful, do not elucidate the full spectrum of monumentality. As we argue, the quality, a structure's inherent properties ascribed by human action, is as much a part of monument making as the energy inputs to create something on a grand scale. Thus, it is the inherent tensions created by these different actions of individuals and the meaning-laden artifacts (e.g., ceramics) and ecofacts (e.g., shell deposits, plants, and other fauna) associated with these processes that enable people and groups to reaffirm and/or renegotiate the importance and function of a particular place or set of architectural elements (e.g., a shell ring) within society. Key to understanding these actions and changes is a careful analysis of not just the artifacts in a deposit, but also the sequence of behaviors associated with their deposition. The use, function, and social meaning of places on the landscape are palimpsests and as such require detailed analyses, such as the ones described in this paper.

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Notes

1. The use of the words "clean," "loose," etc. admittedly cause problems when describing shell layers. Shell midden profiles are often more complex as noted by Waring and Larson for Ring I; however, our use of these terms is not so much as accurate description of the deposit, but rather how archaeologists use these terms to support or refute models. Our purpose in this article is, in part, to present a methodology that provides an additional way to evaluate these deposits.

2. While Simpkins (1975) provides a detailed topographic for the time, he was not able to document the existence of rings II and III. This subsequently led Larson (1998) to speculate that the other two rings did not exist. Thompson (2006; Thompson et al. 2004), using a modern total station and computer processing, has been able to show topographically, in addition to the remote sensing, the other two rings.

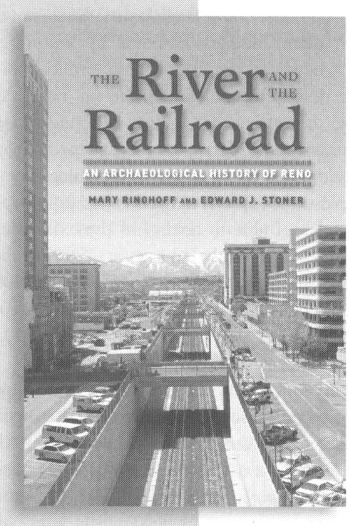
3. The regularity and patterning of Ring III at the Sapelo Island Shell Ring complex suggests a formal site structure. While the site has been plowed, it seems it has suffered minimal disturbance from these activities. In almost all the excavation units, mixed deposits containing later prehistoric pottery is located above Late Archaic deposits suggesting intact Late Archaic deposits. Further in some units, radiocarbon dates are in chronological sequence from the bottom of the excavations to the top. Finally, while mining for shell has impacted a number of shell rings, Ring III seems to have only suffered minimally from such activities. Mining typically leaves gaping depressions and such activities are readily observable in Rings I and II. Ring III only evidence a small area where this is the case. See Thompson (2006, 2007) for a complete description of the archaeological excavations and associated remains.

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