

UNDERSTANDING CHANGE IN VESSEL TECHNOLOGY AT THE SAPELO SHELL  
RING COMPLEX (9MC23), SAPELO ISLAND, GEORGIA

by

BRONWYN MATLICK

(Under the Direction of Victor Thompson)

ABSTRACT

Archaeological sites known as shell rings are found along the southeastern coast of North America. Shell Rings are circular to arcuate-shaped deposits of shell, artifacts, and other faunal remains that occur along both the Atlantic and Gulf coasts of this region. The Sapelo Shell Ring complex located on the northwestern end of Sapelo Island, Georgia, was primarily occupied by hunter-gatherers during the Late Archaic Period (approx. 5000-3000 BP), a time of large-scale environmental shifts on the coast. This study seeks to understand whether shifts in the broader social and natural environment of the southeastern coast are reflected in changes in ceramic technology at the Sapelo Shell Ring complex. This study found significant differences in the size class of vessels over time, which relates to shifts in group size resulting from large-scale environmental changes. This study contributes to our understanding of how technologies change due to social and environmental factors such as climate change and subsistence availability.

INDEX WORDS: Coastal Archaeology, Late Archaic, Shell Rings, Ceramic Analysis

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B.A., University of Georgia, 2024

A Thesis Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment  
of the Requirements for the Degree

MASTER OF ARTS

ATHENS, GEORGIA

2025

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May 2025

## DEDICATION

For my grandfathers B.K. Matlick and Jerald “Poppy” Stover in heaven. Thank you for believing in me and teaching me so much about the world.

## ACKNOWLEDGEMENTS

I am greatly appreciative of the UGA Laboratory of Archaeology for their support, and all they have taught me. I thank my major advisor Victor Thompson, and committee members Attila Gyucha and Danielle Riebe for their help and insights. I also thank my wonderful friends that have always supported and helped me through this project: Sophie Forbes, Haley Liddle, Seungyeon Hong, Solmaz Amiri, and the first-year graduate cohort. I am also indebted to my family for their encouragement and support.

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## CHAPTER 1

### INTRODUCTION

In this thesis, I analyze some of the earliest pottery on the Southeastern Atlantic coast, which is found in association with shell ring sites. These sites were occupied year-round by hunter-gatherer-fisher peoples during the Late Archaic period (5000-3000 BP), who managed marine and estuarine resources in sustainable ways to facilitate occupation at shell rings for over 1000 years. They were known for using fiber-tempered St. Simon's pottery, which can help archaeologists better understand shifts in social and environmental factors overtime. This study aims to determine if and how ceramic changed overtime at the Sapelo Shell Ring Complex (9MC23) and what these changes meant for the people living at these shell ring villages.

Coastal environments around the world have attracted humans for as long as we have been a species (Marean 2014). These areas offered a way to easily move along the shores and river valleys, better connecting social networks and facilitating access to a variety of resources (Bailey 2004:39). The coastal sites of North America tell the stories of people who inhabited these coastlines for millennia prior to European colonial invasion. Among these are shell rings, - formations of round or arcuate shape deposits of shell, faunal bone, and artifact accumulations, encompassing a relatively shell-free interior plaza (Russo and Heide 2001). Early coastal inhabitants created shell rings through the remains of large-scale shellfish harvesting, the most abundant being the oyster (Russo and Heide 2001:491). These sites can range in size from 30 meters to 250 meters in diameter (Russo 2006; Thompson et al. 2024a). They are visible in the archaeological record along the coasts of Florida, Georgia, Mississippi, and South Carolina.

Hunter-gatherer-fisher groups constructed these sites during the Late Archaic period of the along the Southeastern coasts (5000-3000 BP) (Russo and Heide 2001; Thompson et al. 2024). Shell rings are also found along a few other coasts across the globe, such as in Jomon period Japan and South America (Dillehay et al. 2023; Habu 2004).

The shell rings on the Georgia coast lie within the physiological district of the barrier island sequence, which is a chain of islands, the mainland coast, marshes, brackish river channels, and maritime forests (Elliot and Sassaman 1995:7). The appearance of shell rings on the landscape signifies the presence of sedentary communities (Thompson et. al. 2024b). While there is some debate as to the function of shell rings (Russo 2004; Sanger 2015; Sassaman 1993; Saunders 2004; Thompson 2006; Thompson 2010; Thompson et. al. 202 Trinkle 1985; Thompson 2007) we know that some were villages which were occupied by fully to partially sedentary, hunter-gatherer-fisher peoples. These sites represent some of the earliest examples of year-round sedentary settlements and ceremonial spaces in southeastern North America (Thompson and Andrus 2011; Thompson et al. 2024b).

Although Native people lived on the North American Southeastern coast before the “Late Archaic” period (Cook Hale and Garrison 2019; Cook Hale and Sanger 2020; Turck 2012), favorable environmental conditions marked the beginning of increased sedentary living at these shell rings. Sea levels and surface temperatures had reached modern levels on the coast between 6000- and 4000-years before present (BP), which allowed for extensive shellfish beds to form along coastlines (Claasen 1986; Quitmeyer et. al. 2005). Along the Georgia Coast we have good evidence that these oyster reefs were available to humans by at least 5000 years ago (Garland et al. 2024).

The latest research in coastal archaeology of the American Southeast supports the notion that people who lived in the region developed traditions and practices to support an enduring resilience to constantly changing environments (Thompson et. al. 2024b). They practiced a kind of “mariculture” involving large scale yet sustainable harvesting of shellfish beds (Thompson et al. 2020). These groups also harvested from a diverse range of habitats for resources, related to the proprietorship of various reefs and oyster beds managed by social networks or kin-groups (Thompson et. al. 2024a, b).

Hunter-gatherer-fisher groups constructed and inhabited shell ring sites in the region during a time of intensive coastal occupation (Colaninno 2012; Colaninno 2010; Marrinan 2010; Marrinan 1975; Parsons and Marrinan 2013; Sanger and Ogden 2018; Waring 1968; Waring and Larson 1968; Sanger 2015; 2021; Thompson and Turck, 2009; Turck and Thompson 2016). The shift from mobile to sedentary life would have allowed communities to have a more intimate knowledge of their immediate surroundings, and they were now able to construct long-standing spaces of social or religious significance. Sedentary communities often lead to more privatization of the landscape and changes in domestic architecture (Ali 2016:97-99).

To people living on the Georgia bight, oysters and fish were one of the most steady and important food sources depending on the time of year (Reitz et. al. 2022:3). Fisheries were a major part of their subsistence economy, which they likely managed using generations of traditional ecological knowledge (TEK) (Berkes, Colding and Folke 2000; Reitz et. al. 2022). Deep knowledge of their coastal ecosystems developed through this TEK and interactions between their environmental and social networks. Such past sustainable harvesting practices are of interest to current researchers, considering modern commercial fishing activities and their

effects on the live coverage of oysters on the Georgia Coast (Thompson et al. 2020; Walker and Cotton 2001).

Related to subsistence practices is the process of preparing and cooking food for consumption. The emergence of early pottery on the Southeastern coast around 4500 years BP (Elliot and Sassaman 1995; Sassaman 1993, 2004) is associated with the onset of more sedentary communities. This is likely because pottery is breakable and takes a certain amount of time to produce necessitating some degree of reduced mobility for its broad scale adoption (Arnold 1988:109-110). Once these communities became established, there was a rapid adoption of pottery production at these villages (Thompson et al. 2024a).

The advent of ceramics in regions across the world provided a substantial technological advantage because of their use in food processing. Cooking with ceramic vessels made it easier to process food via boiling or steaming and required less effort and supervision than indirect cooking methods like stone boiling (Arnold 1988:128). It keeps nutritious material contained within the vessel during cooking, increases nutritional value, and detoxifies food with potential harmful elements, such as bacteria, natural toxins, or fungus (Arnold 1988:135). These benefits were valuable for communities across the world as they developed their own ceramic vessel technologies.

Baked clay objects (BCOs) were likely important tools used for indirect cooking in the place of boiling stones on the coast (DePratter 1979:19; Sassaman 1993:70). These were used prior to the addition of ceramic vessels to these coastal communities and are found in the older stratigraphic levels at this site (Waring and Larson 1968: 270).

*Thesis Research*

Previous research on shell rings has produced a wealth of data that allows archaeologists to understand how people may have lived in these sedentary coastal villages. Yet, more work is needed to understand how technology cooking in these places has changed throughout the occupation of this site. My research question addresses this problem by asking: Are shifts in the broader social and natural environment documented for the Georgia Coast and at the Sapelo Shell Ring Complex reflected in changes to pottery technology during the Late Archaic period? As noted earlier, Ring III is the smallest shell ring and given its size, likely inhabited by fewer individuals and fewer cooperating households than Ring I and II. During the period that Ring III was occupied, sea levels began to lower, and there was a cessation of shell fishing in the region. As a result of environmental changes, settlements associated with the shell rings were abandoned (Thompson and Turck 2009; Sanger 2013).

To examine if shifts in environmental and social circumstances at the end of the Sapelo Shell Ring complex occupation affected ceramic production and use, I conducted an analysis of ceramics from all three shell rings on Sapelo. All the collections used in this study are housed at the University of Georgia Laboratory of Archaeology and the University of West Georgia Waring Laboratory of Archaeology. This study builds on conclusions previously established by Thompson (2006), with new data and analysis criteria. In short, Thompson (2006) determined that this complex had pottery intended for domestic use, suggesting a primarily residential function.

My research incorporates both temporal data (i.e., the results of radiocarbon dating) and new ceramic samples not available to Thompson when writing his dissertation. Therefore, while Thompson previously observed some differences in his previous study of ceramic technology, sample sizes were limited and changes in technology over time were not well understood.

This thesis is guided by a single overarching hypothesis which is as follows:

**Hypotheses 0 (null). The ceramic assemblage from Ring III will NOT be significantly different from that of Ring I and II in terms of its overall form and function characteristics.**

**Hypotheses 1. The ceramic assemblage from Ring III will be significantly different from that of Ring I and II in terms of its overall form and function characteristics.**

Rejection of the null hypothesis would infer that the pottery at this site changed over time in response to social and environmental factors related to climate change and community decisions.

### *The Sapelo Island Shell Ring Complex*

The Sapelo Shell Ring Complex (9MC23) archaeological site is located on the northwestern end of Sapelo Island, on the Georgia Coast. It is composed of three separate shell rings, as well as areas outside of the rings (Thompson Stoner and Rowe 2008:197). The Sapelo Island Shell Ring Complex contains one of the largest shell rings along the Georgia Coast. Further, its rings date to various periods of use including rings that were occupied during a time that shell ring villages were ubiquitous on the landscape, as well as one of the last shell ring villages of the Late Archaic period (Thompson et al. 2024b). These attributes make it a prime research site for addressing questions regarding changing traditions over the time these villages existed within the landscape.

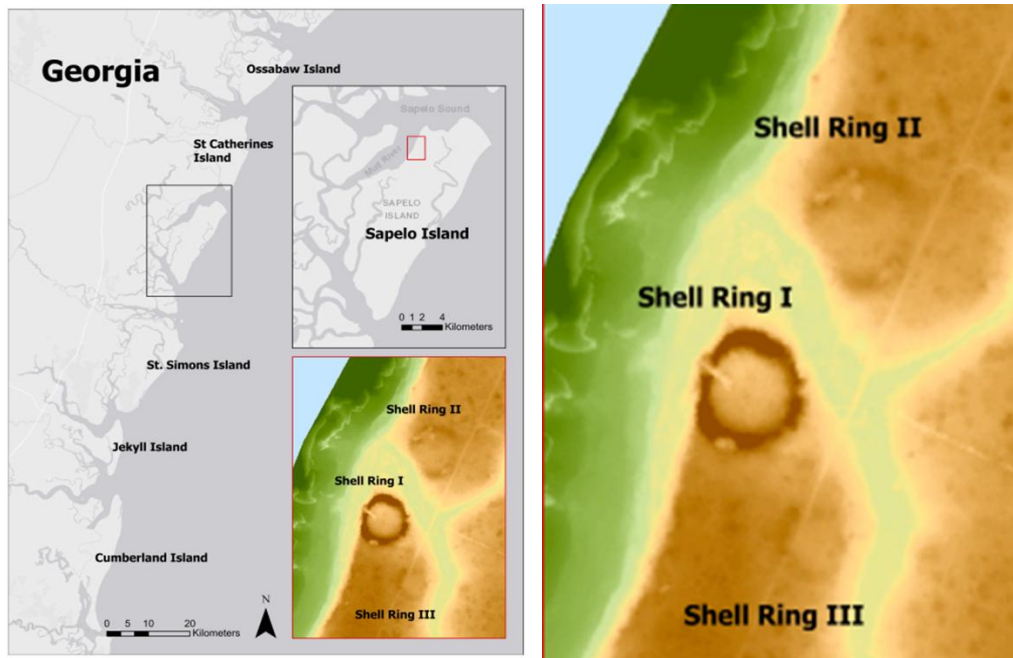


Figure 1.1 Map and LIDAR of the Sapelo Shell Ring Complex from Garland and Thompson 2023:figure 1).

Sapelo Ring I dates from 4210 to about 4140 years before present (68% probability) (Thompson et. al. 2024a). This is the largest of the rings at a shell volume of 5660 cubic meters and covers an area of 6000 square meters (Garland et. al. 2022:4). It is visible from the surface topography and is about 90 meters in diameter and stands up to 3 meters above the modern ground surface.

Ring II is the northernmost ring and dates to 4140 to about 4040 years before present (68% probability) (Thompson et. al. 2024a). This ring has little topographic relief (Thompson and Andrus 2011:328) and is about 90 meters in diameter like Ring I (Thompson et. al. 2024a). Ring III dates from about 4000 to 3900 years before present (68% probability), making its occupation duration later than Rings I and II (Thompson et. al. 2024). Ring III is the smallest at about 52 meters in diameter and was probably inhabited by fewer individuals and cooperating

groups than Rings I and II. It also consists mostly of subsurface shell deposits (Thompson and Andrus 2011).

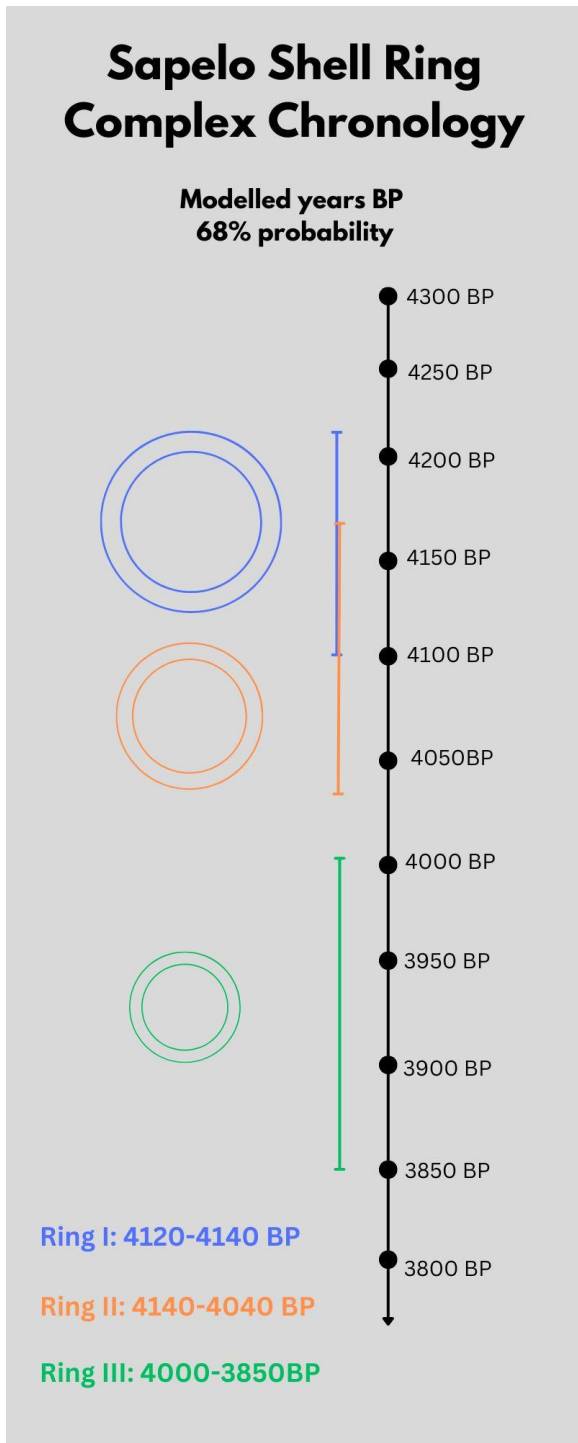


Figure 1.2 Timeline of ring occupation at the Sapelo Shell Ring Complex.

There is also evidence of occupation outside these rings, which is less dense and not associated with any shell deposition (Garland et. al. 2022, Thompson 2006). These spaces were occupied at earlier and later times than the rings themselves (Thompson 2006, 2007). Thompson argues that the additional middens to the south of Ring I represent occupations dated before at least two of the rings (I and II) at this site (Thompson 2006).

Ring III was the last shell rings to be built and occupied on the Georgia coast (Garland et. al 2022), before it was abandonment at around 3850 BP. Little to no evidence of shell fishing after this time is seen in the archaeological record (Ritchison et al. 2021; Turck and Thompson 2019; Turck and Thompson 2016) (Thompson 2007, Thompson, and Andrus 2011). This is supported by isotopic analysis (Thompson et al. 2004b:6) which confirmed that Ring III had significantly lower salinity levels, which correlates with sea level regression and climate shifts like those seen at the beginning of the Late Archaic period that likely negatively impacted fisheries (Thompson et. al. 2024b:6). At the time people occupied Ring III, large-scale environmental changes, including the lowering of sea level and rainfall in the region were shifting from previous more stable conditions (Garland et al. 2022; Thompson et al. 2024b). In the face of these ecological shifts, shell ring communities developed sustainable and resilient strategies to manage resources for over 1000 years (Thompson et. al. 2024b).

### *Theoretical Frameworks*

The theoretical perspectives that I take in this study views ceramic analysis and origins through the lens of cultural and historical ecology, which generalizes about cultural comparisons by looking at the relationship between technological change and the environment (Tucker 2013:142-143). I note that people are not merely reactors to their environment but also are agents of change and make a range of choices within a complex dialectic (see Crumley 2021; Balee

2006). Archaeologists have applied these concepts to a number of ceramic studies. Dean Arnold (1988) provides some of the more relevant points for my own work. He argues that pottery production is related to both the environment and culture, and that these three factors (environment, culture, and production) are connected through a cybernetic perspective (Arnold 1988:17). Arnold found through ethnographic research that climate affects ceramic drying and firing processes, which affect the initial development of pottery production. The onset of ceramic technology in a region is also related to resource access, scheduling conflicts with other subsistence activities, degree of sedentary behavior, demand of ceramic vessels for nutrient flow, and population pressure, among others. These factors, according to him, act as feedback mechanisms which either promote or discourage the initial invention of pottery and its establishment as a craft (Arnold 1988:18).

In terms of middle range theoretical linkages, I draw on insights from behavioral archaeology to look at performance characteristics and how these change over time in terms of the production and use of ceramics. For example, Schiffer and Skibo (1997) proposed that each artifact has a behavioral chain of interactions. They posit that artifact variability is influenced by desired performance characteristics, technical choices, and situational factors such as an artisan's knowledge and experience. A single activity on an artifact's behavioral chain can influence the nature or order of the technical choices that are considered in the artifact's production, such as temper type and proportion. Situational factors are external factors (behavioral, environmental, or social) that influence activities on the behavioral chain of an artifact. These situational factors influence the significance of certain performance characteristics (Schiffer and Skibo 1997). Much like Arnold's interconnected relationships within cultural ecology, ceramics have been

considered within a network of interactions. In this model, a ceramic object is a result of a chain of interactions.

To some extent, Sassaman (1993) and Thompson's (2006) dissertation work follow similar approaches to studying Late Archaic ceramics. However, neither of these studies had the revised chronologies for these sites that we have now to be able to look at this in greater detail and understand how such shifts in technologies related to the suite of choices that people were making in the context of broader environmental shifts. My study detailed herein incorporates previously known research on the ceramic assemblage, along with observation on newly collected samples, at this site and to offer a new perspective on pottery technology change during the occupation of the Sapelo Shell Ring complex. This perspective approaches ongoing questions of how people in these shell ring villages adjusted and changed their lifeways over the centuries.

#### *Thesis Summary*

In this thesis, I explore whether shifts in environmental and social circumstances at the end of the Sapelo Shell Ring complex occupation affected ceramic production and use. High resolution chronology has allowed researchers to gain a more detailed picture of this site, making it a prime case study for understanding the relationships between environmental and social shifts and technological change. Through ceramic analysis I seek to understand how pottery changed overtime at this site in the wake of this constantly changing environment, which answers broader questions about groups that lived on the Georgia coast during the latter part of the Late Archaic period. I use theoretical frameworks of cultural ecology related to ceramic processes (Arnold 1988), and artifact variability (Schiffer and Skibo 1997) to contextualize changes in ceramic technology over time.

In chapter 2, I provide cultural and ecological context of the study region and summarize previous archaeological research on the Georgia coast and the Sapelo Island Shell Ring complex. I discuss the ecological background of the South Atlantic region and highlight its importance as a key factor in bringing people to the coast during the Late Archaic period. I describe how these environmental conditions were related to some of the first sedentary settlements in this highly productive region. I then discuss some past archaeological research that precedes and guides this study, especially previous ceramic analyses (Thompson 2006, Sassaman 1993, 1998) and recent chronological and isotope geochemistry studies (Thompson et. al 2024a, b; Garland and Thompson 2023).

In chapter 3, I describe the methods I used for this study. Using ceramic analysis criteria, I gathered data on the rim sherd material from the Sapelo Shell Ring complex. I analyzed the available rim sherds by measuring a variety of variables related to vessel form, function and style. The results produced quantitative frequencies and qualitative observations of these parameters, which are further understood through statistical methods of analysis.

In chapter 4, I present the results of my ceramic analysis of the rim sherd samples from the Sapelo Shell Ring complex. I compared ceramic characteristics of the rim sherds found at the different areas on the Shell Ring complex to understand the differences in ceramic technology between the roughly contemporary Ring I and II, and the later Ring III. Statistical analyses show that there is a significant difference between the ceramics at Rings I and II, compared to Ring III. The changes I observed led me to reject my null hypothesis and accept the alternative suggestion that pottery changed over time at this village.

In chapter 5, I discuss the conclusions and interpretations of my study. I discuss the further implications of this study and place my research within its greater contexts, as ceramic

technology can be used to further understand the networks between material culture, environmental change and social elements. I answer my research objectives and conclude that there was a change in ceramic technology over time at this complex. I further discuss the most significant trends and what they suggest about life in this unique coastal landscape.

Overall, this study contributes to what archaeologists know about changes in technology in response to social and environmental changes. Long-established traditions of ceramic production contributed to the development of early pottery into a craft within a community. Potters passed down their craft for generations as ceramics became a central cooking tool in early sedentary communities. This study also shows how people were innovating and creating materials that adapted to a variety of factors affecting these early village sites. Classic archaeological tools like ceramic analysis can be adapted to understand greater technological changes in a region, and how these changes were related to a network of external factors. Making connections between material culture and environmental data can inform how deeply we are affected by our social and physical surroundings.

## CHAPTER 2

### CULTURAL AND ECOLOGICAL CONTEXT

In this chapter, I provide a broad overview of the environmental and cultural conditions of the American Southeast during the Middle to Late Archaic periods, or from around 8000 to 3000 years before present (Anderson and Sassaman 2012). Post glacial environments such as these allowed hunter-gatherers to inhabit wider environmental contexts (Erlandson 2001). These conditions led to highly productive ecosystems, creating a steady supply of food for people who began to aggregate more in coastal areas. Native groups that lived here could enjoy an environment that supported a variety of food sources throughout the seasons. I also provide a summary of the research that precedes this study on shell ring and ceramic research. Some of the most recent research from Thompson, Garland and colleagues has played a major role in framing the chronology and seasonality of shell ring occupation on the American Southeastern coast (Thompson et. al. 2024, b; Garland and Thompson 2023)

#### *Geological and Environmental Conditions*

The barrier islands of the Georgia coast including Sapelo are part of the Silver Bluff Islands that formed 25,000 to 35,000 years ago (DePratter and Howard 1977; Howard and Frey 1985). This area became a salt marsh lagoon system during the mid-Holocene termed the Silver Bluff shoreline (DePratter and Howard 1977; Howard and Frey 1985; Elliot and Sassaman 1993:47; Elliot and Sassaman 1995:7). These mid-Holocene changes resulted in sediment deposits of sand and clay in the Silver Bluff River systems, which formed brackish water marshes (Elliot and Sassaman 1995:7). These islands of constantly moving sediment also possess

high biotic values compared to other areas of the Atlantic coast (Hayden and Dolan 1979: 1063) and have the highest concentration of shell ring sites along the Southeastern Atlantic coast (Thompson 2006: 68).

The Silver Bluff islands have the greatest concentration of known sites with fiber-tempered pottery on the coast. In fact, most known Late Archaic period sites along the Georgia coast are on the Silver Bluff Islands and adjacent marshes, including the Sapelo Shell Ring Complex (Crusoe and DePratter 1976; DePratter 1979; DePratter and Howard 1980).

Coastal waters divide the offshore areas at the continental shelf, and the inshore areas in which barrier islands, estuaries and mainland coasts reside (Reitz 2021). The barrier islands of the American Southeast were formed during the Pleistocene and have been part of a constantly changing environmental context ever since. The Georgia coast that we see today is not the same one that inhabitants of this region during the Archaic period experienced.

The establishment of shell ring communities on Ossabaw and likely other islands along the South Atlantic Coast makes a certain degree of sense if one considers some of the broader environmental conditions emerging during the Late Archaic. Preceding the emergence of Late Archaic conditions was the environmental period termed the Hypsithermal period, which occurred between 8000-5000 years BP and was marked by warm and dry weather (Anderson 2002; Anderson et al. 2007; Anderson and Sassaman 2012) (Lapham 2011: 408). Contrasts in seasonal temperature variation decreased and some species such as deer and squirrels decreased in size (Lapham 2011:409). The development of the Late Archaic (ca. 5000 BP) roughly corresponds with the earlier part of the Late Holocene (Kidder and Sassaman 2012). Following mid-Holocene Hypsithermal conditions, the South Atlantic Coast saw more humid conditions and increased rainfall (Lapham 2011: 411-412).

Salinity levels derived from isotopic analysis of oysters from specimens obtained at shell rings have corresponded to observed local sea levels conditions (Thompson et al. 2024b). The analysis of these specimens indicates low salinities at the beginning and end of when shell rings both emerged as well as declined at an archaeologically observable phenomena on the landscape (Thompson et. al. 2024b). Sea levels at the beginning of the Late Archaic period were likely between 1.5 and 4.5 meters below present-day levels, on average (Thompson et. al. 2024b: 3). Some shell ring site locations may have been in supratidal zones and thus were not viable for shellfish beds due to the lower sea levels (Thompson et. al. 2024b: 4). In other areas, modeling of sea level conditions and past oyster reef beds indicates that some areas would have had access to shellfish even during times of sea levels as low as 3 mbp but these would not have been ubiquitous across the landscape (Thompson et. al. 2024: 4).

In summary, this research by Thompson and colleagues indicates that there were similar environmental conditions at the beginning of the shell ring village tradition as sea levels began to rise and stabilize and the oyster reef fishery emerged (Garland et al. 2024). Similarly at the end of the shell ring village tradition we see a decline in the salinity values as sea levels start to lower and many oyster reefs become dormant or greatly reduce their primary productivity (Thompson et al. 2024b).

### *The Beginning of Shell Ring Construction*

The greater Archaic period is set between 10,000-3,000 years BP. Researchers portray many groups during this time as mobile hunter-gatherers (Anderson and Sassaman 2012; Sassaman 2010). However, by the Middle to Late Archaic, some groups settled in local ecosystems by altering their subsistence practices to fit within certain catchment areas, leading to more permanent settlement strategies (Anderson and Sassaman 2012; Sassaman 2010; Lapham

2011: 409). This period is marked by increased social and political aggregation and differentiation, and shell rings are often posited as evidence for this growing socio-political complexity (Anderson and Sassaman 2012; Kidder and Sassaman 2012).

### *A History of Shell Ring Research*

Many researchers in the Southeastern United States have focused on coastal research for its unique settlement patterns and foodways. DePratter (1979) points out that the contemporary mainland sites lacked some defining features that coastal sites possess, such as the subtropical climate, diverse marine and estuarine ecosystems, marsh-lagoons, open seas and beaches. (DePratter 1979: 8).

Shell Rings have been present on the coast since before the invention of pottery in this region. Recent work demonstrates that shell ring villages persisted for more than thousand years on the landscape (Garland et al. 2024; Thompson et. al. 2024a). The earliest known shell ring is on Ossabaw Island, *Hokfv-Mocvse* (9CH160) which dates to around 5000 years ago (Garland et al. 2024; Thompson et. al. 2024a). This shell ring in association with a small, early village marks the beginning of what DePratter (1979) has termed the Shell mound Archaic for the Georgia Coast.

The function of shell rings has been an ongoing debate for over 100 years. There have been three main hypotheses as to the formation of shell rings. The first is that shell rings are the result of daily food deposition from people inhabiting shell rings as villages (Trinkley 1985; Thompson 2007). The second hypothesis suggests that shell rings were intermittently occupied spaces for communal feasting, associated with monumentality and non-egalitarian structures. (Russo 2004; Sassaman 1993; Saunders 2004). The third hypothesis suggests that the shell rings

were used for a combination of both ritual and domestic functions, which may have shifted over time (Sanger 2015; Thompson 2006; Thompson 2010; Thompson et. al. 2024).

Recent interpretations have suggested that it is more complicated than “either this or that,” and that activities at shell ring sites were more fluid and dynamic than earlier interpretations had assumed in their models. However, consensus has emerged that most shell rings were features of villages being occupied throughout the year (Thompson et al. 2024b). This is of course not to say that rituals, feasting and ceremonies did not occur at these villages, because they certainly did (Russo 2004; Sanger 2015). It is also possible that some of the shell deposited were mounded along the ring (see Thompson and Andrus 2011), as I discuss below.

#### *How Did Shell Rings Form?*

Shell rings likely were the result of multiple formation processes (Thompson 2007:105). Theories regarding shell ring formation are dependent upon understanding if shell depositions form by gradual or rapid accumulation. Gradual accumulation of shell deposits supports the idea that shell rings were enclosures of villages that formed from the accumulation and growing together of individual household middens (Trinkley 1985, Thompson 2006, 2007). Isotope data and season of collection suggest not only that shellfish were collected year-round, but they accumulated gradually with the same level having opposing seasons (Thompson and Andrus 2011; Thompson et al. 2024b). Ceramic refit analysis by Cajgas et al. (2024) also supports a graduate accumulation of deposits with ceramic refits occurring mostly within the same level as opposed to crossing multiple levels which would indicate large scale deposition. In contrast, there are few examples of rapid accumulation at shell rings which would support ceremonial mounding (Thompson and Andrus 2011; Thompson et al. 2024b).

There have been a series of questions about the distribution of shell rings along the coastal area. Russo has provided a detailed archaeological and historical context for Late Archaic shell-ring sites across the Southeast, for the purpose of nominating them for designation as National Historic Landmarks (Russo 2006).

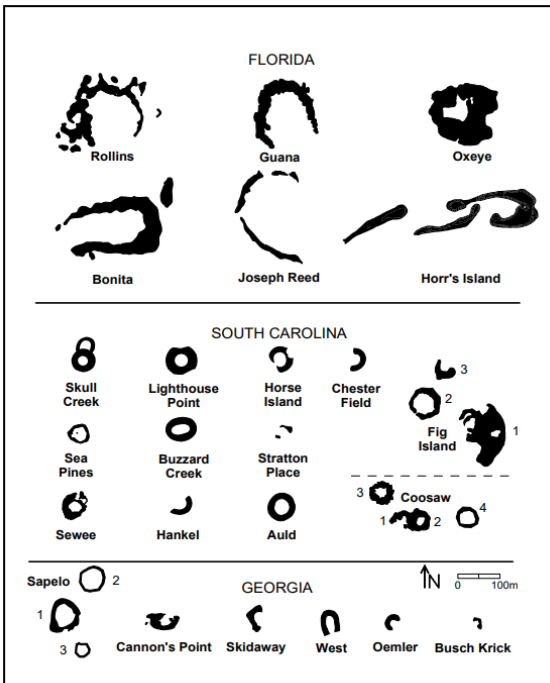


Figure 1. Late Archaic shell-ring footprints in the southeast U.S.

Figure 2.1. Visual of Southeastern Shell Ring shape and scale made by Russo (2002: figure 1).

### *Shell Ring Subsistence*

Coastal settlers focused on exploiting estuarine resources, which were abundant because of the stabilization of post-glacial sea levels (Thompson et. al. 2024b; Garland et. al. 2022). Aquatic microenvironments such as marsh-lagoon systems allowed for abundant shellfish and fish harvesting (Elliot and Sassaman 1995:12). Shellfish were not only food, but they also had numerous other uses such as adornment in the form of beads and ornaments, tools, or even building materials (Marquardt and Kozuch 2016; Thompson et al. 2016).

Faunal analyses of shell rings provide insight into subsistence activities of these communities. Some researchers argue that shellfish such as oysters (*Crassostrea virginica*) were a main source of subsistence for these communities (Caldwell 1958), while others suggest a more supplemental role for shellfish harvesting (Parmalee and Klippel 1974). Claassen (1986:33) argues from a summary of seasonality studies analyzing 94 different sites in nine southeastern states that shellfish were a staple food in this region.

The seasonality of oyster harvesting has seen increased attention in recent years. Archaeologists can understand the time of oyster harvesting through several methods, such as proxy analyses of parasitic organisms. Some research indicates that coastal people may have avoided harvesting oysters in the summer due to risks of disease, to allow sustainable harvesting or to avoid inedible resources (Cannarozzi and Kowalewski 2019). Isotope geochemistry studies indicate that shellfish were harvested throughout the year at these shell rings, with the majority of oysters harvested in the winter (Thompson and Andrus 2012: 336; Thompson et. al. 2024b: 3). Coastal inhabitants likely focused on oyster collection during the cooler months, with other shellfish such as clams being harvested in a more year-round collection (Cannarozzi and Kowalewski 2019; Thompson et. al. 2024b: 4).

Researchers also note that while these villagers were focused on shellfish, they also took advantage of other marine resources. Fish were also an important part of the diet here as faunal remains of sea catfish, hardhead catfish, etc. have been found at shell rings (Trinkley 1980; Sassaman 1993, Thompson 2006). People living on the mainland coast or islands used fishing strategies that allowed them to access a variety of fish species (Reitz 2021).

A recent case study used archaeological fishery data from 22 sites along the Georgia Bight (Including Sapelo Ring III) and compared it to twentieth century fish samples. The study

suggested that the past fishing tradition along the Georgia coast was resilient and diverse, and stable over many generations of exploiting these resources (Reitz 2021). Villagers probably used fish weirs on the Georgia Coast as they have in ethnohistoric accounts (Thomas 2008:122-131), which would have required an immense amount of collective labor effort (Thompson 2018:25). They also engaged in group fishing efforts resulting in mass capture techniques for potential feasting activities (Thompson 2018:26; Colaninno 2010).

Recent efforts have also indicated that people harvested mollusks sustainably for thousands of years, and oyster size generally increased from the Late Archaic to the Mississippian period (Garland and Thompson 2023:5; Thompson et al. 2020). Sustainable management of shellfish reefs and fisheries on the Georgia coast was linked to Ancestral Muskogean practices, which were likely used to maintain the continued health of these resources (Garland and Thompson 2023:5). Isotope geochemistry at the Sapelo Shell Ring Complex has indicated that people were collectively harvesting fish and shellfish from a wide variety of habitats in seasonal patterns (Garland and Thompson 2023:8; Thompson and Andrus 2012).

These longstanding practices of harvesting from the estuaries were a collective effort, likely involving seasonal logistical mobility and resource negotiation (Thompson 2018, Garland and Thompson 2023). Despite the challenges of their fluctuating landscape, groups of people cooperated within and outside of their villages to ensure that everyone had equal access to these marine resources that allowed them to remain in coastal locations throughout the year (Thompson 2018:29-30).

Though marine resources were a staple in these villages, people also had access to a variety of inland resources. Other food sources included turtles, mammals, birds, nuts, and seeds (Colaninno 2010). Plant sources such as hickory nuts were important subsistence materials

despite their limited presence in the archaeological record (Sanger 2015, 2017; Trinkley 1976; Trinkley 1980).

### *Ceramics and Coastal Adaptations*

Given that ceramics are the most common artifact found in shell rings, significant research has focused on how people cooked and prepared food in this region (Sassaman 1993, 2004; Sassaman and Gilmore 2021; Saunders 2004; Saunders and Hays 2004). While inland Georgia peoples had access to various stone tool resources such as chert, clays were abundant in the lagoon areas of “old barrier islands,” which supported local pottery production. These clay deposits made up for the lack of stone outcroppings available in the coastal zone, (Elliott and Sassaman 1995:11) making people more likely to use clay for tools and technology. Inland communities also had access to clay through alluvial deposits across the region (Elliot and Sassaman 1995:11). The lack of stone resources on the coast likely contributed to the emergence of early pottery on the coast prior to inland developments beyond the Savannah River. This was a central factor involved in the shift from indirect cooking with soapstone to more efficient direct-heat technology with ceramics, which I discuss below.

The plasticity of pottery’s main ingredient- clay- makes it formable into a variety of desired shapes for cooking, storage, and ceremonial feasting purposes. It is widely available in many regions at a low opportunity cost. These vessels could withstand direct contact with fire and could be left unattended for lengthy periods of time, and heated food more effectively (Sassaman 1993:186).

Ceramic analysis studies have been an important part of this region’s research, especially as these technological innovations relate to adaptation to the coastal ecosystem and living in villages. Previous work has led scholars to suggest that inhabitants used both indirect and direct

heat cooking in these villages (Sassaman 1993; Thompson 2006). The presence of direct heat cooking technology in all shell rings along the Georgia and Carolina coasts except one (9CH160), which is an aceramic site), indicated that this region saw a shift from indirect to direct cooking practices. This contrasts with more inland areas where indirect heat cooking persisted after the advent of pottery in the region (Sassaman 1993:217).

Sassaman (1993, 1995, 1998) posited that indirect heat cooking is related to the inland soapstone exchange during the Late Archaic. Before the use of ceramic vessels that were used on an open fire, methods such as stone boiling were popular in the Savannah River Valley area. People used locally available materials like soapstone to provide indirect heat in moist cooking methods, due to their thermal shock resistance abilities (Sassaman 1998:120). Indirect cooking methods did not necessarily require the use of stones. Baked clay objects (BCOs) are small spherical (or otherwise shaped) low-fired clay objects, made by a hand molding process from which fingerprints may still be visible (Sassaman 1993). BCO's were thought to be used like boiling stones for cooking activities (DePratter 1979:19; Sassaman 1993:70).

The emergence of early ceramics is “directly” related to the shift from indirect-direct cooking technology. People may have used these vessels for indirect methods as their thick vessel walls would have helped retain heat from an indirect source like a boiling stone (Sassaman 1993:89). People now had portable, efficient versions of cooking pits that were like the technology they had been using before this time, with clay lined pits or baskets. This shift may have originated on the coast with this Stallings/St. Simons pottery tradition, with soapstone cooking technology persisting for longer in inland locations (Sassaman 1998:121).

Understanding the detailed properties of these early ceramics has helped archaeologists understand why certain ceramic traditions persisted and why they might have shifted over time.

Fiber tempering makes a vessel more porous than others, which allows for a lightweight, portable vessel (Skibo et. al. 1989) but also limits a vessel's heat conductivity (Sassaman 1998).

Sassaman observed different performance characteristics over time as these early pottery types emerged and adapted. A notable change was the appearance of bowl and jar forms that had reduced heat loss compared to previous designs (Sassaman 1998: 121). He also found slightly incurvate rim profiles and rounded bases that enhanced thermal efficiency (121). Thom's creek type pottery had shell scraped interiors, which produced thinner walls for better heat conduction and uniformity for better thermal shock resistance (Sassaman 1998: 121). Sassaman found that there while most St. Simon's wares were plain, later iterations of this typology saw incised, grooved and punctate surface treatments. Unique decorations (incised and grooved) set this pottery apart from its interior counterpart (Stallings) (Sassaman 1998: 110). Now that current research has made high resolution chronologies available for many Late Archaic sites along the Georgia coast, we can now revisit this study to incorporate the environmental and social contexts that surrounded these technological developments.

### *Late Archaic Ceramic Types*

Diverse styles of pottery have been identified in the American Southeast to roughly define chronological and sociocultural boundaries. This study focuses on some of the earliest wares found in the region, characterized by organic fiber temper and occasional decorations. This pottery is associated with utilitarian functions such as food preparation and serving (Sassaman 1993: Trinkley 1980). Stallings type pottery is associated with fiber tempered vessels across the American Southeast, while St. Simon's types are unique to the Georgia and parts of the South Carolina coast. I will refer to the ceramics discussed in this thesis within the St. Simon's terminology for this reason as these two types are slightly different. This pottery is in a

simple bowl form, with either straight or slightly incurvate rims. The lips and bases of vessels are either round or flattened, and the lips occasionally appear thickened (Williams and Thompson 1999).

St. Simon's pottery is significant to this study in that it is distinct from interior and neighboring coastal pottery traditions (Elliott and Sassaman 1995; Sassaman 2004), implying a separate identity among past inhabitants of the Georgia barrier islands. St. Simon's pottery is *almost* indistinguishable from the Stallings types; however, they tend to have slightly different decoration motif frequencies at the assemblage level of analysis. Coastal St. Simon's pottery is mostly plain but tends to have incising, regular punctation, and shell punctation. Stallings type pottery tends to have more decoration, linear punctations, and "drag and jab" motifs (Elliot and Sassaman 1995:50). These represent the earliest wares along Georgia coastal region, and likely the earliest in North America, and are characterized by a fiber tempered paste of Spanish moss (Sassaman 2004; Sassaman and Gilmore :20; Williams and Thompson 1999: 117) (See figures 2.2. and 2.3.).

Thom's creek pottery has also been dated to the Late Archaic and the Early Woodland and is distinct from the St. Simon's and Stallings traditions (Thompson, Stoner and Rowe 2008:192). It was first identified in association with South Carolina sites and is characterized by a sand and grit tempered paste (Williams and Thompson 1999). This pottery can be plain, incised, punctate or simple stamped. It is mainly found in South Carolina shell rings but is also recovered in small amounts at some Georgia shell rings, such as at the Sapelo Shell Ring Complex. Studies suggest that the Thom's creek type pottery at Sapelo was manufactured locally (Thompson, Stoner and Rowe 2008: 210).



Figure. 2.2 St. Simon's decorated sherd from 9MC23



Figure. 2.3 St. Simon's Plain sherd from 9MC23

### *Previous Research at the Sapelo Island Shell Ring Complex*

Past efforts have produced extensive excavations and collection analyses at the Sapelo Shell Ring Complex, making it suitable for ongoing research. William McKinley described the Sapelo Shell Ring Complex in 1873, with descriptions of the dimensions of all three rings. C.B. Moore conducted excavations on Ring I in the late 1890s and concluded that local Indigenous peoples constructed this ring (Moore 1897). This is significant because at the time there was an ongoing debate as to who the “moundbuilders” were in the eastern United States (Anderson and Sassaman 2012) and thus Moore’s work was another early example that sided with a Native American origin for these mounds found throughout the region.

Antonio J. Waring and Lewis H. Larson Jr. conducted the first systematic excavations at Ring I in 1950, creating a solid foundation for future research on this site (Waring 1968; Waring and Larson 1968). They excavated a trench from the center to the outside edge of the ring and found that the interior had very little archaeological material. They found fiber tempered pottery on all levels of the excavation, and decorated sherds were found in the upper levels of the excavations, while baked clay objects were found on the lower levels of the excavation (Waring and Larson 1968:273).

Waring and Larson suggested that the occupation of household middens was the main cause of Ring I’s formation (Waring and Larson 1968:273); however, Waring also suggests that the rings likely represented monuments (Waring 1968). After their excavations in Ring I, Larson returned to the site to find the other two rings (in 1974-75) but was unsuccessful. The excavations focused on the area surrounding Ring I (Simpkins 1975).

From these 1970s excavations, they found additional middens south of Ring I, showing that this site was occupied at the same time as the ring, and is evidence of a more complex

settlement pattern found here than researchers previously assumed (Simpkins 1975; Simpkins and McMichael 1976). Through their test excavations from the inside of the ring, Waring and Larson suggested that Ring I formed through occupations on the shell ring midden deposits (Waring and Larson 1968:273; Thompson 2006).

Beginning in the early 2000s, Thompson initiated a geophysical survey with the University of Kentucky to identify exact locations of all the rings and other external occupation areas. (Thompson et. al. 2004; Thompson 2006). The team used ground penetrating radar (GPR) and the RM-15 resistance meter to inform archaeological investigation and understand the vertical and horizontal distributions of the site (Thompson 2006: 77-81). This survey was successful in finding what Larson could not, using resistance technology to identify Rings II and III and producing a more modern topographic map for 9MC23 (Thompson 2006: 77).

Resistance data from Ring III showed that the shell deposits were discontinuous along the ring (Thompson et. al. 2004; Reynold and Thompson 2003; Thompson 2007). Far from being a large, monumental ring, the resistance data shows that each individual midden was likely associated with domestic occupation around the perimeter of the ring (Thompson et al. 2004; Thompson 2007). Similar patterns of discontinuous middens with houses in between have been observed by researchers in other parts of the world where shell rings occur, such as in Japan (Thompson 2006:41).

Thompson (2006, 2007) also examined the distribution of artifacts to provide interpretations of the occupation of Ring III and external occupation areas near the rings. This research supports the model of gradual accumulation regarding shell ring construction. Ring III may have formed through the accumulation of household middens behind permanent residences. (Thompson 2007). This is evidenced by the fact that excavations in between the dense piles of

shell contain black midden soils with abundant artifacts, suggesting domestic habitation (Thompson 2007:100). Thus, Thompson's research supports Trinkley's (1985) model of gradual accumulation for the formation of these rings, though they probably hosted ceremonial events as previously discussed (Thompson 2006).

At the site level, Thompson (2006) found through analysis of ceramic rim diameter across the rings that the size of vessels does not support the hypothesis that these communities engaged in competitive feasting, at least at an inter-ring level. He also found that there were no notable differences between vessel sizes from inside and outside the rings. He concluded that there were no functional differences in the types of cooking activities among different areas of the site. This coincides with the initial conclusion that technology across the complex is similar in form and use, due to the presence of both indirect and direct cooking technology. The pottery at this complex was likely associated with domestic life rather than ceremonial feasting, suggesting that these shell rings were primarily residential (Thompson 2006). Feasting behavior requires larger vessels to cook larger portions of food appropriate for larger gatherings. This research project also indicated that people lived at this location before the emergence of at least Rings II and III (Thompson 2006: 60).

More recent work by Thompson, Garland and colleagues (Garland and Thompson 2023; Garland et al. 2022; Thompson et. al. 2024a, b) have constructed a high-resolution chronology for this complex, as well as other known shell rings in the region. Along with updated radiocarbon analyses, researchers have used isotopic analyses and schlerochronology to further understand seasonal patterns in oyster harvesting (Garland and Thompson 2023; Thompson and Andrus 2011). This new research has allowed for more fine-grained analyses to understand how shell ring villages responded to greater environmental trends (Thompson et. al. 2024a, b). Other

excavations of this site have included a volunteer excavation from 2006, and UGA field school excavations from 2019. Combinations of chronological modeling, mollusk geochemistry, and oyster paleobiology were recently used to understand a chronology of environmental changes associated with the construction, occupation, and abandonment of this site (Garland et. al. 2022).

### *Chapter 2 Summary*

In this chapter, I touched on previous archaeological and environmental research that is relevant to my study-area. I discussed the ecological background of the North American Southeastern coast, and how environmental conditions allowed for people to lead sedentary lifestyles within coastal landscapes. Sea level and salinity data have helped explain precise shifts that would have affected marine life. At the emergence of the Late Archaic, sea levels were stable enough to allow for a longstanding tradition of sustainable marine harvesting practices that required collective efforts within and between villages. I also introduced a history of research along the North American southeastern coast as it related to Late archaic community aggregation and shell ring research. Some of the most recent projects have been instrumental in framing the foundation of my ceramic analysis study (Garland and Thompson 2023, Thompson et. al. 2024a, Thompson et. al. 2024b).

I then move onto a history of research at The Sapelo Shell Ring Complex and discuss the archaeological approaches to ceramics as they relate to this region. This site has caught the attention of archaeologists since the late 19<sup>th</sup> century and has become an important case study for understanding shell ring villages in this region. My study continues from the wealth of research available about the Sapelo Shell Ring Complex and attempts to answer new questions. In the next chapter, I will discuss the methodology I used for this study.

## CHAPTER 3

### METHODS

To approach the research objectives described in Chapter 1, I used ceramic analysis techniques to measure the change in pottery technology over time. The collection I analyzed is housed at the UGA Laboratory of Archaeology, for which I have obtained the necessary permissions to access. A portion of the Ring I samples and baked clay objects are located at the Antonio J. Waring Laboratory of Archaeology at the University of West Georgia. I collected and used this data to understand the trends in ceramic technology in relation to vessel size, form, and function at various locations at the site. I used basic statistical analyses to understand the overall trends and patterns of the data set, the technological trends within each ring, and the differences in technology across each ring.

For this study, I analyzed the extant collection housed at the University of Georgia Laboratory of Archaeology to assess all St. Simons and related type rim sherds in the collection. There was Irene type pottery associated with this site in the collection, which I did not consider for this study. I assessed them through the variables of provenience, classification, vessel form, temper, inclusions, color, forming/firing marks, lip form, vessel/rim measurements, surface treatment, and decorative style. Only viable rim sherds were selected for the project sample and analyzed in this study. I defined viable rim sherds for my study as those that have visible rims that have a measurable thickness, shape (form) and orientation. Thus, sometimes one finds lip fragments which are technically rim sherds, but provide very limited data regarding vessel form,

shape, and or use. My sampling strategy did not favor certain unit proveniences over others; I pulled all viable samples from the available collection.

To compile data, I used ceramic analysis sheets developed by Thompson for southeastern ceramic analysis, which follows many of the standards used by analysts globally (see Rice 1987). In total, I found 138 samples to be viable for this study that met my criteria of ceramic type and had measurable characteristics. In addition, I incorporated all data collected by Thompson (2006) from the collections housed at the Antonio J Waring Jr. Laboratory of Archaeology from Waring and Larson's (1968) 1950s excavations to increase my sample size. These samples are exclusively from Ring I and include both ceramics and baked clay objects (BCOs) (n=106).

#### *Analysis Techniques*

I evaluated each sherd based on the variables I previously outlined and collected measurements for each sample, and the most significant variables were chosen based on their relevance to the research objectives after data collection was finished.

Rim diameter is the circumference of the vessel at its rim, as defined by Sinopoli (1991). I recorded a rim diameter for each sherd that had a sufficient rim portion to accurately measure this parameter using a standard rim diameter form. I define this as consisting of 3cm or more of rim portion present, as suggested by Sinopoli (1991:61), with a degree of curvature visible when placing a rim flat on a rim diameter measurement chart. I measured rim diameter in centimeters using a standard orifice diameter chart that measures both rim diameter and percentage of vessel represented. For Rims that were measurable for diameter, I also recorded the percentage of vessel present for the sample.

I determined lip forms in terms of lip orientation, shape, modifications, and appendages. Measurement of these qualities is meant to serve as a proxy for vessel diversity between rings, as used in Thompson's (2006) research on this assemblage (Thompson 2006). I collected lip thickness values at the edge of the rim with calipers. I measured wall thickness at a maximum and minimum point of thickness across each sherd with calipers.

I evaluated the presence of macroscopic temper and other inclusions and ranked them using a geologic percentage chart. Temper is one or more intentional ingredients added to clay paste to help shape pottery. Inclusions may or may not be intentional in the paste, such as trace amounts of rocks or minerals like mica or quartz. I recorded this measurement as a percentage of appearance in the paste (e.g., fiber temper comprised 20% of the paste in this sherd). These variables indicated how artisans made their pottery and what ingredients they sourced for their paste.

I determined the color of each rim sherd based on Munsell soil colors. I observed surface treatments and decorations on each sample and recorded using previously established descriptions, such as incising and punctation.

The presence of carbon soot deposits on sherd exterior or interior indicates the potential use of these vessels for direct heat cooking (Hally 1983). Vessels with sooting had contact with an open fire after production (post-firing context). I recorded the appearance of soot on each sherd, with a definite potential and absence of sooting for each sample (see figure x. for an example of carbon soot deposits). I only considered the definite appearance of these deposits in the results to ensure consistency and accuracy, though I also noted potential soot.



Figure 3.1 St. Simon's decorated rim sherd with carbon soot deposits.

#### *Data Interpretation and Analysis*

Following data collection, I employed basic statistical analysis methods to further understand the relationships between variables across the different ring proveniences in Microsoft Excel and to generate descriptive graphs and charts. To examine if populations of ceramics were different among the various rings I used two sample T-tests to understand differences between two means from two different datasets, on the assumption that the data has a normal distribution. I used regression analysis to understand how certain variables were related to one another, such as rim diameter and wall thickness.

#### *Limitations*

There are some drawbacks to consider when using a smaller sample of artifacts. The collections are representative of what researchers have excavated through restricted unit or trench excavations. Given that this study is looking at some of the first examples of pottery produced in North America, it would be unreasonable to expect the large samples that are available to researchers working during later time frames and with more densely populated

groups. Nevertheless, I used statistical analyses to mitigate the effects of the small sample sizes in this study. I assume that this data set is representative of the entire ceramic assemblage at this Shell Ring Complex for the purposes of this study.

### Chapter 3 Summary

In this chapter, I introduced the methods employed in my ceramic analysis on the Sapelo Shell Ring Complex (9MC23) assemblage. This included all viable St. Simons and related type rim sherds in the collection. I used certain variables to assess change in ceramic technology overtime within this site, which included classification, vessel form, temper, inclusions, color, forming/firing marks, lip form, vessel/rim measurements, surface treatment, and decorative style. These measurements help archaeologists reconstruct the form and function of past ceramic vessels and were found useful for assessing change in vessel form and function over time. This study produced quantitative frequencies and qualitative observations of these variables, which are further understood through statistical methods of analysis.

A	B	C	D	E	F	G	H	I	J	K	L	M
UGAL #	Sample #	BOX #	Ring	Field Provenience	Provenience	Planart	Feature	Class	Category	Subcategory	Object Form	Object Pd
1	551	1	5020 Ring I	9MC23 Unit 1 level 5	Unit	5	N/A	ICER	Fiber Temper	St. Simon's plain	bowl	rim
2	551	2	5013 Ring I	9MC23 Unit 1 level 2	Unit	2	N/A	ICER	Fiber Temper	St. Simon's plain	bowl	rim
3	551	3	5013 Ring I	9MC23 Unit 1 level 2	Unit	2	N/A	ICER	Fiber Temper	St. Simon's plain	bowl	rim
4	551	4	5006 Outside of Ring I	9MC23 Unit 2 level 12	Unit	12	N/A	ICER	Fiber/sand temper	St. Simon's plain	bowl	rim
5	551	5	5017 Outside of Ring I	9MC23 Unit 3 Level 11	Unit	11	N/A	ICER	Fiber/sand temper	St. Simon's Incised	bowl	rim
6	551	6	5017 Outside of Ring I	9MC23 Unit 3 Level 12	Unit	12	N/A	ICER	Fiber Temper	St. Simon's plain	bowl	rim
7	551	7	4974 Ring III	9MC23 Unit 5 Level 2	Unit	2	N/A	ICER	Fiber Temper	St. Simon's plain	bowl	rim
8	551	8	Ring III	9MC23 Unit 5 Level 3	Unit	3	N/A	ICER	Fiber Temper	St. Simon's plain	bowl	rim
9	551	9	4978 Ring III	9MC23 Unit 5 level 4	Unit	4	N/A	ICER	Fiber Temper	St. Simon's plain	bowl	rim
10	551	10	4978 Ring III	9MC23 Unit 5 level 4	Unit	4	N/A	ICER	Fiber Temper	St. Simon's plain	bowl	rim
11	551	11	4978 Ring III	9MC23 Unit 5 level 4	Unit	4	N/A	ICER	Fiber Temper	St. Simon's plain	bowl	rim
12	551	12	10267 Ring II	9MC23 Unit A-1 level 5	Unit	5	N/A	ICER	Fiber/grit temper	St. Simon's plain	bowl	rim
13	551	13	10267 Ring II	9MC23 Unit A-1 level 5	Unit	5	N/A	ICER	Fiber/grit temper	St. Simon's plain	indeterminate	rim
14	551	14	954 Ring II	9MC23 Unit A-1 Level 5	Unit	5	N/A	ICER	Fiber Temper	St. Simon's plain	bowl	rim
15	551	15	954 Ring II	9MC23 Unit A-1 Level 4	Unit	4	N/A	ICER	Fiber Temper	St. Simon's plain	bowl	rim
16	551	16	959 Ring II	9MC23 Unit A-1 level 4	Unit	4	N/A	ICER	Fiber Temper	St. Simon's plain	indeterminate	rim
17	551	17	959 Ring II	9MC23 Unit A-1 level 5	Unit	5	N/A	ICER	Fiber/grit temper	St. Simon's plain	bowl	rim
18	551	20	4988 Outside of Ring I	9MC23 Unit 2 level 10	Unit	10	N/A	ICER	Fiber/sand temper	St. Simon's plain	bowl	rim
19	551	21	4988 Outside of Ring I	9MC23 Unit 2 level 11	Unit	11	N/A	ICER	Fiber/sand temper	St. Simon's plain	bowl	rim
20	551	22	4975 Ring III	9MC23 Unit 12 level 2	Unit	2	N/A	ICER	Fiber Temper	St. Simon's plain	indeterminate	rim
21	551	23	4975 Ring III	9MC23 Unit 12 level 2	Unit	2	N/A	ICER	Fiber Temper	St. Simon's plain	indeterminate	rim
22	551	24	4975 Ring III	9MC23 Unit 12 level 2	Unit	2	N/A	ICER	Fiber/sand temper	St. Simon's plain	indeterminate	rim
23	551	25	Ring III	9MC23 Unit 6 level 2	Unit	2	N/A	ICER	Fiber Temper	St. Simon's plain	indeterminate	rim
24	551	26	Ring III	9MC23 Unit 9 level 9	Unit	9	N/A	ICER	Fiber/sand temper	St. Simon's plain	indeterminate	rim
25	551	27	Ring III	9MC23 Unit 7 level 2	Unit	2	N/A	ICER	Sand/grit temper	St. Simon's plain	indeterminate	rim
26	551	28	Ring III	9MC23 Unit 8 level 3	Unit	3	N/A	ICER	Fiber/sand temper	St. Simon's plain	indeterminate	rim
27	551	29	12610 Ring III	9MC23 Unit 14 level 5	Unit	5	N/A	ICER	Fiber Temper	St. Simon's plain	bowl	rim
28	551	30	12606 Ring II	9MC23 Unit 15 level 3	Unit	3	N/A	ICER	Fiber Temper	St. Simon's Incised	bowl	rim
29	UGAL_00551	31	5016 Ring III	9MC23 Unit 11 Level 2	Unit	2	N/A	ICER	Fiber Temper	St. Simon's plain	bowl	rim
30	UGAL_00551	32	Ring III	9MC23 Unit 11	Unit	N/A	N/A	ICER	Fiber/sand temper	St. Simon's plain	bowl	rim
31	UGAL_00551	34	Ring III	9MC23 Unit 11 level 3	Unit	3	N/A	ICER	Fiber Temper	St. Simon's plain	indeterminate	rim
32	UGAL_00551	35	5000 Ring I	9MC23 Unit 1 level 1	Unit	1	N/A	ICER	Fiber Temper	St. Simon's plain	indeterminate	rim
33	UGAL_00551	36	4994 Ring II	9MC23 Unit 1 level 2	Unit	2	N/A	ICER	Fiber Temper	St. Simon's plain	indeterminate	rim
34	UGAL_00551	38	12606 Ring II	9MC23 Unit 15 level 3	Unit	3	N/A	ICER	Fiber Temper	St. Simon's Incised/punctate	bowl	rim
35	UGAL_00551	40	Ring II	9MC23 Unit 15 level 3	Unit	3	N/A	ICER	sand/grit temper	St. Simon's plain	bowl	rim
36	UGAL_00551	41	12606 Ring II	9MC23 Unit 15 level 3	Unit	3	N/A	ICER	Fiber Temper	St. Simon's plain	indeterminate	rim
37	UGAL_00551	45	Ring II	9MC23 Unit 15 level 4	Unit	4	N/A	ICER	Fiber/grit temper	St. Simon's plain	bowl	rim
38	UGAL_00551				Unit							

Fig 3.2 Screenshot of the ceramic analysis database created for this study.

In the next chapter, I will present the results of the study based on the measurement I previously described. After discussing the results of my ceramic analysis divided by ring provenience (Ring I, Outside Ring I, Ring II and Ring III) I bring in some basic statistical analyses to assess the differences in technology over time at this shell ring complex.

## CHAPTER 4

### RESULTS

In this chapter I present the data from collected and analyzed rim sherd samples (n=138) on the variables discussed in the previous chapter. I also incorporate data from baked clay objects found at Ring I (n=106). I present a summary of the whole sample set and then present the data by ring provenience. This will outline the general trends of ceramics at the entire site, and trends by individual ring, which are then compared.

Sherd provenience was distributed across the three rings (Table.4.1) and an additional location south of Ring I. See Figure 3.1 for a visual of excavation units distributed across each ring.

Table 4.1. Ring Provenience of Rim Samples

<b>Ring Provenience of Samples</b>	
Ring I	80
Outside of Ring I	8
Ring II	20
Ring III	30
<b>Grand Total</b>	<b>138</b>

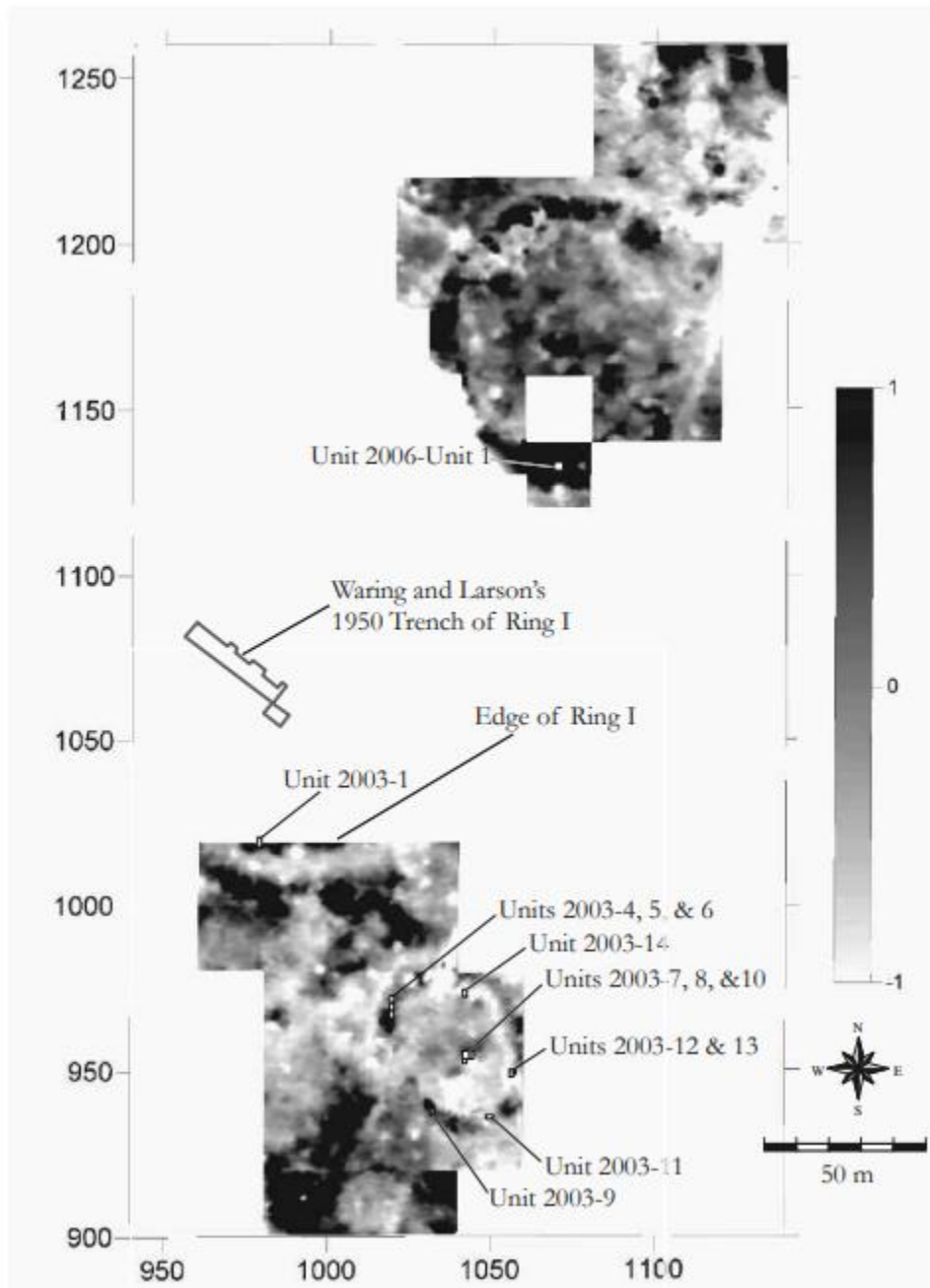


Fig. 3.1. Resistance map showing the location of test units from Thompson and Andrus 2011 (Figure 4) adapted from Thompson 2007 (Figure 4)

### *Temper and Inclusions*

Fiber was the dominant type of temper present in these ceramics (See Table 4.2 below).

There were only two samples without any visible fiber temper, but that were clearly Late Archaic

period ceramics based on form and decorations such as drag and jab, incising and punctation. Additional tempers included sand, grit, or grog in order of frequency. Most of the samples (n=102) only had fiber temper, while 22 had both fiber and sand, ten had both fiber and grit, and two had fiber and grog. The most common inclusions found in the samples, if any, were quartz and mica. They were present in lesser amounts, not exceeding the proportion of the tempering agent.

Table 4.2. Temper of all samples

<b>Temper</b>	
Fiber Temper	102
Fiber/sand temper	22
Fiber/grit temper	10
Sand/grit temper	2
Fiber/grog Temper	2
<b>Grand Total</b>	<b>138</b>

Table. 4.3. Surface treatment and decoration of all samples

<b>Subcategory</b>	
St. Simon's plain	102
St. Simon's smoothed	14
St. Simon's shell scraped	8
St. Simon's burnished	5
St. Simon's Incised	4
St. Simon's punctate	3
St. Simon's	2
Incised/punctate	
<b>Grand Total</b>	<b>138</b>

#### *Surface Treatment and Decoration*

Almost  $\frac{3}{4}$  (74%) of the samples had no surface treatment. This is standard for the St. Simon's plain typology. Those that had prefiring decoration were wet smoothed, shell scraped, burnished, incised, incised, or punctate (see Table 4.3). Two samples had two types of surface

treatments. One had both incising and punctation (sample #38), and one had both incising and cane punctation (sample #91).

### *Vessel Forms*

Many of the vessel forms (e.g. bowl, jar) could not be identified from the portion of the rim represented by the sample (see Table 4.4). This was due to caution/avoidance of misidentification. Those that could be identified were bowls, along with one potential carinated jar.

Table. 4.4. Overall count of object form

<b>Object Form</b>	
Bowl	41
Carinated jar	1
Indeterminate	95
<b>Grand Total</b>	<b>138</b>

### *Wall and Lip Thickness*

I measured wall thickness at multiple points on each sample to account for the possibility that wall thickness is not uniform throughout the vessel. I then took the average of the set of measurements for each sherd (see Fig. 4.1). The average overall wall thickness was 9.59 millimeters. The average maximum wall thickness was also 9.59 millimeters, and the average minimum wall thickness was 7.53 millimeters.

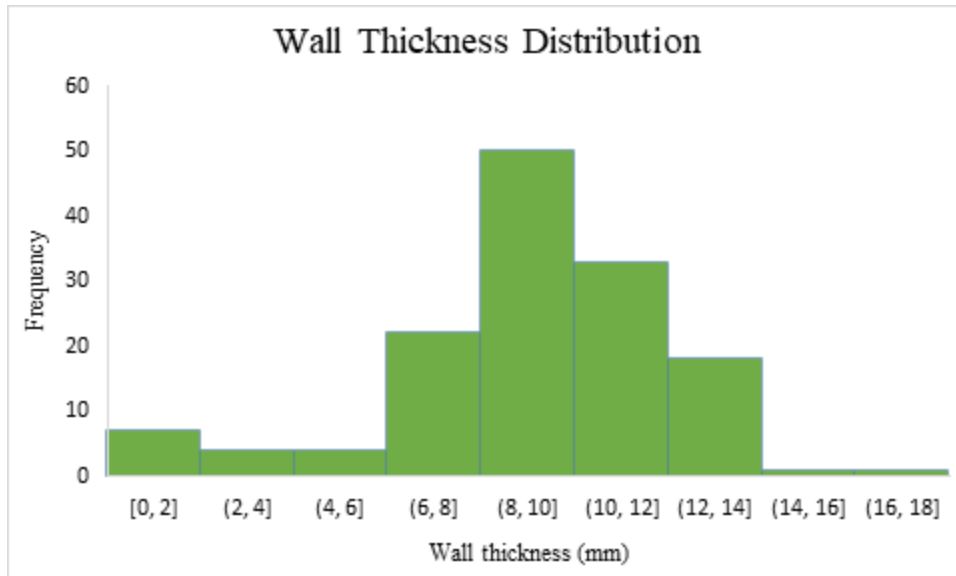


Fig. 4.1. Frequency and distribution of wall thickness measurements. The bottom value is 2.025 millimeters.

The average lip thickness of all samples was 9.03 millimeters. The median overall lip thickness is 8.7 millimeters, with the lowest value being 1.55 millimeters and the highest value being 18.7 millimeters. The dominant lip orientation represented by these samples was direct facing. Four samples had an indeterminate lip orientation, and some samples had everted and inverted lip shapes. The most common lip shapes were rounded (n=61) and flat (n=58), with some tapered, rounded, or beveled (see Table 4.5, Fig. 4.2).

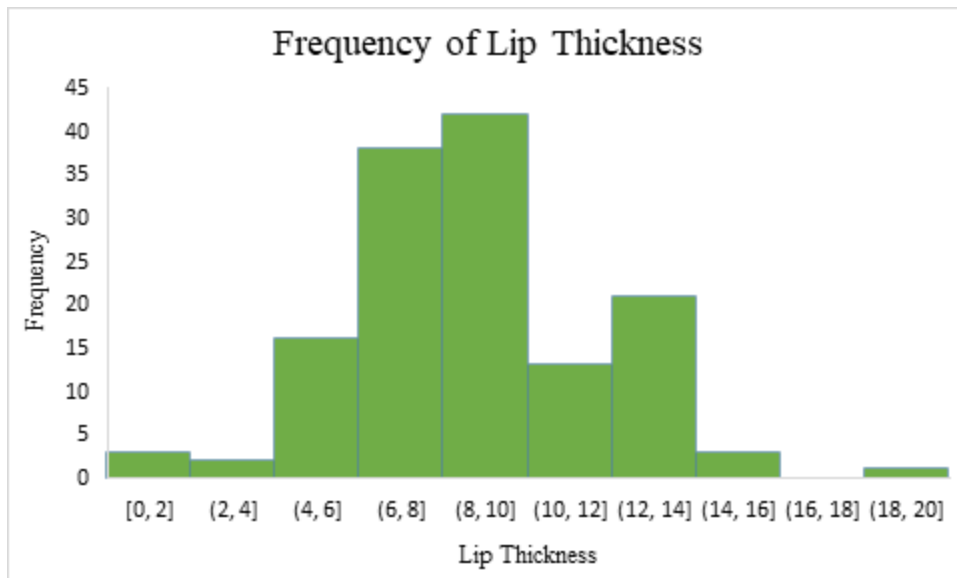


Fig. 4.2. Frequency and distribution of lip thickness measurements. The bottom value is 1.5mm.

Table 4.5. Summary of overall lip shapes.

<b>Lip Shape</b>	
Rounded	61
Flat	58
Tapered	6
Flat/rounded	6
Beveled	3
N/A	2
Flat/squared	1
Beveled or flat	1
<b>Grand Total</b>	<b>138</b>

Most of the sherds had no lip modifications (n=98), but some had thickened (n=21), thinned (n=14), folded or rolled lips (see Table 4.6). There were no observed lip or body appendages found on the samples, and it was not determined important for the study.

Table. 4.6. Summary of overall lip modifications

<b>Lip Modifications</b>	
None	98
Thickened	13
Slightly thickened	8
Thinned	6
Folded	4
Slightly beveled	3
Folded, thickened	2
Potential thickened	1
Slightly thinned	1
Slightly folded	1
Rolled	1
<b>Grand Total</b>	<b>138</b>

Rim diameter is a key metric to understand the size of the ceramics within each ring. A limited number of samples had discernable rim diameters (n=42), as an ample portion of the rim must be present to confidently measure the diameter. Of those with determinate rim diameters, the average was about 30.37 centimeters. The minimum diameter in this assemblage is 10 centimeters, and the maximum measured is 51 centimeters. The overall median rim diameter for measurable rims is 30 centimeters, and the average is 30.37 centimeters (see Fig. 4.3 below).

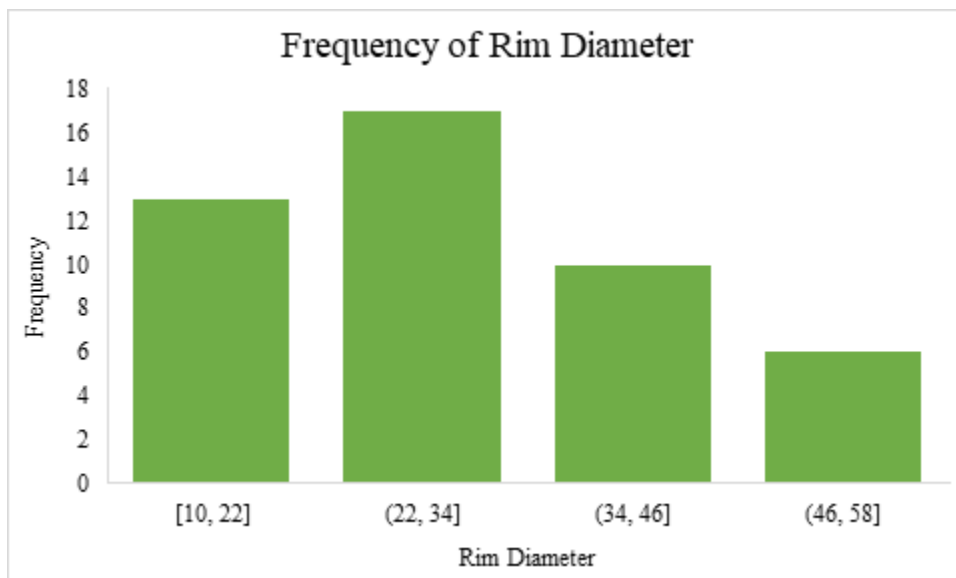


Fig. 4.3. Distribution and Frequency of Rim Diameter. The bottom value is 10 centimeters.

Table 4.7 represents the amount of sooting that was present in this assemblage. Sooting across proveniences will be compared as evidence of potential direct heat cooking with these vessels. Sooting is definite carbon deposits on the vessel surface, while potential sooting is dark residue on the surface of a vessel that might be soot.

Table. 4.7. Overall presence of sooting

<b>Sooting</b>	
N/A	96
Sooting	27
Potential sooting	15
<b>Grand Total</b>	<b>138</b>

#### *Summary of Ring I Data*

A portion of the Ring I samples were taken from Thompson's initial analysis of these rims which are housed in the Antonio J. Waring laboratory at the University of West Georgia. Though the bulk of the samples have been measured for all variables, some of these did not have certain measurements.

I incorporated data from baked clay objects that was previously analyzed data by Thompson in 2003 for his dissertation/master's research (see Table 4.8). These BCOs serve to illustrate the exact point in time at which baked clay objects were no longer used in favor of direct heat cooking vessels. They indicated that people were still using indirect heat cooking in the early phases of this village. All the baked clay object data was collected from Ring I by Waring and Larson (1968). A total of 106 specimens were considered for this study.

Table. 4.8. Field provenience of baked clay objects; many of these objects were from Ring I Unit 4.

<b>Field Provenience</b>	<b>Count of Field Provenience</b>
FS51	4
Unit 1 level 4	7
Unit 2 level 2	1
Unit 4 level 4	5
Unit 4 level 8	4
Unit 4 level 10	8
Unit 4 level 11	7
Unit 4 level 12	2
Unit 4 level 13	22
Unit 4 level 16	12
Unit 4 level 17	23
N/A	11
<b>Grand Total</b>	<b>106</b>

The average weight of each baked clay object sample is 29.56 grams. One hundred and one samples were fragmented pieces, and there were three whole baked clay objects. When forming technique could be identified among the samples, the dominant method was hand-shaping. Some samples (n=4) had measurable finger impressions. Decoration was present on only two of the objects- one was shell scraped, and one was shell, or reed scraped. Two samples had quartz inclusions.

Weights were only available for six samples from Ring I, and the average weight was 25.12 grams. No surface treatment was more common than decoration, but there was a higher proportion of surface decoration in the Ring I sherds compared to Rings II and III (see Table 4.10).

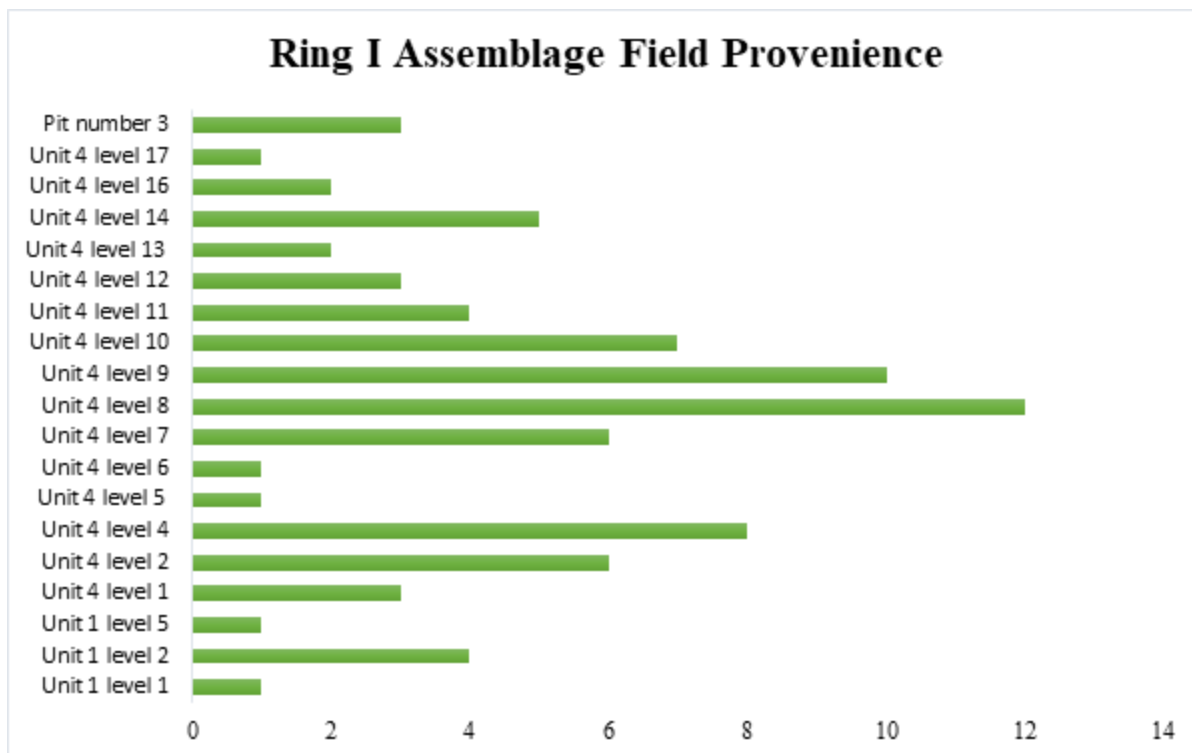


Fig 4.4. Field provenience of samples from Ring I.

I analyzed a total of 80 rim sherds from Ring I from the proveniences listed in Fig. 4.4. Tempered vessels from Ring I were much like the overall temper of the samples, with n=74 samples being solely fiber tempered, two being fiber/grog tempered, and two being fiber/grit tempered.

Table 4.9. Range of tempers from Ring I

<b>Ring I Temper</b>	
Fiber Temper	76
Fiber/grog Temper	2
Fiber/grit temper	2
<b>Grand Total</b>	<b>80</b>

Subcategories from Ring I were reflective of the overall trend, with St. Simon's plain as the most common category (n=47). This ring had more variation in surface treatments than other locations (see Table 4.10). Of the surface treatments present, wet smoothed was the most

common among these samples. Unit 4 level 8 was the most likely to have different surface treatments by far, with eight decorated samples from this provenience. Most of the vessel forms in Ring I were indeterminate (see table 4.11).

Table. 4.10. Ring I surface treatments

<b>Ring I Surface Treatment</b>	
St. Simon's plain	47
St. Simon's smoothed	14
St. Simon's shell scraped	8
St. Simon's burnished	5
St. Simon's punctate	3
St. Simon's Incised	2
St. Simon's Incised/punctate	1
<b>Grand Total</b>	<b>80</b>

Table. 4.11. Ring I vessel forms

<b>Ring I vessel forms</b>	
Indeterminate	74
Bowl	5
Carinated jar	1
<b>Grand Total</b>	<b>80</b>

Lip orientation reflected the overall trend of the assemblage. Direct rims were the most common among Ring I samples, with two inverted rims, one slightly inverted rim, one everted rime, and two indeterminate rims. The most common lip shape was rounded, followed by flat, tapered, flat/rounded, beveled, and indeterminate. Most samples did not have any lip modifications, some were thickened or slightly thickened See Tables 4.12, 4.13).

Table. 4.12. Ring I lip orientation

<b>Ring I Lip Form Orientation</b>	
Direct	74
N/A	2
Inverted	2
Slightly Inverted	1
Everted	1
<b>Grand Total</b>	<b>80</b>

Table. 4.13. Ring I lip shape

<b>Ring I Lip Shape</b>	
Rounded	56
Flat	13
Tapered	4
N/A	2
Beveled	2
Flat/Rounded	2
Beveled or Flat	1
<b>Grand Total</b>	<b>80</b>

The average lip thickness of Ring I was 9.44 millimeters with a median of 9.02 millimeters. The overall average wall thickness for sherds from Ring I was 10.3 millimeters, with a median of 10 millimeters.

Ten samples from Ring I had measurable rim diameters. The average rim diameter from this assemblage was 32.4 centimeters, with a standard deviation of 13.18. Some samples had sooting present (n=6), and some had potential sooting (n=5), but most of them were without sooting (n=69).

#### *Summary of outside Ring I*

I analyzed 8 samples from outside of the rings. While there is a small sample size here, this provenience is representative of what was going on in spaces between the rings. These rim

sherds came from excavation units placed south of Ring I. Samples from Outside Ring I were from Units 2 and 3 from the South of Ring I. These units were excavated in 2003.

Seven of the samples are St. Simon’s plain, and one sample is St. Simon’s incised. Of the 8 sherds from outside of Ring I, most were Fiber/sand tempered (n=5), 2 were Fiber/grit temper, and one was purely fiber temper.

Table. 4.14. Outside Ring I temper

<b>Outside of Ring I</b>	
<b>Temper</b>	
Fiber/sand temper	5
Fiber/grit temper	2
Fiber Temper	1
<b>Grand Total</b>	<b>8</b>

All these samples were identified as bowls. Most samples had a direct orientation (n=7), and one was everted. Most samples had flat lips (n=7), and one had a rounded lip. Most of the samples from the outside of Ring I had no lip modifications, while one had a thinned lip, and 2 had folded lips.

Seven out of eight samples had a measurable rim diameter. (10, 15, 30, 30, 35, 45, 51) The average rim diameter was 30.86 centimeters, with a standard deviation of 14.78 centimeters. The average lip thickness for the outside of Ring I was 8.18 millimeters, with a median value of 8.77 millimeters. The average wall thickness for this provenience was 8.51 millimeters, with a median value of 8.41 millimeters.

Two samples had surface treatment: one had incising, and another had a hole on the body of the sherd, which was probably intentional. One sample from this assemblage had potential fire clouding. Five samples did not have sooting present, while two had potential sooting and one had definite sooting.

*Summary of Ring II*

I analyzed 20 rim sherd samples collected from Ring II. The field provenience of these samples included Units 1 (2006), 14, 15, and A-1 from the 2019 field school (see Figure 4.5). 12 of the 20 samples were identified as only fiber temper, four were fiber/grit temper, and three were fiber/sand temper (see Table 4.15). 18 of the 20 samples from this provenience were identified as St. Simon’s plain, one was St. Simon’s Incised, and one was St. Simon’s incised/punctate (See Table 4.16).

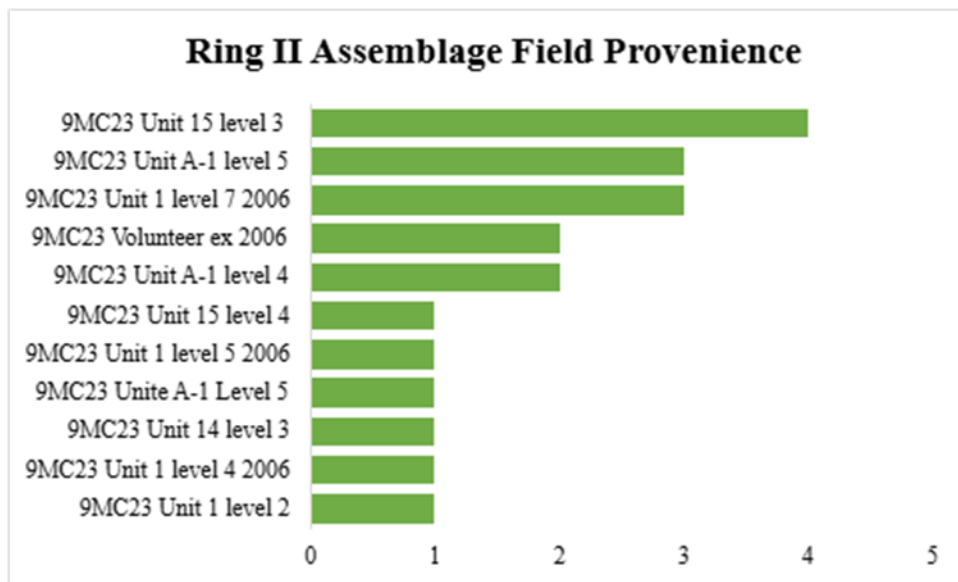


Figure 4.5. Ring II Assemblage Field Provenience

Table. 4.15. Ring II temper

<b>Ring II Temper</b>	
Fiber Temper	12
Fiber/grit temper	4
Fiber/sand temper	3
sand/grit temper	1
<b>Grand Total</b>	<b>20</b>

Table 4.16 Ring II Surface Treatment

Ring II Surface Treatment	
St. Simon's plain	18
St. Simon's Incised	1
St. Simon's Incised/punctate	1
<b>Grand Total</b>	<b>20</b>

Table 4.17 Ring II lip form and shape

Ring II Lip form and shape	
direct flat	14
inverted tapered	2
direct flat/rounded	1
flat	1
direct rounded	1
direct flat/squared	1
<b>Grand Total</b>	<b>20</b>

Ten of the samples were identified as bowls, while ten were indeterminate. When measured for lip form, 16 of the 20 samples had a direct rim, two had inverted/incurvate rims, one was unidentifiable, and one was slightly incurvate. 15 of the 20 samples had flat lips, two were tapered, one was rounded, one was flat/rounded, one was flat/squared. Five of the 20 samples had no lip modifications, four had thickened lips, four were slightly thickened, two were both folded and thickened, two were folded, two were thinned, and one was slightly thinned (see Table 4.17).

Of the 20 samples from Ring II, 11 samples had measurable rim diameters. The average rim diameter of Ring II was 32.64 centimeters, with a standard deviation of 13.25 centimeters. The average lip thickness for Ring II was 10.2 millimeters, with a median of 9.94 millimeters. The overall average wall thickness for Ring II was 8.63 centimeters, with a median value of 8.97

millimeters. Nine out of 20 of the samples had no sooting, six had sooting, and five had potential sooting.

*Summary of Ring III*

There were 30 rim sherd samples collected from Ring III. Samples were collected from a variety of field proveniences excavated within the last 24 years. Fiber temper and Fiber/sand temper are the most common among samples from Ring III. Fourteen samples had Fiber/sand temper, 13 had only fiber temper, two had fiber and grit temper, and one had sand and grit temper (see Table 4.18). All 30 of the samples from Ring III were identified as St. Simon’s plain (Table 4.19). 19 samples were identified as bowls, and 11 samples were indeterminate.

Table. 4.18. Ring III Temper

<b>Ring III Temper</b>	
Fiber/sand temper	14
Fiber temper	13
Fiber/grit temper	2
Sand/grit temper	1
<b>Grand Total</b>	<b>30</b>

Table 4.19 Ring III Surface Treatment

<b>Ring III Surface Treatment</b>	
St. Simon's plain	29
St. Simon's Incised	1
<b>Grand Total</b>	<b>30</b>

Table 4.20 Ring III Lip form and shape

<b>Ring III Lip form and Shape</b>	
direct flat	21
direct flat/rounded	3
direct rounded	2

indt flat	1
incurvate flat	1
direct beveled	1
everted rounded	1
<b>Grand Total</b>	<b>30</b>

When measured for lip forms, 22 of the samples had direct lips, three had incurvate lips, two had direct/slightly incurvate lips, and two were everted lips. When measured for lip shapes 23 samples had flat lips, three samples had rounded lips, three samples had flat/rounded lips, and one sample had a beveled lip. Nineteen samples had unidentifiable lip modifications, three samples had a slight bevel, three had thinned lips, three samples had slightly thickened lips, one sample had a folded lip, and one sample had a rolled lip (Table 4.20).

Of the 30 samples collected from Ring III, 18 were able to be measured for rim diameter. The average rim diameter was 27.67 centimeters, with a standard deviation of 9.47. The average wall thickness of Ring III was 8.68 millimeters, with a median of 8.53 millimeters. The average lip thickness for Ring III was 7.37 millimeters, with a median of 7.14 millimeters.

Most samples had no surface treatment, while 1 sample had a pinched rim, one sample had punctation on the rim, and one sample had incising. Thirteen samples had no sooting, 12 samples had sooting, four samples had potential sooting, and one sample had slight sooting.

### *Comparison of Rings*

Data from each ring was compared using statistical analysis methods to understand the relationships between these proveniences. I discuss the most relevant conclusions in my data analyses to approach my research objectives. I group Rings I and II in my statistical analyses because they are contemporary.

Table. 4.21. Overall Comparison of Rim Diameters across ring proveniences

<b>Rim diameter across rings</b>	<b>Average rim diameter</b>	<b>Standard deviation of rim diameter</b>	<b>Minimum rim</b>	<b>Maximum rim</b>
----------------------------------	-----------------------------	---	--------------------	--------------------

Ring I	32.4	13.18	15	50
Outside of Ring I	30.86	14.78	10	51
Ring II	32.64	13.25	15	50
Ring III	27.67	9.47	10	45

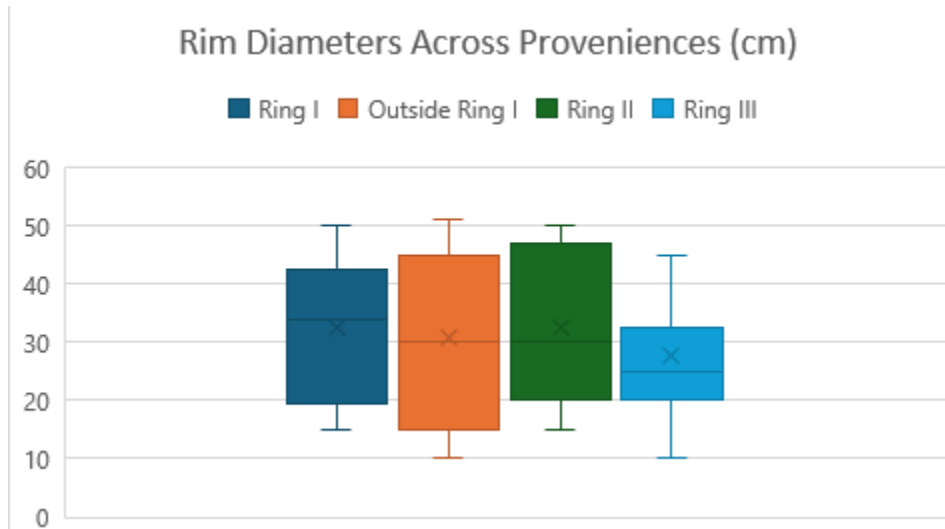


Fig. 4.6. Box and whisker plot of wall thickness across rings

The rim diameter values from Rings I and II were compared to Ring III, in a 2-sample t test, with an assumed significance level (alpha) of .05. The t-test produced a value of .009639, suggesting a rejection of the null hypothesis that the rim diameters between Ring I and II, and Ring III have no significant difference. This suggests that there is a statistically significant difference between vessels from Rings I and II, and Ring III. Ring III has smaller vessels on average than Ring I and II. This supports the alternative hypothesis that there is a difference in vessels at the site at two different points in time. This calculation assumes that the data is normally distributed.

When comparing rim diameters across proveniences, I observe that Rings I, outside Ring I, and Outside Ring 2 have similar trends in distribution, medians, and averages as previously

listed. I observe that Ring III has lower values than these other proveniences, with a lower median, average, and smaller range/distribution of rim diameters.

*Lip Thickness Results and Comparison*

Table. 4.22. Comparison of lip thickness across rings (in mm)

<b>Lip thickness across Rings</b>	<b>Average</b>	<b>Median</b>
Ring I	9.44	9.02
Outside Ring I	8.18	8.77
Ring II	10.2	9.94
Ring III	7.37	7.14

I ran a 2-sample t-test between the average lip thicknesses between Rings I and II, against the average lip thicknesses of Ring III. Given a significance level of .05 and a *p* value of .0128, there is a statistical difference between lip thickness averages from Ring I and II compared to Ring III.

*Wall thickness results and comparison*

Table. 4.23. Comparison of wall thickness across rings (in mm)

<b>Wall thickness across Rings</b>	<b>Average</b>	<b>Median</b>
Ring I	10.3	10
Outside Ring I	8.51	8.41
Ring II	8.63	8.97
Ring III	8.68	8.53

I ran a 2-sample t-test between the wall thicknesses of Ring I and II, against the wall thicknesses of Ring III given a 0.05 significance level. The *p* value was .001794, suggesting that these two datasets are statistically different. This suggests that the null hypothesis should be

rejected and suggests that it is likely that the wall thicknesses between these two areas have changed over time. The greatest diversity in wall thicknesses comes from Ring I, suggesting that there were more diverse vessel thicknesses at this location.

I used a regression analysis to understand the relationship between the two variables of rim diameter and wall thickness. To do this, I calculated a correlation coefficient using the values I collected from both variables. Regression analysis between overall rim diameter and wall thickness produced a very low correlation coefficient of  $R(\text{squared}) = .0344$ . Because the correlation coefficient is relatively low (less than one) I concluded that there was not a significant relationship found between total rim diameter and wall thickness (see Figure 4.7 for a visual representation of the relationship between these two variables).

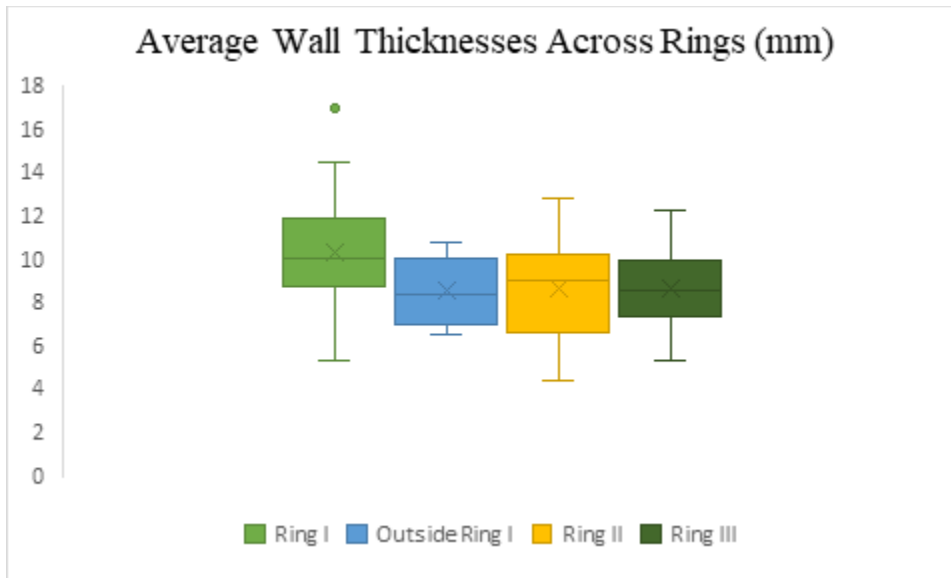


Fig. 4.7. Box and whisker plot of average wall thicknesses across rings.

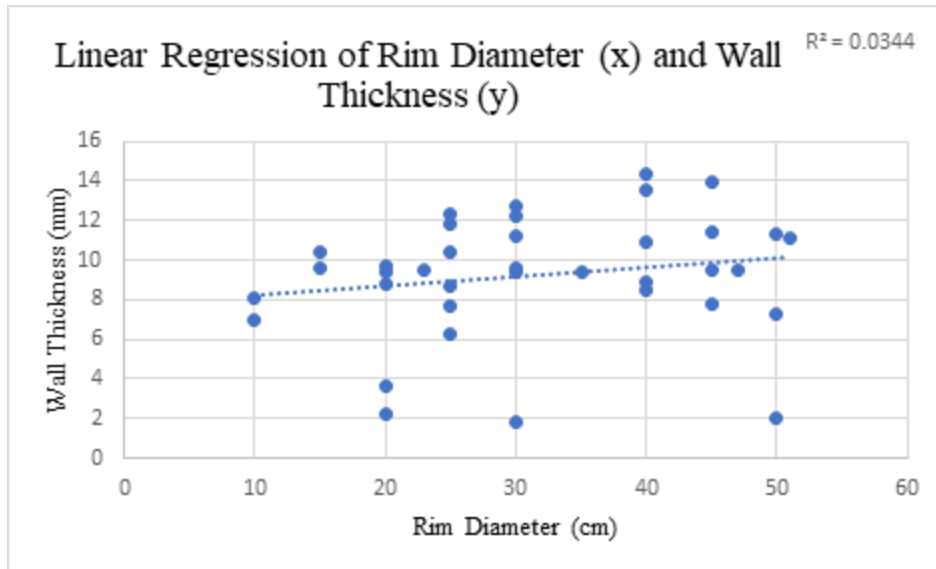


Fig. 4.8. Linear regression of Rim Diameter and Wall Thickness

I produced a T-test between the total average lip thicknesses and total average wall thicknesses to better understand the relationship between these two variables. Assuming the data is two-tailed, the calculation returned a p value of .0062, which given a significance level of .05, suggests that there is a significant difference between overall lip and wall thicknesses. Lip thickness is generally greater than average wall thickness.

*Sooting Presence Across Proveniences*

The presence of soot deposits is shown in the table below (Figure 30). Percentages of sooting frequency were lower for Ring I with 7.5% of vessels with definite presence of sooting, 25% outside of Ring I, 30% in Ring II, and 40% in Ring III. While this is good evidence of potential use of these vessels for direct heat cooking, there is not a significant difference in frequency of soot deposits across these proveniences.

Table. 4.24 Sooting across rings

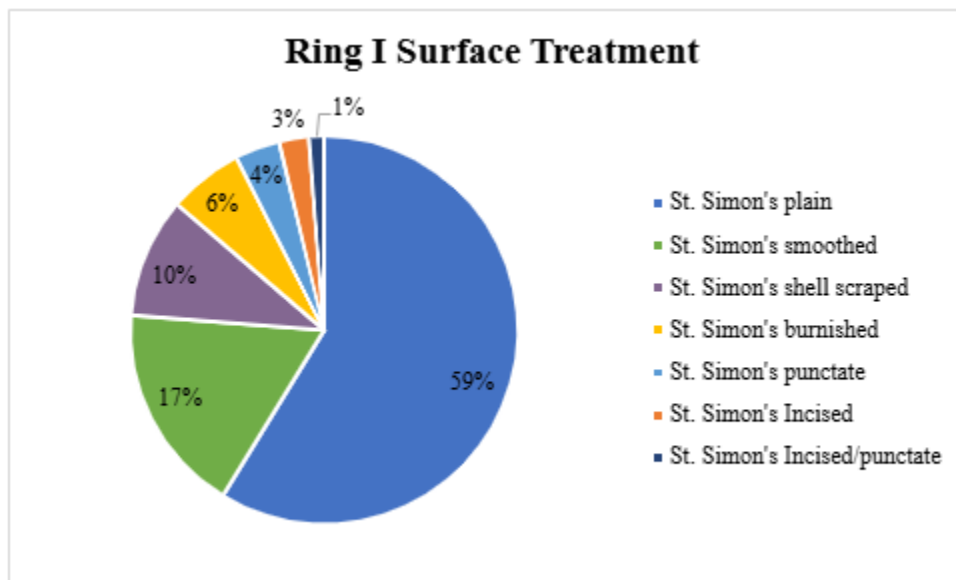
Presence of sooting across rings	Yes	Potential	No	Sooting
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<b>Ring I</b>	6	5	69	7.50%
<b>Outside Ring I</b>	2	1	5	25%
<b>Ring II</b>	6	5	9	30%
<b>Ring III</b>	12	5	13	40%

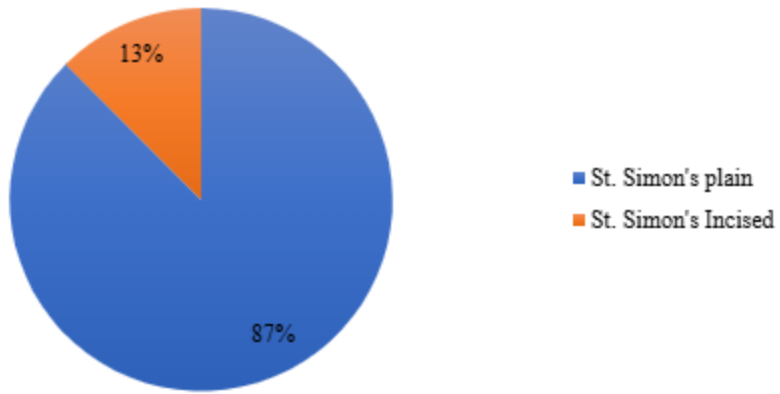
*Paste Elements/inclusions*

I ran a 2-sample t-test of percent inclusions of fiber temper between Rings I and II, compared with Ring III. There was no significant difference found between the percentage of fiber inclusions in these ceramics. The pottery manufacturers during both periods in time/space were likely using a similar proportion of fiber temper.

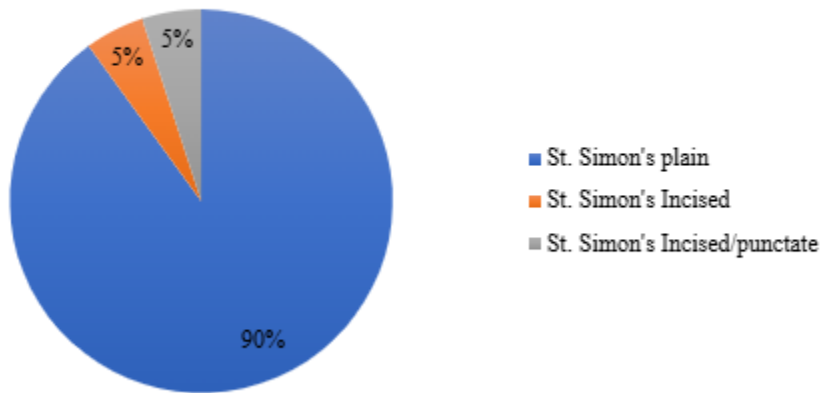
*Surface treatments*



### Outside Ring I



### Ring II



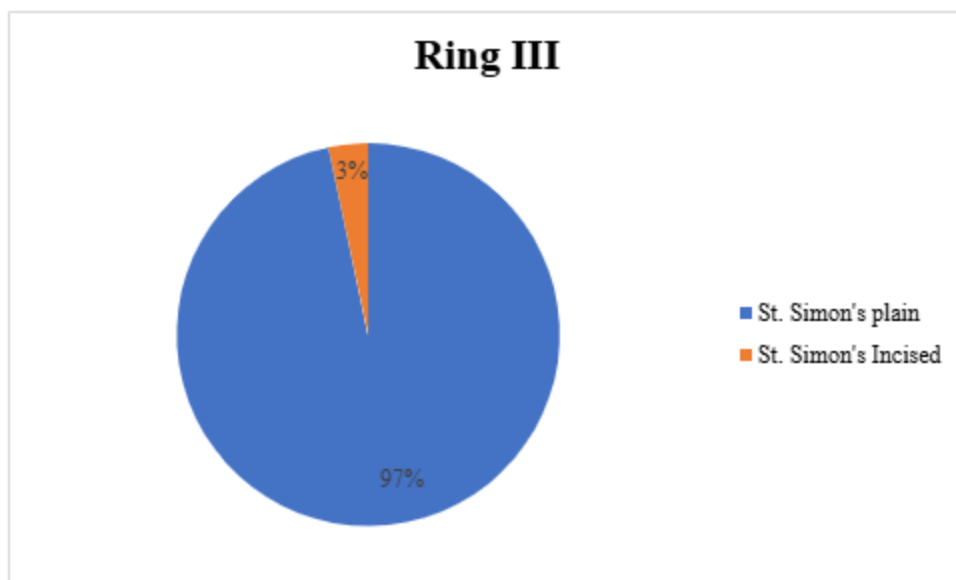
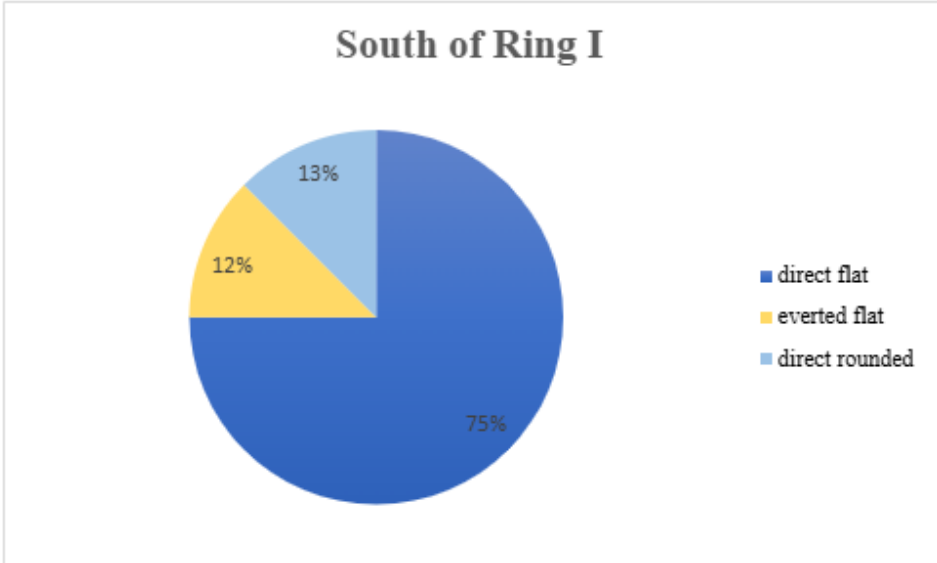
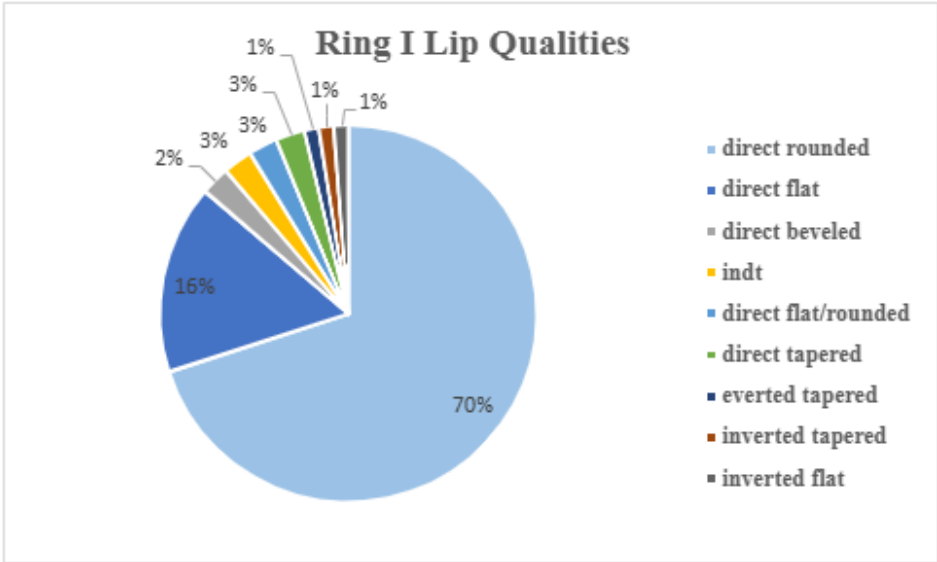


Fig. 4.9. Ring surface treatments

Aside from the lack of surface treatment on most vessels as demonstrated earlier in this chapter, Ring I had the greatest variety of decoration. All three proveniences had a small number of incised vessels. Ring I had unique decorations, such as shell scraped exteriors, which are absent in the other ring assemblages. Ring III had almost no decoration, with only one incised sherd.

#### *Lip Qualities Across Proveniences*



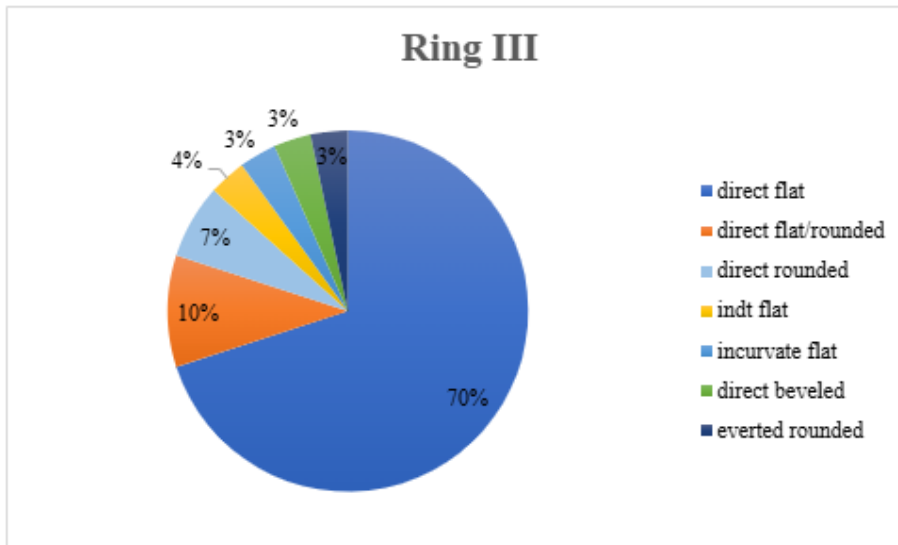
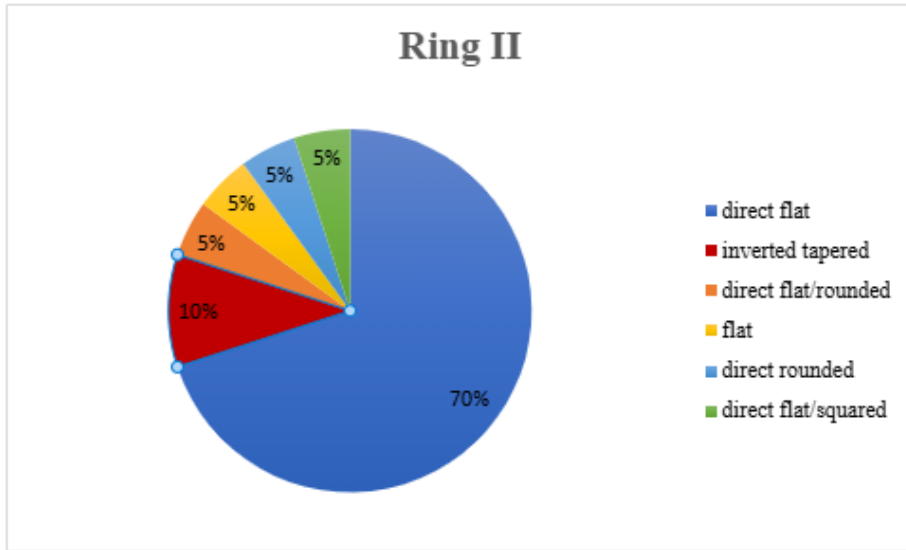


Fig. 4.10. Lip qualities across proveniences.

I compared lip characteristics between proveniences as a proxy for vessel diversity. Upon comparison, there appear to be some differences across proveniences. While the most prevalent lip form is the direct orientation across all proveniences, the lip shape is somewhat different. The most common lip form and shape from Ring I is the direct rounded combination by far (70% of the Ring I assemblage). Among the eight samples from outside the rings, direct flat is the most

common (75%). Ring II and Ring III have mostly direct flat rims (70% for both assemblages). Vessel rims across the site are somewhat consistent, however Ring I reflects a slightly different trend and wider variety of lip qualities than the other proveniences.

*Baked Clay Objects*

As I previously mentioned, excavators only found baked clay objects in the context of Ring I. This is because the presence of baked clay objects represents prolonged use of indirect heat cooking. I considered a total of 106 BCO’s in this study as collected and analyzed by Thompson (2006). These are only found in the lower levels of the excavation units in Ring I. Radiocarbon dates from some Ring I levels are pulled from Thompson (2006) to understand the precise point in time for which the baked clay objects were used. Charcoal and sooted sherds were used for radiocarbon dating.

Table. 4.25. Radiocarbon dates from the Sapelo Shell Ring Complex Ring I from Thompson et. al. 2024a

<b>Ring I Sample</b>	<b>Sample Type</b>	<b>Provenience</b>	<b>Modelled (BP) from 68</b>	<b>To 68</b>	<b>From 95</b>	<b>to 95</b>
<b>UGAMS_52191</b>	collagen	Unit 4 level 17	4240	4190	4240	4170
<b>UGAMS_52190</b>	plant fragment	Unit 4 level 14	4220	4170	4240	4160
<b>UGAMS_52189</b>	collagen	Unit 4 level 13	4210	4170	4220	4150
<b>UGAMS_52188</b>	plant fragment	Unit 4 level 13	4210	4170	4220	4150
<b>UGAMS_52187</b>	collagen	Unit 4 level 11	4190	4160	4210	4150
<b>UGAMS_52186</b>	plant fragment	Unit 4 level 11	4180	4150	4200	4150
<b>UGAMS_52185</b>	collagen	Unit 4 level 10	4170	4150	4190	4140

<b>UGAMS_52184</b> collagen	Unit 4 level 10	4080	3930	4090	3920
<b>UGAMS_52183</b> collagen	Unit 4 level 9	4160	4140	4190	4110
<b>UGAMS_52182</b> charcoal	Unit 4 level 7	4160	4120	4160	4080
<b>UGAMS_15085</b> sooted sherd	Unit 1 level 2	4210	4130	4230	4100
<b>UGAMS_15084</b> sooted sherd	Unit 1 level 2	4070	3830	4090	3720

Baked clay objects are found in Waring’s Unit 4 levels 17, 13, 11, and 10, as well as Unit 2 level 2. Considering the new radiocarbon dates obtained from Thompson et. al. 2024a, we can now understand the precise moment in time that shell rings inhabitants stopped producing these BCOs. The latest level that BCOs are found is in Unit 4 level 10, which is dated from about 4170 to 4150 modelled BP with 68% probability.

#### *Chapter 4 Summary*

In this chapter, I presented the data I gathered from the ceramic analysis of rim sherds found across the Sapelo Shell Ring Complex. I used various ceramic analysis criteria as described in the previous chapter. I first provided a summary of overall trends from the entire assemblage, including all the data I collected. I then provided a summary of general trends in each provenience that I considered for this study, which included each of the three rings and the area south of Ring I. I compared datasets between the rings to understand how pottery technology was different in these locations, using statistical analysis to highlight some of the most important observations. In the next chapter, I interpret the results of this study and put them into the greater context of the era of Late Archaic shell rings. I will discuss the significance of the trends I observed in this chapter and what they imply about changes in vessel and cooking technology over the duration of this site.

## CHAPTER 5

### DISCUSSION AND CONCLUSIONS

In this chapter I interpret the results of the ceramic analysis and consider some of its overarching implications. While this research is site based it is important to place it in the greater context of southeastern archaeology. As noted in my introduction, understanding how ceramic technologies shifted over time at the Sapelo Shell Ring Complex allows us to know how sedentary hunter-gatherers responded to changes in their social and physical landscapes. This is because these rings were occupied at a time when such villages were ubiquitous across the landscape, as well as the time frame where we saw the last of the shell rings along the South Atlantic Coast. The time at which people lived at this complex was one of extreme environmental changes. Changes in sea levels and salinity affected the estuarine ecosystems likely caused significant shifts in the availability of resources for local hunter-gatherer-fishers.

Looking at changes in ceramic technology, style and function over time can provide insights into how people may have made decisions regarding their daily lives in the context of social and environmental changes. Shifts in vessel size, form and style in different spaces indicate intentional choices that local artisans made that best suited the needs of their household and community. In this study, I observed shifts in the early utilitarian pottery through time at the three shell rings that constitute the Sapelo Shell Ring Complex. In this chapter, I explore the potential reasons and implications for these changes. I argue that these changes caused shifts in social dynamics in the form of smaller village sizes, in response to large-scale environmental shifts that affected local subsistence availability. Analyzing the changes in form, function and

decoration of vessels reveals how people may have experienced large climactic shifts and how this affected their daily material culture.

### *Key Findings*

The results for the overall dataset for this site suggest that people used early St. Simon's type pottery across this site, as well as a small amount of Thom's creek pottery, which contains no fiber temper. This is consistent with previous studies of this site's pottery (Sassaman 1993; Thompson 2006). Separate locations were using the same type of pottery, likely from the same community or communities of potters or tradition of manufacture. As Thompson et al. (2024a) suggest, there are village movements overtime with the possibility of descendant communities returning to previous village locations. I assume that because of the relative similarity between temper, surface treatment, wall thickness, vessel, and lip forms and the other variables examined in this study, that a shared community of practice existed among these groups. The use of the same "recipe" for pottery-making concatenates with the Thompson's (2006:213) idea that shell ring inhabitants who lived on separate locations within the site made and used their pottery in the same ways (see also Sassaman 2004; Sassaman and Gilmore 2021; Sassaman and Rudolphi 2001).

### *Vessel Use and Diversity*

The development and use of St. Simon's pottery was likely for utilitarian direct cooking purposes for use within the village. As Thompson et al. (2004a) show, once villages on the coast were established pottery technologies spread rapidly throughout the region. While indirect heat cooking did occur on the coast as seen with the use of BCOs, the presence of sooting at all three Sapelo shell rings suggests that people quickly adopted direct heat cooking despite its predecessor's persistence at inland communities (Sassaman 1993).

The variety of vessel form and decoration found across the site is also interesting to note. I observed a greater variety of decoration in Ring I, and several punctate and incised vessels across the site. While plain pottery was more common across the assemblage, the presence of decoration may be related to occasional feasting behaviors and ceremonial activity and/or other forms of social signaling. However, it does not appear that there were special use vessels as in later periods (see Wallis 2013). These vessels likely had a dual function as both domestic and ceremonial wares given their use ware and the types of depositional environments, we recover them from at these sites (e.g., general midden context).

### *Baked Clay Objects*

There is an inverse relationship between the provenience of these baked clay objects and increase in prevalence of decorated sherds from Waring and Larson's test unit 4 (Thompson 2006). As the presence of BCOs decreases over time, the proportion of decorated sherds increases. The appearance of baked clay objects in the lower levels of Ring I and their absence everywhere else indicates that people stopped using these for indirect cooking purposes, in favor of direct heat cooking (Thompson 2006:60). We now can provide a time estimate of when exactly this happened at the Sapelo Shell Ring Context. People probably brought technologies from inland practices such as stone boiling, which was practiced near the savannah river area, supported by the presence of the soapstone exchange (Sassaman 1993). However, by around 4190 BP people shifted away from this technology. The appearance of sooting in all three rings indicates that direct heat cooking was used across the site and through time. This represents an early shift from using both indirect and direct heat cooking to the sole use of direct heat cooking.

### *Comparisons and Analysis Across Rings*

The cross-ring comparison was the most significant aspect of my study in understanding how pottery technology changed over time. Sorting each rim sample by its provenience allowed demonstrate changes in ceramic technologies of the course of the site's life history. There were different trends across these unique assemblages that suggest how this pottery shifted over the duration of this complex. Below I summarize the most significant findings from a comparative analysis of these rings, indicating a general decline in population over time and intentional choices resulting from external forces discussed previously in this chapter.

Ring I had the wider variety of unique decorations, such as shell scraped exteriors, which is absent in the other ring assemblages. We see shell scraped wares in Thom's creek pottery to achieve thinner walls for better thermal conductivity (Sassaman 1998:121). Ring I also had a wider variety of lip qualities than the other proveniences, potentially noting a more distinct or diverse pottery style. Decoration and lip shape variety may indicate changes in village population or group identity. The diverse pottery from Ring I may indicate that this area had multiple uses, such as a potential ceremonial or social gathering space. Because of Ring I's size and generally larger vessels, it may have had additional functions that the other two rings did not. During the time that Ring I was occupied, shell ring enclosed villages may have been more prevalent in the landscape. Given the scale and size of the shell deposition it is possible that Ring I inhabitants hosted inter-community feasts thus necessitating not only larger vessels but also greater ceramic diversity (Russo 2002; Saunders et al. 1994; Saunders 2002, 2003, 2004, 2014).

One of the more interesting and significant findings of this is study is my observation that the average rim diameters between chronologically different locations (Ring I and II vs. Ring II)

was found to be statistically different, suggesting that these vessels decreased in size over time. Rings I and II are estimated to have had a maximum number of villagers of about 440 people at their highest occupation levels (Thompson and Garland 2025). Given that the size of Ring III is almost half the diameter of the other two rings, it has less domestic living space for that many people and thus we can estimate its population to likely be less than 100 people. Given that there were fewer people during the time Ring III was occupied, this may have impacted the need and or desire for larger vessels. I suggest that smaller vessels were meant for smaller households or groups in this location and later time.

Similarly, there is a statistically significant relationship between lip thickness averages across time and space. This suggests that the thickness of the vessels likely changed over time as well, though this result is not as striking as the differences in rim diameter across these rings. Wall thickness also likely decreased over time between the rings. These slight changes were likely associated with the decrease in vessel size and improvement in technology. Perhaps artisans were able to form thinner walls with a lower risk of thermal shock cracking and better thermal efficiency.

These conclusions point to a gradual decline of occupation at this complex, as villages shifted into smaller groups and exploited less resources from this area. Vessels decreased in size because they likely were no longer needed for large groups of people or feasting behavior that incorporated large groups of peoples, as villagers made ceremonial rounds as in previous decades and centuries (see Garland et al. 2022; Russo 2004; Sanger 2015). This shift in technology thus can be linked to shifts in the social realm of village life (i.e., smaller households and overall village population). However, these shifts were linked to larger environmental changes. While artisans in this community likely used the same method of manufacture as their predecessors and

inherited these traditions over generations. They made minute, technical choices that led the vessels to change to best fit the needs of the community. A smaller cooking pot would have taken less time to dry, required less resources, and was more portable and versatile.

The social and technological changes in the latest occupied ring at Sapelo can be viewed in the broader context of a reduction in harvestable food resources, due to environmental shifts on the coast. It was during this later occupation of Ring III, that oyster fisheries eventually collapsed and environmental conditions became unstable after 3800 BP, pushing people to rely on non-marine subsistence economies (Garland and Thompson 2023; Garland et al. 2022; Ritchison et al. 2021; Thompson et al. 2004; Thompson et al. 2024; Thompson and Turck 2009; Turck and Thompson 2019; Turck and Thompson 2016).

### *Summary and Conclusion*

In this chapter I interpreted the results of my ceramic analysis study with the assumption that the rim sherd analysis is representative of the entire assemblage at this complex. Analysis of this data supports a hypothesis that the pottery technology at Ring III differs from that of the earlier dated Rings I and II. Vessels at Ring III were likely manufactured to be smaller than those at other locations. Ring III also had less decorated sherds than the other proveniences. This supports the conclusion of a smaller population of individuals consistently occupying this area and possibly shifting foodways which is linked to the broader context of shifts in both the social and environmental conditions that ancestral Muskogean people experienced at around 3800 cal. BP. This is consistent with the waning occupation of shell ring villages in general on the coast during the latter part of the Late Archaic period. This supports an observation that the decline in occupation of shell ring village sites was a gradual trend rather than a sudden abandonment among the people inhabiting the coast at this time. People occupying the shell ring complex at

the later part of its duration intentionally shifted their pottery technology to fit their smaller population and to lower opportunity costs from making larger vessels.

This study adds to previous studies of ceramic technologies that link technological changes to environmental and social shifts in past cultures (see Anderson et al. 2017; et al. 2018). Change in technology is intertwined with ecological and cultural variables, which are often hard to identify in the archaeological record. Archaeologists can use changes in ceramic technology to reconstruct cultural identities, practices and climates that affected communities and their materials. Changes in vessel features including size, shape and style can be used to inform situations without extensive environmental data. This study serves as a starting point for further ceramic analyses given my small sample size and restricted study.

This study contributes to several theoretical frameworks that explore how people and their material culture is connected to their surroundings. I considered ideas related to systems theory and response to change, and how this is reflected in the archaeological record in relation to ceramics (Arnold 1988; Schiffer and Skibo 1997)

This study found that ceramic technology shifted over time because of climactic and socio-cultural change, which supports the ceramic and cultural process framework (Arnold 1988). These factors are interconnected and shape human interactions and responses, especially in the form of everyday technological developments. The process of technology change on a small scale is further explained by Schiffer and Skibo (1997). Their experimental research (Skibo et. al. 1989; Schiffer et. al. 1994) indicated that these wares were created with direct heat cooking in mind as they were designed to withstand abrupt changes in heat. The use of ceramics in archaeological analysis (Sinopoli 1991) continues to be a useful approach that, when combined with other methods of analysis, helps paint a picture of past lifeways.

This thesis also reinforces the idea that people are attuned to changes in their environments and will respond and adapt accordingly (Crumley 2021; Balee 2006), showing resilience over generations. During the latter part of the Sapelo Shell Ring complex occupation, some residents shifted their mobility patterns as a result of the changing climate and subsistence availability.

### *What's Next?*

Future research on early ceramic traditions is recommended to further understand the intricate activities of this ancient coastal landscape. I recommend expanding this ceramic analysis to more shell rings sites to see if the pattern holds across the southeastern United States. With high-resolution chronology and isotope geochemistry datasets available for the series of southeastern shell rings, pottery analysis offers an interesting perspective to form a more robust picture of life within these landscapes.

I suggest a comparative study of ceramic traditions across all 30 well dated shell rings in this area to better understand how various groups experienced shifts in social and environmental change over this period. This will supplement known chronology and form of these monumental sites and potentially serve to understand extensive networks between them. My results set a precedent for this expansion and suggest that this study is replicable with any rim sherd assemblage found in the context of a shell ring or other residential site. This is suitable for other regions and contexts that have seen change in ceramic typology and technology through space and time.

This is one of the first times that people are using ceramic technology in this region, as supported by the high-resolution chronology of these sites (Thompson et. al. 2024a). They practiced resilient and sustainable harvesting methods and social organization and developed

technology that was successful in adapting to their needs as community size and environmental conditions changed. The people that lived at these sites had a community of practice regarding their revolutionary technology which persisted for centuries. Continued analysis of early technological developments can be applied to ceramic or other tool contexts around the world. Ceramic analysis will continue to help us better understand social interactions between people across these sites as well as their complex intra-site lifeways across time.

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## APPENDIX A. AVERAGE RIM SHERD WEIGHTS BY RING PROVENIENCE

Table A1: Average rim sherd weights of each provenience

<b>Rim Sherd Provenience</b>	<b>Average</b>
<b>Ring I</b>	25.12g
<b>Outside Ring I</b>	30.72g
<b>Ring II</b>	16.5g
<b>Ring III</b>	16.33g

APPENDIX B. RIM SHERD COLOR BY RING PROVENIENCE

Color descriptions are based on Munsell soil colors.

Table B1. Ring I color analysis.

<b>Sam ple #</b>	<b>Color Exterior Surface 1</b>	<b>Color Exterior Surface 2</b>	<b>Color Interior Surface 1</b>	<b>Color Interior Surface 2</b>	<b>Color Paste</b>
<b>1</b>	10YR 5/3 brown	10YR 6/2 light brown	10YR 5/2 grayish brown	2.5YR 5/6 red	10YR 5/6 red AND 10YR 4/2 dark grayish brown
<b>2</b>	10YR 3/1 very dark gray	10YR 2/1 black	10YR 5/3 brown	10YR 5/4 yellowish brown	10YR 3/1 very dark gray
<b>3</b>	10YR 4/1 dark gray	N/A	10YR 4/1 dark gray	10YR 2/1 black	10YR 4/1 dark gray
<b>35</b>	5YR 4/6 yellowish red	10YR 2/1 black	5YR 4/2 dark reddish brown	5YR 4/3 reddish brown	10YR 2/1 black
<b>71</b>	10YR 4/3 brown	10YR 6/4 reddish yellow	10YR 2/1 black	10YR 6/4 reddish yellow	10YR 2/1 black
<b>146</b>	Grey	orange	Grey	orange	orange/grey
<b>153</b>	10YR 7/8	N/A	N/A	N/A	N/A
<b>154</b>	10YR 6/6	N/A	N/A	N/A	N/A
<b>155</b>	10YR 4/4	2.5YR 4/8	10YR 3/2	2.5YR 4/8	N/A
<b>156</b>	10YR 4/6	N/A	10YR 4/4	N/A	N/A
<b>157</b>	2.5YR 4/6	2.5YR 3/3	2.5YR 3/3	N/A	N/A
<b>158</b>	5YR 4/3	N/A	5YR 4/3	N/A	2.5YR 3/3
<b>159</b>	5YR 4/3	N/A	5YR 5/6	N/A	2.5YR 3/3

Table B2. Outside Ring I color analysis.

<b>Sam ple #</b>	<b>Color Exterior Surface 1</b>	<b>Color Exterior Surface 2</b>	<b>Color Interior Surface 1</b>	<b>Color Interior Surface 2</b>	<b>Color Paste</b>
<b>4</b>	7.5YR 6/4 light brown	10YR 7/2 light gray	7.5YR 5/6 strong brown	10YR 3/1 very dark gray	10YR 2/1 black
<b>5</b>	10 YR 5/2 grayish brown	10YR 3/1 very dark gray	10YR 7/4 very pale brown	10YR 7/2 light gray	10YR 3/1 very dark gray
<b>6</b>	5YR 4/4 reddish brown	10YR 6/4 light yellowish brown	5YR 5/4 reddish brown	5YR 6/4 light yellowish brown	7.5 YR 3/1 very dark gray

<b>20</b>	5YR 4/4 reddish brown	5YR 4/6 yellowish red	10YR 5/6 strong brown	7.5 YR 6/6 reddish yellow	10YR 2/1 black
<b>21</b>	10YR 3/1 very dark gray	10YR 5/3 brown	10YR 3/1 very dark gray	10YR 5/3 brown	10YR 5/3 brown
<b>63</b>	10YR 3/1 very dark gray	10YR 5/4 yellowish brown	N/A	N/A	10YR 2/1 black
<b>64</b>	5YR 5/6 yellowish red	10YR 5/2 grayish brown	N/A	N/A	N/A
<b>65</b>	N/A	N/A	5YR 5/6 yellowish red	10YR 4/1 dark gray	N/A

Table B3. Ring II color analysis

<b>Sam ple #</b>	<b>Color Exterior Surface 1</b>	<b>Color Exterior Surface 2</b>	<b>Color Interior Surface 1</b>	<b>Color Interior Surface 2</b>	<b>Color Paste</b>
<b>12</b>	10YR 6/3 pale brown	10YR 4/1 dark gray	7.5 YR 5/3 brown		10YR 5/2 grayish brown
<b>13</b>	N/A	N/A			
<b>14</b>	10YR 5/2 grayish brown	10YR 5/3 brown	2.5YR 5/8 red	7.5YR 4/2 brown	
<b>15</b>	2.5YR 5/1 reddish gray	2.5YR 5/6 red	7.5YR 6/2 pinkish gray	N/A	N/A
<b>16</b>	10YR 5/2 grayish brown	7.5 YR 6/6 reddish yellow	10YR 5/2 grayish brown	10YR 2/1 black	7.5YR 3/1 very dark gray
<b>17</b>	2.5YR 4/6 red	10YR 6/2 light brownish gray	2.5YR 5/6 red	2.5YR 4/4 reddish brown	10YR 5/1 gray
<b>30</b>	5YR 4/6 yellowish red	10YR 2/1 black	2.5YR 5/8 red	2.5YR 3/1 dark reddish gray	10YR 2/1 black
<b>36</b>	7.5YR 6/2 pinkish gray	2.5YR 6/8 light red	7.5YR 6/2 pinkish gray	2.5YR 5/6 red	2.5YR 5/3 reddish brown
<b>38</b>	5YR 3/1 very dark gray	5YR 3/2 dark reddish brown	5YR 5/3 reddish brown	2.5YR 5/6 red	10YR 2/1 black
<b>40</b>	10YR 3/2 very dark grayish brown	10YR 3/1 very dark gray	10YR 3/2 very dark grayish brown	5YR 4/4 reddish brown	N/A
<b>41</b>	7.5YR 6/4 light brn	7.5YR 5/1 gray	7.5YR 4/1 dark gray	7.5YR 5/2 brown	10YR 3/1 very dark gray
<b>45</b>	7.5YR 4/3 brown	7.5YR 4/2 brown	7.5YR 4/1 dark gray	N/A	10YR 4/2 dark grayish brown
<b>46</b>	10YR 4/3 brown	10YR 4/4 dark yellowish brown	10YR 5/4 yellowish brown	10YR 3/1 very dark gray	10YR 3/1 very dark gray
<b>60</b>	10YR 6/1 gray	5YR 5/8 yellowish red	10YR 5/1 gray	N/A	10YR 5/1 gray
<b>61</b>	10YR 6/1 gray	2.5YR 5/8 red	10YR 3/1 very dark gray	10YR 5/1 gray	10YR 5/8 strong brown

<b>66</b>	10YR 5/2 grayish brn	5YR 5/6 yellowish red	N/A	N/A	10YR 5/1 gray
<b>67</b>	10YR 5/2 grayish brn	5YR 5/6 yellowish red	N/A	N/A	10YR 5/1 gray
<b>68</b>	10YR 7/1 light gray	7.5YR 5/2 brown	10YR 5/1 gray	10YR 5/2 grayish brown	10YR 3/1 very dark gray
<b>69</b>	5YR 6/6	10YR 3/1 very dark gray	5YR 6/6 reddish yellow	5YR 5/1 gray	5YR 4/1 dark gray
<b>70</b>	10YR 3/1 very dark gray	white residue	7.5YR 6/6 reddish yellow	7.5YR 6/1 gray	10YR 2/1 black gray

Table B4. Ring III color analysis.

<b>Sa mpl e #</b>	<b>Color Exterior Surface 1</b>	<b>Color Exterior Surface 2</b>	<b>Color Interior Surface 1</b>	<b>Color Interior Surface 2</b>	<b>Color Paste</b>
<b>7</b>	7.5YR 2.5/1 black	7.5YR 3/2 dark brown	2.5YR 4/6 red	7.5YR 4/3	10YR 2/1 black AND 10YR 3/1 very dark gray
<b>8</b>	10YR 5/1 gray	10YR 4/1 gray	10YR 4/1 dark gray	10YR 3/1 very dark gray	10YR 3/1 very dark gray AND 10YR 6/2 light brownish gray
<b>9</b>	10YR 2/1 black	N/A	5YR 4/6 yellowish red	10YR 3/1 very dark gray	10YR 3/1 AND 10YR 2/1
<b>10</b>	10YR 4/3 brown	10YR 4/1 dark gray	10YR 6/4 light yellowish brown	5YR 5/4 reddish brown	10YR 4/1 dark gray AND 3/1 very dark gray
<b>11</b>	10YR 4/1 dark gray	10YR 5/1 gray	10YR 6/1 gray	10YR 5/6 red	10YR 2/1 black AND 10YR 4/1 dark gray
<b>22</b>	10YR 5/3 brown	N/A	10YR 4/1 dark gray	10YR 3/1 very dark gray	10YR 5/3 brown
<b>23</b>	10YR 6/6 brownish yellow	N/A	10YR 4/3 brown	N/A	10YR 2/1 black
<b>24</b>	10YR 3/1 very dark gray	2.5YR 6.8 light red	10YR 3/1 very dark gray	10YR 4/3 brown	10YR 3/1 very dark gray
<b>25</b>	10YR 3/1 very dark gray	2.5YR 5/6 red	7.5YR 5/4 brown	Gley 1 2.5/n black	N/A
<b>26</b>	10YR 2/1 black	N/A	10YR 5/6 yellowish brown	10YR 2/1 black	N/A
<b>27</b>	10YR 5/2 grayish brown	N/A	10YR 2/1 black	10YR 5/3 brown	10YR 5/3 brown
<b>28</b>	2.5YR 4/6 red	2.5YR 2.5/1 reddish black	2.5YR 2/1 black	N/A	10YR 2/1 black
<b>29</b>	7.5YR 3/1 very dark gray	5YR 5/6 yellowish red	7/5 YR 4/6 strong brown	N/A	N/A

<b>31</b>	10YR 4/4 dark yellowish brown	10YR 4/3 brown	5YR 6/6 reddish yellow	10YR 4/1 dark gray	10YR 4/1 dark gray
<b>32</b>	10YR 3/2 very dark grayish brown	10YR 4/3 brown	10YR 5/4 yellowish brown	5YR 6/6 reddish yellow	10YR 2/1 black
<b>34</b>	5YR 5/6 yellowish red	5YR 5/4 reddish brown	5YR 4/3 reddish brown	5YR 4/1 dark gray	10YR 2/1 black
<b>62</b>	5YR 5/6 yellowish red	5YR 5/1 gray	N/A	N/A	10YR 4/1 dark gray
<b>73</b>	5YR 5/6 yellowish red	10YR 5/3 brown	5YR 5/6 yellowish red	10YR 5/3 brown	10YR 4/2 dark grayish brown
<b>74</b>	10YR 2/1 black	10YR 3/1 very dark gray	2.5 YR 4/8 red	N/A	10YR 2/1 black
<b>75</b>	10YR 6/4 light yellowish brown	5YR 6/4 light reddish brown	10YR 6/4 light yellowish brown	N/A	10YR 3/1 very dark gray
<b>76</b>	10YR 5/3 brown	N/A	10YR 5/3 brown	N/A	5YR 5/6 yellowish red
<b>77</b>	10YR 3/1 very dark gray	10YR 4/2 dark grayish brown	10YR 3/1 very dark gray	10YR 4/4 dark yellowish brown	10YR 3/2 very dark grayish brown
<b>78</b>	10YR 3/1 very dark gray	2.5YR 5/6 red	10YR 4/2 dark grayish brown	10YR 5/6 yellowish brown	10YR 2/1 black
<b>79</b>	10YR 4/2 dark grayish brown	5YR 5/6 yellowish red	10YR 4/2 dark grayish brown	5YR 6/6 reddish yellow	10YR 2/1 black
<b>80</b>	5YR 5/6 yellowish red	10YR 4/1 dark gray	10YR 4/2 dark grayish brown	10YR 5/2 grayish brown	10YR 4/1 dark gray
<b>81</b>	7.5YR 6/6 reddish yellow	N/A	5YR 6/8 reddish yellow	10YR 5/1 gray	10YR 2/1 black
<b>82</b>	5YR 5/6 yellowish red	N/A	10YR 5/1 gray	10YR 4/1 dark gray	10YR 4/1 dark gray
<b>83</b>	2.5YR 4/8 red	N/A	10YR 5/2 grayish brown	N/A	10YR 5/2 grayish brown
<b>84</b>	10YR 6/3 pale brown	2.5YR 4/8 red	10YR 6/3 pale brown	2.5YR 4/8 red	pale brown
<b>85</b>	10YR 5/2 grayish brown	2.5YR 4/8 red	2.5YR 5/6 red	10YR 6/2 light brownish gray	10YR 7/3 very pale brown