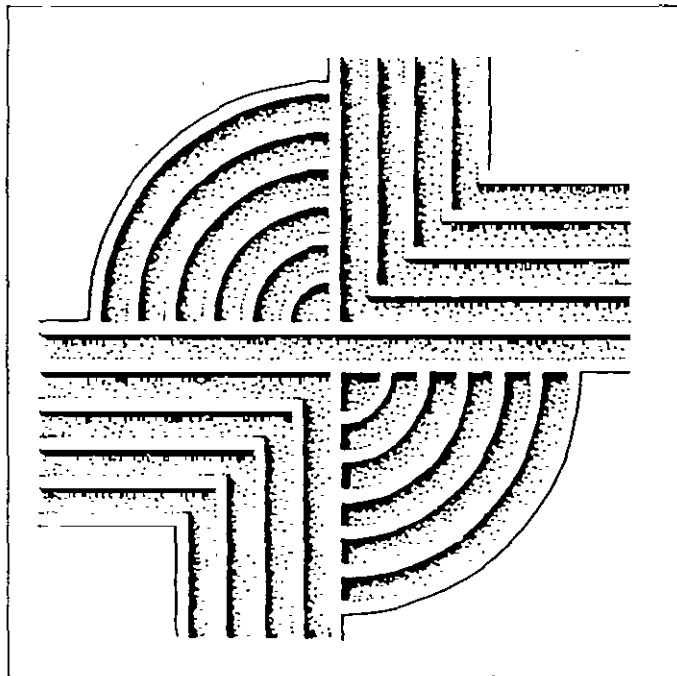


**ARCHAEOLOGICAL DATA RECOVERY
EXCAVATIONS AT 38CH1219, KIAWAH ISLAND:
"ANOTHER" DEPTFORD AND ST. CATHERINES
SHELL MIDDEN**



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**ARCHAEOLOGICAL DATA RECOVERY EXCAVATIONS
AT 38CH1219, KIAWAH ISLAND: "ANOTHER" DEPTFORD AND
ST. CATHERINES SHELL MIDDEN**

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ABSTRACT

This report documents and describes the results of archaeological data recovery excavations undertaken for Kiawah Resort Associates at 38CH1219 on Kiawah Island in Charleston County, South Carolina. It was conducted in compliance with a Memorandum of Agreement between Kiawah Resort Associates, the Army Corps of Engineers, and the South Carolina State Historic Preservation Office.

The site was originally identified by Chicora Foundation's shovel test survey of undeveloped portions of the island and was thought to represent a single, undisturbed shell midden. Recovered were only Deptford pottery and a small quantity of lithic material. The site was recommended as eligible for inclusion on the National Register based on it being representative of a number of small, single component shell middens found on Kiawah.

Archaeological data recovery incorporated auger tests at 10 foot intervals in order to evaluate artifact dispersion and density. A contour map of the site was prepared at 0.2 foot intervals in order to carefully record above ground indications of the midden. Excavation of a 20 by 20 foot block was based on the artifact and shell density. The excavations revealed that the site contained multiple small middens, each with low artifact density. Almost immediately adjacent to these midden piles were areas with appreciably higher artifact density. Features were uncommon and consisted of several small pits exhibiting a fill identical to the middens. At the conclusion of the excavations the area was subjected to limited stripping. No additional midden piles were encountered and only one additional shell pit was revealed. No structural remains were identified in the excavations.

The excavations produced a sizeable collection of prehistoric ceramics identified as Deptford and St. Catherines which were subjected

to detailed typological study. Also recovered were a small collection of lithics, although only one projectile point was found and the bulk of the remains appear to represent (unsuccessful) experimentation with local mudstone or siltstone raw materials. The ethnobotanical collection from the site is of special interest since it produced small quantities of carbonized hickory nutshell and palmetto seeds — all from non-midden areas. The middens themselves produced only wood charcoal. Shellfish analysis from the site, which included seasonal dating, suggested that the shellfish were collected between May and December. Of equal interest were studies of the species identified in the midden. While oyster dominates the collection, clam, periwinkle, and knobbed whelk are also present in appreciable quantities. Animal bone, while dominated by mammals, especially deer, includes a number of other species.

The excavations offer a better understanding of this site and help to clarify research goals, as well as appropriate research methods, for other shell midden sites. Research at 38CH1219, especially when coupled with even more intensive work at sites such as 38BU861, illustrates the possibility of expanding ceramic research into chemical and petrological issues, continuing detailed analyses using traditional typological approaches, and searching for small, well sealed charcoal deposits suitable for accelerated dating.

TABLE OF CONTENTS

List of Figures		iv
List of Tables		iv
Acknowledgements		v
Introduction		1
Background	1	
Site Environs	5	
Previous Research	13	
Excavations at 38CH1219		23
Methods	23	
Findings	26	
Artifact Analysis		37
Pottery	37	
Lithics	44	
Other tools	46	
Subsistence Remains		49
Faunal Materials	49	
Ethnobotanical Remains	53	
Shellfish	56	
Oyster Shells . . . David Lawrence		63
Introduction	63	
Molluscs from 38CH1219	63	
Summary and Conclusions		67
Sources Cited		71

LIST OF FIGURES

Figure		
1.	Kiawah Island vicinity	2
2.	Sketch map of 38CH1219 made during the survey	3
3.	Sea level change curve for South Carolina	6
4.	Vegetation in the 38CH1219 site area	9
5.	Portion of the 1939 aerial photograph showing the site area	10
6.	Portion of the 1989 aerial photograph showing the site area	11
7.	Deptford phase structure identified at 38BU464	15
8.	Shell midden site types	16
9.	Portion of the USGS Kiawah Island topographic map	24
10.	View of 38CH1219 from 38CH129	24
11.	Topographic map of 38CH1219	25
12.	Shell density	27
13.	Artifact density	28
14.	Block excavations at 38CH1219	29
15.	Middens exposed by block excavations	30
16.	Clustering of shell midden dimensions	31
17.	Feature profiles	33
18.	Feature 1, after excavation	34
19.	Feature 2, after excavation	34
20.	Deptford pottery	38
21.	St. Catherines and other artifacts	41
22.	Distribution of different wares in the block excavations	45
23.	Shellfish from midden excavations at 38CH1219	58

LIST OF TABLES

Table		
1.	Soils found on Kiawah Island	7
2.	Shell midden content and density	31
3.	Shell content of features	36
4.	Comparison of Deptford and St. Catherines cordage	43
5.	Comparison of the pottery in the three middens	43
6.	List of allometric values for vertebrate faunal materials	50
7.	MNI, number of bones, and meat yield	50
8.	Comparison of faunal patterns from selected prehistoric sites	52
9.	Flotation sample components	55
10.	Analysis of wood species	56
11.	List of allometric values for shellfish	59
12.	Estimated meat yield for shellfish at 38CH1219	59
13.	Heights of odostomes	64
14.	Larger left and right oyster valves	65

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Although this was a relatively short field project, it was made successful by the diligence, enthusiasm, and dedication of the field archaeologists, including Ms. Natalie Adams, the field director; Mr. Ryan Boera; Ms. Carol Roberts; and Mr. Tariq Ghafar. I also want to thank Ms. Debi Hacker and Ms. Missy Trushel for their

dedication in the analysis of the collection.

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Finally, to all of those others who participate, offer an occasional kind word, or otherwise support the efforts, I want to offer my deepest appreciation.

INTRODUCTION

Background

A Programmatic Memorandum of Agreement between the U.S. Army Corps of Engineers, the Advisory Council on Historic Preservation, the South Carolina State Historic Preservation Office (SHPO), and Kiawah Resort Associates (KRA) was developed in late 1990 (signed by the Advisory Council on September 6, 1990) to protect historic and prehistoric resources on Kiawah Island. The agreement stipulated that archaeological sites determined eligible for inclusion on the National Register of Historic Places would be either green spaced or subjected to archaeological data recovery excavations prior to any development activity.

Although some archaeological survey of the island has been conducted at the time of the MOA (see Poplin 1989), KRA requested that Chicora Foundation, Inc. complete the archaeological survey of the undeveloped portions of Kiawah. A proposal for this work was submitted to both KRA and the S.C. SHPO on December 28, 1990. That proposal was accepted by KRA on January 10, 1991 and an agreement was signed on January 28, 1991. No comments were received from the S.C. SHPO.

This survey, which incorporated approximately 959 acres, was conducted in February and March 1991. The survey identified a total of 25 sites in the survey tracts (Adams 1993:114). Nine of these sites, including the topic of this study, 38CH1219, were recommended as eligible for inclusion on the National Register of Historic Places. The recommendation was eventually concurred with the by S.C. SHPO and the lead federal agency.

In early 1992 KRA requested that Chicora prepare a data recovery plan for a series of sites, including 38CH1219. This plan was submitted to KRA on March 23, 1992, but was not immediately

acted upon. In early 1994 KRA requested that the Foundation update the proposal, incorporate S.C. SHPO comments and resubmit it for approval. The revised data recovery plan for 38CH1219 was dated April 25, 1994. Notice of the proposed undertaking was provided to the Charleston District Corps of Engineers, the Advisory Council on Historic Preservation, and the S.C. SHPO by KRA.

Archaeological investigations at 38CH1219 were begun by a crew of five on May 17, 1994 (which included the project's Principal Investigator, Dr. Michael Trinkley). The work continued through May 27 for a total of 224.5 person hours. A management summary of that work was provided to KRA and the S.C. SHPO on August 1 and August 15, 1994 respectively.

The laboratory work and analyses for this project began in October 1994, with the work directed by Ms. Debi Hacker. Analysis of the prehistoric pottery was conducted by Ms. Missy Trushel under the direction of Dr. Michael Trinkley. Faunal analyses were conducted by Dr. Jack Wilson, Jr. and the ethnobotanical research was conducted by Dr. Michael Trinkley. Dr. David Lawrence conducted an analysis of the oysters recovered from several control blocks at the site.

This work was conducted on Kiawah Island, about 3300 acres in size, which is situated about 14 miles southwest of the City of Charleston and 13 miles northeast of Edisto Island in Charleston County. It is bordered to the north and west by the Kiawah River, to the east by the Stono Inlet and River, and to the south by the Atlantic Ocean. The island is separated from neighboring Folly Island to the east by the Stono Inlet, from Seabrook Island to the west by the Kiawah River, and John's Island to the north by the Kiawah River and associated marshes (Figure 1).

Although development activities on Kiawah Island will be phased, the remainder of the

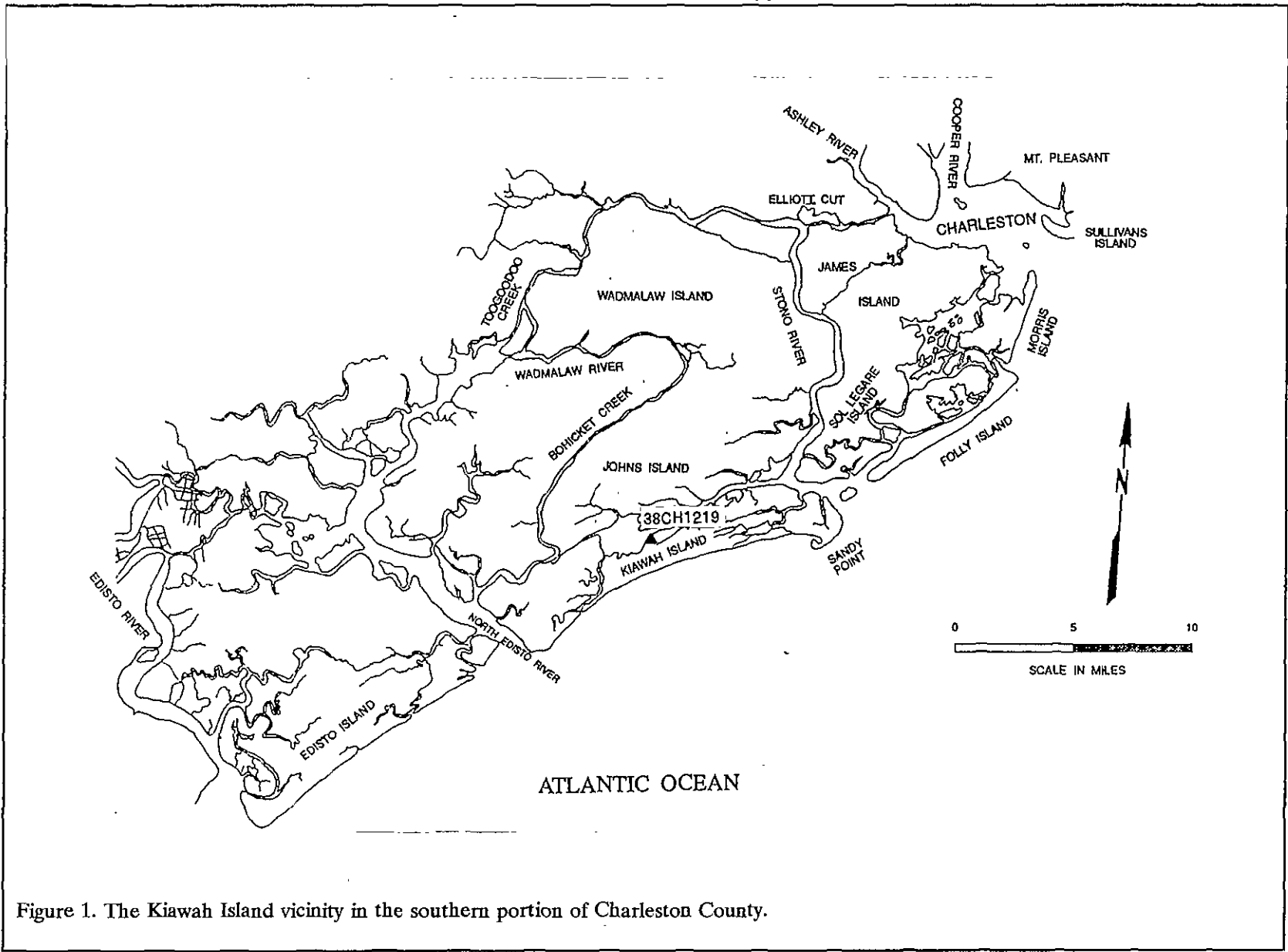


Figure 1. The Kiawah Island vicinity in the southern portion of Charleston County.

island is anticipated to be opened for residential development within the next two to five years. The current project is designed to facilitate the expansion of the West Pasture development. The development activity will involve the clearing, grubbing, filling, and grading of roadways. Construction activities will also include the placement of water and sewer lines, underground utilities, and disturbance caused by house construction on individual lots. These activities will result in considerable land alteration with potential damage to archaeological and historical resources which may exist in the project area.

A series of five shovel tests were excavated in and around the midden. The single test in the midden itself yielded 20 Deptford Cord Mark sherds, one UID sherd, and one flake. Tests surrounding the midden produced no evidence of adjacent occupation or additional middens. The soil profiles revealed about 0.8 foot of very dark grayish-brown (10YR4/2) sand overlying a dark yellowish brown (10YR4/4) sandy subsoil. The identified midden, although obscured by dense vegetation, appeared to measure about 10 feet in diameter. The central shovel test revealed a 0.5 foot deep midden consisting of black (10YR2/1) humic loam and oyster shell overlying a dark yellowish brown sand subsoil.

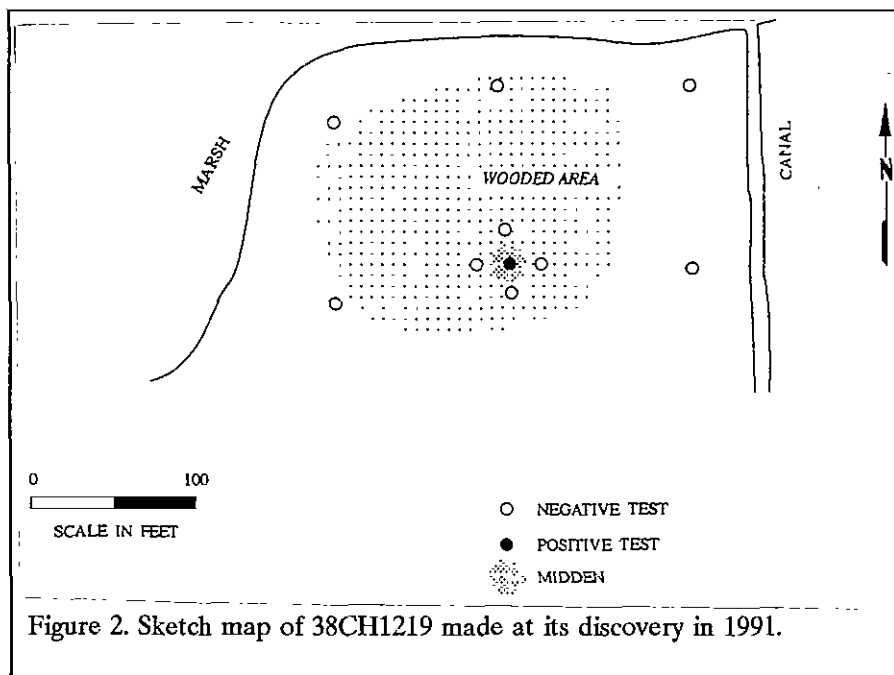


Figure 2. Sketch map of 38CH1219 made at its discovery in 1991.

Based on the survey data Adams (1993:135) suggested that the site represented an example of what was termed a Type 1 midden, more often found in the Kiawah survey as plowed scatters of shell (from sites 38CH229, 38CH1215, 38CH1216, and 38CH1217). The difference was that 38CH1219, "escaped plowing since it is situated in the hardwood vegetation bordering the marsh and on the edge of the agricultural fields" (Adams 1993:135).

Research Goals

The 1991 survey identified 38CH1219 about 500 feet north-northeast of the previously identified, and tested, West Pasture site (38CH123). The site was discovered during transect shovel testing of well drained soils along the edge of the island overlooking the Kiawah River to the north. The area, at an elevation of about 7 feet above mean sea level (AMSL), was in mixed hardwoods, palmetto, and pines at the northern edge of heavily cultivated fields and low wetland areas. Figure 2 illustrates a sketch map of the site, prepared at the time of this survey.

Adams went on to note that the data sets included pottery and, potentially, lithics. She commented that:

All of the identifiable sherds are Deptford and all are cord marked. This homogeneity allows the site to address issues of:

- fabric or paste analysis to distinguish what has been called Deptford from what others (see Anderson et al. 1982) have suggested is Cape Fear (further

refining early Middle Woodland typologies), and

- cordage analysis which may assist in the recognition of specific kin groups through comparison at an intersite level, as well as the refinement of typological constructs.

The presence of lithic material at the site may assist in answering questions regarding lithic procurement and use, as well as identification of source areas and possible procurement rounds. Sites which exhibit lithic materials are not common [on Kiawah], suggesting that this is a particularly significant data set (Adams 1993:135).

The site's integrity set it apart from many of the other sites identified in the survey. In particular its stratigraphy (or absence of stratigraphy), coupled with its seeming homogeneity, suggested that it represented a single episode site. Further, the apparent absence of extensive disturbances around the site suggested that it would be possible to undertake non-midden exploration in the hope of recovering other data, such as structural remains.

The presence of the dense shell remains heightened the possibility that vertebrate faunal material might be recovered from the midden. The presence of carbonized material found in the shovel tests suggested the possibility for procuring good radiocarbon dates on the associated ceramic collection, if good feature contexts could be identified. Adams went on to comment that:

Through 100% excavation it will be possible to address some of the issues associated with sampling at similar sites. This is an ideal site for total excavation since it is well preserved, offers excellent access, and is relatively small (minimizing the expenditure of scarce resources). The

methodological advances possible from such work have wide applicability in the management of other resources in the area, although as O'Neil [1993] points out, the work must be undertaken at multiple middens in order to devise broad patterns (Adams 1993:136).

With this background the 1994 data recovery plan at the site focused on four specific issues.

1. **The research would focus on types of subsistence remains (ethnobotanical, faunal, and shellfish) present at the site, their contributions to the prehistoric diet, and evidence of resource scheduling.** Admittedly, the data sets at 38CH1219 were not as well known as those, for example, from 38BU861 (Trinkley and Adams 1994), but it was hoped that at least some of the research questions at 38BU861 might be applicable to the Kiawah midden and that some of the results might be replicated. Specifically, it was thought that the collection of a broad range of subsistence data — integrated through an ecological approach — might be useful in understanding diet and, ultimately, site function.

2. **Research would explore how these remains compare to other shell midden sites of the same time period excavated elsewhere in the Charleston and Beaufort areas.** The methodology used at this site was designed to be similar to that used at 38BU861 (Trinkley and Adams 1994), allowing at least the data from these two sites to be fully comparable. While it was thought unlikely that such a small sample would allow any great change in

our understanding of prehistoric lifeways, the collection of detailed, and comparable, data will eventually assist in generalizations and re-evaluation of shell midden sites.

3. The remains of structures or other evidence of occupation and settlement would be sought both in and around the shell midden piles. As at site 38BU861, another focus of research at 38CH1219 would be the exploration of settlement questions. Specifically, are structural remains present or are features present which have the potential to assist in better understanding the site function.

4. A final research area would be the typological information potentially provided by the recovered pottery and lithics. Research on the pottery would focus on the cordage analysis and vessel reconstruction as an aid to understanding possible kin group activities and vessel function. Lithic analysis, of course dependent on the quantity of remains recovered, might focus on the stage of lithic reduction present at the site and the source of the recovered materials. These research areas might help in reconstructing settlement rounds and site activities.

The observant reader, or other researchers in this area, may certainly notice that we have proposed a number of different avenues of research based on the data analysis from 38BU861 (Trinkley and Adams 1994). For example, we suggested the use of large number of pollen samples in an effort to explore pre- and post-midden vegetation changes, the use of AMS or accelerator dating, and the use of chemical and petrographic analyses on pottery. Although these are entirely reasonable suggestions, which will again be advanced, the research design (and

budget) for the existing project was developed prior to our analysis of 38BU861 data. Consequently, it has *not* been possible to integrate many of the new approaches into the current research. Nevertheless, the current exploration of a small shell midden site builds on the previous research and extends many of the research questions.

Site Environs

Physiography

Charleston County is located in the lower Atlantic Coastal Plain of South Carolina and is bounded to the east by the Atlantic Ocean and a series of marsh, barrier (such as Kiawah), and sea islands (Mathews et al. 1980:133). Elevations in the County range from sea level to about 70 feet above mean sea level (AMSL). On the island elevations range up to about 25 feet AMSL, while in the vicinity of 38CH1219 the topography is general level, averaging about six to seven feet AMSL and sloping gradually toward the Kiawah River, north of the site.

The mainland topography, which consists of subtle ridge and bay undulations, is characteristic of beach ridge plains. Seven major drainages are found in Charleston County. Four of these, the Wando, Ashley, Stono, and North Edisto, are dominated by tidal flows and are saline. The three with significant freshwater flow are the Santee, forming the northern boundary of the County, the South Edisto, forming the southern boundary, and the Cooper, which bisects the County. Because of the low topography, many broad, low-gradient interior drains are present as either extensions of the tidal rivers or as flooded bays and swales.

Coastal islands are generally placed into three major groupings, based on geomorphology, area, sediment composition, and environment of deposition. The classic sea islands such as Daufuskie, Hilton Head, and James islands, are erosional remnants of coastal sand bodies deposited during the Pleistocene. Some, such as Hilton Head, also have a ocean fringe of beach dune ridges developed during the more recent Holocene period. Barrier islands, in contrast, are

composed of alternating beach ridges and low troughs or lagoons oriented roughly parallel to the present shoreline, deposited during Holocene high sea level stands. Marsh islands, such as Raccoon Key and Morris Island, are composed of isolated or widely spaced Holocene sand ridges surrounded by recent salt marsh. They are typically situated in the filled lagoons behind the barrier islands, although they are also found fronting the Atlantic Ocean where erosion has removed the protecting barrier islands.

Kiawah is classified as a barrier island. It is situated between Folly Island to the northeast and Seabrook Island to the southwest. Kiawah is separated from Folly by the Stono River and from Seabrook by the Kiawah River. It is separated from John's Island to the north by an expanse of marsh and the Kiawah River.

Geology and Soils

Coastal Plain geological formations are unconsolidated sedimentary deposits of very recent age (Pleistocene and Holocene) lying unconformably on ancient crystalline rocks (Cooke 1936; Miller 1971:74). The Pleistocene sediments are organized into topographically distinct, but lithologically similar, geomorphic units, or terraces, parallel to the coast. Kiawah Island is classified by Cooke (1936) as part of the recent Holocene terrace, with elevations under 25 feet AMSL.

The work by Stapor and Mathews (1976) found that Kiawah's deposition began at least 2500 years ago and was essentially complete by 1000 years ago. The oldest portion of Kiawah appears to be the remnant Pleistocene beach ridge on which Rhett's Bluff to the east and 38CH1219 to the west are located (Hayes et al. 1975).

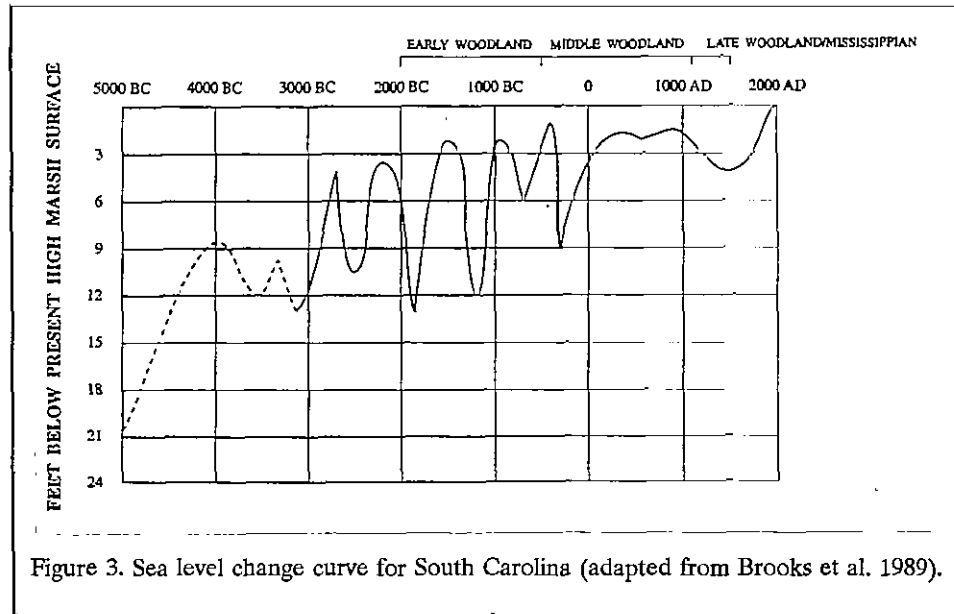


Figure 3. Sea level change curve for South Carolina (adapted from Brooks et al. 1989).

Another aspect of Sea Island geology to be considered in these discussions is the fluctuation of sea level during the late Pleistocene and Holocene epochs. Prior to 15,000 B.C. there is evidence that a warming trend resulted in the gradual increase in Pleistocene sea levels (DePratter and Howard 1980). Work by Brooks et al. (1989) clearly indicates that there were a number of fluctuations during the Holocene (Figure 3). Their data suggests that from about A.D. 300 through about A.D. 900 the sea level was relatively stable at about 2 feet below current levels. By about A.D. 1000 the level began falling to a low of about 4 feet below modern levels at roughly A.D. 1500. Consequently, through most of the Late Woodland St. Catherines phase the sea levels around the site were perhaps 2 to maybe 2.5 feet lower than today (Figure 3).

The effect these lower sea levels would have had on the local environment is hard to gauge, although it seems likely that the estuarine complex of the Kiawah River and marsh area would have been somewhat reduced. The steeper gradient of the nearby slough would have allowed fresh water flow, later eliminated as the gradient was reduced by the rise in sea level to modern stands.

Within the coastal zone the soils are

Holocene and Pleistocene in age and were formed from materials that were deposited during the various stages of coastal submergence. The formation of soils in the study area is affected by this parent material (primarily sands and clays), the temperate climate (to be discussed later in this section), the various soil organisms, topography, and time.

The mainland soils are Pleistocene in age and tend to have more distinct horizon development and diversity than the younger soils of the sea and barrier islands. Sandy to loamy soils predominate in the level to gently sloping mainland areas. The island soils are less diverse and less well developed, frequently lacking a well-defined B horizon. Organic matter is low and the soils tend to be acidic. The Holocene deposits typical of barrier islands and found as a fringe on some sea islands, consist almost entirely of quartz sand

Table 1.
Soils found on Kiawah Island

Soil	% of island	drainage
Crevassee-Dawhoo	41.3	mixed
Dawhoo-Rutledge	5.5	poor
Kiawah	30.1	poor
Rutlege-Pamlico	0.2	poor
Seabrook	7.7	well
Wando	15.2	well

which exhibits little organic matter. Tidal marsh soils are Holocene in age and consist of fine sands, clay, and organic matter deposited over older Pleistocene sands. The soils are frequently covered by up to 2 feet of saltwater during high tides. Historically, marsh soils have been used as compost or fertilizer for a variety of crops, including cotton (Hammond 1884:510) and Allston mentions that the sandy soil of the coastal region, "bears well the admixture of salt and marsh mud with the compost" (Allston 1854:13).

Only six soil series occur on Kiawah Island: Crevassee and Dawhoo association, Dawhoo and Rutledge association, Kiawah, Rutlege-Pamlico association, Seabrook, and Wando (Table 1). Of those soils, only two — the Seabrook and Wando series — are considered well drained. The remainder are poorly drained, except for the

Crevassee-Dawhoo association, found in the ridge and trough area of eastern Kiawah Island, which has mixed drainage (Miller 1971). Table 1 reveals that only 22.9% of the island can be considered well drained. Although some of the Crevassee-Dawhoo soils are well drained, they occur on narrow ridges and are not generally suitable for nineteenth century agriculture.

The western and central thirds of the island consist primarily of Wando soils ringing the edge, while Kiawah and Dawhoo-Rutlege soils are found on the interior. The eastern third of the island contains little well drained soil, being composed largely of Crevassee-Dawhoo soils. The bulk of Rhett's Bluff, including 38CH1219, consists of the well drained Seabrook soils.

Climate

John Lawson described South Carolina, in 1700, as having "a sweet Air, moderate Climate, and fertile Soil" (Lefler 1967:86). Of course, Lawson tended to romanticize Carolina. In December 1740 Robert Pringle remarked that Charleston was having "hard frosts & Snow" characterized as "a great Detriment to the Negroes" (Edgar 1972:282), while in May 1744 Pringle states, "the weather having already Come in very hott" (Edgar 1972:685).

The major climatic controls of the area are latitude, elevation, distance from the ocean, and location with respect to the average tracks of migratory cyclones. Kiawah's latitude of 32°37'N places it on the edge of the balmy subtropical climate typical of Florida, further south. As a result, there are relatively short, mild winters and long, warm, humid summers. The large amount of nearby warm ocean water surface produces a marine climate, which tends to moderate both the cold and hot weather. The Appalachian Mountains, about 220 miles to the northwest, block the shallow cold air masses from the northwest, moderating them before they reach the sea islands (Mathews et al. 1980:46).

The average high temperature on Kiawah in July is 81°F, although temperatures are frequently in the 90s during much of July (Kjerfve 1975:C-4). Mills noted:

in the months of June, July, and August, 1752, the weather in Charleston was warmer than any of the inhabitants before had ever experienced. The mercury in the shade often rose above 90°, and for nearly twenty successive days varied between that an 101° (Mills 1972:444).

Kiawah normally experiences a high relative humidity, adding greatly to the discomfort. Kjerfve (1975:C-5) found an annual mean value of 73.5% RH, with the highest levels occurring during the summer. Pringle remarked in 1742 that guns "sufferr'd with the Rust by Lying so Long here, & which affects any Kind of Iron Ware, much more in this Climate than in Europe" (Edgar 1972:465).

The annual rainfall on Kiawah is 49 inches, fairly evenly spaced over the year. While adequate for most crops, there may be periods of both excessive rain and drought. Kjerfve (1974:C-8) notes that Kiawah has recorded up to 20 inches of rain in a single month and the rainfall over a three month period has exceeded 30 inches no less than 9 times in the past 37 years. Likewise, periods of draught can occur and cause considerable damage to crops and livestock. Mills remarks that the "Summer of 1728 was uncommonly hot; the face of the earth was completely parched; the pools of standing water dried up, and the field reduced to the greatest distress" (Mills 1972:447-448). Another significant historical drought occurred in 1845, affecting both the Low and Up Country.

Early efforts to reconstruct regional climate shifts include the research of Kukla (1969) and Bryson (1965). While there are differences even at this level, it is possible to force a generalization beginning with the "Little Climatic Optimum" of about A.D. 800 with mild to warm temperatures. A cooling period did not begin until perhaps A.D. 1600.

Anderson (1990:543-549; 1994:274-283; see also Stahle and Cleaveland 1992) provides an exceptional view of the climate from A.D. 1300 to A.D. 1600, finding four periods of significant drought which lasted from 10 to 45 years. Although perhaps too late for direct relevance to our understanding of occupation at 38BU861, his

study provides a linkage between short-term climate changes and possible changes in the distribution and organization of Mississippian populations. This suggests that climatic fluctuations which are too short to be of relevance to paleoclimatic reconstructions (e.g., see the work by Foss in Anderson and Joseph 1988:72) may nevertheless influence specific prehistoric peoples, as well as our interpretation of the past.

Floristics

Kiawah Island exhibits three major ecosystems: the maritime forest ecosystem which consists of the upland forest areas of the island, the estuarine ecosystem of deep water tidal habitats, and the palustrine ecosystems which consist of essentially fresh water, non-tidal wetlands (Sandifer et al. 1980:7-9).

The maritime forest ecosystem has been found to consist of five principal forest types, including the Oak-Pine forests, the Mixed Oak Hardwood forests, the Palmetto forests, the Oak thickets, and other miscellaneous wooded areas (such as salt marsh thickets and wax myrtle thickets).

Of these the Oak-Pine forests are most common, constituting over half of the forest community on the island. In some areas palmetto becomes an important sub-dominant. Typically these forests are dominated by the laurel oak with pine (primarily loblolly with minor amounts of longleaf pine) as the major canopy co-dominant. Hickory is present, although uncommon. Other trees found are the sweet gum and magnolia, with sassafras, red bay, American holly, and wax myrtle and palmetto found in the understory. These areas are most likely to be classified as Braun's (1950:284-289) pine or pine-oak forest and These are typically found on sandy, well to excessively drained soils which have relatively little accumulated organic material. Wenger (1968) notes that the presence of loblolly and shortleaf pines is common on coastal plain sites where they are a significant sub-climax aspect of the plant succession toward a hardwood climax. This vegetation, although certainly not the natural potential vegetation, does dominate the immediate area of 38CH1219 (Figure 4).



Figure 4. 38CH1219 site area showing vegetation and area of block excavations. View is to the north.

Several areas of Kiawah evidence upland mesic hardwood communities, also known as "oak-hickory forests" (Braun 1950:297). These forests contain significant quantities of mockernut hickories as well as pignut hickory, species which even today are still present in small quantities.

Understory species consist mainly of the canopy species, although sweetgum and red bay may be found on the lower elevations while sassafras is common throughout the area. Vines include catbriar, cross vine, summer grape, Virginia creeper, poison ivy, and occasionally blackberry. The shrub layer is influenced by the amount of sunlight reaching the forest floor, with open canopy and disturbed areas dominated by saw palmetto, wax myrtle, chinquapin, and yaupon. Like the shrub layer the herbaceous layer is dependent on the amount of light reaching it. Consequently, disturbed ground areas (such as those affected by humans) are often characterized by broomsedge, goldenrod, partridge pea, polkweed, ragweed, and dog fennel.

The estuarine ecosystem in the Kiawah Island vicinity includes those areas of deep-water

tidal habitats and adjacent tidal wetlands. Salinity may range from 0.5 ppt at the head of an estuary to 30 ppt where it comes in contact with the ocean. Estuarine systems are influenced by ocean tides, precipitation, fresh water runoff from the upland areas, evaporation, and wind. The tidal range for the island is 5.2 feet, indicative of an area swept by moderately strong tidal currents. The system may be subdivided into two major components: subtidal and intertidal (Sandifer et al. 1980:158-159). These estuarine systems are extremely important to our understanding of prehistoric occupation because they naturally contain such high biomass (Thompson 1972:9). The estuarine area contributes vascular flora used for basket making, as well as mammals, birds, fish (over 107 species), and shellfish.

The last environment to be briefly discussed is the freshwater palustrine ecosystem, which includes all wetland systems, such as swamps, bays, savannas, pocosins and creeks, where the salinities measure less than 0.5 ppt. The palustrine ecosystem is diverse, although not well studied (Sandifer et al. 1980:295). A number of forest types are found in the palustrine areas which

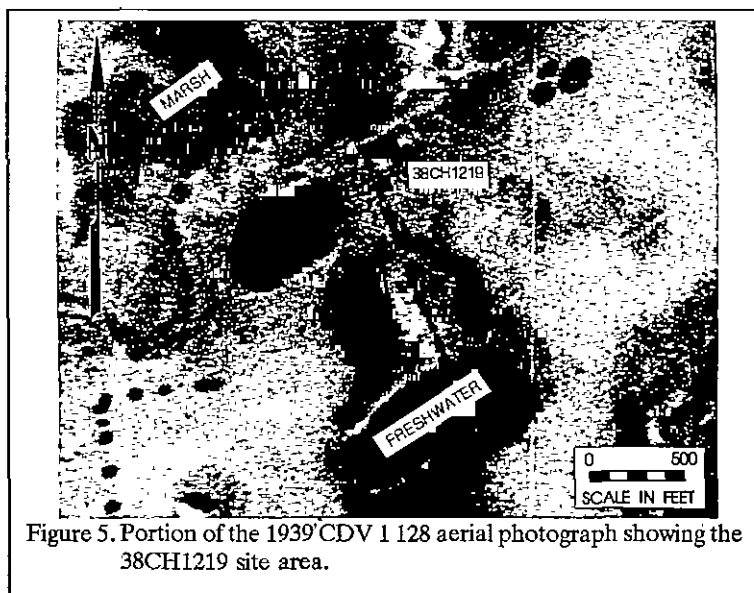


Figure 5. Portion of the 1939 CDV 1 128 aerial photograph showing the 38CH1219 site area.

attract a variety of terrestrial mammals. The typical vegetation might consist of red maple, swamp tupelo, sweet gum, red bay, cypress, and various hollies. Also found are wading birds and reptiles. It seems likely that these freshwater environs were of particular importance to the prehistoric occupants.

The nearest freshwater resource for 38CH1219 may have been nearby Bass Creek, the headwaters of which (prior to its damming) were about 1000 feet to the southeast. Alternatively, immediately to the east of the site is a small natural drainage which has been channelized. This appears to be the remnants of a small freshwater slough. Further inland is a depression, today characterized as a seasonal wetland, which may have been a small pond. These were likely attractive features prehistorically, especially when the sea level was lower and the posited spring was more active.

These areas are clearly seen in Figures 5 and 6. Figure 5, an enlargement of an October 3, 1939 aerial photograph of Kiawah Island (CDV 1 128) reveals the extensive cultivation in the general area, although it appears that 38CH1219 was at the edge of a wooded tract. The photograph shows Bass Creek, not yet impounded, and the already channelized drainage from the interior pond. Figure 6, an enlargement of a February 12, 1989 false color infrared aerial photograph (1358-11) of

the same area, reveals that the area is now covered in second growth and that bass pond is now largely impounded, with only a small portion still intact at its western end. The interior pond and drainage, however, suggest little change over the past 50 years.

Subsistence Resources

It is not possible in these few pages to thoroughly cover all of the species present prehistorically in the site area and, in fact, there are a number of references (e.g., Larson 1969) which offer this information. Nevertheless, it is important, especially for later discussions, to have a general understanding of the estuarine resources upon which site occupation

was focused. In order to make these discussions manageable, only the more common species are included, such as white-tailed deer, raccoon, rabbit, opossum, turtle, turkey, sea catfish, oyster, whelk, ribbed mussel, and hardshell clam.

While population densities and archaeological prevalence are not necessarily related, many of those species found at Late Woodland shell middens are, even today, abundant. For example, a 1965 postal survey of South Carolina hunters found that the five most frequently taken mammals were squirrel, rabbit, raccoon, opossum, and deer (Derrell Shipes, personal communication 1980). Shelford (1963:80) reports that most coastal plain environments can support upwards of 40 deer per square mile. Other researchers report between 65 and 200 raccoons per square mile (Walker 1968:1182; Shelford 1963:81), 220 opossums per square mile (Golley 1966), and 1280 rabbits per square mile (Golley 1966).

Of the mammals identified from coastal shell middens, virtually all are found associated with either the marshes and creeks, or the adjoining maritime forests. In other words, the procured mammals could all be found relatively close to the midden sites and none represent unusual kills. Many species, such as the raccoon, opossum, deer and rabbit, are nocturnal and

solitary (Golley 1966; Larson 1969; Walker 1968) and could have been taken by unattended traps, some perhaps even set in the immediate vicinity of the settlement. There is no evidence that fire drives, or other communal hunting methods were used and most do not congregate in sufficient numbers to warrant such methods. Other species, such as the squirrel, are found throughout the day, although they are more active in the late evening and early morning hours.

Relatively few of these species, however, are good seasonal indicators. One exception is the white-tailed deer. Preserved crania with hard antler development would date from the fall and winter, while shed antler pricked up and used by the Native Americans would date from the late winter through perhaps the early spring. It is unlikely that shed antler not picked up shortly after being shed would be found later in the year (Moore and Bevill 1978:8).

Reptiles may not be a significant food source and may represent only chance encounters, but they seem to be fairly common at many Woodland Period sites. The most common species include the Florida cooter, which tends to be found in freshwater ponds and marshes; the mud turtle, found on freshwater and occasionally brackish water pond bottoms; the diamondback terrapin, a salt marsh turtle which often eats shellfish; and the snapping turtle, which is a true aquatic reptile rarely found on leaving the water.

Birds seem rather uncommon, perhaps indicating that they were rarely worth the effort. The only noticeable exception is the turkey. Data on home ranges provided by Moore and Bevill (1978:27, 35) suggest that population densities from 20 to 50 per square mile may be reasonable. Although able to adapt to a range of habitats, the areas normally used include a scattering of mature mast-producing hardwoods with a mixture of understory plants such as dogwood. Turkeys spend the late fall through early spring in flocks of 30 or more. These flocks break up in late March for the breeding season; the young are born in May and reach a weight of about 5 to 10 pounds by October when the birds begin to congregate again. The bulk of the other birds identified from coastal sites would be found primarily in either fresh

water or marsh environments, although none are found in numbers suggesting more than an occasional catch.

A number of fish have been identified from coastal sites, with the red and black drum, sea catfish, and gar being among the more common, probably because their skeletal remains are so distinctive. In fact, when detailed studies were conducted at one Georgia site, other common species included the Atlantic menhaden and mullet (Marrinan 1975:77). With but a few exceptions (such as the channel catfish and bowfin) the fish found at coastal shell middens are typical of the intertidal creeks, estuaries, and rivers. Even the channel catfish and bowfin may occasionally enter brackish waters or be caught in estuaries during periods of high freshwater runoff.

The fish species found at middens can usually be characterized as either large predators, such as flounder, drum, and catfish, typically found at the mouths of intertidal creeks or the smaller fish, such as mummichog, menhaden, and spot, which follow the tidal flow and provide food for the predators. These two broad categories suggest that at least two different methods of procurement were required. The small fish, occupying a shallow water intertidal creek habitat, and tending to occur in small aggregations, may have been most easily procured by using either gill nets or seines. The gill nets would have been

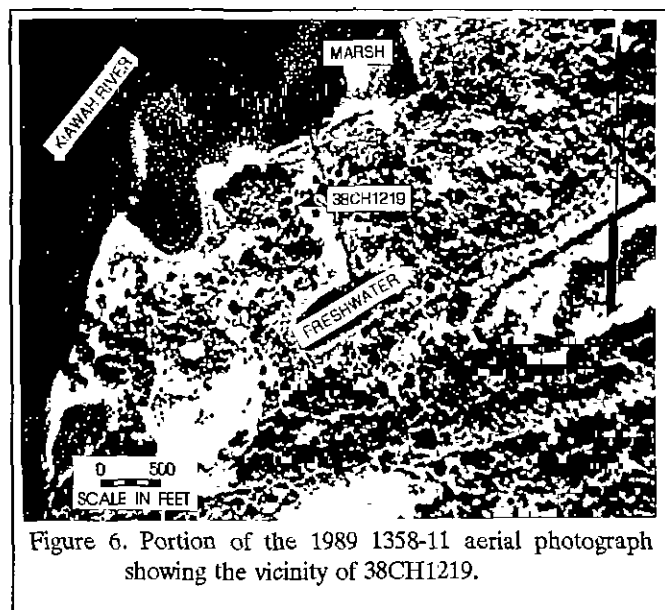


Figure 6. Portion of the 1989 1358-11 aerial photograph showing the vicinity of 38CH1219.

anchored in the channel where the fish are forced to move with the tide and would have caught selectively those fish which could pass their head through the net, and entangle their gills. Larson (1969:181) notes that the net-impressed pottery typical along the coast has a mesh size ranging from 4 to 12 mm, too small to have served as gill nets. This size net, however, could function as a seine to be thrown out and pulled in by waders. Such a method would not have selected specific size fish, but would obtain a wide range of species, perhaps even some larger predatory species. Some of the larger specimens may also have been caught by individual hunting techniques, including either hook or spear fishing (see Larson 1969:193). Larsen (1969:189-192) dismisses the use of weirs and traps along the Georgia and lower South Carolina coasts, noting that the magnitude of the flood tide (from 6 to 9 feet) would make such efforts difficult.

While fish are not particularly good seasonal indicators some do have months during which they are more common. A few species, such as the Atlantic croaker and star drum, are relatively good seasonal indicators, being present in the estuarine system from early spring with a maximum availability in the late fall.

The most common marine invertebrates at Middle and Late Woodland site are the common oyster, Atlantic ribbed mussel, and quahog. Minor species include the stout tagelus, common periwinkle, whelk, blue crab, and an occasional common arc.

Vernberg and Sansbury (1972:275) note that the most common pelecypod mollusk in the Port Royal area is the oyster, with the Beaufort area oyster beds producing approximately 0.25 bushel (about 200) per square yard, of which 39% are over 2 inches in length and 15% are over 3 inches in length. While these data must be carefully interpreted because of commercial oystering pressures, Bearden and Farmer observe that while commercial oyster production has decreased by 56% from 1967 to 1972, the "locations and characteristics" of the beds have "changed insignificantly" (Bearden and Farmer 1972:211). Many other factors must be considered when determining why oyster quality and quantity may have changed. For example, residential and

commercial development have likely changed drainage patterns and rain run-off, both of which effect habitat and productivity.

Quahogs, in less dense bed areas, have an average density of one or two clams per square yard, while ribbed mussels have a maximum density of about 10 per square yard. Periwinkle density will range up to 500 per square yard, although 100 per square yard is probably a more average figure (Vernberg and Sansbury 1972:275-276; Ed Cain, personal communication 1980). Whelk and blue crab are highly mobile and are typically found in relatively small numbers on a per yard basis.

An examination of the preferred habitats of the dominant shellfish suggests that they will be found in three relatively distinct areas, all of which were probably used aboriginally: the hard marsh areas characterized by *Spartina* grass, the intertidal oyster bed areas of the marsh, and the mud-sand intertidal beach areas.

Periwinkles are commonly found migrating up and down *Spartina* in rhythm with the tide in the higher regions of the marsh, often near sandy substrate.

In contrast, prime areas for oyster beds are along the outside edge of bends in tidal stream channels (Larsen 1969:123) and areas of tidal marsh with bottoms adequate to support oyster growth. Oysters grown on intertidal mud flats, where the substrate is marginally adequate, have long, slender shells. Larson has observed that:

within a given locality there are a restricted number of places where it would be possible to collect oysters. Areas where the bottom was too soft or too sandy, where the water was too saline or too fresh, where the temperature was too cold or too warm, where the movement of water was too violent or too stagnant are not productive of oysters (Larsen 1969:120).

While there are a variety of reasons that the oyster industry has declined so significantly over the past 100 years, perhaps the single reason

which can be easily extended into prehistory is the failure to return a portion of the shells harvested back to the growing area, resulting in reduced bottom areas suitable for oyster growth (Harris 1980:10).

Oyster beds, because of their dense mass of shell, are not a likely habitat for many other mollusks, although ribbed mussels may frequently be found mingled with clusters of oysters. Additionally, the various species of whelks are predators of oysters and may be found in shallow water on oyster beds. Otherwise, whelks will be found in shallow water on sandy bottoms.

Finally, species such as the quahog, stout tagelus, and ribbed mussel, will be most often found shallowly burrowed in a mud-sand intertidal beach area. The quahog is found just below the surface of the tidal flat (about an inch or more in depth), occurring in concentrations within very restricted areas. It typically prefers a natural substrate which includes dead shells. Consequently, they may often be found adjacent to oyster beds in intertidal areas. While the oyster has fairly wide salinity tolerances (2.5 to 33 ppm), the quahog is limited to those areas with a salinity over 20 ppm, reflecting its more subtidal nature (see Chestnut 1951; Larson 1969:123). The stout tagelus is also found in the intertidal zone burrowed into the bottom, while the ribbed mussel will be only partially buried in mud. Both species prefer salinities above 10 ppm, they can be found in areas where the salinity is much lower — as low as 2.5 ppm for the stout tagelus and 5 ppm for the ribbed mussel (Castagna and Chanley 1973).

The blue crab is found on mud and sand bottoms over a wide range of salinity. They are especially abundant in estuaries and at the mouths of tidal creeks (where other predatory species congregate). The average size of the blue crab is 5 to 6 inches and they have an average live weight of about a ¼-pound (Freeman and Walford 1976:11; Larson 1969:135). During the warm months crabs frequent the shallow estuarine waters, but during cold months (December through February, when water temperatures are below 50° F) they seek deeper water and would be less available to Native American gatherers.

The only plant food for which there is anything approaching consistent evidence for use during the Middle and Late Woodland Periods is the hickory nut. There are a number of hickories common to the Beaufort area, including the bitternut, water, mockernut, and pignut hickories. These species occur on a variety of soil types, from dry woods to rich or low woods to swamp lands. Along the South Carolina coast they fruit in October, although seeds are dispersed from October through December (Bonner and Maisenhelder 1974:269; Radford et al. 1968:363-366). Good crops of all species are produced at intervals of up to three years when as many as 16,000 nuts may be produced per tree (Bonner and Maisenhelder 1974:271). Complicating this simple seasonality is the ability of the nuts to be stored for up to six months. Hickories were likely an important resource given their high protein and fat yields, providing a caloric value equal to that of many meats (Asch and Ford 1971; Hutchinson 1928:261).

Previous Research

There have been a number of shell midden studies in Charleston and especially in the Beaufort area to the north. This synopsis is not intended to be inclusive, but only to provide a generalized background in an effort to place the study at 38CH1219 in a somewhat wider context. Each of the cited studies can be consulted for a wider, and more extensive list of studies.

Some of the earliest research on Middle Woodland or later shell middens is that by South and Widmer (1976) at Fort Johnson in Charleston County. This site (38CH275) consisted of shell midden and other occupational debris associated with two sand ridges paralleling the Parrot Point Creek marsh. The bulk of the material came from the A horizon and it appears that no stratigraphy existed at the site (South and Widmer 1976:38). All of the pottery was typed as Hanover Fabric Impressed, although the detailed tabulations suggested at least modest amounts of Deptford pottery was also found. Two radiocarbon dates from the site suggested occupation between 280 and 80 B.C. (South and Widmer 1976:45-46).

Beyond the pottery, South and Widmer propose possible use of clam, based on worn edges,

and whelks, based on battered knob projections. While use cannot be disproved, it should be accepted cautiously, especially since similar results have not been identified at other sites. It is also very difficult to eliminate accidental, or incidental, damage from the collection.

Subsistence data from the Fort Johnson site indicate 90% of the shellfish recovered were oyster, while only a small quantity of bone (largely deer) was present. The researchers observed that the "vertebrate faunal assemblage represents a very diverse, and sparse utilization of these resources" (South and Widmer 1976:56). Ethnobotanical remains included seven species, including three nuts, one grass, and three herbaceous plants.

Two phases of excavations were undertaken at the Pinckney Island shell midden (38BU67), first in 1978-1979 and again in 1980. In 1980 work was also conducted at the nearby Mackay Creek shell midden (38BU168) and limited testing was conducted at a shell midden on Victoria Bluff (38BU347) (Trinkley 1980, 1981). While the investigations found a near continuous sequence from the Late Archaic Stallings pottery up to South Appalachian Mississippian complicated stamped wares, perhaps the most significant contributions focused on the St. Catherines pottery (at that time attributed to the Middle Woodland).

The study found no evidence of a sharp occupational break or cultural discontinuity between the Deptford and St. Catherines phases, although the abrupt shift from heavy grit tempering to clay particle tempering was clear. Just as Milanich (1971:148-149) and Caldwell (1970:91) saw St. Catherines as a gradual progression from Deptford to Wilmington to St. Catherines to Savannah, the research at these sites suggested an untyped sandy paste ware might represent a transition between Deptford and St. Catherines.

During the St. Catherines phase there appeared to be an elaboration of the cultural pattern begun in the Early Woodland Deptford phase. The economy was based on shellfish collection and there was evidence of a winter-early spring occupation. The subsistence base became more focused than was evidenced by the Late Archaic Thom's Creek phase.

The creation of the shell middens was found to have been a slow process beginning with a scatter of shell pits. These oyster steaming pits were used once, then abandoned, filled in with the refuse from the meal and general midden refuse. Shell piles, about 10 to 20 feet in diameter, began to form as the occupants piled their season's garbage adjacent to a living area. Some evidence of possible "lean-to" structures was found, although the major finding was an absence of occupation on the middens themselves, as evidenced by the absence of banding or crushing.

A conical sand burial mound possibly associated with 38BU347 may provide evidence of a more permanent, interior settlement. Unfortunately, testing at the site was limited to one area.

This study suggested that the traditional chronology of the Middle and Late Woodland seemed to break down on a regional basis. The Savannah and Irene phases that DePratter (1979) reports for the period from about A.D. 1200 to 1500 were not found in the Victoria Bluff and Pinckney Island area. Instead, the St. Catherines pottery was dated into the fourteenth century on Victoria Bluff and even later on Pinckney Island, suggesting the continuation of essentially a Middle to Late Woodland lifestyle much later than previously anticipated (Trinkley 1980:92).

In 1990 excavations were undertaken at five shell midden sites on Callawassie Island in Beaufort County (38BU19, 38BU464, 38BU1214, 38BU1249, and 38BU1262) (Trinkley 1991). Pottery, spanning the Middle and Late Woodland periods, was the most abundant artifact. While there is little indication that Deptford potters were intentionally selecting particular clays or modifying those clays, by the Savannah phase there is a consistency which suggests the manufacturing process had been refined. Significantly, it was suggested that "the existing typological constructs represents a continuum of indigenous change along the South Carolina coast" (Trinkley 1991:210).

A detailed examination of the cordage found that the Deptford, St. Catherines, and Savannah fabrics were more alike than different, further supporting the paste analysis. Only simple twisted cordage was found, with the Z or left twist

consistently more common than the S or right twist.

Given the similarity in paste and fabrics, it should not be surprising that the study found considerable overlap in the radiocarbon dates. Deptford wares appear to extend to as late as A.D. 930, while St. Catherines dates at the sites ranged from A.D. 750 to 930.

Lithics, while rare, included projectile points typed as the Roanoke Large Triangular (Trinkley 1991:212) and flakes of relatively local materials. The only other artifacts identified were drilled oyster shells, perhaps representing ornamental objects.

The five sites suggested a diffuse faunal subsistence base, with some indication of an increasing focus on fish resources through time. Plant foods, while likely used, were poorly represented. Shellfish, specifically oyster, however represent the greatest contributor of biomass to

Based on the similarities, and differences between these sites it was suggested that:

sites such as 38BU19 appear to represent at least semipermanent "collector" settlements or large residential bases. Sites such as 38BU464 may represent base camps for "foragers" or smaller "collector" settlements. Sites such as 38BU1214, 38BU1262, and 38BU1249 all represent temporary encampments for collection/foraging activities (Trinkley 1991:217).

By 1991 a number of Middle to Late Woodland shell middens had been excavated and Kennedy and Espenshade (1991:40) found that at many of the sites oyster shell was the single most abundant cultural remain, with other artifacts (such as pottery or even faunal remains) being very scarce. Structural data, such as post holes or even

features, was likewise rare. They proposed that at least some shell midden sites (such as 38BU1270, but clearly not like 38BU347 or even 38BU67) did not represent, "sites which were seasonally occupied by a resident population, consuming the oysters which were collected from the nearby marshes," but instead suggested that the "oysters were collected, shucked, preserved (smoking/drying), and removed from the site"

(Kennedy and Espenshade 1991:40). They also suggested, as had Trinkley earlier, that traditional ceramic series such as Deptford and Wilmington overlapped.

These views were further refined and explored by Kennedy and Espenshade (1992) as a result of data recovery excavations at a series of

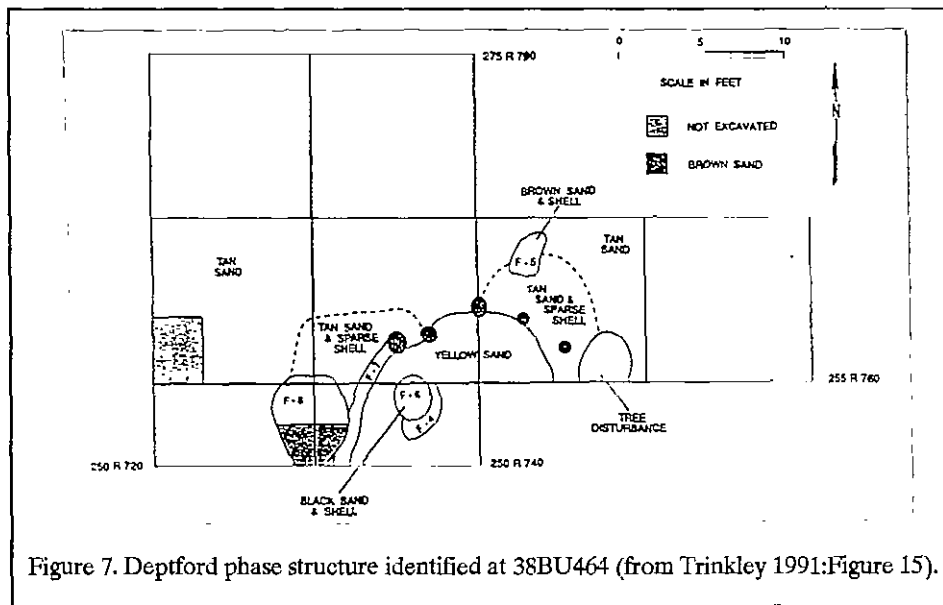


Figure 7. Deptford phase structure identified at 38BU464 (from Trinkley 1991:Figure 15).

the diet at the various sites.

Site 38BU464 revealed both features and a portion of a Deptford phase structure (Figure 7). Likewise, 38BU19 revealed "abundant features, post holes, and daub (probably from structures)" (Trinkley 1991:216-217).

four Middle Woodland sites (38BU132, 38BU372, 38BU1236, and 38BU1241). They noted that although large quantities of shell were found at these sites, artifacts, faunal remains, and ethnobotanical remains were scarce. Further, the

reinforced the perception that some shell midden sites were generally "unproductive." Artifacts consisted almost exclusively of pottery with the observation that:

Attribute	Multi-Family Residential Base	Single Family Shell Midden	Single Family Shell-Less	Oystering Station
Oyster Contribution	High	High	Moderate to Low	Very High
Minority Shellfish Contribution	Moderate	Moderate	Low	Very Low
Vertebrate Faunal Contribution	Moderate	Moderate	Moderate to High	Very Low
Lithic Density	Moderate to High	Moderate	Moderate to Low	Very Low
Lithic Tool Diversity	Moderate to High	Moderate to High	Moderate	Low
Bone Tool Frequency	Relatively High	Moderate	Moderate	Low
Shell Tool Frequency	Relatively High	Moderate	Moderate	Low
Sherd Tool Frequency	Relatively High	Moderate	Moderate	Low
Ideotechnic Items	Relatively High	Moderate to High	Moderate	Low
Sherd Density	Relatively High	Relatively High	Moderate	Low
Human Remains	Relatively Common	Occasional	Occasional to Rare	Very Rare
Structural Features	Relatively Common	Common	Common	Very Rare

Figure 8. Shell Midden Sites Types (adapted from Espenshade et al. 1993:Table 48).

investigated sites all lacked (or had very few) post holes or features (Kennedy and Espenshade 1992:92). They note that, "variation between the study sites is quantitative (how many shell heaps/how many episodes) rather than qualitative (i.e., the site assemblages are very similar in diversity and content)" (Kennedy and Espenshade 1992:93). They reaffirm their earlier view that these types of sites "were established for the procurement and processing of a major resource, the oyster," probably during the spring or summer (based on shellfish seasonality data) (Kennedy and Espenshade 1992:94). They suggest that a focus of future research should be the identification of interior sites representing the remainder of the posited seasonal round.

The 1992 excavations at 38BU833 undertaken by Chicora Foundation in many ways

the artifact collection . . . suggests a site at which very focused or a narrow range of cultural activities took place. Lithics appear to be relatively insignificant and, when present, to be highly curated. Other artifacts, such as bone or shell tools, are absent. The artifactual assemblage, in essence, provides no evidence of specialized activities and argues against the occupants intending to process any quantity of mammals, such as deer (Trinkley et al. 1992:37).

The subsistence remains were also sparse, reflecting a very focal subsistence quest. Vertebrate faunal species were clearly of secondary

importance to the shellfish. Even the invertebrate remains reveal a strong preference for oyster (Trinkley et al. 1992:38).

As a result of additional Early and Middle Woodland excavation on Spring Island, Espenshade et al. offered a further refinement and explanation of their "Woodland Site Types," noting that the "distinctions between these middens types are important to interpreting Woodland settlement" (Espenshade et al. 1994:175). Four specific site types, apparently spanning the Late Archaic and Woodland periods, are identified (see Figure 8).

Multi-family residential bases "represent the largest aggregation of coastal residents" and were perhaps occupied year-round. Espenshade et al. remark that sherd density is high, a broad range of artifacts are present, a number of floral and faunal resources were apparently used, and a range of features may be expected. They offer as a Late Woodland example site 38BU19 (Espenshade et al. 1994:176).

Single family shell middens "are generally smaller versions of the multi-family residential bases" with a slightly decreased diversity of remains. They explain, however, that "a good Wilmington/St. Catherines example is not known" (Espenshade et al. 1994:177).

Single family, limited shell sites are thought to represent a seasonal encampment by a small group or perhaps even single family. Shell, while found, is limited to refuse in pits with no discernable midden. Artifact diversity is significantly less than would be found at even single family shell middens and, again, no Late Woodland examples are reported.

Finally, the oystering station was a site "occupied by small work teams for short visits focused on the procurement and processing of oysters" (Espenshade et al. 1994:177). These sites are similar to those discussed by Kennedy and Espenshade (1991, 1992) and are compared to "encampments for collection activities" (Trinkley 1992:39).

Considering some approximation of the total settlement system, Espenshade et al. observe

that:

the oystering stations on Hilton Head, Spring, and Callawassie Islands (and at Colleton River) are all within a four hour canoe trip from the village at Callawassie [38BU19; the authors do not mention the similar village and mound at nearby 38BU347]. The lack of observed single-family shell middens may indicate that aggregated use of the coastal zone (i.e., year-round occupation of residential base camps) precluded the formation of single family sites (Espenshade et al. 1994:178).

Espenshade and his colleagues have clearly provided the discipline with an excellent starting point for additional discussion and further refinement. Viewing the shell middens as part of a larger subsistence system is an important advance over a simple descriptive typology. Yet, it leaves a variety of questions unanswered (as surely any new development in the discipline is likely to). The use of qualitative terms such as "moderate" and "relatively high" begs the question of where an individual site might fit in the scheme. One person's "moderate" is another's "relatively low." When one is dealing with very small sample sizes it is unlikely that the entire site has been examined, suggesting that it may be "relatively" easy to misjudge where a site fits within the scheme. And certainly even the authors would advise caution when using the scheme when relatively little is known about the site (for example, when only survey data are available). In sum, many are likely to consider this modification of a trait list approach unconvincing and/or confusing.

It is also possible to debate whether the "oystering stations" in fact represent the collecting and processing of oysters for smoking, just as it is possible to dispute the spring-summer season attributed to these sites. While Espenshade and his colleagues present very interesting ethnohistoric data to support the contention that smoking oysters is a viable preservation technique, application of the ethnographic data to the prehistoric period is more problematic. So too is even the

premise -- that drying oysters is something prehistoric groups would want to do, or even could do effectively.¹

But most troubling is that while drying using a fire or smoking would both likely require pits, or at least broad hearth areas, and would result in relatively large quantities of wood charcoal, the posited processing stations have few pits and almost no charcoal. There is, it would seem, no more evidence to support the smoking of oysters than there is to support smoking of fish (see Trinkley 1992:37-38).

These issues aside, the proposed site types provide a valuable heuristic device which may help classify sites, at least once some level of testing or data recovery has been accomplished. Even this brief review of previous research does indicate a seemingly "real" difference between sites such as 38BU19 and 38BU833, representing either extreme of Espenshade et al.'s reconstruction. Sites such as 38BU464 and 38BU1214 seem to fall somewhere between these extremes, representing more than a brief encampment but less than a residential base. Perhaps multi-family shell middens should be considered as a classification during the Late Woodland?

One of the most recent projects, also conducted on Hilton Head Island in the Beaufort area, examined the Middle and Late Woodland shell middens at 38BU861 (also known as Old House Creek) (Trinkley and Adams 1994).

¹ It is important to consider what drying and smoking do. The purpose of drying is to take out enough water from the material so that spoilage organisms are not able to grow and multiply during storage. The final moisture content depends on the nature of the food, the processing techniques, and even the local climate. Smoking, usually at temperatures of 70° to 90° F, colors and flavors the tissues, helps retard rancidity, and assists in drying. Shellfish moisture content can rarely be reduced to below 40%, allowing preservation for a relatively short period. For shellfish to have any significant keeping ability the moisture content must be reduced to below 20%. Even at this level the ideal storage temperature is below 50° F (see Hertzberg et al. 1973 for additional information). This information suggests that drying or smoking of shellfish might allow the food to be kept for two or three days, but it is not likely to allow (in South Carolina's sub-tropical climate) the flesh to be stored for longer periods.

These investigations opened a total of 700 square feet at five middens and 200 square feet at non-midden areas. The bulk of the excavations were screened, minimally, through ¼-inch mesh, although consistent samples of midden and features were water screened through ⅛-inch mesh. Each midden's size and orientation was plotted in the field and the site area was explored using primarily 20-foot auger testing. A topographic map was prepared using a 0.25-foot contour interval. Shell:soil ratios were obtained from each midden, using a standardized procedure.

Pollen samples were collected from below and within middens. Carbonized floral materials were collected from feature flotation and from handpicking of water and dry screenings. Faunal samples were collected primarily from the ¼-inch screening, supplemented by the water screening. Shellfish columns were collected from each midden, both for specialized examination of the oysters and for species tabulations. Five radiometric dates were ultimately obtained for two middens. Clam shell seasonality was examined for one feature (the only feature yielding a sufficient number of clams). Odostome research was conducted using several proveniences and was evaluated for its future potential. The pottery recovered from the site was examined, with special attention paid to paste and fabric attributes. In addition, X-ray fluorescence analysis of one sample offered a tentative look at the paste and its inclusions.

The research was designed to explore the typological validity of the St. Catherines pottery type. The initial testing results, which identified only St. Catherines pottery, was encouraging, since it suggested the site might represent a "pure" St. Catherines midden. The study found, as more auger tests were screened and more units were opened, that the site included not only St. Catherines pottery, but also Deptford wares. This diversity resulted in the need to explore the validity of the St. Catherines type in relationship with the Deptford wares, introducing a variable which was difficult to control. Regardless, the study made substantive contributions to our understanding of the St. Catherines "type," with the ultimate suggestion that it be subsumed within a type-variety system similar to that proposed by Dr. David Anderson (Anderson et al. 1982) as a result

of the Mattassee Lake work.

It was also thought that careful attention to individual middens might help further our understanding of community patterning.

In the 260 by 140 foot study area at Old House Creek, nine individual middens were identified. Most were within 100 feet of the current marsh and all were above 10 feet AMSL (that is, above the wet, mucky soils typical of the lower elevations). The middens tended to get smaller farther inland. There is also some indication of the middens being clustered. For example, within the study tract, there are four middens within an area of 120 by 90 feet (or 0.2 acres). In other words, nearly 45% of the middens were found on about 25% of the study tract.

The middens were found to cluster in size between 92 and 252 square feet, although there was clearly a great range in size. The larger middens, however, may represent similar amounts of shell as in the more modest middens, simply spread out over larger areas (based on our shell weight data). The available data also suggests an inverse relationship between the shell:soil ratio and the midden size in square feet, with the larger middens tending to have a lower shell:soil ratio and the larger middens tending to exhibit fill dominated by soil. This also seems to support the concept that larger middens are simply small middens more spread out and trampled down.

Finally, the Old House Creek work attempted to provide a more integrated environmental approach, emphasizing the dynamic interactions between the human group or groups at the site and the surrounding environment.

An examination of the faunal remains found that the collection exhibited a very low diversity, with a small number of taxa supplying the bulk of the biomass. The high equitability index for the MNI suggests that a number of taxa were being exploited, although there was a strong focus on wild mammals -- such as deer and raccoon -- which contributed 80% of the MNI and 99.9% of the biomass. There was relatively little seasonality evidence in the vertebrate faunal collection, although the presence of silver perch weakly

suggests a fall occupation. Perhaps more importantly, the absence of rodent gnawing on the bone remains suggests that they were quickly buried, consistent with the absence of lensing or microstratigraphy at the site. This, in turn, may suggest that the site was intensively used during its period of occupation. That is, rather than the middens gradually forming over weeks or months, they may have formed within days or a few weeks.

The ethnobotanical remains found a wide variety of wood charcoal, suggesting that foraging activities incorporated a broad range of environments, including the dry uplands, the more mesic marsh edge, and even wetland areas. In spite of the variety, the dominance of pine (which also dominates the pollen record) suggests that the site area was characterized by a pine sub-climax forest. Stands of hickories may have existed as "islands" in the pine forest, focusing human occupation in relatively narrow areas along the marsh.

Other floral remains, such as charred hickory nuts, viburnum seeds, and palmetto seeds, are all suggestive of a fall or winter occupation. Even the failure to recover weed seeds (which should be present in a disturbed habitat) may make sense if the site had only a cool weather occupation.

Shellfish was the most important food source present at Old House Creek. The three middens investigated contributed between 97.7% and 99.9% of the biomass present in each midden. Faunal remains, in comparison, contributed only 0.3% to 1.7%.

The shellfish at the site were dominated by oyster, comprising on average 96.8% of the middens by weight. Examination of the specimens present suggest that middle to high intertidal clusters and scattered individuals from the lower intertidal areas were primarily used. There is also some evidence in one midden of the maximum oyster size decreasing through time. This finding is difficult to interpret, however, since we do not know the length of time represented by the midden. If the bulk of the evidence is correct and the midden represents a relatively short duration, then the decrease in oyster sizes may mean that the site occupants focused their attention on the marsh very close to the site, rapidly depleting the

large oysters and turning to the smaller intertidal clusters. Although the oysters failed to offer seasonality data, the odostomes recovered from two samples are suggestive of a late fall occupation — consistent with the floral remains.

There are other shellfish present at Old House Creek, although admittedly they are relatively uncommon. For example, clams account from 1.5% to 3.2% of the various middens by weight, while ribbed mussel ranges from 0.2% at Middle 3 to 1.2% to 1.8% at Middens 1 and 2. Both probably represent intentional, if opportunistic, collection. Periwinkles, whelk, and other remains suggests incidental inclusion, without any real effort at collection.

Examination of the clam shells from Feature 3 at the base of Midden 3 present a different view of the site's occupation. They suggest death from March to April -- during the spring. Only if a broader interpretation of the data is used do the results encompass the period from December through April. Admittedly, not too much can be made of this information as it reflects only one feature and it cannot be taken as representative of the site as a whole.

The other shellfish are typically weakly suggestive of cool weather collection. For example, the knobbed whelk tends to be most common in the fall and spring. The near absence of periwinkles may be explained by their preference for warmer weather.

Looking at previous research in a broader context some have argued that at least some shell midden research has become unproductive, stale, or that further research is simply unnecessary (for a synthesis of these discussions see Lawrence 1994, cf. Espenshade et al. 1994). It is likely that there are, or may be, some sites which offer limited potential for answering significant questions. Other sites, however, have no shortage of questions which they may address, including:

- The ceramics themselves can be examined for information on kin-based groups using cordage analysis at an intrasite level, comparing materials between a variety of discrete midden piles. Similar analysis can also be accomplished using chemical

analyses of the paste, perhaps concentrating on a small array of trace elements.

- Chemical analyses of the pottery may provide clues to the clay sources, which in turn may provide information on seasonal (or other) rounds. These analyses may also be able, once there are sufficient data, to project the limits of different groups.

- Both chemical analyses and cordage studies may be useful in refining typological issues, especially when conducted with more traditional paste studies. For example, this battery of analytic approaches may be able to refine our understanding of the array of clay and grog tempered Wilmington, Hanover, and St. Catherines pottery. Perhaps there is good reason to review the Mattassee Lake report (Anderson et al. 1979) and adopt a type-variety system.

- Even using different analytic approaches, such as the concept of estimated vessel equivalence, may provide a better understanding of inter and intrasite ceramic diversity. Likewise, making complete cordage analysis a standard feature of all studies would assist in allowing others to adopt a colleague's work to new and different theoretical approaches.

- Radiocarbon dating, based either on relatively large charcoal samples or on AMS dating, could be used to date a variety of discrete shell middens within one site, with 10 or 20 dates refining our understanding of site function. It might be possible to identify sufficient charcoal samples from distinct levels within the midden to allow for beginning and ending dates for individual middens (accepting one or two sigma deviations), providing even closer temporal control.

- Pollen analysis at individual middens could explore the nature of site vegetation, testing for evidence of site disturbance, second growth or weedy species. This information might better help us understand how, and how intensively, sites were used. Such studies could be combined with more traditional ethnobotanical research to identify wood species for cross-checking.

- Incorporation of additional shellfish studies

may be able to further refine our understanding of seasonal use, especially when several seasonal indicators are used as cross-checks from discrete midden areas. It may also be useful to examine middens on a shellfish assemblage basis in an effort to reconstruct specific ecotonal use areas.

Just as it is possible to point out some potential research questions (even more could be added by including a regional scale of comparative analysis), it is also possible to outline successful research techniques. For example:

- Expanding recovery techniques to incorporate some degree of 1/8-inch and even 1/16-inch screening may allow better dietary reconstructions by providing more complete, and representative, recovery of floral and faunal materials. For example, at several sites our research has shown that it would be impossible to document the presence of fish remains unless 1/8-inch mesh was used. Failure to use this level of recovery would have resulted in a flawed interpretation of site dietetics. We have also found from investigations at several Middle Woodland middens that this level of recovery can be achieved only through water screening.

- Close-interval auger testing is a fast, reliable approach to better understanding intrasite variability and patterning. We emphasize *close* interval, meaning maximally 20 feet, since larger intervals completely fail to identify discrete midden areas.

- Site contour mapping at 0.25 foot intervals, combined with close-interval auger testing, provides a comprehensive view of shell midden dispersal and allows the most accurate site patterning studies. Intervals even of 0.5 foot will often fail to provide the degree of precision essential for this type of study.

- The sample sizes that are often used at shell midden sites are likely inappropriate for the level of precision necessary to address comprehensive research questions. While this has gradually become apparent, it is perhaps best demonstrated quantifiably by O'Neil's (1993) recent investigations. Many of the research questions we have outlined require large sample sizes to be

effectively examined. We need to think at the level of minimally 20 to 30% sampling, not at the current levels of 2 or 3% sampling.

- We also believe that the best way to address these significant research topics is through intensive hand excavation. While data recovery programs which rely on large-scale stripping as the primary recovery approach might, in some circumstances, allow features to be rapidly uncovered, such programs also destroy the context of these features, eliminate the small quantity of artifacts typically found at Middle or Late Woodland shell middens, reduce the opportunity to explore intrasite research questions, eliminate the opportunity to explore extensive radiocarbon dating, and seriously constrain the research options at any given site.

Hopefully this overview has made several points. First, there is still much we don't know. This means that we are nowhere near redundancy at any site type in South Carolina. Second, since we can never prove scientific theories, even those concerning cultural behavior, but can only disprove them, continued research is essential for the growth of the discipline. The offeror of a new cultural theorem must be "lucky" every time the theorem is tested, while the researcher seeking to debunk the new law must be "lucky" only once. Third, much research is at the level of only offering "signposts" for those that follow. This is essential and represents the gradual growth of knowledge. Halting research because we have looked at three or thirty sites of a particular "type" also halts our learning process. As long as valid research questions can be posed, or as long as previous research can be refined or further tested, then research at the site is likely in the public interest -- particularly when the site will be destroyed by some development activity.

EXCAVATIONS AT 38CH1219

Proposed and Implemented Methods

As previously mentioned, the site is situated at the western end of Rhett's Bluff on Kiawah Island, overlooking the Kiawah River marsh to the north (Figures 9 and 10). The first activity at the site, not specifically proposed but certainly necessary, was clearing some of the vegetation in order to identify the site location and the boundaries of the midden. Although heavy equipment (a hydro-axe) was available to conduct this work, it was decided that the site was so ephemeral that it would be better not to risk damage to the midden. Consequently, all of the work was conducted by hand using bush hooks and axes. This undertaking, while requiring about a half-day, not only allowed the site to be explored without damage, but also promoted a better understanding the site environs. The midden, which appeared very distinct during the survey, was considerably less distinct during the clearing operations.

In general the area was characterized by a slight sand ridge running roughly parallel to the marsh. The topography tended to drop slightly to the south (toward the access road) and more noticeably to the north (from the woods toward the high marsh). No clearly distinct shell midden was found, although scattered shell was observed on the surface. As the clearing continued, the original central shovel test was identified, with even a bit of the original flagging still in place. This midden appeared to be situated on the marsh side of the ridge, on the last bit of relatively well drained Seabrook soils before the slope toward the marsh.

Site Grid and Auger Testing

This setting directed the placement of the site grid (used initially for the placement of the auger tests). Instead of the site being placed in the center of the grid, the grid was extended more to the south, allowing a greater area of higher soils to

be incorporated in the testing program (Figure 11).

A 90 by 80 foot was incorporated into the grid, which was oriented to magnetic north and tied into several permanent development markers. A modified Chicago 10-foot grid was established, allowing each unit to be designated by its southeast corner from a 0R0 point located off-site. Thus square 50R100 would be located 50 feet north and 100 feet right (or east) of the 0R0 point. Vertical control was maintained through a mean sea level elevation control point — an iron rebar set in a 30R100 on the southern edge of the auger test grid. The top of this rebar has an elevation of 6.16 feet MSL. This ensures that elevations between sites are consistent.

Although the original methodology proposed the excavation of 10-inch auger tests at 20-foot intervals, a decision was made in the field to decrease that interval to 10-foot. This increased the number of auger tests from 25 to 90, but the change was largely based on our previous work at 38BU861, where 20-foot transects were used with mixed results. That work revealed a 20-foot interval was the maximum which would allow middens to be identified. It suggested that better results could be obtained with a closer interval and because of the seemingly sparse remains at 38CH1219, this seemed to be an excellent site on which to decrease the interval.

The auger tests, while placed on the prepared modified Chicago grid system were systematically numbered from west to each and south to north for simplicity and convenience. Consequently 30R60 was Auger Test 1, 30R70 was Auger Test 2, 30R140 was Auger Test 9, 40R60 was Auger Test 10, and so on (Figure 10).

Each test was augered using a two-person mechanical auger with a 10-inch bit. Auger holes were cleaned out using a shovel, the profiles recorded, and the fill was screened through ¼-inch

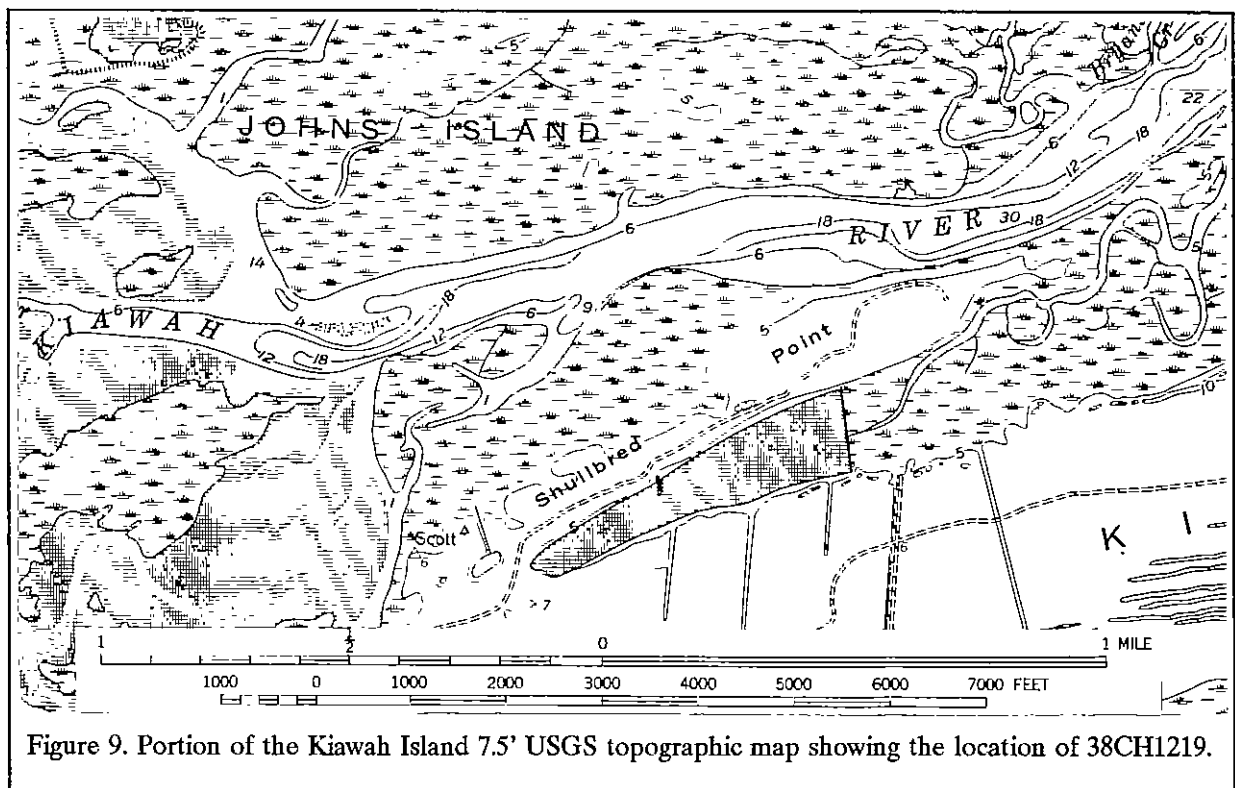


Figure 9. Portion of the Kiawah Island 7.5' USGS topographic map showing the location of 38CH1219.

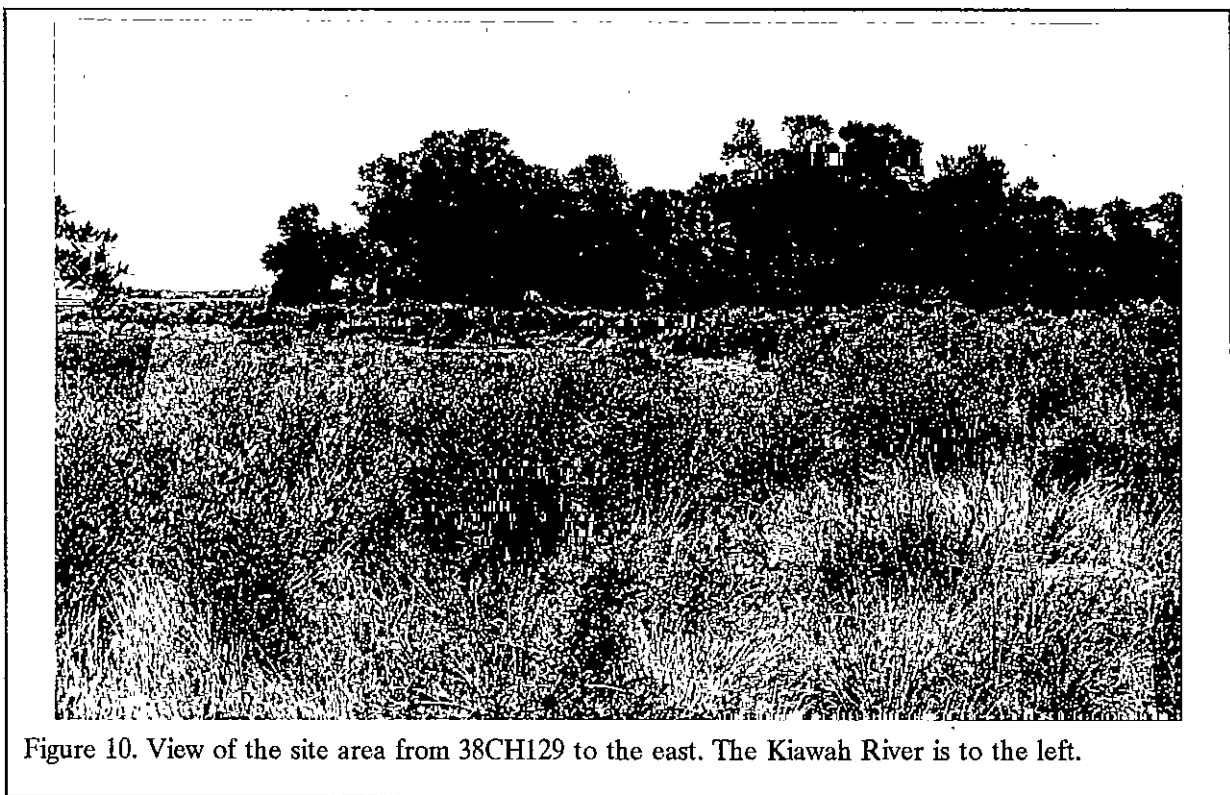
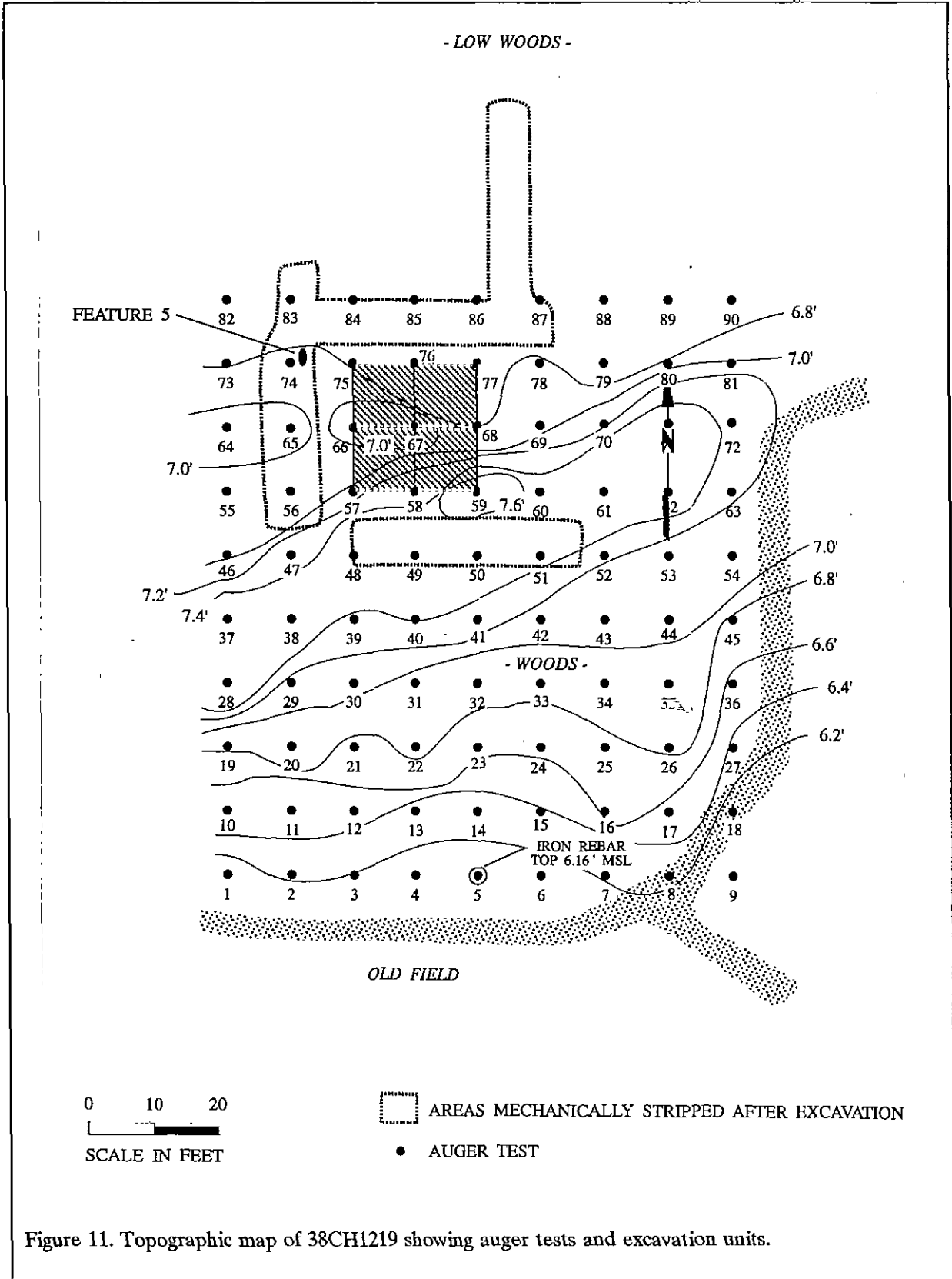


Figure 10. View of the site area from 38CH1219 to the east. The Kiawah River is to the left.



mesh. Afterwards each test was backfilled.

The auger test grid was also to serve as data points for preparation of the detailed topographic map, originally to be prepared at a contour interval of 0.5 feet based on the original proposal. Our research at Old House Creek, however, revealed that contour intervals greater than 0.25 foot would likely not produce meaningful results. Consequently, the decision was made to decrease the contour interval to 0.2 foot, slightly better than the data collection at Old House Creek.

Excavations

Only one midden was known from the site area and the research design had focused on complete or near complete excavation of this feature. The initially proposed minimal excavation unit was a 5 by 5 foot unit, and the 10 by 10 foot units used for the investigation of the midden were consistently divided into quadrants for additional control of artifact distribution.

The excavations were to be by the natural soil zones -- anticipated to be the shell midden, non-shell A horizon, and possibly areas of old A horizon preserved by the middens. The excavations revealed that these zones were essentially correct, although preserved A horizon soils underlying the middens was only rarely identified and in many cases the midden was founded on and extended into subsoil. Consequently, throughout the site there was Zone 1, which consisted of non-shell midden soils, Zone 1a, which consisted of dense middens, and Zone 2, which consisted of old humus largely preserved under the shell middens themselves.

Excavation was to be by hand with all fill dry-screened through ¼-inch mesh to ensure the recovery of cultural materials. A third of all ¼-inch screened material would also be water screened through ⅛-inch mesh for recovery of floral and faunal material. In addition, a 5-gallon volume of sampled midden was to be packed, without additional screening, for waterscreening through very fine mesh for the recovery of small snails (*Boonea impressa*) useful in seasonal dating.

Flotation samples (typically also 5 gallons in size) were to be collected from areas which exhibited a high potential for the recovery of ethnobotanical remains. A mechanical water flotation system would be used for the recovery of the light and heavy fractions. The flotation was conducted at the Chicora Foundation laboratories after the completion of the field work. To maximize the amount of charcoal from the samples, the heavy fraction was re-floated using a method recommended by Dr. Gail Wagner.

A 2.25 square foot shell column was designated from each midden. The shell and soil from the column was weighed prior to shifting and the shell, collected for more detailed analysis, was weighed after screening. This provided a quantified statement of shell density for each of the midden areas investigated.

Each unit was to be troweled at the top of subsoil, photographed in b/w and color slide film, and have profile and plan views drawn. Drawings and/or photographic documentation would occur more frequently if conditions warranted. This was accomplished without modification.

Features encountered during the excavations would be plotted and photographed. Features, or samples of redundant features, would be bisected to provide profiles, photographs, and drawings. All excavated feature fill would be screened through ⅛-inch mesh. Samples retained would minimally include a soil sample and flotation sample. This aspect of the investigations was also accomplished. The only modification was that all features, and not simply samples, were investigated.

Findings

Auger Tests

The 90 auger tests excavated at 38CH1219 confirmed what the shovel test survey suggested in the most general of terms -- the site contains a very low density of both shell and artifacts. The distributions are illustrated in Figures 12 and 13.

Figure 12 reveals only two concentrations of shell midden on the 0.2 acre tract. One is

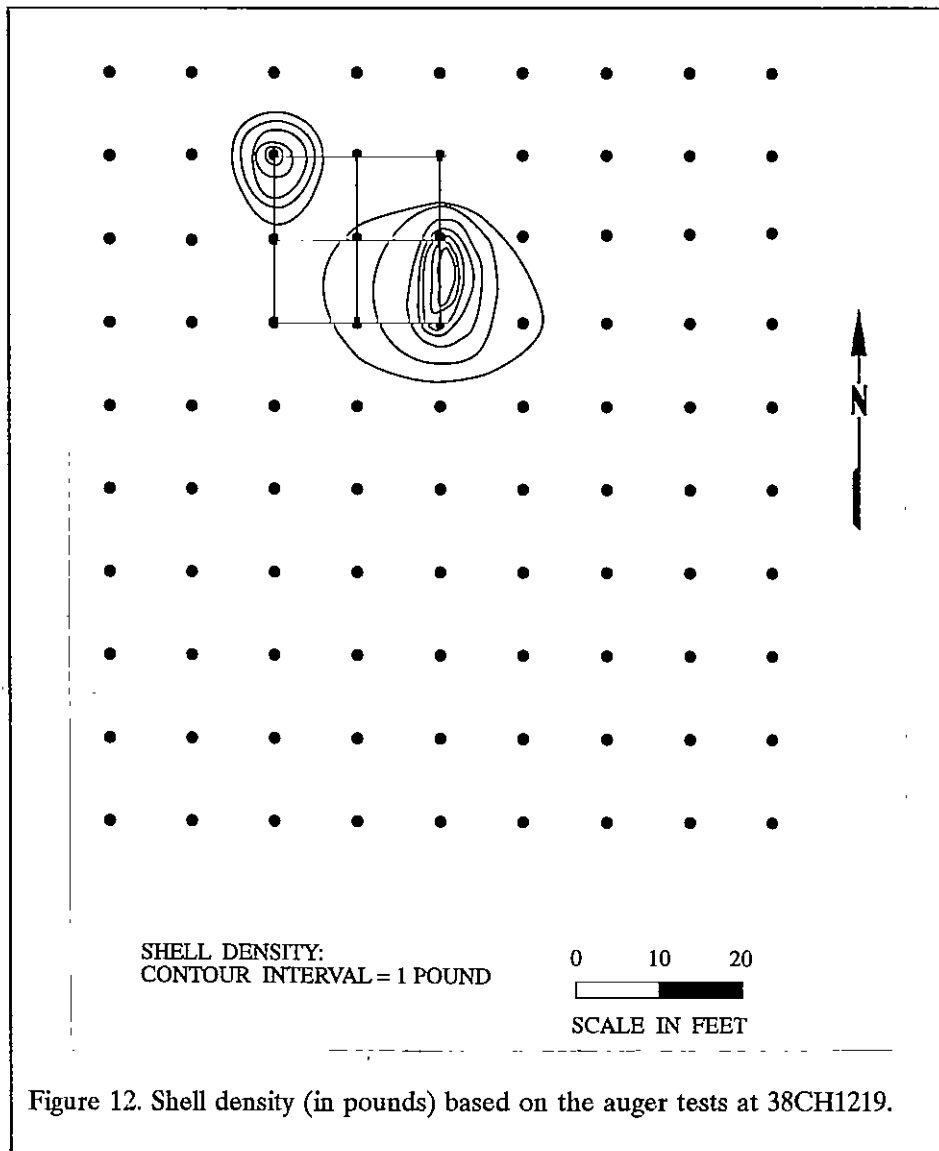


Figure 12. Shell density (in pounds) based on the auger tests at 38CH1219.

centered in the area of 95R100 and covers an area of about 400 square feet (measuring 28 by 20 feet). The other is centered at 110R80 and covers an area of perhaps 100 square feet (measuring about 9 feet in diameter). Besides these two middens, no other shell could be detected in the survey tract.

Figure 13 reveals five concentrations of artifacts. Three of these are some distance from the shell middens and, in each case, represent either isolated artifacts in one or two contiguous tests or, in one instance, three artifacts in a single isolated test. None appear to represent any significant deposition of cultural remains. There are, however, two concentrations which appear

significant. Both appear, based on the mapping, to be associated with the larger midden (compare to Figure 12). Centered at 85R80 are artifacts dispersed over an area of perhaps 400 square feet (measuring about 20 feet in diameter). To the northeast, in the vicinity of 100R100 is a second concentration, just on the edge of the shell midden and spreading north and east to the fringe areas.

Small quantities of primarily nineteenth century historic materials were also recovered in the auger tests. These are likely associated with the large eighteenth and nineteenth century plantation settlement, 38CH129, situated further to the west.

The most revealing aspect of the auger tests is that the distribution of shell midden and artifacts appears to be mutually exclusive. This finding adds additional support to the view that the middens represent trash piles adjacent to occupation areas and, unlike earlier Thom's Creek middens, are not occupational zones themselves.

The study also revealed that the distribution of shell and artifacts would be dramatically different had the initial plan of 20-foot auger tests been implemented. Such an approach (assuming identical beginning and ending points for the survey grid) would have missed all of the small artifact clusters. While this would not really have changed our understanding of the site,

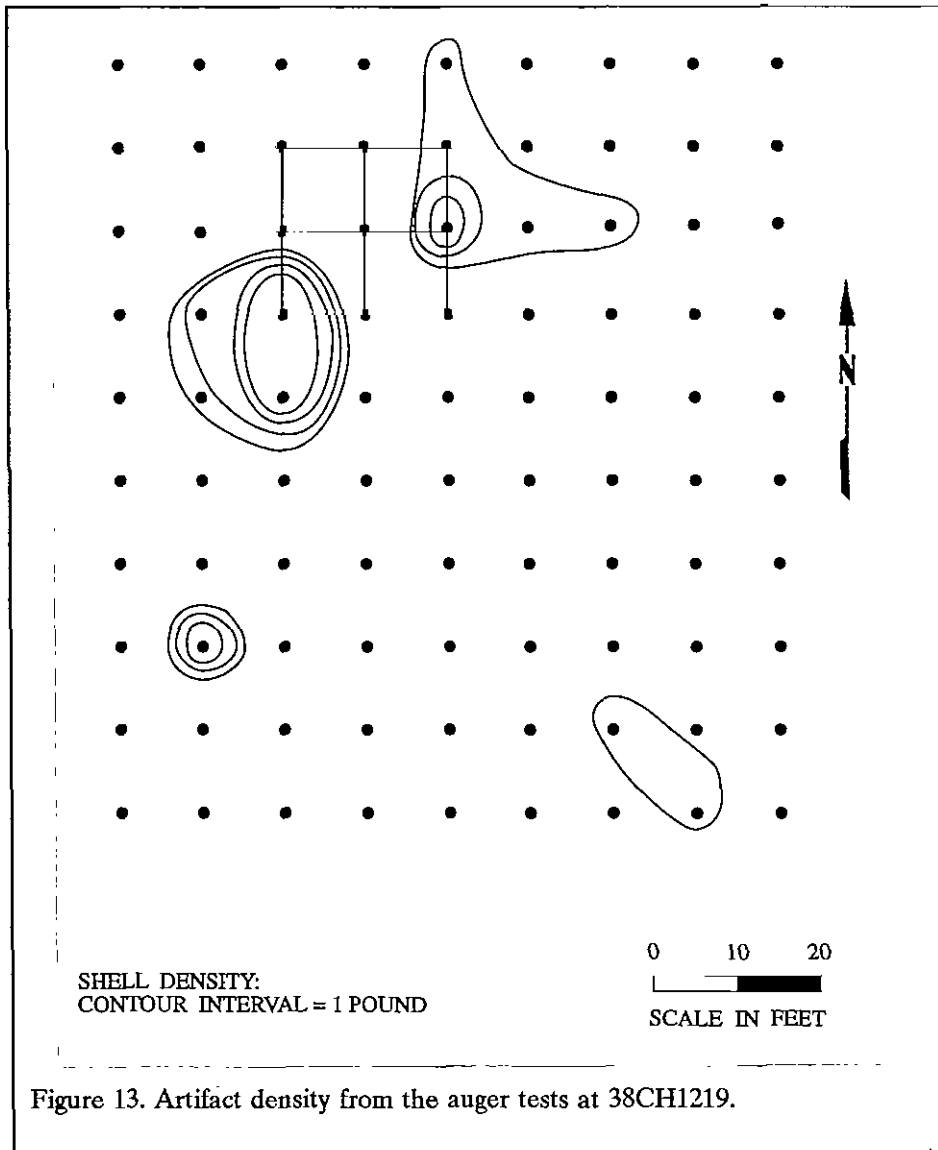


Figure 13. Artifact density from the auger tests at 38CH1219.

the 20-foot testing grid would also have missed the northeastern artifact concentration, converting it to a seemingly isolated occurrence. The southwestern concentration, while noted from four artifacts collected from 90R80 (Auger Test 57), would not have been recognized as being as large or tightly clustered as it appears in the more detailed testing.

In a similar manner, 20-foot testing would not have allowed either midden to be as clearly defined. The least distorted would have been the smaller, northwestern midden. The southeastern midden, lacking data from 100R100 (Auger Test 68), would have been considerably smaller and no boundaries could have been determined.

There seems to be good evidence to support the 10-foot auger testing interval, although such an approach does require additional time and energy. Previous work at 38BU861 suggests that while the closer interval is useful at small sites, it become less useful when denser middens are encountered.

Excavations

The auger tests helped to direct the placement of the excavation units. Since there appeared to be more than one midden, and since at least one of these appeared to be larger than the anticipated 10-foot diameter, it was decided that an effort would be made to explore significant portions of both. While it would not be possible to fully excavate both middens, it might be

possible to ensure the excavation of something approaching 50% of each midden, and still include some excavation of non-midden areas.

As a consequence, a 20-foot square excavation block was placed to incorporate portions of both middens and both artifact concentrations. This block consisted of four units, 90-100R90-100 (Figure 14).

The excavations revealed that shell was sparsely present throughout the excavations. Although clear middens were present, separating Zone 1 soils from Zone 1a midden was difficult and imprecise. Midden definition, however, was

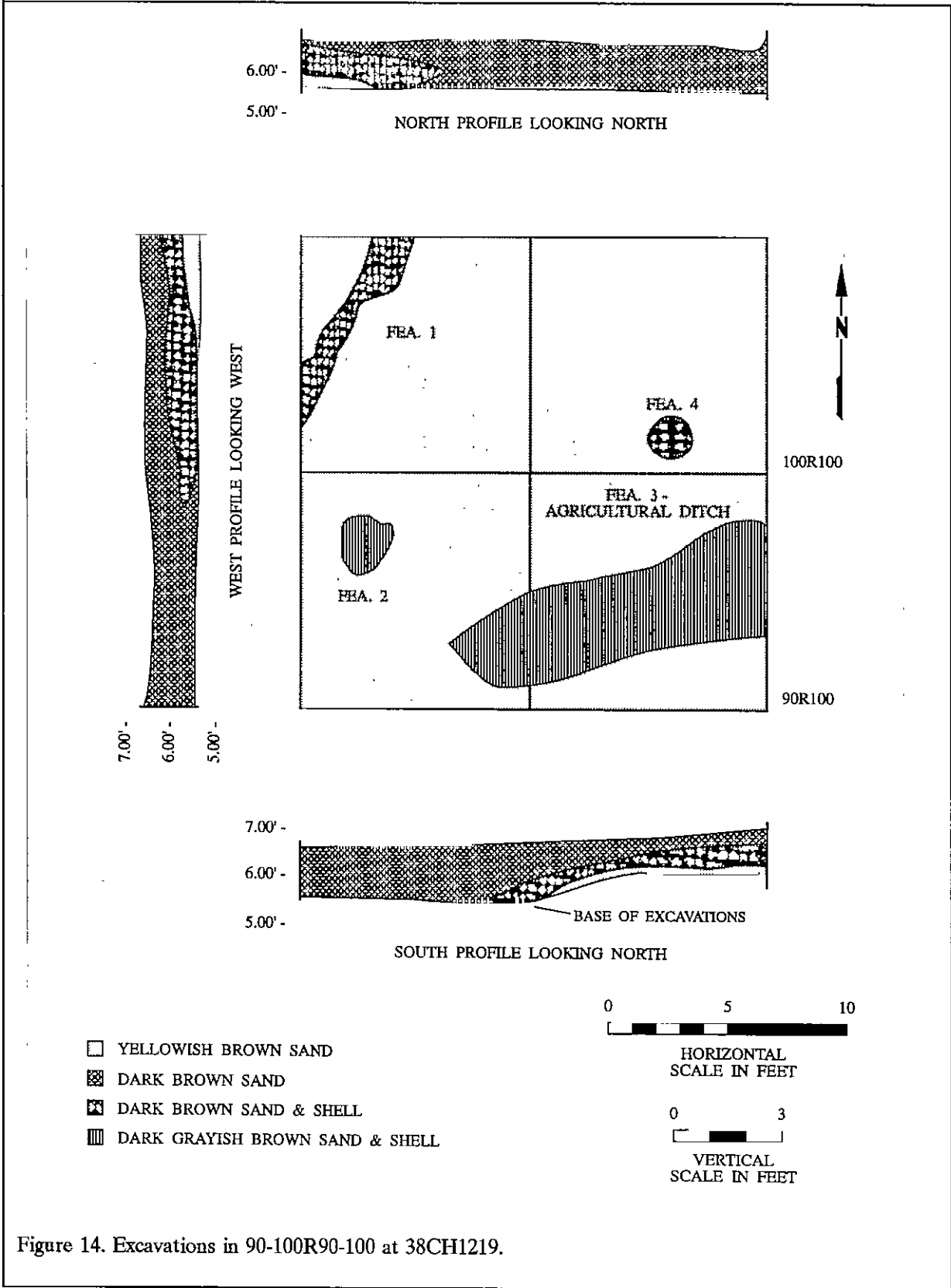


Figure 14. Excavations in 90-100R90-100 at 38CH1219.

generally clear in profile.

Zone 2 soils were equally difficult to define in the field since the boundary between midden and subsoil was rarely clear and was never uniform. There were variable quantities of shell trod into the Zone 2 soils, so it was difficult to create a realistic definition between the two zones. The depth of the Zone 2, pre-midden humus, varied from about 0.8 foot in the northeast corner of 100R90 and northwest corner of 100R100 to only 0.1 foot in the northwest and southeast corners of 90R90. Zone 2 soils were completely absent from the southeast corner of 90R100.

There seems to be no real difference in either the presence, or the preservation, of old humus soils under the middens compared to similar soils in non-midden areas. Site 38CH1219 is somewhat unusual for its relatively good preservation of old humus soils.

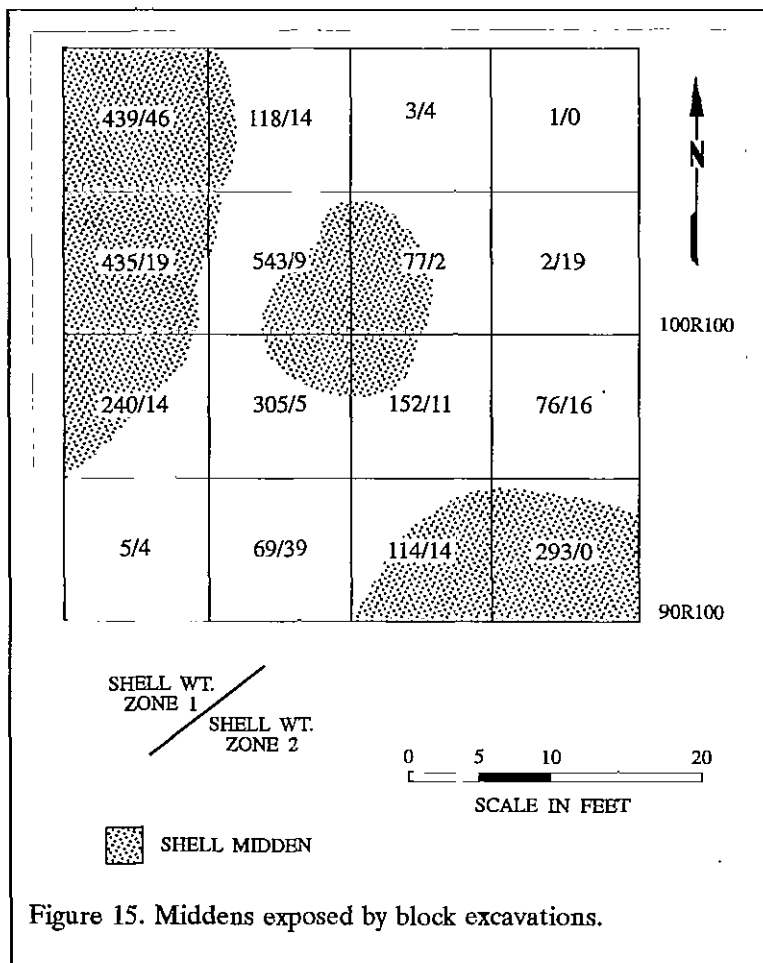
A correlation was found between the middens and the presence of pottery in the underlying old humus. Where the humus was covered by a midden there were few if any ceramics present. Where the humus was not covered by a midden, on the other hand, pottery was relatively common in the Zone 2 soils. This suggests that the middens are all approximately contemporaneous since the middens appear to have been deposited on relatively clean, sterile soils.

Both the profiles from the excavations, and the associated shell weight data (obtained by weighing all of the shell from each quadrant of each 10-foot unit prior to its discard in the field), revealed that the block excavations incorporated three distinct middens. Two were clearly suggested by the auger test data, occurring in the southeast and northwest corners of the block excavation. One additional midden, distinct from both of the others, was found in the center of the block (Figure 15). This third midden, based on the precision offered by even auger tests on 10-foot transects, blurred into the adjacent midden to the southeast and was not visible (see Figure 12).

The northwest midden, exposed in the western profiles of 90-100R90, may have been the largest of the three, measuring about 19 feet north-south (total measurements are estimates based on adjacent stripping, discussed below) by perhaps 10 feet east-west, for a total of approximately 170 square feet. Approximately 40% of this midden was excavated.

The central midden was the smallest of the three and was subjected to 100% excavation. It measured about 7 feet in diameter or 38 square feet.

The southeastern midden was found exclusively in 90R100 and appears to represent only the northern third of the entire feature. The excavated portion measured 10 feet north-south by a maximum of 4 feet



north-south. An overall estimate, again based on adjacent stripping to the south, suggests measurements of approximately 12 feet in diameter, or 113 square feet.

Midden	Size	Ft ²	Shell:Soil	Oyster	Clam	Periwinkle	Whelk	Tagelus	Other
NW	19x10	170	1:1.5	95.2	2.0	1.6	1.2	-	-
Central	7x7	38	1:0.9	90.5	2.0	4.6	2.4	0.1	0.3
SE	12x12	113	1:3.4	96.5	0.7	0.7	2.1	-	-

The placement of the four units and the decision to excavate each 10-foot unit in quadrants allowed considerable understanding of these three middens. Table 2 provides information on the content of the three middens, including the density of the shellfish and the species present (expressed as a percent of the total weight).

The table reveals that there is considerable diversity in the proportion of shell to soil, ranging from a ratio of 1:3.4 at the southeastern midden to 1:0.9 at the central midden. The northwestern midden represents a mid-point ratio of 1:1.5. The southeastern midden ratio, however, is probably unreliable since it was taken from the toe of the midden — an area where a greater amount of soil would be expected.

When these data are compared to shell:soil ratios from four other Middle and Late Woodland sites (Trinkley and Adams 1994:Table 3) all three of the 38CH1219 ratios fit within the previously reported range of 1:0.4 to 1:7.6. This range has a mean of 1:2.8 with a standard deviation of 2.1. The 38CH1219 data exhibit a mean of 1.9 and a standard deviation of 1.3. Although the samples are small, it appears that the 38CH1219 middens, at least in terms of their shell:soil ratios, are typical of other middens.

Two of the three middens cluster in the range previously identified from detailed work at 38BU861 and 38BU1214 (Trinkley and Adams 1994:47-48). Only one of the Kiawah middens

appears to be outside the range of small middens which characterize these sites (Figure 16). Of the 29 middens thus far examined, only 5 (17.2%) are outside the posited range.

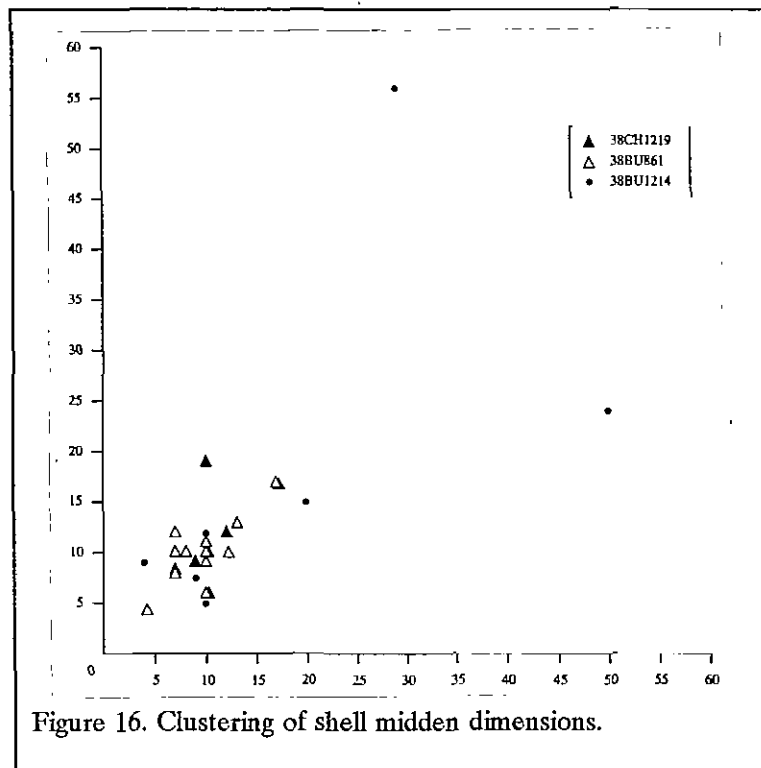


Figure 16. Clustering of shell midden dimensions.

Although the sample is still small, the continued clustering of midden sizes, with relatively few outliers, suggests that the practical range of midden dimensions (from about 5 by 5 feet up to a maximum of about 13 by 13 feet) may have been encountered.

In a similar fashion, the 38CH1219 midden contents are almost identical to that encountered at the 38BU861 middens at Old House Creek on Hilton Head Island (see Trinkley and Adams

1994:Table 1). For example, oyster comprised 94.1% of the samples (by weight), with a standard deviation of 3.2% — within the range of that previously identified (mean of 98.6% with a standard deviation of 1.8%). Clam accounts for an additional 1.5% with a standard deviation of 0.7% at the Kiawah middens, compared to 2.2% and a standard deviation of 1.1% at Old House Creek. The only significant difference is that the Kiawah marsh contributed significant quantities of periwinkle and whelk (together accounting for a mean of 4.2%) while mussel was completely absent. At Old House Creek mussel contributed a mean of 1.0% and periwinkle and whelk were absent.

These differences in minor constituents are may represent differing "tastes," although it is perhaps more likely suggestive of differing environmental conditions. More significant, it seems, is that oyster is consistently the dominant species, typically accounting for 90+% of the shellfish recovered from the middens. The lowest oyster dipped as a contributor to the middens was in 100R100, where it comprised only 80.4% of the midden, with periwinkles accounting for an unprecedented 12.1% of the midden by weight.

Stripping

At the conclusion of the block excavations, it was decided to use a small bulldozer with an 8-foot blade to open additional areas around the excavations. As shown by Figure 11, trenches were opened to the south, west, and north of the block excavations at 90-100R90-100. No stripping was conducted to the east because of dense tree growth. The cuts were placed as close to the block excavations as practical, typically within 4 to 5 feet, and the soils were gradually removed to expose the subsoil. Notations were maintained on the presence of shell (i.e., midden) within each cut and an effort was made to identify any features which penetrated the subsoil.

To the south of the block excavation an area measuring 35 feet in length by 8 feet in width was opened. Only the toe of the midden (evidenced by very light shell) along the southern edge of 90R100 extended into the opened area and no features were encountered.

To the west of the block excavations an area measuring 40 feet in length and about 8 feet in width was opened to subsoil. This excavation revealed that the northwestern midden found in 100R90 did not extend beyond about R86, although one feature (a shell pit designated Feature 5) was encountered at the base of the excavations.

Two different cuts were placed to the north. One, parallel to the block excavations, measured 35 feet in length by 8 feet in width and was located about 4 feet north of the excavations. The other, about 25 feet in length, extended north and was designed to determine if any additional occupation areas or middens might be present outside the area incorporated into the auger testing grid.

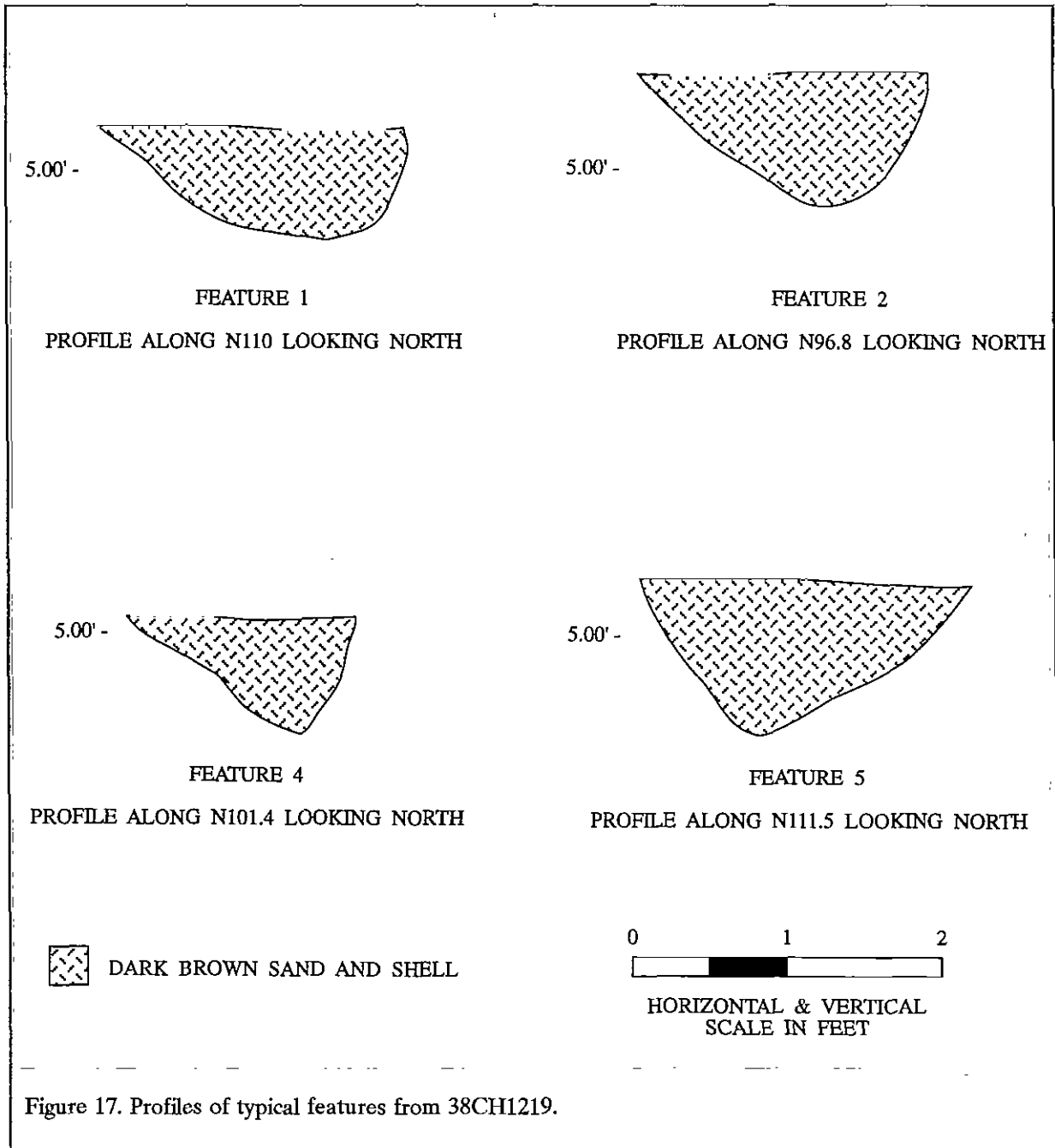
These efforts were, with the exception of Feature 5, unproductive. Yet they did reveal that the site "core" had been identified by the original survey and Chicora's auger testing. No evidence was identified of additional middens and the limits of the identified middens were clearly defined. They also reveal that the site has very discreet boundaries and is very tightly clustered.

Features

Five features were identified and excavated during this research. These features are shown on the block excavation plan view (Figure 14) and representative profiles are provided in Figure 17. No post holes were encountered either in the excavations or the subsequent stripping operations.

Feature 1 was situated in the northwest quadrant of 100R90 and was encountered at the base of the Zone 1a shell midden. The feature initially appeared to represent several intrusive pits, but upon excavation appeared instead to be a trench feature. The fill consisted of dark brown sand and primarily oyster, with small quantities of whelk and periwinkles. The feature produced 97 pounds of shellfish, but only seven small fragments of pottery. The feature was about 2 feet in width and 0.7 feet in depth. The west edge was gradually sloping to the flat base of the trench, while the east wall was relatively steep.

Feature 1 was thought to possibly



represent a trench for a wall post or wattle and daub structure. Yet no evidence of individual posts or daub was encountered in the excavations. Further, the stripping to the west and north, which should have encountered the trench, failed to find any evidence of it.

In comparing Feature 1 to other features found at Middle and Late Woodland shell

middens, it does bear some resemblance to a Deptford structure identified at 38BU464 (Trinkley 1991:81). Those investigations explored about half of the structure, finding a combination of post holes and trench to form a 15-foot diameter structure. At 38CH1219, however, the trench is not associated with any recognized post holes and it has only a slight arc-shape. While Feature 1 *may* represent structural remains, this cannot be



Figure 18. Feature 1, after excavation. View is to the north.



Figure 19. Feature 2, after excavation. View is to the north.

demonstrated conclusively.

Feature 2 was found in the northwest quadrant of 90R90 at the base of Zone 1, just beyond a shell midden. The feature measured about 2 by 2.5 feet. The excavation of the southern half of the feature produced 26 pounds of shell in a dark brown sandy matrix. The shell consisted of oyster with a very small quantity of clams. Also recovered from the feature was a single Deptford Cord Marked sherd.

Feature 3 was encountered running from the R100 profile through 90R100 and terminating in the southeast quadrant of 90R90 (Figure 14). Although the feature contained a matrix very similar to other features on the site, its excavation revealed that it contained not only prehistoric sherds, but also a small quantity of nineteenth century material. The feature was found to be 4 feet in width and a maximum of 1.1 feet in depth. The sides are relatively uniform, sloping to a flat bottom. This feature appears to represent a drainage or agricultural ditch originating in the vicinity of the block excavations and extending eastward, probably to the channelized freshwater slough. The feature reveals no lensing, suggesting that it was intentionally, and rapidly, filled. The matrix also reveals that it was filled with midden soils, likely the same ones which were displaced in its original excavation.

The most important aspect or contribution of this feature is as a caution in the use of the adjacent midden, which was potentially impacted by the excavation and backfilling of the ditch, as well as by any other historic activity which may have taken place at the site.

Feature 4, which measures about 1.5 by 2.0 feet in diameter, is situated in the southeast quadrant of 100R100 and was encountered at the base of the Zone 1 soils. The feature consisted of a dark brown sandy loam mixed with shell. The southern half of the feature was excavated. Recovered were 10 small sherds, one Deptford Check Stamped sherd, and one St. Catherines Cord Marked sherd. Five pounds of shell were also recovered — all of which was oyster. In cross section the pit is somewhat similar to Feature 1, being 0.7 foot in depth, with one gently sloping

and one steeply sloping side.

Feature 5 was found in the western stripping operations, centered at 111.5R77.3. Identified at the base of the Zone 1 soils, it measured 2.4 by 2.2 feet. The south half was excavated, producing no pottery by 23 pounds of shell, 90.2% of which was whelk. This was the only feature identified which was dominated by some species other than oyster. In cross section it was similar to Features 2 and 4, consisting of one steep side and one sloping side.

Features 2, 4, and 5 appear to all represent a very similar form of shell pit. Typically identified as "steaming" pits these features are thought to have contained a fire smoothed to produce heat sufficient to "steam" open the shellfish. The empty pit would then have been used for the trash from that particular meal.

There is some support of this scenario. Certainly some pits appear to contain a single meal or collection episode. This may be the case for Feature 4, where it might be argued that a small meal of oysters had been steamed, with the shells disposed of in the steaming pit.

This scenario, however, begins to break apart when examples such as Feature 5 are included. Whelk, of course, cannot be steamed, since this only draws the meat into the shell, making it more difficult to remove. Whelk is typically boiled to remove the meat and juices from the shell. In addition, for these pits to function as steaming pits would require that they contain a relatively significant fire smothered to create heat, but not direct flame. Yet the features at 38CH1219 produced almost no charcoal. The small quantities produced are about the same as are found in the general midden soils and certainly not sufficient to provide heat for steaming shellfish open. This stands in contrast to the pits recovered at 38BU861, where burnt lenses were present and where the pits even suggested lensing of the shell itself (Trinkley and Adams 1994:50).

If not shellfish steaming pit, then what are Features 2, 4, and 5 at 38CH1219? The consistency in profile and general size suggests that all were used for the same function. When fire pits (or pits associated with activities which would produce

Table 3.
Shell Content of Features, weight in pounds

Feature	Estimated Weight	Percent by Weight			
		Oyster	Clam	Periwinkle	Whelk
Feature 2	52	96.4	2.1	0.6	0.9
Feature 4	10	100.0	-	-	-
Feature 5	46	0.8	-	-	90.2

charcoal) are eliminated, there seem to be relatively few other functions suggested. Unfortunately, there are not sufficient data, at present, to allow any reasonable interpretation.

Table 3 provides information on the shell content of Features 2, 4, and 5. Since only half of each feature was excavated, the weight is estimated by doubling the recovered amount. Data from Feature 1 was not collected since it appeared to be structural and Feature 3 was not included since it represents a historic pit filled with displaced midden soils. In the case of Features 2 and 4, oyster is the most common shellfish present, representing between 96.4% and 100% of the materials recovered. This is about the only similarity between the detailed analysis at 38CH1219 and those from 38BU861 (Trinkley and Adams 1994:53). Examples of ribbed mussel and stout tagelus, present in the Old House features, are absent from Kiawah. Clams, which were consistently the second most common species in the Old House samples, are present in only one of the three Kiawah features. And while whelks were uncommon at Old House, they dominate Feature 5 and are found as a distinct minority species in Feature 2.

Like the differences found in the shell middens themselves, these may represent only the idiosyncrasies or "tastes" of the 38CH1219 occupants. It seems more likely, however, that they represent different environmental opportunities or perhaps even different seasonal occupations. Regardless, the species of the features provide a glimpse of the shellfish readily available for individual meals.

ARTIFACT ANALYSIS

Pottery

A total of 1080 sherds were recovered from the excavations at 38CH1219. Of these, 99 or 9.2%, were over 1-inch in diameter and were considered of adequate size for further analysis. Those under 1-inch take considerable effort to process and identify. Further, Orton et al. remark that "in most quantification methods [these sherds] will make little difference to the overall statistics of an assemblage" (Orton et al. 1993:47). The very large quantity of highly fragmented sherds (approximately 75% of those under 1-inch were also under 1/2-inch in diameter) suggests that there was considerable pedestrian traffic at the site, and specifically on and around the various shell piles, which reduced the size of the pottery.

The quantity of pottery over 1-inch in diameter is considerably smaller at the Kiawah middens than from the Old House Creek site on Hilton Head (where nearly twice as much of the pottery was over an inch in diameter). Since the proportion of sherds under a half inch is very similar it seems most likely that post-depositional disturbance may be cause for the large quantity of small sherds. The single most dramatic post-depositional disturbance is plowing. The site is known to have been on the edge of fields plowed at least during the twentieth century. Although no plowscars were present in the excavations, Feature 3 does reveal the impact of "modern" activities on the midden.

Pottery density at 38CH1219 is 2.7 sherds per square foot in the excavation areas, or about 2.6 sherds per cubic foot of excavation. A previous review of primarily Beaufort County shell middens revealed considerable uniformity of ceramic density, with the majority of the sites producing between one and three sherds per square foot (Trinkley and Adams 1994:54). Some of this variation is likely the result of specific site areas (and relative proportion of different site areas)

actually sampled in the excavations. Nevertheless, the Kiawah midden appears to be at the upper end of the previously established range.

The analysis identified sherds belonging to three series: Deptford (69.7%, n=69), St. Catherines (25.3%, n=25), and Irene (5.0%, n=5). This proportion of Deptford and St. Catherines wares is similar to that found at 38BU861, although unlike the Old House Creek site the Kiawah St. Catherines wares contain noticeably fewer grog/clay particles. In fact, it is likely that some researchers might chose to ignore the clay inclusions and simply classify the entire collection as Deptford or Deptford-like. This analysis will deal with only the Deptford and St. Catherines wares which together comprise 95.0% of the identifiable pottery. The Irene sherds, all Irene Burnished, were found in the northwest quadrant of 90R90, within the upper shell midden zone. In the most general of terms, one ware (the Deptford) consisted of a relatively coarse sand tempered paste, while the other ware (St. Catherines) consisted of pottery with sparse to abundant grog inclusions in a typically fine sandy paste.

Deptford

The 69 Deptford sherds are dominated by cord marked motifs (50 specimens, accounting for 72.5% of the Deptford collection). Check stamping (n=7), simple stamping (n=3), and undecorated (i.e., plain, n=9) are all minor components of the assemblage at 38CH1219 and will receive only minimal attention in this study since they represent such a small collection. This assemblage is similar to that associated with the Deptford II phase, dating about A.D. 300 to A.D. 500 along the Georgia coast (DePratter 1989:111).

Although the size of the sand temper found in the Deptford Cord Marked sherds ranges from fine to very coarse, medium sand is found in

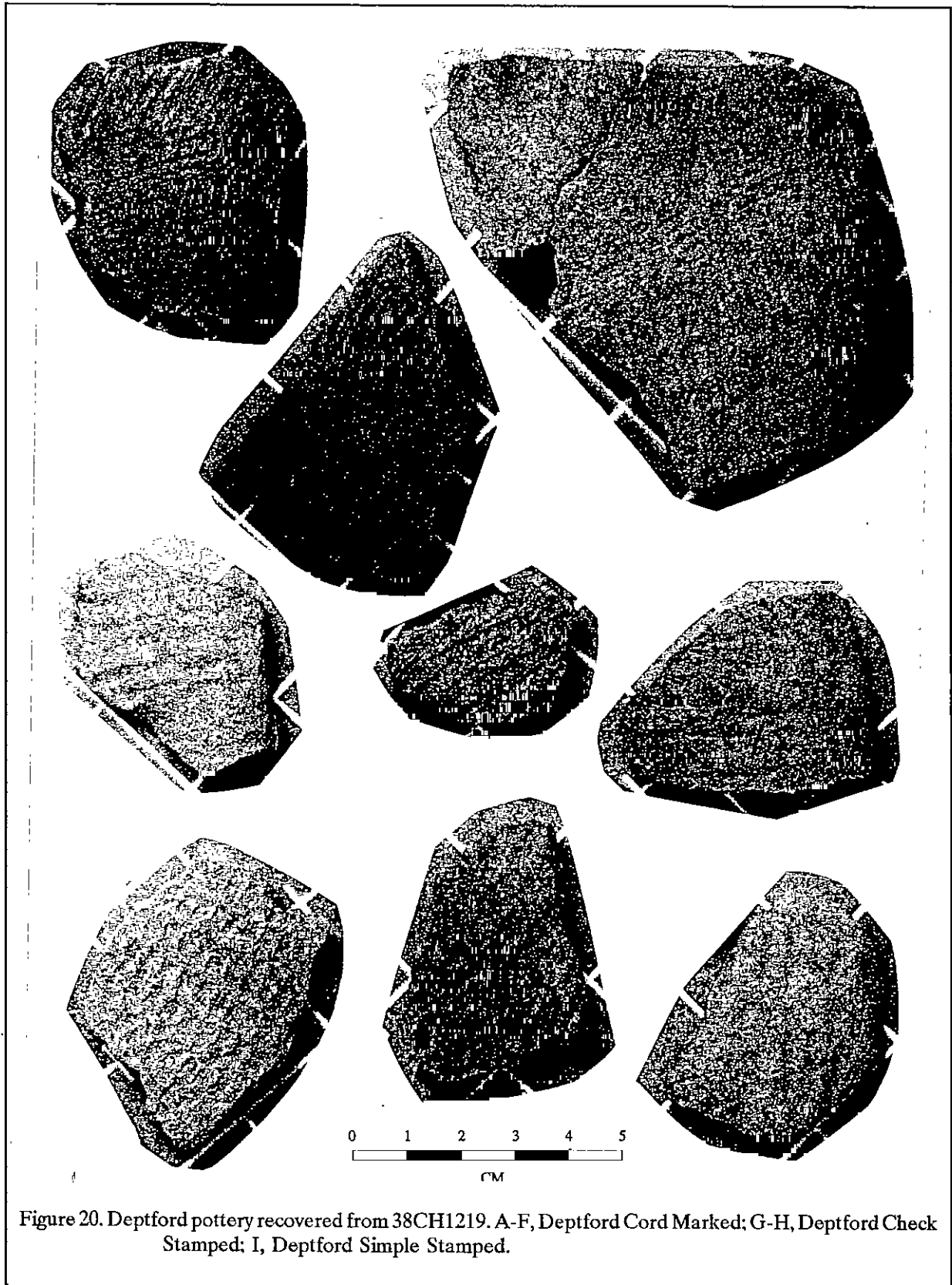


Figure 20. Deptford pottery recovered from 38CH1219. A-F, Deptford Cord Marked; G-H, Deptford Check Stamped; I, Deptford Simple Stamped.

66.0% (n=33) of the specimens. The sand shape is typically rounded (43.8%, n=21), although both angular (n=17) and subangular (n=12) are also found. The ware is characterized by a moderate amount of sand inclusions (78.0%, n=39), with nearly 21% of the assemblage (n=10) characterized by abundant inclusions, accounting for the generally sandy appearance of the ware. Like other assemblages (see Trinkley and Adams 1994:54-55), it appears that the clay used for the Deptford ware contained natural sand inclusions, with little (if any) sand added.

Although considerable diversity was found in the core cross-section and interior treatment of the pottery are considered, the most common cross-section was one totally reduced, indicative of firing in a reducing atmosphere (74.0%, n=37). The next most common (12.5%, n=6) is one which is thoroughly oxidized with no core. While not overwhelming, a small number (8.3%, n=4) evidenced a thin "core" of oxidation with a diffuse margin separating the core from the outer layer. This effect is common when completely oxidized vessels (previously mentioned) are used for cooking, with the outer layer blackened by reducing gases from the cooking fire. Uncommon (2.1%, n=1) were sherds with an oxidized surface layer and a sharp, well defined reduced core. This is typical of vessels fired in a reducing fire, but taken out and allowed to cool in the open. Over a third of the Deptford Cord Marked sherds (34.5%, n=18) exhibited an interior surface lacking evidence of tool marks and with temper particles present, but not protruding. Right at another third (34.0%, n=17) evidenced tool marks created by smoothing the interior surface. In spite of the efforts to smooth the interior surfaces 10 specimens (20.8% of the Deptford Cord Marked collection) evidenced no tool marks and had sand particles protruding.

Exterior smoothing is classified as heavy (with 75% of the specimens having exterior stamping which was almost totally obscured to the point that cordage studies were difficult). The remaining specimens evidenced a moderate amount of smoothing — sufficient to slightly blur cordage stamps). Overstamping was present on virtually all of the sherds, making cordage studies even more difficult. Evidence of vessel use is

limited. Only 2.1% of the Deptford Cord Marked sherds show signs of internal carbon deposits and 4.2% show evidence of external smudging or deposits. Orton et al. (1993:222) caution that carbon evidence of food preparation may be removed during post-excavation processing, unlikely in the case of this collection considering that special care was taken to preserve such evidence throughout the excavation and analysis process. Consequently, it seems reasonable that fewer than 5% of the Deptford Cord Marked vessels provide good evidence of being used for cooking. At Old House Creek around a third of the Deptford specimens provided evidence of cooking, suggesting the possibility that they were used for water or food storage. The very low incidence of sooting at 38CH1219, coupled with very few of the cross-sections suggesting use over fire, makes it even more compelling to consider that these vessels may have been used for functions other than cooking.

Turning to the cordage itself, over two-thirds of the pottery (70.0%, n=35) evidences a right or S-twist using cord ranging in diameter from 1.68 to 3.60 mm (with a mean diameter of 2.27 mm). Not surprisingly, the simple stamped impressions (which may be nothing more than unwoven cordage) have a mean diameter of 2.42 mm. Most of the examples (91.7%, n=44) revealed a medium twist (11° to 25°). Only slighter more variation was found in the twists per centimeter, with 85.4% of the sherds exhibiting 6 twists per centimeter, followed by 8.3% having 8 twists per centimeter. The average distance between the cords was 2.33 mm, with a range of 1.43 mm to 5.79 mm.

Too few Deptford rims were recovered to allow effective reconstructions of vessel sizes or diameters. The single rim of sufficient size to measure yields a vessel diameter of 20 cm. Vessel wall thickness was about 8.3 mm 3 cm below the lip and the shoulder form is straight, suggestive of a deep, large pot. Although no formal minimum number of vessel analysis was conducted, the examination of the different collections suggests that the collection includes fewer than six Deptford Cord Marked vessels and may include as few as four. Only one Deptford Simple Stamped vessel is present, as well as two Deptford Check Stamped vessels. In all, the collection may include the

remains of as few as seven Deptford vessels.

While item by item comparison with other assemblages (especially the collection from Old House Creek, which was examined using identical methods) is possible, the sample size is still too small to offer particularly meaningful comparisons. In terms of a general perception, it seems that the collections from the two sites are very similar, especially if the differences in paste which would be tied to clay sources are ignored (for example, the Old House Creek sherds exhibit a coarser paste than the collection from 38CH1219). Although the cordage at Kiawah is smaller than that noted from Old House Creek, right twists are still the most common, the number of twists per centimeter is identical, the angle of the twists is the same, and the spacing of the cordage is nearly identical. The only dramatic difference seems to be that the 38CH1219 collection contains far fewer sherds suggestive of the vessels' use over fire or for cooking. In other words, there is a suggestion of the two collections representing the "same pottery," but used "differently."

St. Catherines

As previously mentioned, only 25 examples of St. Catherines pottery were identified (representing 25.3% of the total analyzable collection). This ware included primarily cord marked examples (14, or 56.0% of the collections), although small quantities of plain (n=9), net impressed (n=1), and fabric impressed (n=1) were also found. Previous research (e.g., DePratter 1979) has not subdivided the St. Catherines phase, so this collection might typically be dated from about A.D. 1000 to A.D. 1150, some 500 years after the terminal point of the Deptford II phase.

Most of the St. Catherines pottery contained sand inclusions as well as grog. Twenty of the 25 sherds (80.0%) were found to contain sand (12 of the 14 St. Catherines Cord Marked sherds or 85.7%) and most of the samples (68%, n=17) exhibited fine to medium, rounded to subangular sand particles. In each case the sand comprised 20% or less of the paste. One St. Catherines Cord Marked sherd was encountered which contained abundant quantities of sand inclusions, resembling a cross between what traditionally might be considered St. Catherines

and Deptford.

Of course, St. Catherines pottery is typically defined as containing "crushed sherd or crushed, low-fired clay fragments" (DePratter 1979:131). Usually these fragments are described as being "smaller" than the temper encountered in Wilmington wares. The ambiguity, as has been previously discussed, makes definition or identification of the type somewhat problematical. One researcher's "smaller" is not necessarily another's, especially if there is no inherent difference in the nature of the inclusions (either broken sherds or simply clay). Both of these differences are exceedingly important and worthy of discussion.

While the size (or more properly the size range) of the inclusions has a relatively clear impact on the typological definition, the nature of the inclusions is perhaps even more important. Grog is typically defined as crushed sherds (see, for example, Rye 1981:33). It is commonly perceived as having a number of advantages over natural tempers: it is usually abundant, either as waster sherds or as broken pottery in refuse; it is easier to crush than most natural tempers, such as rock; and since sherds have already been fired once and possess the same general properties as the fabric into which they are introduced, they are stable during the firing process. Grog tempering, by definition, can be inferred to be temper rather than a natural inclusion. In contrast, if the inclusions are not grog, but perhaps simply sun-dried clay fragments, they may be either natural (the result of poor clay preparation or even allowing the clay to sit too long and "crust over") or intentional (added to the moist clay).

The St. Catherines Cord Marked sherds exhibit grog/clay averaging 4.6 mm in diameter (with a standard deviation of 1.1 mm), while the plain wares seem to have a slightly smaller inclusion, averaging 4.0 mm (and a standard deviation of 0.9 mm). The amount of grog/clay included ranges from less than 5% of the total sherd to over 30%, although 73.3% of the cord marked specimens (n=11) and 77.8% of the plain wares (n=7) evidence sparse inclusions (ranging from 5% to 10% of the paste).

As with the collection from Old House

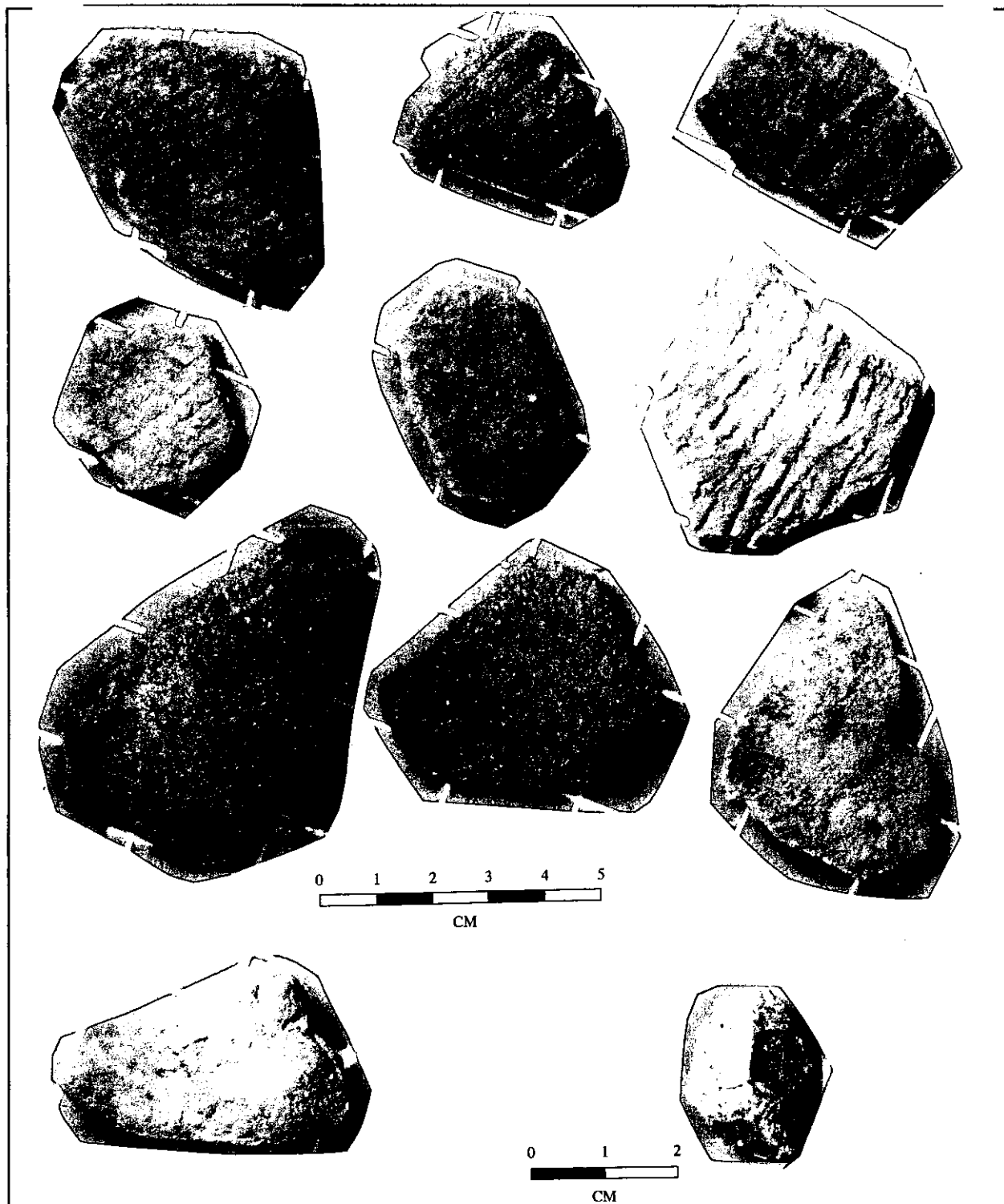


Figure 21. St. Catherines and other artifacts recovered from 38CH1219. A-F, St. Catherines Cord Marked; G-H, Deptford Check Stamped sherd abraders (arrows illustrate wear areas); I, Deptford Cord Marked sherd with mending hole; J, clay object; K, Small Savannah River Stemmed projectile point.

Creek, a portion of one St. Catherines Cord Marked sherd, defined as having a moderate amount of inclusions, was mechanically broken apart, separating out the identifiable inclusions in the process. When the grog/clay inclusions are examined microscopically (at 7x to 30x power), they almost fade into the paste. They may be mechanically separated from the paste with only great difficulty. They present very few flat surfaces suggestive of crushed sherds. In many cases they seem to "disappear" into what may be described as a "contorted" or "swirled" paste. The sherd, by weight, was composed of 96.1% paste (20.37 g) and 3.9% inclusions (0.83 g). The 18 identifiable inclusions, of considerable variation in shape, ranged in size from 0.85 mm to 5.09 mm, with a mean diameter of 4.03 mm and a standard deviation of 1.2 mm.

The inclusions tend to have a relatively constant apparent size, although actually defining the inclusion is more difficult and there is likely some over-estimation of inclusion size. This is possibly caused by the investigator subconsciously avoiding the smaller particles since they are more difficult to measure. Alternatively, the smaller particles may be more easily hidden in the paste, allowing them to be overlooked. Regardless, the quantity of these inclusions may vary considerably from sherd to sherd, or even from edge to edge. It seems reasonable, however, to suggest that most sherds (and hence vessels) have a moderate amount of inclusions, forming somewhere between 10 and 20% of the vessel. While the macro- and microscopic evidence is not conclusive, there is relatively little evidence that these inclusions are crushed sherds. In most respects they appear better described as clay fragments, further documenting the suggestion from the Old House Creek collection that the grog fragments are simply bits of sun-dried clay added to the mixture.

The St. Catherines Cord Marked pottery was dominated by sherds with totally oxidized cross-sections (50%, n=7). The next most common cross-section (21.4%, n=3) were those which were oxidized with diffuse core margins. Only one sherd was found exhibiting a thin "core" of oxidation with a diffuse margin separating the core from the outer layer typical when completely oxidized vessels are used for cooking, with the outer layer blackened by reducing gases from the cooking fire. Very few of

the St. Catherines Cord Marked sherds (28.6% of the interiors [n=4] and 7.1% of the exteriors [n=1]) exhibited any evidence of carbonized material. None of the plain sherds reveal any carbonized materials or sooting. Like the Deptford wares, there seems to be little reason to believe that these vessels were primarily used for cooking.

Interior treatment on both plain and cord marked sherds was minimal, but present. Tooling marks were visible on 77.8% of the plain sherds and 46.7% of the cord marked examples. None of the sherds had temper visibly protruding on the interiors. On the other hand, 11.1% of the plain sherds and 40.0% of the cord marked sherds evidenced temper inclusions which were not protruding. Exterior smoothing was characterized as heavy on 64.3% of the cord marked sherds (n=9) and moderate on 88.9% of the plain sherds (n=8). To further make cordage identification difficult, 93.3% of the cord marked sherds evidenced overstampings.

Cordage impressed into the St. Catherines ware ranged in size from 1.35 to 6.51 mm, with a mean diameter of 2.54 mm. Nearly 86% of the sherds (n=12) exhibited an S or right twist. Only 14% of the cordage was identified as left or Z twists. One additional sherd (representing 7.1% of the assemblage) was impressed with cordage having *both* right and left twists. The twists per centimeter exhibits a unimodal distribution, peaking at 6 twists/cm (73.3%), declining to 25% at four twists and 6.7% at eight twists. The bulk of the collection (92.9%, n=13) revealed a moderate angle of twist. The distance between the cords on the paddle ranged from 1.38 to 3.9, with a mean 2.39 (representing a nearly identical pattern as the cordage diameter itself).

Even fewer St. Catherines rims were found than Deptford. The two examples of St. Catherines Cord Marked pottery encountered revealed straight rims and vessel diameters of 25 and 29 cm. Vessel wall thickness averages 6.4 mm 3 cm below the lip.

Only one fragment of St. Catherines Net Impressed pottery were identified in the collection. The fabric comprising the net averaged about 3.09 mm. In all respects it appeared to represent the same cordage used on the paddles to create cord

marked pottery. One example of St. Catherines Fabric Impressed pottery was also encountered with warp and weft measurements of 8.68 and 5.34

intentionally added. The quantity of these inclusions is not only scarce, but in many of the sherds the inclusions are so infrequent that many researchers might simply ignore this aspect of the paste and "lump" all of the wares together as Deptford.

Table 4.
Comparison of Deptford and St. Catherines Cordage

	∞ cord diameter	cord diameter range	% R twist	∞ distance between cords	distance between cords range
Deptford	2.27	1.68-3.60	68.8	2.33	1.35-6.51
St. Catherines	2.54	1.43-5.79	80.0	2.39	1.38-3.90

In sum, if the exact nature of the aplastic temper were ignored it would be impossible to separate

mm.

Like the Deptford collection, the best comparative collection for the St. Catherines pottery is the collection from Old House Creek (Trinkley and Adams 1994). These collections are even more similar than those identified as Deptford — right twists dominate the collection, with cordage that is almost exactly the same diameter. Spacing is very similar, and both sites reveal identical angles and twists per centimeter. Even the paste is similar, although one distinct difference is that the collection from 38CH1219 exhibits noticeably fewer, and smaller, grog inclusions. In fact, there are sherds in the Kiawah collection which might be classified as Deptford.

these two "types" at 38CH1219. It has been previously suggested that the suitability of maintaining distinct single-tier types for the Deptford and St. Catherines wares may relate only to the degree of temporal (or perhaps even spatial) discreteness evidenced by the two. Further, the suggestion has been advanced that the a two-tier system of "type" and "variety" might be an appropriate approach for the Deptford and St. Catherines dichotomy. Certainly there is a strong argument at 38CH1219 that the St. Catherines wares are, at best, indistinct and poorly defined typologically.

Comparing Deptford and St. Catherines wares at 38CH1219

Comparing the Wares of Specific Middens

There seems to be relatively little difference between the cordage used by the Deptford and St. Catherines potters. The range of cordage diameters, mean cordage diameter, direction of twist, and even distance between the cords are all very similar (see Table 4). The sand inclusions in both the Deptford and St. Catherines wares range from fine to coarse and rounded inclusions are the most common. Sand inclusions are found in moderate amounts (i.e., ranging between 10% and at most 20%) in both. The only "real" difference between the two wares seems to be the presence of the grog/clay inclusions in the few sherds classified as St. Catherines. Combined with the previous discussions of the clay inclusions found the St. Catherines paste, there is evidence that the inclusions may be natural, rather than

As previously discussed, three distinct middens have been identified in the block excavations, designated the northwest, central, and southeast middens. Individually each of these middens produced very small quantities of pottery — the northwest midden produced eight sherds from the northwest and southwest quadrants of 100R90, the central midden produced 16 sherds from the northeast quadrant of 90R90 and the southeast quadrant of 100R90, and the southeast midden produced nine sherds from the southeast and southwest quadrants of 90R100. Although the sample sizes are very small, Table 5 reveals that the three middens do appear to be distinctly different, both in proportions of Deptford and St. Catherines wares present and especially when the cordage of the Deptford and St. Catherines wares are compared. Each midden has a distinctly different mean cord diameter and mean distance between the cordage for both the Deptford and the St. Catherines pottery. There are also differences

in the twists present within the three middens.

Although when taken as a whole the site seems to exhibit rather uniform pottery, there is evidence that each midden contains pottery which more different than at first meets the eye. While relatively little can be made of the very small sample sizes, this finding suggests that each midden may have been deposited by a different kin group, although different temporal episodes is difficult to eliminate based on the available information. This finding is especially important when it is compared to similar observations offered for the Old House Creek middens, where it was noted that each midden contained pottery which was "distinct in at least some of the categories most likely affected by the individual potter" (Trinkley and Adams 1994:62).

Figure 22 offers another view of the wares present in the block excavation, revealing the distribution of Deptford, St. Catherines, and small sherds by quadrant. The Deptford and St. Catherines wares, while illustrating distinct areas of peak occurrence, do greatly overlap and the distribution is not mutually exclusive. Taken in conjunction with the other evidence reviewed, the distribution plots tend to support the concept that the Deptford and St. Catherines wares are more alike — that is, more typologically similar — than they are unlike.

The distribution of small sherds reveals that they occur adjacent to and under virtually all of the middens, but their density declines dramatically to the southwest. This may be interpreted as suggesting that the occupation zones are found both between the middens and also to the northeast, while occupational debris decline to the southwest. The densest occurrences of small sherds are found immediately east of the northwest and central middens, as though kitchen trash was being deposited to the west and southwest.

Lithics

Introduction

A total of 18 lithic artifacts were recovered during the investigation of 38CH1219. Of these specimens, one is a hafted projectile, 16 are lithic

Table 5.
Comparison of the Pottery in the Three Middens

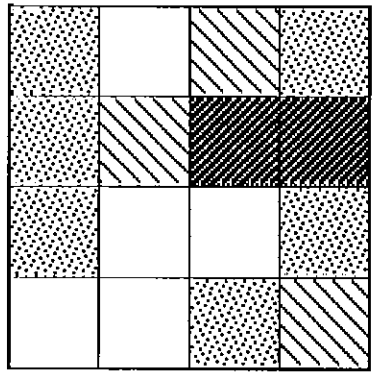
	NW	Central	SE
Deptford Plain (%)	33.3	-	12.5
Deptford Check Stamped (%)	-	-	37.5
Deptford Cord Marked	44.4	25.0	25.0
\bar{x} cord diameter	2.10	2.65	2.42
R twist (%)	100	50	100
L twist (%)	-	50	-
\bar{x} distance between cords	2.48	3.20	2.69
St. Catherines Net Impressed (%)	11.1	-	-
St. Catherines Plain (%)	-	37.5	-
St. Catherines Fabric Impressed (%)	-	6.2	-
St. Catherines Cord Marked	11.1	31.3	25.0
\bar{x} cord diameter	2.15	1.97	2.68
R twist (%)	100	100	-
L twist (%)	-	-	100
\bar{x} distance between cords	1.71	2.31	2.40





debitage, and one is a small quartz river pebble. There is little reason, given the small collection, to provide an extraordinarily detailed analysis of the recovered materials. This section, instead, will briefly describe the single tool, the lithic debitage, and explore the implications for raw material procurement.

Hafted Bifaces

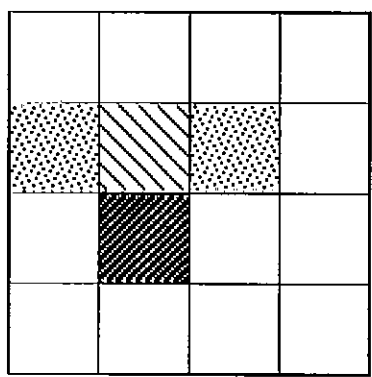
Of the lithic collection, only one is a hafted biface. This specimen, made of heat treated Coastal Plain chert, exhibits heavy resharpening and reworking. At some point the tip snapped off and, since there is no evidence of reworking, the point was either lost or discarded.





The point has a length of 22.4 mm (with a projected length of 30 mm), a blade width of 17.7 mm, a haft width of 12.0 mm, and a thickness of 8.8 mm. These measurements suggest that the specimen was a small Savannah River Stemmed. Oliver (1981:124) describes the small Savannah River Stemmed as a "small to medium-sized broad triangular bladed point with a square to rectangular stem and a straight or incurvate base." These are smaller in size than the Savannah River Stemmed, and the Gypsy Stemmed point is yet smaller. According to Oliver (1981:125) the width of the Small Savannah River Stemmed point may range from 24 mm to 35 mm, with the mean being 30.2 mm. Only one specimen examined by Oliver



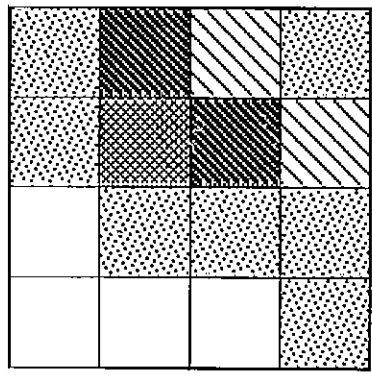
-  0 - 1 SHERDS
-  2 - 3 SHERDS
-  4 - 5 SHERDS
-  6+ SHERDS






DISTRIBUTION OF DEPTFORD



-  0 - 1 SHERDS
-  2 - 3 SHERDS
-  4 - 5 SHERDS
-  6+ SHERDS

DISTRIBUTION OF ST. CATHERINES



-  0 - 25 SHERDS
-  26 - 50 SHERDS
-  51 - 100 SHERDS
-  101 - 150 SHERDS
-  151 - 200 SHERDS

DISTRIBUTION OF SMALL SHERDS

Figure 22. Distribution of different wares in the block excavations at 38CH1219.

was complete enough to provide length, and this specimen was 43 mm long. Although this specimen is much shorter (perhaps 30 mm), this is probably due to the heavy reworking of specimens in areas far away from abundant raw material resources.

There is relatively little temporal information for the Small Savannah River point in South Carolina, although elsewhere it is typically associated with the early portion of the Late Archaic into the Early Woodland Period (Oliver 1981). The association of small, and increasingly diminutive, stemmed points with Middle Woodland ceramics (see, for example, Trinkley et al. 1993:103-104) may indicate that the point has a considerably longer association. An almost identical point was recovered from excavations at the Old House Creek site (Trinkley and Adams 1994:62-63) and Thomas and Larsen (1979:Figure 40j) illustrate a very similar point from Burial 4 at Cunningham Mound D, thought to date sometime between about 1000 B.C. and A.D. 570 (the latter half of this range is, of course, consistent with the dates typically associated with the Deptford II phase).

Lithic Debitage

All of the 16 lithic raw materials from 38CH1219 are what researchers have called siltstone or mudstone. This material is rarely identified as a lithic raw material since it has an undependable fracture, is soft, and is generally a poor material to work. It appears that a effort was made to use the material, although all of the fragments recovered represent either shatter (angular, blocky debitage) or unspecialized flakes (thick, early stage flakes). Curiously, these materials were found scattered across the block excavation, being recovered from 10 of the 16 excavation quadrants. This amorphous distribution suggests that the effort to use this material may have occurred at several times or have been undertaken by several different knappers. It seems unlikely that any tools were produced with the material and the recovered materials may only represent an abortive experiment.

Other Stone

The only other lithic item present at 38CH1219 is a portion of an oval quartz pebble

measuring about 29 mm in length and 6 mm in thickness. The pebble is highly smoothed on its surfaces, including the broken edge. No striations are present on any of the edges, nor is there any edge wear which might suggest that the pebble was used as a small hammerstone. It seems more likely that the object was a ceramic tool, probably being used as a smoothing stone for interior shaping.

Other Tools

Absent from the collection are a broad range of tools, such as worked whelks (see Espenshade et al. 1994:116, 199 for a discussion), bone awls, and steatite disks. Two Deptford Check Stamped sherds reveal wear that Thomas and Larsen (1979:44-46) have noted for Refuge and Deptford sherds on St. Catherines Island. One specimen reveal what they have classified as "acute, rounded edge damage," which is characterized as wear occurring on:

one or more sherd edges, with angles running from 45° to 60° on the same sherd. The abraded material must have been soft because the sherd edges are ground, rather than grooved or faceted as one would expect from a harder surface. Abrasion of hide or soft fiber could produce this kind of wear (Thomas and Larsen 1979:44-45).

Another specimen has "flat surface abrasion" evidenced by damage occurring on the body of the sherd rather than on its edge. Thomas and Larsen observe that:

the abraded object must have been rather soft, since a hard material would produce faceting which is lacking. Wear of this kind could result from a light sandpapering action on any flat, fairly soft surface (Thomas and Larsen 1979:45).

Although it is impossible to determine exactly what functions these sherds served, they a test to the working of soft materials, likely leather and wood, at the site. Since so few are found it also seems

reasonable to speculate that this activity was a relatively insignificant exercise at 38CH1219.

Two additional objects recovered from the excavations are clay fragments. One measures about 55 mm by 35 mm, and is about 20 mm in thickness. The second, which matches but does not mend, measures about 30 mm by 56 mm and is 16 mm in thickness. The original form of the first appears to be similar to stone atl-atl weights commonly called "butterfly" shaped. The second object has a finished edge and two finished faces.

The clay is very well mixed and compact, with sand inclusions comprising about 5% of the paste. These inclusions consist entirely of quartz sand, ranging from medium to coarse and including both rounded and subangular particles. Both are thoroughly oxidized to a mottled red/dark red color (2.5YR5/8 to 2.5YR4/8). In most respects the clay appears to be consistent with that of the finer texture Deptford wares.

The objects are well formed, although no particular effort has been made to finish the surfaces and what appear to be hand or finger striations are present on one surface. The second object was apparently formed and allowed to dry on the ground since one surface is flatter and contains grass impressions. On the surface is a single sharp and well-defined groove, characteristic of sherd hones. The groove is about 3 mm in width by 30 mm in length. Such hones are typically associated with the forming of bone or wood tools, such as awls, needles, and shuttles.

Similar objects have not been previously reported, so it is difficult to attribute these objects to a specific time period or even function. It is possible that they represents no more than a mass of formed clay which was accidentally fired, used as a hone, and then discarded. The careful shape, however, suggests that it may have had a function, perhaps being the ceramic analogue of a stone atl-atl weight.

SUBSISTENCE REMAINS

Faunal Materials

Introduction

The faunal collection from 38CH1219 consists of 49 bone elements and fragments that weight 80.01 gms. Material was recovered by dry-screening unit soil through ¼-inch mesh or water-screening feature soil through ⅛-inch mesh screen. This section of the study provides a description of the animal species represented in the faunal collection, the results of the zooarchaeological analysis of the remains, and a comparison of the data obtained from the site with that for other similar sites.

Analytical Techniques

The faunal collection from Kiawah's 38CH1219 was studied by the authors using standard zooarchaeological procedures and the Chicora Foundation comparative faunal collection. The bone material was sorted to class, suborder or species, and individual bone elements were identified. The bones of all taxa and other analytical categories were also weighed and counted. The Minimum Number of Individuals (MNI) for each animal category was computed using paired bone elements and age (mature/immature) as criteria. A minimum distinction method (Grayson 1973:438) was used to determine the MNI for the site as a whole. Given the small sample size, no effort was made to compute MNI by individual middens.

As a measure of zooarchaeological quantification, MNI has a number of problems (Grayson 1973:438; 1984:28-92; Klein and Cruz-Urbe 1984:26-32). How one aggregates the MNI will affect the number of individuals calculated. If MNI is calculated based on the entire site, the number will be smaller than if it is calculated for each excavation unit and totaled for the site. Use of MNI emphasizes small species over large ones.

For example, a collection may have only a few large mammals, such as deer, and scores of fish. Yet, the amount of meat contributed by one deer may be many times greater than that contributed by a score or two of fish.

Given the problems associated with MNI as a zooarchaeological measure, an estimate of biomass contributed by each taxon to the total available for use by the inhabitants of the site is also calculated. The method used here to determine biomass is based on allometry, or the biological relationship between soft tissue and bone mass. Biomass is determined using the least-squares analysis of logarithmic data in which bone weight is used to predict the amount of soft tissue that might have been supported by the bone (Casteel 1978; Reitz 1982, 1985; Reitz and Cordier 1983; Reitz and Scarry 1985; Reitz et al. 1987; Wing and Brown 1979). The relationship between body weight and skeletal weight is expressed by the allometric equation $Y = aX^b$, which can also be written as $\log Y = \log a + b(\log X)$ (Simpson et al. 1960:397). In this equation, Y is the biomass in kilograms, X is the bone weight in kilograms, a is the Y-intercept for a log-log plot using the method of least-squares regression and the best fit line, and b is the constant of allometry, or the slope of the line defined by the least-squares regression and the best fit line. Table 6 details the constants for a and b used to solve the allometric formula for a given bone weight x for each taxon identified in the archaeological record. In using allometric calculations to predict proportional biomass from bone weight it is important to note that the weight of bone used in the calculation obviously influences the results. There a number of factors, such as differential preservation or discard practices, that may affect the weight of the bone recovered from an archaeological site. Thus, this technique of analysis may not give the precise results that the final numbers would appear to indicate.

Table 6.
List of Allometric Values Utilized in this Study
to Determine Biomass in Kilograms (kg) Based on
Bone Weight Expressed in Kilograms

Faunal Category	log a	b	r ²
Mammal	1.12	0.90	0.94
Bird	1.04	0.91	0.97
Turtle	0.51	0.67	0.55
Perciformes (sea bass, bluefish)	0.93	0.83	0.76

Derived from Table 4 in Reitz (1985:44) and Table 2.3 in Quitnyer (1985b:440).

Identified Fauna

Before considering the results of the zooarchaeological study of the faunal remains recovered from site, the general use and habitat preference for each identified species will be considered. Table 7 lists the various animal species identified in the archaeological collections recovered from the excavations within the identified shell middens and features.

The most numerous of the wild mammals is the white-tailed deer (*Odocoileus virginianus*). A variety of uses exist for the different parts of this animal, so that almost all of a deer was utilized in some manner prehistorically by the Indians (Runquist 1979:169; Swanton 1946:249). Deer metatarsals were used as beamers and split to make needles; ulnae were used as awls; and antlers were made into flakers, projectile points and fish hooks (Swanton 1946:249; see also

Trinkley 1980). Rattles, flutes, bracelets, and beads were also made from deer bone (Swanton 1946:249). Sinew and entrails were manufactured into bow strings, rawhide, throngs, and "thread" (Swanton 1946:249). Deer brains were combined with green corn to tan leather (Lawson 1967:217). The skins, hooves, and antlers were rendered into glue. Heads, skins, and antlers were used as decoys in hunting and as status/clan indicators. Hides were sewn into clothing, and used as coverings for houses/doors (Swanton 1946:249). In general, the deer's preferred habitat is the edge of deciduous forests and open forests, although they will move to mudflats around marshes to feed on the grasses found there.

Male deer tend to grow antlers beginning in May, with full development of hardened antler occurring in September. Antlers are usually dropped between the middle of January and the beginning of February. Females and their young form small family groups from the spring through the summer. These small family groups tend to become larger during the rutting season in September, October and November, with mature males moving amongst the females of small deer bands. Once the males have dropped their antler they stay with the small bands of females and young deer through the winter months. Just prior

Table 7.
Minimum Number of Individuals (MNI), Number of Bones, Weight, and Estimated
Meat Yield by Species for the various middens at 38CH1219

Species by Midden	#	MNI %	Number of Bones	Weight gms	Biomass kg	%
White-tailed Deer, <i>Odocoileus virginianus</i>	2	40.0	13	27.63	0.490	37.9
Raccoon, <i>Procyon lotor</i>	1	20.0	2	1.75	0.031	2.4
Unidentified Mammal	-	-	17	20.65	0.368	28.5
Carolina Diamondback Terrapin, <i>Malaclemys terrapin centrata</i>	1	20.0	9	5.27	0.096	7.4
Box Turtle, <i>Terrapene carolina</i>	1	20.0	3	1.04	0.033	2.6
Unidentified Turtle	-	-	2	22.87	0.257	19.9
Hispid Cotton Rat, <i>Sigmodon hispidus</i>	1	20.0	1	0.18	-	-
Unidentified bird	-	-	1	0.25	0.005	0.4
Unidentified fish	-	-	1	0.37	0.012	0.9
TOTAL	6	100.0	49	80.01	1.292	100.0

to the spring fawning period these bands break-up into small family units, with the males departing and becoming part of all-male groups, which are usually small in number (Smith 1975:18-19).

Raccoon (*Procyon lotor*) bones are present in small numbers in the prehistoric collections. Raccoons served as a food resource for the Indians, the furry skin was used for clothing, and claws were utilized as ornaments (Swanton 1946:250). This mammal is able to adapt to a variety of habitats, although they prefer wooded areas near water.

Remains of fish appear to be only an incidental part of the prehistoric Deptford-St. Catherine's faunal assemblage analyzed for this study. Only one fragmentary item was recovered and this could not be identified as to genus. Only one long bone from a bird was identified in the collection but it, too, could not be identified to genus.

Two different species of turtle are present in the faunal collection — Carolina diamondback terrapin and the box turtle. The diamondback terrapin (*Malaclemys terrapin*) is a turtle usually found in brackish lakes and marshes along the coastal strip or in the brackish estuaries of rivers (Obst 1986:113). The subspecies Carolina diamondback terrapin (*Malaclemys terrapin centrata*), which inhabits the Atlantic coast from North Carolina to Florida (Obst 1986:214), is probably the turtle represented in the 38CH1219 collection. The diamondback terrapin was an important food resource in the Southeast (Hilliard 1972:89) that became an accepted delicacy throughout the United States during the nineteenth and early twentieth centuries (Obst 1986:113, 183). These aquatic turtles can be caught using handlines, traps, or by hand. The other turtle present in very small quantities is the box turtle (*Terrapene carolina*). This turtle is widespread throughout the southeast and is adaptable to both aquatic and terrestrial habitats. Box turtles can be found near permanent bodies of water, or in open, mixed forests where the climate is hot and dry in the summer and the winters are mild (Obst 1986:106). Box turtles were used as a food resource, and their shells were made into rattles by the Indians.

Commensal species are animals such as pests, vermin, animals which prey on pests and vermin, and pets that are commonly found in the vicinity of human occupations. The only identified commensal species is the hispid cotton rat (*Sigmodon hispidus*). This species is likely not a food resource, but an accidental inclusion in the archaeological record.

Analysis and Interpretation of the Faunal Remains

The prehistoric vertebrate faunal remains analyzed for this study total 49 bone elements and fragments that weigh 80.01 grams. Table 7 summarizes the MNI and biomass calculations by faunal category for the site as a whole. Five identified species are present: deer, raccoon, box turtle and diamondback terrapin. Only one individual is identified of each species except for the deer, which is represented by two individuals. Deer is also the single largest biomass contributor, accounting for nearly a half kilogram (37.9% of the total biomass). Combined, the mammals account for half of the MNI and 68.8% of the biomass. The second largest faunal contributor are the turtles, which supply two individuals and 29.9% of the biomass. Fish and birds, in contrast, while accounting for perhaps only two MNI, supply only 1.3% of the biomass — a very inconsequential amount.

It is intuitively obvious that the site exhibits somewhat low diversity. The only two wild animals present are deer and raccoon. No opossum, rabbit, fox, or squirrel were recovered, although all would have been relatively abundant in the project area. On the other hand, both birds and turtles — both common species in the area of 38CH1219 — are present in the collection and reflect some effort to diversify the diet.

Comparison of the 38CH1219 Faunal Assemblage with other Faunal Collections

The faunal assemblage from Kiawah represents a relatively small, although carefully examined collection. Extreme care must be used in interpreting this collection, much less making comparisons to other (often similarly small) assemblages. Regardless, there are several other

Table 8.
Comparison of the Faunal Category Patterns from Selected Prehistoric Sites
by MNI and Biomass Percentages

Faunal Category	38CH1219		38BU861 ¹		38BU805 ²		38CH124 ³		38BU1214 ⁴		38BU464 ⁴		9CAM171 ⁵		38BU2 ⁶	
	MNI	Biomass	MNI	Biomass	MNI	Biomass	MNI	Biomass	MNI	Biomass	MNI	Biomass	MNI	Biomass	MNI	Biomass
Wild Mammals 80.5	50.0	68.8	80.0	99.9	29.4	66.5	32.8	94.1	50.0	62.9	19.4	49.7	1.9	33.6	27.	0
Wild Birds 0.3	t	0.4	0.0	0.0	17.7	4.5	10.3	1.9	0.0	5.8	4.2	3.0	0.8	0.2	4.	0
Reptiles 5.0	33.3	29.4	0.0	0.0	17.7	14.9	15.5	2.0	25.0	9.7	5.6	6.8	3.8	8.9	16.	0
Fish 14.2	t	0.9	20.0	0.1	17.7	13.2	32.8	1.9	25.0	21.5	61.1	37.9	88.7	56.3	53.	0
Commensals 0.0	16.6	-	0.0	0.0	17.7	0.9	8.6	0.1	0.0	0.0	9.7	2.5	4.7	0.8	0.	0
Total MNI	6		10		17		58		12		72		257		55	
Total Biomass	1.29 kg		3.51 kg		2.89 kg		103.18 kg		2.79 kg		7.56 kg		6.27 kg		16.24 kg	

¹Trinkley and Adams 1994:Table 11

²Wilson and Wilson 1986:Table 31 (Stallings Island Component).

³Wilson 1993:Table 26.

⁴Wilson 1991 (38BU1214-Deptford Component; 38BU464-Savannah Component).

⁵Smith et al. 1983:Table 3 (Savannah Component).

⁶Espenshade et al. 1994:Table 31 (Deptford Component).

sites in the coastal areas of the Atlantic seaboard in South Carolina and Georgia possessing prehistoric period faunal remains with which Old House Creek can be compared (Table 8). These include much earlier Stallings and Thom's Creek sites (38BU805 and 38CH124) on Hilton Head Island, and Kiawah Island, S.C. (Wilson and Wilson 1986; Wilson 1993); a slightly earlier Deptford site (38BU1214) from Spring Island, S.C. (Wilson 1991); a Deptford site (38BU2) from Spring Island, S.C. (Espenshade et al. 1994); two collections that date only slightly later, a Savannah faunal assemblages from 38BU464 on Callawassie Island, S.C. (Wilson 1991) and a shell midden site (9CAM171) in King's Bay, Georgia (Reitz and Cordier 1983); and a very similarly dated Deptford-St. Catherines assemblage from Old House Creek on Hilton Head Island, S.C. (Trinkley and Adams 1994).

Comparing the biomass profile for the faunal collection from 38CH1219 with the selected sites, it obviously differs greatly from all of the others. Only the data from 38BU1214 are somewhat similar. In both cases the wild mammals account for about half of the MNI and 63% to 69% of the biomass. Otherwise, there are significant differences. At 38BU1214 fish account for over a fifth of the biomass, while at 38CH1219 fish are an insignificant contributor. At the two sites the role of reptiles are reversed — playing a significant role at the Kiawah midden, but being only a minor source at 38BU1214.

In comparing 38CH1219 with 38BU861 — a site which throughout this study has served as a "foil," there are significant differences. The Kiawah collection exhibits higher diversity, with a broader range of species represented than at 38BU861, where the collection appears more focal, with reliance placed on a smaller number of species. Although the contributions of the different groups from 38BU2, the other Deptford phase site, are different, this site seems to also exhibit some of the diversity seen at Kiawah.

Using generally comparable data, albeit from a very small collection of sites, the Stallings/Thom's Creek sites (38BU805 and 38CH124) seem to suggest a rather diffuse pattern, with a broad range of species being present,

although the biomass is largely contributed by mammals. In the later Savannah phase (represented by sites 38BU464 and 9CAM171) this diffuse pattern is still present, although the major biomass contributor seems to have shifted from mammals to fish. In the intervening Deptford-St. Catherines phase, there appear to be two distinctly different approaches. Sites such as 38CH1219 and 38BU1214, and 38BU2 all seem to exhibit a diffuse pattern of subsistence, although in each case mammals are the single most significant biomass contributor. At site 38BU861, on the other hand, mammals are still the most important biomass contributor, but overall the subsistence base seems much more focal — little is being exploited except mammals (primarily deer).

Ethnobotanical Materials

Introduction

Ethnobotanical remains were recovered from a number of excavation proveniences associated with 38CH1219, including handpicked samples from ¼-inch dry screening of midden soil, ½-inch water screening of midden soil samples, and ⅜-inch water screening of feature samples, as well as water floated samples from Features 1-5.

Flotation samples, offering the potential to recover very small seeds and other food remains, are expected to provide the most reliable and sensitive subsistence information. Samples of 10 to 20 grams of processed fill or carbonized material are usually considered adequate, if no bias was introduced in the field. Popper (1988) explores the "cumulative stages" of patterning, or potential bias, in ethnobotanical data. She notes that the first potential source of bias includes the world view and patterned behavior of the site occupants -- how were the plants used, processed, and discarded, for example. Added to this are the preservation potentials of both the plant itself and the site's depositional history. Of the materials used and actually preserved, additional potential biases are introduced in the collection and processing of the samples. For example, there may be differences between deposits sampled and not sampled, between the materials recovered through flotation and those lost or broken, and even between those that are considered identifiable and

those that are not. In the case of 38CH1219 the soil samples were each 5 gallons in volume (representing soil prescreened to remove the large shell) and were water floated (using a machine assisted system) after the excavations at Chicora's Columbia laboratories.

Handpicked, or even waterscreened samples, may produce little information on subsistence since they often represent primarily wood charcoal large enough to be readily collected during either excavation or screening. Such handpicked samples are perhaps most useful for providing ecological information through examination of the wood species present. Such studies assume that charcoal from different species tends to burn, fragment, and be preserved similarly so that no species naturally produce smaller, or less common, pieces of charcoal and is less likely than others to be represented — an assumption that is dangerous at best. Such studies also assume that the charcoal was being collected in the same proportions by the site occupants as found in the archaeological record — likely, but very difficult to examine in any detail. And finally, an examination of wood species may also assume that the species present represent woods intentionally selected by the Native Americans for use as fuel — probably the easiest assumption to accept if due care is used to exclude the results of nature fires. While this method probably gives a fair indication of the trees in the site area at the time of occupation, there are several factors which may bias any environmental reconstruction based solely on charcoal evidence, including selective gathering by site occupants (perhaps selecting better burning woods, while excluding others) and differential self-pruning of the trees (providing greater availability of some species other others). Smart and Hoffman (1988) provide an excellent review of environment interpretation using charcoal which should be consulted by those particularly interested in this aspect of the study.

Procedures and Results

Three flotation samples (from Features 2, 4, and 5) were prepared in a manner similar to that described by Yarnell (1974:113-114) and were examined under low magnification (7 to 30x) to identify carbonized plant foods and food remains.

Remains were identified on the basis of gross morphological features and seed identification relied on Schopmeyer (1974), United States Department of Agriculture (1971), Martin and Barkley (1961), and Montgomery (1977). All float samples consisted of the charcoal obtained from 5 gallons of soil (by volume). The entire sample from this floated amount was examined. The results of this analysis are provided in Table 9.

In all three samples the uncarbonized materials (rootlets and similar trash) comprised the majority of the remains. Since this dramatically dilutes the information obtained from carbonized materials, the debris was largely removed manually, *prior to the ethnobotanical study*. Ignoring these remains, each sample was exceedingly small and none weighed as much as a gram. Ethnobotanical material was apparently a very minor component of the three features examined.

The samples are composed almost exclusively of wood charcoal (which accounts for between 93.1% and 95.7% of the three samples). Hickory nutshell, however, was found in two of the three samples, but only as a trace (i.e., accounting for less than 0.01 g).

There are four hickories common to the Beaufort area -- bitternut (*Carya cordiformis*), water (*C. aquatica*), mockernut (*C. ovalis*), and pignut (*C. glabra*). These species occur on a variety of soil types, from dry woods to rich or low woods to swamp lands. In South Carolina they fruit in October, although seeds are dispersed from October through December (Bonner and Maisenhelder 1974:269; Radford et al. 1968:363-366). Good crops of all species are produced at intervals of up to three years when up to about 16,000 nuts may be produced per tree (Bonner and Maisenhelder 1974:271). Complicating this simple seasonality is the ability of the nuts to be stored for up to six months.

The presence and diversity of hickories is significant given their suspected contribution to the prehistoric diet. The occurrence of hickory nutshell at Stallings-Thom's Creek sites has been previously noted (see Harris and Sheldon 1982; Trinkley 1976, 1986) and is perhaps most significant because of its high protein and fat content, providing a caloric

value equal to that of many meats (Asch and Ford 1971; Hutchinson 1928:261). They have likewise been found at a variety of Deptford and Middle Woodland sites (Espenshade et al. 1994:132; Trinkley 1991; Trinkley et al. 1993:131)

The handpicked samples were also examined under low magnification with a sample of the wood charcoal identified, where possible, to the genus level, using comparative samples, Panshin and de Zeeuw (1970), and Koehler (1917). Wood charcoal samples were selected on the basis of sufficient size to allow the fragment to be broken in half, exposing a fresh transverse surface. A range of different sizes were examined in order to minimize bias resulting from differential preservation. The results of this analysis are shown in Table 10 as percentages.

Wood charcoal occurs in moderate amounts in all of the 38CH1219 proveniences. This study found that it consists almost entirely of pine (*Pinus* sp.), which is found in 14 of the 18 proveniences. Other species include hickory (*Carya* sp.), found in only one of the 18 proveniences; maple (*Acer* sp., probably *A. rubrum*, red maple), found in two samples; oak (*Quercus* sp.), found in five of the 18 proveniences; and unidentified woods, found in five of the 18 proveniences.

Hickory nutshell is found in six samples, comprising over a quarter or more of the collected charcoal in five.

Two of the samples, from 100R90 and 100R100, produced multiple (8) carbonized examples of palmetto seed (*Sabal* sp.) The palmetto seeds may represent either the *Sabal palmetto*, which has a tree form, or the *S. minor*, which is a low palm. The cabbage palm is very common and while it has few commercial uses, it is extensively used by the rural residents -- the bud provides food and the leaves are used in weaving. While there is no evidence that the fruits were used by the Native Americans, they are eaten by animals and birds (Schopmeyer 1974:744). The fruits ripen in the late fall or winter. Recent research on the Calusa in Florida has revealed that

Table 9.
Flotation sample components, weight in grams

Provenience	Wood		Uncarb. Organic		Hickory Nutshell		Total
	wt	%	wt	%	wt	%	
Feature 2	0.49	95.9	0.02	4.1	t	t	0.49
Feature 4	0.54	93.1	0.04	6.9			0.58
Feature 5	0.22	95.7	0.01	4.3	t	t	0.23

this coastal group ate the berries of the saw palmetto (*Serenoa repens*, *Sabal* and *Serenoa* are the only two genera of the Arecaceae family). While not typically considered "tasty," they are very nutritious, containing 1.6% protein, 4.4% fat, 36.4% carbohydrates, and 55.0% moisture (William Marquardt, personal communication 1994).

Discussion

Both the flotation and waterscreened samples are dominated by wood charcoal, primarily pine, and a single plant food remain -- hickory nutshell. The study perhaps contributes to a better understanding of the site environs, as well as the activities of the Deptford/St. Catherines people who lived around 38CH1219.

The charcoal represents woods which could reasonably be associated with a maritime forest, such as hickory and oak. Trees such as the red maple are likely found in wetland areas or low rich woods. Pine, while suggestive of a disturbed habitat, is present naturally in the more sheltered areas of maritime forests (Barry 1980:179). The dominance of pine, however, suggests a fire sub-climax pine forest with minor components of oak and hickory. The choice of reconstruction is therefore determined by the weight given to the pine -- does it represent the species' occurrence prehistorically, or does it represent intentional cultural selection (perhaps as fuel)? It may be more important that the site exhibits relatively modest diversity, since that suggests relatively foraging activities. Although mesic soils, and even some wetland areas bordering on swamps, may have been included in the round of the Kiawah inhabitants, it seems that most of the activity was localized to the maritime forest in the immediate area of the middens.

If pine was as common as suspected, then

the occurrence of hickory nutshells becomes that much more significant. In the midst of oak-pine forests, presumably maintained through fire, sites like 38CH1219 may represent "islands" where hickory resources were especially prevalent. Even today hickories tend to be found in small, localized areas. Being intolerant of salt, they also avoid maritime forests and near marsh areas.

The hickory nuts suggest a fall or winter occupation of the site, although they can be collected and stored for future use, perhaps as late as March or April. The palmetto seeds are dispersed from September through November. Consequently, these remains suggest that at least some activities took place in the fall or early winter months. Occupation during other seasons, of course, cannot be ruled out based on this evidence.

The absence of "weedy" taxa, often found at coastal sites and suggestive of disturbed habitats, cannot easily be explained. The absence of "weedy" plant seeds may be due to their small size and fragility. However, since most grasses produce seeds during the summer or early fall, their absence may indicate that the site was not occupied during this part of the year.

Shellfish Remains

A following section of this study will explore the ability of oysters (*Crassostrea virginica*) to offer environmental and seasonality dating. There are, however, other shellfish present at Old House Creek and an examination of these species may help us to better understand not only the dietary choices present, but also the environmental

Table 10.
Analysis of wood species from the waterscreened samples, by percent

Provenience	oak	pine	hickory	maple	UID	hickory netshell	palmetto seed	other
90R90, Z1, NW	22.2	11.1			22.2	33.4		11.1
NE		100.0						
Z2, NW		66.7			33.3			
NE		100.0						
90R100, Z1, SE	20.0	60.0				20.0		
SW		100.0						
100R90, Z1, SE						50.0	50.0	
SW		100.0						
NW	25.0	75.0						
Z2, SE		100.0						
SW	50.0	50.0						
NW						100.0		
NE	30.0	30.0			10.0	30.0		
100R100, Z1, SW		50.0			25.0	25.0		
NE		28.6					71.4	
Z2, SW				100.0				
Feature 3			100.0					
Feature 4		66.8		16.6	16.6			

variability of the site area. In particular, small quantities of common cockle (*Trachycardium muricatum*), stout tagelus (*Tagelus plebeius*), hardshell clam (*Merceneria mercenaria*), knobbed whelk (*Busycon carica*), and periwinkle (*Littorina littorea*) were found either in individual features or in the general midden excavations.

Stout Tagelus

The species is found in the general excavation of only the central midden, and even there as only a barely noticeable trace. It was not recovered in any of the exposed features. This very low density of occurrence suggests that tagelus may have been accidentally collected.

It is typically found in similar ecological settings as the clam, preferring sand-mud intertidal areas where it burrows into the bottom. Collecting the species requires that they be dug out and Larson (1969:125) questions the ease with which they could be obtained. Nevertheless, he notes that they contribute noticeable, if small, concentrations to Georgia middens, suggesting at least occasionally they were intentionally collected, perhaps in the process of also collecting burrowing clams. Quitmyer (1985a:31) indicates that the collection process is rather involved, indirectly

suggesting that occasional collection with other species is more likely than direct exploitation. This linkage with clams is reasonable and suggests that at best the tagelus were obtained incidental to the primary goal of clam collection.

Common Cockle

The cockle is found only in the central midden, where it accounts for only 0.1% of the sample by weight. The very rare presence of this species suggests accidental inclusion, likely in the process of gathering of other shellfish. The cockle is typically found very shallowly (under a half inch) buried in sand or mud below the mean low water in depths ranging from 1 to 30 feet (Amos and Amos 1985:398). Its preference is for sandy bottoms along beach and tidal areas.

Clams

Hardshell clams, also known as quahogs, are found in all three of the 38CH1219 middens and in one of the three features. They typically account for around 2% of the shell by weight, suggesting that relatively few individuals were collected.

The clam is typically found in sand or mud in protected areas ranging from intertidal flats to water upwards of 50 feet in depth. They are often no deeper than an inch below the surface and can be in small concentrations within relatively restricted areas. Unlike the oyster, the clam has a fairly narrow range of salinity tolerance, preferring areas with a salinity higher than 20 ppm. In less dense bed areas there may be one or two clams per square yard (Vernberg and Sansbury 1972:275-276).

Periwinkle

While common at Late Archaic sites, the periwinkle is not always common at Middle and Late Woodland middens. At 38CH1219, however, it was recovered from all three middens and from one of the three examined features. It was particularly noticeable in the central midden, where it comprised nearly 5% of the total shell.

The periwinkle's only habitat is the salt marsh, since the snail is totally dependent upon

brackish water. It feeds on algae found growing on marsh grass, shells, debris, and even the marsh surface. They are relatively easy to collect since they tend to move up and down *Spartina* in rhythm with the tides. Vernberg and Sansbury (1972:274) found a periwinkle density of up to 120 individuals per square meter of marsh during the summer. During the cold winter months, however, periwinkles tend to be conspicuously absent from the marsh (Meyer 1991:51).

They may be prepared by steaming them for about 10 minutes and then picking the meat out with a small bit of wood. The snails may also be boiled to produce a broth, with the shells sinking to the bottom of the stew pot.

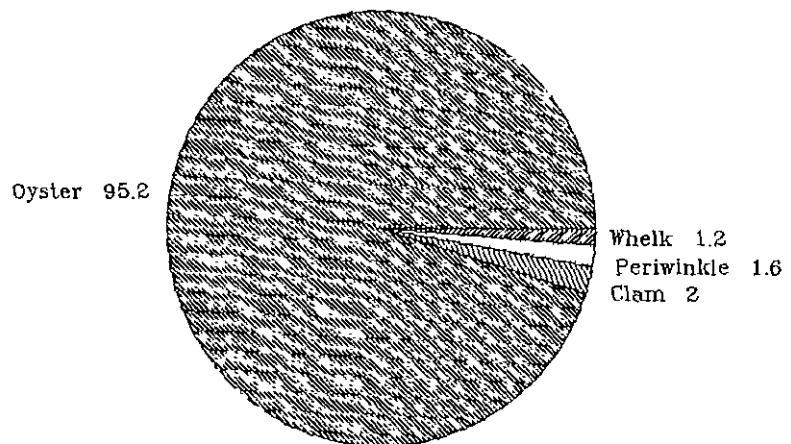
Knobbed Whelk

Whelk was found in all three middens and in two of the three examined features. In fact, it comprised over 90% of the shell in Feature 5, suggesting that this pit represented the remains of a whelk stew. The whelk has traditionally, however, been relatively uncommon at other Middle Woodland sites (see Trinkley and Adams 1994:99).

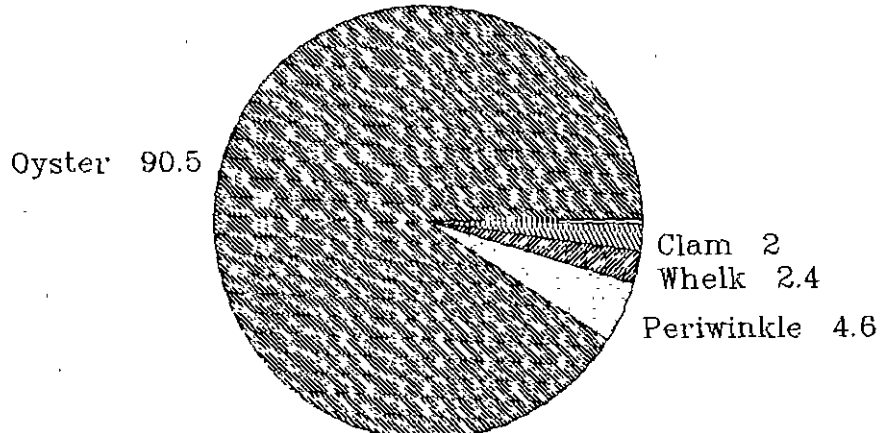
Whelks are typically found on sandy bottoms in shallow waters, although they may also be found buried in sand flats exposed by the low tide and even in oyster beds, where they are a major predator of the oyster. In fact Larson noted that "these few large and edible snails would . . . have been picked up when found among the oysters" (Larson 1969:128). Quitmyer (1985a:32) observes that the whelk is a migratory species, with peak densities in fall and spring. During the winter and summer they typically move into deeper waters or the beach zones – areas which are typically thought to be less attractive to the prehistoric shellfish gatherers.

Shellfish Identified at 38CH1219

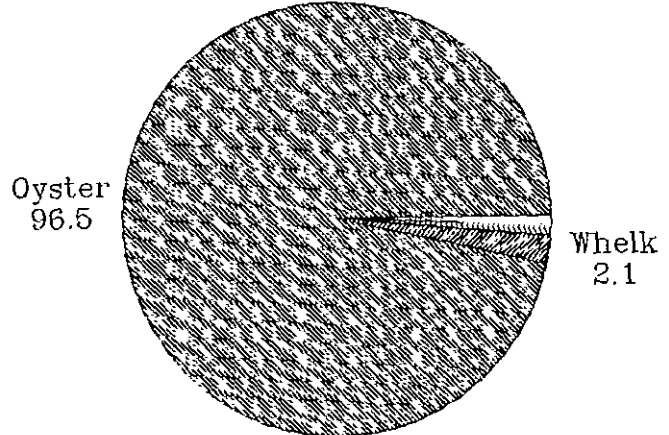
Tables 2 and 3 have detailed the proveniences and percentage (by weight) of the various shellfish found during these investigations. These data are graphically presented in Figure 23. In each of the three middens, oysters dominate the collections, consistently comprising more than 90% of the midden by weight. Only in the central midden do the other species account for more than



Shell Content of the Northwest Midden



Shell Content of the Central Midden



Shell Content of the Southeast Midden

Figure 23. Shellfish from midden excavations at 38CH1219.

Table 11.
Allometric Values Used to Determine
Biomass in Kilograms Based on Shell
Weight Expressed in Kilograms

Shellfish	log a	b
Oyster	- 0.77	0.97
Clam	- 0.50	0.94
Periwinkle	-0.34	0.94
Whelk	-0.12	0.84

Derived from Quitmyer 1985b:40.

a few percent of the total sample. While clam is not especially numerous in the Kiawah middens (hovering around 2% in two middens and dipping as low as 0.7% in the southeastern midden), Espenshade et al. (1994:170) have previously suggested that quantities as low as 0.8% may indicate intentional collection. If this is so then both clam may represent sought after species, rather than shellfish opportunistically collected. There is also a clear indication, at least in Feature 5, that whelk was a sought after species and was not just collected on occasion.

Just as allometric formula are useful for understanding the biomass contribution of different vertebrate remains, they may also be used in the analysis of shellfish. Allometry, as previously discussed, is the biological relationship between soft tissue and bone mass. Biomass is determined using the least squares analysis of logarithmic data in which bone weight is used to predict the amount of soft tissue that might have been contained in the shell. The relationship between body weight and shell weight is expressed by the allometric equation $Y = aX^b$, which can also be written as $\log Y = \log a + b(\log X)$. In this equation, Y is the biomass in kilograms, X is the shell weight in kilograms, a is the Y-intercept for a log-log plot using the method of-least squares regression and the best fit line, and b is the constant of allometry, or the slope of the line defined by the least squares regression and the best fit line. Table 11 details the constants for a and b used to solve the allometric formula for a given shell weight X for each taxon identified in the archaeological record. In using allometric

calculations to predict proportional biomass from shell weight it is important to note that the weight of shell used in the calculation obviously influences the results. There are a number of factors, such as differential preservation or discard practices, that may affect the weight of the shell recovered from an archaeological site. Thus, this technique of analysis may not give the precise results that the final numbers would appear to indicate.¹

Table 12 provides the biomass data for the shellfish recovered from the three middens. As expected, oyster dominates the biomass calculations. With contributions ranging from 3% to over 10% it is difficult to determine if the clams, periwinkles, and whelks may have been intentionally sought out and collected or if they simply represent opportunistic species which were common and therefore well represented in the collections. Clearly, the primary emphasis was

Table 12.
Estimated Meat Yield for Shellfish at 38CH1219

Shellfish	Northwest Midden		Central Midden		Southeast Midden	
	kg	%	kg	%	kg	%
Oyster	80.2	87.8	64.0	78.4	26.7	88.7
Clam	3.3	3.6	2.8	3.4	0.4	1.3
Periwinkle	3.8	4.2	8.7	10.7	0.6	2.0
Whelk	4.0	4.4	6.1	7.5	2.4	8.0

placed on oyster collection. It seems likely that both clam and whelk were likely found in locally abundant areas, associated with the oyster beds, and therefore were collected in conjunction with the oystering activities. The periwinkle, which comprise rather significant proportions of the

¹ Kennedy and Espenshade (1992:85), using the allometric formula, comment that "to compensate for non-meat supporting shell, 82.62 percent of the total shell weight [is] utilized in the meat weight formula (Adams 1985:37)." In actuality, this adjustment was recommended by Quitmyer (1985b:37) to compensate for the dead oysters typically included in clumps. There does not seem to be any indication that he intended it to be a generalized corrective factor applied to all shellfish remains. Nor does there seem to be any particular reason to apply this factor unless there is clear and convincing evidence that the site occupants were collecting substantial amounts of dead shells. In the current study we have not used this factor, although it can certainly be applied by others using our data, if they wish.

biomass at the central and southeastern middens, would be found in distinctly different areas and would most likely not have been collected in the general course of oystering. It seems more likely that a specific effort was made to collect the periwinkles, although this may represent a supplemental activity.

Shellfish, when compared to most mammals, supplies relatively little protein. For example, 100 gms of oyster provides approximately 66 calories and 8 gms of protein, compared to 100 gms of deer meat which provides 126 calories and 21 gms of protein. A shellfish diet, supplemented with fish, hickory nuts, and deer meat, however, is not particularly wanting. In fact, shellfish as a dietary core is likely better in many ways than corn as the dietary core, since corn provides (per 100 gms) only 63 calories and 3 gms of protein.

Several of the minor species found at Old House Creek are considered weak seasonal indicators. Periwinkles, for example, tend to be more common during all seasons except the winter. The knobbed whelk would have been most readily available in the fall and spring. The problem, of course, is that the scarceness of seasonally indicative species may only be an indication of collection during a season of relatively low density. Relatively little weight can be placed on any of these species as more than general indicators.

The data are more helpful when we consider exploitation of distinct habitats. The clams and whelks may be found in close proximity to many oyster beds. For example, intertidal estuarine flats commonly occur in the irregularly flooded high marsh areas. In these areas intertidal oysters are nearly ubiquitous, forming clusters or "rocks." Clams can be abundant in the lower intertidal zone of the same estuarine flats, perhaps only a few hundred feet away (Sandifer et al. 1980:263). Even stout tagelus, which are a very inconsequential addition to the middens, may be found while collecting clams, frequently at the low water mark. What is perhaps more surprising is that associated species, such as crabs, and especially ribbed mussels, are so uncommon in the Kiawah collections. The absence of these species — which are frequently gathered incidental to oystering — suggests that the shellfishing efforts were careful to

focus on specific species. It is almost as though other species were intentionally culled in either the collecting or processing. Only the cockle represents an unusual species, perhaps reflecting exploitation, or at visitation, of a different habitat. Cockle, however, are so uncommon that not much can be made of their occurrence. In sum, the occupants of 38CH1219 limited their visits to two distinct habitats -- areas suitable for collection of oysters (the primary activity) and nearby areas suitable for digging clams (a secondary activity). During these activities occasional other species were either sought, or occurred. The second habitat, of course, was the high marsh where periwinkles were gathered. In this respect the occupants of 38CH1219 appear to be focused, but not nearly so focused as the groups which visited 38BU861, where only oyster appeared to be collected and even clams appeared to be an incidental inclusion.

Summary

Site 38CH1219 produced a wide variety of subsistence remains, including vertebrate faunal, shellfish, and potentially floral materials. Taken together, this analysis suggests a fairly clear picture of the subsistence activities associated with the site.

Vertebrate fauna was not an especially large contributor to the biomass present at the site. For example, the excavations reveal about 1.3 kg of vertebrate biomass, compared to over 200 kg of biomass contributed by the shellfish. In the context of this comparison, it seems that the vertebrate contribution was negligible, perhaps representing little more than opportunistic encounters.

Yet the faunal material present reveals that however opportunistic the encountered might have been, a relatively wide range of resources were being exploited. Mammals were certainly the single most important resource, but also present were birds, fish, and especially reptiles. All of the resources were species which might be readily available in the immediate vicinity of the site. Hence, while the exploitation was diffuse, it does not suggest that the 38CH1219 residents were moving far from the site.

The vertebrate species present were all those which might be found within a mile of the site. Deer would be found in the woods and

adjacent to the marsh. Raccoons might be expected in even closer proximity to the camp. The two turtle species would be found on the marsh or in the nearby freshwater. Although the bird and fish species are not identified it is likely that they were locally available.

Shellfish were certainly the focus of the subsistence activities at the site, contributing over 200 kg of biomass as previously mentioned. Oysters are by far the single largest contributor, although again the subsistence quest was more diffuse than might be imagined, with at least whelk, periwinkle, and clam representing noticeable dietary contributions.

These foods were also in close proximity to the site, although two relatively distinct environments are represented — that associated with the oyster and clam beds, potentially at the edge of the creek banks on mud or sand flats, and that associated with the high *Spartina* marsh. Of course both are again in very close proximity to the site.

Finally, the ethnobotanical collection reveals the presence of a fairly substantial collection of hickory nutshell. While no biomass can be calculated, it seems likely that this was a supplement to the diet, providing a readily available source of protein comparable to meat.

The palmetto berries have been reported from several Deptford-St. Catherines sites. It is tempting to suggest that they represent another food source. Although relatively low in protein (at least compared to hickory nuts), they are a good carbohydrate contributor.

None of the subsistence remains offer any particularly convincing seasonality information. The vertebrate faunal remains are totally lacking in seasonality indicators. Although the turtles would most likely be collected during warm weather, turtles can be seen sunning themselves on warm days even in January or February.

The hickory nutshells are suggestive of a fall occupation, perhaps from October through December. The palmetto fruits are also dispersed in the fall, typically from September through

November. It may be that the absence of "weedy" species offers negative evidence against occupation during the warmer spring and early summer when most grasses produce seed.

The shellfish are only very weak seasonal indicators. Periwinkles, for example, are most common in the warm weather. While they tend to be absent in December, they can be found in October and November, as well as throughout the summer. The whelks achieve peak densities in the fall and spring, although occasional specimens can be found throughout the year.

Taken together, the various food sources suggest occupation during the cooler months, perhaps October or November. It seems relatively unlikely that the site was occupied in the summer months.

OYSTER SHELLS

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Introduction

Archaeological oysters from data recovery excavations at Woodland Period site 38CH1219, near Salt House Creek on Kiawah Island, Charleston County, South Carolina, were supplied to the writer by Chicora Foundation of Columbia, South Carolina. Accompanying the samples was a request for input concerning various behavioral aspects of the original site inhabitants, including the environment(s) from which the oysters were gathered, the uses of the oysters by the site inhabitants, and the season(s) of gathering if decipherable. A summary of these findings is included in this report.

Oyster-based techniques follow those outlined in Lawrence (1988) as subsequently modified (see, for example, Lawrence 1991). The use of pyramidellid snails, as an indicator of season of oyster gathering, follows the review of Lawrence (1994).

Molluscs from 38CH1219

After consultation with Chicora Foundation, a decision was reached to place primary emphasis upon samples from the shell midden at 90R100, and to use multiple lines of inquiry into the season or seasons over which these oysters were gathered. As noted below, this work raised questions concerning oyster resource depletion which, to attempt to answer, required at least a cursory examination of the materials from a second midden at 90R90. The results from this more sketchy analysis are incorporated into the following discussion of the midden of primary emphasis.

Unit 90R100 Column Sample, 2 bags

Unfortunately, the stratigraphic order of the two bags in this column sample is unknown.¹

The biota in this total column sample includes knobbed whelks displaying tool-use abrasion, barnacle fragments, numerous (>60) fragments of quahogs including several discolored and grayed, abraded ones, at least one indeterminate snail and a bivalved clam, and quite numerous (>250) marsh periwinkles. No significant differences in these other organisms occur between the two bags.

In one bag (arbitrarily Bag 1), intertidal cluster oysters form about two-thirds of the 31 larger left valves. Attachment areas are of but moderate size, suggesting that they came from nearby tidal flat areas, and were not collected from the quite crowded oysters which may line creek banks. The smaller valves include many true juveniles, suggesting that the oysters were gathered as "grab" samples with any sorting of valves by size taking place at the occupation site. Beige to gray discolorations are prominent on many of these valves, and stabbing notches, including multiple ones, are also evident. These observations, plus conspicuous cracks on the smaller right valves from this bag, all support food use of the oysters and suggest that they were heated by steaming or baking during food preparation. Season or seasons

¹*Editor's Comment:* The midden, being relatively thin and exhibiting no clear stratigraphic distinctions, was removed as one zone. The two bags from the column sample represent horizontally distinct deposits (within the 2.25 foot square column), but do not represent vertically distinct zones. The differences seen in the shells from the two bags may therefore represent only sampling bias or, alternatively, may reflect unrecognized "dump piles" of discrete food remains.

of gathering cannot be read from an analysis of this bag's oyster ligament geometries.

By contrast, scatter oysters from lower in the tidal gradient form about two-thirds of the 48 larger left valves from the other bag (arbitrarily Bag 2). The minority intertidal cluster oysters appear to have come from nearby tidal flat settings. Adult oysters collected dead, and numerous juveniles point toward "grab" sampling of these shellfish. Beige through dark brown to gray valve discolorations are prominent and these color alterations are most striking near points of greatest convexity on valve exteriors. Sucrose surfaces of internal cavities are present. Some of these oysters lay in contact with hot coals during their heating in food preparation. Food use is also supported by stabbing notches on the larger left valves. Over half of the cluster oysters display ligaments with 2-4 units ventral to the last formed "break" or significant topographic high. Previously this geometry would have been interpreted to indicate a Spring (using the seasonal groupings of Russo 1991) season of gathering. However, recent and background work (Lawrence 1994) has indicated that seasonality in growth might change within the Carolinian Biogeographic Province and, without controlled analysis of living oysters (now underway) from the Sea or Barrier Islands region from which these archaeological oysters come, the season could just as reasonably be interpreted to represent the Late Autumn of the year.

Analysis of valve heights of the oyster parasitic pyramidellid snail, *Boonea impressa* as indicators of season of oyster collection did not allow a choice between these differing interpretations. The basic technique, measuring size at death of these snails, was established by Russo (1991) and is founded upon observations that: (1) primary recruitment of new generations of these snails takes place in the springtime or early summer, (2) the average lifetime of *B. impressa* is about one year, and (3) during its lifetime this impressed odostome undergoes regular and measurable accretionary growth. Russo (1991) wisely used modal size classes as the basis for interpretations and combined sizes into broad, seasonal categories; only 6 seasonal groupings (Spring, Summer, Autumn, Late Autumn, Winter, Late Winter) were recognized. Data grouping is

basically achieved by rounding sizes upward, to the next higher 0.5 mm.

Multiple, nested, and size-graded standard sieves were used in the sorting of sediments; of the sieve sizes readily available to the writer, those with openings of 2.00, 1.18, 0.85, and 0.50 mm were chosen. This size range included a finer mesh opening than that recommended by Russo as a minimum sieve size. Approximately 10 liters of sediment were sieve-processed during the analysis of the 90R100 midden from 38CH1219.

The intact and entire (or nearly entire) snails were affixed to cardboard, partitioned mounts using gum tragacanth, and valve heights were next measured with a micrometer ocular, which had been calibrated with regard to the microscope being used.

Unfortunately, only 17 odostomes were recovered from the processing of this rather extensive volume of sediment. The grouped data for valve heights of these 17 impressed odostomes from the 90R100 midden, rounded up to the nearest 0.5 mm, are presented in Table 13. The use of Russo's seasonal interpretations (Russo 1991:Table 1) generates a Summer primary season of gathering for the oysters and their parasites. However, this sample size is significantly smaller than those used in previous archaeological interpretations (typically, 100 or more odostomes; Russo 1991:Table 2), and the validity of this seasonal reconstruction is open to question. Even if this size-frequency distribution is an accurate representation of season of gathering, the odostomes still do not allow a choice between the contrasting oyster ligament seasons. All that can be said, with certainty, is that these oysters were collected some time

Odostome Height Groups (in mm)	Number of Observations
2.1-2.5	3
2.6-3.0	3
3.1-3.5	6
3.6-4.0	4
4.1-4.5	0
4.6-5.0	1
5.1-5.5	0
Total	17

Table 14.
Larger (height > 75 mm) left and right valves and left/right ratios for the 90R100 column sample

Sample	Larger Left Valves	Larger Right Valves	Left/Right Valve Ratio
Bag 1	31	4	7.8
Bag 2	48	5	9.6

cavity coverings unobjectionable for eating. Quahogs could have been added to these stews, with subsequent "trashing" of valves accounting for at least part of the observed discolorations of their valves.

between May and December.

A most striking aspect of the total column sample is the lack of oysters of truly large size. In Bag 1 the greatest left valve height is 92 mm; in Bag 2, 95 mm. That these maximum sizes are real, and not artifactual, is supported by the ratio between larger (height greater than 75 mm) left and right valves (Table 14). High left/right valve ratios, and a relative paucity of larger right valves, can be related to the fact that oyster right valves often have an extensive, quite thin, organic material-rich, elastic ventral margin or "bill" which is not likely to be preserved. With maximum valve sizes not far exceeding 75 mm, numerous right valves may easily be displaced into the "smaller" size category. This fact is the most likely explanation for the observed quite high left/right valve ratios shown in Table 14.

After this discovery, materials from the three bags of samples from the midden at 90R90 were examined for the maximum heights of oyster left valves. One bag had three individuals with heights in excess of 100 mm; the second bag, four; the third bag, six. Maximum valve height in the entire lot was 120 mm. If these size differences were perceived by the original collectors, then resource depletion arguments can be used to suggest that the midden at 90R90 is older than the midden at 90R100 since the latter, overall, contains smaller oysters.

And finally, a few interpretive words are warranted for the numerous marsh periwinkles of this column sample. These small snails, when present in large numbers, are most easily interpreted as the remnants of soups or stews. Cooking of the entire snails could have separated the snails' opercula from the meats (and allowed these objects to be skimmed off) or rendered these

SUMMARY AND CONCLUSIONS

Site 38CH1219 was initially recognized as a small, seemingly single, midden situated about 500 feet south of the Kiawah River marshes. The midden was recognized in a shovel test and additional tests placed around the site on a 20 foot grid pattern failed to identify any additional deposits. A small quantity of Deptford sherds were recovered from the one shovel test and the site was thought to represent a "pure" Deptford component shell midden with only one discrete pile. Examination of the earliest aerial photographs available for Kiawah, dating to 1939, revealed that the midden was on the edge of a dense wooded area. This suggested that the site might not have suffered plowing with the accompanying dispersal and fragmentation. Further, the site was situated near a channelized freshwater slough, feeding from an interior wetland. This, in proximity to the creeks, created an environmental setting which seemed perfect for Middle Woodland occupation.

Using the system of midden classification proposed by Espenshade et al. (1993:Table 48), this site might reasonable have been identified as an "oystering station." These sites are often thought of as small middens and Espenshade and his colleagues suggest that for this site type the contribution of oysters is very high, while the contribution of other invertebrates and vertebrates is very low. The density of lithic materials is very low, and few (if any) tools (of bone, stone, sherds, or shell) will be found. Sherd density is equally low and structural remains are very rare. In other words, Espenshade and his colleagues seem to suggest that these "oyster stations" are really nothing more than piles of oysters left over from collection and processing.

While the shell midden types proposed by Espenshade et al. (1993) are certainly a beginning point for research and discussion, there are clearly concerns (see Trinkley and Adams 1994). Nevertheless, it seemed appropriate to see how 38CH1219 related to this model and what types of

information the site might contribute. A wide range of research goals and methods had been proposed on the basis of research at Old House Creek, 38BU861. Many of these could not be implemented at 38CH1219 because the scope of work and budget went back further than the research at Old House Creek. Some aspects, however, could be integrated.

Although oystering stations are proposed to be simple, really nothing more than piles of shell, the research at 38CH1219 suggests that this site is somewhat more complex.

A series of 90 auger tests at 10 foot intervals were used to identify the density and distribution of remains at the site. These same points were used for the creation of the topographic map of the site. The auger tests revealed two possible middens, rather than the one originally envisioned. They also revealed two concentrations of artifacts, only one of which correlated with a projected midden. The topographic map was created using a contour interval of 0.2 foot and helped visualize what otherwise seemed to be relatively flat topography. The mapping revealed that the site was on the north (marsh-side) slope of a small sand ridge, a feature which was not immediately obvious without the benefit of very detailed mapping. The topographic mapping, however, failed to reveal any distinct middens. The shell which was present was primarily below the current grade, incorporated into the weak swale and ridge topography.

A 20 by 20 foot block excavation was laid in to incorporate portions of the two shell concentrations and two artifact concentrations revealed by the auger tests. These excavations almost immediately began to reveal the below grade complexity of the site. At the conclusion of the excavations three very distinct middens were identified. None were more than about 0.8 foot in depth and all were covered by what appeared to be

eolian sand deposits. The three middens — one in the northwest corner of the block, one in the center, and one in the southeast corner of the block — were all excavated using identical techniques, which were themselves identical to those recently used at Old House Creek, 38BU861. In each case the middens appeared to be unstratified, single zoned lenses of shell with variable mixtures of a dark brown sand. In each case the midden was resting on top of yellowish brown old humus. Furthermore, features were uncommon and post holes were totally absent.

The preservation of the humus at the site was unusual. At many shell midden sites the humus is absent, probably having been incorporated into the midden as a result of pedestrian traffic. For whatever reason or reasons (which may have as much to do with geology as with culture) the humus was relatively intact at 38CH1219 and suggested that the middens present were all approximately contemporaneous. None of the humic soils suggested previous occupations at the site.

The middens, in general, fit the range of size seen at a wide variety of other shell midden sites. One scenario which would explain the uniformity of shell midden sizes from a wide range of sites is that the middens represent the deposits from a single group, probably a family, for a relatively uniform period of time. If this is correct and if it is also true that the middens are contemporaneous, it may be that the site represents a single episode by a small micro-band of perhaps only three families.

The features present at the site included one which *might* represent a wall trench for a structure and several others which are small pits filled with midden soils. Although the pits found at shell middens are usually attributed to shellfish steaming, those at 38CH1219 were seemingly distinct. There were relatively few of them, certainly not enough to account for the "processing" or steaming of the shellfish present at the site. Further, the pits contain almost no charcoal and provide no indication that they were constructed for steaming. The pits seem generally appropriate (in size and depth) for holding upright large pottery vessels, yet this speculation is still

really only at best a characterization of the pits, not the real function. Why were the vessels being supported? There is no indication of a surrounding fire. There is no indication of any special activity or processing adjacent to the features. The only real clue is that the features, while adjacent to the middens, seem to be spatially distinct. They are also very few in number. The purpose of these features seems to be an issue worthy of additional examination.

In an effort to explore the possibility that there might be structural remains, or perhaps even additional middens surrounding the block excavation, limited stripping was conducted on three sides. This work found only a single feature. Otherwise there was no evidence of any other middens, concentrations of artifacts, features, or post holes.

The site area appears to have been no greater than 700 square feet, of which 400 or 57% were excavated. All of the central midden was excavated, over 40% of the northwest midden was examined, and perhaps 40% of the southeast midden was explored. Consequently, we acquired a very large sample from 38CH1219. It seems unlikely that there are "hidden" or "missing" data sets — almost everything present at the site has been explored either through controlled hand excavations or through stripping.

Pottery was the most common artifact and its density is in the upper range of similar sites. In addition, although the presence of humic soils might suggest limited pedestrian activities, the site contained a very large proportion of highly fragmented sherds. The breakage which occurred at the site, combined with the daily activities and the subsequent history of the site, has produced a relatively large amount of very small sherds.

Deptford pottery is the most common ware at the site, although a small quantity of material which might be classified as St. Catherines was also present. The examination of the pottery supports the suggestion that a type-variety approach is the most feasible means of dealing with the overlap of the various "types." A typological examination revealed considerable overlap between the two, with the site assemblage

clearly being dominated by more-or-less "traditional" Deptford wares. The St. Catherines pottery was characterized by grog inclusions at the very low end of the range in both size and quantity, closely resembling the paste of the Deptford wares. There was likewise little difference between the cordage used by the Deptford and St. Catherines potters. The range of cordage diameters, mean cordage diameter, direction of twist, and even the distance between the cords are all very similar between the two wares.

Even more interesting is that while as a whole the pottery is uniform, there are distinctions between the wares found in each of the three middens. In other words, there are greater differences between middens than within a single midden. Although the sample sizes are small, there is a suggestion in the data that the pottery from each midden was made by different potters, perhaps different kin groups or families.

Plotting the distribution of the small sherds, which may be associated with areas of densest occupation or pedestrian traffic, reveals that they are found under and adjacent to virtually all the middens, although their density does decline to the southwest. This has been taken to suggest that the occupation zones may be between the middens and also to the northeast.

Lithics are, as postulated by Espenshade and his colleagues for "oystering stations," uncommon. They consist of only one heat-treated coastal plain chert projectile point and a series of 16 mudstone or siltstone flakes. The projectile point is similar to a number of other small, stemmed points which have been found with Deptford pottery. It evidences heavy use with abundant retouch. The mudstone flakes are intriguing since they suggest that the knapper was trying to make-do with a clearly inferior material. The absence of finished tools also suggests that this was an abortive attempt. The presence of a heavily used chert point and mudstone flakes may also indicate that the rounds of this group did not frequently take them in very close proximity to a good source of lithic material.

Other tools are uncommon, but interesting in what they tell us about the inhabitants of 38CH1219. For example, there are two Deptford

abraders, each with a type of wear previously identified from other coastal sites suggestive of use on soft materials such as leather, wood, or bone. A sherd hone was also identified, indicative perhaps of preparing bone awls or shuttles for net manufacture. A clay object, perhaps an atl-atl weight, was also recovered from the excavations. A highly polished quartz pebble, thought to have served as a ceramic finishing tool, was recovered. While not common, these tools provide a cross-section of different activities — possible wood or hide working, pottery production, and the making of nets. The tool kit is sparse, but it includes a range of activities.

Excavations at 38CH1219 reveal that the collection of shellfish was the primary subsistence quest. In terms of biomass, shellfish at the site represents over 200 kg of meat. While oyster was the primary contributor, it is clear that other shellfish made significant contributions. Periwinkle, for example, provided 10% and whelk another 7.5% of the biomass from the central midden. The biomass contribution of vertebrate fauna pales in comparison to the shellfish, with only about 1.3 kg. being represented. Vertebrate fauna is dominated by mammals, primarily deer, although turtles are almost as significant and both fish and birds are present. The data suggest that a wide range of resources, all readily available in the immediate site area, were being exploited at 38CH1219. Floral material is not abundant, yet hickory nutshells were found in two of the three flotation samples and in six of the 18 handpicked proveniences, comprising over a quarter or more of the collected charcoal in five. Added to the hickory nuts were perhaps palmetto fruits. Although they are not a widely recognized, or even well documented, food source, they are beginning to be found in several Middle Woodland shell middens.

The subsistence remains suggest that the site occupants, in the big picture, were focused on the collection of oysters. Yet, a wide range of other resources were incorporated. In other words, the site does reflect a relatively low diversity, with the bulk of the biomass coming from one source. But it also reveals a relatively high equitability, with a number of different resources, from a variety of environmental zones, being incorporated into the diet. Seasonality is not particularly

convincing, although there is some indication of perhaps a September through December occupation. Lawrence's examination of the oyster shells suggests either a spring or late fall period of gathering (the difficulty in precise seasonality being related to the geometry of the ligaments. Examination of associated odostomes was not of great assistance since so few were recovered. They suggest, however, collection between May and December. There does seem to be some general consensus that the site was occupied in the cooler months, perhaps the fall or late fall.

In many respects, therefore, 38CH1219 does resemble the "oystering station" of Espenshade and his colleagues. Yet a closer look at the site suggests that it was used by a very small micro-band, or perhaps extended family, and that it represents a short-duration at this one area.

It is only fair to point out that the total biomass represented at 38CH1219 is somewhere in the neighborhood of 350 kg. Assuming that 90% of this biomass is shellfish, 5% is meat, and 5% is plant food, the potential caloric content of 38CH1219 is very high — 34,772,500 calories or 3,252,000 g of protein. Either way, the site has the potential to provide a satisfactory diet for a long period of person days (perhaps as many as 11,000 person days based on calories). This might suggest that the site was, in fact, a processing station where oysters were gathered and somehow preserved for future use.

The problem with this scenario, as has been previously discussed (see Trinkley and Adams 1994:22), is that it is unlikely that oysters could have been very effectively preserved and, beyond that, there is no real evidence of preservation activities. The site seems to simply represent where a small group stopped, camped, and collected resources for a relatively short period. The very high caloric/protein content may suggest that like many other hunter-gatherers (gatherers-hunters?) the site occupants participated in a ritual of feast and famine. When shellfish were available during the cooler months resources were so abundant as to permit unabashed feasting and gorging. In this respect, 38CH1219 may offer a very clear and simple view of Middle Woodland life on Kiawah Island.

The site is, however, different in many respects from larger sites like 38BU861. Whether this difference is simply one of scale (i.e., this location on Kiawah was not visited as often) or of social complexity (i.e., the 38BU861 site may represent a base camp from which smaller family or extended family units dispersed) is not yet understood. The investigations at 38CH1219, however, illustrate the purpose and importance of continuing a broad range of studies at coastal shell middens, *as long as the questions and techniques continue to be refined and perfected.*

SOURCES CITED

- Amos, William H. and Stephen H. Amos
1985 *Atlantic and Gulf Coasts*. Alfred A. Knopf, New York.
- Anderson, David G.
1994 *The Savannah River Chiefdoms: Political Change in the Late Prehistoric Southeast*. University of Alabama Press, Tuscaloosa.
- Anderson, David G., Charles E. Cantley, and A. Lee Novick
1982 *The Mattassee Lake Sites: Archaeological Investigations Along the Lower Santee River in the Coastal Plain of South Carolina*. Commonwealth Associates, Inc., Jackson, Michigan. Submitted to the Charleston District Corps of Engineers, Charleston.
- Asch, Nancy B. and Richard I. Ford
1971 *The Paleoethnobotany of the Koster Site*. Ethnobotanical Laboratory Report 461. University of Michigan, Ann Arbor.
- Barry, John M.
1980 *Natural Vegetation of South Carolina*. University of South Carolina Press, Columbia.
- Bonner, F.T. and L.C. Maisenhelder
1974 *Carya Nutt. - Hickory*. In *Seeds of Woody Plants in the United States*, edited by C.S. Schopmeyer, pp. 269-272. Agricultural Handbook 450, U.S. Department of Agriculture, Forest Service, Washington, D.C.
- Braun, E.L.
1950 *Deciduous Forests of Eastern North America*. Blarison, Philadelphia.
- Brooks, Mark, D.J. Colquhoun, J.G. Brown, and P.A. Stone
1989 Sea Level Change, Estuarine Development and Temporal Variability in Woodland Period Subsistence-Settlement Patterning on the Lower Coastal Plain of South Carolina. In *Studies in South Carolina Archaeology*, edited by Albert C. Goodyear and Glen T. Hanson, pp. 91-100. Anthropological Studies 9. South Carolina Institute of Archaeology and Anthropology, University of South Carolina, Columbia.
- Brown, Paul J.
1975 *Coastal Morphology of South Carolina*. Unpublished M.S. thesis, Department of Geology, University of South Carolina, Columbia.
- Bryson, Reid A.
1965 Recent Climatic Episodes in North America. *Southeastern Archaeological Conference Bulletin* 3:78-81.
- Casteel, Richard W.
1978 Faunal Assemblages and the "Weigemethode" or Weight Method. *Journal of Field Archaeology* 5:71-77.
- Chestnut, Alphonse F.
1951 The Oyster and Other Mollusks in North Carolina. In *Survey of Marine Fisheries of North Carolina*, edited by Harden F. Taylor, pp. 141-190. University of North Carolina Press, Chapel Hill.

- Colquhoun, Donald J.
1969 *Geomorphology of the Lower Coastal Plain of South Carolina*. Division of Geology, S.C. State Development Board, Columbia.
- Cooke, C. Wythe
1936 *Geology of the Coastal Plain of South Carolina*. Bulletin 867. U.S. Geological Survey, Washington, D.C.
- DePratter, Chester
1979 Ceramics. In *The Anthropology of St. Catherines Island 2. The Refuge-Deptford Mortuary Complex*, edited by David Hurst Thomas and Clark Spencer Larsen, pp. 109-132. *Anthropological Papers of the American Museum of Natural History* 56(1).
- Espenshade, Christopher, Linda Kennedy, and Bobby Southerlin
1994 *What is a Shell Midden? Data Recovery Excavations of Thom's Creek and Deptford Shell Middens, 38BU2, Spring Island, South Carolina*. Brockington and Associates, Inc., Atlanta.
- Fowells, H.A.
1965 *Silvics of Forest Trees of the United States*. Agriculture Handbook 271. U.S. Department of Agriculture, Forest Service, Washington, D.C.
- Galtsoff, Paul S.
1964 *The American Oyster, Crassostrea virginica Gmelin*. Fishery Bulletin of the Fish and Wildlife Service 64. U.S. Department of Interior, Washington, D.C.
- Golley, Frank B.
1966 *South Carolina Mammals*. Contributions 15. The Charleston Museum, Charleston, South Carolina.
- Grayson, Donald K.
1973 On the Methodology of Faunal Analysis. *American Antiquity* 38(4):432-439.
1979 On the Quantification of Vertebrate Archaeofaunas. In *Advances in Archaeological Methods and Theory*, edited by Michael B. Schiffer, pp. 200-238. Academic Press, New York.
1984 *Quantitative Zooarchaeology*. Academic Press, New York.
- Harris, Suzanne E. and Elizabeth Sheldon
1982 Ethnobotanical Analysis of the Carbonized Plant Remains from the Mattassee Lake Sites, Cooper River Rediversion Project, Berkeley County, South Carolina. In *The Mattassee Lake Sites: Archaeological Investigations Along the Lower Santee River in the Coastal Plain of South Carolina*, edited by David G. Anderson, pp. 337-352. Commonwealth Associates, Inc., Jackson, Michigan. Submitted to the National Park Services, Atlanta.
- Hilliard, Sam B.
1972 *Hog Meat and Hoecake: Food Supply in the Old South, 1840-1860*. Southern Illinois University Press, Carbondale.
- Hutchinson, Robert
1928 *Food and the Principles of Dietetics*. William Wood, New York.
- Janiskee, Robert L. and Michael Bell
1980 Climate. In *Soil Survey of Beaufort and Jasper Counties, South Carolina*, edited by W.M. Stuck, pp. 1-2. Soil Conservation Service, U.S. Department of Agriculture, Washington, DC.

- Kennedy, Linda and Christopher Espenshade
 1991 *Data Recovery at 38BU1270, Beaufort County, South Carolina*. Brockington and Associates, Inc., Atlanta.
- 1992 *Data Recovery Investigations of Four Wilmington Phase Sites (38BU132, 38BU372, 38BU1236, and 38BU1241), Beaufort County, South Carolina: A Study in Middle Woodland Subsistence Strategies*. Brockington and Associates, Atlanta.
- Klein, Richard G. and Kathryn Cruz-Urbe
 1984 *The Analysis of Animal Bones from Archaeological Sites*. The University of Chicago Press, Chicago.
- Koehler, Arthur
 1917 *Guidebook for the Identification of Woods Used for Ties and Timber*. U.S. Department of Agriculture, Forest Service, Washington, D.C.
- Kuchler, A.W.
 1964 *Potential Natural Vegetation of the Conterminous United States*. *American Geographical Society Special Publication* 36.
- Kukla, J.
 1969 The cause of the Holocene climate change. *Geologie en Mijnbouw* 48:307-334.
- Kurtz, Herman and Kenneth Wagner
 1957 *Tidal Marshes of the Gulf and Atlantic Coasts of Northern Florida and Charleston, South Carolina*. Studies 24. Florida State University, Tallahassee.
- Larsen, Clark Spencer, David Hurst Thomas, Chester B. DePratter and Donald K. Grayson
 1982 *The Anthropology of St. Catherines Island 4. The St. Catherines Period Mortuary Complex*. Anthropological Papers of the American Museum of Natural History 57(4):271-342.
- Larson, Lewis H., Jr.
 1969 *Aboriginal Subsistence Technology on the Southeastern Coastal Plain During the Late Prehistoric Period*. Ph.D. dissertation, University of Michigan. University Microfilms, Ann Arbor.
- Lawrence, David R.
 1988 Oysters as Geoarchaeological Objects. *Geoarchaeology* 3:267-274.
- 1991 Molluscs from the Track Site (38BU927). In *Archaeological Data Recovery at the Track Site, 38BU927, Marine Corps Air Station, Beaufort, South Carolina*, edited by B. Jones, pp. 91-104. Division of Archaeology, University of Alabama, Moundville, Alabama.
- 1994 Seasonality in Occupation of South Carolina's Coastal Shell Midden Sites: Development of Multiple Lines of Evidence. Ms. on file, S.C. Department of Archives and History, Columbia.
- Lawson, John
 1967 *A New Voyage to Carolina* (originally published in 1709, London). Edited by Hugh T. Lefler, University of North Carolina Press, Chapel Hill.
- Martin, Alexander C. and William D. Barkley
 1961 *Seed Identification Manual*. University of California Press, Berkeley.
- Mathews, Thomas, Frank Stapor, Jr., Charles Richter, John Miglarese, Michael McKenzie, and Lee Barclay
 1980 *Ecological Characterization of the Sea Island Region of South Carolina and Georgia*, volume 1.

Office of Biological Services,
United States Fish and Wildlife
Service, Washington, D.C.

Meyer, Peter

- 1991 *Nature Guide to the Carolina Coast*. Avian-Cetacean Press, Wilmington, North Carolina.

Montgomery, F.H.

- 1977 *Seeds and Fruits of Eastern Canada and Northeastern United States*. University of Toronto Press, Toronto.

Moore, Gerald and Vernon Bevell

- 1978 *Game on Your Land -- Turkey and Deer*. South Carolina Wildlife and Marine Resources, Columbia.

Obst, Fritz J.

- 1986 *Turtles, Tortoises and Terrapins*. St. Martin's Press, New York.

Oliver, Billy L.

- 1981 *The Piedmont Tradition: Refinement of the Savannah River Stemmed Point Type*. Unpublished Master's thesis, Department of Anthropology, University of North Carolina, Chapel Hill.

O'Neil, Dennis H.

- 1993 Excavation Sample Size: A Cautionary Tale. *American Antiquity* 58:423-528.

Orton, Clive, Paul Tyers, and Alan Vince

- 1993 *Pottery in Archaeology*. Cambridge University Press, Cambridge.

Panshin, A.J. and Carl de Zeeuw

- 1970 *Textbook of Wood Technology*, vol. I. McGraw-Hill, New York.

Popper, Virginia S.

- 1988 Selecting Quantitative Measurements in Paleoethnobotany. In *Current Paleoethnobotany: Analytical Methods and Cultural*

Interpretations of Archaeological Plant Remains, edited by Christine A. Hastorf and Virginia S. Popper, pp. 53-71. University of Chicago Press, Chicago.

Quitmyer, Irvy R.

- 1985a The Environment of the Kings Bay Locality. In *Aboriginal Subsistence and Settlement Archaeology of the Kings Bay Locality*, edited by William H. Adams, pp. 1-32. Reports of Investigations 2. Department of Anthropology, University of Florida, Gainesville.

- 1985b Zooarchaeological Methods for the Analysis of Shell Middens at Kings Bay. In *Aboriginal Subsistence and Settlement Archaeology of the Kings Bay Locality*, Volume 2, edited by William Adams, pp. 33-44. Report of Investigations 2. Department of Anthropology, University of Florida, Gainesville.

Radford, Albert E., Harry E. Ahles, and C. Ritchie Bell

- 1968 *Manual of the Vascular Flora of the Carolinas*. University of North Carolina Press, Chapel Hill.

Reitz, Elizabeth J.

- 1982 *Application of Allometry to Zooarchaeology*. Paper presented at the 39th Annual Meeting of the Southeastern Archaeological Conference, Memphis, Tennessee.

- 1985 A Comparison of Spanish and Aboriginal Subsistence on the Atlantic Coastal Plain. *Southeastern Archaeology* 4(1):41-50.

Reitz, Elizabeth J. and Dan Cordier

- 1983 Use of Allometry in Zooarchaeological Analysis. In *Animals and Archaeology*: 2.

- Shell Middens, Fishes and Birds*, edited by C. Grigson and J. Clutton-Brock, pp 237-252. BAR International Series 183, London.
- Reitz, Elizabeth J. and C. Margaret Scarry
1985 *Reconstructing Historic Subsistence with an Example from Sixteenth-Century Spanish Florida*. Society for Historical Archaeology, Special Publication Series, Number 3.
- Reitz, Elizabeth J., Irvy R. Quitmyer, H. Stephen Hale, Sylvia J. Scudder, and Elizabeth Wing
1987 Application of Allometry to Zooarchaeology. *American Antiquity* 52(2):304-317.
- Runquist, Jeanette
1979 *Analysis of Flora and Faunal Remains from Proto-historic North Carolina Cherokee Indian Sites*. Ph.D. Dissertation, Department of Zoology, North Carolina State University, Raleigh.
- Russo, M.
1991 A Method for the Measurement of Season and Duration of Oyster Collection: Two Case Studies from the Prehistoric South-East U.S. Coast. *Journal of Archaeological Science* 18:205-221.
- Rye, Owen S.
1981 *Pottery Technology: Principles and Reconstruction*. Taraxacum, Washington, D.C.
- Sandifer, Paul A., John V. Miglarese, Dale R. Calder, John J. Manzi, and Lee A. Barclay
1980 *Ecological Characterization of the Sea Island Coastal Region of South Carolina and Georgia*, vol. 3. Office of Biological Services, Fish and Wildlife Service, Washington, DC.
- Schopmeyer, C.S., editor
1974 *Seeds of Woody Plants in the United States*. Agricultural Handbook 450. U.S. Department of Agriculture, Forest Service, Washington, D.C.
- Sebrell, William H. and James J. Haggerty
1967 *Food and Nutrition*. Life Science Library. Time, New York.
- Simpson, George O., A. Roe, and R.C. Lewontin
1960 *Quantitative Zoology*. Harcourt, Brace and Co., New York.
- Smart, Tristine Lee and Ellen S. Hoffman
1988 Environmental Interpretation of Archaeological Charcoal. In *Current Ethnobotany: Analytical Methods and Cultural Interpretation of Archaeological Plant Remains*, edited by Christine A. Hastorf and Popper, pp. 167-205. University of Chicago Press, Chicago.
- Smith, Bruce
1975 *Middle Mississippi Exploitation of Animal Populations*. Anthropological Papers, Museum of Anthropology, University of Michigan, No. 57, Ann Arbor.
- Smith, Lynwood
1933 *Physiography of South Carolina*. Unpublished M.S. Thesis, Department of Geology, University of South Carolina, Columbia.
- South, Stanley and Randolph Widmer
1976 *Archaeological Sampling at Fort Johnson*. Research Manuscript Series 93. South Carolina Institute of Archaeology and Anthropology, University of South Carolina, Columbia.
- Stahle, D.W. and M.K. Cleaveland
1992 Reconstruction and Analysis of Spring Rainfall Over the

- southwestern USA for the past 1000 years. *Bulletin of the American Meteorological Society* 73:1947-1961.
- Swanton, John
1946 *The Indians of the Southeastern United States*. Bulletin 137. Smithsonian Institution, Bureau of American Ethnology, Washington, D.C.
- Thomas, David Hurst and Clark Spencer Larsen
1979 *The Anthropology of St. Catherines Island. 2. The Refuge-Deptford Mortuary Complex*. *Anthropological Papers* 56(1). American Museum of Natural History, New York.
- Thompson, Morrow B.
1972 What is an Estuary? In *Port Royal Sound Environmental Study*, edited by the S.C. Water Resources Commission, pp. 7-15. State Printing, Columbia.
- Trinkley, Michael
1976 Paleoethnobotanical Remains from Archaic-Woodland Transitional Middens Along the South Carolina Coast. *Southeastern Archaeological Conference Bulletin* 19:64-67.
- 1980 *Investigation of the Woodland Period Along the South Carolina Coast*. Unpublished Ph.D. dissertation, University of North Carolina at Chapel Hill. University Microfilms, Ann Arbor.
- 1986 Ethnobotanical Remains. In *Indian and Freedmen Occupation at the Fish Haul Site (38BU805), Beaufort County, South Carolina*, edited by Michael Trinkley, pp. 313-327. Research Series 7. Chicora Foundation, Inc., Columbia.
- Trinkley, Michael, editor
1991 *Further Investigation of Prehistoric and Historic Lifeways on Callawassie and Spring Islands, Beaufort County, South Carolina*. Research Series 23. Chicora Foundation, Inc., Columbia.
- Trinkley, Michael and Natalie Adams
1994 *Middle and Late Woodland Life at Old House Creek, Hilton Head Island, South Carolina*. Research Series 42. Chicora Foundation, Inc., Columbia.
- Trinkley, Michael, Debi Hacker, and Natalie Adams
1993 *Life in the Pee Dee: Prehistoric and Historic Research on the Roche Carolina Tract, Florence County, South Carolina*. Research Series 29. Chicora Foundation, Inc., Columbia.
- U.S. Department of Agriculture
1971 *Common Weeds of the United States*. Dover Publications, New York.
- Vernburg, F. John and Chester Sansbury
1972 Studies on Salt Marsh Invertebrates of Port Royal Sound. In *Port Royal Sound Environmental Study*, edited by South Carolina Water Resources Commission, pp. 271-277. State Printing, Columbia.
- Walker, Ernest P.
1968 *Mammals of the World*, 2nd edition. Johns Hopkins Press, Baltimore.
- Wenger, Karl F.
1968 Silvics and Ecology of Loblolly-Shortleaf Pine-Hardwood Forests. In *The Ecology of Southern Forests*, edited by Norwin E. Linnartz, pp. 91-98. Louisiana State University Press, Baton Rouge.

Wilson, Jack H., Jr.

1991 The Faunal Remains from the Five Archaeological Sites on Spring and Callawassie Islands. In *Further Investigations of Prehistoric and Historic Lifeways on Callawassie and Spring Islands, Beaufort County, South Carolina*. Chicora Foundation Research Series 23. Chicora Foundation, Columbia.

1993 Faunal Remains from the Thom's Creek Component at 38CH124. In *The History and Archaeology of Kiawah Island, Charleston County, South Carolina*, edited by Michael Trinkley, pp.186-198. Research Series 30. Chicora Foundation, Inc., Columbia.

Wilson, Jack and Homes Wilson

1986 Faunal Remains. In *Indian and Freedmen Occupation at the Fish Haul Site (38BU805), Beaufort County, South Carolina*, edited by Michael Trinkley, pp 282-312. Chicora Foundation Research Series 7, Chicora Foundation, Columbia.

Yarnell, Richard A.

1974 Plant Food and Cultivation of the Salts Cavers. In *Archaeology of the Mammoth Cave Area*, edited by P.J. Watson, pp. 113-122. Academic Press, New York.

Ziegler, John M.

1959 Origin of the Sea Islands of the Southeastern United States. *Geographical Review* 49:222-237.