DATA RECOVERY AT 38CH1693, A SMALL THOM'S CREEK SITE IN CHARLESTON COUNTY, SOUTH CAROLINA

CHICORA FOUNDATION RESEARCH SERIES 69

DATA RECOVERY AT 38CH1693, A SMALL THOM'S CREEK SITE IN CHARLESTON COUNTY, SOUTH CAROLINA

Research Series 69

Michael Trinkley
Debi Hacker

With Contributions By:
Linda Scott Cummings
S. Homes Hogue
Robert L. McCain
Keith Seramur

Chicora Foundation, Inc.
PO Box 8664 ▪ 861 Arbutus Drive
Columbia, SC 29202-8664
803/787-6910
www.chicora.org

May 2007

Library of Congress Cataloging-in-Publication Data

© 2007 by Chicora Foundation, Inc. All rights reserved. No part of this publication may be reproduced or transcribed in any form without permission of Chicora Foundation, Inc. except for brief quotations used in reviews. Full credit must be given to the authors and publisher.

ISBN 978-1-58317-067-0
ISSN 0882-2041

The paper in this book meets the guidelines for permanence and durability of the Committee on Production Guidelines for Book Longevity of the Council on Library Resources.∞

Education is a progressive discovery of our ignorance.

-- Will Durant

ABSTRACT

This document explores data recovery excavations conducted by Chicora Foundation for Carolina Park Associates, LLC at archaeological site 38CH1693, a small Thom's Creek site, under an existing Office of Ocean and Coastal Resources Management (OCRM) Memorandum of Agreement (MOA). The work was based on a data recovery plan submitted by Chicora archaeologists during the spring of 2006.

Previous archaeological investigations found a small Late Archaic/Early Woodland settlement at the site, with research focusing on what was thought to be a shell midden associated with Thom's Creek pottery, primarily Thom's Creek Plain and Thom's Creek Finger Smoothed.

In spite of previous survey and testing, data recovery began with close interval auger testing in an effort to determine the extent of the testing. This was followed by hand excavations with limited mechanical stripping to expose occupation areas that might be associated with the midden. The data recovery was conducted by Chicora archaeologists (the PI and three archaeologists) from July 31 through August 10, 2006, with a total of 296 person hours devoted to the research.

Auger testing, using a 10-inch (0.83 foot) mechanical auger, was conducted at 20 foot intervals within the site boundaries previously established. A total of 106 auger tests were excavated with fill being screened through ¼-inch mesh. This work was used to identify two previously unreported shell concentrations. The previously identified shell concentration, however, was not found beyond the initial test area.

Data recovery excavation included 11 5-foot units (a total of 275 square feet) centered on the initially reported midden. These excavations found that there was no midden, but rather a series of discrete shell pit features. Several of these features blurred together, producing what might be mistaken for a midden in a small test unit. Four features were identified in the excavations. The exposed portions of three were entirely excavated and the fourth was bisected with one-half removed.

All of the feature fill was waterscreened through ⅛-inch mesh to maximize the recovery of small faunal remains. This resulted in the collection of a very large amount of small fish bone, including occasional scales.

Combined with the feature excavation, three of the 5-foot units were excavated in 0.2 foot levels until sterile. One unit, 165R165, produced remains to a depth of nearly 2.5 feet below grade; the other two units revealed materials to only about 1.5 feet (the original test unit produced remains to only 1.6 feet).

With the completion of hand excavation and feature removal, additional stripping was conducted around the excavation units, revealing additional features to the north, downslope. These features were also shell pits and deemed redundant, except for one. This single feature, consisting of heavily burned and ashed shell was bisected with one-half removed and waterscreened through ⅛-inch mesh.

The remaining two shell areas identified through auger testing were also examined by mechanical stripping. One, identified at a much higher elevation, was found to be Deptford midden. The second, at a comparable elevation to the main excavation area, was found to be a

series of Thom's Creek shell-filled pits. One of these was sampled, with screening again through ⅛-inch mesh for comparison with the main excavation area.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Background

The data recovery investigations were conducted by Dr. Michael Trinkley of Chicora Foundation, Inc. for Mr. Stacy Hornstein of Carolina Park Associates, LLC. The field studies were conducted from July 31 through August 10, 2006 with a crew of three archaeologists (Kim Igou, Julie Poppell, and Nicole Southerland), plus the Principal Investigator (who was on-site throughout the project). A total of 296 person hours were spent on the project. A broad range of detailed analysis is in the process of being conducted with the completion of the field investigations.

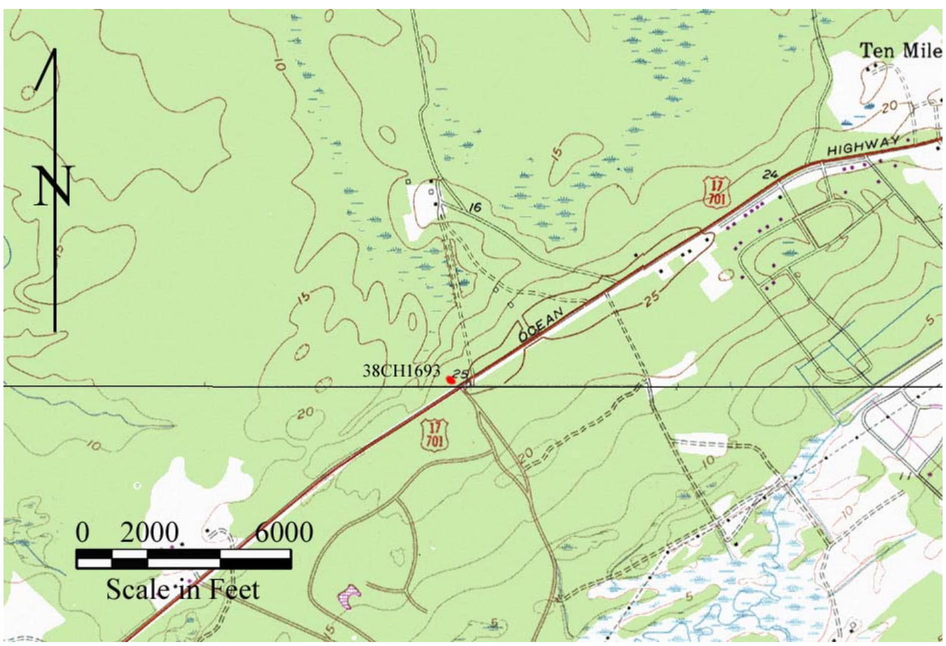

Figure 1. Vicinity of 38CH1693 (basemap is USGS Cainhoy and Fort Moultrie).

Site 38CH1698 was first encountered during a 1997 survey, with a draft report produced in 1999 and a final report completed in 2003 (Pecorelli and Harvey 2003). Apparently the site was initially identified as a result of shovel testing, with 21 shovel tests excavated at approximately 100 foot intervals. Subsequently an additional 40 shovel tests were excavated at 50 foot intervals, and two 3-foot test units were also excavated. Based on this testing the site was defined as measuring about 244 feet north-south by 195 feet east-west (slightly over 1 acre). The site is described as being situated on a relic dune in a wooded area immediately adjacent to a paved road. Artifacts present at the site include Late Archaic/Early Woodland through Middle Woodland pottery.

It appears that 441 artifacts were recovered from the 61 shovel tests, yielding an average density of about 7 artifacts per test. However, fully 364 of these artifacts (82.5%) were classified by the authors as either "eroded," likely meaning too damaged to provide meaningful data, or "residual," meaning too small to be identified. Consequently, in terms of meaningful data, the 61 shovel tests produced only 77 artifacts. Of these 77 specimens, 33 (42.8%) were identified as plain, with no cultural information determined. The majority of identifiable specimens – *accounting for only 4% of the total assemblage* – were Thom's Creek Finger Pinched sherds. In spite of the relatively large number of shovel tests (61 tests over about 1 acre, or one test every 780 square feet), there is no density map provided to help us determine

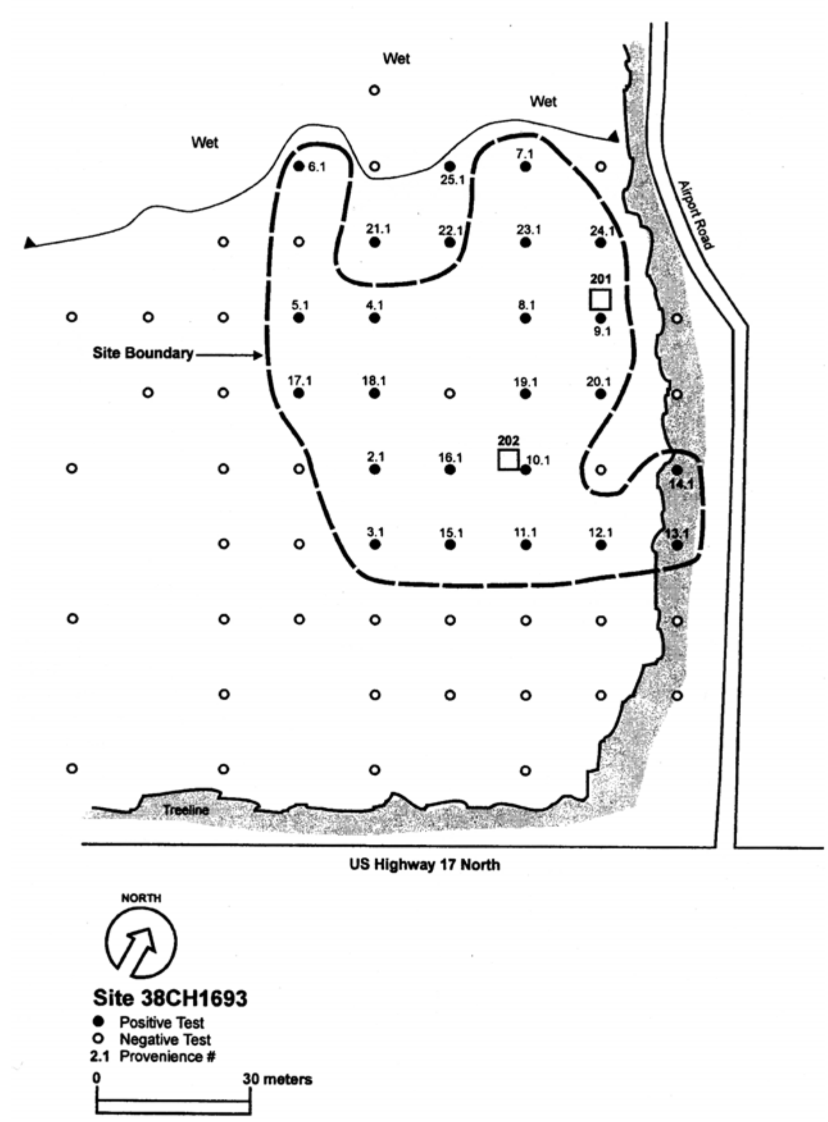

Figure 2. Map of 38CH1693 based on the original survey data (from Pecorelli and Harvey 2003:Figure8).

where the densest portion of the site might be located.

The more northern test unit (201) was excavated in 0.325 foot levels, with a "midden lens" about 0.65 foot thick found 0.6 foot below the surface. Below this midden was yellow sand. For the sake of clarity, we will refer to materials above the midden, in the midden, and below the midden.

Above the midden the authors report a mix of Deptford and Thom's Creek pottery. In the midden the authors identified only Thom's Creek sherds. Unfortunately of the 96 sherds from the midden zone, over 84% were either "residual" or "eroded" – leaving only 3 specimens to make the Thom's Creek cultural identification. Below the midden are only Thom's Creek sherds, but again of the 87 sherds recovered, over 86% are "residual" or "eroded." Within, and apparently immediately below, the midden the authors report a modest amount of faunal material, as well as what they describe (but do not illustrate) as "cut antler." All screening, it appears, was through ¼-inch mesh.

The more southern unit (202) produced a profile similar to the northern unit, except that no shell midden was encountered. Artifacts in the upper 0.65 foot are mixed Deptford and Thom's Creek. Below that Thom's Creek artifacts are found exclusively, primarily to a depth of about 1.6 feet. Again, however, the "residual" and "eroded" sherds account for 87.7% of the total assemblage, leaving identified Thom's Creek materials accounting for only 7.2% of the assemblage.

At the base of the unit the authors report a feature with "a vertical side like a trench." The authors note that there is a buried cable through the site and that this is likely a modern intrusion. Lacking a shell midden to neutralize the acidity of the sandy soils, this southern unit failed to produce either faunal material or worked bone.

The authors, in their assessment of the site(Pecorelli and Harvey 2003), note that "Thom's Creek Finger Pinched ceramics make up 48 percent of the diagnostic artifact assemblage" – although they fail to note that this diagnostic artifact assemblage accounts for only 133 sherds out of 1,926 – or less than 7%.

In the spring of 2006 Chicora was requested by the property owner, Mr. Stacy Hornstein, to prepare a data recovery plan for the property.

<u>Research Questions</u>

The original National Register assessment of the site observed that its significance was based on the prevalence of Thom's Creek Finger Pinched ceramics, which the authors claim "has only been found in the Mount Pleasant area" (Pecorelli and Harvey 2003:51). They also note that "Sassaman (1997) believes this ceramic type may represent a distinct Ceramic Late Archaic population." They suggest that, as a result, 38CH1693 "provides a unique opportunity to gather specific information concerning this possible cultural entity," with topics possibly including "quality of life," site function, and occupation range.

Pecorelli and Harvey (2003:51) suggested that soil conditions at the site were favorable for the preservation of organic materials and while they believe that the site reflects seasonal behavior (apparently based on its small size), the site can address seasonality and subsistence questions. The data recovery plan prepared (Anonymous 1999) offers no additional research directions.

There are several aspects of the original research orientation that are flawed. Perhaps most fundamentally, the Thom's Creek Finger Pinched type (Trinkley 1976c:50-51) is found at sites as far south as Hilton Head Island in Beaufort County (albeit in small numbers) and as far north as the middle of the Francis Marion Forest in Charleston County. The "heartland" appears to be in the vicinity of northern Christ Church Parish. This distribution has been clearly documented by Anderson (1975:147), Trinkley (1976c), and Sassaman (1993:207). To claim that the type "has only been found in the Mt. Pleasant area" is a significant misunderstanding. In addition, while faunal remains were recovered from the site, it seems clear from the contrasting results at the two test units, that "seasonality and subsistence data" will only be available from those areas where intact shell midden is present. Elsewhere there are heavily leached, acidic soils, devoid of features and faunal remains.

When we turn to *Middle and Late Archaic Archaeological Records for South Carolina: A Synthesis for Research and Resource Management* (Sassaman and Anderson 1994:199) to determine what types of sites were suggested as worthy of data recovery, they do recommend that any site with "intact buried deposits, particularly assemblages yielding features or preserved floral and faunal remains" should be "automatically" considered eligible. Yet, their analysis emphasizes the importance of either features or remains beyond pottery. This, again, stresses that while those midden areas within 38CH1693 are eligible, there seems to be little research potential at the remainder of the site. Unfortunately, in spite of multiple testing activities at 38CH1693, there has been no effort to document the extent of the midden.

Sassaman (1993:205) also observes that while finger pinching and related decorations are uncommon on fiber-tempered wares, they are popular on the sandy paste Thom's Creek ware. He attributes them to what he calls Awendaw and places the design in his Phase III, dating from about 3400 BP (1450 B.C.) to about 3000 BP (1050 B.C.) (Sassaman 1993:110).

If subsistence and settlement data are, as we believe, to be best preserved in the midden contexts, then it is regrettable that the initial research at 38CH1693 did not better document the extent of that midden. Nevertheless, it was our view that research should focus on the midden areas, where floral and faunal remains would be best preserved and artifacts could be identified in secure (and datable) contexts.

We identified five specific research topics that appeared to represent significant research goals and that could reasonably be addressed using the data sets present at 38CH1693.

- We proposed a limited geological study of the soils to help better understand the eventual burial of the shell midden, as well as the artifacts found below the midden. Is the burial the result of wind-blown sands gradually covering the midden area? Are the artifacts below the midden the result of materials "sinking" in the loose, unconsolidated sands (bioturbation, e.g., the movement of artifacts down in soil profiles – known also as vertical translocation – see, for example, Frolking and Lepper 2001) – or are there floors that might suggest occupation at the site without reliance on shellfish resources prior to the deposition of the midden?

- A detailed zooarchaeological study of the faunal remains, coupled with screening adequate to recover small fish remains. Much of the Thom's Creek archaeology previously done along the South Carolina coast has relied on ¼-inch mesh, with the result that small faunal remains, such as fish, are routinely missed (see, for example, Wing and Quitmyer 1985, who suggest that 1/8-inch may be the minimally acceptable screen size, with 1/16-inch preferable).

- An examination of soils for pollen and phytolith remains to help address seasonality and assist in reconstructing the nature of the local environs. These studies seem to have been conducted in very few of the earlier studies (such as my own work at sites such as Lighthouse Point and Stratton Place [Trinkley 1980b]). Even the more recent studies, such as the recent work at the Fig Island and Sewee rings (Saunders 2002; Russo and Heide 2003) do not seem to be focusing on environmental issues.

- Adequate radiometric dating to provide refined dating for the site. As with all radiocarbon dating, the goal is to estimate beginning and ending dates for the occupation. To achieve this goal, however, we sought to obtain a sufficient number of dates to reasonably cover the site. At the same time we wished to avoid, if possible, imprecision and large standard deviations that would minimize the use of the resulting dates. One technique to achieve this goal is the use of AMS dating. We would also seek to avoid the use of shell and focus on carbonized nutshell.

- Finally, based on the reported abundance of "worked bone" at the site, we sought careful, microscopic analysis of the specimens to determine if any additional comments could be offered on its function. Other than Sassaman's (1983:191-192) limited discussion of a curated bone tool for pottery decoration, I am unfamiliar with any analysis of bone tools since my own limited work with engraved bone pins (Trinkley 1980b:218-219; for example, there is no discussion of function in Saunders 2002:125-129).

Proposed Data Recovery

Field Investigations

Our proposal specified that the client would bush hog the site prior to our work, opening what had become a heavily overgrown second growth forest (Figure 3).


Figure 3. View of 38CH1693, looking west.

Following the general outline of the original data recovery plan (Anonymous 1999), we proposed block excavations centered on the one test unit where midden was reported, followed by mechanical stripping. We rejected additional testing, arguing that after two testing programs and the excavation of tests at 100 foot intervals, then again at 50 foot intervals, followed by two formal units, it seemed that the client had been required to test the site enough.

The State Historic Preservation Office (SHPO) disagreed, urging, at a minimum, hand coring to determine the location and extent of the midden (letter from Mr. Chad Long, S.C. Department of Archives and History, dated May 30, 2006). The client agreed to the additional work requested by the SHPO and we proposed to mechanically auger 10-inch (0.83-foot) tests at 20-foot intervals across the site area as originally defined. This modification was accepted by the SHPO and was incorporated into the data recovery plan.

These tests, however, were to assist only with estimation of the midden extent. The focus of the investigations was to remain on the immediate vicinity where the midden was reported by test unit 201.

We proposed that up to 300 square feet would be opened as formal units. We would use equipment, however, to strip off the upper 0.6 foot of the soil, in order to expose the top of the midden (this was based on test unit 201, see Pecorelli and Harvey 2003:48). We were willing to sacrifice this upper zone since it was reported to contain mixed deposits of Deptford and Thom's Creek pottery – making application of the data to the proposed research questions problematic.

The midden was to be excavated and screened primarily through ¼-inch mesh for expediency, with standardized samples screened through ⅛-inch mesh for recovery of a fuller range of faunal remains.

At the base of the midden, approximately 25% of the units would be excavated to sterile soil. While this was not expected to yield artifacts or remains useful to our investigations, it would provide samples of materials perhaps subjected to bioturbation and allow for the examination of soil profiles for evidence of floors or other evidence of pedogenic activity.

With the completion of these studies, we then proposed to strip in cardinal directions from the excavation block to expose additional area, allowing for the documentation of features or habitation areas that might not be associated with the midden.

Analysis

Once the field investigation was complete the artifacts would be returned to Columbia for laboratory processing. This would include washing, sorting, and cataloging. We proposed to use the SC Institute of Archaeology and Anthropology for the curation of these remains and their cataloging system is therefore being used. As is standard practice, our agreement for this work specifies that the client provides the curatorial facility with fee-simple ownership of the resulting collections.

Our analysis was devised to address the specific questions and involved specialized studies by a variety of colleagues. For example, a reconnaissance level soils investigation is being conducted by Mr. Keith Seramur of Geonetics Corporation. Pollen and phytolith samples would be examined by Dr. Linda Cummings of Paleo Research Institute. Faunal remains would be examined by Dr. Homes Hogue of the Cobb Institute at Mississippi State. Radiometric studies would be conducted by Beta Analytic. Floral remains would be examined in-house. Detailed shell studies would also be conducted using samples from the field investigations.

Although the auger testing was designed solely to identify the extent of the midden, we also envision the data as helping provide a more detailed understanding of the site as whole, especially since the existing documentation (Pecorelli and Harvey 2003) does not include density data beyond simple presence or absence in shovel tests (see Figure 2). Given the problems of using counts for prehistoric pottery, we also believe that weight (rather than counts) may provide a more reasonable approximation of frequency.

Detailed analysis of the pottery has not been identified as a major research orientation of this study. Nevertheless, the pottery, minimally, would be sorted by surface treatment with attention direction to several issues of ceramic technology that remain worthy of investigation.

In particular, we believe it may be useful to document lip treatments. Sassaman (1993:106) has found this to be a temporally significant feature of the earlier Stallings wares and it may be useful to take another, closer, look at this attribute among Thom's Creek wares. While Saunders' (2002:130-139) analysis coded a great deal of information concerning the pottery, her discussions focused on surface treatment and vessel form (and to a much lesser extent, paste). This seems to reiterate what the senior author encountered as a result of examining thousands of sherds – the pottery is rather amorphous, with relatively little differentiation. Consequently, our pottery analysis focuses on these areas where study seems to hold the greatest promise – surface treatment, lip form, vessel form/shape, rim diameter, and paste.

Saunders (2002:138) does suggest a possible difference between Stallings and Thom's Creek as evidenced by the proportion exhibiting exterior sooting or use over open fires. This is another area of possible research significance.

Finally, given the friability of Thom's Creek pottery (and its abundance), it may be useful to look not simply at either counts or weights, but also the minimum number of vessels, perhaps reflected by the proportion of distinct rim circumferences present in the assemblage.

Curation

An updated site form reflecting this work has already been filed with the South Carolina Institute of Archaeology and Anthropology (SCIAA). The field notes and artifacts from Chicora's data recovery at

38CH1693 will be curated at SCIAA. The artifacts have been cleaned and are currently in the process of being cataloged following that institution's provenience system. All original records and duplicate records will be provided to the curatorial facility on pH neutral, alkaline buffered paper. Photographic materials include B/W negatives and color transparencies. The B/W negatives have been processed to archival standards.

A Synopsis of Previous Thom's Creek Studies

Although early on Clarence B. Moore (1899:166) advised that "on the whole it would seem probable the South Carolina coast has little to offer from an archaeological standpoint" relatively few were dissuaded. In 1925 Laura Bragg (1925) published a description of shell tools from the area and Anne King Gregorie (1925) published her account of the Sewee Indians and various remains. She recognized three decorative motifs found on Thom's Creek pottery (finger pinched, incised, and punctated), but failed to associated these sherds with the shell middens.

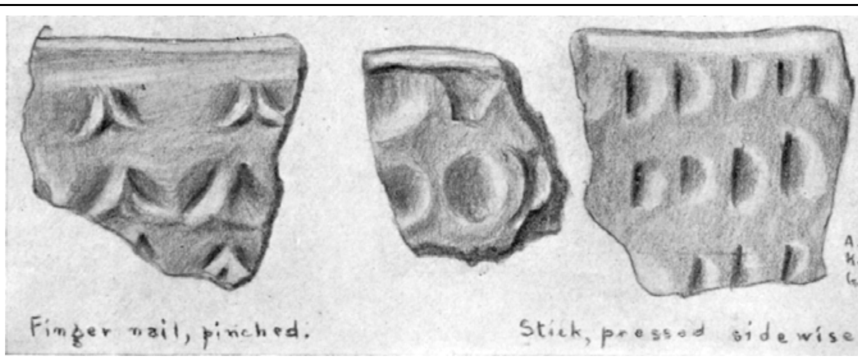

Figure 4. Examples of Thom's Creek pottery (Gregorie 1925: Plate 8).

The Charleston Museum houses collections from Chester Field Shell Ring and Lake Plantation shell middens dating from 1930 through 1939. Nothing was published concerning these sites, however, until Regina Flannery summarized the investigations (Flannery 1943; see also Griffin 1943 and more recently, Trinkley 1980b:23-28).

Of considerable interest was data from the shell ring concerning feature types and placement that would directly correlate with data gathered from the Lighthouse Shell Ring over 40 year later (Trinkley 1980b:24).

In 1945 James B. Griffin published an informal typology of Thom's Creek Punctate, based on 19 sherds from the type site in Lexington County, South Carolina (38LX2). Griffin found the sherds to be non-tempered or slightly grit tempered (Griffin 1945). However, no further work was done at the Thom's Creek site until the late 1960s (Michie 1969, Sutherland 1971, Trinkley 1976a) and throughout this research it has been impossible to isolate the Thom's Creek component at the type site.

Joseph Caldwell recognized the similarity of Thom's Creek to the Stallings Island pottery earlier found by the Claflins' (1931) work, commenting:

> At Thom's Creek and at another site below Columbia is found pottery resembling that of the Savannah River but distinguished by sand tempering by minor differences in form and decoration. One hundred miles away at Horse Island in Charleston District on the coast a similar though not identical ware is in the majority, and some such sherds have been noticed at Stallings Island" (Caldwell 1952:315).

To confuse matters, however, Caldwell's artifact plate (Caldwell 1952:Figure 169, E-H) illustrating this pottery is labeled, "Stallings Punctate from Horse Island." This work was

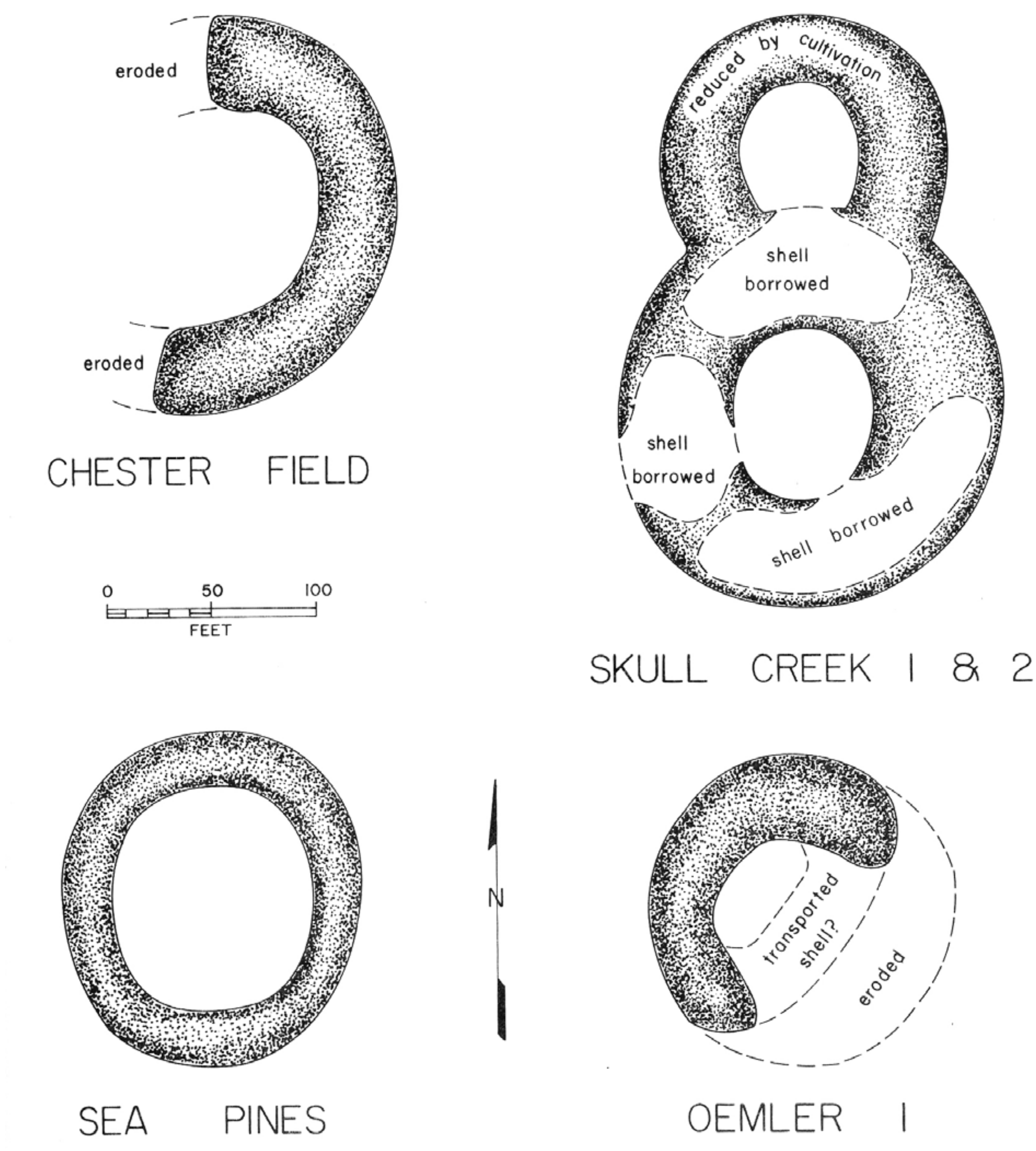

Figure 5. Sketches of the Chester Field, Skull Creek, Sea Pines, and Oemler Shell Rings, after Hemmings and Waddell (South Carolina Institute of Archaeology and Anthropology; published in Trinkley 1980b:Figure 5).

Figure 6. Horse Island Shell Ring looking east from an area of shell removal (Chicora Foundation collections, January 1976).

probably the result of unpublished excavations at Horse Island by Caldwell.

About this same time Antonio Waring was conducting work at the Bilbo and Sapelo shell ring sites. The bulk of the work was associated with WPA projects, although Waring traveled extensively, visiting numerous sites in South Carolina solely for research purposes. Work at Bilbo focused on the Stallings occupation (Williams 1968:152-197; Dye 1976), as did the work at Sapelo (Williams 1968:263-278). At Sapelo features identical to those later encountered at the Thom's Creek Lighthouse Point Shell Ring were again documented (Trinkley 1980b:29-30).

Little additional research followed, although Stanley South (1960) identified similar pottery, which he called a "Thom's creek Punctate Type," along the lower North Carolina coast. He identified the pottery as being either non-tempered or sand tempered.

About this same time there was considerable (but often sparsely documented) excavation by Eugene C. Waddell, Donald MackIntosk, and Alan Combes. Careful review of the literature suggests there was much cross-fertilization and exchange of ideas.

At the 1962 Southeastern Archaeological Conference Waddell (1963) presented a paper offering another brief typology of Thom's Creek that paralleled the earlier descriptions of Griffin and South. He latter provided a radiocarbon date for what he called Awendaw Punctate (Waddell 1965), reporting on Waring's 1963 date from Yough Hall Shell Ring on the South Carolina coast. No type description was offered from Awendaw Punctate, but its relationship to the Stallings Island and Thom's Creek types was discussed. Close technological similarities were noted between Stallings and Awendaw, although the difference in tempering was thought to be a problem.

Calmes' early work on Hilton Head Island (primarily at Sea Pines Shell Ring and Ford's Skull Creek Shell Ring) identified pottery with what he termed finger marked, punctate, and multiple drag and jab – usually on pottery tempered with grit or sand, rather than fiber (Calmes 1967:14). His excavations at Sea Pines were adjacent to a trench bisecting the ring, apparently excavated by Waring. He found fiber tempered Stallings pottery overlying sand tempered sherds at Skull Creek and was the first to suggest that the traditional chronology of fiber tempered to sand tempered sherds might not be accurate. He also was able to offer some observations concerning features and post holes found at the shell rings. While it has become fashionable to criticize these early investigators, it should be noted that Calmes was trained in history, not anthropology. Moreover, he published his results and made some perspective observations.

The first to make a serious effort to establish order and develop a typology was David Phelps, working in the Central Savannah region. He proposed descriptions for Thom's Creek Punctated, Incised, Simple Stamped, and Plain (Phelps 1968). The overlap between Thom's Creek Simple Stamped and Refuge Simple Stamped (Waring in Williams 1968) is problematical, but otherwise Phelps' effort was excellent and far more detailed than any previous attempt. Moreover, he left the door open on there possibly being differences between the inland varieties he examined and the coastal Thom's Creek (Phelps 1968:17).

Although Waring's research was not published until 1968 (Williams 1968), much of his work was disseminated through the Southeastern Archaeological Conference meetings. As seems to be typical for the period, there was a lack of precision or vagueness in many of the constructs, such as "Horse Island Punctate" (Williams 1968:255), Awendaw Complex (Williams 1968:331), and even "Thom's Creek type (Williams 1968:217). Waring never distinguished between Thom's Creek and Horse Island. Perhaps he viewed the former as an entirely interior development, while the latter was characteristic of the coast.

It seems that Caldwell placed little validity in Waring's efforts to distinguish the two from each other. An anonymous article in UGA Notes (probably by Caldwell) commented, "Thom's Creek Punctated is applicable to the pottery from Horse Island" (Anonymous 1969).

In 1965 William Edwards, then South Carolina State Archaeologist, began excavating the Sewee Shell Ring and later described the sherds recovered from this work as Awendaw Red Filmed, Awendaw Combed, Awendaw Punctated, Awendaw Incised, and Awendaw Plain (Edwards 1965). While adequate for an initial study (the report was never finalized), the Awendaw construct was never distinguished from Thom's Creek.

Waddell (1970) attempted to address himself to the problem of Waring's tripartite of Awendaw-Horse Island-Thom's Creek by combining Awendaw, Horse Island, and Stallings Island into one tradition. Awendaw and Horse Island were distinguished from each other primarily on the basis of decorative motif – Awendaw was finger pinched, Horse Island was punctated – and stratigraphic position – Awendaw overlies Horse Island, which in turn overlies Stallings.

Thom's Creek sherds were found by Waddell to be less porous, harder, uniformly buff-colored, and to have a more uniform thickness than the Horse Island type. Although no formal typology was offered, anyone familiar with South Carolina archaeology would immediately recognize these differences: Thom's Creek was an interior ware and Horse Island was a coastal ware. Nevertheless, Waddell did not mention the unsigned 1969 UGA Notes article or did not agree that the two should be combined.

E. Thomas Hemmings (1970a, 1970b), during his work at the South Carolina Institute of Archaeology and Anthropology, followed the lead of Calmes (1968) and Waddell (1970) and continued to distinguish between Awendaw and Horse Island. At the time he stated:

> The Awendaw Complex includes primarily non-tempered plain ware, but finger-pinched and other punctated types are present in low frequencies . . . . the Horse Island Complex includes primarily medium sand-tempered punctated ware and some drag-and-jab (E. Thomas Hemmings, personal communication 1974).

This approach, of course, did little to resolve the basic typological problem since it seems the only way to distinguish an Awendaw punctate from a Horse Island punctate is to know where the sherds came from – geographic position trumping all other typological characteristics.

Hemmings conclusions were based not only on the extensive survey he conducted with Waddell, but also on his excavations at the larger of the two Fig Island rings (Hemmings 1970a, 1970b). He bisected the ring – a standard practice since the early 1900s – and produced a simplified profile that revealed a naturally weathered and crushed humus zone overlying generally loosely packed oyster shell lying uniformly on sterile yellow sand. Slump is noted at each end of the trench, and several bisected features are plotted in the profiles (characterized as "high organic content, much periwinkle" and "fragmentary shell, high organic content, periwinkle and mussel"). No mention is made of pits under the midden, although given the low and inundated setting, it is questionable that features would have been identified (Hemmings 1970a:7).

About the same time James Michie (1969) and later Donald Sutherland (Trinkley 1976c) conducted additional excavations at the Thom's Creek site in Lexington County. Michie found some evidence of Early to Late Archaic stratification, although this stratigraphic separation could not be replicated by Sutherland.

After the 1973 excavations at Spanish Mount, Sutherland (1973) offered a more detailed descriptive analysis of the sherds, but refrained from placing them in a typological classification. The work from the 1975 field season was never combined with the earlier work and no report was ever completed.

About the same time, Chester DePratter, Richard Jefferies, and Charles Pearson (1973) reviewed the confusion surrounding the coastal pottery types and concluded that a, "distinction between an interior, Thom's Creek Complex, and a coastal, Awendaw Complex, appears to be valid. The distinction between Horse Island and Awendaw on the coast is not so clear."

At the 1973 Southeastern Archaeological Conference Stanley South (1973) offered a taxonomic chart of South Carolina pottery, using ware-groups, wares, and types. The Thom's Creek Ware Group was composed of Thom's Creek and Refuge wares. The Thom's Creek Ware was divided into Thom's Creek Punctated, Incised, Simple Stamped,, and Plain. He added two "provisional wares" – Awendaw and Horse Island.

Michie spent many years periodically visiting Daws Island and recording a variety of sites being submerged by rising sea levels. A quantity of Stallings and Thom's Creek pottery, lithics, faunal remains, and worked bone were collected from the surface of the eroding banks. Of greatest interest, however, are the six known burials, either found eroding from the midden or removed from the site by "amateur collectors" (Rathbun et al. 1978:10). Although likely from either the Stallings or Thom's Creek middens, their vague associations preclude any more detailed commentary.

James Stoltman, from work on Groton Plantation, had an opportunity to shed light on the problem of early sandy paste ceramics, but chose only to observe that there was no radiocarbon dating support for the coexistence of fiber and sand tempered wares, thus, "it is felt that the Stallings type must be viewed as standing in an ancestral rather than contemporaneous relationship to Thom's Creek Punctate."

He also further muddied the water by adding Allendale Punctate to the list. The diagnostic feature of this pottery was random punctations; otherwise the pottery was identical in paste, form, and surface finish to Thom's Creek.

In the early 1970s Rochelle Marrinan (1973, 1975a, 1975b) conducted and published

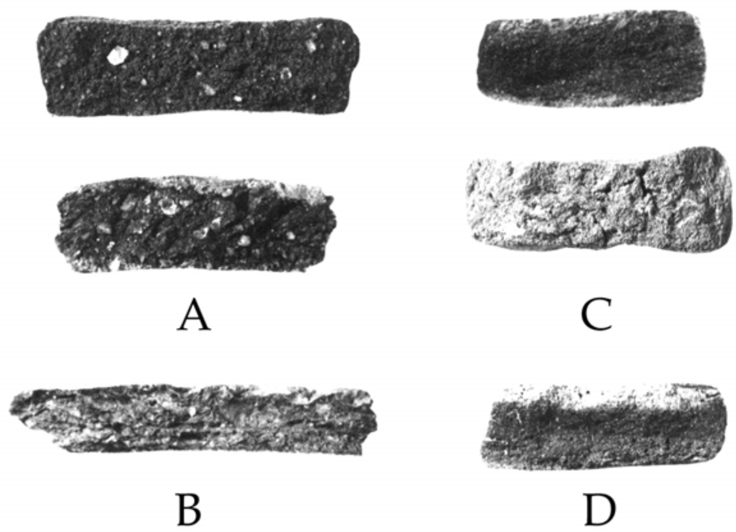

Figure 7. Cross sections of raw clays and Thom's Creek sherds. A. Riverine clay samples with quartz inclusions; B. Thom's Creek sherd with similar paste; C. Marine clay samples with fine, sandy paste and no quartz inclusions. D. Thom's Creek sherd with similar paste (adapted from Trinkley 1976c:Plate 11).

the most extensive Georgia shell ring research since Waring, focusing on what were called the Marsh and West Rings.

In 1975 David G. Anderson (1975), using data from 203 South Carolina coastal sites, presented a detailed distributional study. Thom's Creek was found to be centered in the Santee and Edisto River regions, with gradually decreasing quantities to the northeast and southwest.

In 1976 the senior author completed his thesis on Thom's Creek pottery from the coast, examining over 5,300 sherds from 14 sites, including primarily shell rings although several middens were also included (Trinkley 1976c). The sites ranged geographically from Cat Island in Georgetown County to Sea Pines on the southern end of Hilton Head Island in Beaufort County. The result was a series of typologies: Awendaw Finger Pinched[1]; Thom's Creek Reed Punctate; Thom's Creek Reed Punctate, Drag and Jab variety; Thom's Creek Shell Punctate; Thom's Creek Incised; and Thom's Creek Plain.

Trinkley suggested that the inclusions were not intentionally added, but were native to the clays. The research failed to offer any particularly clear temporal conclusions, although it was suggested that the finger pinched motif might be earlier (Trinkley 1976c:62).

He also suggested that the core area for the shell punctate was from the Savannah River northward to the Cooper River, while the core area for the reed punctates was from the Broad River northward to the North Edisto. The finger pinched pottery seemed to be concentrated in the area from the Cooper River northward to the Santee River (Trinkley 1976c:64). By 1980 the senior author was convinced that shell punctated pottery gradually increased through time, at the expense of reed punctated forms (Trinkley 1980b:63).

At the same time an effort was made to integrate cultural ecology and the examination of subsistence data (Trinkley 1976b). Trinkley suggested that population pressure in the Savannah River area necessitated new forms of subsistence, such as shellfish collection. The expansion of population into the coast might be

[1] The Awendaw designation was retained because of its "long standing in the literature and its frequent past use" (Trinkley 1976c:70). By 1980 when given the opportunity to revise and reprint this work Awendaw was dropped and replaced by Thom's Creek Finger Pinched (Trinkley 1980c).

evidenced at such middens as Daws, Venning Creek, and Spanish Mount – irregularly shaped shell middens with radiocarbon dates averaging about 1920 B.C. It was observed that these early sites have cultural assemblages closely approximating the Stallings Phase: clay balls, lithics, limited amounts of worked bone, and fiber tempered pottery. As these groups became more successfully adapted to the highly productive coastal ecosystem, three major changes occurred: there was a coalescence in population, an increase in the complexity of social organization, and a specialization of technology. In essence this development was based on realizing and using the potential resources concentrated immediately along the coast. Thus, by 1500 B.C. Trinkley suggested that the Thom's Creek Phase was firmly entrenched and generally successful. This success led to larger population centers and the rise of shell rings.

Figure 8. Venning Creek site shown at low tide (Chicora Foundation collections, August 1976).

By the mid-1970s Sapelo was again attracting attention, with extensive excavations conducted by Larson (Simpkins and McMichael 1976:95-99). With most of the work focused on the area immediately surrounding the rings, they found that "occupational midden" was present as far as 50 feet outside the ring. The authors propose that this midden suggests "a somewhat more complex social organization than the egalitarian nature commonly attributed to purely hunting/gathering cultures" (Simpkins and McMichael 1976:99), although it was not determined that the midden was contemporaneous with the ring.

In 1979 Michie (1979) conducted test excavations at Bass Pond on Kiawah Island in Charleston County and, based on the work, developed a settlement reconstruction that viewed sites such as Bass Pond that lacked large accumulations of shell as base camps. This interpretation was based on their supposed artifact diversification, situated on Pleistocene soil deposits, locations that allowed access to both terrestrial and marine resources, and location in proximity to other site types (either shell rings or large amorphous shell piles) (Michie 1979:28). At that time he identified only four base camps: Bilbo, Daws Island, Venning, and Bass Pond. Although the base camp scenario proposed by Michie seems to lack merit (see Trinkley 1980b:310-313), additional excavations at the site (Trinkley 1993:156-158) did identify a relatively permanent Thom's Creek structure. Built of posts about 0.5 foot in diameter placed about 2 feet part, the structure was about 17 feet in diameter. In the center was an ash filled pit interpreted to be a hearth. This stands in contrast to the much less substantial structure identified at the Sol Legare site (Trinkley 1984:18). These continue to be the only two Thom's Creek structures identified along the South Carolina coast.

On the interior the most notable discovery is that by Kenneth Sassaman (1993b) at Mims Point, where two structures were identified based on shallow postholes and a

Figure 9. Thom's Creek Finger Smoothed sherds from Venning Creek in Charleston County.

third structure is possibly documented by a cluster of pits and hearths. The two best documented are circular.

During the late 1970s, the senior author conducted extensive excavations at both Lighthouse Point and Stratton Place shell rings (Trinkley 1980b). The excavation of 3,550 square feet from the two sites provided evidence of permanent site occupation, a heavy reliance on shellfish and deer (although only ¼-inch screening was conducted), and intra-site feature patterning. Trinkley suggested that the rings were formed by the gradual blending together of a number of individual occupations or house middens placed around a communal central area. The ring exterior was not occupied, although a zone of debris, resulting from midden erosion and disposal of garbage over the edge of the ring, was identified. It was suggested that the ring midden was formed through the process of gradual accretion – as evidenced by banded and crushed shell, and large shell pits used for steaming oysters. The interior edge of the ring was characterized by pits, filled with ash, which were used for food preparation, probably the roasting of meat cuts. The ring interior evidenced use, as pottery and small features were present. It was argued that the shell ring sites indicate a sedentary existence, with the "settling-down" process being similar to that suggested by Michael Coe and Kent Flannery for Mesoamerica.

The investigations at these sites provided then – and continue to provide – the largest and best assemblage of shell ring data, including pottery, worked bone, lithics, ethnobotanical remains, faunal remains, coprolites, and worked shell.

Although typological study was not a major goal of the study, the work did report:

> the new variation of Awendaw Finger Pinched, termed Awendaw Finger Impressed, has been noted. This variety of Awendaw Finger Pinched appears to have temporal validity, although its spatial limits, and typological ranges, are only poorly understood (Trinkley 1980b:293).

Trinkley cautioned that the effort seen in other studies (for example Michie's (1979) work at Bass Pond) tended to exaggerate typological divisions through unnecessary and ill-conceived "splitting" – a view that we still hold.

Although noted, but not tabulated for the Lighthouse Point excavations, this pottery accounted for about 1% of the Stratton Place collection (finger pinching accounted for about

8% at Lighthouse Point and 17% at Stratton Place; Trinkley 1980b:260). It was described as being characterized:

> by broad, generally shallow (3-5 millimeters deep) grooves which appear to be the result of carefully impressing the fingers of one's hand in the moist clay and dragging them. The result is a series of broad, shallow marks resembling simple-stamping, but created by the use of a hand. The action is more than smoothing, as the result is actually the opposite for smoothing, and yet it cannot properly be called stamping or slapping, because there is evidence that the hand was dragged, pulling at sand grains and creating striations in the moist clay. There is circumstantial evidence that this pottery is related to the . . . finger pinched type. Reference to Table 25 will indicate that the finger impressed pottery was found only in those levels also having a quantity of [finger pinched] ware. Both types, being characterized by a motif produced solely with the hands, are distinct from those types requiring some sort of tool (Trinkley 1980b:263).

Research at the Georgetown County Minim Island site was initially begun by Lesley Drucker and Susan Jackson (1984). This work suggested the site was occupied seasonally, with oysters seeing relatively little use. Additional investigation was conducted several years later by Espenshade and Brockington (1989). They concurred that shellfish was a minor dietary component, finding a much greater reliance on estuarine fish, especially sturgeon and gar. They also concluded that the Thom's Creek and Refuge series were contemporaneous. The authors note, "the coexistence of the two wares at a single site at 1450 BC has both cultural/temporal and behavioral implications" (Espenshade and Brockington 1989:214). The separation of Thom's Creek and Refuge wares, however, remained problematic, with the pastes reflecting considerable overlap (Espenshade and Brockington 1989:162) and only thickness being consistently useful (with the Thom's Creek sherds averaging 6 mm compared to an average of 7.8 mm for Refuge – no ranges were provided).

In 1993 Sassaman (1993a) published *Early Pottery in the Southeast: Tradition and Innovation in Cooking Technology*. He traces the development of pottery both among coastal groups and also those producing soapstone slabs for indirect cooking/heating. Sassaman suggests that "intensive shellfishing on the coast created social demands on labor that in turn placed a premium on the development of technological innovations" (such as pottery). In the interior he suggests that soapstone exchange inhibited the adoption of pottery since the new technology was perceived of as a threat to the developed social relations.

A major methodological contribution of his research is the development of a chronology for fiber tempered pottery. Phase I consists of assemblages with flanged and/or thickened lips accounting for 20% or more of the collection. Separate linear punctations are dominant, drag and jab or incising is relatively minor, simple stamping is present, but multiple designs are absent. Plain vessels are common. This phase began by 4,500 B.P. and terminated perhaps 3,700 B.P.

By 3,900 to 3,800 B.P. he suggests Phase II pottery dominated. Flanged or thickened lips account for less than 20% of the collection. Drag and jab punctations account for at least 25% of the collection. Simple stamping is nearly absent and virtually all assemblages include evidence of multiple designs.

The final phase (Phase III) of fiber tempered pottery began about 3,400 B.P. and continued to perhaps 3,000 B.P. Flanged or thickened lips are absent and multiple designs are absent. Decorated vessels may include separate punctations, drag and jab, or incising, with the proportions varying widely. There is also a resurgence of plain vessels, dispelling the notion that plain pottery occurs only early.

Sassaman (1993a) also illustrates that "reed" punctations could just as easily have been produced with bone tools, illustrated by one such curated tool from Stallings Island. Rather than identifying shell punctations he also prefers to distinguish between hollow cylinder punctations and solid cylinder punctations. It may be that the mode of punctation (hollow or solid, shell or reed) is not particularly important.

Figure 10. Spanish Mount Shell Mound, mound face profile looking west – the top could not be cleaned because of extensive vegetation. The holes in the basal sand are looting holes (Chicora Foundation Collections, June 1973).

Of consequence to this study, Sassaman (1993a:205) briefly discusses "Fingernail punctation and finger pinching," noting that the motif is not particularly popular in fiber tempered pottery, although it is found during his Phase III (3,400- 3,200 B.P.). While there is some evidence that it originated earlier and to the south, he concurs that it ultimately becomes the "most spatially discrete and well-defined of all decorative techniques used on Late Archaic pottery" (Sassaman 1993:205).

In 1993 Cable re-evaluated the Spanish Mount excavations. Two outcomes are worthy of note. Cable suggests that the mound is actually the remnant of a shell ring that has been largely eroded into adjacent Scott Creek. He feels the site was predominantly domestic, with the relatively even distribution of rings along the coast suggesting, "a system of interacting, but simple, Late Archaic local populations that were only loosely integrated and lacked an established regional site hierarchy" (Cable 1993:191).

He also proposed a new typology, based to some degree on Sassaman's fiber tempered research. His seriation begins with fiber tempered pottery, progressing to Horse Island A – a fine sandy ware. Then is Horse Island B, also with fine sandy paste, but a later design assemblage. Finally, there is Thom's Creek, characterized by coarse sand. In many aspects, though not all, Cable's seriation follows Sassaman's projections for fiber tempered wares. What is lacking is clear evidence that the sandy paste pottery – whether called Horse Island or Thom's Creek – will follow Sassaman's reconstruction. Cable was unable to present a similar massing of data that Sassaman used to support his synthesis. Since 1993 relatively little effort has been made to prove, disprove, or refine Cable's suggested sequence.

The following year Sassaman and Anderson (1994) authored a volume that sought to synthesize research and provide a resource management context for Thom's Creek (and other Middle to Late Archaic materials) in South Carolina. Well perhaps dated now, it provides an excellent and well-balanced review of the literature and various constructs present at that time. It also provides excellent eligibility guidance for sites of this time period.

Figure 11. Sewee Shell Ring, looking east (Chicora Foundation collections, August 1976).

In 2002 Rebecca Saunders conducted additional research on Fig Island in Charleston County. Much of her research focused on simple descriptive cultural historical concerns. She amassed considerable methodological techniques, including probing to map shell buried in the marsh, soil analysis to study paleoenvironmental issues and document site changes, fine screening to collect representative floral and faunal remains, and detailed recordation of profiles to document microstratigraphy. Considerable analysis was undertaken, although she acknowledges that "the overwhelming amount of data . . . will take years to digest" (Saunders 2002:i) learning what those who have previously conducted shell ring research knew so well. Our failure to understand shell rings isn't for lack of data – it may be that there is simply too much data.

In many respects the preliminary analysis reiterates previous studies. She suggests that small estuarine fish and shellfish (primarily oyster) were the main components of the diet. Limited seasonality studies suggest a late fall–winter, although this precludes occupation at other times. The soil study was unable to ascertain whether the site was begun when sea levels were lower or whether it was formed on a slight rise within a marshy area. The dates for the site suggest occupation from about 4,240-3,680 B.P. and mapping suggests three rings. The dominant potteries are Thom's Creek Plain and Punctated.

Much of Saunders' study, however, is devoted to an effort to dismiss the interpretation that rings are village sites, opting instead for an interpretation that they are ceremonial structures. Since only about 182 square feet – less than two 10-foot units – were excavated on the three rings, this interpretation is based almost entirely on the mapping, which to Saunders reveals "enormous height and the probable presence of ramps, a conical mound, and several smaller enclosures." Whether this interpretation is accurate clearly requires far more intensive investigations.

Russo and Heide (2003) attempt the same kind of research at the Sewee Ring. Combining minimal excavation (10.5 square feet placed as one unit at the southern ring edge) and extensive probing, these authors again conclude that the ring must represent a ceremonial village.

Synopsis of Thom's Creek Artifacts

This section will present a brief overview of the different artifacts found at Thom's Creek sites, both shell rings and middens. Most of this is adapted from work at Lighthouse Point and Stratton Place shell rings.

Pottery

As the above discussions indicate, even the most fundamental aspect of archaeological research – typology – is not entirely established for the Thom's Creek Phase. This study, however, will use the typology developed by Trinkley (1976b) with minor modifications (Trinkley 1980c). Thus, the identified and described types include: Thom's Creek (previously Awendaw) Finger Pinched, Thom's Creek Reed Punctate (with Drag and Jab as a variety), Thom's Creek Shell Punctate, Thom's Creek Incised, and Thom's Creek Plain. There is legitimate concern that at least the reed and shell designation is confusing and inaccurate. We nevertheless maintain the terminology out of consistency.

To these we add in this study a formalized description of Thom's Creek Finger Smoothed. While this may be an inconsequential variation of plain, it seems to be correlated with the Finger Pinched motif and thus is defined as a distinct type. We nevertheless recognize that additional study is necessary.

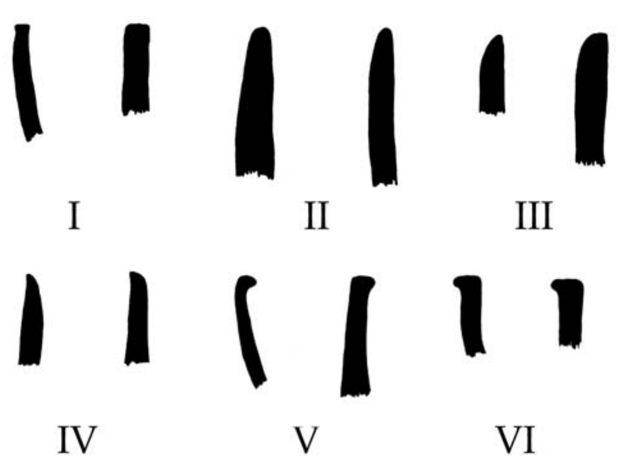

Figure 12. Typical Thom's Creek rim forms (adapted from Trinkley 1976:Figure 3-6).

The analysis of the 38CH1693 pottery focuses on several areas that may be spatially, temporally, or cultural significant. These include the surface treatment, thickness (measured 1 cm. below the rim), the shape of the lip (based on Trinkley 1976b:44), rim form (which relates to vessel form and is described as straight, slightly incurving, or slightly outcurving), the presence of charring on the interior (evidence of burned food) or exterior (evidence of use directly over a fire), sand temper size (ranging from very fine to very coarse), sand temper shape (rounded, sub-angular, or angular), frequency of sand inclusions, and bivalve smoothing (on the interior or exterior).

Sherd Abraders/Hones

Sherds were used as tools in at least two ways. Some were used as abraders of bone pins or awls and these were briefly mentioned in the Lighthouse Point study. The sherds might have one or more grooves about 4 cm in length and from 5 to 10 mm in width (Trinkley 1980b:174). Likely used for the shaping of antler tines or bone pins, little more was said about them. Semenov (1976:140-141) provides a clear illustration of this abrasive process, illustrating tools with nearly identical impressions. Some researchers (see, for example Thomas and Larsen 1979:45) describe these as hones, rather than abraders. Their presence on a site, even when the resulting bone tools are not found, should provide clear indication that bone was being processed.

Distinct from these abraders with grooves are those with different wear patterns, similar to those described by Thomas and Larsen (1979:44-46). They identify four associated with Refuge and Deptford complexes that are found on

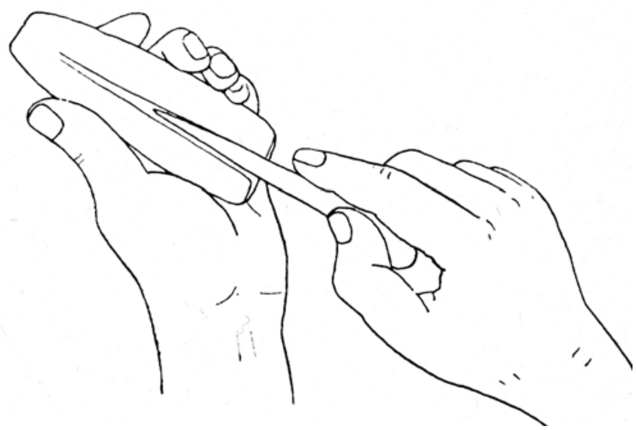

Figure 13. Method of using a sherd abrader to sharpen a bone pin or antler point, creating a sharp, well-defined groove in the sherd (adapted from Semenov 1976:Figure 69-10).

Thom's Creek sherds (but are rarely noted). Type I damage is described as "acute, rounded edge damage" and consists of wear on one or more sherd edge, with angles of 45 to 60º. The abraded material is thought to be soft since the sherd edge is rounded. Type II damage is called "faceted edge damage" resulting from a hard object that produces wear that is flat, not rounded. Type III, called "flat surface abrasion" is evidenced by damage on sherd bodies, rather than edges. The wear obliterates the surface texture and the authors suggest that the object being abraded must have been fairly soft. The final abrasion damage is Type IV, called "shallow groove surface damage." The damage consists of gradual, shallow surface depressions. These are distinct from what the authors describe as hones, producing sharp grooves.

Lithics

In this category are stone tools, flakes, and steatite items (such as vessels and disks). Tools may include projectile points or knives, bifaces and preforms, and hammerstones. Lithics typically represent small assemblages on the coast and the lithics may include a variety of raw materials, such as chert, rhyolite, orthoquartzite, silicified sandstone, quartzite, and steatite/soapstone. Many, although not all, of the lithics seem to represent Piedmont sources.

The projectile points are generally a Savannah River Stemmed variant, sometimes called a Small Savannah River Stemmed (Oliver 1981:151). Many are characterized by basal sections, extensive hinge fractures, and a "lopsided" appearance – suggesting their use as knives rather than (or in addition to) spear or atl-atl tips.

Careful examination may also reveal basal grinding, perhaps to facilitate hafting or perhaps representing an unintentional consequence of hafting. Tips may evidence wear and polishing, suggesting their use as awls. It has been suggested that this range of wear is suggestive of multipurpose use (Trinkley 1980b:207) – an entirely reasonable conclusion considering the rarity of stone on the coast.

Hammerstones are typically 60 to 99 mm in diameter and may consist of quartz river stones or metamorphic rock.

Flakes identified represent primarily bifacial retouch, although bi-polar flakes have also been identified.

Far less common are items such as the stone pendant found at Stratton Place. Teardrop-shaped, the pendant measured 47 mm in length, 17 mm in width, and 9 mm in thickness. A small (1 mm in diameter) hole was drilled through the stone at the narrow end of the specimen (Trinkley 1980b:272).

Soapstone does not seem particularly common at Thom's Creek sites, although fragments of both vessels and slabs have been previously identified.

Shell Tools

Shell tools attracted attention early, with the first discussion perhaps being the publication by Bragg (1925). Much of this attention has been directed to altered whelks – particularly those with holes in the body whorls. Three types are recognized based on the Lighthouse Point research (Trinkley 1980b:209).

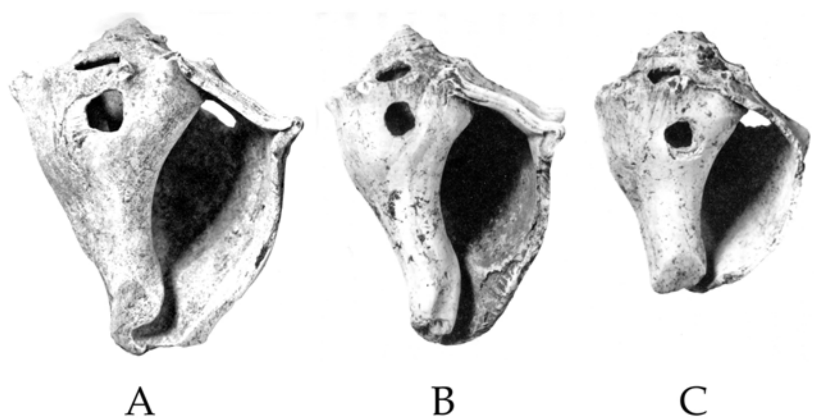

Figure 14. Three identified types of worked whelk shells from Thom's Creek sites (adapted from Trinkley 1980:Plates 15 and 16).

Type A whelk tools are characterized by at least one carefully executed hole in the shoulder of the body whorl close to the aperture and a heavily worn or smoothed columella and outer lip. Type B whelk tools have at least one hole in the body whorl, but the columella shows heavy battering rather than uniform wear. This battering has fragmented and splintered the tip so that it is blunted. Type C whelk tools evidence both wear patterns, with the columella showing that the tool was first used in such a way that uniform wear was present, and then was used as a battering tool. None have been found that suggested an effort – intentional or otherwise – to repair or reduce the battering through wear that produced smoothing.

Whelk height can vary from 90 to 170 mm, with the angle of wear on the columella tip varying from 22 to 45º (mean of 33º and median of 35º). The size of the opening averages 24 by 18 mm. Generally, the larger the shell, the larger the opening. The hole is more or less rectangular and well made, with the edges smoothed. The hole can be clearly distinguished from the hole made to release the whelk muscle, which are crudely made and typically on the opposite side of the shell from the aperture, where the animal is attached.

The range in size represents about a third of the specimens occurring naturally, suggesting that the specimen size was carefully selected by the site occupants (Trinkley 1980b:273-274).

Although these tools are often thought to be digging tools (Bragg 1925), a careful analysis reveals that the wear is inconsistent with a digging or hoeing function. A more plausible explanation is that these whelks were used in a plane-like manner, resulting with wear on one side of the blade (or columella as the case might be) and clearly defined striations (which are often visible on the worn shell. Analysis of the Lighthouse Point tools suggests a working movement pushing the tool forward (Trinkley 1980b:213). Although skin preparation seems unlikely, no experimental research has been conducted that would help refine their use.

Recently Saunders (2002) identified a considerable array of posited tools (punches, gouges, hammers) from very limited excavations. Having spent years comparing whelks found naturally with those recovered from Thom's Creek middens, we are disinclined to accept many of these as actual tools. They appear, instead, to be damage that could easily occur naturally or through archaeological collection. Shells may take on a number of forms and shapes – and exhibit considerable variation in breakage patterns, and there seems to be no compelling evidence at this point to expand tool forms beyond those which are clearly used. Saunders calls these "cutting edge tools."

Other shell items include beads, made from ribbed mussel or similar flat shells. Those found measure from 9 to about 14 mm in diameter with central holes ranging from ca. 2 to 4 mm. Their rarity is likely related to the fragility of the shell.

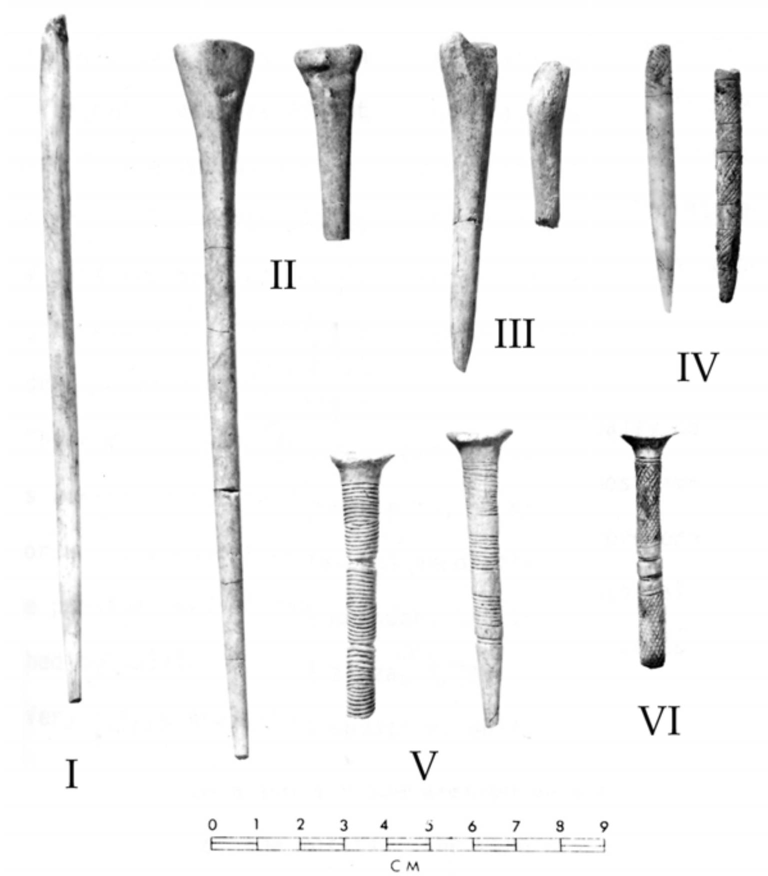

Figure 15. Bone pin types (adapted from Trinkley 1980:Plate 17).

Modified Bone

Included in this category are bone pins, worked bone, modified antler, and modified bone. Well preserved in shell midden contexts, these tools or items are common at shell rings, but seemingly less common at mounds.

The largest category are worked bone pins. Type I specimens are slender, cylindrical pins with rounded heads. The bone is completely smoothed with no articulatory surface remaining. Type II pins are also cylindrical, but are thicker and have spatulate heads. Type III pins are cylindrical with bulbous heads still showing remnant articulatory surfaces. All have gently tapering shafts that come to a point. All are also carefully smoothed with no evidence of unfinished areas. Type IV pins are engraved in the round and have rounded heads. Type V specimens are engraved on only half of their diameter and have spatulate heads. They are at times more crudely worked than other pin forms (Trinkley 1980b:214-216).

Associated with these pins are various waste products, such as proximal ends of deer cannon bones that evidence splitting or smoothing.

Waring spent more time on the designs than on the pins themselves, identifying five distinct motifs: the positive meander, the interlocking fret, the chevron, the diamond, and zigzag lines (Williams 1968:169). At Lighthouse Point 40% of the engraved specimens were similar to Waring's diamond incised pattern (Marrinan [1975b:63] notes that this pattern is also the most frequently recovered in her research). Nevertheless, considerable variation was noted and no preference could be discerned – which is why perhaps the study has not been taken up by others.

Figure 16. Antler tine sockets.

Curiously, some of the engraved pins show wear on the engraved designs, which prompted Trinkley (1980b:218) to suggest that the pins had more than a purely decorative function. The one possibility that seems to account for the observed wear (as well as the breakage pattern) is use as weaving tools (shuttles or needles).

The next most common bone modification consists of worked antler. Most of these are antler projectile points. These are generally under 80 mm, slightly pointed, and hollowed out or socketed for mounting. Occasionally longer tines are found and these are interpreted to represent knife handles.

Also present are occasional antler batons. Manufactured from the beam portion of the rack, they evidence heavy battering and wear – suggestive of use in flint knapping.

There are also occasional polished or worked bone with no clear function. There are cut bone fragments with no other sign of utilization (perhaps representing only aggressive butchering practices), as well as bone awls, and worked turtle shell. As previously discussed, Sassaman (1993:192) clearly illustrates that some worked bone may represent pottery production tools.

Baked Clay Objects/Balls

Like soapstone disks that have been studied at length by Sassaman (1993), these clay balls (or occasionally, irregularly shaped "objects") are also thought to represent a means of indirect cooking. Sassaman (1993:130-135) provides a cogent synopsis and suggests that rather than being used for moist cooking, it is far more likely they were used for pit roasting. He points out that this explanation also conveniently explains the on-site co-occurrence of baked clay objects or balls with soapstone slabs or disks – they simply did not serve the exact same function (although both were used in cooking).

They seem to be more commonly found in association with fiber tempered pottery than with Thom's Creek, but they are nevertheless found in small numbers. Also found are natural sandstone concretions that may have substituted for clay specimens (Trinkley 1980b:272).

Coprolites

Coprolite fragments have been recovered from at least Lighthouse Point and Daws Island. Preserved by the alkaline environment, the organic material has been gradually replaced by a calcium solution. This, unfortunately, reduces their potential to address dietary and parasitic research questions (cf. Rathbun et al. [1978] where at least one hook worm could be identified). Efforts to reconstitute the coprolites using tri-sodium phosphate (Na_3PO_4) have generally been unsatisfactory, although they provide some softening and identify a bile color consistent with humans rather than scavengers. The specimens from Lighthouse Point (where they have received the most intensive study) were broken into two groups – those with abundant fish bones (which had mean diameters of 2.62 cm) and those with small quantities of bone (where the mean diameter was 1.85 cm). The study of these remains suggests that small fish were eaten whole and served a function similar

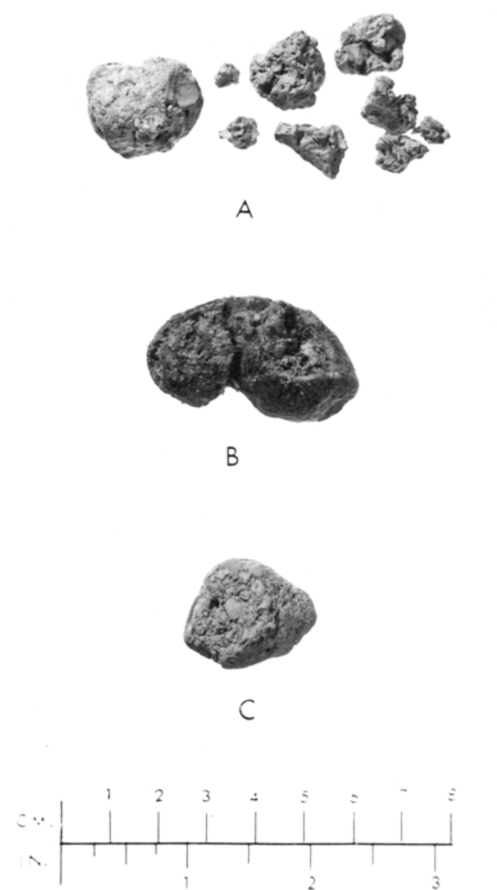

Figure 17. Coprolite fragments from Lighthouse Point Shell Ring (adapted from Trinkley 1980:Plate 19).

to fiber, bulking the stool samples. Nevertheless, the overall diameters, even allowing for shrinkage, suggests a diet low in fiber, but high in proteins.

Radiocarbon Dates

Recently Saunders (2002) and Russo and Heide (2003) have provided syntheses of many radiocarbon dates associated with Thom's Creek rings. They have not, however, incorporated the few dates obtained from non-ring sites. Figure 18 provides all of the South Carolina dates that we have been able to identify for Thom's Creek assemblages. All dates are corrected and the figure shows the one sigma standard error for the conventional age (this follows the convention of Russo and Heide).

While 35 dates are impressive, particularly when compared to the dates available for Early and Middle Archaic assemblages in South Carolina (see Sassaman and Anderson 1994:Figure 3-5), there is considerable spatial variability, as well as variation in dominant pottery or even the type of site represented. Consequently, while this array provides good information on the temporal range, we resist the temptation to push the results further.

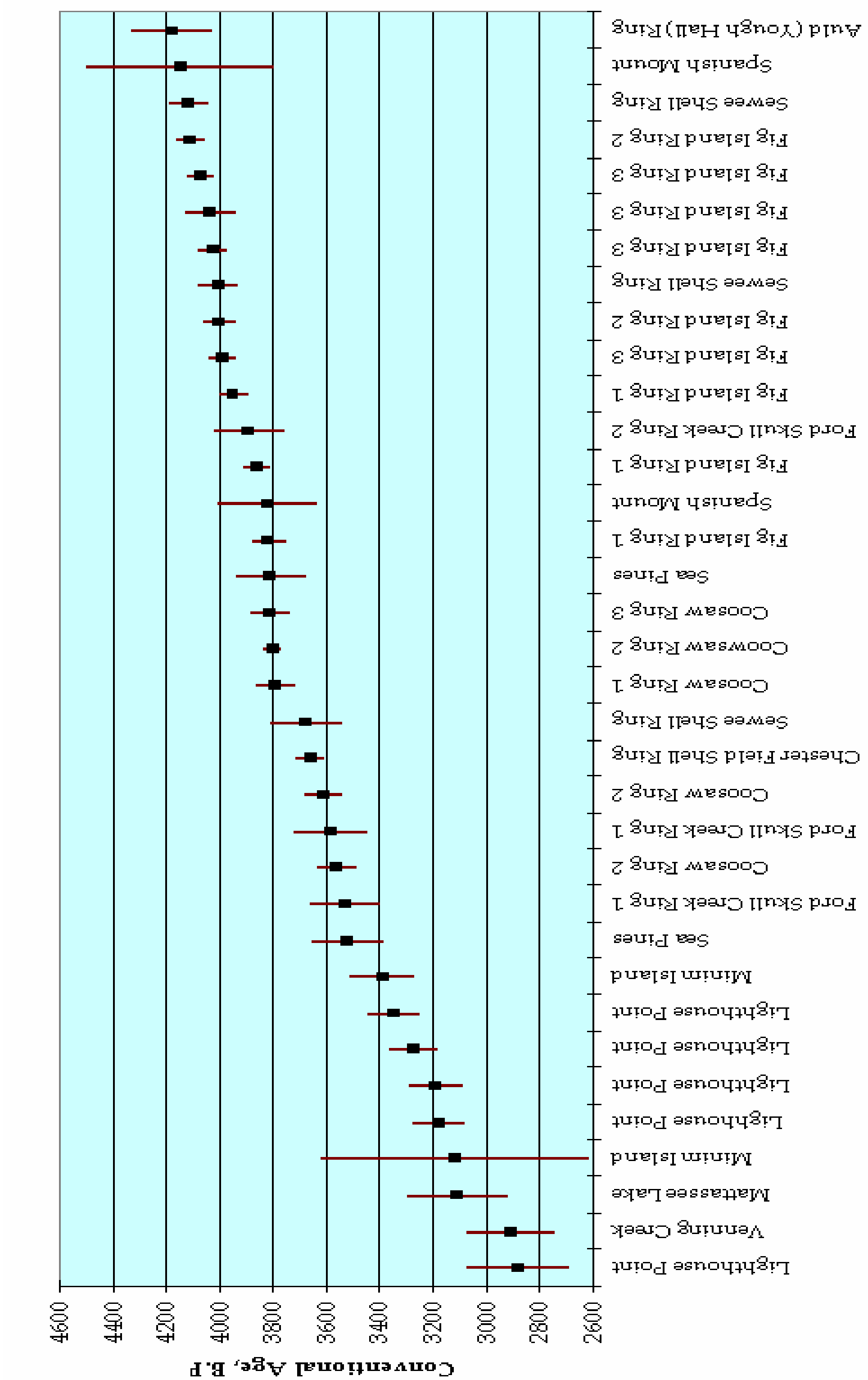

Figure 18. Conventional radiocarbon dates from South Carolina Thom's Creek assemblages.

NATURAL SETTING

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, 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). 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.

Reference to Figure 1 reveals that 38CH1693 is situated at the western edge of a sandy ridge – a remnant beech dune ridge – at an elevation of about 23 feet AMSL. US 17, following a very old historic route, was built on the highest elevations of this ridge, which tends southwest-northeast.

The topography drops dramatically to the north and northwest, into swampy lands that, with more careful inspection, represent the drowned headwaters of Toomer Creek to the northwest and Alston Creek to the northeast. Between these is Darrell Creek. These comprise the complex system of low-gradient drains previously mentioned and serve to define the area and its environment today. All flow into the Wando River, a tidal river that supports extensive intertidal oysters at least as far upriver as Alston Creek.

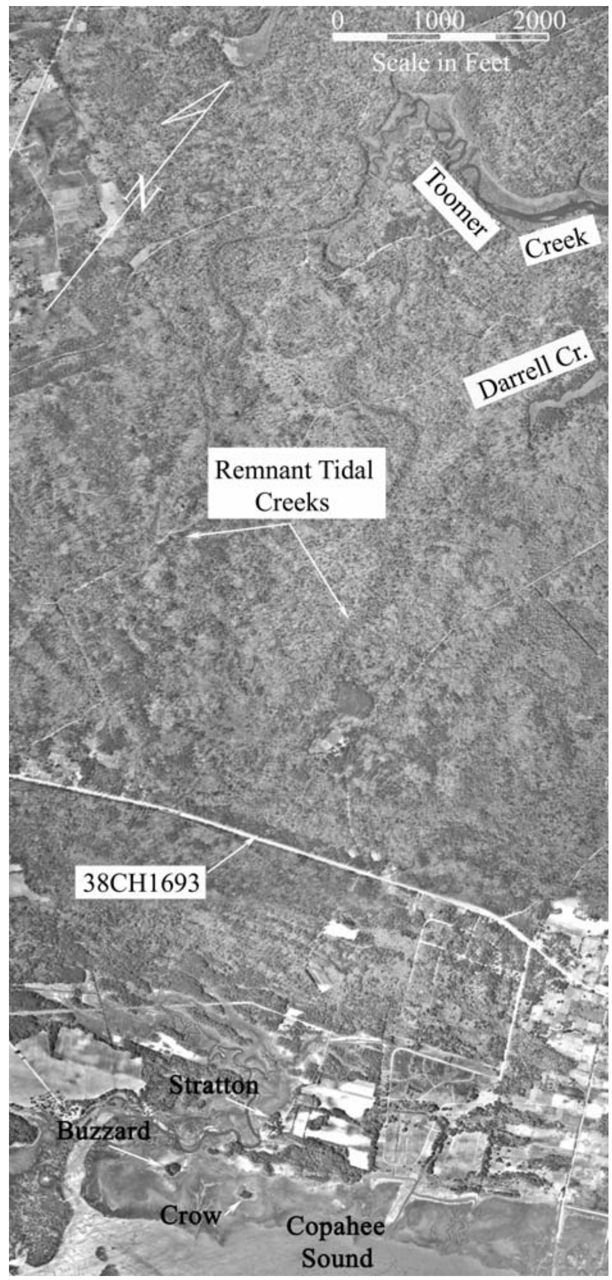

Figure 19. 1967 aerial photography showing the project area and major physiographic features.

It's likely, however, that prehistorically these interior, low-gradient drains were sources of fresh water. Only as they approached the Wando is it likely that a salt wedge developed.

About 0.7 mile to the south or southeast is the Copahee marsh. Topography from the site slopes gradually in this direction, but when the marsh is encountered it quickly dominates the modern environment. In the immediate area there is up to 0.8 mile of marsh exposed at low tide before Copahee Sound is encountered. Beyond the Sound is Dewees Island, a Holocene barrier island situated between the Isle of Palms to the southwest and Capers Island to the northeast.

At the southern end of Copahee Sound, where it meets Hamlin Sound, is Porcher Creek, a tidal creek that ribbons its way inland to within about three-quarters of a mile from 38CH1693. Providing access to a broad range of tidal resources, this creek was eloquently described by John Leland (2003).

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 soils formed from these Holocene and Pleistocene soils were typically deposited in various stages of coastal submergence. Soil formation is affected by the parent material (primarily sands and clays), the temperate climate (discussed later), the various soil organisms, the flat topography of the area, and time.

Mainland soils are primarily Pleistocene in age and tend to have more distinct horizons and greater diversity than the younger soils found on the sea and barrier islands. Sandy to loamy soils predominate in the level to gently sloping mainland areas. The adjacent tidal marsh soils are Holocene in age and consist of fine sands, clay, and organic matter deposited over older Pleistocene sands. These 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.

In the immediate site area the soils are classified as the Chipley Series – soils that are sandy throughout, nearly level, and moderately well drained to somewhat poorly drained depending on local condition. A typical profile would consist of an A horizon about 0.5 foot in depth that is very dark gray (10YR3/1) loamy fine sand overlying a C horizon of yellowish-brown (10YR5/4) loamy fine sand that gets lighter in color with depth. Available water capacity, inherent fertility, and organic matter are all low (Miller 1971).

Surrounding soils include the Rutlege and Scranton series. Rutlege soils, while having deeper surface soils, are more poorly drained and are often found in depressional areas. The Scranton soils, while more poorly drained than Chipley soils, are better drained than the Scanton Series. Both series, like Chipley, lack a developed B horizon.

To the north of the site are Meggett soils. These soils have a clayey subsoil, are poorly drained, and are indicative of remnant drainages.

Climate and Sea Level

The major climatic controls of the area are today the latitude, elevation, distance from the ocean, and location with respect to the average tracks of migratory cyclones. The area's latitude of 32º 49′ N places it just beyond the balmy subtropical zone and in a more temperate zone. Winters are relatively short and mild, while the summers may be long, warm, and humid. 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 shallow cold air masses from the northwest, moderating them before they reach the Charleston area (Mathews et al. 1980:46).

In modern times the maximum daily temperatures in the summer tend to be near or above 90ºF and the minimum daily temperatures tend to be about 68ºF. The summer water temperatures average 83ºF. The abundant supply of warm, moist, and relatively unstable air produces frequent scattered showers and thunderstorms in the summer. Winter has average daily maximum and minimum temperatures of 63ºF and 38ºF respectively. Precipitation is in the forms of rain associated with fronts and cyclones; snow is uncommon (Janiskee and Bell 1980:1-2). The wind shifts from the north-northeast in the fall to the west in the winter. By the late spring it has again shifted to the south and southwest.

The average yearly precipitation is 51 inches, with nearly 34.5 inches occurring from April through October, the growing season for most coastal crops. With about 240 frost free days this represents a relatively mild climate, responsible for many of the historic southern crops, such as cotton.

Early efforts to reconstruct regional climate shifts include the research of Kukla (1969) and Bruson (1965). While there are differences even at this level, it is possible to force a generalization. There may have been a cooling and mild period following the Climatic Optimum around 4,000 B.C. This mild period may have ended about 1,400 B.C. and was perhaps followed by a cold period until 600 B.C. when Kukla suggests a warming trend occurred. Climate may then have improved from A.D. 400 until the beginning of the "Little Climatic Optimum" about A.D. 800. The synthesis of this work suggests that changes have been generally minor, usually amounting to only a few degrees difference in temperature over a span of several generations.

Gunn (1997) has elaborated on this, providing more detailed studies applicable to the Southeast. He notes that climatic conditions in the transitional Late Holocene produced more equitable seasonal insolation. The decline of the sea levels at 3,000 B.C. marks the collapse of the Altithermal. Sea levels maintained their low levels through about 2,000 B.C. Coasts became favored occupation areas and this suggests a reduction in tropical storms, probably occurring as a result of the continuous depletion of ocean heat (Gunn 1997:146).

Gunn classifies the period from about 2,000 B.C. to 600 B.C. the Early Late Holocene. There was a return to higher sea levels after 2,000 B.C., but these levels were not stable and began, instead, a period of oscillations. Gunn (1997:146) classifies this period as one of "global, century-scale instability." He points out that even a small increment in sea level change had the potential to cause extensive ground surface condition modifications. At his Hilton Head Island example, he observes that only a one meter sea level rise made the Osprey Marsh site, situated 3-meters AMSL, marginally habitable (Gunn et al. 1995). It was during this period that large coastal sites (such as shell rings) were abandoned and settlement shifted toward the fall line. It may also suggest more active hurricane seasons, making the coastal zone less stable and attractive.

Work by Brooks et al. (1989) suggests a number of fluctuations during the Holocene (Figure 20). Their data suggests that sea levels peaked at 4.5 feet below the present marsh surfaces about 2,200 B.C. and then began to decline. By about 1,800 B.C. the levels were perhaps 13 feet below the present marsh surface. Then sea levels began rising again, surpassing previous levels by about 1,500 B.C. As Gunn has suggested, it was this steady rise in sea levels that flooded coastal Thom's Creek sites, making the area less hospitable and ending permanent coastal habitation.

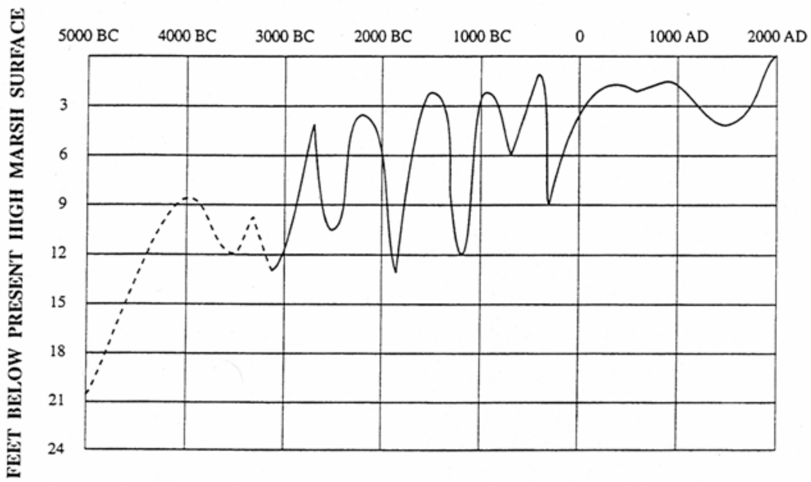

Figure 20. Sea level change curve for South Carolina (adapted from Brooks et al. 1989).

Settlement at 38CH1693 would have been at the very lowest stands of sea level according to both Brooks et al. (1989)and Gunn (1997) – suggesting that the site vicinity might have been higher and drier than at present, with more clearly defined and pronounced marsh creeks to the north.

Data being generated to explore the results of rising sea levels today may provide some clues concerning what happened as the sea levels began to rise after 1,800 B.C. For example, Kana et al. (1988) observe that the rate of sea level rise affects the outcome. They found that an accelerated sea level rise would reduce the area covered by marshes and result in marked habitat changes. Given the steepness of the curve produced by Brooks and his colleagues (Brooks et al. 1989), such a situation may have occurred around 1,800 B.C., resulting in extensive, and dramatic, changes.

Floristics

Küchler (1964) identifies the natural potential vegetation of the study area as a combination of Live Oak-Sea Oats and Oak-Hickory-Pine. The physiognomy of the Live Oak-Sea Oats region would have been irregular, varying from open grasslands to dense shrubby areas and groves of low broadleaf evergreen trees (primarily live oaks). In contrast, the Oak-Hickory-Pine area would have consisted of medium tall to tall forests of broadleaf deciduous and needleleaf evergreen trees. The dominants in the site area would likely have been hickories and oaks in the mesophytic habitats. Pines (mixed with some oaks) would have occurred only in the excessively dry (xerophytic) areas.

It should be stressed that Küchler's forests represent what would "exist today if man were removed from the scene and if the resulting plant succession were telescoped into a single moment" (Küchler 1964:2). This characterization is useful, of course, only if we assume that the influence of man on the vegetation up until this time has been minimal, since the determination of natural vegetation allows man's earlier activities to stand intact (Küchler 1964:2). Such a concept, while approximating the forest type present immediately prior to the arrival of European explorers, provides increasingly less secure reconstructions the further one pushes into the prehistoric past. While it is impossible with this data to reconstruct the local forest environment of 38CH1693, it is possible to place the site more securely in a broad environmental framework.

There are four major ecosystems in the vicinity of 38CH1693 today: the coastal marine ecosystem where land has unobstructed access to the ocean, the maritime ecosystem which consists of upland forest areas, the estuarine ecosystem of deep water tidal habitats, and the palustrine ecosystem which consists of essentially fresh water, non-tidal wetlands (Sandifer et al. 1980:7-9).

For the maritime ecosystem Sandifer et al. (1980:108-109) define four subsystems, including the sand spits and bars, dunes, transition shrub, and maritime forest. Of these, only the maritime forest subsystem is likely to have been significant to the prehistoric occupants and only it will be further discussed. While this subsystem is frequently characterized by the dominance of live oak and the presence of salt spray, these gradually disappear and the maritime forest transitions into upland forests.

The area contains communities of oak-pine, oak-palmetto-pine, oak-magnolia, palmetto, or low oak woods. Many nearby areas 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. Only the driest areas with excessively drained soils and little accumulated organic matter will be classified as Braun's (1950:284-289) pine or pine-oak forest. Where present, the major constituents include live oak, laurel oak, water oak, and loblolly pine.

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, silverling, 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 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‰ 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 mean tidal range for nearby Hamlin Sound is 5.2 feet. On the Wando River at Paradise Island the mean tidal range is 6.5 feet.

This tidal range is indicative of an area swept by moderately strong tidal currents. The range is also sufficient to prevent storm tides from covering oyster beds and other estuarine resources for several days at nearly any time – ensuring resources are commonly available.

The system may be subdivided into two major components: subtidal and intertidal (Sandifer et al. 1980:158-159). The salinity, frequency, and extent of flooding in the intertidal marsh determine the types of plants and animals found. The low marsh floods twice daily, while the high marsh floods only during storms and unusually high tides. These estuarine systems are extremely important to our understanding of prehistoric occupation because they naturally contain such high biomass (Thompson 1972:9).

The high marsh contains a great variety of species, including black needlerush, salt meadow cordgrass, sea oxeye daisy, marsh elder, and short-form smooth cordgrass. This high marsh grades into a marsh-upland border which is a transitional zone between the salt marsh and the previously discussed maritime shrub community that consists of wax myrtle, yaupon and cedar. Many of the high marsh plants require fresh water runoff from the upland to survive.

Intermixed are salt flats, open sandy places that are typically devoid of plants (except perhaps glasswort or salt grass). Flooded at the highest tides, the water evaporates leaving behind very high levels of salt in the soil.

One plant, smooth cordgrass (*Spartina alterniflora*), dominates the regularly flooded low marsh and is responsible for the marsh's productivity. Although from a distance the low marsh seems to be uniform, it is actually composed of two forms of *Spartina*. One is a tall form, up to 9 feet in height, which grows along creek banks. Further in the interior, at higher elevations, is a short form that is only 2 to 3 feet in height. While difficult to see, the marsh periwinkle is found climbing the *Spartina*. At the edge of the marsh are oyster reefs, one of the few hard places in the marsh.

Animals and plants live in these zones of the marsh, depending on how well they can withstand the drier conditions of the upper marsh or the wet conditions that regularly occur in the lower marsh. Fish (over 107 species), crabs, and shrimp live in salt marshes where the *Spartina* provides food and shelter from predators. The young of many species, such as the blue crab, white shrimp and spot tail bass, use the salt marsh as a nursery. Some fish that inhabit marshes move on and off the marsh surface with the tide. There are few reptiles in salt marsh habitats, although the diamond back terrapin and American alligator are notable exceptions. The marshes, however, provide excellent cover for birds. Some, such as the heron and egret, feed on fish, shrimp, and fiddler crabs year-round. Oystercatchers are common on the oyster reefs. Clapper rails form roosting areas on the marsh surface.

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‰. 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 that attract a variety of terrestrial mammals. Common are 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, but probably of limited importance to historic occupants (who tended to describe them in the nineteenth century as "impenetrable swamps").

It is likely that there were several fresh water springs in the immediate area of 38CH1693, feeding into Darrell and Toomer creeks. Today these areas are recognizable primarily through their soils and mesophytic vegetation. It is likely that when the sea level was lower these springs would have been more active.

Catchments

Traditionally, archaeologists have defined site catchments in one of three ways: natural boundaries, simple Euclidean distance, or travel time. Natural boundaries are convenient and simple. However, site catchments should be about socio-economic use, while natural boundary definitions are entirely arbitrary. They often reflect the area of a survey rather than the area of use.

Euclidean distance catchments are determined by placing a radius of a predefined distance around a site. This, too, is simple and runs into problems only when natural terrain is a limiting factor. Often a 0.6, 1.2, or 3-mile radius is used, although this seems to be more a matter of convention than justifiable science.

The final approach uses time-travel catchments where it is travel time, not distance, that defines the catchment. Often a 2 or 3 hour catchment is used in an effort to better reflect the way in which people actually work.

Each approach is limited by the assumptions being made. For example, would a hunter-gatherer be willing to *only* walk 2-3 hours in search of food? Is a 0.5 mile radius *fundamentally* more realistic than a 1.0 mile radius? Moreover, at a site such as 38CH1693, where we have little idea concerning the size of

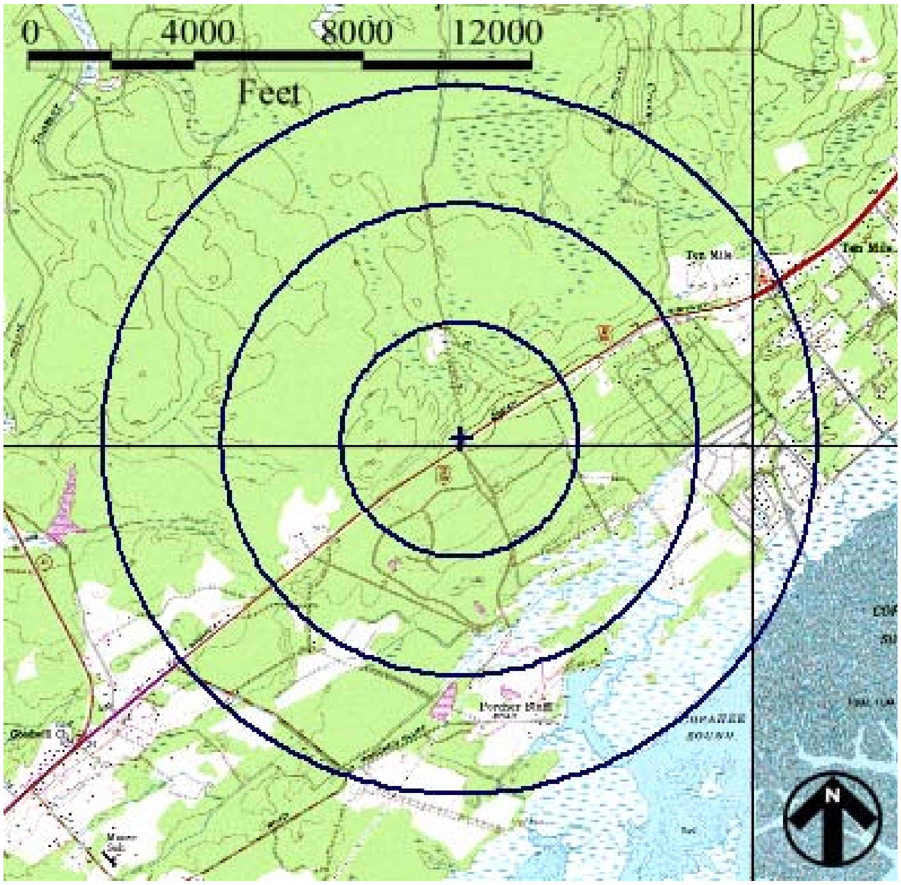

Figure 21. Projected catchments at 38CH1693. Each ring represents 0.5 mile or about a 30 minute walk from the site center.

the group occupying the site, or season of the site's use, it is very difficult to evaluate what size catchment might be appropriate.

However, we can examine several catchments to explore the diversity of the site area. While this does not provide any especially sound interpretative model, it does help to demonstrate the diversity of the local habitats.

For coastal areas the terrain is easy, but the dissected topography reduces travel to no more than a mile an hour. Figure 21 illustrates the catchment around 38CH1693 showing 0.5, 1, and 1.5 mile bands – reflecting no more than about a 2 hour distance from the site.

Table 1 shows the acreage in the three catchments broken down into estuarine, palustrine, and upland. As is intuitively obvious from Figure 21, the proportion of marsh acreage increases with distance from the site. Expectedly, the acreage and overall percent of upland environments decreases as you move away from the site center. Palustrine, or fresh water, resources also decline from a high of nearly 6% to about 3%.

Thus, within a half mile or a brief walk would have been several freshwater sources, but probably no significant tidal resources (such as shellfish). This catchment, however, would produce a wide range of upland mammals and reptiles. To add shellfish would have required expanding the catchment to at least a mile, perhaps more (depending on prehistoric ecological reconstructions and the productivity of the local shellfish beds).

In Table 2 we examine the hydric rating of the soils in these three catchments. Hydric soils are those that are formed under conditions of saturation, flooding, or ponding long enough during the growing season to support hydrophytic vegetation. The partially hydric soils are likely the best areas for mesic species, such as hickories. The non-hydric soils are those that are well to excessively drained and are more likely to support more xeric vegetation, such as pine.

We see that each of the three catchments is dominated by wet or hydric soils. Non-hydric soils are relatively scarce in each of the catchments, never accounting for more than 1.1% of the acreage. The partially hydric soils are most common within the 0.5 mile catchment, but stabilize at just above a third the acreage in each of the expanding catchment zones.

Table 1.
Major Ecological Zones in the Catchments Surrounding 38CH1693 in acres (percents in parentheses)

Zone	0.5 mile	1.0 mile	1.5 mile
Estuarine	0 (0)	75 (3.8)	357 (7.9)
Palustrine	30 (5.8)	75 (3.8)	132 (2.9)
Upland	482 (94.2)	1834 (92.4)	4055 (89.2)

Table 2.
Hydric Soil Ratings for the Catchments Surrounding 38CH1693 (by percent)

Rating	0.5 mile	1.0 mile	1.5 mile
Hydric	56.3	59.1	51.8
Partially Hydric	43.6	33.7	35.4
Not Hydric	0	0.2	1.2
Water	0.1	0.1	1.1
Tidal	0	6.9	10.5

Interpretation is difficult since we can't precisely estimate changes in estuarine coverage or hydric ratings resulting from low sea level stands at the time the site was occupied. We are inclined to ignore these issues (an approach that is supported by the pollen study presented later in this study). If we assume relatively stable site conditions that are not too dissimilar than present, then the site was located in a prime area for harvesting the nut masts of more mesic trees, such as hickories. The site was also in a prime location for access to fresh water.

There are at least two shell rings within the 1.5 mile catchment of 38CH1693 (Stratton Place and Buzzard Island; the status of Crow Island as a shell ring is dubious). Given their proximity to the estuarine setting, it would be interesting to examine their dates to see if they, too, date from the low sea level stands. Certainly their catchments would be dramatically different than that for 38CH1693. Unfortunately, neither ring has any radiometric dates available – confirming our earlier concern that many additional dates are necessary if we are to understand the development of rings along the South Carolina coast.

EXCAVATIONS

Methods

Prior to our arrival, the client's representatives had visited the site and identified still extant flagging marking the boundaries of the site on its northern, western, and southern edges (the eastern edge was defined by the adjacent Airport Road). This area was reflagged and bush hogged prior to our arrival. Although the original site boundaries (see Figure 2) were reported as approximately 245 feet north-south, this would have extended the site into wetlands to the north and on the cut bank of the road to the east. With these areas excluded from research, the bush hogged area was about 225 feet square (or about 1.2 acres).

To provide horizontal control at the site we created a grid covering an area 200 feet north-south by 200 feet east-west (Figure 22). To allow the grid to easily fit into the study area, it was oriented 332º (N28ºW). This was a modified Chicago-style grid based on an arbitrary 0R0 point located at the southwest edge of the tract. Units are identified by the coordinates of their southeast corner relative to this datum. Thus, 100R50 is 100 feet to the north and 50 feet right (or east).

A single vertical control point was used for the excavations at 38CH1693 in the center of the site at 100R120 with an assumed elevation (AE) of 10 feet above mean sea level (AMSL). All of the excavations' vertical elevations were tied into this datum.

A contour map of the site was created based on the created grid and assumed elevation datum. This clearly reveals that the site is situated on the north edge of a sand ridge, with the topography falling dramatically (for the low country) to the north and northwest (Figure 22).

Each grid point was indicated by a surveyor's pin flag. The auger tests were excavated using an 10-inch power auger (the equivalent of 0.83 ft^2) mounted on a Bobcat (Figure 23). After excavation the fill was hand screened through ¼-inch mesh, with shell being quantified in the field and discarded.

The minimal excavation unit was a 5 by 5 foot unit. Chicora has adopted engineering measurements (feet and tenths of feet) for consistency in its work. Formal excavations at the units were conducted by hand, using mechanical sifters fitted with ¼-inch inserts for standardized recovery of artifacts and ⅛-inch waterscreening for recovery of faunal remains from all features (Figure 24).

Excavation was conducted by both natural soil zones and arbitrary depths. The site exhibits an A horizon of very dark brown (10YR2/2) loamy sand, designated Level 1. This was stripped off using a Bobcat with a 39-inch toothless bucket. Below this was either shell or a lighter colored sand, often a brownish yellow (10YR6/6) or yellowish brown (10YR5/4) sand, designated as Level 2. Level was flat shoveled to a depth of about 0.2 foot in order to provide a clean surface and good definition of features. While Level 1 was not screened, Level 2 was screened through ¼-inch mesh.

Where excavation continued (in the three deep test units), 0.2 foot arbitrary levels were used, designed Levels 3, 4, and so forth. Excavations were terminated in sterile soil.

Munsell soil color notations were made during the course of excavations, typically on moist soils freshly exposed. All materials except shell were retained by provenience. Shell was weighed (to the nearest pound/kilogram) and discarded on-site. A one-ounce soil sample was

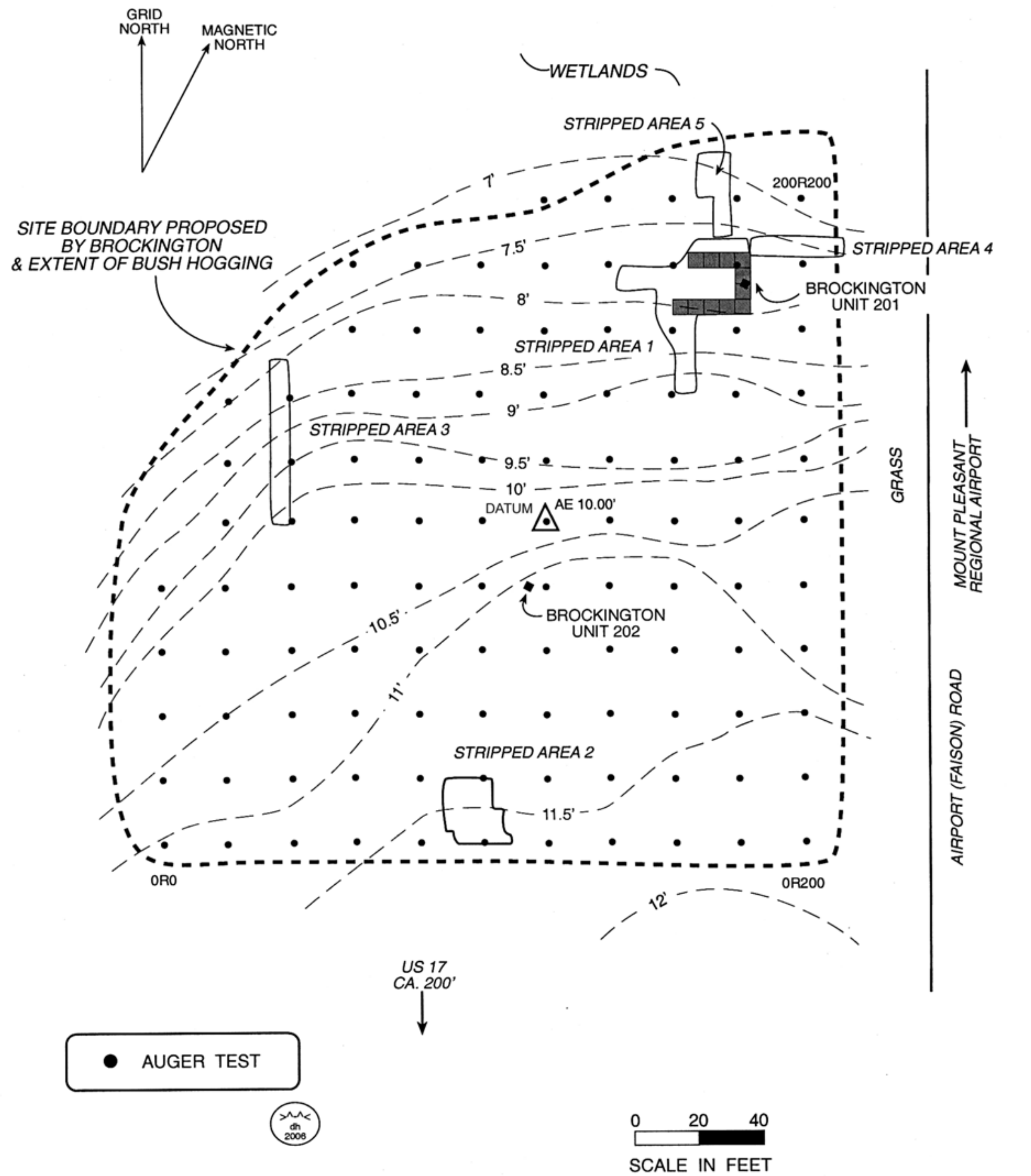

Figure 22. Site 38CH1693.

Figure 23. Using a Bobcat to auger at 38CH1693.

retained from each zone. We have previously retained much larger samples, allowing the luxury of a variety of soil studies. With the current curation issues at SCIAA, this is no longer practical and we have abandoned the retention of large samples.

Units were troweled and photographed using black and white negative and color transparency film at the base of the excavations. Each unit was drawn at a scale of 1 inch to 2 feet. Features were designated by consecutive numbers (beginning with Feature 1). Features, depending on the evaluation of the field director, were either completely excavated, or bisected (i.e., partially excavated).

Feature fill was waterscreened through ⅛-inch mesh and features, upon completion of their excavation, were also photographed using black and white negative film and color transparencies. Since we anticipated pollen and phytolith studies of many features, larger soil samples were routinely collected by dry screening out shell through ¼-inch mesh, prior to waterscreening. A 5-gallon sample was also retained from each feature for flotation using mechanically assisted water float equipment.

The first screen of each feature was sorted by shell species during artifact collection; each species was weighed separately, allowing for the feature's shell content to be roughly approximated. Although this assumes that shell was homogeneously dispersed through features, we do not believe this introduced appreciable bias. The technique provides an opportunity to calculate both diversity and biomass for the shellfish within features, allowing comparison with vertebrate faunal studies and a better estimation of diet.

Figure 24. Waterscreening feature fill.

As a result of this work, 275 ft^2 were hand excavated and an additional 1,470 ft^2 mechanically stripped and plotted in three

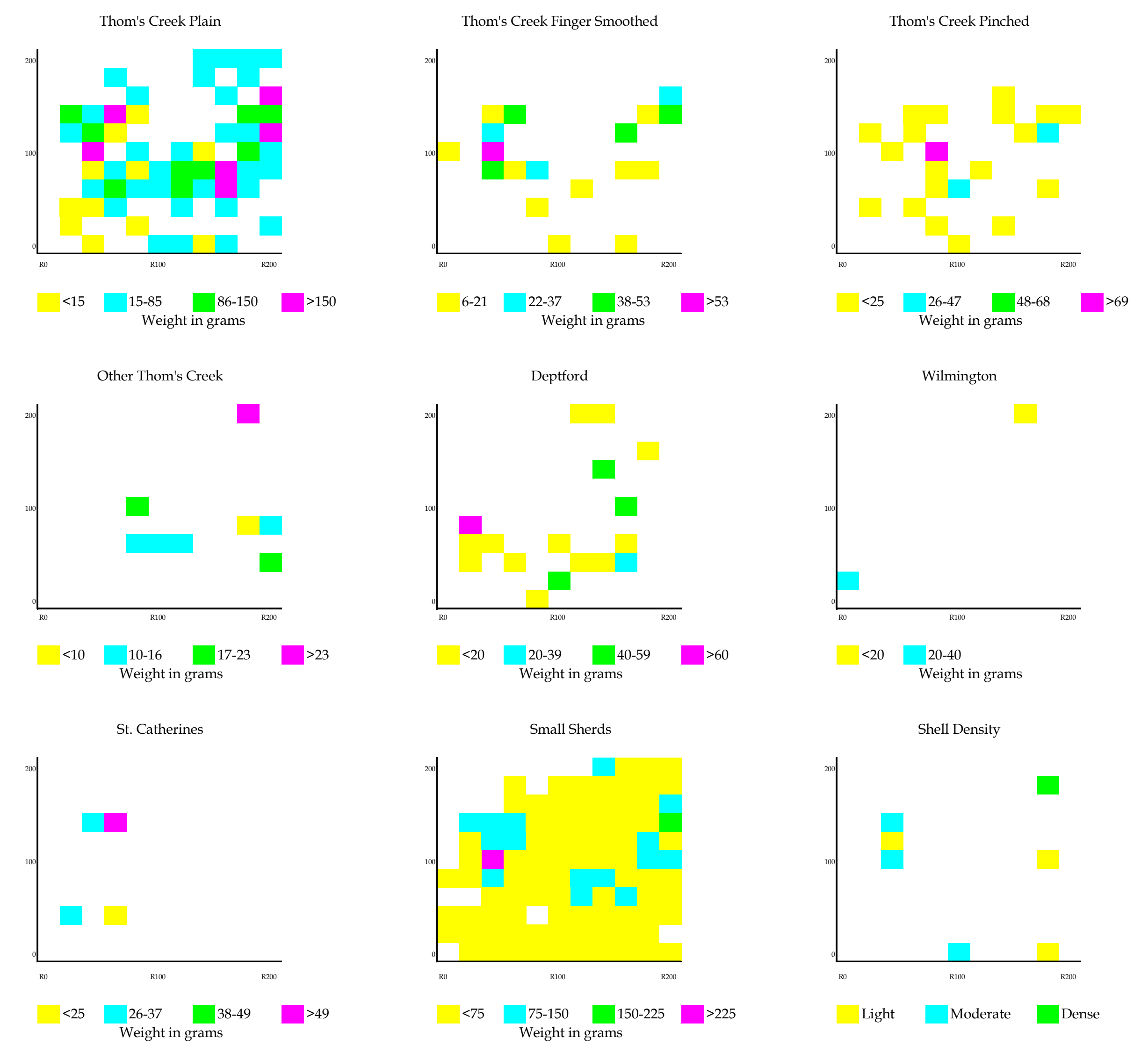

Figure 25. Occurrence of various pottery types and shell density in the close interval auger testing.

locations – 900 ft^2 in the area of the hand excavations (identified as Areas 1, 4, and 5), 290 ft^2 at the southern edge of the site (identified as Area 2), and 280 ft^2 at the northwestern edge of the site (identified as Area 3). This work was accomplished using the Bobcat excavator and its 39-inch toothless bucket. This provided excellent maneuverability in the wooded site conditions, adequate power to cut through tree roots, and a reasonably clean floor that required minimal clean-up afterwards.

Results of Close Interval Testing

Figure 25 illustrates the results of the auger testing. These figures use the weights (not counts) of the various sherds identified since we believe that this may provide a more unbiased representation of the distribution. The Thom's Creek Plain sherds reveal what appears to be an arc-shaped distribution running across the site, open to the north. When this distribution is compared to the topographic map of the site it appears that the bulk of the settlement may have taken place on the low elevations overlooking the wetlands to the northwest. The distribution of Thom's Creek Finger Smoothed pottery is essentially similar (although much less common). Other Thom's Creek wares are found in such low densities that no observations can be drawn from the density maps.

Other pottery present in the collection includes Deptford, Wilmington, and St. Catherines. Although the latter two assemblages are too sparse to allow observations concerning their distribution, the Deptford pottery appears to be more common on the southern half of the site, with relatively smaller quantities commingling with the Thom's Creek pottery. This suggests that the Deptford people may have preferred the slightly higher elevations of the site.

None of the distributions provide particularly good indications that the site edges have been identified. In fact, the distribution of small sherds (those under 1-inch in diameter) appears to be found to the edges of the site grid to the south, east, and north. Only to the northwest – along the edge of the sand ridge where it drops into the wetlands – does it appear that we have identified the site boundaries. The site is truncated by Airport Road to the east and it is uncertain how far the site might extend to the south (toward US 17). Nevertheless, it appears that the study area does include the core of the Thom's Creek settlement. In fact, this distribution of the small sherds may be the result of A horizon activities, perhaps logging.

A primary goal of this testing, however, was to identify the distribution of shell on site. Figure 25 illustrates that shell is not abundant when examined at 20 foot intervals. In fact, the only area of dense shell was at 180R180 – in the immediate area of Brockington Test Pit 201 and the area of our proposed block excavation.

Elsewhere across the site shell was encountered at only four locations and was considered moderate at two and light at the other two. Discounting the occurrence of light shell, the two areas with moderate shell were 0R100 (on the south central edge of the site) and 100R40 through 140R40 (along the western edge of the site).

One review commented that the Wilmington and St. Catherines pottery distributions "likely represent the archaeological residue of brief occupations too small to be adequately sampled using a 20 ft sampling interval." The reviewer noted that such sites can contain important information on topics ranging from temporal placement to site structure, especially if they retain integrity.

Our own long history of coastal research entirely supports this view. For example, considerable research was conducted at the Deptford and St. Catherines site 38BU1214 on Spring Island (Trinkley 1991). There we found middens ranging in size from as little as 5 feet up to 20 feet in diameter – certainly suggesting that a 20 foot testing interval is likely to miss many such middens.

However, as explained on pages 3-5, the State Historic Preservation Office had twice before approved testing programs at the site and had determined that eligibility was limited to the Thom's Creek components.

Results of Excavations

The two previous excavations, having been left open since 1999, were readily identified during the initial stage of field work. Unit 201 in the northeast corner of the site evidenced sparse shell in the north and west profiles; unit 202 revealed only yellow sands.

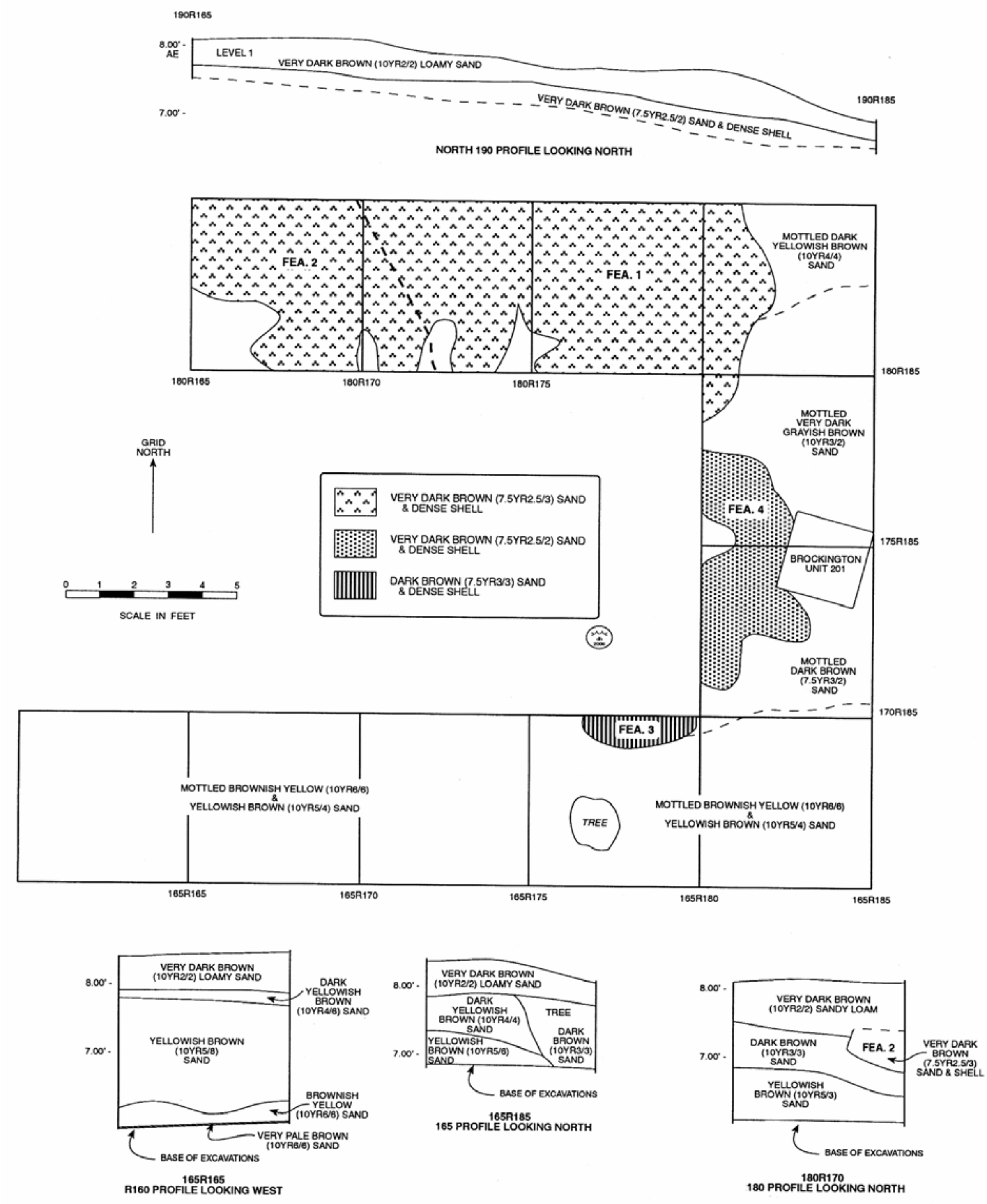

Figure 26. Plan and profiles of the block excavation.

The data recovery plan specified that investigations would focus on the posited shell midden at Unit 201, which was also the area where auger testing revealed the densest shell.

Block Excavations

As a result an initial series of four 5-foot units were laid in along the R185 line from N165 to N180 (Figure 26). These units encompassed the test pit and would, in theory, bisect the reported midden. The excavation began by stripping off the A horizon soils using the Bobcat and a 39-inch toothless bucket to expose what we thought would be a midden. As the work progressed we discovered that there was, in fact, shell, but that it was spotty, being found only at the north and central areas.

Once the A horizon was removed, the units were flat shoveled to level them and more clearly define the shell. This work revealed what appeared to be a shell pit in 180R185 and another pit spanning units 170-175R185.

With this finding four additional units were laid out at the southern end, running to the west (165R165-180). Again the A horizon was mechanically removed and the units were flat shoveled. This work revealed a small shell pit on the north edge of 165R180, but elsewhere there was no evidence of shell.

An additional three units, 180R170-180, were laid in to the west of 180R185. After the mechanical removal of the A horizon we found dense shell spanning the entire trench. This was flat shoveled and while there were spotty areas lacking shell, it was not possible to identify specific features that might have blurred together to create this deposit.

Mechanical Stripping

At the conclusion of the block excavations, mechanical stripping took place using a Bobcat with a 39-inch toothless bucket. Stripped Areas 1, 4, and 5 examined the area immediately around the block excavations, opening an area of about 900 square feet. Stripped Area 1 focused on the area to the west and south of the block excavation, as well as within the two east-west arms of the excavation. This work revealed the extent of several shell pits initially identified through block excavation (discussed below). The work also revealed that there do not appear to be additional features to either the south or west of the block excavation area. Stripped Area 4 extended our view to the east, downslope from the main excavations. No additional features were encountered. Stripped Area 5 extended the investigations to the north and in this area we identified the north edge of Feature 1, as well as four additional shell pits. Three of these pits appear to be identical to Features 1, 2, and 4 (discussed below) and were not excavated. Feature 6, however, appeared to

Figure 27. Stripped area to the north of block excavations, looking south.

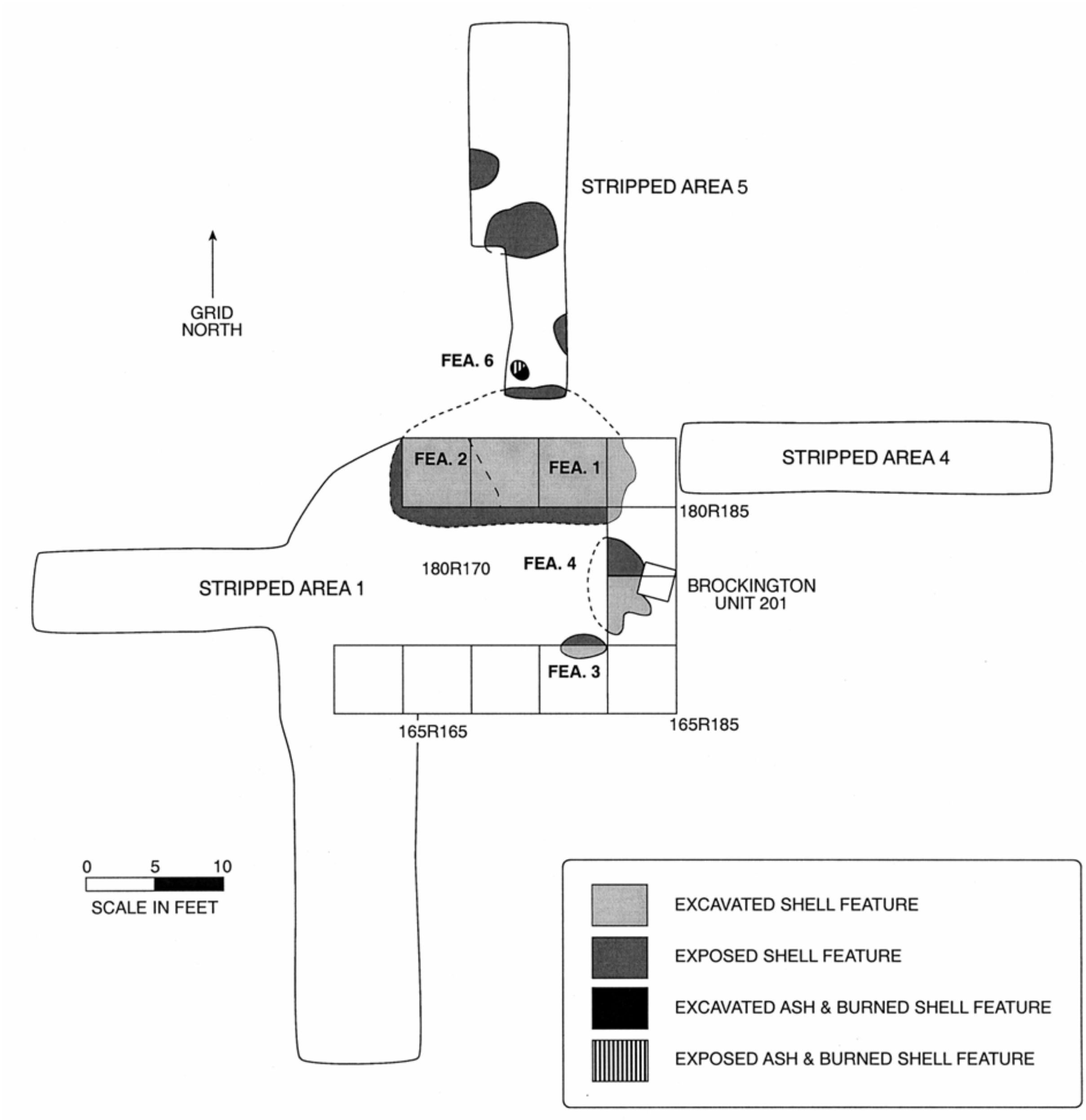

Figure 28. Plan view of Stripped Areas 1, 4, and 5 showing the extent of identified features.

be distinct and the southeastern half was removed.

The examination around the block excavation suggests that shell features were distributed over an area oriented north-south and measuring about 40 by 25 feet (1,000 ft²).

Another area was opened at the south edge of the site, in the vicinity of the moderate shell found in the 0R100 auger test. Stripped Area 2 was 290 square feet in extent and revealed the northern edge of a Deptford midden within the A horizon. At the base of the

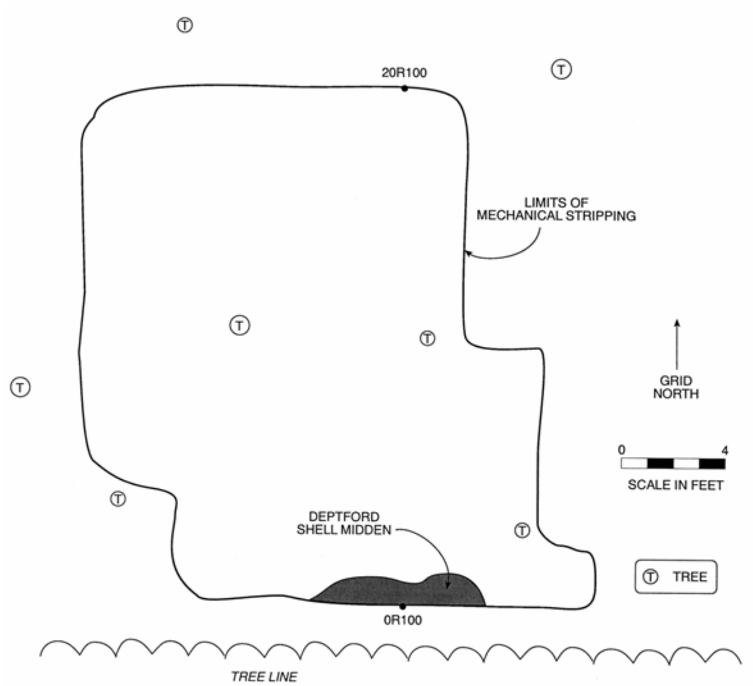

Figure 29. Plan view of Stripped Area 2 showing the Deptford midden.

midden was the subsoil characteristic of the remainder of the site. The midden extended to the south, beyond the site boundaries as originally defined and was not followed. No features, however, were found to the north.

Stripped Area 3, consisting of 280 square feet, was placed in the vicinity of the 100-140R40 auger tests that produced moderate shell. This stripped area revealed five additional shell pits – at least two very large and similar in appearance to those in the block excavation and three others that appear smaller (one possibly representing a shell-filled post hole). One of these large pits was designed Feature 5 and was sampled in order to obtain data for comparison with the block excavation area. Thom's Creek pottery was abundant in this area (which of course represents the western arm of the arc identified in Figure 25).

Features

Feature 1

Excavations began at the eastern edge of the shell lens identified in the 180R170-185 line.

The shell was removed using trowels and, where appropriate, shovels. Excavation revealed a uniform shell lens about 0.4 to 0.6 foot in depth. At the base of the shell was a zone of very dark brown (7.5YR2.5/3) sand about 0.1 to 0.2 foot that appears to represent organic leaching and light shell from above.

The feature was found to be about 7-feet in length, based on the floor, which revealed an upward slope where it was intruded into by Feature 2. The approximate center of Feature 1 was 183R179 and only 5-feet were exposed north-south.

All of the shell was removed and waterscreened through ⅛-inch mesh, allowing for excellent recovery. A total of 135.8 kg of shell were recovered from the feature, with the remains dominated by oyster (see Table 3). Artifacts from the feature include abundant Thom's Creek pottery, handpicked floral remains with large quantities of carbonized hickory nutshell, very large amounts of faunal remains with fish vertebra to 1 mm in diameter, and several coprolite fragments.

Other samples collected from the feature include a soil sample and a flotation sample. A hickory nut shell fragment was submitted to Beta Analytic for AMS dating. A soil sample was examined by Paleo Research for combined pollen and phytolith remains. Additional soil was examined by Hahn Laboratories for macronutrient analysis. The flotation sample has been processed, revealing abundant floral

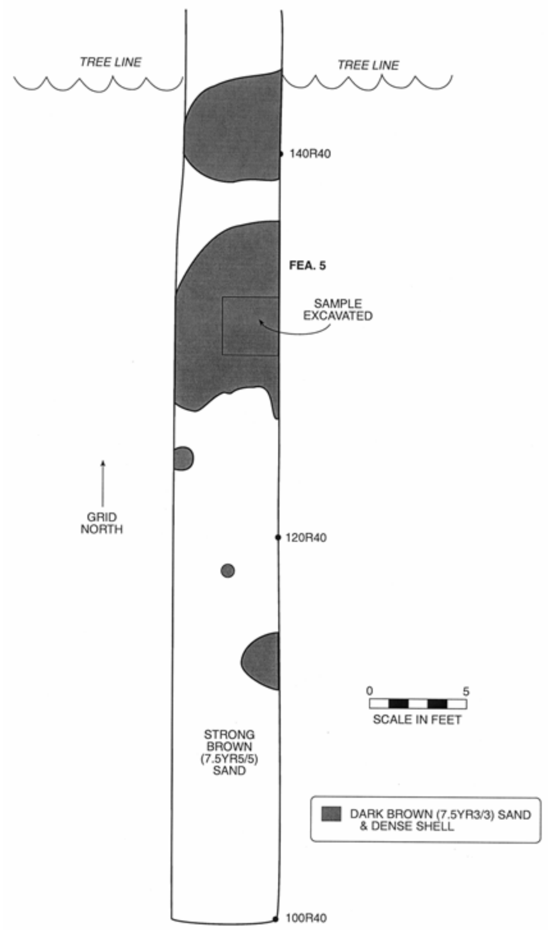

Figure 30. Plan view of Stripped Area 3.

remains. The faunal remains were examined by the Cobb Institute.

The function of features such as this has traditionally been interpreted as shell steaming or roasting pits. The failure to encounter burned or charred shells suggests that the shell was protected from the fire using green leaves and that the pits were used to contain heat that promoted the opening of the shells. This is supported by the abundant charcoal and absence of ash. Afterwards the pits served as convenient receptacles for the disposal of the shellfish.

This re-mains a reasonable explanation, at least for the abundant bivalves, such as oyster, ribbed mussel, and stout tagelus. The occurrence of large numbers of periwinkles (which cannot be processed in the same manner), however, suggests that the pit may have received more general trash. This would also serve to explain the abundant faunal remains also present.

While it is not possible to relate the contents of the feature to a single meal, the absence of lensing suggests that the pit remained open (or unfilled) for a relatively short period of time. If it does not represent a single meal, then it likely represents a very short episode of discard. This feature is, in virtually all respects, identical to the shell-filled pits of Lighthouse Point Shell Ring (Trinkley 1980: 170-172, 184-186).

Feature 2

Feature 2 intruded into Feature 1 and was found in the western end of the 180R165-185 block, with a center point at approximately

Table 3.
Shell Weights Recovered from Features

Fea	Total Shell Wt. (Kg)	Oyster Kg (%)	Periwinkle Kg (%)	Clam Kg (%)	Stout Tagelus Kg (%)	Ribbed Mussel Kg (%)	Whelk Kg (%)	Other Kg (%)
1	135.80	112.44 (82.8)	18.74 (13.8)	t	-	t	t	4.62 (3.4)
2	125.70	105.84 (84.2)	13.20 (10.5)	t	t	t	-	6.66 (5.3)
3	5.90	4.79 (81.2)	0.74 (12.5)	0.37 (6.3)	-	-	-	-
4	53.3	49.04 (92.0)	4.00 (7.5)	t	t	t	t	0.26 (0.5)
5	23.9	11.95 (50.0)	7.48 (31.3)	-	2.99 (12.5)	1.48 (6.2)	-	-
6	2.8							

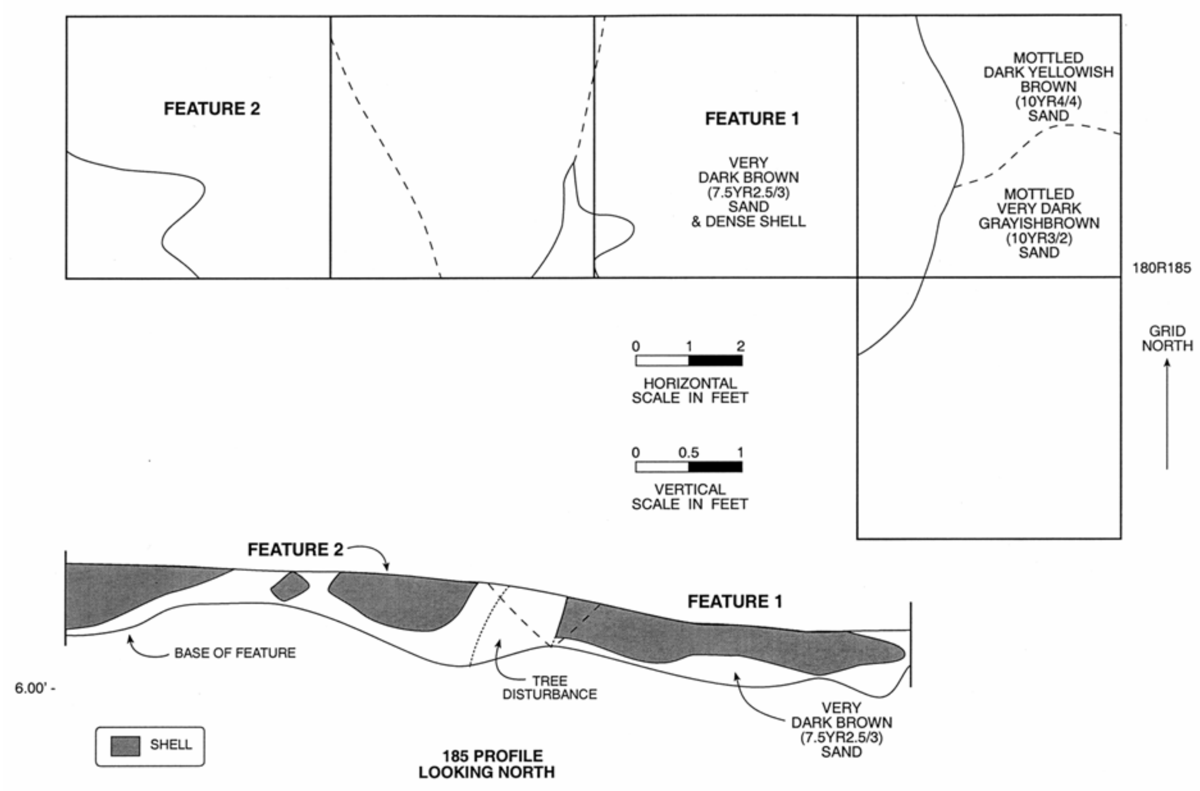

Figure 31. Plan and profile of Features 1 and 2.

182.5R173 (Figure 31). The exact boundary was blurred by the remains of a tree that had intruded through both features. Nevertheless, this feature covered about 9 feet east-west and had a depth of up to 1.02 feet. As with Feature 1 the base of the feature was undulating, with a very dark brown (7.5YR2.5/3) sand at the base.

Excavation and processing of the feature was identical to Feature 1 and the shell weights are shown in Table 3. Oyster again dominates the collection, followed by periwinkle. The function of this feature also appears to be identical to Feature 1.

Feature 3

While similar in many respects to Features 1 and 2, Feature 3 is considerably smaller, measuring only about 3.4 feet east-west and 2 feet north-south (Figure 32). The feature is centered at 170R178.5 and is bisected by the N170 profile. Upon excavation the feature was found to be basin shaped and to measure about 0.46 foot in depth. The profile reveals a single, homogenous level of dense shell, while the base consists of a dark brown (7.5YR3/2) sand with very occasional small and heavily fragmented shell fragments. There is also a lens of slightly lighter brownish yellow (10YR6/6) sand at the eastern edge.

This feature is similar to many identified at Lighthouse Point Shell Ring (Trinkley 1980:184-186), where the shell appeared to be at one edge, while the soil appeared to be raked to the opposite edge. One interpretation is that this is an artifact of opening the pit and pulling back a soil cap to recover the steamed oysters. The only clear difference is that most of the Lighthouse Point

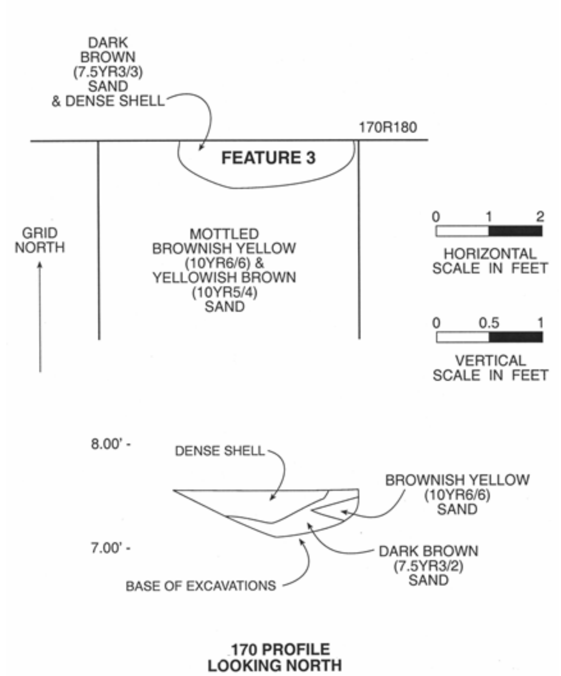

Figure 32. Plan and profile of Feature 3.

pits were far larger (similar in size to Features 1 and 2).

No radiometric dating, pollen, or phytolith studies are being conducted on Feature 3 because of its small size. A soil sample was examined for macronutrients and a flotation sample has been processed from the feature. The proportion of oyster and periwinkle is very similar to Features 1 and 2, although clam is far more common in this pit than any other on the site. Unfortunately, the shells are badly fragmented and insufficient intact edge fragments were recovered to allow seasonality studies by Claassen.

Feature 4

Feature 4 is centered at 175R180 and the exposed portion measured 6.8 feet north-south. Although bisected by the R180 line, the feature (based on stripping information) extends east-west about 5 feet – resulting in a pit that is slightly smaller than Features 1 or 2 (Figure 33). Upon excavation the feature was found to be about 1.3 feet in depth. The profile is also consistent with Features 1 and 2, exhibiting a dense and homogenous shell lens with a very dark brown (7.5YR2.5/3) sand below. The lower zone is likely the result of leaching and it contains very sparse and highly fragmented shell fragments.

The feature is dominated by oyster and periwinkle comprises a much lower proportion of the shell in this feature than the others identified at the site.

It was this feature that the Brockington Unit 201 encountered and which was interpreted to represent a midden deposit. This illustrates the problem of using small test units to interpret features.

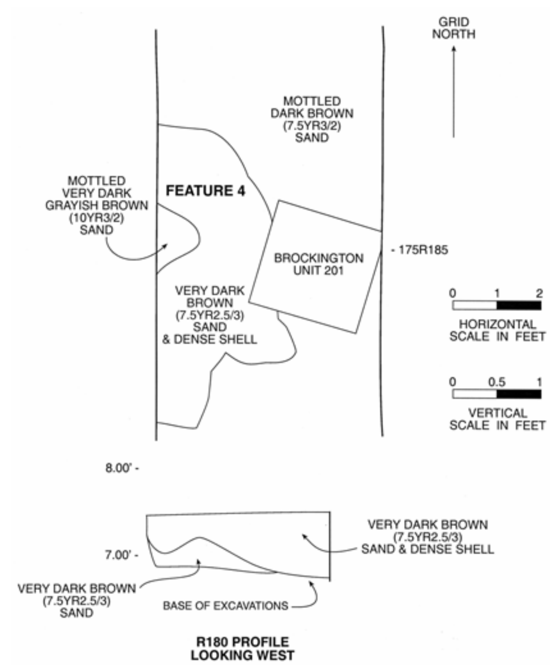

Figure 33. Plan and profile of Feature 4.

Remains from this feature are similar to those recovered from Features 1 and 2. A sample was submitted to Beta Analytic for AMS dating; additional samples were examined by Paleo Research for pollen and phytolith remains; and a soil sample was examined for macronutrients. A significant quantity of faunal remains was

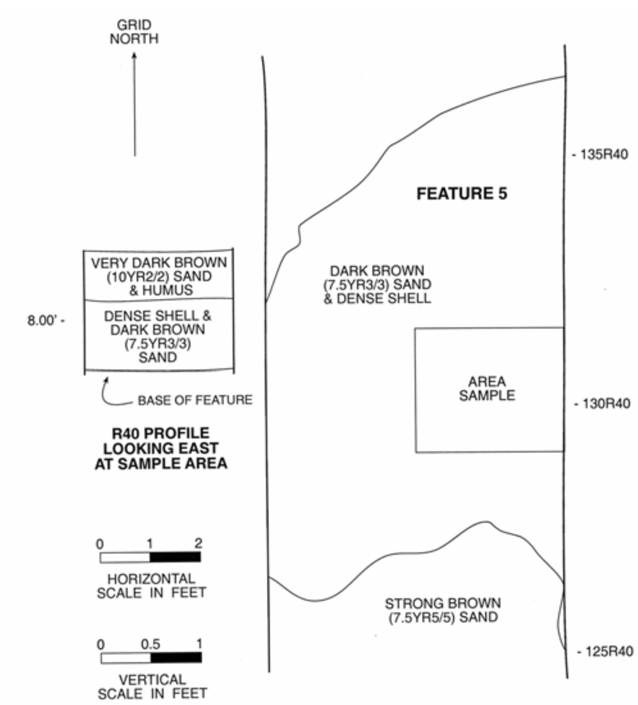

Figure 34. Plan and profile of Feature 5.

recovered through ⅛-inch waterscreening and these were submitted to the Cobb Institute. Floral remains have been recovered from water flotation.

Feature 5

This is a shell pit found in Stripped Area 3, centered at 133R37.5 (Figure 34). The exposed portion of this feature measures about 11.6 feet north-south and about 6 feet east-west. A sample measuring 2.5 feet north-south by 3-feet east-west (7.5 ft² or 16% of the total feature) was removed for waterscreening through ⅛-inch mesh.

Unlike the other shell pits, Feature 5 failed to reveal a distinct leach zone at its base. The depth of the shell was about 0.7 foot. It was also distinct from Features 1, 2, and 4 in that it was less homogenous. Oyster comprises only about 50% of the shell weight, with a substantial quantity of periwinkle and stout tagelus – both of which appeared to represent distinct dumps or clusters within the feature.

A sample from this feature was subjected to AMS dating, pollen and phytolith studies have been conducted on a soil sample, and macronutrients were examined from the soils. A collection of faunal remains were submitted to the Cobb Institute for study and a flotation sample has been examined.

Feature 6

The final feature examined in this study is centered at 190R174 and was exposed from Stripped Area 5 north of the block excavation. This feature measured 2 feet northwest-southeast by 1.4 feet northeast-southwest and consisted of light gray (2.5Y7/1) burned and crushed shell with ash surrounded by a collar of brown (10YR4/3) sand with sparse shell. Upon excavation of the southeast half, the profile revealed that the feature was 0.64 foot in depth (Figure 35).

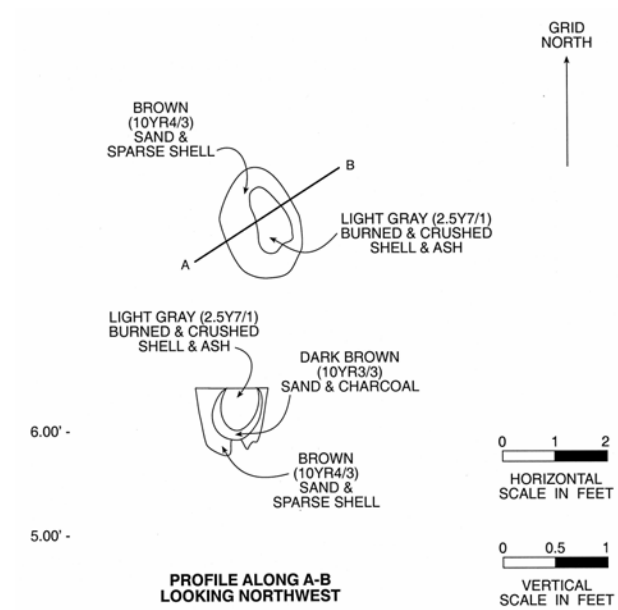

Figure 35. Plan and profile of Feature 6.

This feature is reminiscent of those identified at Lighthouse Point:

pits characterized by a smaller size, complete oxidation producing ash rather than charcoal, cemented masses of shell and ash resulting from the high burning temperature, and smaller quantities of artifacts (Trinkley 1980:184).

It was suggested that while the large shell pits were used for steaming shellfish, the ash pits might have been used for roasting or perhaps only for warmth during winter months (Trinkley 1980:186). Curiously, the two types of features studied at shell rings are found in different ring areas – the shell pits are found under and within the ring, while the ash pits are found at its inner edge.

The one pit identified at 38CH1693 does not exhibit the quantity of ash or the cemented masses identified elsewhere, but the shell is entirely crushed and burnt. Artifacts are sparse, small in size, and fire smudged. The darker soil around the feature is consistent with on-site burning.

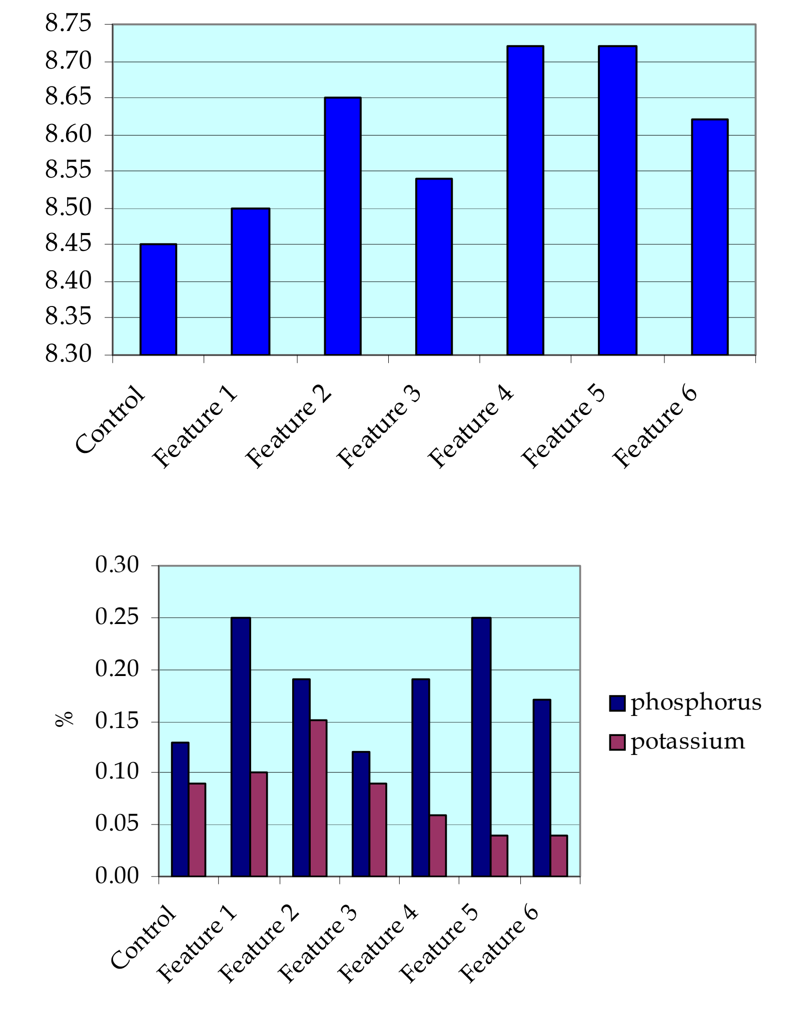

Figure 36. Soil chemistry of the 38CH1693 features. At the top is soil pH; at the bottom are potassium and phosphorus.

Samples from this feature have been submitted for phytolith study, although it seems unlikely that pollen would survive the fire. No radiometric dating is being conducted since charcoal is very sparse. Faunal remains are also uncommon and floral remains are very sparse in the flotation sample.

Soil Chemistry of Features

Soil samples from Features 1-6 were submitted to Hahn Laboratories in Columbia for analysis of pH, phosphorus, and potassium levels. The results of this work are shown in Figure 36. A control, from off the occupied site area, is also provided.

It is not surprising that the pH levels are higher in each of the features as this represents the moderating effect of the shell inclusions on the naturally acidic soil. Nor are the limited differences of concern since the pH scale is logarithmic. What is surprising is that even off site the soils are slightly alkaline. The reason for this is unclear.

The potassium levels are, at best, indeterminate. Four of the six features have levels that are equal to, or lower, than the control sample. Acidic sandy soils and acidic soils low in illites are unable to supply or fix potassium. What is added through organic debris and human occupation is rapidly leached out of the sand matrix.

The phosphorus levels provide the clearest indication of aboriginal activities. All of the shell pits except Feature 3 reveal very high levels of phosphorus when compared to the off-site control.

Deep Tests

We anticipated excavating one quadrant of each 10-foot midden unit to sterile soil. Although no midden was encountered, this still seemed to be an appropriate technique to examine soil genesis and the effects of bioturbation at the site. The work would also allow comparison to the excavation conducted in Brockington's Unit 201, where excavation was taken to a depth of about 68 cm (2.2 feet) generally in either 10 cm (0.3 foot) or 20 cm (0.6 foot) levels. Artifacts were apparently found in only the four levels. It appears that if the "shell midden" (revealed by this work to be Feature 4) is ignored, the levels below the midden contributed very few sherds and had a combined density of about 14 sherds per cubic foot (declining from 24 to 1 sherd per cubic foot).

Consequently, deep tests were excavated at units 165R165, 165R185, and 180R170, providing aerial coverage in the block excavation. Each unit was excavated in 0.2 foot levels with screening through ¼-inch mesh. In each case excavation began either at the base of the flat shoveled Level 2 or the base of the excavated feature in that unit.

165R165

This unit had no feature and excavation began about 0.8 foot below the extant ground surface. A series of eight levels (designated levels 3 through 10) were removed, taking the unit to a depth of about 2.5 feet below the surface. The density of sherds ranges from a high (in level 5) of 100 sherds per cubic foot to a low of only 3 per cubic foot (in level 10) – significantly higher than Brockington's Unit 201.

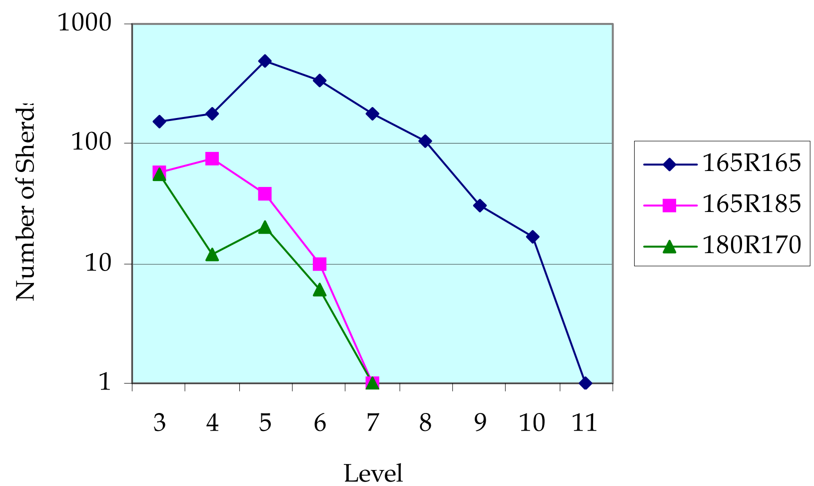

Figure 37. Sherd count by level in the deep tests.

The graph of sherds by level is shown in Figure 37, illustrating the peak in level 5 and the steady decline through the remaining levels. Artifacts were dominated by pottery, although occasional charcoal and several chert flakes were present.

The unit revealed a yellowish brown (10YR5/8) sand found in levels 3 through 9 overlying a brownish yellow (10YR6/6) sand in level 10. At the base and on the floor of the unit was a very pale brown (10YR5/4) sand. No strata or lamina were apparent.

165R185

Figure 38. Excavation of the deep test in 165R165, view to the southeast.

This unit had no features, but the base of Level 2 did reveal several tree stains that certainly contributed to the movement of artifacts through the various levels. Often, however, these stains were only clearly visible in profile. Excavation sought to block these out and excavate them separately, especially in the lower levels, to preclude the decision on sterile soil being biased by materials that might have been in the stains. This unit contained only four levels (levels 3-6) below level 2, for a total depth of 1.5 feet. The profile revealed, below the Level 1 very dark brown (10YR2/2) loamy sand, about 0.5 foot of dark yellowish brown (10YR4/4) sand that laid on a yellowish-brown (10YR5/6) sand to the base of the excavations.

Artifacts in this unit included only sherds, although small quantities of carbonized nutshell were occasionally identified. Densities in this unit range from a high of 15 sherds per cubic foot to a low of 2 – more in line with those identified from Unit 201.

180R170

The final unit investigated had a series of five levels below Level 2 and Feature 2, with artifact densities ranging from 11 sherds per cubic foot to a low of less than 1. This is the lowest density at the site and may be related to the dense, overlying shell feature.

The profile of the unit, below the shell of Feature 2, was a dark brown (10YR3/3) sand to a depth of nearly 0.5 foot, perhaps reflecting leaching from the overlying shell. Below was the yellowish brown (10YR3/2) sand observed in the other units.

Only pottery and very small quantities of floral remains were observed in the various levels – no lithics were recovered.

GEOMORPHOLOGY

Keith C. Seramur, P.G., PC

Introduction

A geomorphology investigation was conducted at 38CH1693 (Figure 1) to describe and analyze the stratigraphy, pedology, and sedimentology at the site. Soil development and particle size analyses allow us to interpret prehistoric geomorphology and evaluate the Mid- to Late-Holocene environment along the coast during site occupation. This data also provides an indication of preservation potential in these sandy deposits.

Methods

The geomorphology of 38CH1693 is described from the topographic map, aerial photograph, and field observations (Figure 39). A profile of the deep test unit located at 165R165 was described and sampled for particle size analyses (Figure 40). The descriptions follow standard soil taxonomy (Birkeland 1999, Schoeneberger et al. 1998) and geological descriptive methods (Folk 1980). Particle-size analyses were completed for eight sediment samples collected at 20 cm intervals. This analysis included determining percent sand and fines (silt and clay) and the distribution of the sand fraction.

Particle size analyses included drying, splitting, and weighing each sample using a digital torsion balance. Samples were then placed in distilled water and dispersed using a sonic dismembrator. Each sample was wet sieved through a 63-micron sieve and the sand fraction retained on the sieve was then dried. Weight of the sand fraction was divided by total dry weight of each sample to determine percent sand. Sand was dry sieved and each one-half phi size fraction was weighed and recorded. The phi grade scale ($\phi = \log2d$, where d is grain diameter in mm) is used for grain size measurements. A larger phi size represents smaller grain sizes as 4 phi is the boundary between sand and silt and –1 phi is the boundary between sand and gravel.

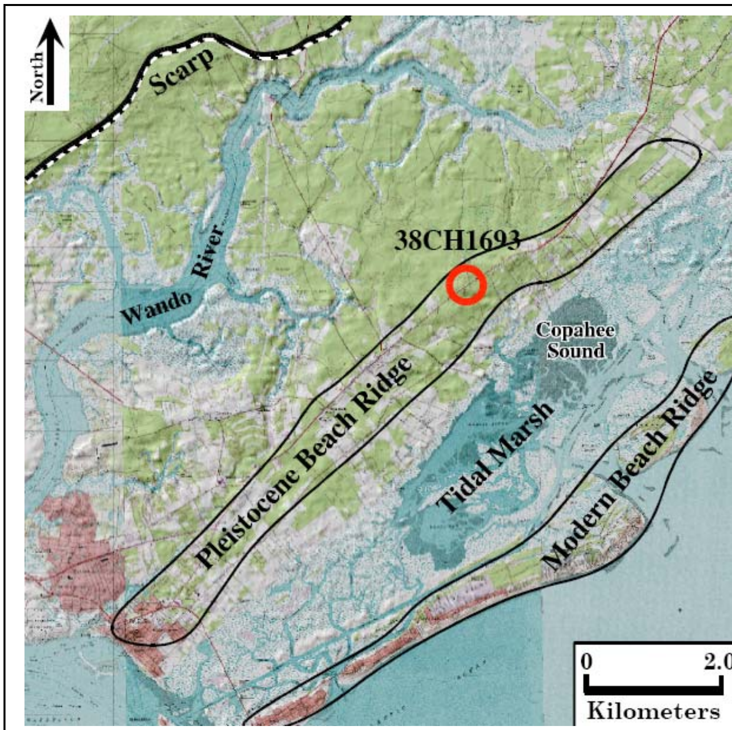

Figure 39. Small scale compilation of Geological Survey topographic maps with a hillshade overlay. This image shows the location of the Pleistocene beach ridge relative to the modern beach ridge to the southeast and the floodplain of the Wando River northwest of the site.

This scale facilitates the application of conventional statistical practices to the sedimentology data (Folk 1980). A sedimentology log is shown for this profile (Figure 41). Particle size distribution can be used to interpret processes that deposited the sediment and delineate stratigraphic boundaries based on changes in grain size with depth.

<u>Geology and Geomorphology of 38CH1693</u>

Site 38CH1693 is located on a southwest-northeast trending ridge at an approximate elevation of 25 feet above mean sea level. This is a Pleistocene beach ridge that extends along the coast for a distance of about 11 km between the mouth of the Wando River to the southwest and a paleo-tidal inlet to the northeast (Figure 39). The site is located on the southern edge of the highest point on this ridge (Figure 1). The modern beach ridge is located 2 km southeast of the Pleistocene beach ridge and a shallow tidal marsh separates the two beach ridges (Figure 39). Northwest of the site is the floodplain of the Wando River. The tides move up and down the river periodically inundating the adjacent low-lying floodplain. The Wando River and its flood channels have meandered across this floodplain and a paleochannel or older flood chute just north of the site is visible on aerial photographs. This channel is now occupied by a marsh that leads to a tidal stream about 3 km northwest of the site. The closest tidal marsh to 38CH1693 is in Copahee Sound about 700 m to southeast between the beach ridges (Figures 1 and 39).

These beach ridges formed on barrier islands that follow the southeastern coast of the U.S. They include a foreshore consisting of the beach face and berm along the shoreline and a backshore that includes an aeolian dune field. These dunes form the elevated portion of the beach ridges and 38CH1693 is located within a Pleistocene dune field. Sand in these Pleistocene Beach Ridges can be remobilized during droughts or after hurricanes when vegetation is removed.

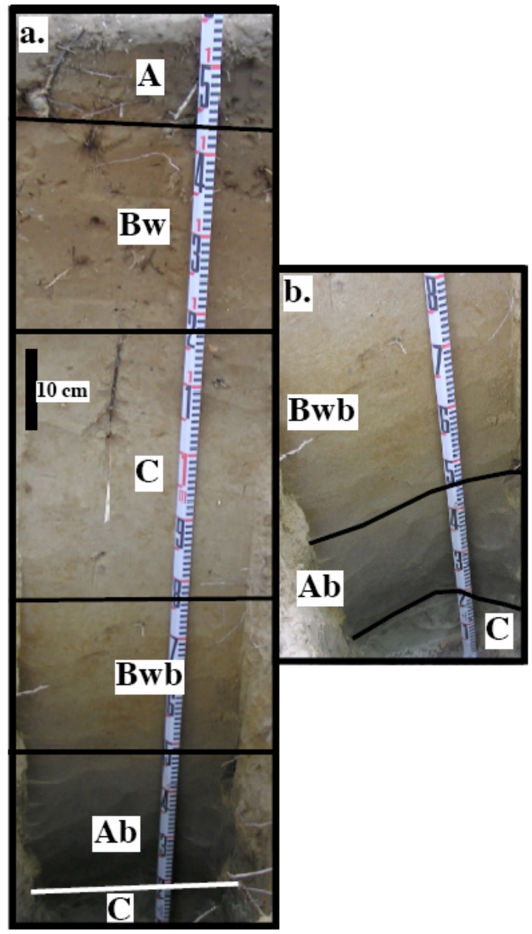

Figure 40. Deep test profile at 165R165 that was recorded and sampled during the geomorphology investigation. 3a. shows the soil horizons described down the profile and b is a closeup image of the buried A-horizon (Ab) at the base of the profile.

Modern dune fields on barrier islands migrate landward with the rising sea level. They are deposited on top of tidal marsh silt and mud and form a shallow freshwater aquifer. This is a perched aquifer with permeable sand dunes on top of low permeability silts and clays. There is a relatively steep northern slope on the Pleistocene beach ridge at 38CH1693. It drops in elevation from 25 feet on the crest to about 9 feet in elevation in the marsh. Springs can be found

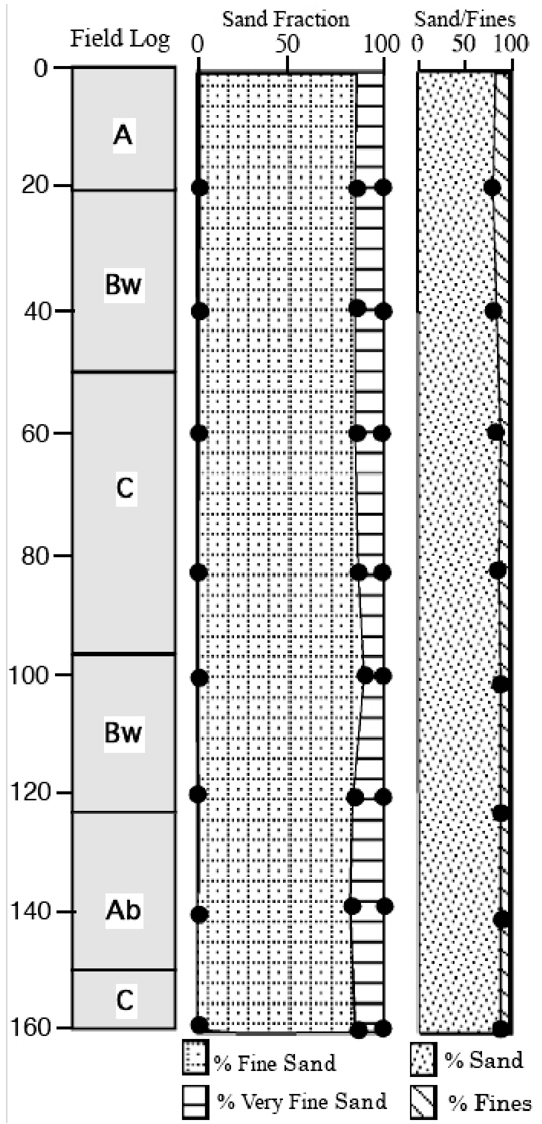

Figure 41. Field log and sedimentology log of particle-size analytical results for deep test profile at 165R165. Center log shows distribution of sand size grains. Log on right shows percent sand and fines (silt and clay)

at the base of these steep slopes where the ground surface intersects the edge of a gently sloping water table. These springs are fed by the shallow perched aquifer in the beach ridge sand.

Sea level fluctuated along the coast of the southeastern U.S. during the Holocene (Colquhoun and Brooks 1986, DePratter and Howard 1981, Stapor and Mathews 1983, Scott and Collins 1996). Most researchers agree that there was a fairly rapid rise in sea level until about 6,000 years BP when the transgression slowed. After that, sea level fluctuated over several meters and these changes are recorded in near shore geomorphology and deposits. DePratter and Howard (1981) suggest that sea level was 1.5 to 2 m below present by about 4,000 years BP Their evidence for this includes a Daws Island shell midden that extends 1.5 m below mean sea level (at 3,395 BP), and shell middens at the Bilbo site and a St. Simons Island site at 0.5 m below mean sea level. By 3,000 years BP DePratter and Howard (1981) interpret a drop in sea level between 3 m and 4 m below present mean sea level. By 2,400 BP they suggest that sea level had risen to its present elevation.

Colquhoun and Brooks (1986) constructed a sea level curve from the elevation of archaeological sites and intertidal freshwater peats. This curve shows four cycles of a rise and fall of sea level between 4,000 years BP and 2,000 BP This includes one regression from 2 m below present high marsh surface (high tide) at 4,000 BP to about 3.3 m below present high marsh surface at 3,800 to 3,900 BP The high stands along this curve appear to be well documented with the base of archaeology sites, but the low stands, based on freshwater diatoms in peat deposits, are probably less certain.

Stapor and Mathews (1983) present evidence of a higher than present sea level at Old Island in Beaufort County, SC. Here they use two wave-cut scarps to measure sea level at 80 cm and 110 cm above present mean spring high water (mshw). The 110 cm scarp is suggested to possibly correlate to high terraces on the Florida Panhandle with shell middens dating to 3,000 BP Therefore these higher terraces would be older than 3,000 BP The terrace 80 cm above mshw is younger, but was formed prior to deposition of a shell midden at about 1,600 BP

The paleo-channel or marsh north of the site is at an elevation of about 9 feet. This is 3 feet above present high tide. Sea level would have to be at least 1 m higher than today for the channel north of 38CH1963 to be inundated at high tide. This could have occurred during the high stand in sea level suggested by Stapor and Mathews (1983), but this channel was probably not deep enough or sandy enough to provide a good habitat for oyster and stout tagelus recorded at the site.

Stratigraphy and Sedimentology

A profile of the deep test unit at 165R165 was extended to a depth of 160 cm and cleaned (Figure 40). The soil at the site is an inceptisol or incipient soil consisting of an A-horizon over a weakly developed B-horizon (Bw) that exhibited a slight color change due to iron oxides. The modern A-horizon extends to a depth of 21 cm with the Bw-horizon from 21 cm to 50 cm (Figure 41). A second buried Bw-horizon (Bwb) is recorded from a depth of 95 cm to 125 cm with a buried A-horizon (Ab) below at a depth of 125 cm to 150 cm.

Sedimentology of sand on the ridge is very consistent down the profile with sediment being primarily fine sand. Silt and clay make up less than 12% of the deposits (Figure 41 and Table 4). A subtle change in particle size with depth occurs in the weight percent of the sand fraction of the 2.5, 3.0 and 3.5 phi size intervals (Table 4). The weight percents are fairly consistent down to the 100 cm sample where there is an increase in fine sand (2.5 phi) and a decrease in very fine sand (3.0 and 3.5 phi) (Table 4). The sediment is finer below this with an increase in the weight percent of the 3.0-3.5 phi size intervals along with an increase in percent silt and clay.

Results and Discussion

The buried soil horizons in this dune indicate that sediment has continued to accumulate on the Pleistocene beach ridge during the Holocene. A typical soil profile in these sandy deposits includes a sequence of A-, E-, and B-horizons. Presently, the modern A-horizon directly overlies the Bw-horizon with no E-horizon. Illuvial B-horizons occur below a zone of leaching that is referred to as the eluvial or E-horizon. The thickness of the E-horizon or depth to the top of the B-horizon is dependent on grain size, climate and other factors. In this setting the E-horizon can range from 40 cm to 100 cm. A B-horizon can migrate up through the profile as sediment accumulates on the surface of the landform. However an illuvial B-horizon does not migrate up to the base of the A-horizon because illuviation requires the downward translocation of silt and clay from the E-horizon.

Therefore, the lack of an E-horizon on this landform is interpreted to indicate that that there has been historic erosion of the surficial soils. The buried soil horizons include the Bwb-horizon and the Ab-horizon. The buried Ab-horizon represents a stable land surface that probably dates to the Early Holocene, based on the degree of ped development in the Bw-horizon above. The soil horizons recorded at 38CH1693 represent three periods of landscape stability separated by periods of aeolian sand deposition.

Coastal dunes derive sediment from the well-sorted beach sands. This beach ridge was constructed during the last high Pleistocene sea level. Holocene aeolian sand deposition most likely occurred during periods of drought or possibly after hurricane events when there was little vegetation to hold the sand in place. Wind is a very effective sorting agent that selectively eroded and transported fine and very fine sand up into the dune field. Silt and clay is winnowed from these deposits and transported past the dune field into the adjacent marsh and beyond. Stratigraphy in these aeolian deposits can be delineated by subtle changes in particle size down the profile. A slight decrease in very fine sand is shown on the sedimentology log at 100 cm followed by an increase below 120 cm (Figure 41). This change is subtle, but is consistent across the weight percentages measured in the 2.5, 3.0 and 3.5 phi size intervals

(Table 4). This change in particle size distribution occurs at the top of the buried A-horizon. Preservation of a buried A-horizon requires rapid burial before pedogenesis leaches organics from the profile. The coarser sediment above the Ab-horizon (120-100 cm) was probably deposited during an extended period of drought.

Prior to historic logging, the dune field on this Pleistocene beach ridge was an area of sediment deposition with the potential for good preservation of stratigraphy. The process of sand deposition by wind would not have disturbed the context of artifacts in the buried Thom's Creek cultural horizon. Bioturbation is always a factor and needs to be considered when assessing the vertical distribution of artifacts. However, the preservation of the two buried soil horizons and evidence of a preserved stratigraphic boundary at 100 cm indicates that cultural context of the archaeology site has not been significantly disturbed by bioturbation.

The paleochannel north of the site was probably not a suitable habitat for shellfish during the Mid- to Late Holocene based on current reconstructions of sea level change during this time. The closest tidal marsh and source of shellfish would have been Copahee Sound about 700 m southeast of the site. A spring at the base of the steep slope north of the site could have been an important source of fresh water and would have been most reliable during wetter climatic periods. The Thom's Creek and Deptford occupations probably correlate to periods when the spring was active. Aeolian sand deposition between these occupations indicates drought conditions some time between 3,700 BP and 2,500 BP The Deptford horizon could also have been buried during a Late Holocene drought, but historic erosion has deflated the surface of the dune field leaving the Deptford artifacts in the modern A-horizon.

Table 4.
Results of Particle Size Analyses, 165R165

	Wet Sieve		**Dry Sieving - Weight percent of sand fraction remaining on each sieve (sieve size shown in phi)**										
Depth (cm)	**% Sand**	**% Fines**	-1.0 phi	-0.5 phi	0 phi	0.5 phi	1.0 phi	1.5 phi	2.0 phi	2.5 phi	3.0 phi	3.5 phi	4.0 phi
20	88	12	0.46	0.01	0.03	0.10	0.14	0.31	2.92	35.47	48.99	10.23	1.80
40	89	11	0.03	0.00	0.07	0.10	0.12	0.24	2.59	35.74	48.92	10.28	1.97
60	91	9	0.00	0.00	0.01	0.02	0.05	0.19	2.45	35.99	49.31	10.21	1.77
80	93	7	0.00	0.00	0.01	0.01	0.03	0.12	2.57	38.68	47.39	9.48	1.72
100	94	6	0.00	0.00	0.00	0.01	0.01	0.08	2.39	39.23	47.74	9.10	1.44
120	93	7	0.00	0.00	0.00	0.00	0.01	0.05	1.55	34.04	51.09	11.46	1.79
140	92	8	0.00	0.00	0.00	0.00	0.02	0.07	1.51	31.09	52.30	12.83	2.17
160	93	7	0.00	0.02	0.00	0.01	0.02	0.07	2.57	39.60	45.11	10.92	1.69

Future Recommendations

A geomorphology survey of archaeology sites on the Coastal Plain is used to determine the process of site burial, identify stratigraphic boundaries, and recognize buried soil horizons that represent former stable land surfaces. Site burial in sandy Coastal Plain sediment can occur through sedimentation as well as bioturbation. If an upland site is buried in aeolian sediment then there is the potential that archaeological context and stratigraphy will be preserved. In contrast, if the site is buried in ancient marine or fluvial deposits then bioturbation is the likely process of burial and little context would be preserved. A sedimentology analysis of the deposits can differentiate between aeolian and other types of sediment.

Aeolian processes bury archaeology sites in coastal and riverine dunes. It is very difficult to identify stratigraphic horizons during a field reconnaissance because changes in the particle size distribution down the profile are quite subtle. Particle size analyses of samples collected from test units and backhoe profiles can delineate stratigraphic boundaries and assist in reconstructing the archaeological stratigraphy at Coastal Plain sites. A description and interpretation of pedogenic horizons provides data on the history of sedimentation and erosion on a landform. Missing soil horizons indicate periods of erosion and buried soil profiles document episodes of sedimentation and possibly burial of cultural horizons. Buried A-horizons represent a former stable land surface that could have been occupied by Native Americans. These horizons are buried rapidly and have good potential for preservation of cultural context.

These are some of the issues that can be addressed through geomorphology surveys. Other specialized studies can be designed to address specific archaeological questions using geochemistry, petrology, and microscopy.

ARTIFACTS

Pottery

Methods

Perhaps the most fundamental issue with pottery analysis is *quantification*. Without some way of measuring ceramic quantity it is impossible to move on to other issues, such as typology or seriation. In South Carolina weights or some variation on minimum number of vessels have been used occasionally (see Orton et al. 1993 for a more thorough discussion of these different techniques). The most common approach, however, is to count the sherds.

We have previously used the concept of the estimated vessel equivalent (eve). Orten et al. (1993:172) suggest this is the least biased, most accurate approximation of the proportion of the different types present. Unfortunately, this approach has never gained wide-spread acceptance and thus provides data that is not immediately comparable to other research. Thus, for this study we are relying on counts.

Moving on to the actual analysis, we have chosen to concentrate on paste analysis, coupled with examination of the surface decoration, and form (i.e., the shape of the vessel). Each of these has been suggested by previous research to be a significant characteristic.

The paste studies will concentrate on three areas:

- Temper Size: based on a freshly broken section and defined as very fine (<0.08mm), fine (0.08-0.43mm), medium (0.43-2.0mm), coarse (2.0-4.8mm), and very coarse (>4.8mm) using the Unified Soil Classification System (USCS). This was judged using lower power (7 to 30x) magnification.

- Temper Shape, also known as "rounding": with the inclusions defined as angular (particles have sharp edges and relatively plane sides with unpolished surfaces), subangular (particles are similar to angular description, but have rounded edges), or rounded (particles have smoothly curved sides and no edges). These determinations were made using a geotechnical gauge chart.

- Frequency of Inclusions: using a three point scale of abundant, moderate, or sparse. These can be estimated by reference to percentage inclusion estimation charts (see Mathew et al. 1991), with 30% or more being abundant, ranges of 10 to 20% being moderate, and 5% being sparse.

Although many other areas of study are possible, we have not found other features to be particularly revealing. These data are similar to information collected recently by Saunders (2002:130) from Fig Island.

Other vessel studies, such as form, function, and decorative motif examinations will concentrate on a smaller constellation of essential features:

- Bivalve smoothing: the presence of bivalve (probably cockle) smoothing was noted as present (indicated by parallel striations) or absent on both the interior and exterior of the sherd.

- Rim diameter: measured in centimeters when a reliable arc was present.

- Thickness: following common practice this measurement was taken 3 cm below the rim and expressed in mm. When this portion of the vessel was not present, no thickness measurement was taken. Clearly, much of the diversity in thickness found in the literature must be from measurements taken on body sherds, which may represent virtually any part of the vessel.

- Rim or shoulder form: defined as straight, slightly incurving, or slightly outcurving.

- Shape of lip: following previous investigations (Trinkley 1976c) these were defined as flat (Type I), rounded (Type II), straight interior wall and gently rounded exterior wall (Type III), gently rounded interior wall and a straight exterior wall (Type IV), interior flange (Type V), exterior flange (Type VI). These were based on a more elaborate scheme developed by Phelps (1968) and have been illustrated in this study as Figure 12.

- Type: defined based on the descriptions provided by Trinkley (1976c) and revised in Trinkley (1980c), these included Thom's Creek Plain, Thom's Creek Finger Pinched, Thom's Creek Reed Punctate, and Thom's Creek Shell Punctate. Thom's Creek Finger Impressed, while briefly mentioned in several previous studies, has not been formally defined prior to this work.

A final area of examination was the recordation of either interior or exterior charring on the sherds. Interior charring might represent burn food residues, while exterior charring might indicate the pot was used over an open fire (see, for example, Sassaman 1993a:150-154).

Findings

The collection includes 1,230 sherds that were over 1-inch in diameter and subjected to analysis. Given the relatively small assemblage, all proveniences were combined for the typological analysis.

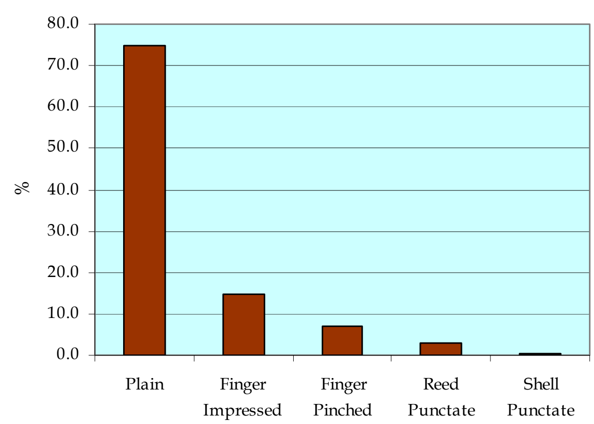

Figure 42. Thom's Creek types identified from 38CH1693.

The most abundant pottery was identified as Thom's Creek Plain, accounting for 75% of the collection (n=923). The next most abundant pottery was the previously undescribed Thom's Creek Finger Impressed, accounting for 14.8% (n=182). Thom's Creek Finger Pinched accounted for 7% (n=86). Thom's Creek Reed Punctate accounted for 3% (n=37). Only two Thom's Creek Shell Punctate sherds were identified in the collection (0.2%).

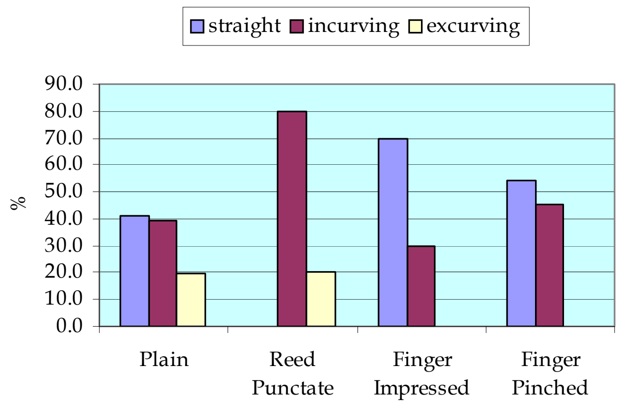

Figure 43. Rim forms at 38CH1693.

As Figure 43 reveals, the mean thickness of the pottery for each type was very similar – about 8 mm. The mode for Thom's Creek Plain (the only collection suitable for modal analysis) was 6.7 mm. The range of minimum and maximum thickness varied considerably, although this is attributable to the small sample sizes. For the largest assemblage, Thom's Creek Plain, the range was from 5.2 to 13.7 mm.

The collection is therefore not appreciably different from the type description, where Thom's Creek Plain sherds have a range from 5 to 16 mm, with a mean of 8.4mm and a mode of 8.0mm. (Trinkley 1976c:58).

If all of the rims are combined, the most common lip shape is rounded (Type II) form, accounting for 58.5% of the collection. It is followed by the flattened lip (Type I), which accounts for 30.1%. Types V and VI, both exhibiting flanges, are equally represented in the collections, each accounting for 4.9% of the total. Finally, the Type III lip with a straight interior wall and gently rounded exterior wall is a minority, found on only 1.6% of the assemblage. The only notable deviation from this pattern is found in the relatively small collection of Thom's Creek Finger Pinched sherds, where Type I rims are the most common, comprising 54.5% of the collection. The Thom's Creek Finger Impressed type exhibit lip form proportions that are more closely aligned with those associated with Thom's Creek Plain than the Finger Pinched wares (35% of the collection consists of Type I lips and 60% are Type II lips).

Again this is within the parameters of the original type description. Plain wares were dominated by Types I and II, with the remaining lip forms accounting for about 20% (more than in the current study) (Trinkley 1976c:58). The Thom's Creek Finger Pinched type description (Trinkley 1976c:51) note that the only lip forms found are I and II, with both occurring about equally -- almost identical to the findings of this study.

When we look at rim form, however, it appears that the Thom's Creek Plain and Thom's Creek Reed Punctate are more similar to each other, while the Finger Pinched and Finger Impressed wares have a more common form.

The plain and reed punctate sherds both have around 20% excurvate rims – a style that is not found on either the finger pinched or finger impressed types at 38CH1693. For both of these latter styles, the straight rim is the predominate form found. These findings are different from those originally reported for the Thom's Creek Series. The plain wares are reported to have straight to excurvate, rarely incurving; while the finger pinched pottery was reported to have straight to slightly excurvate rims (Trinkley 1986c:51, 58).

Although Sassaman (1993a:141-142) associated rim form with convection heat loss and thus functionality for heating, it may be that the slight amount of curvature of the vessel walls exhibited in the Thom's Creek collections are not sufficient to make a significant difference. In fact, none of the examples from 38CH1693 are dramatically in or out flaring. All are more – or less – straight sided, with some minor degree of flare.

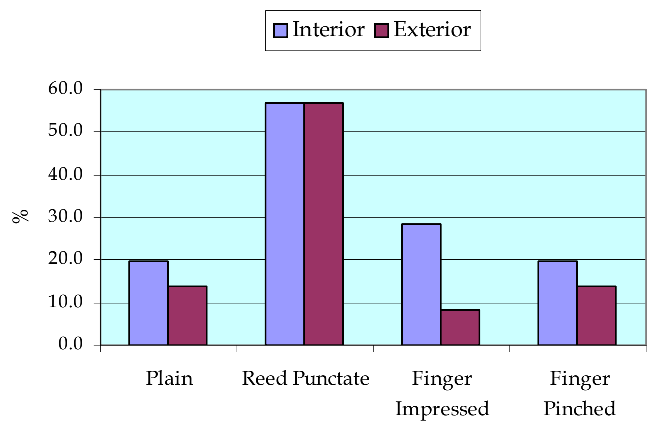

Figure 44. Presence of bivalve smoothing ("shell scraping") on sherds from 38CH1693.

We also examined the rim diameters for the vessels present at 38CH1693. As revealed by Table 5 there is considerable similarity across surface treatments. The mean and minimum diameters vary by only 3 cm, while the other measurements are identical. All of the vessels at this site appear intended for the processing or cooking of family-sized meals. The sizes identified at 38CH1693 are consistent with those projected for the type (Trinkley 1976c).

The recent work at Fig Island revealed greater variation, with diameters "between 12 and 46 cm with no clear modal value(s)" (Sanders 2002:138). The consistency at 38CH1693 and the variation at Fig Island suggest a fundamental functional difference between the two occupations.

Table 5.
Vessel Diameters (in cm)

	Mean	Mode	Min	Max
Plain (n=57)	34	41	15	41
Reed Punctate (n=3)	32			
Finger Impressed (n=18)	35	41	18	41
Finger Pinched (n=10)	33	41	18	41

We found no evidence of interior or exterior carbon deposits on the sherds from 38CH1693. Since the process that promotes the preservation of such remains is not well understood, it is difficult to suggest that Thom's Creek vessels (unlike the Stallings examples examined by Sassaman [1993a:150]) fail to exhibit evidence of open fire cooking. Rather we may simply not have site conditions that promoted preservation.

Sassaman (1993a:178) also suggests that shell scraping was intended to "thin vessel walls or at least to achieve uniform wall thickness." He related the desire to thin the vessel walls with sooting with the two traits, in turn, providing evidence of thermal efficiency.

If we ignore the very small sample of reed punctate sherds, then at 38CH1693 around 20 to 30% of the interiors exhibit scraping and 8 to 14% of the exteriors exhibit this treatment. This is higher than found during the development of the Thom's Creek series (Trinkley 1976c:41), but true to the initial study, the proportion of finger pinched sherds that were scraped is higher than plain wares and throughout the assemblage it is more typical of the interior to be scraped than the exterior.

While some variations are seen in these examinations of vessel forms and other attributes, the paste of the Thom's Creek material at 38CH1693 is rather uniform – perhaps suggesting that all of the potters were using the same clay source and preparation techniques were uniform throughout the group. This limited variability may also suggest a rather small group.

The sand temper size is dominated by fine and medium inclusions, almost exclusively quartz. When the graphs of sand size for plain and finger impressed sherds are compared they are nearly identical, strongly suggesting that the clay sources were the same for the different wares.

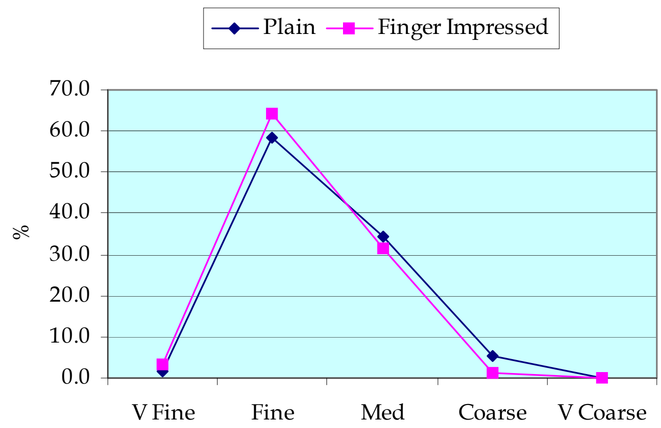

Figure 45. Comparison of sand temper size of plain and finger impressed wares.

The curves are also suggestive of moderately well sorted sand, suggesting relatively little modification of the clay source. The bulk of the sand is subangular (97.6% of the plain sherds exhibit subangular, but not crushed, sand). Taken together these characteristics are typical of a sediment that is submature.

The bulk (41%) of the plain sherds exhibit a paste where the sand inclusions comprise about 10-20%. In about a third of the sherds the sandy inclusions comprise 30% or more of the paste. The finger impressed sherds exhibit a very similar distribution of inclusions, with the bulk of the sherds (42%) revealing 10-20% inclusions. Thus, while the sand is not especially large in size, it is abundant and generally well distributed throughout the paste. This results in the paste feeling "sandy."

These observations do not change the impression – never validated through petrographic analysis – that Thom's Creek is essentially non-tempered. We believe that we are seeing evidence of native clays with probably little preparation. The result is a sandy paste, but one that is not artificially tempered through the addition of specially selected sands.

Table 6.
Pottery Assemblages and Radiocarbon Dates

	Fig Island Combined	Fig Island 1	Lighthouse Point Ring	Stratton Place	38CH1693	Sewee
Plain	51.3	58.6	82	77	75.0	92
Punctated	38.0	23.2	8	5	0.2	<1
Drag and Jab	6.8	16.4	1	1	0.0	0
Finger Pinched	1.6	0.9	8	17	7.0	2
Finger Impressed	0.0	0.0	0	1	14.8	4
Radiocarbon Date Average	3954		3247		3802	3935

Fig Island – Sanders (1992:135, 139)
Lighthouse Point – Trinkley (1980b:194)
Stratton Place – Trinkley (1980b:261)
Sewee – Russo and Heide 2003:17

Punctate includes both Thom's Creek Reed Punctated and Thom's Creek Shell Punctated

Conclusions

The Thom's Creek pottery from 38CH1693 – with the exception of those sherds identified as Thom's Creek Finger Impressed – easily fit the previous established typology for this ware (Trinkley 1986c). In addition, the pottery at 38CH1693, regardless of surface treatment or location on the site, appears to have been produced using very similar clay sources and techniques. This homogeneity at the site extends even to vessel form, with very little variability exhibited in vessel diameters.

Table 6 compares several sites with good collections and radiocarbon dates. While Fig Island is only 150 years older than 38CH1693, the site exhibits a very different assemblage. The Sewee Ring, situated northeast of 38CH1693 reveals an assemblage that is closer in appearance, but is also nearly 150 years old (similar in age to the Fig Island rings). It appears

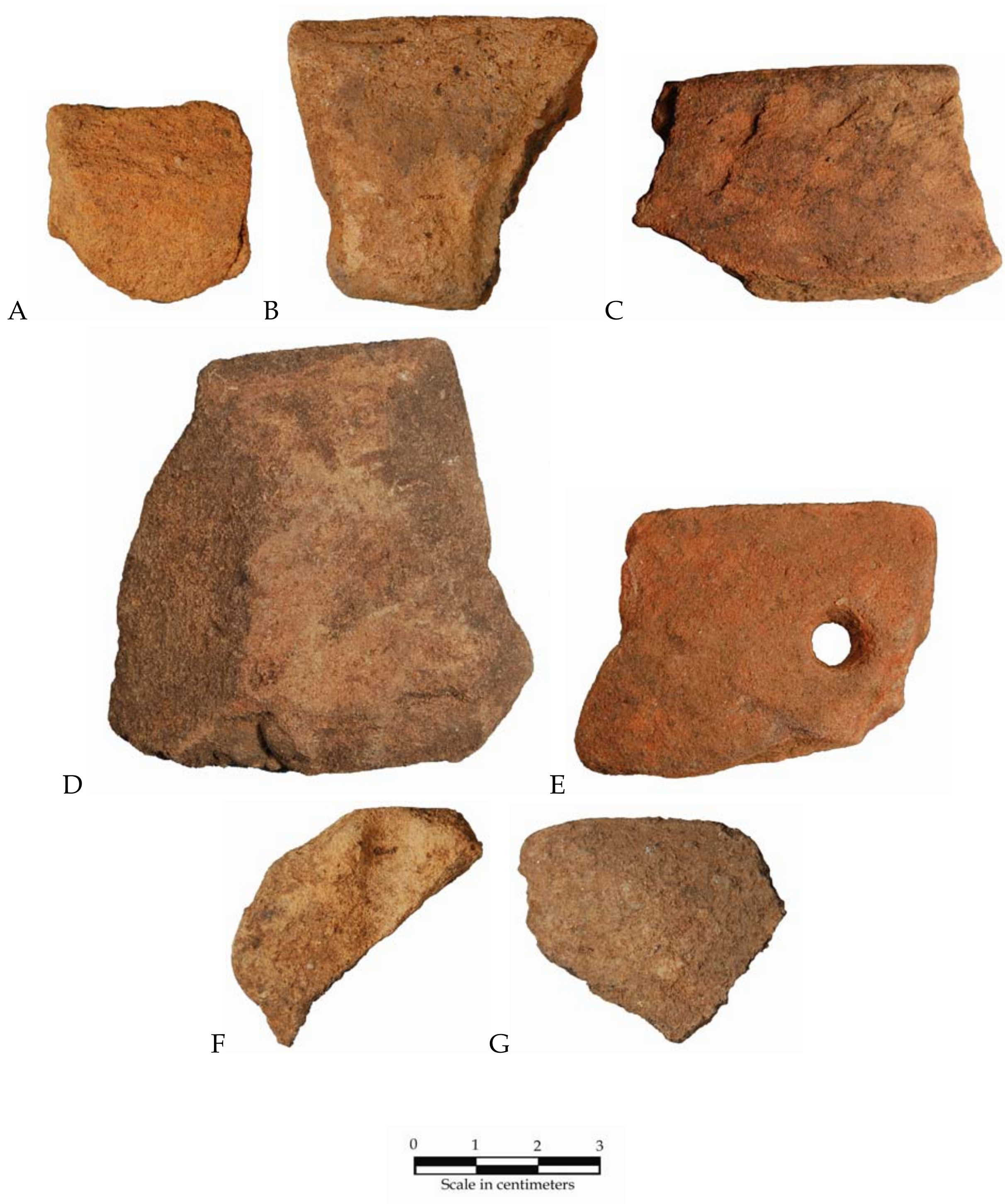

Figure 46. A-C, Thom's Creek Plain rims, hones; D-E, Thom's Creek Plain rims, E exhibits a mending hole; F-G, Thom's Creek Plain rims, abraders.

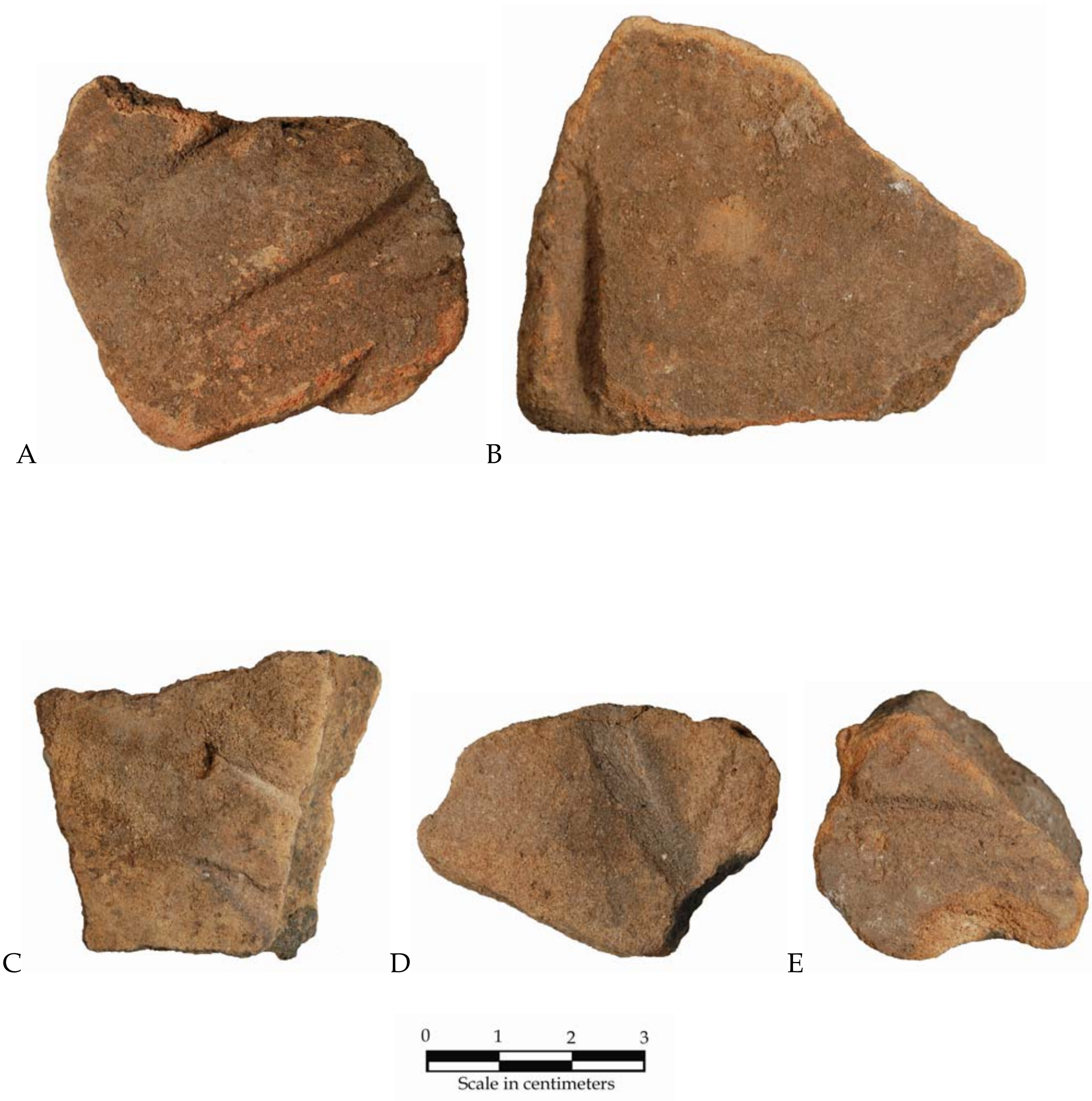

Figure 47. A-E, Thom's Creek Plain, abraders.

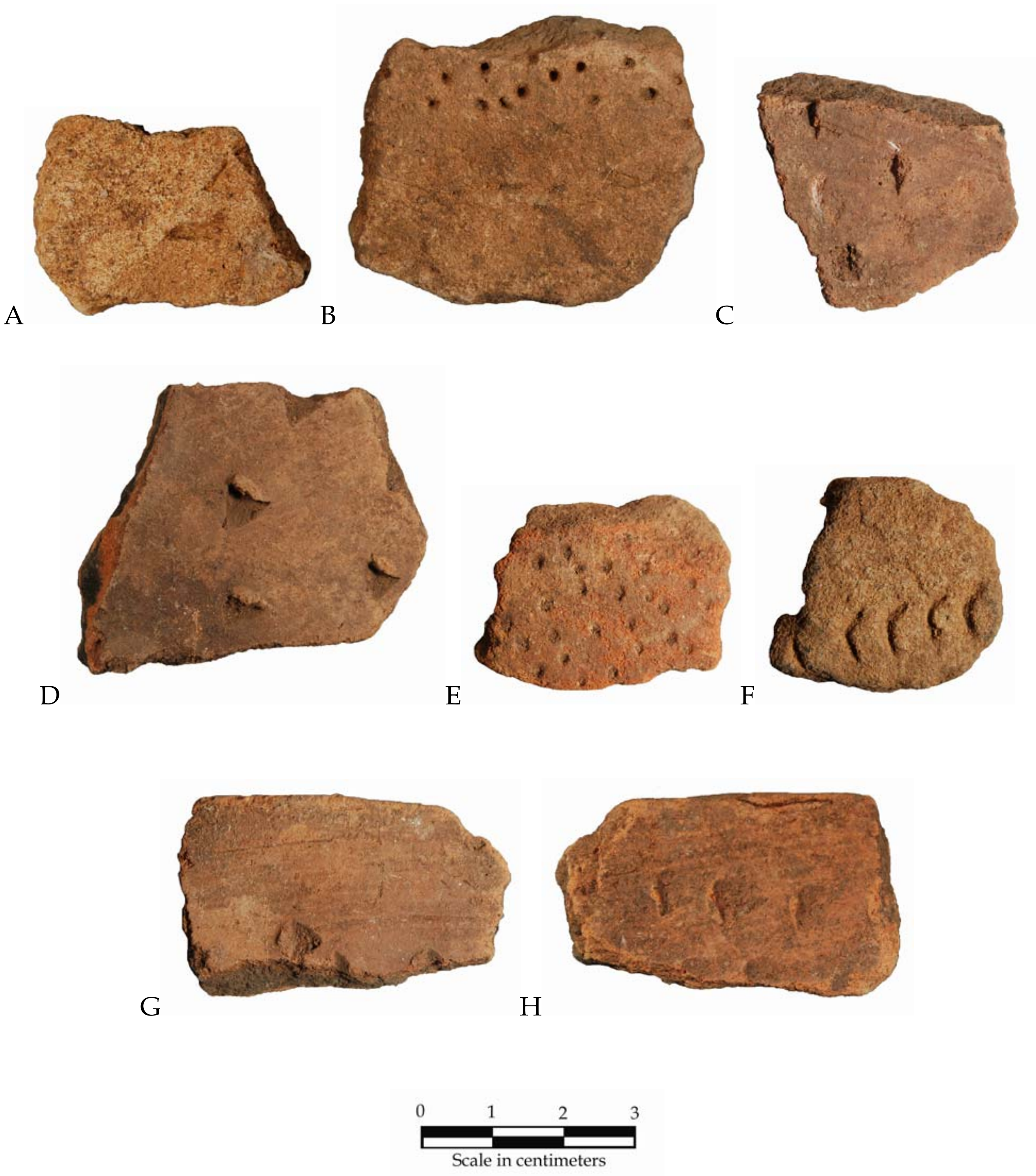

Figure 48. A, Thom's Creek Reed Punctate, hone; B-F, Thom's Creek Reed Punctate; G-H, Thom's Creek Reed Punctate, showing treatment on the exterior and interior (which is also shell scraped).

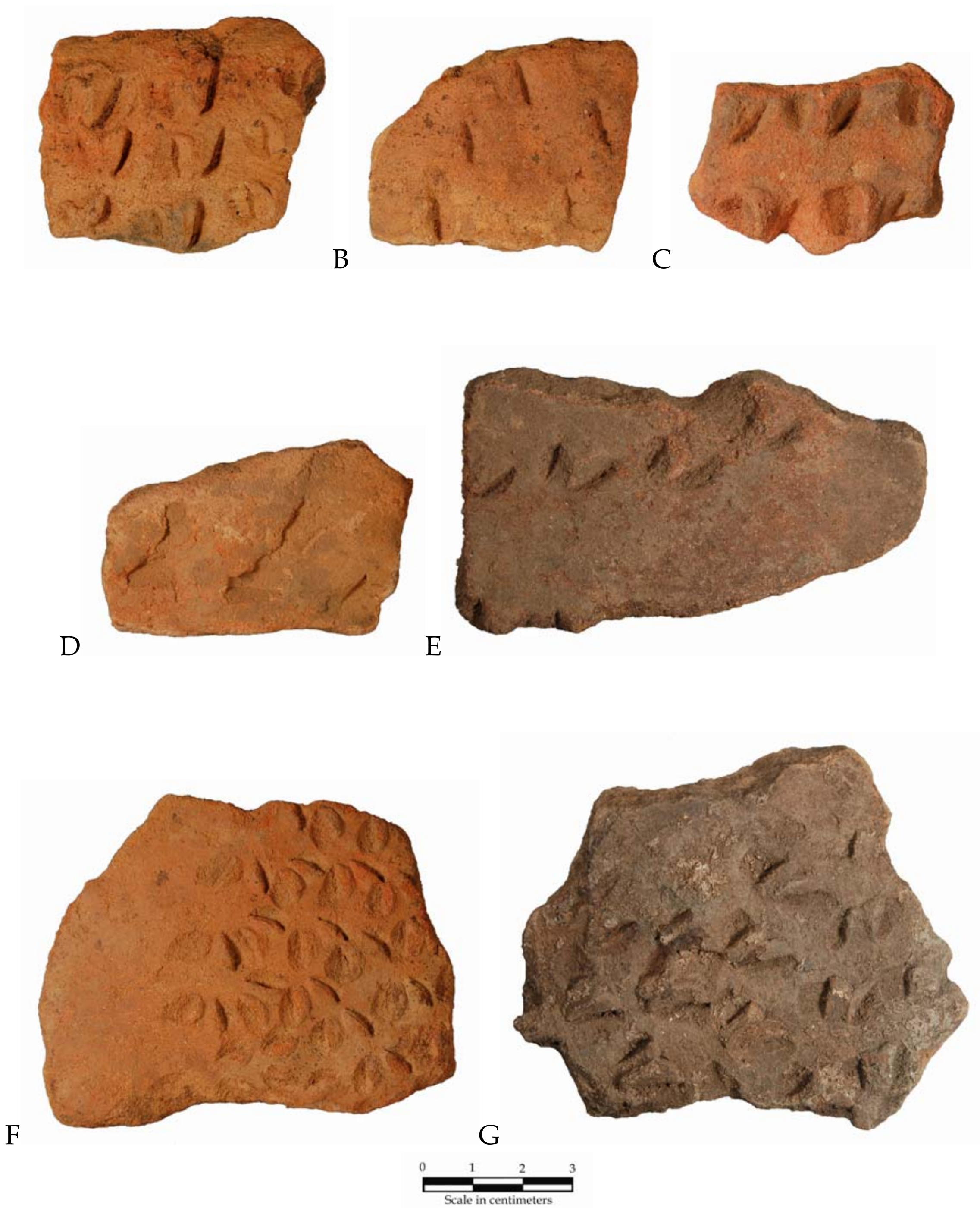

Figure 49. A-G, Thom's Creek Finger Pinched.

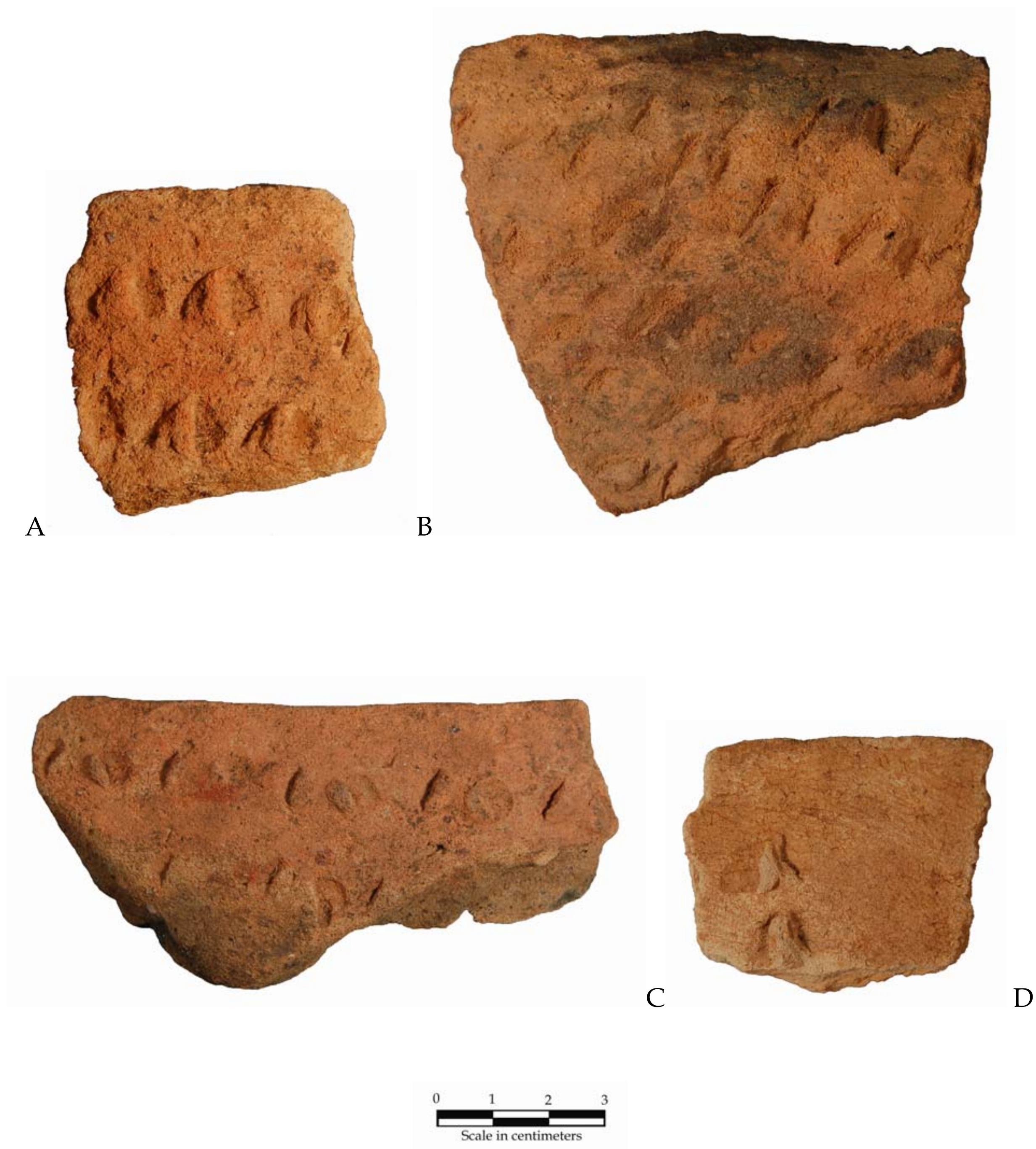

Figure 50. A-D, Thom's Creek Finger Pinched, rims.

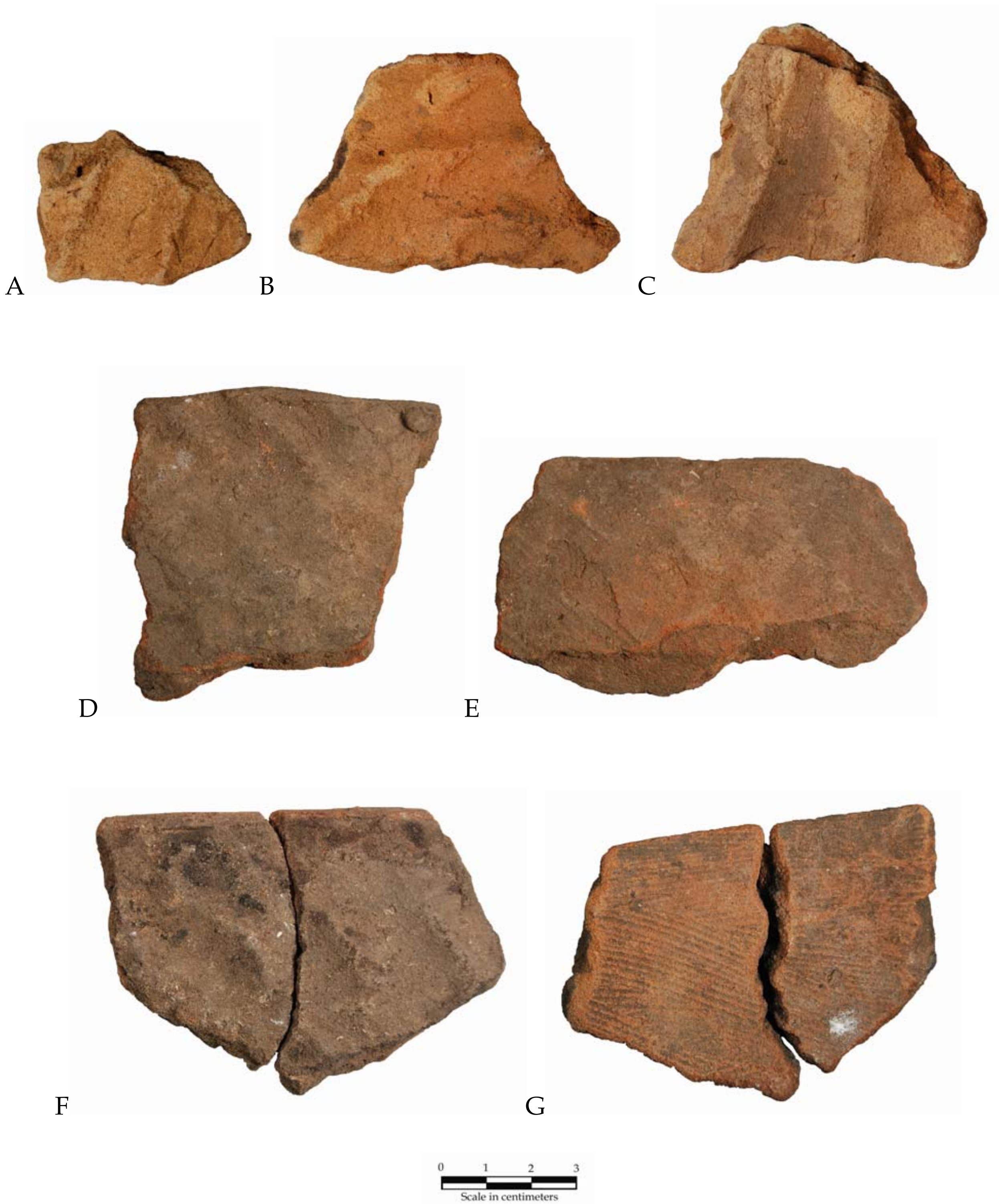

Figure 51. A-C, Thom's Creek Finger Impressed; D-E, Thom's Creek Finger Impressed, rim; F-G, Thom's Creek Finger Impressed, rim, exterior and interior.

that the assemblage is varying with movement northward more than it is varying temporally. This presents an opportunity for additional research and clearly reveals the need for additional radiometric dating.

Baked Clay Objects

Four baked clay objects were recovered from the excavations at 38CH1693, three fragments from excavation units and one from Feature 2. None of the specimens were intact and, as revealed by Table 7 and Figure 52, they were largely fragmented (although one does exhibit parallel grooves on one surface). All appear to have been typical of the amorphous lumps or balls that are most frequently found associated with Thom's Creek sites, typically in small numbers.

Table 7.
Baked Clay Objects

Provenience	Size (mm)	Weight (g)
165R180, Lv 2	15x15x20	6.0
165R185, Lv 2	25x30x15	13.5
165R185, Lv 2	25x25x15	11.5
Feature 2	30x35x25	27.5

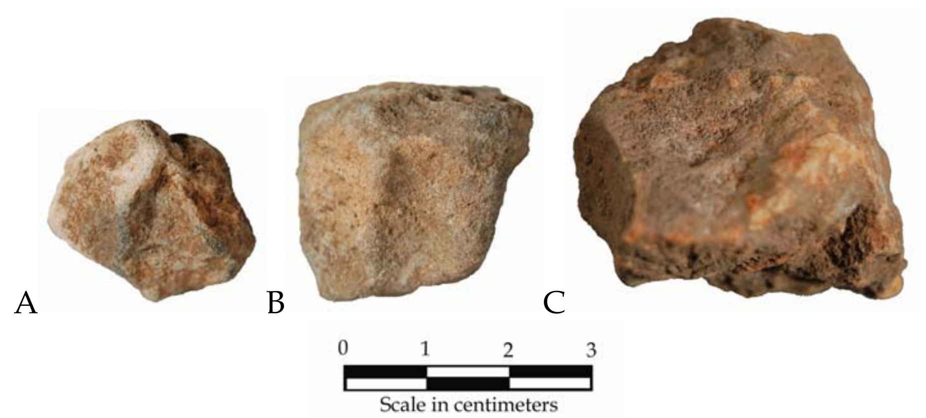

Figure 52. Fragments of baked clay objects from 38CH1693.

Sassaman (1993a:133) postulates that these objects were cooking "stones," having the functional equivalence of steatite disks. He also suggests that their occurrence with pottery indicates the technology of indirect cooking continued to at least 3,700 B.P. (nearly 3,900 B.P. based on the 38CH1693 data).

The examples from 38CH1693 have paste that appears identical to the pottery, suggesting the same clay source was used for both items. The paste consists of very fine to medium sand, all of which is subangular. The frequency of sand inclusions ranges from 0-5% to >30%. The fragments are all approximately the same size – in each case suggesting that the ball fragmented or shattered, perhaps as a result of repeated use.

The sample size is so small and the context of the finds is so varied that we can add little concerning Sassaman's conclusions concerning these items, other than to reiterate that at most Thom's Creek sites we have studied, these baked clay objects are consistently a minority artifacts.

Abraders and Hones

This type of wear on Thom's Creek sherds has been discussed in the context of previous investigations. We noted that it could be divided into two broad categories – distinct grooves 5 to 10 mm in width suggestive of forming and shaping bone and wood (which we call abraders) and those sherds with broader, more shallow grooves or edge damage (which we call hones).

Abraders

Sixteen sherds reveal evidence that is consistent with our definition of an abrader and the measurements for these specimens are

Table 8.
Measurements (in mm) of abraders at 38CH1693

Provenience	Width	Depth	Length	Notes
165R165, Lv 5	7.77	3.02	28.73	very uniform, smooth
165R170, Lv 2	6.16	4.77	15.35	conical, coarse
165R180, Lv 2	8.28	3.91	22.46	conical, coarse
165R185, Lv 2	4.61	1.85	34.08	thin, conical, coarse
	1.77	1.34	13.32	thin, conical, coarse
	1.21	0.77	14.43	thin, needle-like
	6.86	1.81	24.20	conical, flat on one edge
165R185, Lv 3	4.87	1.42	14.40	conical, coarse
	2.57	1.53	12.60	conical, coarse
	6.99	2.71	49.42	conical, coarse
180R185, Lv 2	7.13	3.28	37.94	conical, coarse
Feature 2	5.07	2.18	36.85	conical, coarse
	6.21	0.96	38.97	conical, coarse
	4.69	1.63	26.68	conical, coarse
Feature 3	7.13	2.07	27.55	conical, coarse
	5.76	5.63	27.53	conical, coarse
Mean	5.44	2.43		

provided in Table 8. Figure 53 reveals that 13 of these specimens have grooves that are approximately 4 to 8 mm in width. These 13 specimens have a mean width of 6.27 mm and a mean depth of 2.71 mm.

There are three outliers, however, that cluster together and appear to have very narrow and shallow grooves – for these the mean width is 1.85 mm and the mean depth is 1.21 mm. We do not believe that these represent a different activity; rather they are the tips of the abrasion process. Reference to Table 8 reveals that these specimens are among the shortest of the use patterns.

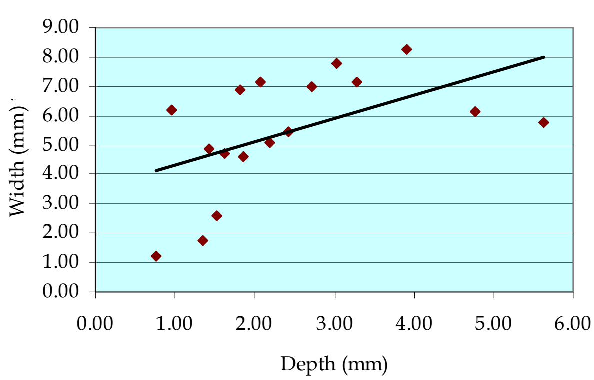

Figure 53. Plot of abrader depths and widths with a linear trend line.

A brief experiment was conducted to determine if there were visible differences between abraders used on wood (fresh red cedar) and those used on bone (green, split deer bone). Those abraders used on bone exhibited very smooth surface textures (at magnifications of 7x to 30x); those used on wood exhibited striations in the sides of the grooves. Why the wood pulled at the sherd inclusions and created striations is not known at present, but the results were consistent.

The shape of the groove does not appear to correlate with the material used to produce the groove. Instead it appears dependent on the width of the material and the technique.

When archaeological specimens were similarly examined under low magnification we failed to find any evidence of the striations associated with wood. Unfortunately, many of the samples were eroded, so it is possible that this erosion – resulting from deposition and soil actions – may have obliterated evidence of the sherds being used to smooth or shape wood.

Nevertheless, the presence of these items is of interest since the excavations at the site failed to identify any worked pin fragments (and very little worked bone of any description). The only evidence of bone pins appears to consist of these abraders.

Hones

An additional 11 sherds fall into the category we describe as hones (Table 9). The most common variety is the Type II hone, defined as exhibiting faceted edge damage. This damage results in a flat edge with no rounding. Thomas and Larsen note that this wear is rare at Deptford sites; they also note that it indicates a "steady back-and-forth pressure at a constant angle against a resistant surface" (Thomas and Larsen 1979:45). This is suggestive of rasping action, perhaps for smoothing wood or flat bone.

Table 9.
Hones at 38CH1693

Type	No. (%)
I – acute, rounded edge	1 (8.3)
II – faceted edge damage	5 (41.7)
III – flat surface abrasion	4 (33.3)
IV – shallow groove	2 (16.7)

The next most common is the Type III hone, identified as having flat surface abrasion, consistent with the sherd being used as a sanding block. Thomas and Larsen suggest this damage results from "a light sandpapering action on any flat, fairly soft surface" (Thomas and Larsen 1979:45).

Conclusions

Unfortunately, detailed analyses of hones have not been undertaken at similar Thom's Creek sites. In fact, often hones are not distinguished from abraders.

Nevertheless, the ratio of sherd tools to sherds is 1:45 at 38CH1693. At the Kiawah Island Bass Pond site (38CH124) the ratio was found to be nearly identical at 1:47 (Trinkley 1993:161). The ratio is 1:32 at Lighthouse Point (Trinkley 1980b:203). The only dramatic departure is found at Stratton Place where tabulations are available only for a limited sample directly on the ring edge. There the ratio is 1:380 (Trinkley 1980b:265-266), although it is almost certainly affected by the sample location. If excluded, we have a mean ratio of 1:41.

What is more interesting is that worked bone is not well preserved at 38CH1693, evidence of it having been worked is preserved in the sherd abraders. Similarly, the sherd hones are evidence of other, less well understood, types of activities.

<u>Worked Bone</u>

Four examples of worked bone were identified in the collection. The tip of a worked antler was recovered from Feature 3. It measures 37 mm in length and at its widest is 12 mm (Figure 54).

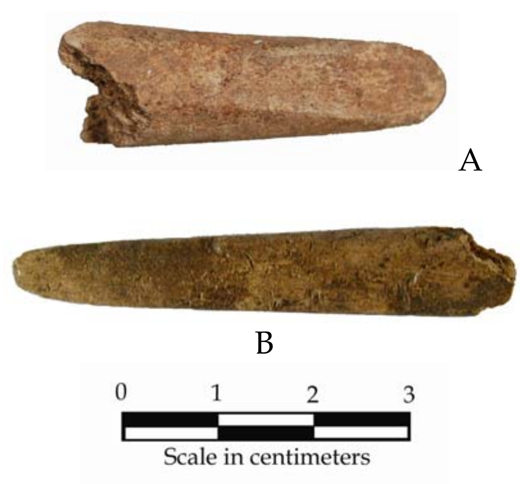

Figure 54. Worked bone. A. tip of probable socketed antler projectile point; B. tip of bone pin.

The specimen is identical to intact specimens of socketed antler project points (Trinkley 1980b:219). Most previous specimens have been under 80 mm, so the 38CH1693 example may represent about one-half of the original, perhaps breaking at the socket – a common occurrence.

Under low magnification (7x), striations are clearly visible parallel to the shaft of the antler. Based on our experimental work, this is consistent with polishing using sherd hones.

The tip and side of the antler had been damaged and repolished. Additional damage at the tip appears to be more consistent with abrasion than with shattering, suggesting that the item may have been used as a gig, with abrasion against sandy bottoms.

Two additional worked antler fragments were recovered from Feature 1. Both represent mid-shafts, limiting the amount of analysis. One measures 31 mm in length and 10 mm in diameter; the other measures 53 mm in length and 18 mm in diameter. This latter specimen is also curved, suggesting that it may represent a knife handle, rather than a projectile point (Trinkley 1980b:219).

The final specimen, recovered from 165R185, level 2, is the tip of a worked bone pin. Lacking the head, it is difficult to assign the specimen to a specific pin type, but it is overall similar to Type C pins. It measures 58 mm in length and at its widest is 10 mm. There is no engraving, but the bone is highly polished. The tip is both pointed and flattened. It suggests some chipping at the tip. Microscopic examination (30x) reveals fine striations along the length of the object. Identical striations are found on the modern experimentally polished bone using sherd hones.

Although a sample of one precludes any meaningful statement concerning the use of the pins as a whole, our experimental works suggests that the formation of this plain pin would have required no more than an hour, suggesting that they are perhaps less "special" than previously though.

Lithics

The lithic assemblage consists of seven items. Five are a light buff (more technically a moderate orange pink, 5YR8/4 to a pale yellowish orange, 10YR8/6 using the Geological Society of America Rock-Color Chart) coastal plain chert. All are flakes of bifacial retouch, produced as a result of resharpening of existing tools.

These specimens were all recovered from 165R165, in levels 5 (1), 7 (1), 8 (1), and 9 (2). They suggest the process of resharpening an existing chert tool.

A sixth specimen (also from 165R164, lv. 8) is an orthoquartzite flake.

The final specimen, from 180R170, level 2, is an exterior cortext fragment of a quartz cobble. The color is a moderate brown (5YR4/4).

All of the materials are extralocal. The chert likely came from the Savannah drainage (perhaps from the Flint River Formation). There are several sources for the orthoquartzite in the Upper Coastal Plain of South Carolina, most clustering in the area of the Black Mingo Formation. The quartz cobble may have traveled from the fall line (Anderson et al. 1982, Blanton et al. 1986).

The failure to recover any finished tools from the excavations suggests that such items were rare and highly curated. This is typical of Thom's Creek sites along the South Carolina coast.

Ecofacts – Coprolites

During these investigations seven coprolite fragments were recovered, four from Feature 1 and an additional three from Feature 2. As at other Thom's Creek sites, they were preserved by the highly alkaline environment, with the organic material in the specimens gradually being replaced by a calcium solution, so that all are more-or-less calcified. Past attempts to reconstitute coprolites from Thom's Creek middens have had limited success (Trinkley 1980b:226), thus the specimens from 38CH1693 were explored dry under low magnification (7x).

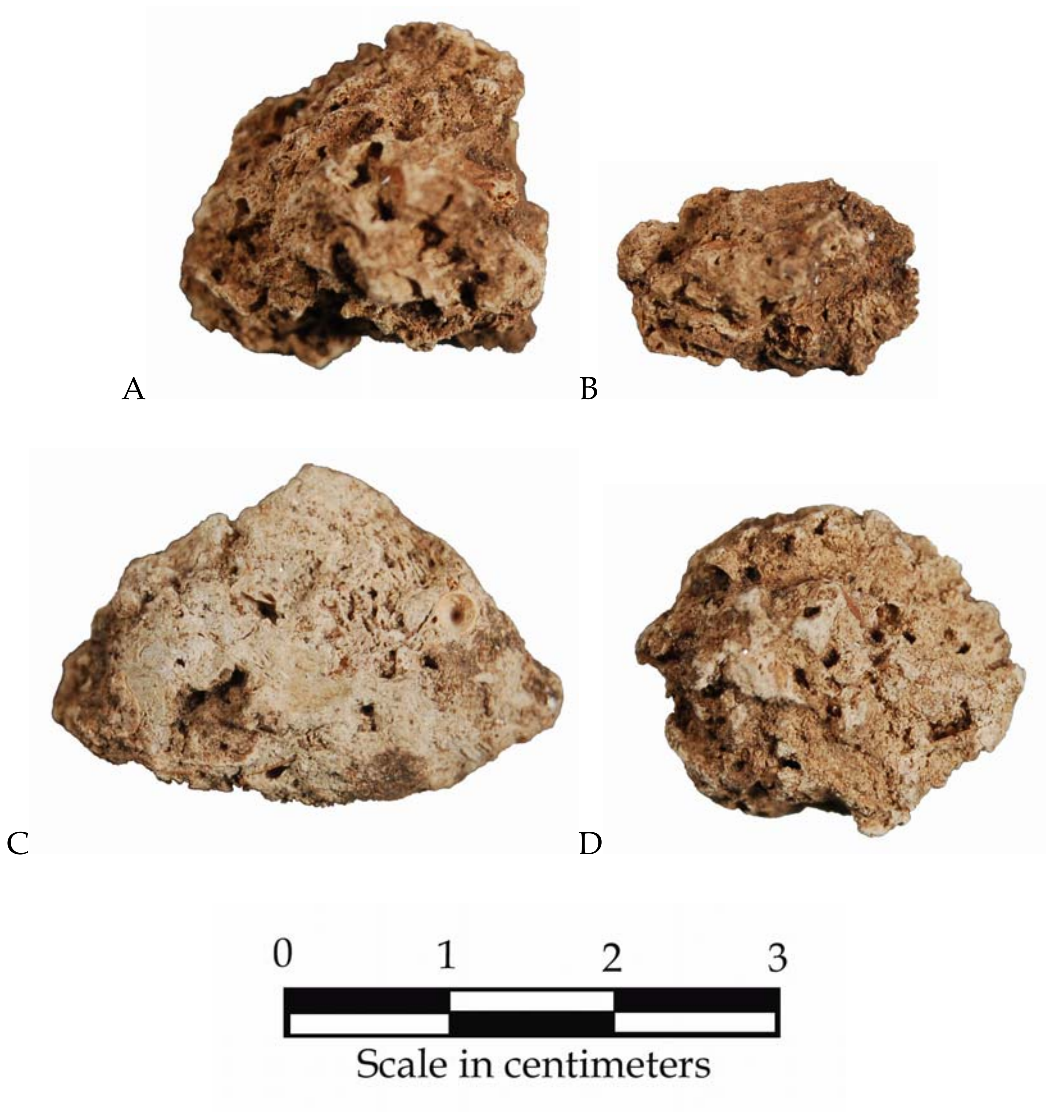

Figure 55. Coprolites from 38CH1693. Specimen "C" is the tip of the only measurable specimen. A fish vertebra is visible in the upper tip of this specimen.

Only one specimen was sufficiently intact for measurements – it is approximately 20 mm in diameter and over 30 mm in length. This diameter closely approximates the mean from Lighthouse Point of 23 mm (Trinkley 1980b:230). This remains consistent with a diet low in fiber and high in proteins.

Distinct from the Lighthouse Point specimens, however, those from 38CH1693 provide little visual indication of fish vertebra (n=2) or other identifiable parts. This is at least suggestive that the 38CH1693 diet was different from that at Lighthouse Point.

SHELLFISH ANALYSIS

Shellfish Species

While a rather large range of shellfish species have been identified from shell ring work – at least where the work has been detailed (see Table 10), a more spartan assemblage is identified from the features at 38CH1693. Of course it is difficult in some cases to determine if a species was a primary food source, secondary prey, an accidental inclusion, or perhaps a commensal species.

Table 10.
Shellfish Identified at Selected Thom's Creek Sites

Shellfish	Lighhouse Point[1]	Stratton Place[1]	Fig Island[2]	Sewee[3]	38CH 1693
Oyster, *Crassostrea virginica*	X	X	X	X	X
Clam, *Mercenaria mercenaria*	X	X	X	X	X
Ribbed mussel, *Geukensia demissus*	X	X	X	X	X
Common cockle, *Trachycardium muricatum*	X	X		?	
Great heart cockle, *Dinicardium robustum robustum*	X				
Stout tagelus, *Tagelus plebeius*	X	X	X		X
Angel wing, *Crytopleura costata*	X			?	
Periwinkle, *Littorina irrorata*	X	X	X	X	X
Knobbed whelk, *Busycon carica*	X	X		?	X
Channeled whelk, *Busycon canaliculatum*	X				
Perverse whelk, *Busycon perversum*	X				
Lightning whelk, *Busycon contrarium*	X				
Horse conch, *Pleuroploca gigantean*	X				
Mud dog whelk, *Nassarius obsoletus*	X	X			
Fat dove shell, *Anachis obesa*	X				
Lobed moon shell, *Oliva sayana*	X				
Olive shell, *Oliva sayana*	X				

[1] Trinkley 1980; Trinkley 1975b:31
[2] Saunders 2002:Table 17
[3] Russo and Heide 2003:14; Edwards 1965:16

The six species identified at 38CH1693 include oysters – the most obviously abundant shellfish present at the site (hence its description as an "oyster midden"), clam, ribbed mussel, periwinkle, stout tagelus, and knobbed whelk. The biology and ecology of each are briefly discussed below.

Oyster, *Crassostrea virginica*

The oyster is adapted to considerable environmental variations. While its optimum salinity range is about 10 to 28‰ (Sandifer 1980:179), studies suggest much greater variability is possible (Castagna and Chanley 1973:66). Galtsoff (1964:404) notes that those conditions above or below a range of 5 to 30‰ can be considered marginal and they are even able to survive extensive freshets.

Many factors appear more significant to the growth and survival of the oyster than salinity; both Galtsoff (1964) and Sandifer (1980) in particular note the importance of the bottom on which the oyster is attempting to grow. Both firm, hard bottoms and bottoms of semihard mud are equally acceptable. It is only bottoms of shifting sand or soft mud that are unsuitable for oyster growth – and even these can be colonized by oysters over time. The conditions under which oysters grow are evidenced in their shape. At the end of the nineteenth century Dean described a common South Carolina sight:

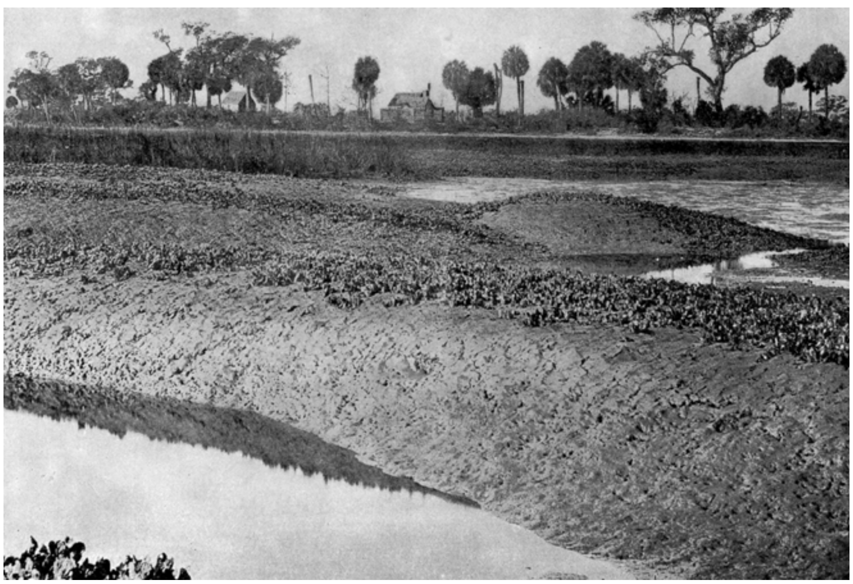

Figure 56. Oyster flat along the South Carolina coast in 1891.

> They are here found skirting the shore in fringing tidal reefs, living as much of their life in air as in water. Often at low tide the oyster ledges appear to the eye curiously like a low hedge of frosted herbage, grayish-green in color. A nearer view discloses branching clusters or clumps of oysters, densely packed together, whose crowded individuals now become modified or distorted according to their position on the cluster. The individuals that cap the cluster project upward like flat-tipped fingers, slender, narrow, and long, whose shape has given them throughout the South the names "cat tongues," "raccoon pays," or "raccoons" [also coon oysters]. In many localities . . . the raccoon ledges, continuing for ages to encroach upon the steam bed, have formed vast oyster flats, acres, sometimes miles in extent (Dean 1892:335).

Even today the bulk of South Carolina oysters are intertidal (Sandifer 1980:180). Subtidal oysters were probably no more common during the prehistoric periods and would have presented a more substantial challenge to collection than the readily accessible intertidal oysters.

Archaeologists, however, have attempted to correlate the shape of oysters with their habitat. Crook (1992), for example, identified four basic intertidal oyster communities in coastal Georgia: singles, clusters, banks, and reefs. These are likely applicable to the South Carolina area as well.

The communities of single oysters, together with clumps of up to six or seven, are found in the lower portion of the intertidal zone along small creeks. Crook, however, notes that these communities are rare and that the number of oysters within any one community will be limited (Crook 1992:485).

Cluster communities, consisting of small clumps of 10 to 30 attached oysters, are found scattered along larger tidal streams. Crook (1992:485) suggests there are likely many such communities although they have been rarely

Table 11.
Oyster Height-Length Ratio Variation by Habitat

Georgia

	Soft Mud/Singles	Firm Bottoms/ Clusters	Bank Communities	Reef Communities
HLR	1.73	1.67	1.74	3.14

Maryland

	Sand Beaches/ Singles	Mixed Mud with Sand/ Loose Clusters	Soft Mud Bottoms/ Channels	Reef Communities
HLR	<1.3	1.3-2.0	>2.0	>2.0

documented. This lack of documentation may be related to the relative difficulty in harvesting these oysters – a situation that likely extended into the prehistoric period.

Bank communities, consisting on what Crook (1992:485) calls contiguous individual clusters of 30 or more individual oysters, are also found along larger tidal streams and throughout the intertidal range. They are the dominant community.

Reef communities consist of very dense communities found in optimal environments and are formed on the top and sides of dead oyster substrate (Crook 1992:486).

Kent (1988), from work in Maryland, also identified four environments, although these are slightly different in the Mid-Atlantic than those identified in the Southeast: beaches of firmly packed sand, mixed mud and sand, soft mud bottoms, and reefs.

Each author has suggested height-length ratios for each environment, shown here in Table 11. Claassen suggests the differences are "both striking and significant," their use resulting in very different interpretations of the same data. She wonders if these differences might be resolved through better studies of ecological differences and larger samples (Claassen 1998:137). This may be, however Crook himself observes that in his data suggests considerable variation within each group and the standard deviations overlap significantly even between the communities (Crook 1992:488). He goes on to note that the research of Dame (1972) was even unable to distinguish intertidal from subtidal oysters based on the height-length ratios.

The most cautious interpretation at this point is that the shell is an imprecise indicator of the environment. There seems to only be general agreement that, "oysters grown on mud have long, slender shells" resulting from their need to rise above the mud and suspended particulates while those grown in calm waters on hard surfaces tend to have a round shape (Galtsoff 1964:2, 399).

The earliest study of South Carolina

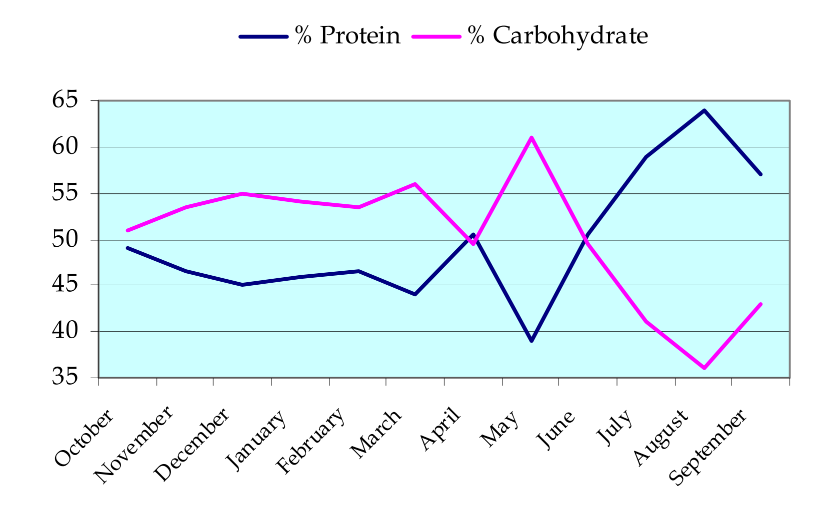

Figure 57. Average protein and carbohydrate content (from Galtsoff 1968:Figure 355).

Figure 58. Typical oyster grown on a soft, muddy bottom.

oyster beds found that the portion of the Wando examined (to the north and northwest of 38CH1693) contained about 34.8 acres of natural oyster beds. To the south, in the area between Dewees and Bull Bay, the study found 28.8 acres of natural oyster beds (Battle 1892:330). Using Beaufort data (the only such information we have identified), the average bed contains 200 oysters per yd^2 or around 967,000 oysters per acre (Vernberg and Sansbury 1972:275). Thus, the beds identified in the last decade of the nineteenth century in the site area would have contained over 44 million oysters.

There is also rather good data on the nutritional composition of oysters. Galtsoff (1968:382-383) notes that there is an inverse relationship between the carbohydrate and protein content of oysters by season (related to their reproductive cycle). The percentage of protein sharply decreases in May, peaking again in August. Carbohydrate levels peak in May, then rapidly decline through October (Figure 57). This is interesting since it reveals that oysters, if eaten during the "traditional" winter months will have relatively high levels of carbohydrates and relatively low levels of protein. If, however, they are eaten during the warm season (avoided today because they tend to be watery and gritty with the spat), then oysters provide respectable levels of protein.

Table 12 provides nutritional data for oysters from the USDA. Oysters are also good sources of iodine, B12, and zinc. Galtsoff(1968:393) also notes that antibacterial and antiviral agents have been identified in the meat of the oyster. Preparation may be by steaming or roasting, although oysters tend to be delicate and are easily overcooked. They are considered adequately cooked when their mantle starts to curl (generally 10 minutes or less).

Predators of the oyster include crabs, especially the blue crab, oyster drills, starfish, whelks, and boring sponges. Many of these predators, however, suffer more from exposure to the elements than do the oysters; thus, intertidal oysters are often less subject to attack than subtidal oysters. Oyster drills are also limited by the brackish water of the upper estuaries (Galtsoff 1968:430). Fish such as the drum and birds like the oystercatcher are also natural predators, causing extensive localized damage.

Clam, *Mercenaria mercenaria*

Clams prefer shelly areas, such as oyster reefs and along the low tide mark (although they can be found throughout the intertidal zone). The optimum salinity for clams is from 24 to 32‰, although like the oyster they can be found in areas of higher (up to 36‰) or lower (down to 10-12.5‰) salinity (Castagna and Chanley 1973:70, Mulholland 1984).

Since clams usually occur in groups, the discovery of one or two clams generally suggests the chance of finding others in the same area is high. Research reveals a density of about 85 clams per square yard in shelly substrates, compared to less than 1 clam per square yard in sandy bottom areas (Sandifer et al. 1980:180).

Table 12.
Nutritional Composition of Various Shellfish (per 100 g) based on the USDA Food Composition Data (http://cgi.fatfree.com/usda/).

Food	Serving Size	% Calories from Fat	% Calories from Protein	% Calcories from Carbs	Kcal	Protein, g	Carbs, g	Fat, g
Oyster, raw	6 medium = 84 g	33.9	44.1	22.0	68	7.0	3.9	2.4
Oyster, cooked moist heat	6 medium = 42 g	33.8	44.1	22.0	137	14.1	7.8	4.9
Clam, raw	20 small = 180 g	12.4	74.2	13.4	74	12.8	2.6	1.0
Clam, cooked moist heat	20 small = 90 g	12.5	74.2	13.4	148	25.5	5.1	1.9
Mussel (blue), raw		24.5	59.1	16.5	86	11.9	3.7	2.2
Mussel (blue), cooked moist heat		24.5	59.0	16.5	172	23.8	7.4	4.5
Periwinkle, raw					134	26.1	5.0	1.2
Whelk, raw		2.8	75.2	22.0	137	23.8	7.8	0.4
Whelk, cooked moist heat		2.8	75.2	22.0	275	47.7	15.5	0.8

Thus, clams and oysters have similar requirements. Neither is likely to be found on pluff mud banks, requiring firm or shelly substrates. They, too, will often be found in similar locations, making their collection together an easier task. Unlike the oyster, however, the clam is able to move through its habitat using its muscular foot.

The predators typically associated with clams are crabs, moon snails, sting rays, whelks, and oyster drills (Sandifer et al. 1980:180). Again, these are similar to those associated with oysters, which is reasonable considering the two species co-occur.

Figure 59. Example of the clam, ***Mercenaria mercenaria.***

Preparation of clams will involve either steaming or roasting. Either approach is done until the clam opens, typically requiring 4-5 minutes. Their nutrition is provided by Table 12 and they are excellent sources of both B12 and iron. Given the difficulty in opening clams it seems unlikely that they would have been eaten raw.

Ribbed mussel, *Geukensia demissus*

The ribbed mussel is common to the South Carolina tidal marshes, typically found in the intertidal zone half embedded in the mud and frequently intermixed with the roots of culms of *Spartina* or found in association with oyster reefs. Although the actual populations are unknown, they are estimated to form rather dense colonies – around 139 per square foot (Coen et al. 1999).

Their upper intertidal limits are associated with the high temperatures and limited food availability, while their lower limits are determined by refuge from predators such as crabs. Salinity, however, plays a relatively minor role; studies have shown that the mussel can survive in salinities ranging from 3 to 48‰ (Pierce 1970; see also Castagna and Chanley 1973:64).

Unlike the blue mussel (*Mytilus edulis*), ribbed mussels are rich in organic bacteria (at least today) and are not commonly eaten by people (although they have a number of natural predators, including birds, crabs, and fish). The South Carolina Department of Natural Resources does, however, consider them to be harvested recreationally. Ursin (1972) warns that while edible they are not considered especially palatable. The meat is a yellowish color and, like oysters and clams, they can be either steamed or roasted. The shell is relatively easy to open and presumably they could also have been eaten raw. The typical ribbed mussel contains about 4 g of meat.

Figure 60. Ribbed mussel.

Stout tagelus, *Tagelus plebeius*

Unlike the other species discussed, which are generally shallow burrowing and easily accessible, the stout tagelus, also known as the stout razor clam, is a deeper burrowing species that can form very high population densities (up to 7600 individuals per square yard) in some selected intertidal sandbar settings (Holland and Dean 1977:186). The highest densities appear to occur in the early spring, declining thereafter, and in the low intertidal areas. It does best in stable and protected habitats (such as sandbars in lagoon areas) – and in such locations this species can represent considerable biomass. It appears far less commonly in areas of greater movement, such as sandbars along tidal creek fringe areas.

Figure 61. Stout tagelus.

In the Virginia area it is reported to be found in waters with salinity ranging from 10 to over 30‰ (Chanley and Castagna 1971:167, Castagna and Chanley 1973:78), although Holland and Dean (1977) suggest that it does best at higher salinities.

Holland and Dean (1977:193) report that one of the most serious predators of the tagelus is the American oystercatcher, which uses its long bill to excavate the shell from the burrow. Other predators include the stingray, whelks, and crabs.

There are occasional references to the stout tagelus being used as a food source. It has been commonly collected by the population of the State of Paraíba, in northeast Brazil (Nishida et al. 2006) and is reported to be a delicacy, called "longironi" in the Minorcan community of St. Augustine, Florida. We have not, however, been able to identify nutritional data for this species.

Periwinkle, *Littorina irrorata*

The Gulf or marsh periwinkle is a gastropod found in coastal brackish and salt water marshes. It is virtually ubiquitous, seen migrating up and down smooth cordgrass (*Spartina alterniflora*) in rhythm with the tides (called circumtidal migratory behavior) during the summer. In the winter the animals tend to be inactive and aggregate in debris at the base of the *Spartina* plants (Vaughn and Fisher 1992). The shell ranges from about 19 to 32 mm in size and is easily


Figure 62. Marsh periwinkle on cordgrass.

overlooked, being a dull reddish brown to mud gray.

Its density is reported to be up to 420 per square yard, especially in the high marsh zone, although densities of perhaps 50 per square yard are more common in the low marsh (Walters and Coen 2005:1). The periwinkle will be found in areas with fresh water seepage (with salinity as low as 5‰), as well as in areas with salinities of at least 25‰.

The periwinkle's predators include fish, crabs, birds, sea urchins, small mammals, and some turtles.

While the larger common periwinkle, *L. littorea*, is more commonly eaten today, the smaller Gulf or marsh periwinkle is equally eatable. Periwinkles are typically cooked no longer than 3 minutes. This will toughen and loosen the meat, allowing it to be removed with a toothpick. The meat tends to be firm and have a strong taste. Like other snails the periwinkle has a hard operculum on the end of the foot that is used to seal the shell. Although this is today removed since it is crunchy, it seems unlikely that prehistoric people would have bothered.

Knobbed whelk, *Busycon carica*

Today the most common whelk found in South Carolina waters, the knobbed whelk adult ranges from 5 to 9 inches in length. The whelk migrates from shallow shelf waters to coastal estuaries, apparently in response to weather conditions. In the estuaries – where they would have been available to prehistoric people, they may congregate on oyster reefs and clam beds where they are feeding on these and other bivalves (Anderson 2005). Wells (1961:256) suggests that they prefer the sand flats, where they feed on clams, over the oyster reefs.

Megalhaes (1948) has also suggested that the knobbed whelk is most active in the tidal marsh in June and July, being absent during the winter months of December through February. Juveniles peak from June through August and are most active during the day, while adults tend to be more active at night.


Figure 63. Knobbed whelk on a sand flat.

The most common predators are gulls, occasionally crabs, and even other whelks.

Like many other shellfish, whelks are not commonly eaten today, although they are locally prized. The meat is naturally tough and cooks typically recommend tenderizing by pounding – although it seems unlikely such efforts were taken by prehistoric populations. The meat is loosened from the shell by boiling small whelks 8 to 10 minutes and large whelks for up to 20 minutes. Excessive boiling, however, will make the meat tougher than normal and also hinder its removal.

Quantification of Shell at 38CH1693

Shell samples were collected from the features using two techniques. In the field single screen load (approximately 20 gallons of matrix) was waterscreened through ⅛-inch mesh. The shell was quantified by weight and recognizable pieces were sorted. The results of this work are shown as Table 13.

Table 13.
Field Quantification of Feature Shell

Feature	Shell Wt. (kg)	Oyster %	Periwinkle %	Other %	Other Species
1	135.8	82.8	13.8	3.4	Whelk, clam, ribbed mussel
2	125.7	84.2	10.5	5.3	Clam, cockle, ribbed mussel, tagelus
3	5.9	81.2	12.5	6.3	Clam (6.3%)
4	53.3	92.0	7.5	0.5	Tagelus, ribbed mussel, clam, whelk
5	23.9	50.0	31.3	18.7	Tagelus (12.5%), ribbed mussel (6.2%)

This sampling technique suggests that oyster is the dominant shellfish, accounting for an average of 78% of the feature shell. Periwinkle is the only other species consistently found in large numbers, averaging 15% of the samples. Other species are generally minor components, although several are locally abundant. For example, Feature 3 contains a notable quantity of clam, while Feature 5 is unusual in the quantity of both stout tagelus and ribbed mussel present. These data can be broadly interpreted as suggesting that while oyster was consistently collected (perhaps even a dietary staple), other species (clam, tagelus, and mussel) were occasionally collected in quantity. The only shellfish which were not clearly a focus of collection efforts were cockles and whelks – both appear to represent opportunistic catches.

In addition to this approximation, 5 gallon samples of Features 1, 2, 4, 5, and 6 were collected and subjected to more detailed analysis in the laboratory. For these samples the weight of the sample was first taken (in order to eventually calculate the shell-soil ratio). Then the bucket was waterscreened through 1-inch, ¼-inch, ⅛-inch, and 0.0661-inch mesh. Shell retained in the first three screens was identified to species and then both weighed and counted (with percentages of each calculated). The 0.0661-inch sample was collected only to examine the features for the presence of shrimp remains (especially shrimp mandibles, see Wing and Quitmyer 1985:58) which was done under low magnification. The results of these studies are shown in Table 14 below.

From the 1-inch screen all oysters were then separated by right and left valves. Each was weighed and a sample of 10 was randomly selected to be measured for the calculation of height-length ratios. The results of this work are shown in Table 14.

Interpretations

At the most fundamental level, this work illustrates the problems inherent in the use of ¼-inch screen size at shell midden sites. Table 14 reveals that if we were only concerned with shellfish recovery and very simple identification, the ¼-inch mesh does an acceptable job. Few of the interpretations (concerning shellfish) would have changed

Table 14.
Shell Quantification by Feature

Feature 1

	1-inch mesh				¼-inch mesh				0.125-inch mesh				0.0661-inch mesh				Combined	
	Count	Count %	Wt	Wt %	Count	Count %	Wt	Wt %	Count	Count %	Wt	Wt %	Count	Count %	Wt	Wt %	Count	Wt
Oyster	108	100	1559.2	100	750	71	1530.9	76	4	24	4.0	3					862	3094.1
Clam					9	1	2.8	0									9	2.8
Periwinkle					253	24	453.6	23	10	59	5.0	3					263	458.6
Stout tagulus					44	4	22.7	1	3	18	0.9	1					47	23.6
UID											141.7	93			79.0	100		220.7

Total Shell Wt.	3799.8
Soil Wt.	9156.9
Ratio shell:soil	1:2.4

Feature 2

	1-inch mesh				¼-inch mesh				0.125-inch mesh				0.0661-inch mesh				Combined	
	Count	Count %	Wt	Wt %	Count	Count %	Wt	Wt %	Count	Count %	Wt	Wt %	Count	Count %	Wt	Wt %	Count	Wt
Oyster	90	100	2551.5	100	610	78	1530.9	89	2	13	1.0	0					702	4083.4
Clam						0		0									0	0.0
Periwinkle					144	18	170.1	10	11	69	7.0	2					155	177.1
Stout tagulus					32	4	12.0	1	3	19	1.0	0					35	13.0
UID											373.0	98			48.0	100		421.0

Total Shell Wt.	4694.5
Soil Wt.	8419.8
Ratio shell:soil	1:1.8

Feature 4

	1-inch mesh				¼-inch mesh				0.125-inch mesh				0.0661-inch mesh				Combined	
	Count	Count %	Wt	Wt %	Count	Count %	Wt	Wt %	Count	Count %	Wt	Wt %	Count	Count %	Wt	Wt %	Count	Wt
Oyster	96	100	1842.7	100	615	84	595.3	85	5	63	1.0	1					716	2439.0
Clam					22	3	6.0	1									22	6.0
Periwinkle					69	9	91.0	13									69	91.0
Stout tagulus					27	4	10.0	1	3	38	1.0	1					30	11.0
UID											96.0	98			22.0	100		118.0

Total Shell Wt.	2665.0
Soil Wt.	13777.9
Ratio shell:soil	1:5.2

Feature 5

	1-inch mesh				¼-inch mesh				0.125-inch mesh				0.0661-inch mesh				Combined	
	Count	Count %	Wt	Wt %	Count	Count %	Wt	Wt %	Count	Count %	Wt	Wt %	Count	Count %	Wt	Wt %	Count	Wt
Oyster	93	95	1644.3	99	305	17	655.0	18									398	2299.3
Clam	1	1	8.0	0	43	2	109.0	3									44	117.0
Periwinkle					1138	62	2268.0	63									1138	2268.0
Stout tagulus	4		17.0	0	336	18	155.0	4	3	100	1.0	0					343	173.0
UID							440.0	12			485.0	100			22.0	100		947.0

Total Shell Wt.	5804.3
Soil Wt.	7399.2
Ratio shell:soil	1:1.3

Table 14, cont.
Shell Quantification by Feature

Feature 7

	1-inch mesh				¼-inch mesh				0.125-inch mesh				0.0661-inch mesh				Combined	
	Count	Count %	Wt	Wt %	Count	Count %	Wt	Wt %	Count	Count %	Wt	Wt %	Count	Count %	Wt	Wt %	Count	Wt
Oyster	53	96		0	150	15	197.0	13	2	25	1.0	0					205	198.0
Clam					4	0	1.0	0									4	1.0
Periwinkle					782	78	1219.0	81	3	38	3.0	1					785	1222.0
Stout tagulus				0	58	6	13.0	1	3	38	1.0	0					61	14.0
Whelk	2	4	67.0	100	9	1	19.0	1										
UID							50.0	3			216.0	98			104.0	100		370.0
Total Shell Wt.																		1805.0
Soil Wt.																		7399.2
Ratio shell:soil																		1:1.3

dramatically if only ¼-inch mesh had been used. Oyster, regardless of screen size, is the dominant species, followed by periwinkle, with a few minor species also recovered.

Yet when we look at how the shell is quantified – by count or weight – we begin to see significant problems. Claassen (1998:107) observes that weights may be biased by the "diagenesis which affects different species at different rates." There is also concern that species with heavier shells may be disproportionately represented in the collection. We can certainly see that there are significant differences in the cumulative percentages. For example, Feature 2 is overwhelmingly (95.6%) oyster with only minor periwinkle (4.1%), and the smallest quantity of stout tagelus (0.3%) when we look at the species by weight. A different perception of the sample is provided when it is expressed by counts – oyster, while still dominant, accounts for just less than 79%, periwinkle is far more common (17.4%), and even the tagelus is up to nearly 4%. Feature 5 shows similarly startling differences. Relying on weights, oyster and periwinkle are almost equally represented (47.3 and 46.7%), yet looking at counts periwinkles account for nearly three-fifths of the collection to only one-fifth by oyster.

It is more difficult to ascribe accuracy since it seems to depend on what one hopes to do with the data. There are allometric formulae for converting weights to meat yields, although Claassen (1998:188-191) doubts their validity and suggests they should be tested against modern samples. Similarly, with counts it is possible to ascribe a mean meat weight, although it seems this is not likely to be much more accurate. Table 15 provides the allometric calculations from 38CH1693, *although they have not been compared to modern data*. Even if we halve the data (since Claassen reports errors approaching that magnitude), we can still gain some idea of the dietary contribution of shellfish – and it seems significant. Certainly it offers us another view of the contribution made by the lowly periwinkle in Features 5 and 7. And it suggests that shellfish such as the stout tagelus can, in at least some situations, provide a considerable contribution to the diet (see Feature 5).

Table 15.
Shellfish Meat Weights (in kg) Derived from Allometric Regression Formula

	oyster	clam	periwinkle	tagelus	whelk
Fea 1	335.6	0.5	95.9	41.6	0.0
Fea 2	439.2	0.0	39.2	23.1	0.0
Fea 4	266.4	1.1	21.0	19.5	0.0
Fea 5	251.6	18.4	430.8	299.0	0.0
Fea 7	23.3	0.2	240.9	24.8	2.3

Allometric formula based on Quitmyer (1985)

Table 16.
Fragmentation and Shell-Soil Ratios

Feature	Fragmentation Ratio	Shell-Soil Ratio
1	4.9	2.4
2	7.9	1.8
4	9.9	5.2
5	3.8	1.3

Claassen (1998:114) also suggests examining the fragmentation ratios at shell midden sites, suggesting that this ratio may help interpret taphonomic activities that took place at the site. These ratios for several features are presented here as Table 16. Their meaning, however, is difficult to assess. Features 2 and 4 have similar, relatively low, levels of fragmentation, while Features 1 and 5 have significantly higher levels. Perhaps the most straight-forward interpretation is that Features 1 and 5 were open longer, received more pedestrian traffic, and thus exhibit more compaction. However, Features 1 and 5 also exhibit higher proportions of fragile shells. The fragmentation ratios may therefore be little more than an expression of the shellfish present in the collection and the degree to which natural ground compaction and/or excavation results in degradation of the shell. We believe the latter explanation is more likely the explanation, at least for these samples.

We have also calculated the shell-soil ratio. Also shown in Table 16, this varies from 1:1.3 to 1:5.2. Feature 2, 5, and 7 have a mean ratio of 1:1.5, indicating features with relatively small quantities of included soil. Feature 4 is markedly different, containing 5 times more soil than shell.

The analysis also sought to examine the weight of the right and left oyster valves, as well as the height-length ratios. The means of these results are provided in Table 17. The height-length ratios for the right and left valves are notably different; if, however, we look only at the ratios for the left valves (as is standard) we find that four of the five samples are very similar, ranging from 1.56 to 1.64. These data seem most similar to what Crook (1992) associated with cluster communities – small clumps of from 10 to 30 individuals found along larger tidal creeks. In contrast, Feature 4 is anomalous, being far more characteristic of a reef setting of dense and closely spaced individuals. Even the Maryland data supports the idea that the oysters from Features 1, 2, 5, and 7 came from similar communities, while those in Feature 4 are clearly distinct.

In Crook's work, the reef oysters contained about a third more meat weight than the cluster oysters – thus there may have been an advantage to seeking and collecting from reef settings. Yet the bulk of the 38CH1693 samples came from locales that produced less meat. This suggests that the small cluster communities were more common – a feature confirmed by Crook's (1992:485-486) observations, at least for current Georgia settings.

<u>Seasonality</u>

Few shellfish species have been useful for seasonality. Most, especially those that are found in abundance, such as oyster and periwinkle, are available throughout the year. Claassen (1998) and others have been successful in deriving at least broad seasonal patterns using clam. It is necessary to look at assemblages, and not individual specimens. Unfortunately at 38CH1693 the sample sizes were too small to be of use.

Another approach has been to screen for the recovery of the very small gastropod, *Boonea impressa*. This species is an ectoparasite of the oyster, attaching itself to the mantle edge of the oyster, penetrating the soft tissues using a stylet and feeding off the oyster tissue fluids. The gastropod appears to have a low salinity tolerance of 11‰ and an upper limit of 35‰ (Miller 2000:118). The seasonal studies

Table 17.
Oyster Shell Weights (in g) and Measurements (in mm)

Feature	Right: mean weight	SD weight	mean length	SD length	max length	min length	mean height	SD height	max height	min height	H/L ratio
1	18.85	8.64	23.51	6.51	38.26	15.27	59.64	15.45	82.82	36.48	2.53
2	18.84	9.33	42.60	6.26	53.44	34.33	67.81	13.60	100.13	45.85	1.59
4	16.50	8.67	32.53	6.65	42.99	21.98	66.18	16.15	85.35	36.78	2.03
5	15.55	17.71	42.51	9.51	62.17	25.57	65.80	21.11	104.21	31.68	1.55
7	18.73	10.34	44.63	5.06	52.17	38.92	80.05	11.62	97.71	64.63	1.79

Feature	Left: mean weight	SD weight	mean length	SD length	max length	min length	mean height	SD height	max height	min height	H/L ratio
1	21.42	11.39	37.55	9.23	53.90	24.46	68.64	9.26	84.39	51.97	1.56
2	26.95	16.32	38.34	7.72	48.09	23.25	73.58	9.90	94.66	62.67	1.57
4	21.08	12.87	23.11	14.93	49.90	131.00	67.69	38.74	160.91	13.27	2.93
5	18.13	14.82	41.46	11.91	72.35	31.64	68.12	18.70	102.53	42.30	1.64
7	19.06	10.51	40.37	6.04	47.72	31.06	62.93	16.17	85.91	43.36	1.56

associated with the *Boonea* are briefly reviewed by Claassen (1998:147-148). Like clams, seasonality is derived from an assemblage with various authors proposing different minimum sample sizes.

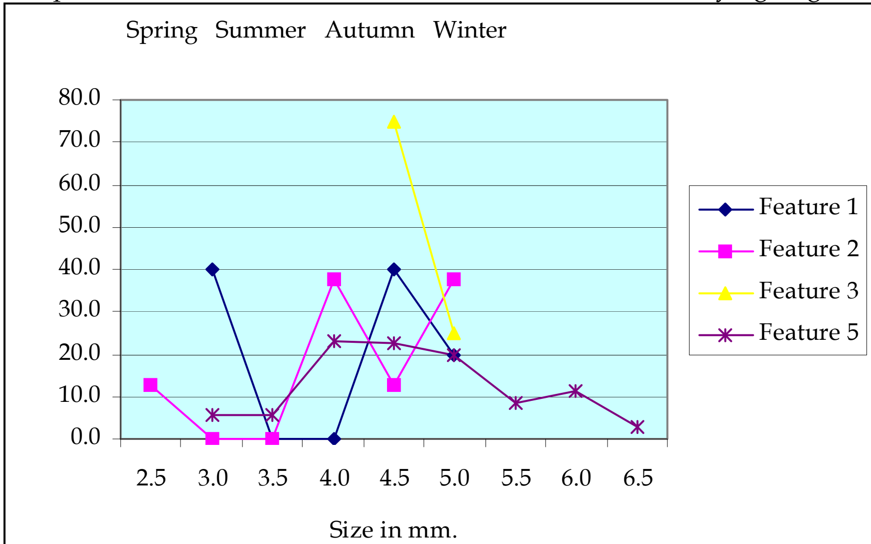

Figure 64. *Boonea impressa* size class relative to season of collection

Measurements were obtained and rounded to the nearest 0.5 mm for *Boonea* found in the flotation heavy fraction and special soil samples of Features 1, 2, 3, and 5. The largest – and thus most reliable – is the sample of 35 shells from Feature 5. Nevertheless, all samples are shown in Figure 64. The collection from Feature 5 indicates collection from the autumn into the early winter.

While the samples are very small, Feature 1 is suggestive of summer and autumn. Feature 2 is suggestive of autumn and early winter, while Feature 3 is also indicative of oyster collection in the autumn.

Thus, all of the samples point, with varying degrees of certainty to oyster collection taking place in the months of September through November. During these months oysters would have relatively stable levels of carbohydrates and proteins, with the carbohydrates dominating.

Although the low frequency of *Boonea* specimens may result from sampling bias, it is worth noting that at least one researcher has observed that this species was "nowhere abundant on oyster reef and oyster patches" of St. Catherines Island (Prezant et al. 2002:24).

Conclusions

The shellfish present at 38CH1693 seem to be far less varied than those recovered from shell rings where there has been extensive study. One interpretation of this difference is that while shell rings reflect large populations settled for prolonged periods of time, and thus scouring the estuary at different seasons, site 38CH1693 represents a smaller population that exploited the surrounding ecosystem seasonally (perhaps September through December or January) and for shorter periods of time.

The low incidence of whelk may support the collection in cooler weather (when many whelk begin to migrate to deeper waters). Similarly, the absence of indication of shrimp in the fine screen collection may indicate that the site was not occupied during the summer, when shrimp would be available in the shallow tidal waters.

The shellfish present may reflect two distinctly different procurement areas. The oyster reef or small cluster communities could easily account for the oysters, clams, and ribbed mussels. The whelk and tagelus, however, were likely not found in this setting and were more likely obtained from sand bar/beach locations. The periwinkles are nearly ubiquitous and would have been found in close proximity (or during the walk to or from) either location. In spite of these differences, our discussions are suggestive of "complexes" – the ribbed mussels frequently being associated with the *Spartina*, as are the periwinkles, or being found intermingled with oysters. The clams prefer an association with the oyster reefs since the substrate is shelly. Similarly, the tagelus and whelk both prefer a sandy beach area, distinct from the oyster reefs and creek banks.

In addition, it should be noticed that where clams are found, so too are rays – a natural predator. Thus, prehistoric exploitation of the clam would naturally lead to the occasional capture of rays (which are found in the faunal collection). The turtles that might be drawn to the periwinkles would present yet another subsistence opportunity for the people at 38CH1693. Moreover, these different ecosystems are in close proximity along the Carolina marsh, frequently being only a few hundred yards apart.

Food preparation was relatively simple, requiring for many species little more than a few minutes of boiling or steam roasting. Many could be combined in stews or eaten directly from the fire or pot.

Claassen sees little purpose in deriving meat weight estimates for shellfish flesh, citing a variety of problems. She goes on to add that, "when these estimates are combined with similarly derived estimates for vertebrate flesh and plants to talk about nutrition and dietary makeup, the enterprise is hopeless (Claassen 1998:191). We cannot take exception to her reasoning and insistence on caution.

While dietary reconstructions may be a fool's errand, it seems appropriate to offer at least some brief observations concerning the overall quality of a shellfish diet.

Shellfish contain significant amounts of the omega-3 fatty acids, or the so-called "good" fats. Shellfish provides a high quality protein and contains all of the dietary essential amino acids (Dong 2001:3).

They are also rich in a variety of nutrients that are needed in the body. For example, iron is an essential mineral in the heme molecule of hemoglobin. Very high amounts are found in clams, although oysters and mussels also have significant amounts. Zinc assists the immune function and is essential for the healing of wounds, sperm production, fetal development, growth and development of children, and in the formation of hemoglobin. Oyster is a very rich source, possessing four times the level found in deer. Copper is critical for the formation of collagen and assists in reactions that lead to the release of energy in the body. Oyster is an excellent source, with clam and mussels following distantly. Finally, vitamin B12 helps maintain the nervous system and make red blood cells. The vitamin is particularly deficient in plant materials, but it is abundant in clam, oyster, and mussel (Dong 2001).

Although we are not familiar with any study comparing the energy costs associated with hunting to those of collecting shellfish, we suspect that shellfish collection might have been a far wiser decision on the part of coastal inhabitants. For example, 100 g of cooked deer meat contains about 158 calories. This is not significantly different from the calories contributed by 20 cooked clams or 32 oysters.

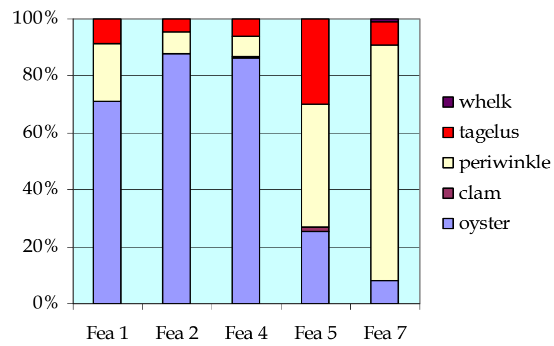

Figure 65. Dietary contribution of the various shellfish identified at 38CH1693.

When we look at the species and their dietary contribution (Figure 65), we see that in three of the five examined features oysters represent the primary caloric contributor. Other shellfish contributed a quarter or less of the diet. In two features, however, we see a very different situation. In these oyster is the minor contributor and periwinkle provides the bulk of the caloric contribution. In four of the five stout tagelus represents less than 10%, although in the fifth tagelus contributed 30% of the calories.

The picture, then, suggests that the occupants of 38CH1693 exploited what was readily available, but willingly broadened their strategy to include other species when they were found locally abundant.

The evidence points to a focus, albeit not exclusive, on small cluster communities, with only occasional exploitation of major oyster reef areas. Whether this is the result of access, availability, or other factors is unclear.

RADIOCARBON DATES

Background

We have previously discussed the 35 radiocarbon dates available for other Thom's Creek sites along the South Carolina coast, noting that these dates range from 2,885 to 4,180 BP (or from about 2,230 to 935 BC).

Table 18.
Radiocarbon Dates from 38CH1693

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age	Calibrated BC Date	Calibrated BP Date
Feature 1 Beta-219984	3930±50 BP	-27.1‰	3900±50 BP	BC 2430 BC 2470-2300	BP 4380 BP 4420-4250
Feature 2 Beta-219985	3720±60 BP	-24.9‰	3720±60 BP	BC 2130 BC 2200-2030	BP 4080 BP 4150-3980
Feature 4 Beta-219986	3720±50 BP	-24.3‰	3730±50 BP	BC 2140 BC 2200-2040	BP 4090 BP 4150-3990
Feature 5 Beta-219987	3870±40 BP	-25.9‰	3860±40 BP	BC 2310 BC 2430-2280	BP 4260 BP 4380-4230

38CH1693 Dates

Four radiocarbon dates were obtained from discrete features at 38CH1693. Each is an AMS (Accelerator Mass Spectrometry) date derived from a single fragment of hickory nutshell taken from each feature. The resulting dates are provided in Table 18 and are graphically presented in Figure 66.

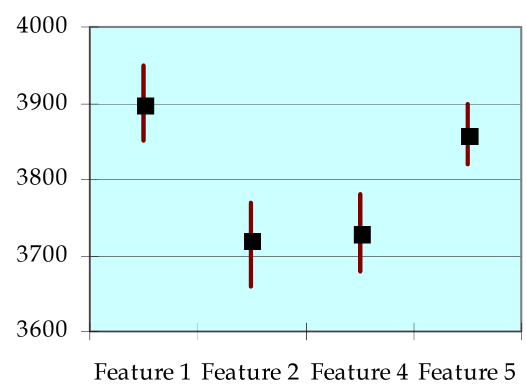

Figure 66. Radiocarbon dates from 38CH1693.

The results reveal that the site was used by makers of Thom's Creek pottery between about 3,650 and 3,950 BP (1,700 BC and 2,000 BC). More specifically, the dates are suggestive of at least two non-overlapping periods of use – one at about 3,775 BP (1,825 BC) and a second at about 3,875 BP (1,925 BC). Of course, these dates become overlapping if the more cautious 2 sigma calibration is used.

Either way, the dates suggest that 38CH1693 was used for a relatively short period of time. The occupation also occurred during the middle of the current Thom's Creek range. This suggests that the assemblage observed at the site is neither particularly early nor late.

POLLEN AND PHYTOLITH ANALYSIS

Linda Scott Cummings, Ph.D.
Paleo Research Institute
Golden, Colorado

Introduction

Four pollen and phytolith samples were examined from shell pits at 38CH1693. This site yielded four radiocarbon ages that indicate occupation between approximately 3720 ± 50 or 60 BP and 3930 ± 50 BP. A fifth phytolith sample was examined from a roasting pit at this site. These analyses were conducted to examine the microscopic record for prehistoric vegetation and potential uses of these pits. Whole oyster shells were recovered from all of the pits, although burned shells are reported only in the roasting pit. Because of burning, the roasting pit fill was not examined for pollen.

Methods

Pollen

A chemical extraction technique based on flotation is the standard preparation technique used in this laboratory for the removal of the pollen from the large volume of sand, silt, and clay with which they are mixed. This particular process was developed for extraction of pollen from soils where preservation has been less than ideal and pollen density is lower than in peat.

Hydrochloric acid (10%) is used to remove calcium carbonates present in the soil, after which the samples are screened through 150 micron mesh. The samples are rinsed until neutral by adding water, letting the samples stand for 2 hours, then pouring off the supernatant. A small quantity of sodium hexametaphosphate is added to each sample once it reaches neutrality, then the samples are allowed to settle according to Stoke's Law in settling columns. This process is repeated with ethylenediaminetetraacetic acid (EDTA). These steps remove clay prior to heavy liquid separation. The samples are then freeze dried. Sodium polytungstate (SPT), with a density 1.8, is used for the flotation process. The samples are mixed with SPT and centrifuged at 1500 rpm for 10 minutes to separate organic from inorganic remains. The supernatant containing pollen and organic remains is decanted. Sodium polytungstate is again added to the inorganic fraction to repeat the separation process. The supernatant is decanted into the same tube as the supernatant from the first separation. This supernatant is then centrifuged at 1500 rpm for 10 minutes to allow any silica remaining to be separated from the organics. Following this, the supernatant is decanted into a 50 ml conical tube and diluted with distilled water. These samples are centrifuged at 3000 rpm to concentrate the organic fraction in the bottom of the tube. After rinsing the pollen-rich organic fraction obtained by this separation, all samples receive a short (20-30 minute) treatment in hot hydrofluoric acid to remove any remaining inorganic particles. The samples are then acetolated for 3-5 minutes to remove any extraneous organic matter.

A light microscope is used to count the pollen to a total of approximately 100 pollen grains at a magnification of 500x. Pollen preservation in these samples varied from good to poor. Comparative reference material collected at the Intermountain Herbarium at Utah State University and the University of

Colorado Herbarium was used to identify the pollen to the family, genus, and species level, where possible.

Pollen aggregates were recorded during identification of the pollen. Aggregates are clumps of a single type of pollen and may be interpreted to represent pollen dispersal over short distances, or the introduction of portions of the plant represented into an archaeological setting. Aggregates were included in the pollen counts as single grains, as is customary. The presence of aggregates is noted by an "A" next to the pollen frequency on the pollen diagram. Pollen diagrams are produced using Tilia, which was developed by Dr. Eric Grimm of the Illinois State Museum. Total pollen concentrations are calculated in Tilia using the quantity of sample processed in cubic centimeters (cc), the quantity of exotics (spores) added to the sample, the quantity of exotics counted, and the total pollen counted and expressed as pollen per cc of sediment.

Indeterminate pollen includes pollen grains that are folded, mutilated, and otherwise distorted beyond recognition. These grains are included in the total pollen count, as they are part of the pollen record. Microscopic charcoal frequency is expressed as the number of microscopic charcoal particles encountered in the space that it takes to record 100 pollen grains. Therefore, if the number of microscopic charcoal particles is 1440, this means that 1440 microscopic pieces of charcoal were encountered in the space that it took to find and identify 100 pollen. It also means that charcoal in this hypothetical sample was 14.4 times as abundant as pollen.

Pollen analysis also includes identification of starch granules to general categories, if they are present. Starch granules are a plant's mechanism for storing carbohydrates. Starches are found in numerous seeds, as well as in starchy roots and tubers. The primary categories of starches include the following: with or without visible hila, hilum centric or eccentric, hila patterns (dot, cracked, elongated), and shape of starch (angular, ellipse, circular, eccentric). Some of these starch categories are typical of specific plants, while others are more common and tend to occur in many different types of plants.

Phytoliths

Extraction of phytoliths from these sediments was also based on heavy liquid floatation. Sodium hypochlorite (bleach) was first used to destroy the organic fraction from 50 ml of sediment. Once this reaction was complete, the samples were rinsed to remove the bleach. If the samples contained calcium carbonates, they were reacted with hydrochloric acid, then the samples were rinsed until neutral. A small quantity of sodium hexametaphosphate was added to each sample once it reached neutrality, then the samples were allowed to settle according to Stoke's Law in settling columns. This process was repeated with EDTA. These steps remove clay prior to heavy liquid separation. Next the samples are freeze dried. The dried silts and sands were then mixed with sodium polytungstate (density 2.3) and centrifuged to separate the phytoliths, which will float, from the other silica, which will not. Phytoliths, in the broader sense, may include opal phytoliths and calcium oxalate crystals. Calcium oxalate crystals are formed by *Opuntia* (prickly pear cactus) and other plants including *Yucca*, and are separated, rather than destroyed, using this extraction technique, if these forms have survived in the sediments. Any remaining clay is floated with the phytoliths, and is further removed by mixing with sodium hexametaphosphate and distilled water. The samples are then rinsed with distilled water, then alcohols to remove the water. After several alcohol rinses, the samples are mounted in cinnamaldehyde for counting with a light microscope at a magnification of 500x. Phytolith diagrams are produced using Tilia, which was developed by Dr. Eric Grimm of the Illinois State Museum for diagraming pollen.

Phytolith Review

Phytoliths are silica bodies produced by plants when soluble silica in the ground water is absorbed by the roots and carried up to the plant via the vascular system. Evaporation and metabolism of this water result in precipitation of the silica in and around the cellular walls. Opal phytoliths, which are distinct and decay-resistant plant remains, are deposited in the soil as the plant or plant parts die and break down. They are, however, subject to mechanical breakage, erosion, and deterioration in high pH soils. Phytoliths are usually introduced directly into the soils in which the plants decay. Transportation of phytoliths occurs primarily by animal consumption, gathering of plants by humans, or by erosion or transportation of the soil by wind, water, or ice.

The three major types of grass short-cell phytoliths include festucoid, chloridoid, and panicoid. Smooth elongate phytoliths are of no aid in interpreting either paleoenvironmental conditions or the subsistence record because they are produced by all grasses. Phytoliths tabulated to represent "total phytoliths" include the grass short-cells, buliform, trichome, elongate, and dicot forms. Frequencies for all other bodies recovered are calculated by dividing the number of each type recovered by the "total phytoliths."

The festucoid class of phytoliths is ascribed primarily to the Subfamily Pooideae and occur most abundantly in cool, moist climates. However, Brown (1984) notes that festucoid phytoliths are produced in small quantity by nearly all grasses. Therefore, while they are typical phytoliths produced by the Subfamily Pooideae, they are not exclusive to this subfamily. Chloridoid phytoliths are found primarily in the Subfamily Chloridoideae, a warm-season grass that grows in arid to semi-arid areas and require less available soil moisture. Chloridoid grasses are the most abundant in the American Southwest (Gould and Shaw 1983:120). Bilobates and polylobates are produced mainly by panicoid grasses, although a few of the festucoid grasses also produce these forms. Panicoid phytoliths occur in warm-season or tall grasses that frequently thrive in humid conditions. Twiss (1987:181) also notes that some members of the Subfamily Chloridoideae produce both bilobate (Panicoid) and Festucoid phytoliths. "According to Gould and Shaw (1983:110) more than 97% of the native US grass species (1,026 of 1,053) are divided equally among three subfamilies Pooideae, Chloridoideae, and Panicoideae" (Twiss 1987:181).

Buliform phytoliths are produced by grasses in response to wet conditions and are to be expected in wet habitats of floodplains and other places. Trichomes represent silicified hairs, which may occur on the stems, leaves, and the glumes or bran surrounding grass seeds.

Diatoms and sponge spicules also were noted. Long diatoms are cosmopolitan, occurring in many sediments. They indicate at least some soil moisture. Sponge spicules represent fresh water sponges. Their presence in these samples might reflect water puddling and affording a habitat for these microscopic organisms.

Ethnobotanic Review

It is a commonly accepted practice in archaeological studies to reference ethnographically documented plant uses as indicators of possible or even probable plant uses in prehistoric times. The ethnobotanic literature provides evidence for the exploitation of numerous plants in historic times, both by broad categories and by specific example. Evidence for exploitation from numerous sources can suggest a widespread utilization and strengthens the possibility that the same or similar resources were used in prehistoric times. Ethnographic sources outside the study area have been consulted to permit a more exhaustive review of potential uses for each plant. Ethnographic sources document that with some plants, the historic use was developed and carried from the past. A plant with medicinal qualities very likely was discovered in prehistoric times and the usage persisted into historic times. There is, however, likely to have been a loss of knowledge concerning the utilization of plant resources as cultures moved from subsistence to agricultural economies and/or were introduced to European foods during the historic period. The ethnobotanic literature serves only as a guide indicating that the potential for utilization existed in prehistoric times--not as conclusive evidence that the resources were used. Pollen and macrofloral remains, when compared with the material culture (artifacts and features) recovered by archaeologists, can become indicators of use. Plants represented by pollen and charred macrofloral remains will be discussed in the following paragraphs in order to provide an ethnobotanic background for discussing the remains.

Trees

Carya (Hickory)

Hickory nuts (*Carya* sp.) are recorded as the most important nut used by Indians of North America at the time of contact (Reidhead 1981:189). Several species of hickory are sweet and edible, although some are bitter. The nuts were usually harvested in the fall when the outer husks dried and split. Hickory nuts had to be collected early before competing animals harvested them all. Nuts were usually shelled by crushing, often using two rocks. Wooden mortars were used historically for processing large quantities of hickory nuts. After the nuts were crushed, they were usually placed in boiling water. Most of the shell fragments would sink to the bottom, while the nutmeats would float or be held in suspension. The nutmeats could then be skimmed off and used immediately or dried for storage. Many ethnographic sources suggest that hickory nut oil and "milk" were the desired product. The pulverized nuts were placed in slowly boiling water for a long period of time. The oil from the nutmeats (hickory butter) would separate and float to the surface where it was skimmed off and stored for later use. The rest of the nutmeats would dissolve into a milky fluid (hickory milk) that was drunk or used as stock for soup. Hickory sap can be used like maple sap. The various species of edible hickories are found in a variety of habitats including rich moist soils of bottomland woods, dry to moist upland woods, alluvial floodplains of major streams, slightly acidic soils, dry ridges, and well-drained hillsides (Peterson 1977:190; Talalay et al. 1984:338-359).

Juglans (Walnut)

Walnuts (*Juglans*) are noted to have been used less intensively than hickory nuts (Reidhead 1981:186). Both black walnut (*Juglans nigra*) and butternut (*Juglans cinerea*) produce sweet nuts that can be eaten raw or roasted. Walnuts and butternuts can be harvested from late September to late December to early January. Competition with other animals is not as great, probably due to the bitter outer husk which does not split and separate from the nut like hickories. Early in fall, the fibrous outer husk is green, firm, and very difficult to remove. In December, however, the husks are black, rotten, and fairly easy to remove. Walnuts and butternut trees are not found close to one another like hickories can be. The roots of walnut and butternut produce a substance called juglone which is toxic to other walnut and butternut trees, and the trees are intolerant of shade (Talalay, et al. 1984:340). Walnuts and butternuts were processed using a hammer stone and anvil method. The nut was placed on a large flat stone, then cracked using a smaller, hand-held hammer stone. The nutmeat was then picked out of the shell and eaten plain or added to broth, grain dishes, or cakes. Walnuts and butternuts were not usually processed for the oil since portions of the husk get caught in the shell and nutmeat mass. When this is placed in boiling water, the husk fragments will float to the top. If left boiling long enough, the husk fragments dissolve and make everything black and bitter-tasting. Walnut and butternut sap also can be used like maple sap (Peterson 1977:188; Talalay, et al. 1984:354-355).

The inner bark of *Juglans nigra* was used as an emetic and a laxative, and the bark chewed for toothaches. Husk juice was used to treat ringworm and the husk was chewed for colic and poulticed for inflammation. Tea made from dried leaves was astringent and can be used as an insecticide against bedbugs. Black walnut can be found in the deep rich soil of bottomlands and fertile hillsides (Foster and Duke 1990:273; Peattie 1966:121-125; Talalay, et al. 1984:339-340). *Juglans cinerea* grows best along streams and ravines, particularly in well-drained gravelly soil, but also can be found in the rich soils of deciduous woods. Butternut husks are very sticky, and were used to make a brown dye. The white innerbark yields an orange or yellow dye. A bark tea was used to treat rheumatism, headaches, and toothaches. A strong, warm tea was used on wounds to stop bleeding and to promote healing. Tapeworms and fungal infections were treated with oil from butternuts (Foster and Duke 1990:276; Peattie 1966:119-121; Talalay, et al. 1984:340).

Quercus (Oak)

Acorns (*Quercus*) are noted to have been a food source for aboriginal groups in North America. Acorns have a high degree of tannic acid, which must be removed in order to be palatable. Acorns were parched, then immersed or buried whole, with or without the shell, for a long period of time. The moisture diluted or dissolved the tannin. Tannin also was removed by leaching, which involved pulverizing the shelled, parched acorn meats and soaking the acorn meal in running or frequently changed water, or boiling the ground meal in several changes of water. Wood ash could be added to the boiling water to help neutralize the tannin. The leached meal was most commonly baked into a cake or pancake. The meal also was made into a gruel, porridge, or soup. The ground, roasted acorn shells were used to make a beverage similar to coffee. Oil also was extracted from acorns. Acorns have a high percentage of carbohydrates and relatively low percentages of protein, fat, and fiber.

Oaks are commonly divided into the white oak group and the black or red oak group. White acorns are relatively sweeter than black oak acorns. In the eastern United States, white oak acorns are generally available from mid-September to late November. White oak acorns require less processing, but are more rapidly eaten by mammals, birds, and insects. Black oak acorns are more bitter and often are available from late September to mid-February. Black oak acorns tend to have a higher percentage of fat and a lower percentage of carbohydrates than white oak acorns. Black oak acorns also provide more calories per 100 grams. Oak wood is very hard, heavy, and strong. It was valued as firewood because the hard wood would burn slowly, and a large log could burn all night. Oaks are distinctive deciduous or evergreen, hardwood shrubs to large trees found in dry to moist ground in many different habitats (Gallagher 1977:113; Kirk 1975:104-106; Munson 1984:468; Petruso and Wickens 1984:360-378).

Shrubs and Herbaceous Plants

Apiaceae (Parsley Family)

Several members of the Apiaceae (parsley) family were used for food, medicines, and charms by eastern tribes. Many plants were utilized for their greens, cooked as potherbs, and roots, which were most often boiled. These include *Heracleum* (cow parsnip), *Angelica* (angelica), *Pastinaca* (wild parsnip), *Cryptotaenia* (honewort), *Carum* (caraway), *Daucus* (wild carrot), *Sium* (water-parsnip), *Osmorhiza* (sweet cicely), and *Erigenia* (harbinger-of-spring). The seeds of several of these plants also may be used as a seasoning (Peterson 1977:38-42). Seeds of these and other plants such as *Taenidia* (yellow pimpernel) also were smoked as hunting and fishing charms. *Cicuta* (water-hemlock) is noted to be poisonous, but medicinal and contraceptive uses are reported. *Angelica*, *Thaspium* (meadow parsnip), *Sanicula* (black snakeroot), *Erigenia*, *Pimpinella* (anise), *Heracleum*, and *Sium* also provided medicinal resources (Hamel and Chiltoskey 1975:23, 27, 31, 48, 55; Yarnell 1964:164, 171, 178, 180).

Cheno-ams

Cheno-ams are a group of plants that include *Chenopodium* (goosefoot) and *Amaranthus* (pigweed). These plants were exploited for both their greens and seeds. The greens are most tender in the spring when young but can be used at any time. Leaves and tips often were steamed or boiled. The seeds were eaten raw or ground into a meal that was used to make a variety of mushes and cakes. The seeds are usually noted to have been parched prior to grinding. The high protein and fat content of the seeds result in a high caloric value. Seeds are usually harvested in the fall and early winter, and harvestable quantities of *Chenopodium* seed persists late into the winter. *Chenopodium* and *Amaranthus* are both weedy annuals capable of producing large quantities of seeds (Kindscher 1987:18-22, 79-83; Peterson 1977:152, 154; Seeman and Wilson 1984:301-305). *Chenopodium* leaves are rich in vitamin C and were eaten to treat stomachaches and to prevent scurvy. Leaf poultices were applied to burns, and a tea made from the whole plant was used to treat diarrhea. *Chenopodium* is commonly found in cultivated fields, waste places, open woods or thickets, and on stony hills. It is an opportunistic weed, often establishing itself rapidly in disturbed areas. *Amaranthus* leaves were an important source of iron. *Amaranthus* poultices were used to reduce swellings and to soothe aching teeth. A leaf tea was used to stop bleeding and to treat dysentery, ulcers, diarrhea, mouth sores, sore throats, and hoarseness. *Amaranthus* commonly grows along roadsides and waste places, and in disturbed ground (Angier 1978:33-35; Fernald 1950:592-596; Foster and Duke 1990:216; Harris 1972:58; Krochmal and Krochmal 1973:34-35, 66-67; Martin 1972).

***Corylus* (Hazelnut)**

Two species of *Corylus* (hazelnut) are native to the United States. *C. americana* (American hazelnut) and *C. cornuta* (beaked hazelnut) are found in the eastern United States, while *C. cornuta* var. *californica* (California hazelnut) is a western variety. *C. americana* is noted to be "quite common in Indiana" (Deam 1931:72-74). American hazelnuts are spreading shrubs with hairy twigs and a husk that is open at one end, while beaked hazelnuts have a bristly, extended, beaklike husk completely surrounding the nut. Hazelnuts generally ripen in August but can remain on the bushes until late fall. The thin shells are easily cracked and contain a sweet nut. Riedhead (1981:187) notes that abundant evidence exists for the ethnohistorical and archaeological use of hazelnuts. Nuts were eaten fresh, used in soups, and stored for winter use. Nuts also can be roasted and ground into a flour. American hazelnut requires a great deal of sunlight and grows best in rich, moist soils in thickets and edges of woods. It is found only in eastern North America, but not in the Deep South. Beaked hazelnut grows in the northern United States and southern Canada, from coast to coast, in dry or moist woodlands, hillsides, thickets, and on mountain slopes (Brill and Dean 1994:155-157; Harlow, et al. 1991:349; Medsger 1966:105-107; Peterson 1977:200; Reidhead 1981:187-189).

***Toxicodendron* (Poison Ivy)**

Toxicodendron (poison ivy, poison sumac, etc.) might be found as a coarse shrub or small tree or perhaps a vining plant (Fernald 1950:978). It often grows in wooded swamps and at the edges of wooded areas. The poison oil found in *Toxicodendron* is called unishiol. Many people are allergic to this compound, which produces a rash and itching in those people. Prolonged or recent exposure increases ones potential for allergy. When the plant is burned the unishiol oil released is then disbursed into the air and can cause rash and open blisters on 100% of the body surfaces as well as inside the throat and lungs. Both modern day and historical cures to intense sensitivity to poison ivy include beginning to consume small quantities of leaves in the spring when the oil production is minimal, to titrate the internal unishiol level in your body to build a tolerance. This remedy is only for the brave and desperate, as it can backfire and cause severe swelling inside the throat and esophagus - causing death due to asphyxiation in the most severe cases.

This plant was most often exploited for its medicinal properties. A decoction (extracting the desired substance in a boiling down process) was used as an emetic (to induce vomiting). For example, during religious ceremonies vomiting was part of the process to cleanse the body and soul. A poultice of roasted crushed roots held a general medicinal value. A poultice or salve containing the root was used for chronic sores, swollen glands, and sores on the lips. A root poultice also was applied to swollen areas to make the swelling reduce by "opening up" the area. Poison sumac is noted to have been used for asthma, fever, and the clap. This plant was considered poisonous by all tribes mentioned. Periods of temporary blindness are reported after contact with poison ivy, etc. - for example as a result of rubbing the eyes. Yet, western tribes are reported to use it directly on eyes to lessen sores and improve vision. Alder (*Alnus*) was used as a skin wash to treat the rash occurring from poison oak (Brill and Dean 1994:38-9; Hauser 2002; Moerman 1998:564-5; Tilford 1997:12).

Typha (Cattail)

Typha (cattail) are perennial marsh or aquatic plants with creeping rhizomes. This plant is a rich source of nutrients and noted to be one of the most important and common wild foods. Cattails were a staple for many American Indian groups. Various parts of the cattail plant can be used throughout the year. In the spring, young shoots can be peeled and the white inner core eaten raw or cooked like asparagus. Cattail shoots provide beta carotene, niacin, riboflavin, thiamin, potassium, phosphorus, and vitamin C. During the summer, young flower stalks were taken out of their sheaths and cooked. The male portions of the immature, green flower head can be steamed or simmered and eaten like corn. Flowers were eaten alone or added as a flavoring or thickening for other foods. Pollen-producing flowers and the pollen itself were collected and used as flour, either alone or mixed with other meal. In the fall, the rootstalks were collected, the outer peel removed, and the white inner cores of almost pure starch were eaten raw, boiled, baked, or dried and ground into flour. Cattail roots are richer in starch during the fall. Cattail starch flour is noted to be similar in quantities of fats, proteins, and carbohydrates to flour from rice and corn. The seed-like fruits also were collected and eaten in the fall. Indian groups are noted to process these "seeds" by burning off the bristles. The seeds were then parched and could be more easily rubbed off the spike. The slightly astringent flower heads were sometimes used to relieve diarrhea and other digestive disorders. The "jelly" from between the young leaves and pounded roots was applied to wounds, sores, carbuncles, boils, external inflammations, burns, scalds, and to soothe pain. Cattail down was used as dressing for wounds and padding in cradleboards and moccasins. Leaves and stems were used for weaving mats and baskets, to make toys, and to thatch roofs. Cattails form dense stands in marshes, swamps, ponds, sloughs, ditches, shallow stagnant water, and edges of streams (Brill and Dean 1994:67-71; Foster and Duke 1990:312; Medsger 1966:196; Niering 1985:431-432; Peterson 1977:158).

Vitis (Wild Grape)

Vitis (wild grape) are thornless, high-climbing vines that often climb to the tops of large forest trees. Some vines can be parasitic. Grape leaves are an excellent source of beta carotene and niacin, and can be collected in the summer and boiled as potherbs. The fruits ripen in the late summer and fall and are round, few-seeded, juicy berries that can be purple, blue, black, red, or amber. Wild grapes are less sweet than commercial varieties but contain more flavor. Grapes were eaten fresh and were dried for future use. They provide potassium, beta carotene, fructose, tartaric acid, quercitrin, tannin, malic acid, gum, and potassium bitartrate. A grape leaf or seed infusion is noted to be astringent and used to treat bleeding and diarrhea. Indian groups used it for stomachaches and hepatitis. The fruit, leaves, and tendrils also were used to treat diarrhea and snakebite. Leaves were used for poultices, bandages, and for wrapping foods. Wild grapes are reported to be diuretic and can be used to treat urinary tract infections. The skins contain resveratrol, which can prevent cardiovascular disease by reducing blood clots and raising high-density lipoprotein cholesterol. Wild grape vines are found in woods, thickets, in wetlands, and along streams and riverbanks (Angell 1981:156; Brill and Dean 1994:165-168; Medsger 1966:53-59; Meuninck 1988:15-16; Peterson 1977:198).

Discussion

Site 38CH1693 is situated on a relic dune in a wooded area overlooking a wetland to the north. In addition to shell middens and a roasting pit, the site yielded Thom's Creek pottery, some of which exhibited residues. The site appears to reflect seasonal activities and conditions at the site were evaluated as being favorable for preservation of organic materials (Trinkley 2006:3). Specifically, pollen and phytolith analyses were undertaken to help address questions of seasonality and to assist in reconstructing local vegetation. Fill from several of the identified features was examined for pollen and phytoliths.

The pollen record from all samples was dominated by arboreal pollen, reflecting the local forest. *Pinus* and *Quercus* pollen (Figure 67, Table 19) dominate the records, indicating that pines and oaks dominated the local forest. *Carya* pollen is observed regularly, although it is not a major constituent of the record. This is consistent in descriptions of the area as supporting a pine, oak, hickory forest. Hickory is often under-represented in the pollen records. Other tree pollen included *Alnus*, *Betula*, *Castanea*, *Ilex*, *Juglans*, *Liquidambar*, *Nyssa*, *Prunus*-type, and *Tilia* reflecting local growth of alder, birch, chestnut, holly, walnut, gum, black gum, chokecherry, and basswood trees. These pollen types were observed in small quantities in some, but not all of the samples, and are interpreted to reflect elements of the local forest or trees growing along the local creek.

The non-arboreal portion of the pollen record includes a variety of plants that grew as part of the local, native vegetation. Apiaceae, *Cephalanthus*, Corylaceae, and *Typha angustifolia*-type pollen represent a member of the umbel family, buttonbush, hazel, and cattails growing in a riparian vegetation community in the nearby wetland. Low-spine Asteraceae, High-spine Asteraceae, Brassicaceae, Caryophyllaceae, Cheno-am, Fabaceae, Onagraceae, Poaceae, *Polemonium*-type, Rosaceae, *Toxicodendron*-type, *Parthenocissus*, and *Vitis* pollen reflect various members of the sunflower family including ragweed/marshelder, sunflower and aster-type plants, members of the mustard and pink families, one or more members of the Cheno-am group, legumes, a member of the evening primrose family, grasses, jacob's ladder, a member of the rose family, poison ivy, Virginia creeper, and grape. This wide variety of pollen probably reflects only a portion of the local vegetation community growing in the vicinity of the site at the time of occupation. Specific

Table 19.
Observed Pollen Types

Scientific Name	Comon Name
ARBOREAL POLLEN:	
Alnus	Alder
Betula	Birch
Carya	Hickory, pecan
Castanea	Chestnut
Ilex	Holly
Juglans	Walnut
Liquidambar	Gum
Nyssa	Tupelo
Pinus	Pine
Prunus	Plum
Quercus	Oak
Tilia	Liden, basswood
NON-ARBOREAL POLLEN:	
Apiaceae	Parsley/carrot family
Asteraceae:	Sunflower family
Low-spine	Includes ragweed, cocklebur, sumpweed
High-spine	Includes aster, snakeweed, sunflower
Brassicaceae	Mustard family
Caryophyllaceae	Pink family
Cephalanthus	Buttonbush
Cheno-am	Includes the goosefoot family and amaranth
Corylus	Hazel
Fabaceae	Bean or Legume family
Onagraceae	Evening primrose family
Poaceae	Grass family
Polemonium	Jacob's-ladder
Rosaceae	Rose family
Toxicodendron	Poison ivy
Typha angustifolia	Cattail
Parthenocissus	Virginia creeper
Vitis	Grape
Indeterminate	Too badly deteriorated to identify
SPORES	
Monolete, Trilete	Ferns
FUNGAL SPORES	
Tetraploa	Fungal spore
OTHER	
Charred Asteraceae tissue fragment	Charred tissue fragment from a member of the sunflower family
Scolecodont	Worm jaw

variations in the pollen record will be discussed below as they pertain to each feature sampled.

Feature 1 yielded large quantities of oyster shell, as well as abundant Thom's Creek pottery, large quantities of carbonized hickory nutshell, and large quantities of faunal remains including fish vertebra. A radiocarbon age of 3930 $\pm$ 50 BP is reported on hickory nut shell fragments (Beta 219984). The pollen record from Feature 1 exhibits a "typical" pollen record, heavily dominated by arboreal pollen. This sample yielded a large quantity of Poaceae pollen, suggesting that grasses grew in the midden. Recovery of a moderate quantity of charred Asteraceae tissue fragments suggests the possibility of burning the midden. If this happened, it is likely that weedy members of the sunflower family grew in the midden areas and were burned off. Charcoal was moderately abundant in this sample, indicating either discard of remains from a feature used for cooking or burning the midden.

The phytolith record is dominated by elongate smooth forms (Figure 67) in all samples, representing grasses in general. The grass short cells are most informative concerning the types of grasses present. Sample 1 from Feature 1 displays moderate quantities of both festucoid and panicoid grass short cells, representing cool season and tall grasses, with a smaller quantity of chloridoid short cells present, reflecting short grasses that thrive in sunny, dry conditions. These grass short cell phytoliths characterize the local grass population as one that includes cool season grasses growing in the cooler months of the year, as well as shady places. Tall grasses are more abundant than short grasses, indicating that in sunny areas tall grasses, which require more moisture, are more prevalent. This phytolith signature reflects a moderately well watered area. This is substantiated by recovery of large quantities of buliform

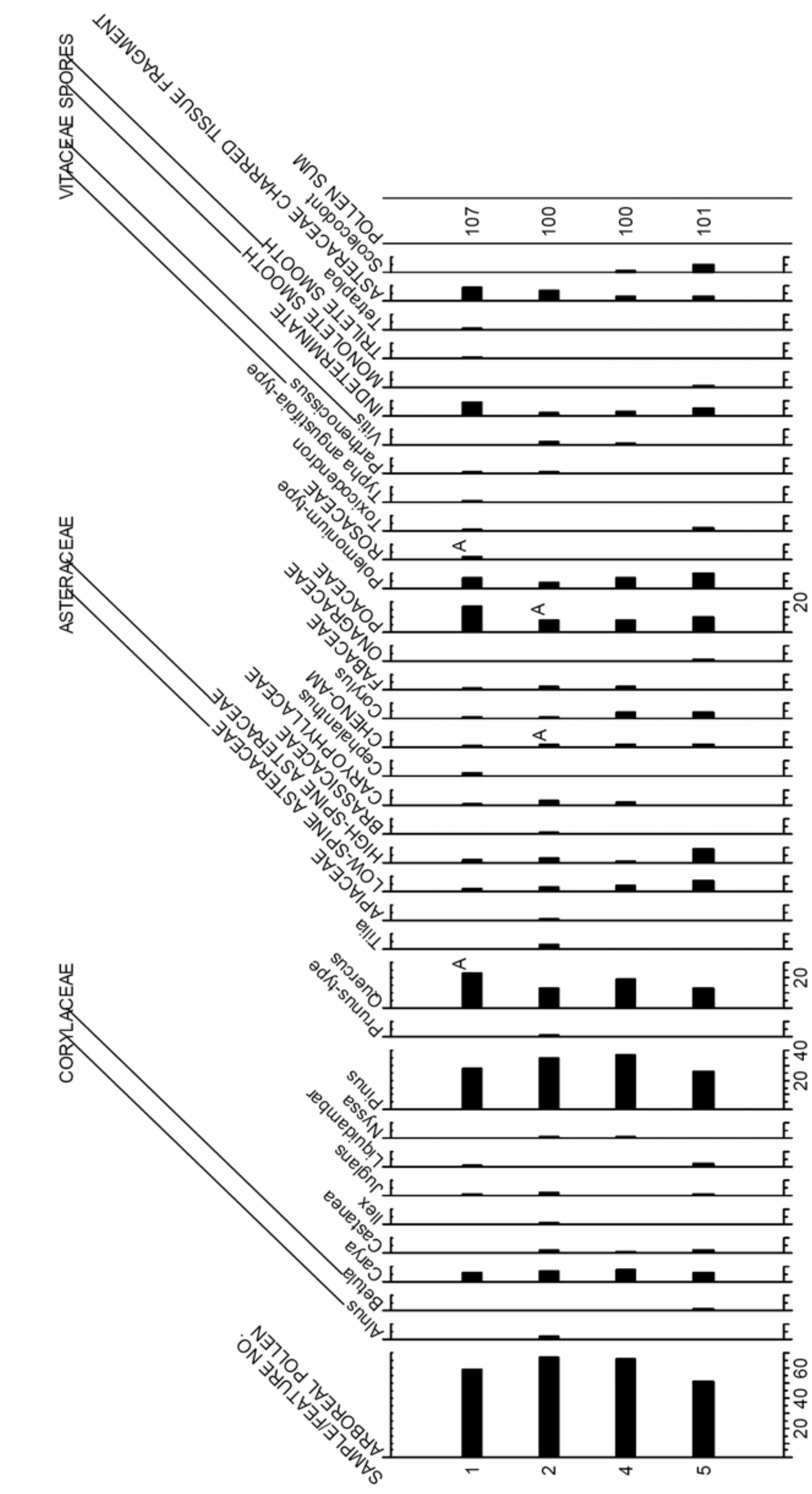

Figure 67. Pollen diagram for 38CH1693.

phytoliths, which represent the cells that control leaf rolling in response to drought conditions. When these cells are used regularly, they tend not to silicify. Therefore, recovery of larger quantities of buliforms in the presence of well-preserved grass short cell phytoliths is interpreted to represent sufficient water for optimal growth of the local grasses. The presence of water in the sediments is further substantiated by recovery of sponge spicules, which represent organisms that grow in the presence of water. A small quantity of spiny spheroid phytoliths was observed. These phytoliths were not considered to be diagnostic of palms, so were left at the descriptive level of identification. They might represent a plant in the Euphorbiaceae (spurge family) or perhaps might reflect a non-diagnostic form produced by palms.

Feature 2, which yielded a radiocarbon age of 3720 ± 60 BP, exhibits *Vitis* pollen, suggesting the possibility that grapes were processed and perhaps the remains discarded in the midden. It is also possible that grape vines grew in disturbed sediments in the vicinity of the midden. This appears to be a less satisfactory explanation for recovery of *Vitis* pollen since the grape vines would probably have been prized and their growth in an area that was used as a midden would probably have made protection of the plants, until harvest, difficult. Therefore, it is likely that grapes were used or processed by occupants of this site.

The phytolith record from Feature 2 is very similar to that from Feature 1. Very few differences are recorded and these include a larger frequency of panicoid grass short cells and a reduced quantity of buliforms. In addition, the frequency of sponge spicules is reduced. These differences are very slight and represent a local grass population very similar to that interpreted for Feature 1. A small quantity of charred Asteraceae tissue fragments was noted in this sample, indicating that a member of the sunflower family was burned, either in a natural fire or in a fire related to cultural activities. The spiny spheroid phytoliths recovered in this sample were similar to those in Sample 1.

The pollen record from Feature 4, which yielded a radiocarbon age of 3720 ± 50 BP, also exhibits a small quantity of *Vitis* pollen, suggesting economic activity or at least local growth of wild grapes. No other portions of the pollen record from this feature are noteworthy.

The phytolith record from Feature 4 exhibits smaller festucoid and panicoid grass short cell frequencies and a larger chloridoid grass short cell frequency than the other samples examined from this site. This suggests slightly drier conditions associated with this portion of the midden. A small quantity of Arecaceae phytoliths was observed, representing palms growing in the local vegetation community. These phytoliths were large and robust and considered diagnostic for palms, rather than being small and undiagnostic for any plant family.

The pollen record from Feature 5 appears to be unremarkable, providing no information concerning possible use. This feature yielded a radiocarbon age of 3870 ± 40 BP.

The phytolith record from Feature 5 yielded small quantities of festucoid and chloridoid phytoliths and an elevated panicoid grass short cell frequency. In addition, it yielded diagnostic Arecaceae phytoliths, rather than the undiagnostic spiny spheroid forms. In general, this sample yields a picture of a local grass population that was dominated by tall grasses, indicating that this was a relatively sunny location. The quantities of panicoid grass short cells, coupled with the quantity of buliforms, suggest that plenty of water was available for the grasses.

The phytolith record from Feature 6, representing the roasting pit, is marked by moderate quantities of festucoid and panicoid grass short cells and a small quantity of chloridoid forms. The buliforms were moderately abundant and sponge spicules were almost as abundant as all phytoliths. This suggests the presence of large quantities of water, perhaps associated with use of the roasting pit. Once again, Arecaceae phytoliths were recovered, indicating the presence of palms. No pollen sample was examined from this roasting pit because it was probable that given the location of the sample within the pit, all of the pollen relating to use of the pit had been consumed by fire.

Summary and Conclusions

The combined pollen and phytolith records for site 38CH1693 indicate that local vegetation included trees typical of a mixed oak pine woodland that included hickory. Other trees growing in the area, either in the woodland or perhaps near the wetland, include alder, birch, chestnut, holly, walnut, gum, black gum, chokecherry, and basswood. Plants that likely grew in the vicinity of the wetland include a member of the umbel family, buttonbush, hazel, and cattail. Other plants that grew in the vicinity of the site include various members of the aster or sunflower family, mustards, a member of the pink family, Cheno-ams, legumes, a member of the evening primrose family, grasses, jacob's ladder, a member of the rose family, poison ivy, Virginia creeper, wild grapes, and palms. The grasses included cool season grasses that grow in the cooler months of the year and/or in shady places, as well as tall grasses that grow in sunny areas and require soil moisture. A few short grasses, which are drought tolerant and grow in sunny areas, also grew in this area. Although many of the plants represented in these records have economic uses, quantities of pollen and phytoliths recovered in these samples do not point solidly to evidence of their use and discard. It is possible that wild grapes were processed, since recovery of this type of pollen is usually rare and *Vitis* pollen was recorded in two of the four pollen samples examined.

FAUNAL MATERIALS AND ANALYSIS

S. Homes Hogue, Ph.D. and Lauren Lowrey
Mississippi State University

Introduction

Analysis of the vertebrate faunal materials from 38CH1693 provided the opportunity to address several questions regarding the adaptation and hunting strategies of Late Archaic/Early Woodland prehistoric Native Americans. Research questions addressed in this study include:

- What were the preferred animal foods for the occupants?
- How did different screen size used in levels and feature affect faunal recovery?
- Are the faunal samples adequate in size and representative for each feature?
- Are there differences among the features in the amount and types of fauna present that could suggest some specialized or seasonal use of a particular resource?
- How does the collection compare to others from the same temporal period?
- Are certain cuts of meat preferred or represented over others?
- Is deer bone heavily processed to extract the most meat/marrow?
- Do the features represent a seasonal or year/round use of the site?
- What modifications are present on the faunal elements? Were bones fashioned into tools?

The methods used to test these and other questions are discussed below. While these questions are meant to direct the research presented here additional questions may be identified during the course of this study which can be addressed in the future.

Methods

The 38CH1693 faunal materials were recovered archaeologically using different screen sizes. Unit level fill was processed differently from fill of intact features. The A horizons (Level 1) materials were not screened and other unit strata removed by levels (the shell or sand Level 2 fill, etc.) was screened through ¼ inch mesh. Feature fill was waterscreened though ⅛ inch mesh to ensure proper recovery of fish remains (Trinkley 2006). Analysis by the authors employed standard zooarchaeological procedures and methods. To aid in element identification the comparative collection at Cobb Institute of Archaeology, Mississippi State University, was used. Unfortunately, the limited comparative collection housed at the Cobb Institute restricted the identification by species of most of the fish remains. Time and financial restraints prevented travel to use other comparative collections. It is desired that the faunal materials can be more thoroughly analyzed for a graduate thesis when time and funds can be made available.

All recovered faunal materials were sorted to class, suborder, or species, and individual bone elements were identified. When preservation permitted the side (right or left), specific bone section (diaphysis, epiphysis, distal, proximal, etc.), and level of maturity (immature, adult, old adult) were recorded. A count was made of all elements in a classification (class, species, etc) and weighed in grams. In instances where deer bone elements were complete (Features 1, 2, and 4 and several unit levels) measurements were taken following the standards outlined in Von den Driesch (1976).

The Minimum Number of Individuals (MNI) was computed for each animal category using paired bone elements and age (mature/immature) as criteria. Grayson' s (1973) maximum distinction method was employed to determine MNI. For the collections analyzed in this study, this meant treating both horizontal and vertical strata as single independent proveniences (Grayson 1973: 438). Features were also treated as individual data sets and kept separate at all levels of interpretations. Data from the different proveniences (levels and features) are combined together to provide a site total.

Since MNI as a zooarchaeological measure can be problematical, the biomass contribution of each species was estimated. The method used in this study is based on allometry—the biological relationship between soft tissue and bone mass. Biomass is calculated using a least squares analysis of logarithmic data where bone weight is used to estimate soft tissue amounts that would have been supported by the bone (Reitz and Wing 1999). The biomass equation $Y= aX^b$, can be written as $\log Y= \log a + b(\log X)$ (Simpson et. al. 1960:397) where Y is the biomass (in kilograms), X is the weight of bone (in kilograms), "a" is the Y-intercept for a log-plot based on a least squares regression and the best fit line, and "b" is the constant of allometry—the slope of the line defined by the least squares regression and the best fit line.

A constructive method for comparing similarities and differences in faunal assemblages among sites is to observe the percentages of MNI and biomass percentages for specific faunal categories. For this study, MNI and biomass percentages were combined in configuring the faunal category patterns for mammal, bird, amphibians, reptiles, fish, and crab for the larger feature samples.

As a measure of zooarchaeological quantification, using MNI is problematical (Casteel 1977; Grayson 1973; 1984). Depending on the method used (minimum distinction, maximum distinction, or stratigraphic layers), the MNI calculated for a faunal assemblage may be under or over representative. Likewise, use of MNI emphasizes small mammals over large ones. For example, a bird species or rabbit may be represented five times, but one large mammal such as a deer would contribute more to the diet.

Additionally, representation of an animal does not presume its use in entirety at the site (Reitz and Weinand 1995). Certain deer meat cuts may have been traded elsewhere (Scott 1981: Thomas 1971: Welch 1991) or a deer dressed in the field, with less desirable parts being under-represented at a site. In both cases deer element representation at a site would be biased so it is important that research questions consider the limitations inherent in using MNI. One way to test for these problems is to observe element presence or absence to gain insight on butchery and meat preference patterns. Deer weight (Jackson and Scott 1995) and the number of identified specimens (NISP) (Reitz and Wing 1999) compared with information for standard deer will reveal over- and under-representation of specific elements. Butchering and processing of deer carcasses on-site would be very similar to standard deer in element representation. To test for over- and under-representation of particular bone elements identified and weighed deer elements were placed in one of five categories: skull (cranium, mandible, teeth), axial (vertebrae, sternum, sacrum, ribs), forequarter (scapula, humerus, radius, ulna), hindquarter (innominate, femur, tibia, fibula, patella), and lower legs and feet (metacarpals, metatarsals, phalanges). Percentages of representation for each group is calculated and compared with known standards.

The degree of bone processing also was recorded for deer. The amount of processing associated with a faunal collection provides useful information on food needs and dietary requirements. Extracting bone marrow, crushing bone for oil, and other types of bone breakage and processing indicates a greater dependency on large animal byproducts. Site duration (Peacock et al. 2005; Zeder and Arter 1996), population size, or seasonal use of resources are all factors. More processing of large mammal skeletal elements is expected if deer meat and other foods are not adequate to feed the general populace. Bone processing was documented by recording the degree of fragmentation for deer elements and large unidentified mammals (presumed to represent mostly deer since no other large mammal was regularly identified). This involved using a scale of four categories; each fragment was recorded as representing < 25, 25-50, 50-75, or > 75% of the total element. A similar method is outlined in Scott and Jackson (1998).

Observations of bone modifications classified as cut, burned, gnawed, and worked are included in the analysis. Burned bone is modified by exposure to fire during preparation or after discard and is distinguished form other bone by its black or gray color. Gnawed bone signifies that it was not initially buried and was exposed to animals such as rodents or carnivores. Human modification of bone not associated with butchering is identified as worked bone (Reitz and Weinand 1995). Only faunal remains recovered from feature contexts were included in this study.

Results

Identified Species

Table 20 provides a summary of the combined data for the site, which includes level materials screened through ¼ inch mesh. Tables 21-26 provide summaries of the faunal analysis for the six features. A total of 8599 animal bones were analyzed with a total weight of 2900.54 gm. MNI totaled 117 for the entire site and thirty-one taxa and 28 species were identified in the collection. These include seven mammals, deer (*Odocoileus virgiananus*), eastern cottontail (*Sylvilagus floridanus*), raccoon (*Procyon lotor*), grey squirrel (*Sciurus sciurus*), fox squirrel (*Sciurus niger*), bobcat (*Lynx rufus*), and rat (*Rattus* sp.); two bird species, turkey (*Meleagris gallapavo*), and Canadian goose (*Branta canadensis*); seven reptile species, garter snake (*Thmnophis sirtalis*), black racer (*Coluber constrictor*), water snake (*Natrix* sp), cotton mouth (*Agkistrodaon* sp.), box turtle (*Terrapene carolina*), snapping turtle (*Chelydra serpentine*), and river cooter (*Chrysemys floridana*); two amphibian species, Southern toad (*Bufo terrestris*), and one unidentified frog species (*Anura* sp.); eleven fish species, hardhead catfish (*Arius felis*), gafftopsail catfish (*Bagre marinus*), bass (*Micropterus* spp.), red drum (*Sciaenops ocellatus*), flounder (*Paralichthys* sp.), bluefish (*Pomatomus saltatrix*), bowfin (*Amia calva*), spotted seatrout (*Cynoscion nebulosus*), Atlantic croaker (*Micropogonias undulates*), ray (*Myliobatidae* sp., probably eagle ray), skate (*Rajidae* sp.), and finally blue crab (*Callinectes* sp). Mammal dominated the percentage of biomass weight (76.50%) for the site, followed by fish (10.41%), bird (6.61%), reptiles (5.21%), crab (0.46%), and amphibian (0.02%).

A summary discussion of the faunal material recovered from Features 1-6 follows. Feature 1 (Table 21) contained 2,271 bone fragments (782.61 gm) representing 23 taxa and 29 MNI, consisting mostly of fish (38%). Biomass weight was however dominated by mammals (78%) specifically deer. Feature 2 (Table 22) yielded the largest number of bones at 4,349 weighing 1,099.26 gm. One unusual species, bobcat, was only identified in this feature and in unit 180R170, level 5. Bobcats occupy a diversity of habitats but prefer areas with dense vegetation such as forests and swamps (Choate 1994) so its presence in the faunal assemblage is not unexpected. Twenty taxa are represented and 26 MNI. Mammal species contributed to the majority of the MNI (38%) and biomass weight (73%). Feature 3 (Table 23) yielded 73 bone fragments representing eight MNI and weighing 14.61 gm. This was a relatively small faunal

Table 20.
Faunal Identification, MNI, Number, Weight, and Biomass Measures for 38CH1693

Species	MNI #	%	# of Bones	Weight (gm)	Biomass (kg)	%
Deer, *Odocoileus virginianus*	17	14.53	270	1236.93		
Deer, *Odocoileus virginianus*- Burned	-	-	21	39.41		
Deer, *Odocoileus virginianus*- Immature	5	4.27	224	182.35		
Bobcat, *Lynx rufus*	1	0.85	9	3.91		
Bobcat, *Lynx rufus-Burned*	-	-	1	0.97		
Eastern Cottontail, *Sylvilagus floridanus*	4	3.42	9	1.07		
Raccoon, *Procyon lotor*	5	4.27	34	20.14		
Grey Squirrel, *Sciurus sciurus*	4	3.42	11	2.00		
Grey Squirrel, *Sciurus sciurus*- Burned	1	0.85	1	0.09		
Fox Squirrel, *Sciurus niger*	1	0.85	1	0.13		
Rattus sp.	4	3.42	12	0.78		
Unidentified Large Mammal	-	-	1221	558.86		
Unidentified Large Mammal-Burned	-	-	171	101.53		
Unidentified Small Mammal	-	-	314	43.04		
Unidentified Small Mammal-Burned	-	-	4	1.71		
Unidentified Mammal	-	-	1366	165.12		
Unidentified Mammal-Burned	-	-	33	7.77		
Mammal Subtotals	**42**	**35.88**	**3702**	**2365.81**	**28.6086**	**77.25**
Goose, *Branta canadensis*	7	5.98	53	38.74		
Turkey, *Meleagris gallapavo*	2	1.71	18	11.09		
Unidentified Bird	-	-	516	141.58		
Unidentified Bird-Burned	-	-	8	1.82		
Bird Subtotals	**9**	**7.69**	**595**	**193.23**	**2.4566**	**6.63**
Garter Snake, *Thamnophis sirtalis*	1	0.85	3	0.12	0.0016	
Black Racer, *Coluber constrictor*	7	5.98	32	3.25	0.0454	
Black Racer, *Coluber constrictor* -Burned	1	0.85	5	1.00	0.0138	
Water Snake, *Natrix sp.*	1	0.85	4	0.15	0.0020	
C. Moccasin, *Agkistrodaon sp.*	1	0.85	1	0.05	0.0007	
Unidentified Snake	-	-	3	0.11	0.0015	
Box Turtle, *Terrapene carolina*	4	3.42	50	26.32	0.2829	
Box Turtle, Terrapene carolina-Burned	1	0.85	5	1.15	0.0337	
River Cooter, *Chrysemys floridana*	8	7.69	155	78.95	0.5905	
River Cooter, *Chrysemys floridana*- Burned	1	0.85	6	2.30	0.0553	
Snapping Turtle, *Chelydra serpentina*	1	0.85	12	13.40	0.1800	
Unidentified Reptile	-	-	9	3.61	0.0747	
Unidentified Turtle	-	-	316	73.02	0.5604	
Unidentified Turtle-Burmed	-	-	31	4.98	0.0927	
Reptile Subtotals	**26**	**23.04**	**632**	**208.41**	**1.9352**	**5.23**
Southern Toad, *Bufo terrestris*	2	1.71	2	0.03		
Unidentified Frog, Anura sp.	3	2.56	27	0.81		
Amphibian Subtotals	**5**	**4.27**	**29**	**0.84**	**0.0057**	**0.02**
Skate/Shark, *Rajidae spp.*	1	0.85	1	2.88	0.3126	
Ray, *Myliobatidae sp.*	1	0.85	66	23.15	1.8771	
Ray, *Myliobatidae sp.*- Burned	-	-	3	0.49	0.0682	
Gafftopsail, *Bagre marinus*	3	2.56	25	1.13	0.0224	
Hardhead Catfish, *Arius felis*	9	7.69	99	17.06	0.2955	
Unidentified Catfish, *Arridae sp.*	-		28	2.52	0.0480	
Bass, *Micropterus* spp.	5	4.27	68	3.08	0.0701	
Bluefish, *Pomatomus saltatrix*	1	0.85	3	0.68	0.0200	
Flounder, *Paralichthys sp.*	3	2.56	15	0.45	0.0129	
Atlantic Croaker, *Micropogonias undulatus*	2	1.71	9	0.55	0.0250	
Bowfin, *Amia calva*	2	1.71	14	1.51	0.0418	
Red Drum, *Sciaenops ocellatus*	2	1.71	23	1.77	0.0594	
Drum, *Scianidae* spp.	2	1.71	18	3.41	0.0965	
Spotted Seatrout, *Cynoscion nebulosus*	2	1.71	11	1.29	0.0470	
Unidentified Trout	-	-	9	0.52	0.0240	
Unidentified Fish	-	-	2953	59.59	0.8326	
Unidentified Fish-Burned	-	-	3	0.15	0.0062	
Fish Subtotals	**33**	**28.18**	**3348**	**120.23**	**3.8593**	**10.42**
Crab, *Callinectes* sp.	2	1.71	7	0.43	0.1696	0.46
Miscellaneous Unidentified	-	-	282	11.49	-	-
Miscellaneous Unidentified-Burned	-	-	4	0.10	-	-
Totals	**117**	**100.77**	**8599**	**2900.54**	**37.0350**	**100.01**

Table 21.
Faunal Identification, MNI, Number, Weight, and Biomass Measures for Feature 1

Species	MNI #	%	# of Bones	Weight (gm)	Biomass kg	%
Deer, *Odocoileus virginianus*	2	6.70	108	448.50		
Deer, Odocoileus virginianus-Burned	-	-	2	1.91		
Deer, *Odocoileus virginianus* -Immature	1	3.45	29	19.65		
Eastern Cottontail, *Sylvilagus floridanus*	1	3.45	5	0.46		
Raccoon, *Procyon lotor*	1	3.45	9	2.63		
Fox Squirrel, *Sciurus niger*	1	3.45	1	0.13		
Grey Squirrel, *Sciurus sciurus*	2	6.70	5	1.04		
Rattus sp.	1	3.45	7	0.27		
Unidentified Large Mammal	-	-	162	111.20		
Unidentified Large Mammal-Burned	-	-	25	18.45		
Unidentified Small Mammal	-	-	45	7.78		
Unidentified Small Mammal-Burned	-	-	1	0.30		
Unidentified Mammal	-	-	512	59.61		
Unidentified Mammal-Burned	-	-	21	4.43		
Mammal Subtotals	**9**	**31.03**	**932**	**676.36**	**9.2699**	**77.91**
Turkey, *Meleagris gallapavo*	1	3.45	9	4.62		
Goose, *Branta canadensis*	1	3.45	11	6.98		
Unidentified Bird	-	-	76	8.26		
Bird Subtotals	**2**	**6.90**	**96**	**19.86**	**0.3099**	**2.60**
Box Turtle, *Terrapene carolina*	1	3.45	9	5.89	0.1037	
River Cooter, *Chrysemys floridana*	1	3.45	15	9.75	0.1454	
Unidentified Turtle	-	-	88	21.70	0.2486	
Unidentified Turtle-Burned	-	-	27	3.73	0.0764	
Water Snake, *Natrix* sp.	1	3.45	4	0.15	0.0020	
C. Moccasin, *Agkistrodaon sp.*	1	3.45	1	0.05	0.0007	
Black Racer, *Coluber constrictor*	1	3.45	5	0.73	0.0100	
Black Racer, *Coluber constrictor* -Burned	-		5	1.00	0.0138	
Reptile Subtotals	**5**	**17.24**	**154**	**43.00**	**0.6006**	**5.05**
Southern Toad, *Bufo terrestris*	1	3.45	1	0.02	0.0002	
Unidentified Frog, Anura sp. .	1	3.45	8	0.16	0.0013	
Amphibian Subtotals	**2**	**6.90**	**9**	**0.18**	**0.0015**	**0.01**
Ray, *Myliobatidae sp.*	1	3.45	32	12.78	1.1261	
Gafftopsail, *Bagre marinus*	1	3.45	6	0.45	0.0093	
Hardhead Catfish, *Arius felis*	3	10.34	24	3.98	0.0741	
Bass, *Micropterus* spp.	1	3.45	7	0.32	0.0107	
Red Drum, *Sciaenops ocellatuss*	1	3.45	13	2.67	0.0804	
Flounder, *Paralichthys sp.*	1	3.45	6	0.23	0.0071	
Bluefish, *Pomatomus saitatrix*	1	3.45	3	0.68	0.0200	
Bowfin, *Amia calva*	1	3.45	12	1.46	0.0398	
Speckled Seatrout, *Cynoscion nebulosus*	1	3.45	5	0.46	0.0154	
Unidentified Fish	-	-	934	19.13	0.3279	
Unidentified Fish-Burned	-	-	3	0.15	0.0062	
Fish Subtotals	**11**	**37.93**	**1045**	**42.31**	**1.7170**	**14.43**
Miscellaneous Unidentified	-	-	33	0.86	-	-
Miscellaneous Unidentified-Burned	-	-	2	0.04	-	-
Totals	**29**	**99.64**	**2271**	**782.61**	**11.8989**	**100.00**

Table 22.
Faunal Identification, MNI, Number, Weight, and Biomass Measures for Feature 2

Species	MNI #	MNI %	# of Bones	Weight (gm)	Biomass (kg)	%
Deer, *Odocoileus virginianus*	2	7.69	56	281.18	4.2073	
Deer, *Odocoileus virginianus*- Burned	-	-	2	5.34	0.1188	
Deer, *Odocoileus virginianus*- Immature	2	7.69	171	139.61	2.2405	
Bobcat, *Lynx rufus*	1	3.85	6	1.64	0.0410	
Bobcat, *Lynx rufus-Burned*	-	-	1	0.97	0.0256	
Eastern Cottontail, *Sylvilagus floridanus*	1	3.85	2	0.33	0.0097	
Raccoon, *Procyon lotor*	1	3.85	18	13.9	0.2809	
Grey Squirrel, *Sciurus sciurus*	2	7.69	6	0.96	0.0253	
Grey Squirrel, *Sciurus sciurus*- Burned	-	-	1	0.09	0.0030	
Rattus sp.	1	3.85	5	0.51	0.0143	
Unidentified Large Mammal	-	-	779	221.64	3.3962	
Unidentified Large Mammal-Burned	-	-	`	15.76	0.3146	
Unidentified Small Mammal	-	-	245	29.79	0.5579	
Unidentified Mammal	-	-	702	91.08	1.5254	
Mammal Subtotals	**10**	**38.46**	**1994**	**802.8**	**12.7605**	**73.59**
Goose, *Branta canadensis*	3	11.54	36	27	0.4098	
Turkey, *Meleagris gallapavo*	1	3.85	7	5.39	0.0946	
Unidentified Bird	-	-	412	124.88	1.6513	
Unidentified Bird-Burned	-	-	6	1.27	0.0254	
Bird Subtotals	**4**	**15.38**	**461**	**158.54**	**2.1811**	**12.62**
Garter Snake, *Thamnophis sirtalis*	1	3.85	3	0.12	0.0016	
Black Racer, *Coluber constrictor*	1	3.85	20	1.73	0.0240	
Unidentified Snake	-	-	3	0.11	0.0015	
Box Turtle, *Terrapene carolina*	1	3.85	36	20.64	0.2404	
Box Turtle, Terrapene carolina-Burned	-	-	5	1.15	0.0347	
River Cooter, *Chrysemys floridana*	1	3.85	19	13.74	0.1830	
River Cooter, *Chrysemys floridana*- Burned	-	-	3	1.76	0.0462	
Snapping Turtle, *Chelydra serpentina*	1	3.85	13	13.47	0.1800	
Unidentified Reptile	-	-	9	3.61	0.0748	
Unidentified Turtle	-	-	125	31.62	0.3204	
Reptile Subtotals	**5**	**19.23**	**236**	**87.95**	**1.1066**	**6.38**
Unidentified Frog, Anura sp.	1	3.85	12	0.56	0.0042	
Amphibian Subtotals	**1**	**3.85**	**12**	**0.56**	**0.0042**	**0.02**
Ray, *Myliobatidae sp.*	1	3.85	18	6.17	0.6020	
Hardhead Catfish, *Arius felis*	1	3.85	29	5.44	0.0998	
Unidentified Catfish, *Arridae sp.*	-	-	27	1.44	0.0282	
Bass, *Micropterus* spp.	1	3.85	41	1.48	0.0381	
Atlantic Croaker, *Micropogonias undulatus*	1	3.85	2	0.08	0.0037	
Red Drum, *Sciaenops ocellatuss*	1	3.85	16	1.45	0.0512	
Speckled Seatrout, *Cynoscion nebulosus*	1	3.85	6	0.83	0.0250	
Unidentified Fish	-	-	1350	27.29	0.4389	
Fish Subtotals	**6**	**23.08**	**1489**	**44.18**	**1.2869**	**7.42**
Miscellaneous Unidentified	-	-	123	5.23	-	-
Totals	**26**	**100.06**	**4315**	**1099.26**	**17.3393**	**100.03**

Table 23.
Faunal Identification, MNI, Number, Weight, and Biomass Measures for Feature 3

	MNI #	%	# of Bones	Weight (gm)	Biomass (kg)	%
Deer, *Odocoileus virginianus*	1	12.50	1	1.17		
Unidentified Large Mammal	-	-	8	6.30		
Unidentified Small Mammal-Burned	-	-	1	0.07		
Mammal Subtotals	**1**		**10**	**7.54**	**0.1705**	**28.74**
Black Racer, *Coluber constrictor*	1	12.50	2	0.20	0.0027	
River Cooter, *Chrysemys floridana*	1	12.50	9	2.22	0.0540	
Reptile Subtotals	**2**		**11**	**2.42**	**0.0567**	**9.56**
Skate, *Rajidae* spp.	1	12.50	1	2.88	0.3126	
Gafftop Catfish, *Bagre marinus*	1	12.50	8	0.18	0.0039	
Flounder, *Paralichthys sp.*	1	12.50	4	0.13	0.0055	
Bass, *Micropterus* spp.	1	12.50	5	0.23	0.0081	
Bowfin, *Amia calva*	1	12.50	2	0.05	0.0025	
Unidentified Fish	-	-	32	1.18	0.0334	
Fish Subtotals	**5**		**52**	**4.65**	**0.3660**	**61.71**
Totals	**8**	**100.00**	**73**	**14.61**	**0.4227**	**99.98**

sample dominated by fish remains (62% of the MNI and 62% of the biomass weight). One unusual finding was skate vertebra identified in this sample. Skate often are found in shallow shore waters (Boschung 1983). Feature 4 (Table 24) had 15 MNI mostly fish (n=6) and 522 fragments weighing 98.92 gm. Over 60 percent of the biomass weight was from mammal predominately deer. Feature 5 (Table 25) was not fully excavated and a sample of fill was removed from this feature. Seven hundred sixty seven (767) bone fragments were recovered weighing 226.83 gm. Eighteen MNI were identified consisting mainly of fish species (n=11). As with most of the other features mammal, specifically deer, made up the majority of the biomass weight. Feature 6 (Table 26) contained only 77 bones, all identified as large mammal, probably deer. Most of the bones (68%) were burned an expected finding given the identification of this feature as a steaming pit where on site burning was identified (Trinkley 2006:21).

Screening

The use of ⅛ inch mesh for feature fill screening did indeed yield significantly greater numbers of fish remains than levels screened using ¼ inch mesh. Over 3,000 fish (3,277) fragments were recovered from Features 1-5 (Feature 6 had no fish remains) compared with 20 fragments recovered from eight level proveniences. Thus, 99.004% of the total fish elements were recovered using 1/8 inch mesh. This finding supports the standard use of a minimum screen size ⅛ inch mesh in archaeological recovery, particularly in coastal shell middens where fish are more likely to be exploited and survive to be recovered.

Sample Adequacy

The six features sampled at 38CH1693 varied considerably in the NISP present. Features 3 (Table 23) and 6 (Table 26) were small with less than 100 fragments present in each, while Features 1, 2, 4, and 5 all contained over 400 bone fragments. To assess sample bias in the

Table 24.
Faunal Identification, MNI, Number, Weight, and Biomass Measures for Feature 4

Species	MNI #	%	# of Bones	Weight (gm)	Biomass (kg)	%
Deer, *Odocoileus virginianus*	1	6.6	19	34.50		
Deer, Odocoileus virginianus-Burned	-	-	5	5.45		
Eastern Cottontail, *Sylvilagus floridanus*	1	6.6	1	0.07		
Rattus sp.	2	13.3	6	0.32		
Unidentified Large Mammal	-	-	56	19.23		
Unidentified Large Mammal-Burned	-	-	13	10.41		
Unidentified Small Mammal	-	-	3	0.09		
Unidentified Mammal	-	-	25	1.47		
Mammal Subtotals	**4**	**26.6**	**128**	**71.54**	**1.2275**	**61.82**
Unidentified Bird	1	6.6	3	1.64	0.0320	
Bird Subtotals	**1**	**6.6**	**3**	**1.64**	**0.0320**	**1.61**
Unidentified Turtle	-	-	42	5.90	0.1039	
River Cooter, *Chrysemys floridana*	1	6.6	16	6.96	0.1160	
River Cooter, *Chrysemys floridana* -Burned	-	-	3	0.54	0.0209	
Black Racer, *Coluber constrictor*	1	6.6	2	0.09	0.0012	
Reptile Subtotals	**2**	**13.3**	**63**	**13.49**	**0.2420**	**12.19**
Southern Toad, *Bufo terrestris*	1	6.6	1	0.01	0.0001	
Anura sp.	1	6.6	6	0.08	0.0007	
Amphibian Subtotals	**2**	**13.3**	**7**	**0.09**	**0.0008**	**0.04**
Ray, *Myliobatidae sp.*	1	6.6	7	2.44	0.2711	
Ray, *Myliobatidae sp.* -Burned	-	-	2	0.21	0.0329	
Flounder, *Paralichthys sp.*	1	6.6	5	0.09	0.0031	
Gafftopsail, *Bagre marinus*	1	6.6	11	0.50	0.0133	
Hardhead Catfish, *Arius felis*	1	6.6	1	0.51	0.0105	
Bass, *Micropterus* spp.	1	6.6	14	0.49	0.0152	
Drum, *Scianidae* spp.	1	6.6	10	0.96	0.0378	
Unidentified Fish	-	-	207	4.46	0.0994	
Fish Subtotals	**6**	**39.6**	**257**	**9.66**	**0.4833**	**24.34**
Miscellaneous Unidentified	-	-	64	2.50	-	-
Totals	**15**	**99.4**	**522**	**98.92**	**1.9856**	**100.00**

Table 25.
Faunal Identification, MNI, Number, Weight, and Biomass Measures for Feature 5

`	MNI #	%	# of Bones	Weight (gm)	Biomass (kg)	%
Deer, *Odocoileus virginianus*	1	5.56	15	156.55		
Raccoon, *Procyon lotor*	1	5.56	4	0.49		
Unidentified Large Mammal	-	-	36	24.10		
Unidentified Large Mammal-Burned			7	4.12		
Unidentified Small Mammal	-	-	3	0.10		
Unidentified Mammal	-	-	57	5.58		
Unidentified Mammal-Burned	-	-	2	0.25		
Mammal Subtotals	**2**	**11.11**	**124**	**191.19**	**2.9733**	**75.91**
Black Racer, *Coluber constrictor*	1	5.56	1	0.08	0.0011	
River Cooter, *Chrysemys floridana*	1	5.56	64	18.20	0.2209	
Unidentified Turtle	-	-	30	2.04	0.051	
Unidentified Turtle-Burned	-	-	3	0.48	0.0193	
Reptile Subtotals	**2**	**11.11**	**98**	**20.80**	**0.2923**	**7.46**
Anura sp.	1	5.56	1	0.01	0.0001	0.01
Amphibian Subtotals	**1**	**5.56**	**1**	**0.01**	**0.0001**	**0.01**
Ray, *Myliobatidae sp.*	1	5.56	8	1.48	0.1764	
Hardhead Catfish, *Arius felis*	2	11.11	29	2.39	0.0457	
Bass, *Micropterus* spp.	1	5.56	15	0.56	0.0702	
Drum, *Scianidae* spp.	1	5.56	2	0.10	0.0071	
Flounder, *Paralichthys sp.*	1	5.56	4	0.04	0.0021	
Unidentified Trout	1	5.56	9	0.52	0.0171	
Atlantic Croaker, *Micropogonias undulatus*	4	22.22	7	0.47	0.0157	
Unidentified Fish	-	-	428	7.20	0.1472	
Fish Subtotals	**11**	**61.11**	**502**	**12.76**	**0.4815**	**12.29**
Crab, *Callinectes* sp.	**2**	**11.11**	**7**	**0.43**	**0.1696**	**4.33**
Miscellaneous Unidentified	-	-	35	1.64	-	-
Totals	**18**	**100.04**	**767**	**226.83**	**3.9168**	**100.00**

Table 26.
Faunal Identification, MNI, Number, Weight, and Biomass Measures for Feature 6

Species	MNI #	%	# of Bones	Weight (gm)	Biomass (kg)	%
Unidentified Large Mammal	-	-	7	4.31	0.0979	31.97
Unidentified Large Mammal-Burned	-	-	70	9.97	0.2083	68.03
Totals	**-**	**-**	**77**	**14.28**	**0.3062**	**100.00**

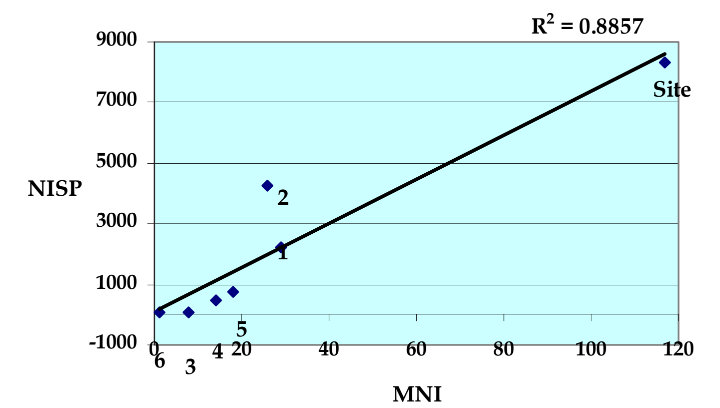

Figure 68. A graph comparing the MNI and NISP identified for the six features and the site total. The R^2 value indicates that there is a strong correlation between NISP and MNI. The NISP for Feature 2 is large relative to the number of MNI identified.

faunal materials, identified MNI, NISP, and taxa were plotted for the total site and each sample to evaluate their relationship. The method for assessing sample reliability outlined in Wing and Brown (1979: 118-121) is used here. Regression charts, Figures 68 and 69, were employed first by comparing NISP and MNI and then MNI and taxa for each feature. For MNI and NISP, the resulting R^2 = .8857 (Figure 68) demonstrates a good correlation between the two measures. The Feature 6 sample is not large enough to yield representative results and the NISP for Feature 2 is relatively large for the MNI count, no doubt a factor of our inability to adequately identify the majority of fish remains to species.

A similar correlation is seen between the MNI and taxa measures (Figure 69), where R^2 = .8986. Based on this survey, Feature 6 is biased towards mammals with regards to species representation. Features 1 and 5 are interesting in that Feature 1 does not have enough MNI for the taxa represented and Feature 5 too many MNI. These figures show that for each feature there is little observer bias in species identification relative to the site total. Compared to the other features, Feature 6 faunal materials were found to be biased towards mammals, so only Features 1-5 are used for comparative studies.

Comparisons of Features and Other Sites

The faunal materials recovered from Features 1-5, 38CH1693, and two other contemporaneous features from sites in Charleston County, 38CH42, Fig Island, and 38CH1456, Secessionville, were compared with regard to MNI and biomass percentages for the six animal classes: mammal, birds, retiles, amphibians, fish, and crab. These data are presented in Figures 70 and 71. One cautious note regarding MNI of fish; Feature 5, 28CH1456, contained numerous otoliths which could easily be identified to species. In contrast, the 38CH1693 contained relatively few otoliths, resulting in fewer fish species being identified in the samples. For 38CH1693 and the other sites the MNI percentages show fish dominating in all features with the exception of Feature 2.

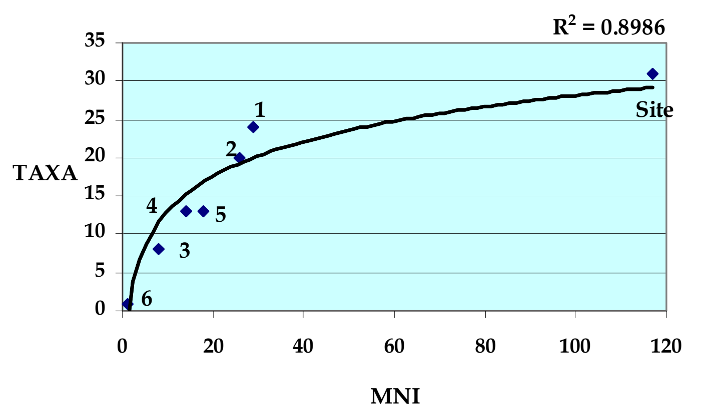

Figure 69. A graph comparing the MNI and taxa identified for the site total and six features. The R^2 value indicates a strong correlation between MNI and the taxa identified.

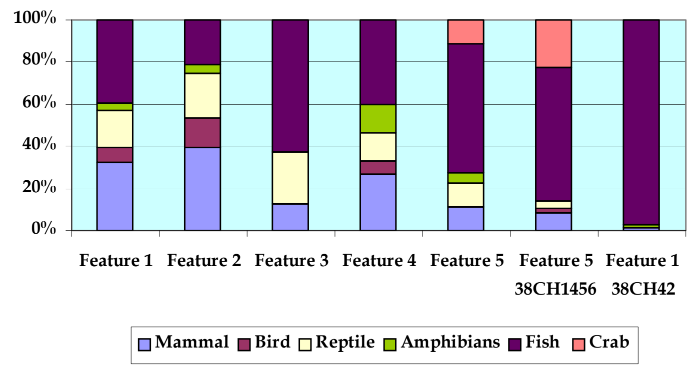

Figure 70. MNI percentages for the 38CH1693 features compared with other sites.

Features 1, 2, and 4 are relatively similar in the representation of the six classes while Features 3 and 5 and the two other site features show more emphasis on fish resources. When biomass percentages are considered, mammal dominates in all features with the exception of Feature 3 and Feature 1, 38CH42. Based on this comparative data, Feature 3 emerges as unique in the quantity of fish remains. Feature 3 fill was small and stratified with clamshell observed in unusual high quantities (Trinkley 2006: 19).

These factors may point towards a focal or seasonal exploitation of marine/estuarine resources over a short period of time, in other words, a single use of the pit. The small diversity and number of faunal remains recovered from the feature tends to support this interpretation. A similar function has been described for Feature 1, 38CH42, where a single dumping episode rather than a long- term use of the pit is hypothesized since the faunal materials are dominated by fish and show modest breakage (Saunders 2002: 142).

Features 1, 2, and 4 (38CH1693) are similar in several ways. They are larger pits with relatively homogenous fill, no stratification, with similar species and biomass frequencies. Their use as open pits used over a short duration (Trinkley 2006) could be supported by the diversity and representation of the faunal materials recovered. Feature 5 unfortunately was only sampled, but based on the materials recovered shows much diversity in fish remains relative to the amount of fill recovered. Evidence for dumping episodes could be observed in the profile (Trinkley 2006: 20). This factor coupled with the diversity and size of the faunal sample indicates that the pit may have been used over a longer duration compared with the other features. This feature seems similar to Feature 5, 38CH1456, which is described as representing a seasonal use of estuarine and tidal environment supplemented by forest and other available resources (Hogue 1997).

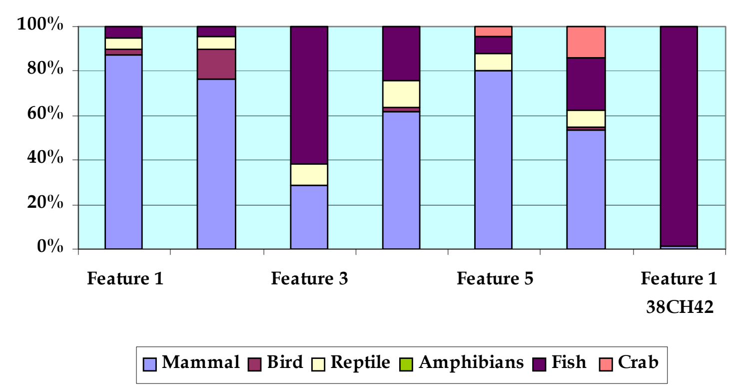

Figure 71. Biomass percentages for the 38CH1693 features compared with other sites.

Cuts of Meat

Log differences calculated from percentages of weight (Jackson and Scott 1995) and NISP (Reitz and Wing 1999) identified for the five analytical categories (skull, axial, fore quarter, hind quarter, foot, and lower limbs) for standard deer can bear out over- and under-representation of particular elements. If butchering and processing of whole deer

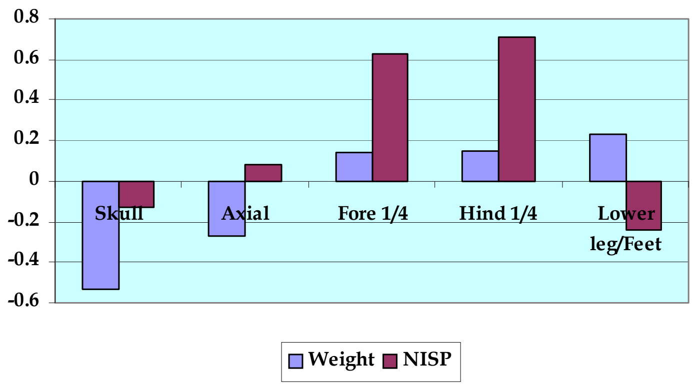

Figure 72. Log difference scale compared by weight and NISP.

carcasses occurred on-site, it is expected that the log scale pattern would be similar to standard deer in element representation.

The entire site data were compared using log-difference scales for both weight and NISP. Both weight and NISP (Figure 72) show over-representation of the meatier deer elements (forequarter and hindquarter) and under-representation of skull fragments. These patterns point towards possible selection in the field for certain cuts over others, but the evidence is inconclusive since lower leg and feet are also represented when weight is used. Since bone processing can increase the NISP in a sample and therefore bias element representation, weight is considered the more reliable indicator of cut preference than NISP.

Figure 73 compares the five features by weight for deer representation. Features 1 and 2 had the largest number of deer remains and contained deer elements from all five categories. The presence of all deer elements is expected if deer were processed on site and discarded in a single pit at one time, but certain categories are under and others over-represented in these two features. Meatier cuts occur most frequently in Features 2 and 5 and less frequently in Features 1, 3, and 4.

These differences in deer skeletal elements may reflect diverse activity areas of the site. Features 2 and 5 are located to the west and may represent domestic areas while Features 1, 3, and 4, located along the eastern slope of the site, may be areas delegated for discard. Alternatively, we may be seeing evidence of different occupations, with resulting different utilization patterns.

Processing

To access the amount of processing, each identified deer element was coded in one of the four categories < 25, 25-50,

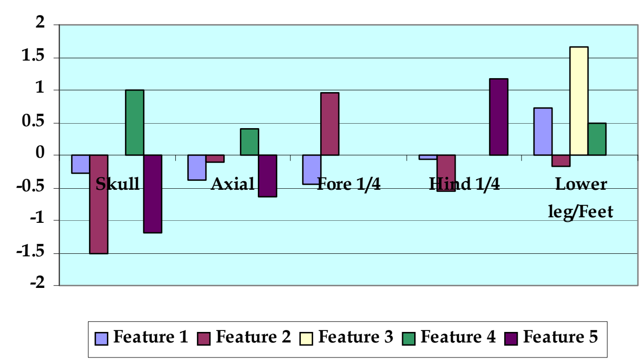

Figure 73. Log difference scale comparing deer cuts by weigh for the five features, 38CH1693.

50-75, or > 75% of the total elements. Table 27 presents this data for the frequency of deer bone processed to < 25%. The average weight for deer fragments (computed by total deer weight in grams divided by total deer NISP) is also presented in the table as a measure of processing. The latter method is considerably more reliable as it is not limited to deer bone that can be positively identified to element.

Deer bone is highly processed in all five features but both methods show deer bone from Features 1 and 5 as being less processed than the other three features. Unfortunately, Features 3, 4, and 5 have relatively small deer bone samples (30 NISP or less) to compare in this study.

Table 27.
Deer Bone Processing

Fragmentation followed by the % (of each feature) of less than 25%

Element	**Feature 1**	**%**	**Feature 2**	**%**	**Feature 3**	**%**	**Feature 4**	**%**	**Feature 5**	**%**
Cranium	10	83.33	6	75.00	-	-	7	77.78	2	66.66
Antler	2	100.00	-	-	-	-	-	-	-	-
						-				
Sternum	-	-	-	-	-	-	-	-	-	-
Atlas	-	-	1	100.00	-	-	-	-	-	-
Axis	-	-	-	-	-	-	-	-	1	100.00
Cervical Vert.	-	-	-	-	-	-	-	-	-	-
Thoracic Vert.	-	-	2	100.00	-	-	-	-	-	-
Lumbar Vert.	-	-	-	-	-	-	-	-	-	-
Indeterm. Vert	3	100.00	8	100.00	-	-	5	71.43	5	100.00
Ribs	5	100.00	10	90.91	-	-	3	100.00	2	100.00
Sacrum	-	-	-	-	-	-	-	-	-	-
Caudal Vert	-	-	-	-	-	-	-	-	-	-
Scapula	1	100.00	-	-	-	-	-	-	-	-
Humerus	-	-	4	80.00	-	-	-	-	-	-
Radius	2	100.00	1	50.00	-	-	-	-	-	-
Ulna	-	-	1	100.00	-	-	-	-	-	-
Pelvis	3	75.00	5	100.00	-	-	-	-	-	-
Femur	7	100.00	5	100.00	-	-	-	-	-	-
Patella	-	-	-	-	-	-	-	-	-	-
Tibia	5	83.33	-	-	-	-	-	-	1	100.00
Tarsals	-	-	-	-	-	-	-	-	-	-
Astragalus	1	100.00	-	-	-	-	-	-	-	-
Calcaneum	1	50.00	-	-	-	-	-	-	-	-
Metatarsals	2	100.00	-	-	-	-	-	-	-	-
Phalanx 1	2	50.00	-	-	-	-	1	100.00	-	-
Phalanx 2	-	-	-	-	-	-	1	100.00	-	-
Phalanx 3	-	-	-	-	-	-	1	100.00	-	-
Indet. Phalanx	15	100.00	4	100.00	1	100.00	1	100.00	-	-
Lateral Phalanx	-	-	-	-	-	-	-	-	-	-
Metapodial	-	-	2	100.00	-	-	-	-	-	-
Carpal/Tarsal	0	0.00	1	33.33	-	-	1	100.00	-	-
Sesamoid	-	-	-	-	-	-	-	-	-	-
Carpals	-	-	-	-	-	-	-	-	-	-
Metacarpals	2	66.67	-	-	-	-	-	-	-	-
Total	61	77.22	50	83.33	1	100.00	20	83.33	11	78.57
Weight/Deer NISP	**3.38**		**1.86**		**1.17**		**1.66**		**10.43**	

Table 28.
Bone Modifications

Modified Bones from Feature 1

	Cut	Burned	Gnawed
Deer	4	2	-
Unidentified Large Mammal	-	25	-
Unidentified Small Mammal	-	1	-
Unidentified Mammal	-	21	-
Unidentified Turtle	-	27	-
Unidentified Fish	-	3	-
Black Racer	-	5	-
Unidentified	-	2	-
Totals	4	86	0
% of NISP (2271 total)	0.18	3.79	0.00

Modified Bones from Feature 2

	Cut	Burned	Gnawed
Deer	-	2	-
Bobcat, *Lynx rufus*	-	1	-
Squirrel	-	1	-
Unidentified Large Mammal	1	34	-
Unidentified Bird	-	6	-
Box Turtle	-	5	-
Cooter	-	3	-
Totals	1	52	0
% of NISP (4349 total)	0.02	1.20	0.00

Modified Bones from Feature 3

	Cut	Burned	Gnawed
Unidentified Small Mammal	-	1	-
Totals	0	1	0
% of NISP (73 total)	0.00	1.37	0.00

Modified Bones from Feature 4

	Cut	Burned	Gnawed
Deer	1	5	-
Unidentified Large Mammal	-	13	-
Cooter	-	3	-
Ray	-	2	-
Totals	1	23	0
% of NISP (522 total)	0.19	4.41	0.00

Modified Bones from Feature 5

	Cut	Burned	Gnawed
Unidentified Large Mammal	-	7	-
Unidentified Mammal	-	2	-
Unidentified Turtle	-	3	-
Totals	0	12	0
% of NISP (767 total)	0.00	1.56	0.00

Modified Bones from Feature 6

	Cut	Burned	Gnawed
Unidentified Large Mammal	-	70	-
Totals	0	70	0
% of NISP (77 total)	0.00	90.91	0.00
Site Total	6	244	0
Feature Percentage of NISP (7982 total)	0.08	3.06	0.00

Table 29.
Deer Bone Measurements (Standards follow Von den Driesch 1976)

Deer Element	Measurement					
Feature 1						
L Lower M1	13.7L	9.0B				
L Lower P3	13.0L	7.5B				
R Ulna	37.0 DPA-TPA	20.2 BPC	29.1 SDO-KTO			
R Astragalus	39.1 GLI	37.4 GLm	27.0 Bd	21.4 Dm	22.9 DI	
R Navicular	24.7 GB					
R Navicular	32.4 GB					
L Cunieform	17.1 GB					
L Cunieform	18.3 GB					
R Cunieform	19.3 GB					
L Cunieform	8.1 GB					
L 1st Phalanx	11.8 SD	14.2 BP	19.3 DP	13.2 BFp		
R 2nd Phalanx	8.6 SD	12.0 BP		10.3 BFp	8.0 Bd	33.6 GLPe
1st Phalanx				10.3 BFp		
Feature 2						
R Dist. Humerus	34.9 BT	38.3 Bd				
L Upper M2	16.1 L	15.3 B				
L 3rd Phalanx	31.5 Ld	34.7 DLS				
R 3rd Phalanx	33.7 Ld	35.5 DLS				
Feature 4						
L Upper P4	12.35 L	8.86 B				
R 1st Phalanx	11.26 SD	14.95 BP	18.81 DP	11.70 BFp	44.25 GL	43.16 GLPe
R 2nd Phalanx	10.37 SD	13.16 BP	18.65 DP	13.00 BFp	34.52 GL	
R 3rd Phalanx	32.01 DLS	12.14 MBS	30.94 Ld			
165R185-Flt Shvl Lvl 2						
R Ulna	49.4 LO	19.7 BPC	30.8 SDO			
R Dist Tibia	28.3 Dd					
165R185-Lvl2						
R dist Humerus	37.5 BT	43.0 Bd				
L 3rd Phalanx	29.1 DLS	10.3 MBS	26.6 Ld			
180R180-Flt Shvl Lvl2						
R Calcaneus	83.4 GL	30.2 GB				
180R170-Flt Shvl Lvl 2						
L Cuneiform	22.0 GB					
R Lower M3	9.9 B	21.3 L				

Key:

Teeth
B=breadth
L=Length

Phalanges
SD=Smallest breadth of diaphysis
DP=Depth of proximal end
BFp=Greatest breadthof facies articularis proximalis
GLPe=Greatest length of peripheral half
Ld=Length of dorsal surface
DLS= Greatest diagonal length of sole
MBS=Middle breadth of sole

Tarsals/Carpals
GB=Greatest breadth

Humerus
BT=Greatest breadth of trochlea
Bd=Greatest breadth of distal end

Tibia
Dd=Greatest depth of distal end

Ulna
DPA=Depth across Processus anconaeus
BPC=Greatest breadth across coronoid process
SDO=Smallest depth of olecranon
LO=Length of olecranon

Astragalus
GL1=Greatest length of lateral half
GLm=Greatest length of medial half
Bd=Greatest breadth of distal end
Dm=Greatest depth of medial half
D1=Greatest depth of lateral half

Features 1 and 2 have the largest and best samples (both over 125 fragments). The high degree of deer bone processing observed for these two features points towards a greater dependency on large animal byproducts a pattern possibly associated with intense use of seasonally available resources.

The low frequency of otoliths, especially compared to some other Thom's Creek sites, may suggest that the fish were being processed at the catch site, with only the more usable portions returned to the settlement.

Bone Modifications

Most of the faunal materials other than fish vertebrae recovered form the six features had in most cases been highly processed. Several elements had been cut, burned, or modified into tools. This analysis is presented in Table 28. No evidence of gnawing was present on any of the remains. Two hundred and fifty two bones had been modified. Most modifications were observed as burned bone (96.8%), however two worked broken deer antler tines were recovered from Feature 1. In addition to burned bone cut marks were noted on deer elements in Feature 1 and unidentified large mammal, probably deer, recovered in Feature 2.

Seasonality

The 38CH1693 faunal assemblage points towards a spring/summer occupation of the site, however a fall/winter use of the area cannot be ruled out. Prehistorically the site was probably located within a mile of tidal creeks that provided an abundance of resources.

This type of estuarine system historically serves as a preferred environment for drum during the warm seasons. Red drum and Atlantic croaker, both drum species, were the most common fish species identified in the MNI. Atlantic croaker generally occupy this system following the beginning of spring into late fall (Quitmyer 1985a:89).

One winter migratory fowl species, Canadian goose, was identified in Features 1 and 2. However, both features contained numerous immature deer bone (NISP = 200) of individuals aged probably between birth and six months old, strongly signifying a spring/summer occupation of the site. The presence of these bones in Feature 1 may reflect excavation intrusion into Feature 2 as the exact boundary between the features was distorted by tree root disturbance (Trinkley 2006: 18).

Drum species were identified in all features except 3 and 6 while reptiles were identified in all features except Feature 6. This strongly supports a spring through fall habitation.

Ray or skate were identified in Features 1, 2, 3, 4, and 5 and are considered to be good indicators of seasonality (Lawson 2005: 97). Some species of skates and rays are found feeding in shallow waters from March to November and returning to deeper waters in the winter (Boschung et al. 1983; Lawson 2005).

Another possible source of evidence for a spring-fall habitation of 38CH1693 are the numerous amounts of small fish vertebrae and small otoliths, perhaps evidence for young fish being harvested during the spring and summer months.

Measurements

Deer bone elements were complete enough in several features and levels (Features 1, 2, and 4 and several unit levels) to permit measurements. Standards outlined in Von den Driesch (1976) were followed. The results are presented in Table 29.

Conclusions

The 38CH1693 faunal remains provided an excellent opportunity to examine faunal exploitation at a small Thom's Creek phase site. The features are similar in content to other contemporaneous sites. The variety of warm weather faunal species, especially fish and reptiles, in conjunction with single use pits (Features 1, 2, and 4) seems to suggest a seasonal use of the site during the spring through late summer/early fall. Deer MNI appears relatively low compared to fish. Fragmentation of the deer remains led us to conclude that deer was processed intensely to extract as much nutritional value as possible, suggesting that deer was not readily available at the time of occupation. During the fall rutting season deer hunting would have provided the best meat yield while fish and other species may have become less important. This lends to more evidence for a spring/summer seasonal use of the area.

One major problem was in the identification of fish remains. Few otoliths were present in the sample the identification of which would provide a more accurate identification of fish remains and MNI and the Cobb Institute comparative collection was limited analysis often to class. Further investigations using comparative collections housed elsewhere are warranted to better understand the role of fish in the 38CH1693 diet.

ETHNOBOTANICAL REMAINS

Introduction

Ethnobotanical remains were recovered from flotation samples, as well as being hand-picked from ⅛-inch water screening.

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 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 which are considered identifiable and those which are not.

In the case of 38CH1693 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. Prescreening may cause some fragmentation, but it ensures a much larger soil sample than would be the case if shell were retained.

Hand-picked (or even waterscreened samples in some cases) 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 hand-picked 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 natural 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 over others). Smart and Hoffman (1988) provide an excellent review of environment interpretation using charcoal that should be consulted by those particularly interested in this aspect of the study.

Procedures and Results

The four flotation samples 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 on 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 30.

Table 30.
Analysis of Flotation Samples

Feature & Provenience	Wood Charcoal Wt.	%	Uncarb. Organic Wt.	%	Bone Wt.	%	Shell Wt.	%	Hickory Nutshell Wt.	%	Seeds Wt.	%	Total	Seeds
Feature 1	5.51	52.98	3.65	35.1	0.69	6.62	0.26	2.48	0.26	2.48	0.03	0.33	10.40	2 *Vitis* sp., 2 *Galium* sp., 2 UID frags.
Feature 2	1.78	15.52	5.37	46.62	0.72	6.24	1.72	14.9	1.78	15.42	0.16	1.39	11.53	3 *Ilex* sp., 3 *Polygonum* sp., 2 *Galium* sp., 2 UID frags.
Feature 4	2.14	20.22	7.09	66.79	0.04	0.36	1.09	10.29	0.25	2.35			10.61	
Feature 5	3.21	21.51	3.10	20.77	0.62	4.15	7.35	49.26	0.60	4.01	0.04	0.30	14.92	1 *Polygonum* sp., 1 *Smilax* sp., 2 frags.

Ignoring the uncarbonized component in each sample, the collections are composed largely of wood charcoal (which clearly dominates all of the features). Hickory nutshell is present in all four samples, with the percentage by weight ranging from a low of 2.35% in Feature 4 to a high of 15.42% in Feature 2.

Seeds are not common, but species identified include knotweed (*Polygonum* sp.), grape (*Vitis* sp.), holly (*Ilex* sp.), *Galium* sp. (bedstraw), and greenbrier (*Smilax* sp.).

The hand-picked samples were bagged in the field directly from the ⅛-inch screen and were therefore clean and easily sorted. The waterscreened samples also examined under low magnification with the larger pieces of wood charcoal identified, where possible, to the genus level using comparative samples, Panshin and de Zeeuw (1970), and Koehler (1917). Wood charcoal samples were broken in half to expose a fresh transverse surface. The results of this analysis are shown in Table 31.

All but two of the hand-picked samples contained hickory nutshell and 15 of the 21 samples (71.4%) of the samples with hickory were dominated by this material. Pine is found in 19 of the 23 samples (82.6%). Oak is the next most common, found in 21.7% of the samples. Only one seed was identified in the samples – grape (*Vitis* sp.), found in two of the hand-picked samples.

There are four hickories common to the Charleston area -- bitternut (*Carya cordiformis*), water (*C. aquatica*), mockernut (*C. ovalis*), and pignut (*C. glabra*). The specimens which could be identified include the mockernut and pignut. These species prefer drier, better drained upland soils, with the mockernut associated with yaupon and live oak on coastal sites and the pignut often found with oak and black oaks or with post and white oaks (Fowells 1965:116,125)

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 Trinkley 1976b, 1986, 1993:199-204; Harris and Sheldon 1982) 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).

Table 31.
Hand-picked Ethnobotanical Remains

Provenience	*Pinus* sp.	*Carya* sp.	*Quercus* sp.	*Juniperus* sp.	*Sassafras* sp.	*Acer* sp.	*Nyssa* sp.	*Fraxinus* sp.	UID	Hickory Nutshell	Seeds
165R165, Lv. 5	A	P	P							A	
160R165. Lv. 6	P						P			P	
165R165, Lv. 7	P		P			P		P		A	
165R165, Lv. 9	P		P							A	
165R165, Lv. 10									P	A	
165R185, Lv. 2										P	
165R185, Lv. 3	P									P	
165R185, Lv. 4										P	
165R185, Lv. 6	P			P						A	
180R170, Lv. 2	A									P	
180R170, Lv. 3	A									A	
180R170, Lv. 5	P		P							A	
180R170, Lv. 6									P	A	
180R170, Lv. 7	A									A	
180R175, Lv. 2	P										
185R185. Lv. 2	A									P	*Vitis* sp.
180R175, Lv. 3	A	P			P					A	
Feature 1	A									A	
Feature 2	A								P	A	
Feature 3	P									A	
Feature 4	A	P	P	P						A	
Feature 5	A									A	
Feature 6	P	P			P						*Vitis* sp.

Smilax or greenbrier is an herbaceous or woody vine, usually spiny. It is typically found in deciduous woods and moist thickets, and will often form impenetrable thickets. Greenbrier typically fruits from September through November (Radford et al. 1968:284). Although the berries are edible (Medsger 1966:88), their low incidence is more suggestive of accidental inclusion; the plant is common to the wet woods of the site area today.

Polygonum or knotweed is an annual or perennial commonly found in disturbed habitats and waste places. It fruits from May until the first frost (Radford et al. 1968:409-410). Both the leaves and tuber are edible (Medsger 1966:162) and Morton (1974:115) also notes the plant has been used as an antiseptic and astringent. Yarnell suggests, however, that it is primarily indicative of disturbed habitats (Yarnell 1974:117).

Bedstraw (*Galium* sp.) is a perennial or annual herb found in woods and clearings which fruits from May through August (Radford et al. 1968:986). At least one common plant, *Galium tinctorium*, is found extensively in swamps, marshes, and other wet areas. While there are occasional reports of various uses, this plant was most likely drawn to the disturbed habitat of the Thom's Creek settlement.

There are a number of hollies present on the South Carolina coast, including both the large tree, *Ilex opaca*, and the large shrub, *I. vomitoria* or yaupon. The latter is particularly common in maritime forests and fruits from October through November (Radford et al. 1968:681). Morton (1974:81) notes that the leaves contain caffeine and act as an emetic and powerful diuretic. South Appalachian Mississippian groups used the yaupon in the "black drink," but there is no certain association with earlier groups.

Vitis sp. or grape is a high-climbing or trailing vine. *V. rotundifolia*, or muscadine is found in low woods, upland woods, and on sand dunes. It fruits from August through October (Radford et al. 1968:695). Medsger (1966:57-58) comments on its pleasant taste and frequent use. Seeds of this species were found not only in the flotation samples, but also in the hand-picked samples. It seems likely that it was being collected and consumed by the site inhabitants.

Turning to the wood species, the most abundant was pine (*Pinus* sp.). This may reflect the density of the species, or it may only reflect that pine is a good self-pruner, making its wood readily accessible. Other species include hickory (*Carya* sp.), oak (*Quercus* sp.), and cedar (*Juniperus* sp., possibly southern red cedar, *J. silicicola*). All are typical of maritime forests and will be found on sandy soils, generally well drained.

Other species include sassafras (*Sassafras* sp.) often found on the margins of woodlands and in old fields. It prefers moist, well drained soils, but will tolerate drier conditions. The maple (*Acer* sp.) is likely the red maple (*A. rubrum*) found in the low, rich woods of the coastal plain. A single example of gum (*Nyssa* sp.) was identified, possibly the tupelo gum (*N. aquatica*) or black gum (*N. sylvatica*). The former is a swamp tree, requiring wet soils, while the latter requires moist, but not wet, locations. The last specimen is the ash (*Fraxinus* sp.), possibly either the water ash (*F. caroliniana*) or white ash (*F. americana*). Both are found in low woods, although the white ash can also be found on well drained uplands.

The wood species are suggestive of two distinct habitats – the pine, oak, and hickory are generally characterized by sandier and better drained soils; the maple, gum, and ash are more often associated with low to swampy locations.

Discussion

The charcoal represents woods which could reasonably be associated with a maritime forest, such as hickory and oak. The sassafras and cedar represent typical understory trees. The presence of the grape, holy, and greenbrier seeds is consistent which such an environmental reconstruction. 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)? Pine is an excellent self-pruner, provides hot fires, and is easy to ignite – all qualities which would support intentional selection.

There is another environment reflected by the gum, ash, and maple, as well as bedstraw – ranging from moist to wet.

The catchment reconstruction for 38CH1693 certainly supports the presence of both environmental settings within a mile of the site. Moreover, the ethnobotanical remains show excellent congruence with the pollen and phytolith research. The reader will recall that research suggested a mixed oak-pine forest that included hickory – all species identified in the ethnobotanical work. Also present in the pollen and ethnobotanical record are holly and gum. Both studies also suggest the presence of wet soils in proximity to the settlement. And both studies also reveal the presence of grape – making it almost certain that the site occupants were collecting wild grapes.

But perhaps of greatest interest in the seemingly heavy reliance on hickory nut – found in each flotation sample and in 21 of the 23 hand-picked samples.

In the midst of oak-pine forests, presumably maintained through fire, sites like 38CH1693 (as well as Bass Pond, see Trinkley 1993) 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.

It therefore becomes important that the only plant food remains consistently found at

Stallings and Thom's Creek sites have been hickory nutshells and acorn (see Trinkley 1976b). As previously mentioned, hickory is a high quality protein with a caloric value equal to that of many meats. It appears reasonable, given the ubiquity and abundance of the nutshell fragments, to interpret these Late Archaic-Early Woodland people as using hickory as a major food source.

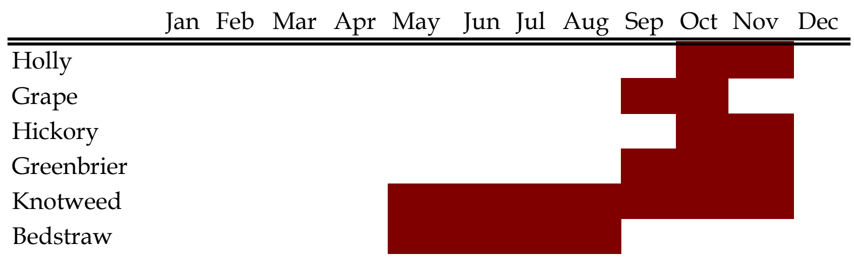

Figure 74. Seasonality of the ethnobotanical collections.

As revealed by Figure 74, the ethnobotanical remains are suggestive of a fall or perhaps early winter settlement. Most critical are the hickory, which become available in October, although they can be collected and stored for future use, perhaps as late as March or April, and the grape, which are available in September and October.

CONCLUSIONS

Research Questions

We initially identified five specific research topics that appeared to represent significant research goals that could reasonably be addressed using the data sets present at 38CH1693.

The first dealt with geomorphological issues concerning the site's location, the burial of the midden, and the dispersion of artifacts in the soil profile. The limited study revealed that the site was situated on a Pleistocene beach ridge or dune. The profiles at the site revealed three periods of landscape stability separated by periods of aeolian sand deposition. It appears that the Thom's Creek occupation was buried by sand deposited through wind action. The distribution of artifacts down the profile, however, is most likely accounted for by bioturbation. There appears to be no cultural material originating in the two buried soil horizons below the Thom's Creek occupation. Thus, while materials were found at considerable depths, all appear related to the Thom's Creek component at the site.

This study points out that given the correct circumstances, there is a potential for deeply buried sites in the coastal plain. While marine or fluvial burial is likely to result in the preservation of little context, aeolian deposits have the potential to preserve stratigraphy and cultural context. Archaeological deposits at Thom's Creek sites can be more complex than might be imagined and geomorphological studies hold the potential to help interpret these sites and their stratigraphy.

A second research goal focused on a more comprehensive zooarchaeological study of the Thom's Creek components than we had been able to undertake at past sites. We were able, once again, to confirm that the use of ¼-inch mesh at these Thom's Creek sites with shell features and excellent faunal preservation would fail to provide a realistic representation of the species present. Although the problem of screen size and its affect on the faunal collection has been understood for nearly 20 years, relatively little archaeological data recovery has switched to ⅛-inch mesh.

Of course, as the screen size is decreased, the quantity of remains – especially difficult to identify fish remains – increases dramatically. This study was hindered by the abundance of small remains and the relatively low incidence of the more easily identifiable otoliths. While this suggests that the heads were removed and discarded at the catch site, it also resulted in a large quantity of material that could not be identified within the funding and time limits of the project.

Nevertheless, the study provides an excellent synthesis of Thom's Creek faunal exploitation. The study found evidence for seasonal use during the spring through late summer or early fall. The research also revealed that the abundance of deer was relatively low compared to fish. It may be that 38CH1693, during the spring and summer, focused on the collection of fish, especially relatively small fish that would be pushed up and down the smaller tidal creeks. The deer that was present at the site suggests intensive processing – perhaps another indicator that deer were in short supply. The study was inconclusive regarding possible selection in the field for certain cuts over others. While head remains (which are low in meat yield) are under-represented, leg and foot remains (also low in meat yield) appear to be over-represented.

The assemblage is diverse, including rabbits, turtles, and other species that would be naturally found – and easily procured either during other activities or through traps – in the immediate site area. In this sense, the collection is reminiscent of other Thom's Creek sites.

A third research topic was the expansion of pollen and phytolith research into Thom's Creek sites. This work, too, was productive. The results suggested that the local environment was dominated by a mixed oak-pine forest that also contained hickory. These results precisely paralleled the ethnobotanical study that found the charcoal at the site – from both feature flotation and hand-picked samples – to also be dominated by pine and oak, with abundant evidence of hickory in the form of both wood charcoal and, especially, nutshell. The pollen work, however, also revealed that the site was in proximity to a wetland environment. This was anticipated by the catchment analysis that showed the site may have been located to take advantage of nearby spring-fed fresh water creeks.

The pollen found evidence of wild grape and, based on its abundance, it was suggested that the grape might represent an intentionally collected food. This is further supported by the recovery of grape seed in the ethnobotanical collections.

In contrast to the faunal study's suggestion of a spring and summer occupation, the ethnobotanical remains, especially the abundance of hickory nutshells, is suggestive of a late fall or early winter occupation.

A fourth research topic included good radiometric dating of the site. This was considered especially important since the site contained an abundance of a particular pottery (Thom's Creek Finger Impressed) that is both unusual and apparently confined to the northern extend of the Thom's Creek range. We were also concerned that too many Thom's Creek dates have relied on shell or that too few dates were collected to realistically date the site. Consequently, we selected samples from four of the excavated features, ensuring solid contexts. We also limited the dating to a single hickory nutshell in each case. We hoped that this would avoid the concern that accidentally burned charcoal was being dated. The use of AMS dating allowed single fragments to be used to eliminate averaging and provide very tight date ranges.

The results of this work were dates that ranged from roughly 3,720 to 3,900 B.P. The dates suggest that 38CH1693 was used for a relatively short period of time during the middle of what is recognized as the range for the Thom's Creek occupation on the South Carolina coast. The site, therefore, is neither particularly early nor late.

A final area of specific research was to focus on the reported abundant worked bone at the site. We hoped that microscopic examination might expand research begun at the Lighthouse Point site (Trinkley 1980b). Unfortunately, the enthusiasm concerning worked bone was misplaced and the excavations produced only four specimens. These remains failed to offer any significant expansion on previous work.

Nevertheless, there were a variety of other artifacts produced and their analysis helps to interpret the site. For example, the site produced a relatively large quantity of sherd abraders and hones – many of which were likely used in the manufacture of bone items, even though these bone artifacts were not recovered. Our study – which must be recognized as preliminary – suggests that most were used in bone modification, with little indication that wood was being processed.

The largest artifact assemblage at 38CH1693 was that of pottery. The site provided the opportunity to provide a typological description of Thom's Creek Finger Impressed – which has been found in small quantities at a number of sites, all north of Charleston. In addition, with the excellent radiocarbon dates available from the site, it was possible to compare the assemblage at 38CH1693 with assemblages from sites of approximately the same date range. Curiously, what we found is that the assemblage is varying with movement northward more than it is varying temporally. This opens an avenue of research not previously recognized or explored.

Other than the finger impressed materials, the assemblage easily fits the previous established typology for this ware (Trinkley 1986c). In addition, the pottery at 38CH1693, regardless of surface treatment or location on the site, appears to have been produced using very similar clay sources and techniques. This homogeneity at the site extends even to vessel form, with very little variability exhibited in vessel diameters.

Even the baked clay objects exhibit a paste that is essentially identical to the pottery. In all cases it appears that the paste is non-tempered. We believe that native clays were being used with little preparation. The result – for both pottery and the baked clay objects – is a sandy paste, but one that is not artificially tempered through the addition of specially selected sands.

Lithics, typical of Thom's Creek coastal sites, were scarce. No tools were recovered and the flakes found were all the result of reworking or resharpening existing tools.

Synthesis

Site 38CH1693 consists of several areas of shell features, but no shell midden. The features appear to represent discrete, single use episodes of meal preparation and discard. While shell pits were identified in at least two separate site areas, it is possible, given the radiocarbon dates, that the site was used many times, albeit each time for only a short duration.

The zooarchaeological and ethnobotanical remains suggest different seasons of use, with the faunal remains suggestive of spring-summer use and the ethnobotanical suggestive of fall-winter use. Neither study, however, precludes other seasons of occupation. It may be that the site, being periodically occupied, was visited throughout the year. Year round occupation seems unlikely given the low density of remains and absence of any structural evidence. Occupation, however, was sufficiently intensive to create open areas that promoted the growth of the weedy species found in the pollen study.

It seems likely that the proximity of fresh water springs may have been the critical attraction to the Thom's Creek people. Of course, the site was situated in close proximity to a broad range of habitats, allowing access to estuarine resources, as well as abundant hunting territory. All of the resources documented by the zooarchaeological study would have been available within one or two miles of the site.

Another, less obvious, attraction may have been an abundance of hickory resources localized in the pine-oak forest. The idea of an "island" of hickory mast resources has been suggested to account for the location of other Stallings or Thom's Creek sites such as Fish Haul (Trinkley 1986) and Bass Pond (Trinkley 1993).

However short the duration of site occupation, there was still adequate time for the occupants to use a large quantity of sherds to manufacture or repair bone tools (although few such tools were recovered). The abundance of hones and abraders stands in contrast to the very low density of lithics. This, however, is likely a phenomenon of resource availability. More curious is that the site failed to yield any shell tools – standing in considerable contrast to their abundance at shell rings. This suggests that whatever shell tools were used for, the activity was not taking place at 38CH1693.

One of the most significant unaddressed questions is how 38CH1693 related to the more visible shell rings. One possibility is that if, as Saunders (2002) and Russo and Heide (2003) suggest the shell rings are "ceremonial" sites, 38CH1693 might represent a satellite settlement – representing what Thom's Creek people were doing when they weren't piling together masses of shell. If the shell rings were permanent habitations, as suggested by Trinkley (1980c), then it is possible that 38CH1693 represents a processing station or short-term camp away from the main shell ring settlement, periodically reoccupied during different seasons for a few days.

Curiously, in all of the Thom's Creek research, sites such as 38CH1693 do not appear to have been identified, have not be recognized, or have not been investigated. Regardless, the work at 38CH1693 now adds another element to the Thom's Creek settlement pattern and requires that we direct additional attention to finding and examining other examples.

Since 38CH1693 is in very close proximity to both the Stratton Place and Buzzard Island shell rings, it also illustrates the importance of additional shell ring research to document such mundane issues as pottery assemblages and radiometric dates. Without such information it will be very difficult to fully understand the place of 38CH1693 in the settlement framework.

SOURCES CITED

Anderson, David G.
1975 Inferences for Distributional Studies of Prehistoric Artifacts in the Coastal Plain of South Carolina. *Southeastern Archaeology Conference Bulletin* 18:180-194.

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 National Park Service, Archaeological Services Branch, Atlanta.

Anderson, William D.
2005 *Knobbed Whelk, Busycon carica*. S.C. Department of Natural Resources, Columbia.

Angell, Madeline
1981 *A Field Guide to Berries and Berrylike Fruits*. The Bobbs-Merrill Company, Inc., New York, New York.

Angier, Bradford
1978 *Field Guide to Medicinal Wild Plants*. Stackpole Books, Harrisburg, Pennsylvania.

Anonymous
1969 Horse Island. *University of Georgia Notes,* November.

1999 *Technical Proposal for 38CH1693.* Brockington and Associates, Atlanta.

Asch, Nancy B. and Richard I. Ford
1971 *The Paleoethnobotany of the Koster Site.* Ethnobotanical Laboratory Report 461. University of Michigan, Ann Arbor.

Battle, John D.
1892 An Investigation the Coast Waters of South Carolina with Reference to Oyster Culture. *Fisheries Bulletin* 10:303-330.

Birkeland, P.W.
1999 *Soils and Geomorphology*, 3rd ed. Oxford Univ. Press, New York.

Blanton, Dennis B., Christopher T. Espenshade, and Paul E. Brockington, Jr.
1986 *An Archaeological Study of 38SU83: A Yadkin Phase Site in the Upper Coastal Plain of South Carolina*. Garrow and Associates, Inc., Atlanta.

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.

Boschung, H. T., J. Williams, D. Goshall, D. Caldwell, M. Caldwell
1983 *The Audubon Society Field Guide to North American Fishes, Whales, and Dolphins*. Alfred A. Knopf, New York.

Bragg, Laura M.
1925 An Indian Shell Culture in South

Carolina. *Charleston Museum Quarterly* 1:3-7.

Braun, E.L.
1950 *Deciduous Forests of Eastern North America*. Blarison, Philadelphia.

Brill, Steve and Evelyn Dean
1994 *Identifying and Harvesting Edible and Medicinal Plants in Wild (and Not So Wild) Places*. Hearst Books, New York.

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, Dwight A.
1984 Prospects and Limits of Phytolith Key for Grasses in the Central United States. *Journal of Archeological Science* 11:345-368.

Bryson, Reid A.
1965 Recent Climatic Episodes in North America. *Southeastern Archaeological Conference Bulletin* 3:78-81.

Cable, John S.
1993 *Cultural Resources Survey and Archaeological Site Evaluation of the Edisto Beach State Park, Colleton County, South Carolina.* New South, Stone Mountain, Georgia.

Caldwell, Joseph R.
1952 The Archaeology of Eastern Georgia and South Carolina. In *Archaeology of Eastern United States*, edited by James B. Griffin, pp. 312-321. The University of Chicago Press, Chicago.

Calmes, Alan R.
1967 *Test Excavations at Two Late Archaic Sites on Hilton Head Island, Beaufort County, S.C.* Ms. on file, Institute of Archaeology and Anthropology, University of South Carolina.

1968 *Test Excavations at Three Late Archaic Shell-Ring Mounds on Hilton Head Island, Beaufort County, South Carolina.* Paper presented at the 24th Southeastern Archaeological Conference, Macon, Georgia.

Castagna, Michael and Paul Chanley
1973 Salinity Tolerance of Some Marine Bivalves from Inshore and Estuarine Environments in Virginia Waters on the Western Mid-Atlantic Coast. *Malacologia* 12(1):47-96.

Casteel, R. W.
1978 Faunal Assemblages and "Wiegemethode" or Weight Method. *Journal of Field Archaeology* 5:72-77.

Chanley, Paul and Michael Castagna
1971 Larval Development of the Stout Razor Clam, *Tagelus plebeius* Solander (Solecurtidae: Bivalvia). *Chesapeake Science* 12(3):167-172.

Choate, J., J. Jones, and C. Jones
1994 *Handbook of Mammals of the South-Central States*. Louisiana State University Press: Baton Rouge.

Classmen, Cheryl
1998 *Shells.* Cambridge University Press, New York.

Catlin, William H.
1931 The Stallings Island Mound, Columbia County, Georgia. *Papers of the Peabody Museum of American Archaeology and Ethnology,* Harvard University 14(1).

Cone, L.D., D.M. Knott, E.L. Winner, N.H. Hadley, A.H. Ringwood
1999 Intertidal Oyster Reef Studies in South Carolina: Design, Sampling and Experimental Focus for Evaluating Habitat Value and Function. In *Oyster Reef Habitat Restoration: A Synopsis and Synthesis of Approaches*. Edited by M.W. Luckenback, R. Mann, and J.A. Wesson. Virginia Institute of Marine Science Press. Gloucester Point, Virginia.

Coen, L.D. and M.W. Luckenbach
2000 Developing Success Criteria and Goals for Evaluating Oyster Reef Restoration: Ecological Function or Resource Exploitation? *Ecological Engineering* 15:323-343.

Colquhoun, Donald J. and Brooks, Mark J.
1986 New Evidence for Eustatic Components in Late Holocene Sea Levels. *Geoarchaeology* 1: 275-291.

Cooke, C. Wythe
1936 *Geology of the Coastal Plain of South Carolina*. Bulletin 867. U.S. Geological Survey, Washington, D.C.

Crook, Morgan R., Jr.
1992 Oyster Sources and Their Prehistoric Use on the Georgia Coast. *Journal of Archaeological Science* 19:483-496.

Dame, R.F.
1972 Comparison of Various Allometric Relationships in Intertidal and Subtidal American Oysters. *Fisheries Bulletin* 70:1121-1126.

Dean, Bashford
1892 The Physical and Biological Characteristics of the Natural Oyster-Grounds of South Carolina. *Fisheries Bulletin* 10:335-361.

Deam, Charles C.
1931 *Trees of Indiana*. Indiana Department of Conservation, Forestry Division, Indianapolis, Indiana.

DePratter, Chester B. and Howard, J.D.
1981 Evidence for a Sea Level Lowstand Between 4500 and 2400 Years B.P. on the Southeast Coast of the United States. *Journal of Sedimentary Petrology* 51(4): 1287-1295.

DePratter, Chester B., Richard W. Jeffries, and Charles Pearson
1973 A Review of Early Pottery from the South Carolina Coast. *Institute of Archaeology and Anthropology Notebook* 5(2):45-53.

Dong, Faye M.
2001 *The Nutritional Value of Shellfish*. Washington Sea Grant Program, Seattle, Washington.

Drucker, Lesley M. and Susan Jackson
1984 *Shell in Motion: An Archaeological Study of the Minim Island National Register Site, Georgetown County, South Carolina*. Resources Studies

Series 73. Carolina Archaeological Services, Columbia.

Dye, David H.
1976 *The Bilbo Site Revisited: Archaeological Investigations from Chatham County, Georgia.* Unpublished M.A. thesis, Department of Geography and Anthropology, Louisiana State University.

Edwards, William
1965 *Preliminary Report on Excavations at Sewee Indian Mound.* Ms. on file, Institute of Archaeology and Anthropology, University of South Carolina.

Espenshade, Christopher T. and Paul E. Brockington
1989 *An Archaeological Study of the Minim Island Site: Early Woodland Dynamics in Coastal South Carolina.* Brockington and Associates, Atlanta.

Fernald, M.L.
1950 *Gray's Manual of Botany*. 8 ed. American Book Company, New York, New York.

Flannery, Regina
1943 Some Notes on a Few Sites in Beaufort County, S.C. *Bureau of American Ethnology,* Bulletin 133:147-153.

Folk, R.L.
1980 *Petrology of Sedimentary Rocks*. Hemphill's Publishing, Austin.

Foster, Steven and James A. Duke
1990 *A Field Guide to Medicinal Plants*. Houghton Mifflin Company, Boston, Massachusetts.

Fowells, H.A.
1965 *Silvics of Forest Trees of the United States*. Agricultural Handbook 271. U.S. Department of Agriculture, Washington, D.C.

Frolking, Tod A. and Bradley T. Lepper
2001 Geomorphic and Pedogenic Evidence for Bioturbation of Artifacts at a Multicomponent Site in Licking County, Ohio, U.S.A. *Geoarchaeology* 16:243-262.

Gallagher, Marsha V.
1977 *Contemporary Ethnobotany Among the Apache of the Clarkdale, Arizona Area Coconino and Prescott National Forests*. USDA Forest Service, Southwest Region, Albuquerque, New Mexico.

Galtsoff, Paul S.
1964 The American Oyster, *Crassostrea viginica* Gmelin. *Fishery Bulletin* 64.

Gould, F. N. and R. B. Shaw
1983 *Grass Systematics*. Texas A&M University Press, College Station.

Grayson, D. K.
1973 On The Methodology of Faunal Analysis. *American Antiquity* 38(4): 432-439.

1984 On Quantification of Vertebrate Archaeofauna. In *Advances in Archaeological Method and Theory*. Vol 2, pp. 199-237. Academic Press, New York.

Gregorie, Anne King
1925 Notes on Sewee Indians and Indian remains. *Contributions From the Charleston Museum* 5.

Griffin, James B.
1943 An Analysis and Interpretation of

the Ceramic Remains from Two Sites Near Beaufort, S.C. *Bureau of American Ethnology,* Bulletin 133:159-167.

1945 Ceramic Collections from Two South Carolina Sites. *Papers of the Michigan Academy of Sciences, Arts, and Letters* 30:465-476.

Gunn, Joel D.
1997 A Framework for the Middle-Late Holocene Transition: Astronomical and Geophysical Conditions. *Southeastern Archaeology* 16:134-151.

Gunn, Joel D., Thomas G. Lilly, Cheryl Claassen, John Byrd, and Andrea Brewer Shea
1995 *Archaeological Data Recovery Investigations at Sites 38BU905 and 38BU921 Along the Hilton Head Cross Island Expressway, Beaufort County, South Carolina*. Garrow and Associates, Inc., Raleigh.

Hamel, Paul B. and Mary U. Chiltoskey
1975 *Cherokee Plants and Their Uses--A 400 Year History*. Paul B. Harnel and Mary U. Chiltoskey.

Harlow, William M., Ellwood S. Harrar, James W. Hardin and Fred M. White
1991 *Textbook of Dendrology*. McGraw-Hill, New York, New York.

Harris, Ben Charles
1972 *The Compleat Herbal*. Larchmont Books, New York, 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.

Hauser, Susan
2002 Outwitting Poison Ivy. Retrieved May 23, 2003, http:www.intraart.com/susanha user.

Hemmings, E. Thomas
1970a *Emergence of Formative Life on the Atlantic Coast of the Southeast.* Institute of Archaeology and Anthropology Research Manuscript Series 7, University of South Carolina, Columbia.

1970b Preliminary Report of Excavations at Fig Island, S.C. *Institute of Archaeology and Anthropology Notebook* 2(203):9-15.

Holland, A.F. and J.M. Dean
1977 The Biology of the Stout Razor Clam *Tagelus plebeius:* II. Some Aspects of Population Dynamics. *Chesapeake Science* 18(2):186-196.

Hogue, S. Homes
1997 Faunal Remains from Secessionville. In *Excavations at the Portion of the Secessionville Archaeological Site (38Ch1456), James Island, Charleston, South Carolina*, edited by Michael Trinkley and Debi Hacker, pp. 127-156. Research Series 52. Chicora Foundation, Inc., Columbia.

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.

Kana, Timothy W., Bart J. Baca, and Mark L. Williams
1988 Charleston Case Study. In *Greenhouse Effect, Sea Level Rise, and Coastal Wetlands*, edited by J.G. Titus, pp. 37-59. Environmental Protection Agency, Washington, D.C.

Kent, Bretton W.
1988 *Making Dead Oysters Talk: Techniques for Analyzing Oysters from Archaeological Sites*. Maryland Historical Trust, Historic St. Marys City, Maryland.

Kindscher, Kelly
1987 *Edible Wild Plants of the Prairie*. University Press of Kansas, Lawrence, Kansas.

Kirk, Donald R.
1975 *Wild Edible Plants of Western North America*. Naturegraph Publishers, Happy Camp, California.

Koehler, Arthur
1917 *Guidebook for the Identification of Woods Used for Ties and Timber*. U.S. Department of Agriculture, Forest Service, Washington, D.C.

Krochmal, Arnold and Connie Krochmal
1973 *A Guide to the Medicinal Plants of the United States*. Quadrangle, the New York Times Book Co., New York, New York.

Kukla, J.
1969 The cause of the Holocene climate change. *Geologie en Mijnbouw* 48:307-334.

Küchler, A.W.
1964 Potential Natural Vegetation of the Conterminous United States. *American Geographical Society Special Publication* 36.

Lawson, Ariana S.
2005 *Vertebrate Fauna form the Refuge Fire Tower site (8WA14): A Study of Coastal Subsistence in the Early Woodland Period*. Unpublished MS Thesis. Department of Anthropology, Florida State University. Gainesville.

Leland, John
2003 *Porcher's Creek: Lives Between the Tides.* University of South Carolina Press, Columbia.

Marrinan, Rochelle
1973 *The Cultural Ecology of Fiber-tempered Ceramic Sites: South Carolina and Georgia.* Unpublished M.A. thesis, Department of Anthropology, Tulane University.

1975a *Ceramics, Molluscs, and Sedentism: The Late Archaic Period on the Georgia Coast.* Unpublished Ph.D. dissertation, Department of Anthropology, University of Florida.

1975b *Coastal Adaptation in the Late Archaic.* Paper presented at the 40th meeting of Society for American Archaeology, Dallas.

Martin, Alexander C.

1972 *Weeds*. Golden Press, Western Publishing Company, Inc., New York, New York.

Martin, Alexander C. and William D. Barkley
1961 *Seed Identification Manual*. University of California Press, Berkeley.

Mathew, A.J., A.J. Woods, and C. Oliver
1991 Spots Before Your Eyes: New Comparison Charts for Visual Percentage Estimation in Archaeological Material. In *Recent Developments in Ceramic Petrology*, edited by A.P. Middleton and I.C. Freestone, pp. 211-263. Occasional Paper 81. British Museum, London.

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.

Medsger, Oliver Perry
1966 *Edible Wild Plants*. MacMillan Publishing Company, Inc., Racine, Wisconsin.

Meuninck, Jim
1988 *The Basic Essentials of Edible Wild Plants and Useful Herbs*. ICS Books, Inc., Merrillville, Indiana.

Michie, James
1969 Excavations at Thom's Creek. *Institute of Archaeology and Anthropology Notebook* 1(10):1-11.
1979 *The Bass Pond Dam Site.* Institute of Archaeology and Anthropology Research Manuscript Series 154. University of South Carolina.

Miller, Alexander W.
2000 *Assessing the Importance of Biological Attributes for Invasion Success: Eastern Oyster (Crassostrea virginica) Introductions and Associated Molluscan Invasions of Pacific and Atlantic Coastal Systems*. Unpublished Ph.D. dissertation, University of California at Los Angeles. University Microforms, Ann Arbor.

Miller. E.N., Jr.
1971 *Soil Survey of Charleston County, South Carolina.* U.S.D.A., Soil Conservation Service, Washington, D.C.

Moore, Clarence B.
1899 Certain Aboriginal Mounds of the Coast of South Carolina. *Journal of the Philadelphia Academy of Natural Sciences* 11:147-166.

Moerman, Daniel E.
1998 *Native American Ethnobotany*. Timber Press, Portland, Oregon.

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

Morton, Julia F.
1974 *Folk Remedies of the Low Country*. E.A. Seemann, Miami.

Mulholland, Rosemarie
1984 *Habitat Suitability Index Models: Hard Clam*. Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C.

Munson, Patrick J.
1984 Comments on Some Additional Species, and Summary of Seasonality. In *Experiments and Observations on Aboriginal Wild Plant Food Utilization in Eastern North America*, edited by P. J. Munson, pp. 459-473. Prehistory Research Series. vol. VI (2). Indiana Historical Society, Indianapolis, Indiana.

Niering, W. A.
1985 *Wetlands*. The Audubon Society Nature Guides. Alfred A. Knopf, New York.

Nishida, Alberto K., Nivaldo Nordi, and Rômulo R.N. Alves
2006 The Lunar-Tide Cycle Viewed by Crustacean and Mollusc Gatherers in the State of Paraíba, Northeast Brazil and Their Influence in Collection Attitudes. *Journal of Ethnobiology and Etnomedicine* 2(1):1-12.

Oliver, Billy L.
1981 *The Piedmont Tradition: Refinement of the Savannah River Stemmed Point Type.* Unpublished M.A. thesis, Department of Anthropology, University of North Carolina, Chapel Hill.

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.

Pecorelli, Harry and Bruce Harvey
2003 *Cultural Resource Inventory of the Marino Tract, Charleston County, South Carolina.* Brockington and Associates, Atlanta.

Peacock, Evan, Janet Rafferty, and S. Homes Hogue.
2005 Land Snails, Artifacts, and Faunal Remains: Understanding Site Formation Processes at Prehistoric/Protohistoric Sites in Southeastern United States. In *Archaeometery: Molluscs in Former Environments of Human Behavior*, edited by Daniella Bar-Yosef, pp. 6-17. Oxbow Books. Oxford.

Peattie, Donald Culross
1966 *A Natural History of Trees of Eastern and Central North America*. Bonanza Books, New York, New York.

Peterson, Lee A.
1977 *Edible Wild Plants*. Collier Books, New York, New York.

Petruso, Karl M. and Jere M. Wickens
1984 The Acorn in Aboriginal Subsistence in Eastern North America: A Report on Miscellaneous Experiments. In *Experiments and Observations on Aboriginal Wild Plant Food Utilization in Eastern North America*, edited by P. J. Munson, pp. 360-378. Prehistory Research Series. vol. VI (2). Indiana Historical Society, Indianapolis, Indiana.

Phelps, David S.
1968 Thom's Creek Ceramics in the Central Savannah River Locality. *Florida Anthropologist* 21(1):17-30.

Pierce, S.K.
1970 The Water Balance of *Modiolus* (Mollusca: Bivalvia: Mytilidae): Osmotic Concentrations in Changing Salinities. *Comparative Biochemistry and Physiology* 36:521-533.

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.

Prezant, Robert S., Ronald B. Toll, Harold B. Rollins, and Eric J. Chapman
2002 *Marine Macroinvertebrate Diversity of St. Catherines Island, Georgia*. Novitates 3367. American Museum of Natural History, New York.

Quitmyer, Irvy R.
1985 1985a Aboriginal Subsistence Activities in the Kings Bay Locality. In *Aboriginal Subsistence and Settlement Archaeology of the Kings Bay Locality.* Vol. 2: Zooarchaeology, edited by William Hampton Adams, pp. 73-92. Department of Anthropology, University of Florida, Gainesville.

1986b Zooarchaeological Methods for the Analysis of Shell Middens at Kings Bay. In *Aboriginal Subsistence and Settlement Archaeology of the Kings Bay Locality*, Vol. 2: Zooarchaeology, edited by William Hampton Adams, pp. 33-48. 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.

Rathbun, Ted A., James Sexton, and James Michie
1978 *Disease Patterns in a Formative Period South Carolina Coastal Population.* Paper presented at the Southeastern Archaeological Conference, Knoxville.

Reidhead, Van A.
1981 *A Linear Programming Model of Prehistoric Subsistence Optimization: A Southeastern Indiana Example*. Prehistory Research Series VI (1). Indiana Historical Society, Indianapolis, Indiana.

Reitz, E. J., and D. C. Weinand
1995 Vertebrate Fauna from the Nathaniel Russell House. In *Initial Archaeological Testing: The Nathaniel Russell House*. Archaeological Contributions 24. The Charleston Museum, Charleston, South Carolina.

Reitz, Elizabeth J. and Elizabeth S. Wing
1999 *Zooarchaeology.* Cambridge University Press, New York.

Russo, Michael and Gregory Heide
2003 *Mapping the Sewee Shell Ring.* National Park Service, Southeast Archaeological Center, Tallahassee.

Sandifer, Paul A., John V. Miglarese, Dale R. Calder, John J. Manzi, Lee A. Barclay
1980 *Ecological Characterization of the Sea Island Coastal Region of South Carolina and Georgia*. Vol. 3. Biological Features of the Characterization Area. Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C.

Sassaman, Kenneth E.
1983 *Middle and Late Archaic Settlement in the South Carolina Piedmont.*

Unpublished M.A. thesis. Department of Anthropology, University of South Carolina, Columbia.

1993a *Early Pottery in the Southeast: Trend and Innovation in Cooking Technology.* University of Alabama Press, Tuscaloosa.

1993b *Mims Point 1992: Archaeological Investigations at a Prehistoric Habitation Site in the Sumter National Forest, South Carolina*. Savannah River Archaeological Research Papers 4. Occasional Papers of the Savannah River Archaeological Research Program, South Carolina Institute of Archaeology and Anthropology, University of South Carolina, Columbia.

1997 The Symbolism of Circles: The Stalling's Culture. *Shell Rings of the Late Archaic* (archaeology week poster). South Carolina Institute of Archaeology and Anthropology, University of South Carolina, Columbia.

Sassaman, Kenneth E. and David G. Anderson
1993 *Middle and Late Archaic Archaeological Records of South Carolina: A Synthesis for Research and Resource Management.* Council of South Carolina Professional Archaeologists, Columbia.

Sassaman, Kenneth E., Meggan E. Blessing, and Asa R. Randall
2006 Stallings Island Revisited: New Evidence for Occupational History, Community Pattern and Subsistence Technology. *American Antiquity* 71:539-566.

Saunders, Rebecca (editor)
2002 *The Fig Island Ring Complex (38CH42): Coastal Adaptation and the Question of Ring Function in the Late Archaic.* National Park Service, Southeast Archaeological Center, Tallahassee.

Schoeneberger, P.J., D.A. Wysocki, E.C. Benham, and W.D. Broderson
1998 *Field Book for Describing and Sampling Soils*. Natural Resources Conservation Service, U.S. Dept. of Agriculture, National Soil Survey Center, Lincoln.

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.

Scott D.B. and Collins, E.S.
1996 Late Mid-Holocene Sea Level Oscillation: A Possible Cause. *Quaternary Science Reviews* 15:851-856.

Scott, Susan L.
1981 Economic and Organizational Aspects of Deer Procurement in the Late Prehistoric Period. Paper presented at the 38th Annual Southeastern Conference, Asheville.

Scott, Susan L. and H. Edwin Jackson
1998 Caddo Ritual and Patterns of Animal Use: An Analysis of Faunal Remains from the Crenshaw Site (3MI6), Southwestern Arkansas. *The Arkansas Archaeologist* 37:1-37.

Seeman, Mark F. and Hugh D. Wilson
1984 The Food Potential of *Chenopodium* for the Prehistoric Midwest. In *Experiments and*

Observations on Aboriginal Wild Plant Food Utilization in Eastern North America, edited by P. J. Munson, pp. 299-316. Prehistory in Eastern North America. vol. VI (2). Indiana Historical Society, Indianapolis, Indiana.

Semenov, S.A.
1976 *Prehistoric Technology: An Experimental Study of the Oldest Tools and Artifacts from Traces of Manufacture and Wear.* Barnes and Noble, New York.

Simpkins, Daniel L. and Alan E. McMichael
1976 Sapelo Island: A Preliminary Report. *Southeastern Archaeological Conference,* Bulletin 19:95-99.

Simpson, G. O., A. Roe, and R. 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.

South, Stanley
1960 *An Archaeological Survey of Southeastern North Carolina.* Ms. on file, Research Laboratories of Anthropology, University of North Carolina, Chapel Hill.

1973 Indian Pottery Taxonomy for the South Carolina Coast. *Institute of Archaeology and Anthropology Notebook* 5(2):54-55.

Stapor, F.W. and Mathews, T.D.
1983 Higher–Than-Present Holocene Sea-Level Events Recorded in Wave Cut Terraces and Scarps: Old Island, Beaufort County, South Carolina. *Marine Geology* 52: M53-M60.

Sutherland, Donald R.
1971 U.S.C. Field Course in Archeology: Summer 1970. *Institute of Archaeology and Anthropology Notebook* 3(1):13-14.

1973 Preliminary Analysis of Ceramic Materials Recovered from the Spanish Mount Site, Edisto Island, S.C. *South Carolina Antiquities* 5(2):46-50.

Talalay, Laurie, Donald R. Keller and Patrick J. Munson
1984 Hickory Nuts, Walnuts, Butternuts, and Hazelnuts: Observations and Experiments Relevant to their Aboriginal Exploitation in Eastern North America. In *Experiments and Observations on Aboriginal Wild Plant Food Utilization in Eastern North America*, edited by P. J. Munson, pp. 338-359. Prehistory Research Series. vol. 6 (2). Indiana Historical Society, Indianapolis, Indiana.

Thomas, David Hurst
1971 On Distinguishing Natural from Cultural Bone in Archaeological Sites. *American Antiquity* 36:366-371.

Thomas, David Hurst and Clark Spencer Larsen
1979 *The Anthropology of St. Catherines Island 2. he Refuse-Deptford Mortuary Complex.* Anthropological Papers of the American Museum of Natural

History 56(1).

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.

Tilford, Gregory L.
1997 *Edible and Medicinal Plants of the West*. Mountain Press Publishing Company, Missoula, Montana.

Trinkley, Michael
1975a *Analysis of ceramics from Fennel Hill, South Carolina.* Ms. on file, Research Laboratories of Anthropology, University of North Carolina, Chapel Hill.

1975b Preliminary Report of Archaeological Excavations at Lighthouse Point Shell Ring, South Carolina. *Southern Indian Studies* 27:3-36.

1976a Excavations at Thom's Creek (38LX2), South Carolina. *South Carolina Antiquities* 6(2):10-23.

1976b *The Thom's Creek Phase: Cultural Ecology and Subsistence.* Paper presented at the 3rd Conference on South Carolina Archaeology, Columbia.

1976c *A Typology of Thom's Creek Pottery for the South Carolina Coast.* Unpublished M.A. Thesis, Department of Anthropology, University of North Carolina, Chapel Hill.

1980a *Additional Investigations of 38LX5.* South Carolina Department of Highways and Public Transportation, Columbia.

1980b *Investigation of the Woodland Period Along the South Carolina Coast.* Ph.D. dissertation, Department of Anthropology, University of North Carolina, Chapel Hill.

1980c A Typology of Thom's Creek Pottery for the South Carolina Coast. *South Carolina Antiquities* 12(1):1-35.

1984 *The Archaeology of Sol Legare Island, Charleston County, South Carolina.* Research Series 1. Chicora Foundation, Inc., Columbia.

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.

2006 *Management Summary of Data Recovery Excavations at 38CH1693, A Small Thom's Creek Site, Charleston County, South Carolina.* Research Contribution 451. Chicora Foundation, Inc. Columbia.

Trinkley, Michael (editor)
1991 *Further Investigations of Prehistoric and Historic Lifeways on Callawassie and Spring Islands, Beaufort County, South Carolina.* Research Series 23. Chicora Foundation, Inc., Columbia.

1993 *The History and Archaeology of Kiawah Island, Charleston County, South Carolina.* Research Series 30. Chicora Foundation, Inc., Columbia.

Twiss, Page C.

1987 Grass-Opal Phytoliths as Climatic Indicators of the Great Plains Pleistocene. In *Quaternary Environments of Kansas*, edited by W. C. Johnson, pp. 179-188. 5 ed. Kansas Geological Survey Guidebook Series.

United States Department of Agriculture

1971 *Common Weeds of the United States.* Dover Publications, New York.

Ursin, Michael J.

1972 *Life In and Around the Salt Marshes: A Handbook of Plant and Animal Life In and Around the Temperate Atlantic Coastal Marshes.* Crowell, New York.

Vaughn, Caryn C. and Frank N. Fisher

1992 Dispersion of the Salt-Marsh Periwinkle, *Littoraria irrorata*: Effects of Water Level, Size, and Season. *Estuaries* 15(2):246-250.

Vernberg, F. John and Chester Sansbury

1972 Studies on Salt Marsh Invertebrates of Port Royal Sound. In *Port Royal Sound Environmental Study*, edited by the S.C. Water Resources Commission, pp. 271-277. State Printing Co., Columbia.

Von den Driesch, Angela

1976 *A Guide to the Measurement of Animal Bones from Archaeological Sites*. Peabody Museum of Archaeology and Ethnology, Harvard University.

Waddell, Eugene G.

1963 Thom's Creek Punctate. *Southeastern Archaeological Conference,* Newsletter 9(2):3-5.

1965 A C-14 Date for Awendaw Punctate. S*outheastern Archaeological Conference Bulletin* 3:82-85.

1970 A Ceramic Sequence for the Coastal Plain of South Carolina. *South Carolina Antiquities* 2(1):7-27.

Walters, Keith and Loren Coen

2005 March Periwinkle, *Littoraria irrorata*. S.C. Department of Natural Resources, Columbia.

Welch, P. D.

1991 *Moundville's Economy*. University of Alabama Press, Tuscaloosa.

Wells, Harry W.

1961 The Fauna of Oyster Beds, with Special Reference to the Salinity Factor. *Ecological Monographs* 31(3):239-266.

Whiterker, John O.

1997 *National Audubon Society Field Guide to North American Mammals.* Alfred A. Knopf, New York.

Williams, Stephen B. (editor)

1968 The Waring Papers: The Collected Works of Antonio J. Waring, Jr. *Papers of the Peabody Museum of Archaeology and Ethnology* 58.

Wing, E. S. and A. B. Brown

1979 *Paleonutrition: Method and Theory in Prehistoric Foodways*. Academic Press, New York.

Wing, Elizabeth S. and Irvy R. Quitmyer

1985 Screen Size for Optimal Data Recovery: A Case Study. In *Aboriginal Subsistence and Settlement Archaeology of the Kings Bay Locality*, Vol. 2:

Zooarchaeology, edited by William Hampton Adams, pp. 49-58. Department of Anthropology, University of Florida, Gainesville.

Yarnell, Richard A.
1964 *Aboriginal Relationships Between Culture and Plant Life in the Upper Great Lakes Region*. Anthropological Papers, Museum of Anthropology, University of Michigan, No. 23. The University of Michigan, Ann Arbor, Michigan.

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.

Zeder, Melinda A. and Susan R. Arter
1996 Meat Consumption and Bone Use in a Mississippian Village. In *Case Studies in Environmental Archaeology*, edited by Elizabeth J. Reitz, Lee A. Newsom, and Sylvia J. Scudder, pp.319-337. Plenum Press, New York.

APPENDIX 1: THOM'S CREEK FINGER IMPRESSED

Paste:

Method of Manufacture: coiling, with occasional coil fractures observed.

Temper: fine subangular quartz inclusions dominate the paste, although occasionally medium and very rarely coarse inclusions are present. These sand inclusions are well sorted and are probably native to the clay; thus the pottery is most probably non-tempered.

Texture: fine; compact.

Hardness: 2.0 – 3.0

Color: interior and exterior color ranges from brown to tan.

Firing: typically incompletely oxidized with darker core.

Surface Finish: Nearly a third of the specimens exhibit interior smoothing or finishing using a bivalve, creating a distinctive combed appeared. Exteriors are smooth, with less than 10% showing evidence of having been scraped with a bivalve.

Decoration: Sherds have been smoothed with the fingers, producing rows of grooves that are typically distinct and well formed. These grooves are typically about 20 mm in width and impressed into the clay fabric from 1 or 2 mm to as much as 6-7 mm. Where identified on rims the finger impressions are at a 45^{o} angle to the rim, evidencing a pull away from the rim. Inclusions are occasionally drug in the impressions.

Form:

Rim: straight to very slightly incurving.

Lip: The most common lip form is rounded (found on about 60%), followed by flattened (35%). These correspond to Types II and I respectively (Trinkley 1976c).

Body: Typical form appears to be a deep jar with an unrestricted or slightly constrictive orifice. Less common is a wide mouth bowl. Mean vessel diameter is 35 cm, with a range of 18 to 41 cm. The mode is 41 cm.

Base: slightly flattened.

Thickness: the average is 7.9 mm, with a range of 5.9 to 10.3mm.

Sample: 182 specimens from 38CH1693; non-quantified samples from Lighthouse Point Shell Ring, Stratton Place Shell Ring, Venning Creek midden, and Sewee Shell Ring.

Geographical Range: northern half of Charleston County, South Carolina, from the Stono River northward to the South Santee, with proportions in collections increasing northward. Core area appears to be the region from the Wando River to Jeremy Creek.

Chronological Position: C-14 dates from 38CH1693 suggest a date of 1,900 to 1,800 B.C.

Archaeological Investigations

Historical Research

Preservation

Education

Interpretation

Heritage Marketing

Museum Support Programs

ISBN 978-1-58317-067-0

Chicora Foundation, Inc.
PO Box 8664 ▪ 861 Arbutus Drive
Columbia, SC 29202-8664
Tel: 803-787-6910
Fax: 803-787-6910
www.chicora.org