The Fig Island Ring Complex (38CH42): Coastal Adaptation and the Question of Ring Function in the Late Archaic

edited by
Rebecca Saunders

with contributions by
William Green, Gregory Heide, David S. Leigh,
Michael Russo, Rebecca Saunders, and William Stanyard

Principal Investigators:

Dr. Rebecca Saunders
Museum of Natural Science
119 Foster Hall
Louisiana State University
Baton Rouge, LA 70803

AND

Dr. Michael Russo
NPS, SEAC
2035 E Paul Dirac Dr., Box 7
Johnson Bldg, Suite 120
Tallahassee, FL 32310

Report prepared for the South Carolina Department of Archives and History
under grant #45-01-16441
August 5, 2002

ABSTRACT

This report describes fieldwork and laboratory analysis undertaken at the Late Archaic Fig Island site (38CH42), located on a marsh island associated with Edisto Island, off the South Carolina coast. The fieldwork and subsequent analysis were undertaken to address, in part, simple descriptive cultural historical concerns, such as what the site looked like, when the site was occupied, how the site was formed, what the artifact assemblage was like, and when the site was abandoned. A rigorous mapping program that included subsurface probing at 5 m intervals was undertaken to describe the topography and possible disturbances at the site; probing included determining shell depth within the rings in order to define the original topography and determine total volume of shell throughout the site. Soils analysis was included as part of this descriptive history, as the authors wished to learn more about the paleoenvironment when the site was occupied and to identify both anthropogenic and natural disturbances to the site. Fine screened invertebrate and vertebrate faunal samples were studied to learn more about the diet of the inhabitants of the site and to use seasonal information derived from these fauna to identify season(s) of site occupation. Data on site stratigraphy and material culture, along with radiocarbon dates—all information gleaned from the limited subsurface testing undertaken—were gathered to address site chronology and the lifeways of the inhabitants. Finally, the authors hoped to marshal these data to address site function—egalitarian village or village/ceremonial center—and to theorize over issues of cultural complexity that the site function might indicate.

The overwhelming amount of data derived from the fieldwork and the analysis will take years to digest. However, preliminary data indicate that the site was occupied between about 4240-3680 B.P. (the one sigma, calibrated radiocarbon date range). Mapping disclosed three rings. Radiocarbon dating indicates that two of these, Fig Island 2 and Fig Island 3, may have been occupied in the earlier part of this range, and may be contemporaneous. In addition, probing revealed a shell "walkway" now submerged beneath the marsh surface, between the two structures. Fig Island 1, which had never been mapped, proved to be one of the largest rings on record. It is associated with a number of smaller ring enclosures on the northern and western sides and a distinct mound may be present on the south side. The radiocarbon date from the top of Fig Island 1 is slightly younger than those from Fig Island 2, but the two dates from a unit in one of the small enclosures is significantly younger, and may indicate a different site function late in the occupation.

Stratigraphy in excavation units in many places tested in the site conformed with the stratigraphy observed at other shell ring sites, though the authors' interpretation of that stratigraphy differs from that of some other researchers. However, the aforementioned unit at the base of Fig Island 1 stood out also in terms of both stratigraphy and artifact content; these data indicate a wider range and more spatial segregation of activities at ring sites with small enclosures than has been appreciated in the past.

Fine screened subsistence remains indicated—no surprise—that small estuarine fish and shellfish, principally oyster, were the main components of the diet. Seasonal indicators,

unfortunately, were few. However, length of *Boonea impressa* from four discrete areas of the site indicated that those deposits accrued in the late fall and winter.

Soils analysis raised a number of questions. The site may have been located on slight rises in an environment already in marsh (Leigh, Appendix 1), or, more like the conventional wisdom, the site was established when sea level was lower and a peninsula of land was exposed (Russo, Chapter 7).

The importance of the Fig Island site as research laboratory into coastal adaptations of the past cannot be overstated. The site has been acquired by the South Carolina Department of Natural Resources and is now protected. A public interpretation program is encouraged, though access to the site should probably be limited. As this report demonstrates, additional research by archaeologists, geologists, botanists, and others will no doubt ensue and should be encouraged. Much more research is necessary to understand these important monuments of the past.

ACKNOWLEDGEMENTS

The authors (Saunders, Russo, and Heide) would like to thank Bill Green and Chris Judge for involving us in the study of South Carolina shell rings. Both further contributed, and are continuing to contribute, to these studies.

We are grateful to the South Carolina Department of Natural Resources for allowing us access to the property. Chris Judge, Archaeologist for the SCDNR Heritage Trust Program, our liason with the SCDNR, saw to it that we had that access, and provided fundamental logistical support (housing and boats). Chris also lent us the talents of Sean Taylor, Genevieve Brown, and Chris Compton for three days, and Jon Rood for four, and worked several days at the site himself.

Brad Sauls was patient throughout the protracted contract negotiations between the South Carolina Department of Archives and History (SCDAH) and LSU. We were out of the field by the time we actually had a signed contract between these two august institutions. Brad also helped with a number of technical aspects of the report production and kept us (mostly) on time. Many thanks to SCDAH for making this project possible.

We received help from many other South Carolina organizations and individuals. Martha Zierden suggested and then implemented the involvement of the archaeological field school at the College of Charleston, and oversaw that program as well as the field lab. Her sons were great screeners and her husband, who realized that on the highest tides one could boat pretty close to Fig Island 3, is no doubt responsible for the ridiculous amounts of column and other special samples ultimately transferred to LSU. Thanks to the field school students for their hard work and good attitudes—they signed up to work on a nice, safe, terrestrial historic site (Charles Town Landing) and found themselves consigned for one week to…well, it rhymes with 'shell.' The Archaeological Society of South Carolina also provided dependable, professional labor. Special thanks to Richie Lahan for his loyalty to the project.

Sharon Pekrul, Curator of Collections for the South Carolina Institute of Archaeology and Anthropology, did a tremendous job of getting the previously-excavated Fig Island materials at the Institute organized for the background research portion of this project. Chris Amer, Deputy State Underwater Archaeologist, lent us a boat to haul equipment out to the islands.

Chris Clements contributed a GPS survey and saved a boat. Rick Bordelon, of the Louisiana Archaeological Society, provided boat, sadly just before Tropical Storm Allison flooded his own house and he needed a boat for the first time in four years. Rick and his wife Vicky also labored at the site.

Our two fellow "ringers" (paid staff), Vicki Rolland and Norm Davis, were essential to the completion of this project. Vicki has a phenomenal capacity for hard work in the worst of conditions, but knows when it's time to retire to the porch for a brewski. Norman Davis braved the boats and the marsh (again) to do terrestrial archaeology by day and celestial archaeology by night. He kept us wondering (guessing and in awe) at astronomical alignments at Fig Island (not to mention Marksville, Poverty Point, and sites in between and on to Mexico).

Thanks to the folks in the Archaeology Lab of the Museum of Natural Science at LSU for their fine work on sample processing and artifact analysis. Bryan Tucker and Steve Fullen deserve special recognition.

Greg Heide produced all the Fig Island site maps. Clifford Duplechin drafted Figure 1 and Mary Lee Eggart drew the incised bone pins (Figure 34). Both Dup and Mary Lee work for the Cartographic Information Center at LSU.

Finally, we thank the Southeastern Archaeological Center (SEAC) of the National Park Service for allowing Greg and Mike to take time off for fieldwork and for the time spent on some of the analysis at the Center. SEAC also lent a total station to the project, as did Rochelle Marrinan at Florida State University.

The activity that is the subject of this report has been financed in part with Federal funds from the National Park Service, U.S. Department of the Interior, and administered by the South Carolina Department of Archives and History. However, the contents and opinions do not necessarily reflect the views or the policies of the Department of the Interior.

TABLE OF CONTENTS

List of Figures

List of Tables

CHAPTER 1:
INTRODUCTION

The Fig Island site was 29th out of 100 top cultural sites ranked by the South Carolina Heritage Trust Program's 1990 Statewide Assessment of Cultural Sites Program (Judge 1999:4). The site has long been recognized as containing one of the best-preserved circular shell rings on the lower Atlantic coast. The circular ring, Fig Island 2, and the two other shell features, a semi-circular ring, Fig Island 3, and Fig Island 1—and enormous ring and possible mound complex—cover a 300 x 275 m area.

[redacted]

Within the last decade, a number of previously undated sites with monumental architecture (earth and shell mounds) have been dated to the Middle and Late Archaic Stage. We believe that coastal Archaic shell rings should be included in this group and our research at the Fig Island site was designed to address the question of the function of shell rings in Late Archaic cultures.

This report details the results of archaeological fieldwork at the Fig Island site between May 18 and June 20, 2001. Work undertaken at the site in 2001, funded by a South Carolina Department of Archives and History Grant (NPS #45-01-16441), had three primary goals. The first goal was to produce a detailed topographic and stratigraphic map of all three structures on the site. Fig Island 2 and 3 had been mapped by Hemmings in 1970; however, our program was more detailed in that it entailed mapping at 5 m intervals across the site and included probing for shell below the infilled marsh between the rings and probing for shell depth through the rings. Fig Island 1 had never been mapped. Mapping duties were generally the responsibility of Dr. Michael Russo and Gregory Heide, both of the Southeastern Archaeological Center of the National Park Service, Tallahassee; Vicki Rolland, Department of Anthropology, Florida State University, also provided major input to the mapping project. Heide was responsible for the ultimate map production.

The second goal was to core portions of the site to provide samples for both soil chemistry and stratigraphy. Soil chemistry was to be used to determine whether some areas of the rings had been disturbed; stratigraphic information provided by the additional cores would be used for limited paleoenvironmental reconstruction. We were particularly interested in the substrate(s) of the rings and in whether or not it would be possible to determine when marsh inundation of the rings began. Core samples were taken by Russo; Dr. David Leigh of the University of Georgia analyzed the cores.

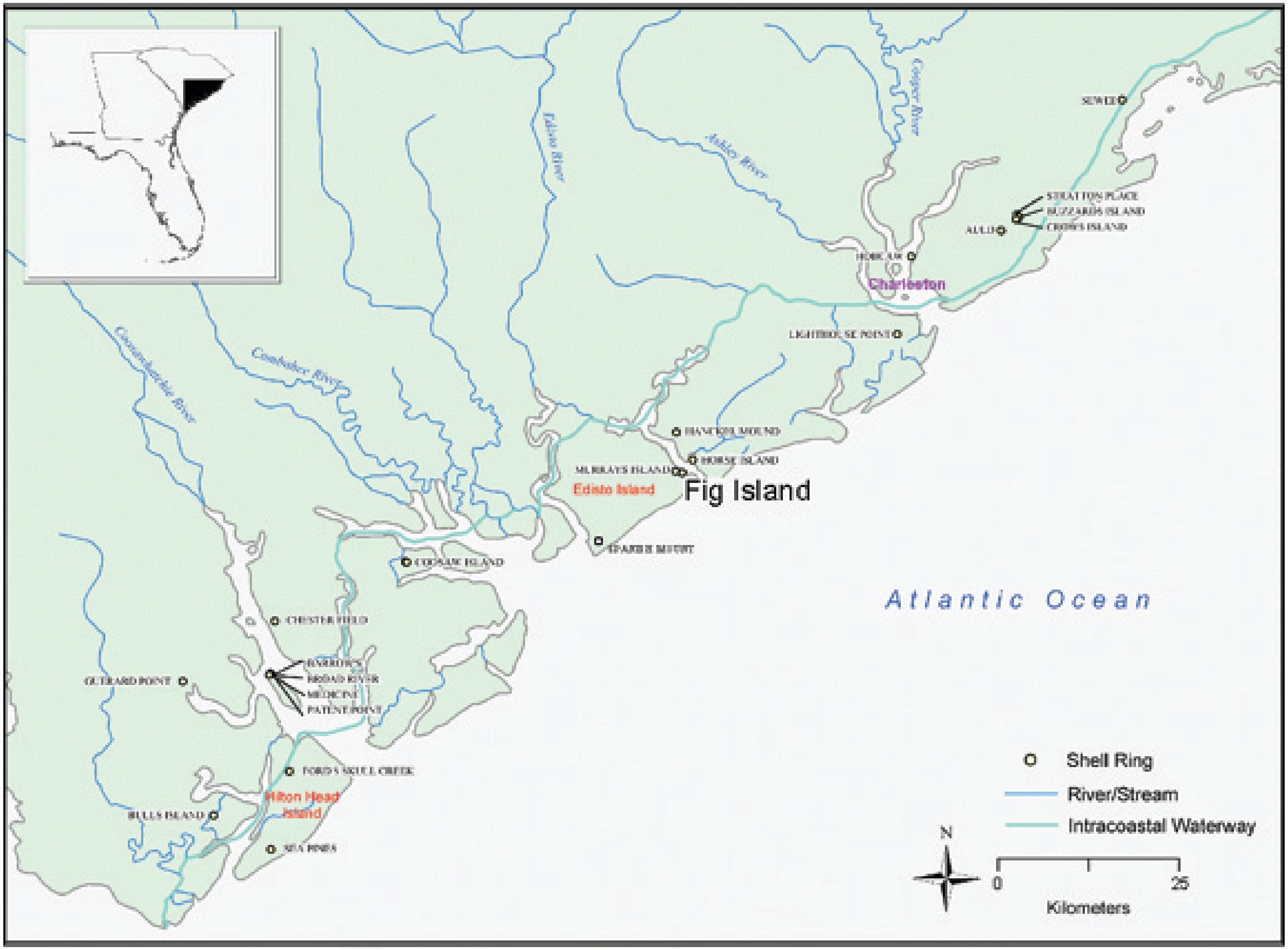


Figure 1. Site locations, Fig Island and Spanish Mount.

Finally, we proposed to generate more information about the lifeways at the site by doing limited subsurface testing in all three rings. Testing results were intended to provide more information on ring construction: on the stratigraphy of the rings, including evidence for the intentional mounding of shell and other materials; evidence for the rapidity of ring construction via stratigraphy and radiocarbon dates; and evidence for contemporaneity between the rings, or for sequential construction, using radiocarbon dates and artifacts. Developing evidence for season(s) of site use from fine screened faunal samples from each ring, and evidence of subsistence focus and subsistence technology, were also primary goals of the project. The excavation portion of the project was under the direction of Dr. Rebecca Saunders, Museum of Natural Science, Louisiana State University, with substantial help from Norman Davis, a private archeological contractor from Abita Springs, Louisiana.

Taken together, the results from mapping, soil coring, and subsurface testing were to be used to address the long-standing question of ring function and the more-recently developed question of the emergence of sociopolitical complexity in the Late Archaic.

Funded for four weeks of fieldwork, we ultimately extended work to five. Work began on May 18, 2001, with the transfer of field equipment from the mainland to the island. Site set-up continued through the weekend with the help of personnel from the South Carolina Institute of Archaeology and Anthropology, South Carolina Department of Natural Resources, and the Charleston Museum. The first formal day of fieldwork began on Monday, May 21, with the arrival of the paid field crew. Throughout the project, numerous other individuals worked to enhance the project. These included two, two-week sessions of a field school run by the College of Charleston and volunteers from the South Carolina Archaeological Association. Both of these groups were ably organized by Martha Zierden of the Charleston Museum. Zierden also organized the field lab and participated in the field work. Chris Judge of the South Carolina Heritage Trust Program provided invaluable logistical support and also helped out with the fieldwork, as did several other members of the Heritage Trust. Altogether, some 1642 hours (205 person days) were donated to the project. The site excavations were closed on June 20.

Analysis of cultural materials recovered was under the direction of Saunders at the Museum of Natural Science at Louisiana State University. All ceramics were analyzed by Saunders' curatorial assistant, Bryan Tucker; student workers, again under Saunders' direction, analyzed the shell and bone tools, and any other cultural materials recovered. Zooarchaeological analysis of fine screened samples was done by Rolland; Russo produced the report on the fauna from Rolland's analysis. Saunders was responsible for report production. Field notes, maps, slides, and other materials associated with the project will be curated at the South Carolina Insitute of Archaeology and Anthropology. Copies of these materials are also available at the Museum of Natural Science, Louisiana State University.

CHAPTER 2:
ENVIRONMENTAL SETTING

Fig Island proper is a roughly 900 m^2 area of high ground (5 ft amsl) on the extreme northeast end of Edisto Island. Fig Island is surrounded by salt marsh, which is bordered on the west, southwest, and southeast by Ocella Creek (Figure 1). The southeast and northeast bends in Ocella Creek create a peninsula of marsh that is bordered on the north by the North Edisto River. Though at one time this peninsula, along with the adjacent marsh between Fig Island and Edisto Island, were probably dry land, access to Fig Island is now by boat only.

Northeast of Fig Island are three prehistoric shell structures creating another three distinct areas of high ground in the salt marsh. Off the rings and the island proper, the marsh is crosscut with numerous tidal creeks. One of these creeks runs along the eastern edge of Fig Island 1 and an indeterminate portion of this impressive feature has eroded into the creek. This area, as well as other portions of the rings, are subject to flooding and erosion during high winds and tides, and can be expected to suffer more damage in hurricanes and other severe storms.

Edisto Island is one of a string of sea islands that stretch from the central coast of South Carolina to northern Florida. Unlike barrier islands, which are Holocene deposits of shifting sands, sea islands are erosional remnants of the seaward side of the continent; during periods of lower sea level these Pleistocene deposits were conjoined with the mainland. Because relative sea level has risen dramatically since 18,000 B.P. (see below), the lower, eroded areas have become marsh or open water.

Relative sea level takes into account both absolute rises in sea level due to glacial melting—a process that continues today at about a rate of 10 cm/century (Gayes et al. 1992:159)—and subsidence (lowering) of the earth's surface. At present, the South Carolina coast is subsiding at the relatively high rate of 2 – 4 mm/year. This may be due to the fact that there is an important seismic trend that transects the Carolina embayment (Fairbridge 1992:16; see Fairbridge 1992 for other hypotheses).
Another geologic fault or series of faults is present along the Ashley River where a 90° shift in course changes the direction of the river from NE-SW to NW-SE. According to Rhea (1989), the 90º shift is a result of earthquake activity and a similar 90º course change in the Edisto River could have been the result of uplift northeast of the course change. Prior to that course change, in the Pleistocene, the Edisto River probably continued on a southeasterly course, perhaps down the lower reaches of the current Ashley River channel. LANDSAT and aerial photographs indicate channel characteristics indicative of subsequent stream capture of the Edisto River by a river to the south (Rhea 1989:313), but this has not been dated.

A magnitude 7 earthquake occurred in Charleston in 1886; according to Obermeier et al. (1985:408), at least two prehistoric quakes in the region can be inferred from sand blows, which occur as small sand mounds or "sand volcanoes" and "as sand-filled fissures or craters surrounded by surficial sheets of ejected sand" up to 100 km from

Charleston (Edisto Island is ca. 55 km SW of Charleston). Soil formations from before and after one such crater was formed yielded maximum and minimum ages 4680 ± 150 and 1380 ± 120 radiocarbon years B.P., respectively—not precise enough to correlate with hypothetical culture changes in the Edisto area. One imagines, however, that these earthshaking events must have had some impact on native peoples.

The Edisto Island area is considered subtropical, with relatively long, hot summers and short, mild winters. Abundant precipitation is well distributed throughout the year, though as temperatures rise in the summer, rainfall also increases. The highest storm tide recorded for the years prior to 1971 was 11.2 ft above mean low water, which occurred in August of 1893 during a hurricane (USDA 1971:72). More commonly, tides range between 4.5 and 6 feet.

Vegetation on the sea islands, nearby barrier islands, and the adjacent coastal plain is classified as maritime forest. Five types of maritime forest exist in South Carolina: 1) oak-pine, 2) oak-palmetto-pine, 3) oak-magnolia, 4) palmetto, and 5) low oak woods (Sharitz 1975). Oak magnolia forests are considered the climax forest. The other types represent successional or subclimax forests with the presence of one over another dependent on elevation, exposure, and prior disturbance. According to Cable and Williams (1993:6-7):

> The oak-pine community has a supercanopy of loblolly and longleaf pines and a secondary canopy of laurel oak. Other important arboreal species include red bay, hickories, cabbage palmetto and sweet gum. The shrub layer is dominated by yaupon holly, American holly, red bay, and blueberry. The oak-palmetto-pine community occurs at the edge of the transition shrub communities and supports a supercanopy of laurel oak, cabbage palmetto and loblolly and longleaf pines. Live oak and southern red cedar form important species of the subcanopy, while the shrub layer is dominated by yaupon holly and red bay. The oak-magnolia community is dominated by laurel oak, live oak, magnolia, and red bay, although pines are also present in the supercanopy. The palmetto community is common at the edges of ponds and is dominated by the cabbage palmetto and laurel oak.

Communities dominated by pine would have the least to offer Native American foragers. However, almost every native plant in the aforementioned communities could provide a useful substance. Beyond the constant need for wood for cooking fires, structures, canoes, paddles, and, no doubt, a plethora of other utilitarian and decorative wooden objects, the native flora provided: dyes (e.g., sumac bark and seeds and bedstraw root; Jakes and Ericksen 2001); medicines (e.g., yaupon, used to make black drink, a powerful emetic and stimulant; sassafras; willow); fibers and thatching (e.g., palmetto, Spanish moss), containers (gourds), and foodstuffs. Starches could have been provided by morning glory roots (*Ipomoea macrorhiza*). This plant is now exceedingly rare, but has been identified on the Fig Island rings (see below) (Townsend

2000:21); these could have been encouraged or cultivated by Native Americans. Other starchy seed plants such as sunflower, the protein rich amaranth (including a species, sea-beach amaranth, that grows between sand dunes and the high-tide line) (Cubie 2001), chenopodium, and many others were probably exploited. Nutmeats would have been highly prized for both protein and oil; some believe that the earliest pottery vessels were used to process nuts for their oil (Sassaman 1993).

In a study of the vegetation associated with aboriginal shell sites of the South hell structures at Fig Island. The low marsh areas in the center of Rings 2 and 3 contain *Juncus roemerianus, Spartina alterniflora, Salicornia virginica, and Borrichia frutescens*. As the elevation rises along the ring, there is a transition from spartina to *Borrichia frutescens* and *Limonium carolinianum*, and, at the tops of these rings, *Distichlis spicata, Ilex vomitoria*, and *Quercus virginiana*.

The Fig Island shell rings also contain some unique flora. Midden soils sweetened with calcium have produced a soil “with tempered acidity and superior structure” (Townsend 2000:18). Common barrier island and maritime forest species like palmettos, live oak and red cedar, prickly pear, devil’s joint, saltbush, and catbrier are joined by rare shell-mound buckthorn (*Sageretia minutiflora*) and Carolina buckthorn (*Frangula caroliniana*), both of which are generally considered tropical species. Other “calciphiles” include Carolina basswoods (*Tilia caroliniana*), red mulberry (*Morus rubra),* Florida maples (*Acer barbatum*), and the very rare shrub Goodfrey’s forestiera (*Forestiera godfreyi*) (Townsend 2000). Townsend described the aforementioned morning glory in conjunction with the shelly soils of the Fig Island site.

Diverse fauna are available in this mixed environment. While Late Archaic subsistence at Fig Island was focused on estuarine resources, some terrestrial fauna found in maritime forests were also exploited. These included deer, alligator, turtle, and some smaller mammals. Primarily freshwater species such as bowfin and gar were also exploited, as well as strictly freshwater species such as musk and mudturtles.

During the Late Archaic occupation of Fig Island, the immediate area probably supported a maritime forest (cf. Leigh, Appendix 1). Today, the area is salt marsh and estuary, and there is abundant evidence that salt marsh habitats were available for exploitation by Fig Island peoples. Salt marshes are tidal, and frequently flooded. The most abundant marsh resources exploited by Native American peoples were crabs, possibly grass shrimp (which leave nothing to posterity but a thread-like mandible fragment), marsh periwinkle, and ribbed mussel. Shells from both of the latter were present in small quantities more or less throughout the subsistence remains at Fig Island; on occasion, they were found in extraordinary quantities.

The estuaries that surround the marsh are less saline than open bay or beach waters, and support a rich and diverse fauna. In terms of biomass, estuaries are one of the most productive environments on the planet. The invertebrate species that provided a steady, dependable food source, and which left behind such resilient evidence of Native American presence, are found in estuaries. Most visible is oyster, but quahog clam and the Atlantic ribbed mussel (found also in higher marsh grass areas) were important components of the Fig Island diet.

Though oysters are the most visible remnant of prehistoric diets, another powerhouse of coastal diets, from the Middle Archaic on, were the nursery fishes of the estuary. Whenever subsistence information is pursued with fine screened faunal samples, study after study of coastal middens indicate that these small fishes were netted in huge quantities, and may have provided the bulk of dietary protein. The species most represented at Fig Island was the catfish, but small flounder and mullet were also present. Other coastal peoples relied to a greater extent on small croakers or herrings (e.g., at Rollins Shell Ring; Saunders n.d.). Some larger fishes are encountered in middens, including, in the case of Fig Island, large black drum.

Late Pleistocene Environment

The first Native Americans to inhabit what is now South Carolina, who had arrived by at least 12,000 years ago (Goodyear et al. 1989:19), encountered an environment much different from that prevailing today. They entered during the late Pleistocene, at the waning of the last great glacial episode known as the Late Wisconsin Stage. At the low stand of sea level during the Late Wisconsin, between 22,000 and 18,000 years ago (Saucier 1994:50), global water resources were locked into glaciers and sea levels were as much as 100-120 m lower than today. Thus, coastlines included a much larger area of subaerially exposed continental shelf. Along the lower Atlantic coast, the coastal plain extended 50 to 100 km farther east than it does today (Goodyear et al. 1989).

After 18,000 B.P., sea level rose rapidly, perhaps as much as 2-3 cm/yr (Fairbridge 1992:10; Saucier 1994:48). Mounting evidence suggests that the rise was not constant, but that intervals of global cooling, usually of periods of less than 300-500 years, produced rapid oscillations in sea level, with amplitudes of several meters, especially prior to 6000 B.P. (Fairbridge 1992:10). Four global cooling events have been identified for the early Holocene, from 9600-9300 B.P.; from 9100-8800; from 7350-6750; and a more minor cooling period from 6190-6140 B.P. Each of these would be associated with a fall in sea level, the amplitude of which would depend greatly on local geological and hydrological conditions. Human occupation of seaward landforms exposed during these cool periods is likely; all of these occupations would now be drowned.

How early estuaries formed during this dynamic period is a matter of debate. Until recently, there was a weak consensus that sea level rise was too rapid prior to ca. 4000 B.P. (a date formerly much-cited for the “stillstand” or dramatic slowing of sea level rise) for estuaries to form (see Russo 1996a:177). However, geological data suggest that estuaries, and their concomitant resources, could have been present when the first Native Americans settled. Sediments of the upper Satilla Formation from Grays Reef, a series of low-relief, dolomitized sandstone outcrops some 35 km east of Spell Island, Georgia, along the 20 m bathymetric contour line, reflect a succession of neritic (near-shore marine), barrier/back-barrier and marsh facies with both *Mercenaria sp.* and *Crassostrea* present (Littman 2000:59). Unfortunately, reworking of the sediments has resulted in an allogenic (mixed/reworked) deposit. A carbonate sediment within a mineralized burrow cast of a possible estuarine *ophiamorpha* from this deposit dated to 18,970 ± 400 B.P. (Beta 92356); but a fossilized oyster shell collected in 1974 from the same context produced a date of 31,520 (Beta; number unknown; Littman 2000:47) and a *Bovidae spp.* (Bison) metapodial produced an age of 6030 ± 60 (Beta 103683) (Littman 2000:37, 47). The 19,000 year old date is suspect because estuarine formations, if they existed at all at this time, should have been significantly more seaward at the Pleistocene low stand than Gray's Reef. The 6000 B.P. date is a reasonable date for subaerial exposure of the continental shelf in this location. Other Pleistocene fauna, including two Mammoth (*Probiscidea)* longbone shaft fragments and a horse (*Equus spp.*) tooth, indicative of grazing habitat, have also been recovered from this deposit. Finally, human occupation of the reef area may be indicated by an (undated) ivory pressure flaker (Littman 2000:10).

Better stratigraphic control for environmental succession was visible in cores from J Reef, 18 km north of Gray's Reef, 30 km east of St. Catherines Island. These cores, from a paleo-drainage at J Reef, identified as the paleo-Medway River, demonstrated a change from estuarine to fluvial to marine conditions (Littman 2000:44). The lowest, estuarine component is still undated.

While they do not yet present a coherent picture of coastal development, these disparate data do indicate the presence of estuarine conditions off the coast prior to 4200 B.P. Human exploitation of these estuaries is likely, but sites, of course, will be drowned and probably extensively reworked.

The inexorable rise in sea level slowed significantly after 6000 B.P., however oscillations in sea level continued. After 6000 B.P., sea level fluctuated "2-3 m within a 4 m range of the present level" (Sassaman and Anderson 1995:12; Colquhoun and Brooks 1986). However, the actual progress of sea level transgressions and regressions remains controversial.

The warming trend that produced the rise in sea level also affected vegetation. A minor climatic amelioration at 16,500 B.P. resulted in the northward retreat of the Laurentide Ice Sheet, producing a surge of meltwater that carved out the major watercourses of the Southeast. With major climatic amelioration by 12,500 B.C. (Delcourt and Delcourt 1985), South Carolina had two distinct bands of vegetation. Above 33°, the latitude of Charleston, cool, mesic temperate, deciduous plant communities composed of beech, hickory, hornbeam, oak, elm, and ash replaced the pre-existing boreal forests (Delcourt and Delcourt 1985:19; Goodyear et al. 1989:19). Continued warming, produced, by 9,500 B.P, forests composed of modern southern pine and oaks. Oak was dominant between 9,500 and 7000 B.P. "After about 7,000 B.P., pine replaces oak as the dominant and the modern forest was essentially established (Watts 1980:194)" (quoted in Goodyear et al. 1989:20).

Below the 33rd parallel, across the Southeast, a warmer, temperate climate prevailed, producing the Southeastern Evergreen Forest, composed of oak, hickory, sweetgum, and southern pine. Due to the persistence of the Maritime Tropical Airmass, this climatic regime was in place as early as 20,000 B.P. and remained until 6,000 B.P. (Goodyear et al. 1989; though see Watts et al. 1996:32).

These two climatic regimes produced three distinct late Pleistocene faunal assemblages in South Carolina. North of an east-west transect drawn at about Columbia, S.C., fossils from Boreal zone species, including woolly mammoth, caribou, horse, and bison, have been found. South of this line, to about the latitude of Charleston, mixed temperate forests and grasslands, which became prominent on the coastal plain, provided subsistence for grazers and browsers, including mammoth (and woolly mammoth as a seasonal inhabitant), mastodons, bison, equus, deer, camelids, and capybaras (Goodyear et al. 1989:22).

South of Charleston, a subtropical zone favored species suitable for a warm, moist climate, including giant sloth and giant tortoise. Webb (1981) examined fossils from a late Pleistocene site on Edisto Island that confirms its subtropical environment during that time. According to Webb (1981:I-104), the fossil assemblage indicated:

> The predominant vertebrate fossils are large grazers, most of which were herd ungulates. These include horses, camels, mammoths, and bison. Giant tortoises, glyptodonts, and most of the ground sloths also fall into this broad category. Browsing vertebrates were also present, notably mastodons, tapirs, and peccaries. Large freshwater mammals, notably giant beavers, giant capybaras, and abundant muskrats, not to mention fishes, turtles, and alligators indicate the proximity of a major river system. The aquatic and terrestrial vertebrate fauna suggests a mosaic of deciduous woodland and grassland savanna, crossed by major meandering streams.

The mixed deposit on Gray's Reef contained some of these same species.

Holocene Environment

Though it does not coincide with any abrupt climatic change, the Pleistocene-Holocene boundary is generally set by geologists and archaeologists at 10,000 B.P. (Saucier 1994:41). Sea level was about 9 m lower than present (Brooks et al. 1989:92) and still rising rapidly. However, one significant change had occurred by 10,000 B.P.; one that does help to define Holocene environments. Most of the Pleistocene megafauna were extinct by this time. In terms of the cooler climate species, warming temperatures and changing habitats have been cited as the cause for the extinction; some have argued that PaleoIndians contributed to the demise of the economically useful species (Martin and Klein 1984). On the other hand, Goodyear et al. (1989:25) cited evidence that the colder weather caused by Arctic air masses entering the continental U.S. through the ice free corridor between the Cordilleran and Laurentide Ice Sheets might have impacted animal populations as well, particularly those of the subtropical zone. In any event, though there were still climatic perturbations, including oscillations of sea level that may have had profound effects on the lifeways of the coastal populations of the

Southeast (see below), Early Archaic peoples dealt with an essentially modern faunal environment. However, Early Archaic landscapes were dry, with the only available water sources cenotes (e.g., Clear Pond in Horry County, South Carolina), what are now deep lakes, or along major rivers (which were established by this time) (Watts et al. 1996:30).

The period between 8000-5000 B.P., which corresponds to the Middle Archaic (or, geologically, the mid-Holocene) encompasses what is referred to variously as the Climatic Optimum, the Altithermal, or the Hypsithermal, a period of gradual climatic amelioration during which there were major changes in the lifeways of the hunting and gathering populations of the Southeast (Sassaman and Anderson 1996:xvii). On the Coastal Plain, the oak forests referred to above were replaced by pine and swamp plants and there was an extensive development of swamps and lakes (Watts et al. 1996). It is during this time that shell middens appeared along rivers in the interior and along the coast. Between 6000-5000 B.P., these gradual changes in weather patterns and floral distributions produced a fully modern environment.

The year 6000 B.P. marks another watershed; after this date cumulative sea level rise became significantly more gradual. However, the cumulative rise was composed of a series of rapid oscillations between sea level regression and transgression of 1 to 2 m within a range of 3-4 m of present sea level (Brooks et al. 1989:92). Some of the transgressions may have been higher than present sea level (DePratter 1977; Brooks et al. 1989). Following reconstructions by Brooks and Colquhoun (1991), Sassaman and Anderson (1995:13) note peaks in sea level at around 4800, 4200, and 3700 B.P., which were “interspersed with low stands at about 5000, 4500, and 3300 B.P.” These reconstructions are important for determining where coastal sites of certain ages are more likely to be found. Sites established during low stands can be expected to be underwater; during high stands, sites containing fauna indicating estuarine exploitation could be in what are now freshwater environments.

As noted previously, in South Carolina, the earliest dates for sites with an estuarine focus are in the neighborhood of 4200 B.P. However, Russo and Saunders (1999) have documented shellfish use on the coast of northern Florida, at the aceramic Spencer’s Midden site, as early as 5700 years ago, though the faunal material from Spencer’s contains more terrestrial species than are found in later middens. A more complete coastal adaptation (one that would prevail until the introduction of agriculture around A.D. 1200) is seen in a slightly later site from the same area. The Oxeye Island site is a shell ring, now lying beneath 1 to 3 m of marsh, that dates to between 4580 and 4370; like Spencer’s Midden, the site is aceramic. At Oxeye, the faunal assemblage was far less diverse and equitably distributed than that at Spencer’s Midden. Oyster and small estuarine fishes, particularly menhaden, were the focal resources (Russo and Saunders 1999:3). On the northern Gulf coast, Saunders and Mikell have identified estuarine shellfish use, in what is now a fresh water environment, as early as 5500 B.P. and Russo has identified estuarine exploitations in southwest Florida as early as 7200 B.P. (Russo 1996). Ultimately, the date of the first estuaries in any region will depend on a number of local environmental and geological factors such as topography of the land/sea interface, slope, fluvial regimes, and the presence of barrier island, among others.

The fact that many of these early shell sites are now inundated or located seaward of estuaries indicates that sea level has risen since their deposition. Many of these sites are buried or submerged as much as 1.2 m below the existing high marsh surface (Sassaman and Anderson 1995:13); a datum that has been useful in the development of sea level curves. If sites were established earlier, or even later during a sea level regression, they may be even more seaward and more deeply buried.

One of the aforementioned sea level oscillations bears directly on the Late Archaic coastal populations that are the focus of this report. Between 4200 and 3000 B.P., when sea level appears to have oscillated drastically, shell rings and shell middens—many of them massive—located either in or alongside present-day estuaries, evidence relatively large, sedentary populations living along the coast in concentrations heretofore unseen in the prehistoric record. The Late Archaic comes to a close around 3000 B.P., when a more modest regressive interval is coincident with smaller shell middens and a more dispersed settlement pattern. According to Sassaman and Anderson (1995:156): “This effect is in fact manifested in the terminal Late Archaic settlement of South Carolina’s coast north of Edisto Island, where small shell rings and middens of the late Thom’s Creek phase constitute the last vestiges of the period.” Why societies appear to have been more stable during large sea level oscillations than during more mild ones is an important topic for research. After 3000 B.P. and until 800 B.P. (about the time that agriculture was introduced), there was “a general trend for shell middens to form farther inland and to be smaller and more dispersed” (Sassaman and Anderson 1995:13). Brooks et al. (1989) attribute this to an overall expansion in estuaries with the cumulative rise in sea level and hypothesized that a dispersed settlement pattern was the best way to exploit the expanding estuarine habitat. However, the fact that sites established during regressive intervals may now be completely inundated means that sites as large or larger than the Late Archaic sites may be missing from the archaeological record.

CHAPTER 3:
CULTURE HISTORY

Table 1 lists the culture periods, cultural phases, and date ranges for the prehistory of southern and central South Carolina, which ends with the de Soto entrada of 1540. The cultural phases reflect the project orientation to the area south of Charleston. A focus on sites north of Charleston would produce a culture history that, in the Early Woodland and throughout the rest of prehistory, would reflect more influence from the "Northern Tradition" (Trinkley 1989).

Table 1. Generalized cultural chronology for the prehistoric occupation of the South Carolina Coast and Coastal Plain.

DATE RANGE	Period	Mouth of the Savannah Phases	Central Coast Phases
A.D. 1450–1575	MISSISSIPPIAN	Irene/Pine Harbor	Sewee
A.D. 1350–1450		Irene II	PeeDee
A.D. 1300–1350		Irene I	
A.D. 1200–1300		Savannah II	Jeremy
A.D. 1150–1200		Savannah I	
A.D. 1000–1150	LATE WOODLAND	St. Catherines	McClellanville/Santee↔
A.D. 500-1000		Wilmington	Mt. Pleasant↔
A.D. 250-500	MIDDLE WOODLAND	Deptford II	Hanover↔
650 B.C.–A.D. 250		Deptford I	Deptford/Deep Creek
2800–2600 B.P.	EARLY WOODLAND	Refuge II	
3000–2800 B.P.		Refuge I	
3700–3000 B.P.	LATE ARCHAIC	Stallings III	Thoms Creek
4500–3700 B.P.		Stalling II	
5000–4500 B.P.		Stallings I	
5200–4600 B.P.	MIDDLE ARCHAIC	Guilford	
7750–5200 B.P.		Morrow Mountain	
8500–7750 B.P.	EARLY ARCHAIC	Kirk Stemmed↓	
9000–8500 B.P.		Bifurcate↔	
9500–9000 B.P.		Palmer/Kirk↑	
10,000–9500 B.P.		Taylor/Big Sandy↔	
10,500–10,000 B.P.	PALEOINDIAN	Dalton	
11,000–10,500 B.P.		Simpson/Suwannee /Quad	
Unknown–11,000 B.		Clovis	

The Archaic and Woodland sequences overlap considerably. The direction of overlap is represented by the following symbols: ↑ represents overlap into later time periods; ↓ represents overlap into earlier time periods; and ↔ indicates overlap into both earlier and later time periods. Middle Woodland pottery series are still not well dated, so the same method is used for that time period.

PaleoIndian Period (ca. 12,500–10,000 B.P.)

The PaleoIndian period marks the beginning of human occupation in the New World. Exactly when the first human populations permanently settled the western hemisphere is uncertain. Most Americanist archaeologists believe it was sometime between 20,000 and 13,000 years ago, in the last stages of the Pleistocene glaciation. The earliest securely dated PaleoIndian site is the Monte Verde, in southern Chile, where dates as early as ca. 13,800 B.P. have been obtained (Dillehay 1989). These “pre-Clovis,” or pre-fluted lithic sites remain controversial: radiocarbon dates have been called into question, stratigraphic associations have been challenged, and it has been difficult to generate agreement on what a pre-Clovis lithic assemblage should like (Marshall 2001). In South Carolina, the Topper site (38AL23) is one of a growing number of such controversial pre-Clovis sites nationwide.

Clovis points, the *sine qua non* of the PaleoIndian tool kit, appeared throughout the continental U.S. by 11,800 B.P. It is the earliest universally recognized projectile point type in the western hemisphere and has been found in unmodified and in variant forms from Alaska to the tip of South America. This fluted point is generally believed to have been hafted to a spear (the flute of this and other projectile points was an aid in hafting) and used in the pursuit of Pleistocene megafauna. Fluted and unfluted points were only part of a lithic tool kit that was based on a highly refined flake and blade technology. Examples of PaleoIndian lithic tool types include: unspecialized flake tools; formal side and end scrapers; gravers; denticulates; specialized hafted unifacial knives; large bifacial knives; and the aforementioned specialized lanceolate projectile points.

Formal variation in projectile point morphology began to emerge in regions of the Southeast by about 11,000 B.P., probably due to restricted movement and the formation of loosely defined social networks and habitual use areas (Anderson 1995; Anderson et al. 1992). These later forms include the Cumberland, Suwannee, Simpson, Beaver Lake, and Quad types (Anderson et al. 1990; Justice 1987:17–43; Milanich 1994).

A significant wood, bone, and antler technology was utilized as well. Organic materials such as these do not preserve in the acidic soils that cover much of the Southeast, and they are very rarely found. However, at inundated sites where they have been preserved, primarily in Florida, it is clear that organic media such as wood, bone, and antler were very important. These materials were manufactured into projectile points, foreshafts, leisters, awls, needles, and even the head of a wooden boomerang, to name just a few tool categories (Milanich 1994:52-53).

Early models of PaleoIndian subsistence economy were based on observations from a series of sites in the western United States where PaleoIndian artifacts, particularly large, lanceolate, fluted points, were recovered in direct association with the remains of several species of now-extinct Pleistocene megafauna. Initial interpretations of PaleoIndian subsistence suggested that these early inhabitants focused primarily on hunting large mammals such as mammoth, mastodon, bison, ground sloth, giant armadillo, tapir, horse, wild pig, and caribou. Resources such as arboreal seed and nut crops as well as small mammals, birds, and fish were, until recently, assumed to have been minor dietary constituents.

Because of the striking similarity in PaleoIndian technological organization that pervaded most regions of the western hemisphere until ca. 10,500 B.P., the large game-oriented subsistence model devised from evidence in the western United States was assumed to have applied to all PaleoIndian economic systems, including those associated with groups in Georgia and South Carolina. However, archaeologists working in this area have yet to document a clear association between PaleoIndian tools and the remains of displaced and extinct animal species known to have been present in the state as late as 11,000–10,200 B.P.—mastodon, bison, giant ground sloth, and giant armadillo, for example (Webb 1981).

Over the past 15 years there has been a reevaluation of PaleoIndian subsistence, particularly for eastern North America. Cushman's (1982:207–220) analysis of the PaleoIndian occupation at Meadowcroft Rockshelter in Pennsylvania suggests that the occupants were geared toward the type of broad-spectrum resource utilization traditionally associated with the subsequent Archaic period. Her (Cushman 1982:207–220) examination of the botanical remains indicates that various leafy plants, seeds, nuts, and berries were important dietary components.

Broad-based PaleoIndian subsistence is also indicated by evidence from Florida. At Little Salt Spring, an important underwater site in Sarasota County, Florida, a variety of smaller mammals, fish, plants, and reptiles (including a now-extinct form of giant land tortoise) have been shown to be constituents of the PaleoIndian diet in that region (Clausen et al. 1979). Similar data are available from Warm Mineral Spring (Cockrell and Murphy 1978:6). Some have even suggested the possibility of PaleoIndian shell middens—and therefore the exploitation of estuarine resources—in Tampa Bay (Goodyear et al. 1983; Milanich 1994).

Unfortunately, there is very little hard evidence of sites on the now-drowned coastal plain surfaces exposed during the late Pleistocene/early Holocene (see Chapter 2). Subsequent, successive periods of sea level transgression and regression during the Holocene have no doubt eroded, reworked, inundated, or buried many, if not most of these. Using side high resolution acoustic reflection and side scan sonar to map sea floor and near-sea facies, Littman (2000) reconstructed the paleoenvironment of a portion of the Georgia Bight and found that there was a strong possibility that this now-submerged coastal plain was available for human habitation. Similarly, underwater archaeologists have identified a number of locations along the northern Gulf coast that appear to be likely late Pleistocene habitation areas, but have found no direct evidence in the form of artifacts (Dunbar et al. 1992).

In summary, new perspectives on PaleoIndian subsistence economy emphasize the utilization of a broader spectrum of ecozones and resources and de-emphasize the degree to which PaleoIndians relied on large-game hunting for sustenance (Dunbar 1991).

In the Eastern Woodlands, the majority of PaleoIndian sites consist largely of diffuse lithic scatters at open locations, with more intensive occupations in rockshelter or cave settings. No conclusive evidence of permanent structures or long-term encampments has been located for this time period in the Southeast. The majority of the PaleoIndian data recovered in the Southeast to date is derived from surface scatters of projectile points and a small assortment of chipped stone implements collected from disturbed settings. However, limited data has been recovered from several intact contexts (Anderson and Schuldenrein 1985; Daniel and Wisenbaker 1987; Elliott and Doyon 1981; O'Steen et al. 1986). No PaleoIndian sites are known from coastal plain of South Carolina (excluding the possibility of Topper) in general or the Edisto Island area in particular.

Several models of early PaleoIndian settlement patterning have been advanced in the past 25 years (see Anderson et al. 1992 for an overview). Some are concerned with PaleoIndians in general (Anderson 1990a; Kelly and Todd 1988; Martin 1973), and others with regional trends (Anderson 1995; Gardner 1983; Morse and Morse 1983). Most are mechanistic models that portray specific economic strategies as primary reasons for how PaleoIndians settled upon and utilized the landscape. Each is slightly different in its focus, with primacy placed on one of three major influences: (1) the need to maintain access to prominent, high-quality raw material sources (e.g., Gardner 1983); (2) a preference for exploiting specific habitual use zones and staging areas (e.g., Anderson 1995); or (3) a nomadic or semi-nomadic existence dictated to a large degree by the movements and availability of large game (e.g., Kelly and Todd 1988).

An attempt to review and assess each model is beyond the scope of this report; however, there is a general consensus among archaeologists involved in PaleoIndian research regarding settlement patterns. Groups were probably comprised of four or five extended families and included 25–50 individuals. Marriage was almost certainly exogamous, and residence was likely extralocal. This would have assured that primary social groups remained small enough to be economically sustainable, but linked with a larger, interactive social network that provided information, cooperation, and mates of suitable kin distance.

Primary social groups very likely met at predetermined locations with other groups at specific times of the year to cooperate in large-scale food acquisition (e.g., nut harvesting, fishing, shellfish gathering, etc.) and/or lithic resource extraction, as well as to exchange information, renew or create alliances, fulfill social obligations, find mates, and perform rituals. For most of the year, however, primary groups appear to have dispersed into loosely defined habitual use areas. They probably exploited a wide variety of economic resources and moved often to take advantage of seasonal resources. It also is possible that they periodically established logistical base camps and used them as staging areas for special activity forays.

The end of the PaleoIndian period (ca. 10,000 B.P.) is associated with the arrival of new environmental conditions (see Chapter 2) that influenced how humans organized their society and coped with the environmental and social pressures that came about during the climatic transition. New settlement and subsistence patterns were established and regional technological innovations were developed. These trends are associated with the subsequent Archaic period.

Archaic Period (ca. 10,000–3000 B.P.)

The transition from PaleoIndian to Archaic is loosely defined, and in the Southeast the chronological interface ranges from ca. 10,000 to 8500 B.P. In addition to changes in environmental conditions that were nearing completion by 10,000 B.P. (Delcourt and Delcourt 1985), and the changes in utilitarian technology that were developed to cope with those changes, population demography and diversity in social organization distinguish the Archaic from the preceding PaleoIndian period. A tripartite scheme, dividing the Archaic period into Early, Middle, and Late subperiods, is traditionally used to demarcate some of the important developments of this time. It should be emphasized, however, that these subdivisions are heuristic devices; changes across the Southeast were more gradual and nonuniform.

Early Archaic (ca. 10,000–8000 B.P.). Tool assemblages associated with the Early Archaic period are similar to those of the PaleoIndian period, although a variety of ground stone tools first appear at this time. Notched and/or stemmed hafted bifaces replace lanceolate forms by 10,000 B.P. in the Southeast. Big Sandy, Palmer-Kirk series, Kirk Corner Notched, Kirk Stemmed, and several bifurcate styles are the Early Archaic types known in the project area. Wear patterns suggest that these tools were utilized for activities such as killing, butchering, skinning game, and woodworking.

The Early Archaic lifeway is represented by social, settlement, and subsistence strategies designed to take advantage of the biotic diversity of the early Holocene environment, and also to cope with movement restrictions placed upon some Early Archaic societies because of increased population. Environmental conditions were becoming similar to those that the first Europeans encountered in the sixteenth century. Hardwood primary forests provided large and small game and a variety of plants for medicine, subsistence, clothing, and shelter. Rivers were used as travel corridors and provided fresh water, and fish. The only areas of low productivity would have been the pine stands that began to emerge after 8000 B.P. (Watts et al. 1996).

Based on the increased number and size of Early Archaic sites encountered by archaeologists, a dramatic population increase appears to have occurred in this era. Dryer conditions during this period of time probably also contributed to population nucleation around permanent water sources. Consequently, the social landscape became much more complex. Several models of Early Archaic social organization have been proposed for the region (Anderson et al. 1992: Part II; Anderson and Hanson 1988). In general, however, it is hypothesized that Early Archaic societies in Georgia and the Carolinas were organized into band-sized communities (population 25–50) whose main territory surrounded a segment of a major river such as the Savannah River. These bands may have been organized into larger macrobands that gathered on special occasions for community food harvesting, rituals, and the exchange of mates and information. These activities probably took place at or near the heads of rivers close to the Fall Line, or at the mouth of the rivers on the coast. The similarity in certain tool forms throughout and across drainages—projectile points, for example—and the apparent movement of raw materials over long distances, supports this argument.

Recently, however, Daniel (2001:237–265) has argued that access to high quality lithic material has been an under-appreciated component of Early Archaic settlement strategies. He also presents compelling evidence that groups were moving across major drainages just as easily as they were moving along them. Thus, in contrast to the Anderson and Hanson model, group movements may have been "tethered" to stone quarries rather than to specific drainages.

As noted above, Early Archaic settlement patterns are not well understood; however, two types of settlements have been especially noted: small, short-term camps and large, densely occupied areas that appear to have been base camps or congregation sites (see above). As before, high-quality cherts were accessible and were the raw material of choice for stone tools. Also, specific point types, such as Palmer-Kirk series and bifurcate styles, were widely distributed across the Southeast and the Eastern Woodlands. This suggests that territories were large and/or that the exchange of information, ideas, and material culture took place frequently and over large distances.

Middle Archaic (ca. 8,000–5000 B.P.). The advent of the Middle Archaic period coincides with the climatic warming trend variously referred to as the Altithermal, Hypsithermal, or the Climatic Optimum. However, it is unclear if the technological and economic conditions that became manifest in the Middle Archaic were primarily adaptive responses to environmental changes, or if social and political pressures were more responsible for their appearance.

Piedmont Middle Archaic sites have been described as small, randomly distributed occupations exhibiting very little intersite technological variability. Local raw materials were used almost exclusively, and the vast majority of tools were technologically expedient (Blanton and Sassaman 1989; Sassaman 1993a). In terms of social organization, small hunting and gathering bands of 25–50 people probably still formed the primary social and economic units. Residences were moved frequently, subsistence was generalized, and social groups were small, mobile, and likely co-residential. Long-term investments and social obligations were probably kept to a minimum, insuring that there were very few restrictions on group movement or group fissioning (Sassaman 1993b). According to Sassaman et al. (1988; summarized in Jeffries 1996), an analysis of lithic procurement strategies suggests a reduction in territorial range through time. This circumscription is reflected in a greater emphasis on local lithic resources. Sassaman reconstructed two, geographically distinct bands occupying the Savannah River valley during the Middle Archaic, one occupying the Piedmont and the other the Coastal Plain.

Large-scale tool production and intensive occupation characterize many Middle Archaic habitations in the Coastal Plain, especially in the latter half of the period (Sassaman 1988). According to Sassaman et al. (1990), this population nucleation may have been due to the patchy distribution of both lithic and organic resources in that region, as opposed to the relatively homogeneous distribution of resources that characterized the piedmont (Sassaman et al. 1990). However, the limited availability of water sources on the Coastal Plain at this time may also have contributed.

Subsistence data are scarce, but archaeologists assume that a variety of interior floral and faunal resources were exploited on both a general (e.g., white-tailed deer) and seasonal (e.g., nuts, fish, and migratory waterfowl) basis. It is during the Middle Archaic that the great shell mounds of the interior Southeast began to accrue (as early as 7150 B.P. at the Eva site in Tennessee). Evidence for coastal exploitation during this period has not been found in South Carolina, but partially and wholly inundated sites in Florida suggest utilization of estuarine resources as early as 5700 B.P. Earlier exploitation is possible, but coastal submergence and rising sea level have inundated previously exposed coastline and obscured the importance of littoral resources in this and earlier eras.

Diagnostic hafted biface types dating to this period include Stanley, Morrow Mountain, and Guilford, as well as those that belong to the MALA series. MALA is an acronym for Middle Archaic/Late Archaic, referring to the temporal position of these specimens, and it is used to describe a group of hafted biface types that exhibit lanceolate, stemmed, and notched configurations (Sassaman 1985; Sassaman and Anderson 1994). The lanceolates are often referred to as Brier Creek lanceolates (Michie 1968); the notched and stemmed forms do not have formal type names but they are very similar to forms associated with the Benton series. The latter series, always produced from exotic, Fort Payne chert, was involved in a long-distance (100 mi/160 km) exchange network in northeast Mississippi. According to Johnson and Brooks (1989), this network developed as a risk-sharing mechanism. It developed when population increase began to restrict mobility and territoriality emerged, while at the same time, the subsistence system continued to emphasize mobility. The social response was to maintain access to resources in adjacent territories during times of subsistence stress through ritualized exchange. Johnson and Brooks (1989) also hypothesized that such exchange networks were an important factor in the development of status differentiation. Jeffries (1996) noted the similarity in the production-distribution system for Savannah River bifaces in the Savannah River valley to that of the Benton series. Both used extra-local sources, in the case of the Savannah River population, a nonlocal rhyolite from as much as 175 km away. In his exploration of the Savannah River valley exchange in bifaces, Sassaman (1994) hypothesized that the production of these large “Benton-like” bifaces may have been one of the options for establishing and maintaining intergroup alliances—in effect, functioning as Johnson and Brooks described for the Benton exchange network.

Late Archaic (ca. 5000–3000 B.P.). The Late Archaic was once associated with the population nucleation, greater sedentism, and the emergence of territoriality. As demonstrated above, with more data emerging on the Middle Archaic in the last decade or so, it is clear that all of these defining features had roots in the Middle Archaic.

The hafted biface most commonly associated with the Late Archaic period in South Carolina is the Savannah River point. These point types are often very large (over 12 cm in length is not uncommon) and exhibit a straight stem, straight base, and triangular blade.

Other Late Archaic varieties found in the project region are known by various names such as Appalachian Stemmed, small Savannah River Stemmed, Kiokee Creek, Ledbetter, Otarre, and Paris Island (Bullen and Greene 1970; Cambron and Hulse 1983; Chapman 1981; Coe 1964; Elliott et al. 1994; Keel 1976; Sassaman 1985; Whatley 1985). Except for the Ledbetter hafted biface, which appears to have had a specialized function—it exhibits a heavily reworked, asymmetrical blade—these type names are more a product of parochial terminology than of actual morphological differences. Like Savannah River hafted bifaces, they are characterized by triangular blades, straight or slightly contracting stems, and straight bases. The primary difference is size; Savannah River points tend to be longer and wider than the other types.

The earliest dated ceramics in the region were tempered with fiber. According to radiocarbon evidence obtained from Rabbit Mount, a Late Archaic shell midden along the southern portion of the Savannah River in Allendale County, South Carolina, this ceramic technology may have been introduced as early as 4465 ± 95 B.P. This uncorrected date, and another dating to 4450 ± 150 B.P, were obtained from wood charcoal recovered from excavation levels containing fiber-tempered sherds (Stoltman 1966).

The earliest ceramic-bearing components on the Georgia/Carolina coast date to approximately 4200 B.P. (Sassaman 1993b). These components also are the oldest known along the current coastline, so this evidence does not necessarily demonstrate that coastal groups did not produce and use pottery prior to 4200 B.P. Most likely, sea level rise has inundated earlier ceramic-bearing assemblages. However, local geological conditions may have prevented the development of estuaries in this area and may have constrained coastal occupation before 4200 B.P. (Sassaman 1993b:19).

The Late Archaic ceramic sequence has been refined over the years and a detailed chronology for both the interior and coastal zone has been developed. Two distinct ware series are present on the South Carolina coast, a fiber tempered series known as Stallings and a series with sand inclusions and little or no fiber known as Thom's Creek. At Late Archaic sites in Georgia, Stallings (sometimes referred to as St. Simons; see below) wares predominate. Stallings and Thoms Creek wares overlap in distribution between the Savannah River and the Santee; Thoms Creek becomes the dominant ware north of the Santee River. Thoms Creek and Stalling types approach identity in terms of surface decoration, with the exception of a finger pinching treatment (called Awendaw by some) that is restricted to the Thoms Creek Series. Indeed, sorting of Stallings and Thoms Creek pottery is not as simple as it might appear. Both Sassaman (1993:80) and Trinkley (1980a:18) note the difficulty of segregating Stallings pottery with little fiber and Thoms Creek pottery with incidental vegetal inclusions. This difficulty is confronted but not resolved in the analysis section of this report.

A number of researchers have postulated coastal variants for both Stallings and Thoms Creek wares, though attempts to incorporate this variation into types has tended to confuse rather than clarify the literature. Stallings was proposed as a type by Claflin in 1931. However, Holder called the fiber tempered ware recovered during his 1936-37 excavations on St. Simons Island, Georgia, “St. Simons.” This typology was taken up by Waring (1968a) at the Bilbo site, by Caldwell and Waring (1939) for Chatham County, Georgia, and by Kelly (1938) for his excavations at Macon. Waring (1968a:160) believed that interior fiber tempered wares were thinner and more uniform than coastal wares, that punctations were smaller, neater, and more varied, and that interior assemblages contained simple stamping on bases and carinated vessel forms, both of which were absent from coastal assemblages. Griffin (1943) was a strong opponent of the concept of a coastal variant. He concluded that there were no significant differences between coastal and interior assemblages, a position reiterated in a larger study by Sears and Griffin (1950).

This disagreement has not been resolved. DePratter (1979, 1991), Elliott and Sassaman (1995), and Cable (1993), to name a few, continue to use the St. Simons terminology for Georgia coastal fiber tempered assemblages, while Stoltman (1972) and Trinkley (1986:159) maintain that coastal and interior assemblages are not divergent enough to warrant a distinct nomenclature. Indeed, Stoltman (1972:42) argued that the first two of Waring’s differences were not sortable and that incidences of the latter two attributes were so rare in Stallings assemblages that their lack in coastal assemblages was simply not significant. Elliott and Sassaman (1995:50) rely on a different set of attributes to distinguish St. Simons from Stallings. They note that “assemblages from the Georgia coast are dominated by plain pottery and sherds have a consistently fine paste.” They also point to differences in design element frequency. However, element frequency and the dominance of plain sherds are assemblage-level observations and cannot produce a sortable pottery type. “St. Simons” might most appropriately be considered a phase or a series of phases rather than a pottery type, with various percentages of Stallings Plain and Decorated (and the presence of other southern fiber tempered types like Orange and Norwood) in any given component.

In the interior and on the coast, fiber tempered assemblages exhibit changes through time. Based on his extensive research on Late Archaic ceramics from various sites along the Georgia and South Carolina coasts, DePratter (1979) identified a time-transgressive trend in surface decoration techniques that led him to divide St. Simons into two subphases, St. Simons I and St. Simons II.

In DePratter’s scheme, St. Simons I dates to ca. 4200–3700 B.P. This phase is characterized by the production of fiber-tempered pottery with plain surfaces (DePratter 1979:114). St. Simons II dates to ca. 3700–3000 B.P. The ceramics produced in this era also are fiber-tempered and exhibit plain, punctated, incised, incised and punctated, and grooved surface designs. Vessel form is limited to simple bowls with round or flattened bases. Rims are straight or slightly incurving, and the lip is rounded or flattened (DePratter 1979:114).

The term "Stallings Culture" was introduced by Stoltman (1974) to describe the material culture associated with Late Archaic populations residing in the central Savannah River region. Stallings I was defined as a preceramic phase that dated to the earliest part of the period (ca. 5000–4500 B.P.). The hallmark of Stallings II (ca. 4500–3700 B.P.) was the production of fiber-tempered pottery with plain surfaces. Stallings III lasted from 3700 B.P. until the end of the period (ca. 3000 B.P.), and is characterized by fiber-tempered vessels with plain, punctated, incised, incised and punctated, and grooved surface treatments. Vessel form is limited to the simple bowls discussed above.

The close similarity between St. Simons I and II and Stallings II and III is evident. Sassaman's research has led him to refine the St. Simons and Stallings ceramic series and incorporate them into a single chronological sequence. This new chronology is provisionally defined as Group I, Group II, and Group III (Sassaman 1993b:102–110). Group I assemblages date to approximately 4500–3800 B.P. in the interior and 4200–3800 B.P. on the coast. Most of the pottery manufactured in this era has plain surfaces. When designs are present they are usually simple and limited to a single simple stamped, incised, or punctated motif. Vessels are simple bowls with thickened and flanged lips.

Group II (ca. 3800–3400 B.P.) is defined by a marked increase in decorated vessels. Incising, punctations, and grooving are common surface treatments; simple stamping is almost absent, however. Many vessels exhibit multiple design motifs. Wares with thickened and flanged lips occur less often; by the end of the phase this decorative device is no longer produced. Vessel form is restricted to the simple bowl.

Group III dates to between ca. 3400 and 3000 B.P. The ceramics produced in that era exhibit plain, incised, punctated, and simple stamped designs. Plain ceramics are the most common; the relative frequency of decorated wares is much lower than for Group II. Multiple design motifs are not evident. Plain vessels in Group III can be distinguished from Group I wares by the absence of thickened and flanged lips. Simple bowls continue to be the exclusive vessel form.

While there is general agreement on the evolution of Stallings wares through time, there is little consensus on Thoms Creek developments. As in the Stalling series, there are disagreements over coastal variants. Thoms Creek was first defined by Griffin (1945) from a site near Columbia, South Carolina, and all early sandy pastes in the interior are referred to as Thoms Creek. Early coastal sandy paste wares have been typed as Awendaw, Horse Island, or Thoms Creek on the basis of the size of sand inclusions and/or surface decoration (see Cable 1993; DePratter et al. 1973; Elliott and Sassaman 1995; Trinkley 1976, 1980a for more in-depth discussion). Some have argued that quartz inclusion size and frequency are temporally diagnostic in Thoms Creek wares (e.g., Cable 1993), and have used these characteristics to establish types.

Others, however, insist that these paste attributes reflect only clay resource variability and are not temporally diagnostic. In one of the most exhaustive studies of Thom's Creek wares, Trinkley (1976, 1980a) concluded the latter and argued against using the presence or size of sand inclusions as the basis for different types. Trinkley (1983) has subsumed both Horse Island and Awendaw under the type name Thoms Creek. Cable (1993:178) favors retaining a Horse Island type for fine sand pastes and restricting Thoms Creek for sherds with coarse sand pastes.

There is also no consensus over the temporal relationship of Stallings and Thoms Creek. Stallings is considered by some to be incontestably ancestral to Thoms Creek (Stoltman 1972; Cable 1993), and it is true that no Thoms Creek site has yet produced a date as old as the oldest dates on fiber tempered wares from South Carolina and Florida. Others (e.g., Trinkley 1980a), however, stress the contemporaneity of the two types for most of their time ranges and conclude that the exact temporal relationship between the wares is unresolved at present. The stratigraphic evidence is unclear. In a number of instances, "pure" Thoms Creek components underlie those with both types. In others, assemblages with only Stallings sherds appear below mixed Thoms Creek/Stallings components. There has not been enough study of the dates, inter- and intra-site distributions, vessel forms, and site functions of these contradictory examples to indicate whether there are temporal, cultural, or functional reasons for the conflicting data, or whether they arise from site formation processes.

One of the most intensively occupied Late Archaic sites yet discovered is on Stallings Island, located in the Savannah River in Columbia County, Georgia (Bullen and Greene 1970; Claflin 1931; Crusoe and DePratter 1976; Fairbanks 1942; Jones 1873). Although looting for highly prized engraved bone pins has devastated much of the site, recent excavations by Ken Sassaman and his students have uncovered a substantial number of features and intact remains (K. Sassaman, personal communication, 2000).

The earliest Late Archaic levels at Stallings Island have been dated to between 4700 and 4450 B.P. (Williams 1968:331). These basal levels lacked ceramics but, among many other tool types, contained classic Savannah River projectile points (Coe 1964). Subsequent excavations elsewhere in the region have shown that these large classic Savannah River points are associated with the incipient use of fiber-tempered ceramics (Elliott et al. 1994:370). Large Savannah River bifaces were often manufactured from metavolcanic rock; some assemblages—from sites such as the Mill Branch, Toliver, Chase, 9RO7, and 9RO20, for example—are dominated by points of this material (Ledbetter 1991, 1994; Stanyard and Stoops 1995; Stanyard 1997). This particular manifestation of Late Archaic technology is chronologically specific (ca. 4200–3600 B.P.) and, depending on geography, is currently referred to as the Mill Branch or Black Shoals phase (Elliott et al. 1994; Ledbetter 1994; Stanyard 1997; Stanyard and Stoops 1995).

As noted, ceramics have been dated to as early as 4500 B.P. at Rabbit Mount, but they did not appear at Stallings Island until about 3730 B.P., when ceramic technology first began to be utilized on a regional scale. Projectile point styles associated with the ceramic levels at Stallings Island are smaller than Savannah River point types and tend to have slightly contracting, rather than straight, stems (Bullen and Greene 1970). Elliott et al. (1994) refer to this technological expression of the Late Archaic period as the Lovers Lane phase and frame it between about 3800 and 3350 B.P.

Curiously, soapstone vessels, a hallmark of the Late Archaic in the interior of Georgia, are almost absent in the archeological record at Stallings Island—there is one soapstone bowl sherd (Elliott et al. 1994)—and in the central Savannah River Valley in general. This is despite several nearby sources of soapstone that were used to obtain raw material for perforated slabs, gorgets, and bannerstones.

Sassaman has recognized a correlation between pottery use and soapstone utilization in Late Archaic groups inhabiting the fall zone and coastal plain region of the Savannah River Valley (Sassaman 1993b). During the early part of the Late Archaic (ca. 5000–4200 B.P.), fall zone and coastal plain groups utilized soapstone as cooking slabs for indirect cooking in fiber-tempered pots. Sassaman has introduced evidence that the residents of the fall zone were exchanging soapstone slabs with coastal plain people for some unknown commodity (Sassaman 1993b:213–215). By 4200 B.P., however, soapstone slabs disappear from the archaeological record of the coastal plain. It was at this time (Group I/St. Simons I/Stallings II) that ceramic vessels began to be used for direct fire cooking in the interior coastal plain and on the coast. Soapstone slab manufacture continued among fall line groups until about 3500 B.P., however, in a social context that apparently precluded the use of ceramic vessels for direct fire cooking. Pottery continued to be used for indirect cooking with heated soapstone slabs.

The break in the exchange conduit between the fall line and coastal plain at approximately 4200 B.P. is thought to represent the coalescing of the two distinct social entities that first emerged in the Middle Archaic Savannah River point exchange system. These two entities, one associated with the interior coastal plain and coast and one identified with the fall zone environs of the central Savannah River valley, continued to have diverging historical trajectories through time.

While coastal plain groups applied new ceramic technology to cooking innovations and found little need for soapstone slabs, fall zone residents resisted changes in cooking technology. Sassaman (1993b) postulates that this was because the control of soapstone in general, and soapstone slabs specifically, played an important role in the acquisition and maintenance of power in Stallings society. By 3500 B.P., that once cohesive social entity had dissolved, and power was no longer manifest in the control of cooking technology. As a result, direct fire cooking became widely adopted in the region.

Settlement patterns varied significantly between those that inhabited the fall zone/interior coastal plain and those occupying the coast. Recent modeling of Late Archaic settlement organization associated with these groups is based on extensive archaeological investigations in the Savannah River region and surrounding area (Brooks and Hanson 1987; Elliott et al. 1994; Ledbetter 1991; Sassaman 1983; Sassaman et al. 1990; Stanyard 1997). This model posits that groups congregated in large numbers at specific locations along the Savannah River in the spring and summer; Stallings Island and Lake Spring are two notable sites where this is thought to have occurred. Base camps—smaller, amorphous shell midden sites—were established near the mouths of large tributaries; they functioned as multi-household staging areas from early spring through fall. Some non-shell sites containing principally lithics may be hunting camps associated with these occupations. However, for at least part of the Late Archaic, some interior peoples inhabiting the terraces above river valleys apparently distanced themselves from the river valley peoples and continued a lifeway without pottery (Sassaman 2001).

In the late fall and winter months, small groups dispersed into the uplands along smaller tributaries of large rivers and led a relatively autonomous existence within specified foraging zones. Some of these fall/winter-hunting territories were established as far away as the piedmont Oconee and Upper Ocmulgee river catchments in north Georgia (Stanyard 1997) and the Santee River drainage in South Carolina (O'Steen 1994). In the spring and summer, subsistence was directed toward obtaining freshwater shellfish and anadromous fish. White-tailed deer was also important, as were smaller mammals, freshwater fish, birds, and turtles (House and Ballenger 1976; Stoltman 1974). In the late fall/winter dispersal, it is suspected that a focus was placed on white-tailed deer and comestible nuts, such as hickory nut, walnut, and acorns.

Coastal groups are thought to have been fairly sedentary (DePratter 1979; Trinkley 1980b). They maintained permanent residences in the littoral zone and made forays into estuarine and interior settings for specific needs. Three settlement types are recognized for the coast (DePratter 1979): shell rings, amorphous shell middens, and non-shell sites with artifact scatters. The function of shell ring sites is debated. Trinkley (1985) and others (e.g., Espenshade et al. 1993) believe that shell rings are the accreted midden of permanent settlements of egalitarian societies whose households were arranged in a circle around a central plaza. Habitations were either on top of or immediately interior to the ring. Others (e.g., Sassaman 1993 [cf. Sassaman and Ledbetter 1996:80]); Waring 1968b; Russo and Saunders 1999; Saunders 1998) believe that rings are a form of monumental architecture and mark territories where macrobands come together at certain times of the year for ceremony, feasting, information exchange, and etc. This latter argument was more difficult to sustain when there were no other examples of monumental architecture in the Late Archaic in the Southeast. Research in the last decade has demonstrated that mounds began to be built in the lower Mississippi River valley and in Florida as early as 6000 B.P. (in the late Middle Archaic) (Russo 1996b), rendering the possibility that rings were also monumental more plausible. Research at Fig Island is directed towards the resolution of this debate.

Shell rings are only along the coast; examples of this site type include Sapelo Island (Simpkins 1975), Cannon's Point (Marrinan 1975), and Fig Island (Hemmings 1970; this report). Amorphous middens and mounds are found in estuarine settings; notable sites of this type are Bilbo, in Georgia (Waring 1968a), and Spanish Mount, in South Carolina (Sutherland 1973, 1974). Non-shell sites are found in the same settings and likely served a short-term, specialized function. Many of these occupations were small and ephemeral and may represent hunting camps or other short-term site usage. However, Cable (1993:203) noted that within Edisto Beach State Park, non-shell Late Archaic sites were associated with fiber tempered wares, while shell sites more commonly contained Thoms Creek sherds with only small amounts of fiber tempered wares. To Cable, this indicated that intensive shell fishing only began later, in the Thoms Creek ceramic period. Acceptance of this scenario depends on the acceptance of Cable's ceramic seriation of Spanish Mount pottery (see Chapter 4), which needs confirmation from other dated Thoms Creek deposits.

Late Archaic domestic architecture is not well understood and only a few examples have been investigated in the interior or in the Coastal Plain (see Sassaman and Ledbetter 1996 for a review). At Mims Point (38ED9), Sassaman (Sassaman and Ledbetter 1996; Sassaman1993a) uncovered shallow postholes of two structures and a cluster of deep pits and hearths that suggested a third. These circular structures appeared to be arranged in a circular settlement plan.

During excavations at 9WR4, in Warren County, Georgia, Ledbetter (1991:200) discovered a Late Archaic pithouse measuring approximately 4 × 5 m. It was subrectangular in plan and approximately 35 cm deep (Ledbetter 1991:200). Large corner posts and a few wall posts defined the perimeter. A large hearth area in the eastern portion of the structure is interpreted as a hearth and earth oven that may have been partitioned (Ledbetter 1991:201); three caches of debitage surrounded the hearth area.

Six structures associated with the Late Archaic occupation of the Lovers Lane site have been documented (Elliott et al. 1994; Sassaman and Ledbetter 1996). All were subrectangular or oval in plan; only one structure (Structure 6) was determined to be a pithouse similar to the one at 9WR4. The smallest structure measured 5 × 8 m and the two largest 8 × 8 m. None of the structures contained discernible hearths.

Although post holes have been discovered below the large shell middens that characterize coastal settlements in South Carolina, structures associated with these occupations have never been completely delineated. Therefore, very little data concerning their size, shape, or function exists. At the Summer Haven site, a large shell mounded midden below St. Augustine, on the Florida coast, Grad-all exposure of over 1000 m^2 of soil below the midden revealed a minimum of four partial, circular structures; however, no village plan was apparent (DOT 1995).

One factor in the inability to identify structures may be that they were often constructed on top of a pre-existing shell midden, and their configuration has become obfuscated by human activity subsequent to their occupation (Marrinan 1975). Another factor may be insufficient exposure. Most coastal excavations continue to expose, at most, tens of square meters in block excavation; at the least, exposures of 2 x 2 m or 1 x 2 meters in widely separated units. It is noteworthy that the examples above all come from relatively large exposures.

Shellfish were very important to Late Archaic populations that inhabited the coast, as evidenced by the large accumulation of shell at coastal sites. The degree of their importance to subsistence is debated, however (see Russo, Chapter 9). Based on the sheer amount of shell that had accumulated, early researchers believed that shellfish exploitation significantly affected both settlement and subsistence. Shellfish were thought to have decreased the need to hunt deer and other mammals in shrinking territories and to have freed people from the necessity of continually moving in search of food (Caldwell 1958:14; Claassen 1996:240).

Also important to the coastal Late Archaic diet were the nursery fishes of the estuary. Fine screened analysis from sites in coastal Florida and Georgia indicate that these small fishes, probably netted in huge quantities, provided the much of the protein and calories in coastal diets.

Plant remains, including nuts (hickory and acorn), fruits (hackberry), and seeds (hawthorn), have been discovered at many sites in variable quantities (Marrinan 1975; Trinkley 1986). Nuts were probably a major food source, especially in the fall; hackberry and hawthorn presumably provided sustenance as well. Although lacking in the archaeological record, many other plant materials were probably used, not only for sustenance but also as medicine, fabric, implements, and construction material. There is no conclusive evidence that Late Archaic people in the Southeast practiced horticulture, but it is possible that clearing overstory encouraged the growth of certain useful, opportunistic plants. The most likely candidates are cucurbits (*Cucurbita* sp.) and weeds containing starchy seeds (e.g., *Chenopodium* sp.; *Helianthus* sp.).

The end of the Archaic period and advent of the Woodland period is a demarcation created by archaeologists in recognition of the widespread adoption of an improved ceramic technology by 3000 B.P. However, there were environmental changes at about this same time that may have precipitated changes in social systems. As noted in the section on Holocene climate above, the close of the Late Archaic is coincident with a rise in sea level and the more dispersed settlement pattern of the Refuge period. Presumably, social structures would have changed to accommodate these altered lifestyles.

Woodland Period (ca. 3000 B.P.–A.D. 1150)

The improved ceramic technology that became widely available by 3000 B.P. in the Southeast greatly altered food storage and preparation capabilities, though it did not have an immediate effect on subsistence. Throughout most of the coastal Woodland period, subsistence strategies (as opposed to settlement patterns) were a continuation of the less nucleated fishing, gathering, and hunting regimes that emerged at the end of the Late Archaic. On the lower coastal plain and coast, maize did not begin to play an important economic role until approximately A.D. 1300; the role of native cultigens is still unknown.

With a few exceptions, the nature of Woodland people ideological and nonsubsistence-related economic systems are more accessible to modern researchers than those of earlier peoples because they involved activities, architecture, and artifacts that are more visible in the archaeological record. For example, mounds associated with mortuary, ceremonial, and status-related domestic domains first appear by about A.D. 1. Also, large quantities of magico-religious and prestige goods manufactured from such durable media as stone and unsmelted metal were deposited in and around these mounds beginning at approximately the same time. The Woodland period also witnessed the waxing and waning of a long-distance trade and exchange network in exotic materials such as copper, mica, obsidian, and marine shell, which are ultimately associated with the Hopewell culture of the Ohio and Illinois River valleys. However, the influence of this politico-religious system was not very pronounced in the Edisto Island area.

Diagnostic projectile point styles attributable to Woodland developments south of the Fall Line include small-stemmed specimens, large and small triangular types, and notched varieties. The introduction of very small triangular projectile points (<1–3 cm in length) around A.D. 600 suggests that bow and arrow technology was adopted in the southeastern United States at about this time. Ceramics became more refined, and regional technological differences, particularly with respect to temper and surface decoration, became embedded during the period.

Woodland cultures of the Georgia/Carolina Coastal Plain and coastal zone are often referred to by the names of their principal ceramic types. However, the Edisto area was a borderland. It is immediately south of the North Edisto River, which Trinkley (1983) defined as the southern limit of the "central coast," but it is far enough away from the mouth of the Savannah (MOS) to justify doubts about the appropriateness of applying MOS chronologies to occupations there. MOS chronologies are applicable to sites from the mouth of the Savannah River south at least to the Altamaha River, but the northern extent of this culture area is still ill-defined. For the earliest part of the ceramic sequence, the entire South Carolina coastal plain "closely mirrors that defined for the mouth-of-the-Savannah, but over time Northern and Middle Eastern tradition elements begin to exert very strong influences on ceramic assemblages in the region, creating a number of taxonomic and typological problems which are yet unresolved" (Cable and Williams1993:15). According to Trinkley (1983, 1989:80), during the Deptford phase (600 B.C.-A.D. 500), increasing influence from the "Northern Tradition" introduced cordmarking, simple stamping, and fabric marking into the coastal zone. Trinkley (1989:79) has assigned assemblages north of Charleston containing both (southern) Deptford check stamping and (northern) fabric marked pottery to a "Deep Creek" phase, referencing assemblages in northern coastal North Carolina (Phelps 1983). Cable (1993) has criticized the Deep Creek application to South Carolina on typological and temporal grounds, arguing instead for the introduction of fabric marking from the Piedmont interior.

Middle Woodland pottery assemblages on the coast are comprised of Wilmington plain and cordmarked ceramics on the southern coast, south of the Edisto River, and Hanover, Mount Pleasant and McClellanville/Santee assemblages to the north. According to Trinkley (1989:80), Wilmington and Hanover are regional varieties of the same ceramic tradition. Both are grog tempered; surface treatments include plain, cordmarked, fabric impressed, and net impressed. Trinkely (1983:46) observed, however, that simple stamping, check stamping, complicated stamping, and brushing, which are sometimes associated with these two series, are so rare on the coast at this time period that "they appear to represent typological mixing." The Mount Pleasant series paste is sandy and has variable quantities of pebble-sized inclusions (Trinkley 1983:47). Decorative treatments include fabric impressed, cord marked, net impressed, and plain.

According to Cable and Williams (1993:31), significant divergence between southern and central South Carolina pottery sequences occurred during the Middle-to-Late Woodland transition. At this time, Cable and Williams (1993:32) put the northern boundary of southern influence between Port Royal Sound and the Cooper River, south of Edisto Island. They noted (1993:32): "this area has also been considered a boundary between the ethnohistoric Siouan and Muskhogean linguistic groups," implying considerable time depth to this boundary. During this time period, Cable and Williams (1993:32) align the central coast, including the Edisto area, with influences from the Coastal Plain and Sand Hills interior. "It would seem, then, that the Middle and Late Woodland ceramic traditions of the central South Carolina coast belong to a macro-stylistic unit located within the Broad-Congaree-Wateree-Santee drainage system, and not to some pan-coastal tradition linking this area to the mouth-of-the-Savannah" (Cable and Williams1993:32). Cordmarking, check stamping, and fabric marking disappeared, and pottery was either left plain or simple stamped on a sandy paste. This new series is referred to as Santee in the interior or McClellanville on the coast. Trinkley (1981) distinguished the coastal McClellanville from the interior Santee series (Anderson 1982) on the basis of rim form differences. However, Cable and Williams (1993:32) argued that the differences were not significant enough to justify the establishment of two separate series and appeared to favor the application of the Santee series to the coast.

By A.D. 1100-1200, curvilinear-design paddle stamping emerges (or re-emerges in some areas) as the principal decoration on pottery over a wide area; a phenomenon that Cable and Williams (1993:33) referred to as the "Mississippian Stylistic Integration." This complicated stamped pottery is known "generically" as Savannah Complicated Stamped (Cable and Williams1993:33) and has a number of regional variants across the lower Southeast. For the central coast, Trinkley (1983:48) applied the Jeremy and PeeDee series to emphasize associations with south central North Carolina, though developments parallel the MOS Savannah and Irene progression. Jeremy assemblages contain complicated stamped and minor amounts of check and simple stamping on a fine sand paste. The subsequent PeeDee pastes are also sand tempered, but have a compact, granular or "sugary" texture (Trinkley 1983:49). Rim elaborations, very similar to those in the MOS Irene series, appear, but incising, which becomes relatively common in Irene assemblages after A.D. 1400 (around 6% of surface treatments; Saunders 2000), is very uncommon in the Pee Dee series. Not surprisingly, Cable and Williams (1993:33) have argued that, ultimately, central coast ceramic series will be aligned with interior Wateree and Upper Santee assemblages.

The practical effect of these disagreements over influences is that different researchers use different pottery typologies for the same assemblages. For this report, because Edisto Island is below the southern end of the central coast as defined by Trinkley (1983, 1989) we will use the mouth-of-the-Savannah typology; readers are urged to keep alternative interpretations in mind.

The Woodland period, like the Archaic, is divided into three subperiods—Early, Middle, and Late—based upon changes in general social patterns. As with the Archaic period, changes were actually more gradual and less uniform across the Southeast than the temporal divisions intimate.

Early Woodland (ca. 3000–2500 B.P.). As noted above, the Late Archaic/Early Woodland interface is placed at ca. 3000 B.P. based on extensive archaeological evidence that an improved ceramic technology was developed and widely adopted by this time. Early Woodland social formations on the coast and coastal plain arose out of the dissolution of the relatively centralized populations that previously inhabited the region.

Along the coast and on the coastal plain, the onset of the Early Woodland period is recognized archaeologically by the appearance of Refuge ceramics. This pottery complex was defined by Waring (1968c) based on data obtained from the Refuge site, which is on the southern South Carolina coast. Refuge pastes contain "considerable" quantities of grit and sand (DePratter 1991:163). Waring described four types of surface decorations associated with the Refuge ceramic series: Refuge Punctate, Refuge Incised, Refuge Simple Stamped, and Refuge Dentate. Some of these surface treatments are recognized as derived from late Thoms Creek or St. Simons/Stallings surface decorations, indicating population continuity in the area.

Simple stamping was a technique developed in the Late Archaic but was used as a decorative motif until the end of the Middle Woodland. As a result, the sand/grit-tempered wares associated with the Early Woodland (Refuge phase) and Middle Woodland (Deptford phase) periods are difficult to distinguish. Waring (1968c:200) noted that Refuge simple stamping tended to be haphazard and that the lips of these vessels were sometimes notched. Deptford wares, by contrast, primarily exhibit parallel or crossed designs that were applied with more control.

Recent stratigraphic evidence obtained from 38AK157, which is on the Aiken Plateau at the Savannah River Site in Aiken County, South Carolina, suggests that Refuge simple stamping can be distinguished from Deptford on the basis of the medium used to stamp the vessel (Sassaman 1993c). Based on stratigraphic analysis, Sassaman and Stephenson (in Sassaman 1993c:119–120) observed that there were proportionally less sherds with V-shaped grooves than with U-shaped grooves later in the stratigraphic sequence. In addition, parallel and evenly crossed designs were present in proportionally larger numbers in the upper levels, while sloppy designs were more prevalent in the lower levels. Sassaman (1993c) suggested that the earlier, more haphazard designs were applied with a dowel or stick and were the products of Refuge potters, while the more controlled designs were applied with a carved paddle. Since the check-stamped pottery associated with Deptford was definitely created with a carved paddle, it is reasonable to associate the paddle simple stamped sherds with the Deptford culture.

Refuge ceramics from sites near the mouth of the Savannah River are usually grit-tempered and the temper is abundant. Grog tempering occurs in a minority of wares found in the South Carolina coastal plain (Anderson 1982), but it is dominant on the Refuge series of the Santee River (Espenshade and Brockington 1989). The most prevalent vessel form is a hemispherical bowl with a rounded base. Deep, straight-sided jars also were produced, but in lesser numbers. Rims are incurving or straight; the vessel lips are rounded or squared and are occasionally decorated (DePratter 1979). Punctations and incising sometimes occur on vessel interiors (DePratter 1991; Sassaman et al. 1990).

With the exception of ceramics, very little is known about Refuge material culture. Lithics associated with the Refuge phase consist of small, stemmed hafted bifaces that are similar to the varieties manufactured in the later part of the Late Archaic period. However, lithics occur in low frequencies at Refuge sites, which may indicate that the lithic sources in the interior were not easily accessible (Hanson and DePratter 1985). Another reason lithics are not abundant, one that may or may not be directly related to the availability of lithic material, is the ready accessibility of shell. Shell and bone tools are common additions to components of this age (Lepionka et al. 1983). The relative lack of lithics on the coast during this period presages lithic use in later periods, when a complete adaptation to the coast obviated the need for lithics from the interior.

The Refuge phase has been divided into subphases based on temporal differences in the popularity of ceramic surface design types. DePratter (1979) describes three subphases, Refuge I, Refuge II, and Refuge III. In his scheme, Refuge I dates to ca. 3100–3000 B.P. and is defined by punctated and incised wares. Dentate stamping is the diagnostic surface decoration for Refuge II, and this surface decoration was produced between 3000–2900 B.P. According to DePratter, Refuge III (ca. 2900–2400 B.P.) is defined by the manufacture of linear check and check-stamped wares. Plain and simple stamped pottery was manufactured throughout all three subphases.

Anderson (Sassaman et al. 1990) argues that, given the general lack of radiocarbon dates, DePratter's chronology is too refined. In addition, there is no conclusive evidence that linear check and check-stamped designs were in use as early as 2900 B.P. Sassaman (1993c:190) suggests that only two subphases are recognizable with the Refuge ceramic complex. Refuge I dates to ca. 3000–2800 B.P. and is defined by Refuge Punctated and Refuge Stamped Dentate designs. Refuge II is characterized by the absence of punctated and dentate stamped surface designs and by the emergence of plain and simple stamped surfaces as the primary surface decorations. According to this chronology, Refuge II occurred between approximately 2800 and 2600 B.P.

Environmental and/or social transformations at the end of the Late Archaic resulted in population decentralization in the Refuge phase (Sassaman 1991, 1993c; Stanyard 1997). Small groups disengaged from their social obligations to the larger community and created dispersed year-round settlements. People that produced Refuge ceramics settled the fall zone uplands, the lower coastal plain interior, and the coast. Upland and interior sites tend to be on well-drained ridges, while coastal sites are often situated near marshes in riverine and estuarine settings (DePratter 1976). The upland and interior sites are usually small and lack evidence of intensive utilization (Hanson and DePratter 1985; Sassaman 1993c). The coastal sites usually contain large middens and appear to have been utilized more intensively and extensively (Hanson and DePratter 1985). This pattern suggests that coastal and lower coastal plain sites functioned as permanent or semipermanent residences, while interior sites perhaps served as single-household seasonal base camps.

Subsistence was generalized, and the resource base was very similar to that of the Late Archaic period, with the possible exception of the intensity of use of shellfish. Although shellfish were harvested during the Refuge phase, the degree of dietary importance appears to have been dramatically lower than it was in the Late Archaic. This may be due to lower productivity caused by sea level fluctuations (DePratter 1977). It also is possible that the larger shell midden sites are currently inundated, as sea level has risen about three meters since the Early Woodland period (Hanson and DePratter 1985). In any event, Refuge phase faunal assemblages indicate that white-tailed deer, bear, a variety of small mammal species, reptiles, freshwater fish, marine fish, anadromous fish, and mollusks were exploited (Hanson and DePratter 1985; Lepionka et al. 1983; Marrinan 1975).

Middle Woodland (ca. 2600–1500 B.P.). The Middle Woodland period on the southern coastal plain and coast is known as the Deptford phase; the term is derived from the ceramic series of the same name. Deptford wares exhibit plain, linear check-stamped, check-stamped, simple stamped, cord-marked, and zoned-incised surface designs. Swift Creek Complicated Stamped pottery also appears in late Deptford assemblages.

Diagnostic lithics associated with the Deptford phase include small-stemmed hafted bifaces and medium to large triangular hafted bifaces. Polished stone ornaments and pipes, engraved shell and bone, bone awls and pins, manos, metates, and a variety of formal and expedient chipped stone tools also occur in Deptford components (Hanson and DePratter 1985). Although some aspects of Deptford material cultural are elaborate—platform pipes and engraved bone and shell, for example—there is no evidence that Deptford peoples of the lower Atlantic coast participated in, or were significantly affected by, the Hopewellian exchange system that was flourishing in many parts of the eastern United States in the first few centuries A.D.

Deptford pottery usually exhibits a sandy paste and medium to fine grit temper. The primary vessel type is a cylindrical jar with a rounded or conoidal base; tetrapods, which may reflect influence from the St. Johns culture to the south, may or may not be present. Rims are straight or slightly out-flaring, and lips are square, rounded, or beveled (DePratter 1979:123–127).

The Deptford ceramic series was defined on the basis of results obtained during WPA excavations at the Deptford site, a large shell midden along the Savannah River near Savannah (Waring and Holder 1968). Excavations at Deptford and at Evelyn Plantation in Chatham County, Georgia, demonstrated through stratigraphic evidence that Deptford ceramics were manufactured later than Stallings series pottery and earlier than those produced during the Wilmington phase.

DePratter (1979) has defined two subphases within the Deptford phase: Deptford I and Deptford II. The distinction is based on observed differences in the relative frequencies of certain surface design types found in Deptford assemblages of different ages. Deptford Plain, Deptford Simple Stamped, Deptford Check Stamped, and Deptford Cord Marked vessels were produced during both Deptford I and Deptford II subphases, according to DePratter (1979:111–112). Deptford I (ca. 2400 – 1700 B.P.) is defined by the presence of Deptford Linear Check Stamped pottery in addition to the types mentioned above. Deptford Linear Check Stamped designs were no longer produced during Deptford II (ca. 1700 – 1500 B.P.), while distinctive Swift Creek Complicated Stamped wares appeared in assemblages at this time.

Anderson (Sassaman et al. 1990) has proposed a chronological sequence for Deptford ceramics from the middle Savannah River valley that is similar to DePratter's. Anderson's chronology was based on evidence obtained near the mouth of the Savannah River and along the coast. Anderson (Sassaman et al. 1990) also proposed two subphases termed Deptford I and II. His chronology defined a Deptford I between ca. 2600 and 1000 B.P. Deptford I assemblages were comprised of Deptford Plain, Deptford Simple Stamped, Deptford Check Stamped, and Deptford Linear Check Stamped surface designs. Deptford II (ca. 2000 – 1500 BP.) included the above with the exception of Deptford Linear Check Stamped motifs and the addition of Deptford Cord Marked, Deptford Zoned-Incised, and Swift Creek Complicated Stamped surface treatments. Anderson's chronology places the advent of Deptford II about 300 years earlier than DePratter's, implying that Deptford Cord Marked, Deptford Zoned-Incised, and Swift Creek Complicated Stamped designs were first introduced in the interior. From this time forward, new ceramic developments do seem to spread from the interior to the coast.

Four types of Deptford settlements are recognized on the lower coastal plain and coast: large, permanently occupied villages that contain midden deposits, marsh-edge gathering loci, interior specialized extraction sites, and specialized mortuary sites (Hanson and DePratter 1985; Milanich 1973; Sassaman et al. 1990). Two of the best examples of large, permanently occupied village sites are the Deptford (Waring and Holder 1968) and G. S. Lewis sites (Hanson 1985). The Deptford site is situated near the coast at the mouth of the Savannah River; it contained Middle Woodland midden deposits that extended over 10 hectares. Features indicated that several structures were once present and that the site was occupied year-round by at least a portion of the population (Hanson and DePratter 1985; Waring and Holder 1968). The G. S. Lewis site, in the interior upper coastal plain along the Savannah River, is a multicomponent site that also contained an extensive Deptford midden; cultural deposits extended over at least 5 hectares (Hanson 1985). Evidence of three or four Deptford structures was discovered. They appeared to be roughly circular, 4–6 m in diameter, and they had central support posts. At least 25 refuse pits used by the Deptford occupants also were encountered, as was a single burial (Hanson 1985; Hanson and DePratter 1985). This site appears to have been permanently occupied (Hanson and DePratter 1985; Sassaman et al. 1990).

Marsh-edge sites, and the majority of interior sites, appear to be logistical encampments occupied by task groups obtaining seasonally available and/or specialized resources (Espenshade et al. 1993; Hanson et al. 1981). Mortuary sites consist of small sand mounds containing human interments; they appear to have been used solely as cemeteries (Thomas and Larsen 1979).

The similarities in ceramic technology and preference for specific surface designs indicate that the interior and coast were integrated in terms of both information exchange and transfer of human resources. The following settlement model has emerged from extensive research on the Deptford phase (Milanich 1973); it applies to both interior fall line/upper coastal plain and lower coastal plain/coastal populations.

Deptford people resided in permanent villages both in the interior and on the coast. At various times of the year, task groups were sent to specific locations in the surrounding area to obtain seasonally available resources or to extract important resources—lithic raw material, for example—that had become depleted. These specialized forays probably were of short duration.

Subsistence was generalized and based on a fishing-gathering-hunting economy. No secure evidence indicates that horticulture was practiced to any significant extent. The resource base is essentially the same as that utilized in the Late Archaic period, as shellfish became an important resource once again, after its apparent decline in importance during the Refuge phase.

Late Woodland (ca. 2500–1000 B.P.). Very little attention has been focused on aspects of material culture other than pottery for Late Woodland societies inhabiting the coastal plain and coast. The small to medium-sized triangular hafted bifaces associated with this period also were produced in subsequent eras, and therefore are not diagnostic. In any event, lithic tools are uncommon in Late Woodland assemblages. Shell and bone are known to have been used in a variety of ways, however. Whelk was an especially important raw material; it was used to manufacture awls, picks, chisels, adzes, abraders, toggles, and ornaments (Cable 1992; Espenshade and Brockington 1989).

The onset of the Late Woodland period in the project region is defined by the appearance of cord-marked pottery and the disappearance of check-stamped and simple stamped wares. Cord marked ceramics found on the coast and in the lower coastal plain are grog-tempered; sand-tempered cord-marked pottery that occurs in the upper coastal plain and fall zone in the Savannah River drainage has also been included in the Wilmington Cord Marked category (Anderson 1985; Hanson and DePratter 1985; Stoltman 1974), though this has been criticized (Trinkley 1983:46).

Late Woodland settlements are small, dispersed, and apparently less integrated than those associated with the Deptford phase (Sassaman et al. 1990:14; Stoltman 1974). The subsistence economy was based on generalized hunting, fishing, and gathering. Although cultigens such as squash and corn had been introduced into the region by this time, they were not a significant part of the diet (Wood et al. 1986).

Social, economic, and technological manifestations that are associated with the Mississippian period became established on the lower coastal plain and coast at approximately A.D. 1150. These changes were dramatic, and some have argued that they occurred when the loosely integrated Late Woodland populations in the region were colonized and acculturated by the chiefdom-level societies that had emerged in the Etowah River and piedmont Oconee River valleys by A.D. 1100 (Anderson et al. 1985).

Mississippian Period (ca. A.D. 1150–1550)

Savannah (ca. A.D. 1150–1300). Coastal Savannah phase sites are characterized by the grit-tempered, complicated-stamped and incised ceramics that belong to the Savannah series. Mississippian influence is visible on the coastal landscape for the first time during the Savannah phase in the presence of platform mounds and in some artifact categories. Arguably, complex chiefdoms arose on the coast at this time as well.

The paramount Savannah phase site on the coast was the Irene site (9CH1) near the mouth of the Savannah River (Anderson 1994; Caldwell and McCann 1941). This site contains the only Savannah phase platform mound identified along the coast. It was a political and ceremonial center occupied throughout the Savannah phase and into the early Irene phase, but it was abandoned around A.D. 1450. Savannah phase features at the site included the aforementioned platform mound, which had seven pentagonal construction levels. The first four construction phases were not mounds per se but surface structures with earthen embankments. True platform mound stages with summit structures appeared by the fifth construction level. Most of the stages contained palisades, which may indicate inter-village raiding or warfare. Other Savannah phase features included a burial mound adjacent to the platform mound, and a series of enclosures of unknown function.

The burial mound was approximately 16.75 m (55 feet) in diameter and 0.75 m (2.5 feet) high. It consisted of a central shell deposit—a typical burial mound feature of the time—surrounded by shell layers separated by layers of sand (Caldwell and McCann 1941:22). A total of 106 interments were identified during the 1937–1940 excavations, and although both Savannah and Irene phase burials were present, most are attributable to the Savannah occupation (Caldwell and McCann 1941:22).

The Savannah ceramic series consists of Savannah Cord-Marked, Savannah Check Stamped, Savannah Complicated Stamped, and Savannah Plain types. Savannah Cord Marked pottery is grit-tempered. Cord marking is usually cross-stamped on these wares; vessel forms include flared-rimmed globular jars and conoidal jars. Savannah Check Stamped vessels are tempered with grit or coarse grit. Flared-rimmed globular jars, conoidal jars, and hemispherical bowls are the most common forms. Savannah Complicated Stamped ceramics exhibit a variety of surface designs. The most common motifs are diamond, barred-diamond, double-barred circle, double-barred oval, figure eight, figure nine, and concentric circle. Savannah Complicated Stamped pottery also is tempered with grit or coarse grit; the common form is the flared-rimmed globular jar.

Savannah Plain wares are usually burnished. They have a sand or grit temper and were produced in a variety of forms. Vessel shapes include carinated bowls, shallow bowls, and hemispherical bowls with outflaring rims; cup-shaped and boat-shaped forms also occur (Caldwell and McCann 1941:46).

Temporal differences in ceramic technology and decoration have long been noted within the Savannah phase, and several Savannah sequence chronologies have been proposed (Braley 1990; Caldwell 1971; Crook 1990; DePratter 1979). This report follows the sequence proposed by Braley (1990) and recognizes two subphases: Savannah I and Savannah II. Savannah I (ca. A.D. 1150–1200) is defined by large jars with check-stamped surfaces, vessels with cord-marked surfaces, and carinated bowls with plain surfaces. Check-stamped wares and carinated bowls with plain surfaces also occur during Savannah II (ca. A.D. 1200–1300); large complicated-stamped jars and vessels with noded rims distinguish Savannah II from Savannah I.

Other media associated with Savannah phase material cultural include chipped stone, polished stone, shell, bone, and copper. The vast majority of hafted bifaces are small triangular projectile points that presumably functioned as arrowheads. Various utilitarian items were manufactured from stone, bone, and shell. An elaborate material culture associated with ideological and religious beliefs and practices also existed. These items, part of the Southeastern Ceremonial Complex, were used symbolically to obtain, maintain, and sanction chiefly and priestly power and status. Goods associated with the Southeastern Ceremonial Complex include embossed copper plates and cutouts, monolithic polished stone axes, shell gorgets, stone statues, carved slate palettes, and pins made of shell or copper.

In terms of settlement organization, local mound centers such as Irene formed the center of political power. The ruling elite and a resident population permanently occupied these villages. As political control waxed and waned among elite factions in this politically turbulent era, mound centers were periodically constructed, maintained, and abandoned (Anderson 1990b). Many mound centers were abandoned and then reoccupied several times.

Large permanent villages that were not associated with mounds also were established during the Savannah phase, usually along major rivers. These places were probably inhabited by elites that were subordinate to those residing at the mound centers. A resident population of commoners also is assumed.

Small hamlets and homesteads were established as well. In addition to sustaining themselves and their families, residents of these locations likely provided the permanent villages and mound centers with food and other important resources as tribute, in return for protection and inclusion in the political system.

Hunting, gathering, and fishing were still very important to the Savannah phase subsistence economy for those residing along the lower coastal plain and coast; there is little archaeological evidence of domesticates, corn in particular. Poor preservation of pollen in sandy coastal soils has frustrated attempts to identify corn pollen from Mississippian period sites along the coast; food preparation techniques, such as boiling as opposed to roasting, may prevent the preservation of kernels and cobs. Interesting data have emerged from stable isotope analyses, however. Stable carbon and nitrogen isotope analysis on the Savannah phase skeletal remains from the Irene site indicated an increase in the reliance on maize agriculture and a decrease in the use of marine resources as compared to earlier periods. Coastal populations also showed more reliance on maize during the Savannah phase, but showed no concomitant decrease in the use of marine resources (Hutchinson et al. 1998; Larsen et al. 1992). Despite these results, it is by no means clear that agriculture was as important on the coast as it was in the upper coastal plain and piedmont. In those areas, domesticates were cultivated both at large village sites and in homestead situations. The elite largely controlled the production, collection, and distribution, and the success that elites had in marshalling these resources may have played a central role in acquiring and maintaining power in those areas (Anderson 1990b).

Irene (ca. A.D. 1300–1450). The Irene phase is associated with political instability and dramatic demographic shifts. During the Savannah phase, political authority appears to have remained relatively stable. Central authority began to break down by A.D. 1300, however, and fortified villages became common. This suggests that warfare between polities was an integral part of the political landscape at that time (as it was at contact), and it probably erupted over such important issues as the control of trade routes, agricultural land, and hunting territories (Anderson 1990b; Anderson and Joseph 1988:316; Anderson and Schuldenrein 1985; Larson 1972).

By ca. A.D. 1350, some mound centers—Hollywood and Irene, for example—were abandoned, and the nucleated population may have declined considerably (Anderson 1990b:483). This apparent population decrease probably represents population dispersal rather than severe population loss; late Irene phase sites are smaller but more numerous than early those in the early Irene (e.g., Stanyard 1993). In either case, the dissolution of hierarchical centers, and presumably of complex chiefdoms, occurred not only at the Irene site, but at many centers throughout the Southeast. By about A.D.1450, many were in decline. The societies that met the earliest European explorers were less complex than those that had existed a couple of centuries before. Climatic deterioration associated with the Little Ice Age may have upset the delicate balance between climate, agricultural production, and chiefly authority that sustained the Mississippian way of life.

Irene phase mounds were circular and relatively large and exhibited rounded summits, rather than the flat summits associated with the platform mounds of the Savannah phase (Caldwell and McCann 1941:18–20). Burials occur in the mounds, but the presence of structures on the summits suggests that the mounds also were used for ceremonial purposes and/or as residences for the elite. At Irene, the summit structures appear to have been significant, as wall trenches, fired wall plaster, and daub was discovered in association with the final mound-building episode at the large mound, the only one of the eight episodes associated with the Irene phase occupation.

As discussed earlier, the burial mound at Irene was used during both the Savannah and Irene occupations, but the majority of interments are from the Savannah phase. The mortuary, however, appears to be exclusively associated with the Irene phase inhabitants. This structure consisted of wall posts arranged as a square with rounded corners; each wall was approximately 7.3 m (24 feet) long. The walls were apparently plastered, and it may have had a palmetto thatch roof (Caldwell and McCann 1941:25).

Two concentric walls, or palisades, surrounded the main structure. They are thought to have demarcated the boundary of the Irene phase cemetery created after the mortuary was destroyed by a fire, which may have been intentionally set (Caldwell and McCann 1941:25, 27–28).

Stable isotope studies conducted on the skeletal population of the Irene phase burials may indicate that political instability affected the subsistence system (or that changes in the subsistence system affected the political atmosphere). At the Irene site, the Irene phase population consumed significantly less maize than did the earlier Savannah peoples. This is strongly correlated with other architectural and, presumably, sociopolitical changes at the site. However, values on coastal Irene phase populations did not show a similar decline. Data are limited, but individuals from Southend Mound I on St. Catherines Island appear to have consumed the same amount of maize as did individuals from the St. Catherines phase on the coast and as those from the Savannah phase population at the Irene site(Hutchinson et al. 1998).

Irene series ceramics include Irene Plain, Irene Incised, and Irene Complicated Stamped types, all of which are tempered with grit or coarse grit. Irene Plain vessels may exhibit rims with nodes, punctations, rosettes, or appliqué strips. The most common form is the hemispherical bowl; rims may be straight, slightly incurving, or slightly outflaring.

Incised motifs consist of parallel lines arranged in patterns of straight lines and concentric pendant half-circles and scrolls. The incising technique varies from precise to careless. Designs are usually placed just below the rim or at the collar; nodes may also be present. The most common vessel form is the flat-bottomed hemispherical bowl. Rims are usually incurving, but may also be carinated. Incised globular jars with outflaring rims are rare (Caldwell and McCann 1941:48).

The most popular designs on Irene Complicated Stamped vessels are variations on the filfot cross motif. The most common forms exhibiting Irene Complicated Stamped designs are hemispherical bowls with incurved or straight rims and globular jars with outflaring or straight rims. Nodes, punctations, rosettes, and appliqué strips are commonly found as decorations under the lip of jars.

Small triangular arrowheads and dart points manufactured from chipped stone continued to be produced during the Irene phase. Utilitarian, decorative, and ceremonial items were produced from polished stone, bone, and shell, but the importance of items specifically associated with the Southeastern Ceremonial Complex apparently diminished in this era (though see below).

Based on investigations at Harris Neck, an Irene phase site in McIntosh County, Georgia (Braley et al. 1986), Braley (1990) defined two phases of the Irene phase: Irene I and Irene II. Irene I (ca. A.D. 1350–1450) is characterized by large jars with plain surfaces and by reed punctated and noded rims. Irene II dates to ca. A.D. 1450–1550. The phase begins with the introduction of incising to the design repertoire. Large jars with appliqué and segmented rim strips were produced in this era, as were small jars with simple scroll designs. Carinated bowls also occur in assemblages of this age. They exhibit various straight-lined, curved, and angular designs consisting of two or three incised parallel lines (Braley 1990). A final Irene phase, called Pine Harbor by Larson and Braley, appears during the Protohistoric period. Pine Harbor assemblages are defined by the appearance of a fine lined incised type called McIntosh Incised that has designs reminiscent of Southeastern Ceremonial Complex (SECC) motifs. Indeed, according to Cook and Pearson (1989), more SECC motifs occur on the Georgia coast after contact, as opposed to during the heyday of the SECC cult in the early to middle Mississippian periods, and they occur primarily on pottery vessels and pipes.

Irene phase sites occur on barrier islands and on the mainland, and the bulk of these are situated adjacent to or within 100 m of the salt marsh edge (Pearson 1979:70). The presence of archaeologically recovered burned corncobs from several Irene phase sites notwithstanding, this environmental situation reflects the society’s reliance on estuarine resources. The typical Irene intrasite structure is one of discrete, apparently randomly distributed midden piles thought to represent the refuse from individual households. Sites may have been hierarchically organized. Pearson (1977, 1979, 1980) identified 61 sites with Irene phase components on Ossabaw Island, just north of St. Catherines Island. These clustered into four size classes. Pearson found that site size was correlated with environmental factors and postulated a settlement hierarchy (which has been criticized by Crook [1986:47-48]). The single, presumably paramount, Class I site was 140,000 square meters, had multiple burial mounds, and was correlated with advantageous environmental parameters (mixed oak-hardwood forests). Class II sites were smaller (56,000-26,000 m), but more numerous (n=7). These generally did not have burial mounds and were sometimes found in locations other than the most environmentally advantageous. Six of the Class III (n=19; size range 18,000-6,600 m^2) sites had burial mounds, but the mounds were small—less than a meter in height.

Pearson (1979:135-138) suggested that some of these sites might have been occupied seasonally to exploit a limited range of resources but that others, including all those with burial mounds, represented permanent settlement expansion into less advantageous resource areas. The smallest sites (n=34; 5000-1 m^2), Class IV sites, were considered seasonal extractive sites.

Ethnohistorical data are generally consistent with this description of settlement hierarchy. Early French and Spanish accounts indicate that paramount chiefs and their families permanently occupied the large mound center(s); a resident population of non-elites protected and maintained the village. Large surrounding villages are postulated to have been permanent residences for subordinate chiefs, their families, and a contingent of non-elites. Small single-family farmsteads may have been established in outlying areas, perhaps to tend small fields cultivated with corn, beans, and squash. Seasonal camps likely took advantage of seasonally available resources—nuts and fish, for example—at the appropriate time of year.

Horticulture was probably practiced during the Irene phase, but the degree to which corn, beans, and squash contributed to the diet in the project region is unclear (Crook 1978, 1986; DePratter 1984; Larson 1980; Saunders 2000). For most of the population at least, sustenance was primarily achieved through a generalized diet of resources procured by fishing, gathering, and hunting.

From all available archaeological and ethnohistoric evidence, it appears that the prehistoric Irene peoples can be identified as the historic Guale. There were significant changes in Irene pottery by A.D. 1600 (Saunders 2000); the pottery associated with the historic Guale in Spanish colonial contexts and later with the immigrant Yamasee (and perhaps other groups—Saunders 2001) is referred to as Altamaha in Georgia and South Carolina and San Marcos in Florida. The type is clearly derived from the earlier Irene, but there are significant stylistic differences that make distinguishing Irene and Altamaha relatively easy. Stamping becomes bolder, curvilinear elements associated with the filfot cross disappear, and folded rims are introduced. Vessel forms include large jars with wide folded rims, reed-punctated rims, rectilinear complicated stamping, or cross-simple stamping; small jars with fine incising, red filming, or punctations; and cazuelas with narrow or broad incising or punctuations. Pure Altamaha contexts are found as early as 1595 (Saunders 2000) on the Georgia coast

Protohistoric Period (A.D. 1513–1715)

Sixteenth Century Europe was plagued by conflict between the Protestant and Roman Catholic communities. These religious conflicts, coupled with the need to replace depleted resources such as timber, precious metals, and especially slaves, fueled the creation of overseas empires (Wolf 1982:109). Spain began explorations along the eastern coast of North America at least as early 1513.

European colonization of the New World depended on Native American labor. By 1520, the Native Americans of the Caribbean and the Bahamas had all but disappeared, having succumbed to disease, famine, the drudgery of the mines in Hispañola, and the concomitant social disintegration attendant on these factors. The presence of another land rich in resources, including slave labor, had become known in the early 1500s. Ponce de Leon skirted the lower Florida coast in 1513. Sometime between 1514 and 1516, Pedro de Salazar landed northwest of the Bahamas and returned to Hispañola with "giants" which he sold as slaves (Hoffman 1984; 1990:6).

Salazar's voyage was financed, in part, by Lucas Vasquez de Ayllón, a major landowner in and around Santo Domingo, a judge of the *audencia*, and a slaver. Salazar's discovery whet Ayllón's ambition further. Along with Hernán Cortes, who advanced into Mexico at about this same time, Ayllón envisioned himself an *adelantado*—one who advanced the frontier of the Spanish empire.

In 1521, two ships, one sponsored by Diego Cavallero and Ayllón and the other by Sancho Ortiz de Urrutía and Juan Ortiz de Matienzo, sailed to the Atlantic shore. According to Hoffman (1990:3), the Spaniards sailed up the South Santee River, which they called the Jordan. There they remained for several days, trading with the Native Americans they encountered and exploring the coast and inland waterways. Later they moved north, up to "Chicora," which Hoffman places around Winyah Bay, and additional inland forays were made from this anchorage. After about three weeks the Spaniards decided to return to Santo Domingo, but not before enticing some 60 Native Americans on board with presents, then hoisting anchor and setting out, intending to sell the Natives as slaves. A second trip, in anticipation of a colonization attempt, reconnoitered from Delaware Bay to Amelia Island, Florida. Contact with local populations is mentioned for the Savannah River and Winyah Bay areas, and possibly St. Simons and St. Marys (Amelia Island) Sounds (Hoffman 1990:52-54). The Spaniards must have made landfall north of Winyah Bay as well, because the ships returned to Santo Domingo with Native Americans who spoke four mutually intelligible languages—Algonkian, Siouan, Muskogean, and Timucuan.

Though there is no direct evidence, Native Americans on Edisto Island, probably Siouan speakers at that time, could certainly have been contacted by representatives of these voyages; at the very least, they must have heard something was up. Certainly, on Ayllón's subsequent (1526) voyage of colonization, the coast was strangely devoid of people. Survivors reported sightings of homesteads, and of a council house, but no natives were seen. The 1529 version of the Ribeiro map contains the 16th century understanding for the deserted coast. The caption by "The Land of Ayllón" states "the natives fled inland out of fear so that when winter came many persons died from hunger and cold" (Hoffman 1990:86).

Ayllón's ambitious colonization attempt was a failure. With six ships, six hundred volunteers, and abundant supplies, the party set sail to establish the town of San Miguel de Gualdape in 1526. According to Hoffman, the fleet arrived at the Jordan River (the Santee) on August 9, 1526. Here the ill fortune that plagued the settlers began. The largest supply ship foundered at the entrance to the river and all its cargo was lost. Native interpreters, seized on previous voyages, bolted. Scouting parties returned from the interior to report no land suitable for settlement. Three ships were sent south to find a more propitious location. Upon their return, Allyón decided to found the colony 40-45 leagues south.

The location of San Miguel de Gualdape has not been established, but it was most likely located on the coast of Georgia (Hoffman 1990) or South Carolina (Swanton 1946:135). The new settlement was a disaster. After enduring disease, starvation, and, after Ayllón's death, mutiny, the settlers returned to Hispañiola. On the frigid return trip across the Atlantic, more settlers perished. Of the six hundred settlers who founded the colony, only 150 survived (Hoffman 1990).

After numerous colonization failures (de Leon [1513, 1521], de Soto [1539-1542], Narvaez [1528], de Luna [1559]), the Spanish were content to leave the lower Atlantic coast to more casual exploitation. The French, however, still seduced by the idea of "Chicora," launched a series of expeditions. The first, led by Jean Ribault, encountered the village of Adusta, which Waddell (1980:126) glosses to Edisto, about 12 miles inland of Port Royal Sound. This would place Adusta in the vicinity of Chechessee Bluff (Waddell 1980:141). Adusta was the name of the village, as well as of the principal tribe of the Port Royal/Santa Elena region, and of the powerful cacique who interacted with the French explorers.

A great deal of ethnographic information is available from this voyage, as well as from the subsequent French voyage of 1564, led by Laudonnière. After the French were defeated by the Spanish (whose colonial designs on the area were re-energized by French intentions) at Matanzas Inlet, south of St. Augustine, Florida, the Spanish continued interacting with the Orista. Continuity in place names and tribal leaders indicate clearly that the Orista of the Spanish were the French Adusta. Waddel (1980) has gathered together many of the early ethnohistoric documents detailing the relationships of the Edisto and the Spanish and French in the early contact period. These are relevant to the mid 16th century in southern South Carolina. By 1586, the Edisto had moved north to the area of the island and the rivers that bear their name (Waddell 1980:153). It is unclear at this time how closely the precontact peoples of the central coast were related, genealogically and culturally, to the Edisto and other peoples further south. Scattered references to the Edisto continue through the documents of a third colonial power, the English, who claimed the South Carolina coast with the settlement of Charleston in 1670. Allusions to the Edisto occur in English documents until the early 18th century. The last direct reference to the Edisto, in an act permitting English trade with the "Edistoes," appears in 1707 (Waddell 1980:166). After that time, the Edisto, a group that had negotiated with all three European colonial powers for over a century, ceased to exist as a distinct people.

Historic Overview

The British chartered the colony of Carolina in 1663, during the reign of Charles II. The British wanted to protect their interests in the New World and the new colony would give them a strong foothold on the east coast (Huger-Smith 1917). Present day South Carolina is much smaller than the original land grant. In 1665 the colony included present-day Virginia and continued south to just above Daytona Beach, Florida. It was bordered by the Atlantic Ocean on the east and the Pacific Ocean on the west.

Carolina would serve two purposes for the British—it would prevent Spanish incursions from the south and provide income to a badly depleted British treasury. William Hilton explored the coastal Carolina area in August of 1663, noting the lush trees and good soil on the island that now bears his name. Hilton Head Island, however, would be passed over as the site of the first colony in favor of the Charlestown site on the Ashley River. The Charles Town settlers first landed on Port Royal Island, and were persuaded by the Cacique of the Kiawah to move to Charles Town, where they would be safe from the Westo Indians (Edgar 1998:48).

Edisto Island was purchased from the Edisto tribe in 1674 by the Earl of Shaftsbury, one of the original Lord Proprietors. The cost was some cloth, hatchets, beads, and other goods. Rice and indigo were some of the first crops planted there, but Sea Island cotton soon replaced those less profitable crops.

Indian trade was also profitable; corruption plagued the Indian trade from the outset. In 1707, the Commons House passed the Indian Trade bill in order to quell the worst of the abuses. Under the new legislation, an Indian agent would live in the villages with the natives ten months out of the year. These agents answered to a commission and were responsible for supervising the trade in each community. Records from the trade commission show Samuel Hilden, a Daufuskie Island trader, as “the most flagrant malefactor” (Starr 1984). Hilden was notorious for selling rum to the Indians, who ran up enormous debts to pay for the rum. Hilden would then force them to go to war to collect captives for the slave trade in order to pay their debt.

The Yamasee War of the early eighteenth century exemplified the deteriorating relationship between the Indians and Europeans. The Yamasee had been an ally of the white settlers for many years, even going into battle with them against various enemies, but the relationship had become strained because of trader abuse and white encroachment on native lands (Green 1992). Compounding the troubles with the natives were the Spanish settlements to the South. At this time, the Beaufort area represented the southernmost tip of English control. The Spanish, eager to gain a stronger foothold in the New World, rekindled their relationship with the Yamasee, and may even have instigated the impending war between the Indians and the English settlers (McTeer 1971:2–6). On April 15, 1715, Yamasee and Creek joined forces with several other Indian tribes and launched attacks on almost all English settlements. The war, one of skirmishes as opposed to battles, dragged on for four years. By 1719, the fighting was winding down. But in the Carolinas, the 18th century was uneasy, as the white colonial minority faced “two exploited colored majorities,” red and black, and anticipated an inevitable alliance between the two to overthrow colonial rule (Willis 1971:101). The Carolinians deliberately created hostilities between the two groups, forestalling any alliance (Willis 1971:112), paving the way for the creation of the United States in the latter part of the century.

CHAPTER 4:
PREVIOUS ARCHAEOLOGICAL RESEARCH

This chapter focuses on sites on Edisto Island and on previous research into shell rings on the South Carolina coast and elsewhere. The discussion on shell rings focuses on previous interpretations of shell ring function and pottery relationships within rings.

Edisto Island

While locals were no doubt aware of the occupations of Native Americans on Edisto Island, the area saw no concerted archaeological efforts until those of Hemmings and Waddell (Hemmings 1972), who, under the auspices of the newly-created South Carolina Institute of Archaeology and Anthropology (SCIAA), surveyed for late Archaic sites along 150 miles of Georgia and South Carolina coast in the spring of 1970. Eighteen shell ring sites were recorded, and nine of the sites in South Carolina were nominated to the National Register (Cable and Williams 1993). Hemmings followed up this research with excavations at Fig Island Shell Ring the following July and August. Those excavations have not been fully reported, though Hemmings (1970) published a short synopsis of results. Trinkley (1976, 1980a) examined the pottery from Hemming's excavations in his Master's thesis research.

The large mounded midden site Spanish Mount, in Edisto Beach State Park (Figure 2), provided the obvious comparative site, and excavations between 1973 and 1975 at that site were conducted by Sutherland (1973, 1974) and Trinkley, also of SCIAA. During the initial excavations, Trinkley (1973) recorded five other late Archaic sites in the vicinity of Spanish Mount. A detailed site report on the Spanish Mount excavations was not available until Cable (1993) reanalyzed the material for a cultural resource management project in Edisto Beach State Park. That report contains profiles and plan maps of the 1973 and 1975 excavations, and much of the following discussion is based on Cable's presentation of these data.

In 1973, as today, a cutbank of Scott Creek was eroding the high sand bluff where the Spanish Mount site overlooked the marsh and estuary system to the south. Sutherland cleaned most of the 28 m of shell midden exposed on the cutbank and profiled 19 m. He cut three short trenches into the wall to gather zooarchaeological and other samples, including radiocarbon samples. The profile (Cable 1993: Figure 50) indicated a maximum of 3 m of relatively undifferentiated shell midden, which on examination by the author in 2001, was composed of loose, large, clean oyster shell (erosion may have affected this profile). Below this was a less compact zone of shell and sand that Sutherland speculated was the earliest occupation and one that might have been preceramic Cable 1993:171). An "ashy deposit" and two pits (one a possible pothole) were also mapped in this zone. Below this was a lens of dark sand that Sutherland referred to as an old humus layer; this zone also contained two areas of "dark stained sand." On the bluff, Sutherland excavated four contiguous 2 X 2 m units, creating a trench that extended from the base of the mound towards the cutbank. This trench was intentionally offset from the center of the mound.

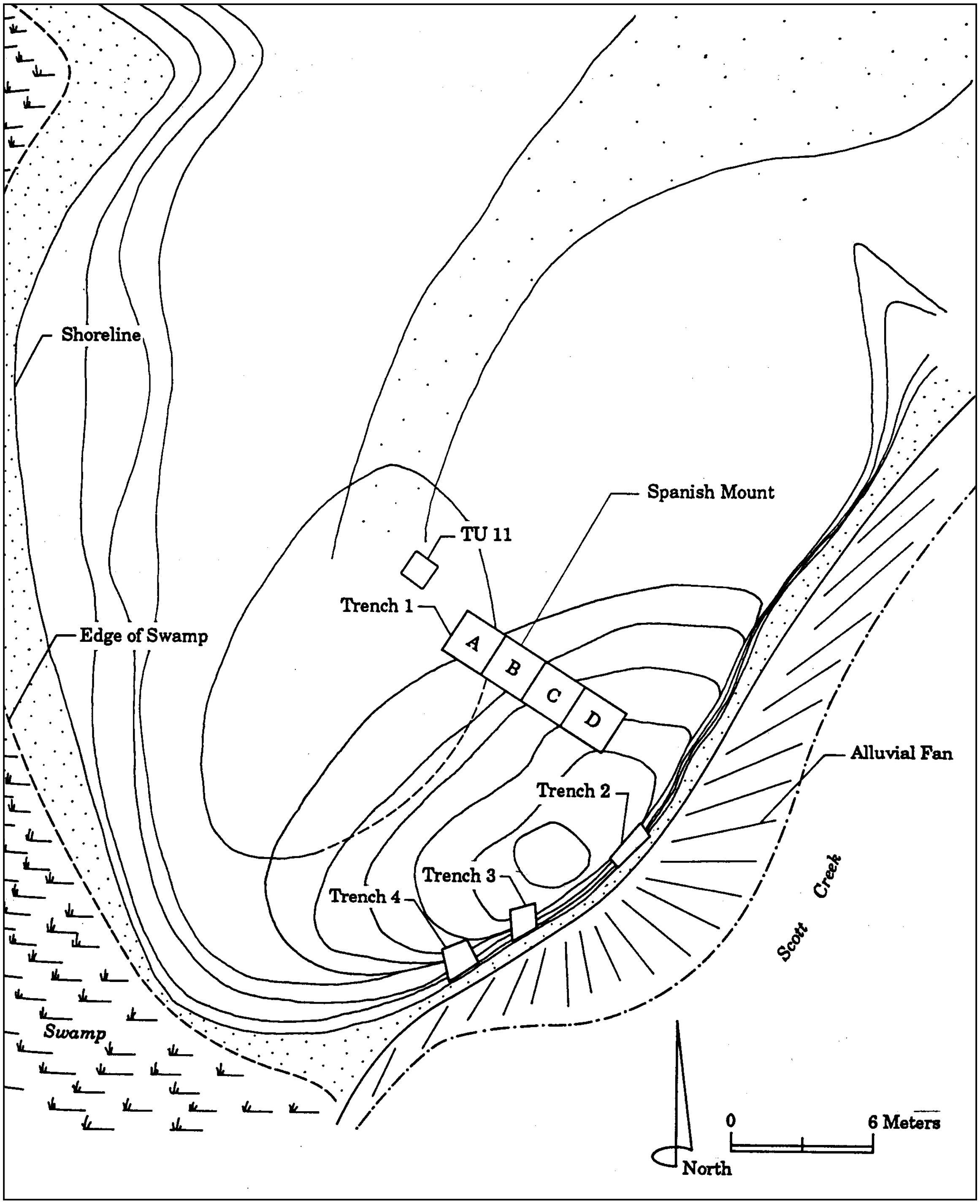


Figure 2. Sutherland's plan map of Spanish Mount (Cable 1993: Figure 45).

Stratigraphy in the trench essentially duplicated the information revealed in the cutbank profiles. Despite a testing program designed to uncover them, no living floors were found within the shell deposit, though a discrete deposit of ash and burnt shell was identified. A “living floor” or other activity area, defined by the presence of “sherds in place, an intact deer radius, a turtle shell, cracked but laying in place, etc.,” was identified in the sand and shell zone below the principal mound shell fill (Cable 1993:160; the quote is from Sutherland’s field notes). A 1 x 1 m test unit, Unit 11, was located northwest of the western end of the trench, and tested what Cable (1993:169) referred to as “an anomalous lower shelf.” According to Cable (1993:169):

> Sutherland (n.d.) indicated in his notes that he was expecting to find a “horizontally older part of the mound” in this location, and although unstated, it may be that he suspected an earlier mound. The sand-shell contact zone was encountered at 160 cm below ground surface and was characterized by a very non-compacted surface of loose shell. Sutherland (n.d.) noted that the sherds in this zone were very large, crisply preserved, tempered with very coarse sand, and exhibited a high incidence of decoration. An association between deep stratigraphic levels and sherds with coarse sand inclusions was an expectation that Sutherland had carried over from the first field season where he documented such a relationship in the cutbank around Trench 2. Two radiocarbon assays from this trench had supplied confirmatory evidence by yielding extremely early dates for pottery associations in North America.

Indeed, the dates were the second oldest for pottery in North America at the time. The two dates, on charcoal from the premound surface, but definitely associated with Thoms Creek pottery, were 3820 ± 185 B.P. and 4170 ± 350 B.P. (Cable 1993:151). It appears that these dates were not corrected (Cable 1993:176). Corrected and calibrated, the two dates have intercepts of 4828 and 5298 B.P., respectively. The corrections and calibrations do make for dates that are earlier than most current chronologies accept for coastal ceramic-bearing occupations. However, the baseline for those ceramic chronologies remains the early dates from Rabbit Mount (Stoltman 1972). The uncorrected (Stoltman, personal communication, 2001), uncalibrated dates for that pottery are 4450 ± 135 (GXO 343) and 4465 ± 95 B.P. Corrected and calibrated, the first date has an intercept of 3096 B.P. and a 2 cal range of 5569-2710. The second date has multiple intercepts of 3257, 3245, and 3098 and a 2 cal range of 5450 to 4834.

As Cable (1993:171) noted, “without a doubt, the most famous finding of the Spanish Mount excavations is the apparent stratigraphic superiority (lower position) of sand-tempered Archaic ceramics over those with fiber-tempering.” Similar superpositioning of fiber-tempered wares over Thoms Creek wares had been reported from Skull Creek Shell Rings (Calmes 1967) on Hilton Head Island; Calmes also reported a sequence of paste and surface decorations from which Waddell (1971) proposed the early occurrence of an Awendaw Complex, followed by the Horse Island Complex, and ending with Stallings.

It was the relationship of paste categories (based on the presence/absence of fiber and sand grain size) and surface decoration through time that Cable sought to test in his reanalysis. He also included information on sherd condition as an avenue towards understanding site formation processes, and coded for sherd weathering (erosion), use wear, and size classes. Using Sassaman's (1993) seriation of Stallings surface decoration and other attributes into three time sensitive groupings, Cable found that paste types did covary with design. However, contrary to Sutherland's interpretation (Sutherland found coarse pastes at the base of the midden and interpreted those pastes as early), Cable (1993:174) found that "when the paste types are seriated in accordance with Sassaman's model, the coarse sand variant must be placed on the late end of the continuum. Moreover, the fiber-tempered paste subtypes are positioned in the earliest position by virtue of the very low percentages of drag-and-jab styles."

In order to explain this apparent stratigraphic anomaly, Cable attempted to demonstrate that the Spanish Mount mounded midden began as a shell ring, which accreted laterally towards the bluff, resulting in the mound. He explained the presence of fiber tempered sherds in higher levels as a result of secondary deposition for mound stabilization, which created a reverse stratigraphy in the upper levels and used the small sherd size of the fiber tempered pottery in these levels as evidence of trampling over this redeposited surface (Cable1993:183). Much of this latter discussion depends upon the assumption that *all* fiber tempered sherds were earlier than sand tempered types, and not just that fiber tempered pottery had an earlier incipience, after which both wares were produced. It is also unclear how these hypothetical secondary fiber tempered deposits correlate with Cable's later discussion (1993:185), in which he concluded that the highest deposits were primary refuse. It is interesting, however, that Cable (1993:186) believed that some of the earliest deposits were deliberately mounded, and it is this finding (among others) that led them to suggest that an early site settlement pattern was in a ring.

Cable's paste/design seriation began with fiber tempered pottery, progressing to Horse Island A, a fine sandy ware, through Horse Island B and Thoms Creek—the former having a fine sand paste similar to the A variety but with a later design assemblage, and the last, Thoms Creek, corresponding to the coarse sand varieties that Sutherland thought early. Fiber tempered pottery was associated with very little drag and jab, and large amounts of reed separate punctate (46.6%) and shell point punctate (48.5%). And, as Sassaman's seriation predicted, a rise in drag and jab frequency was seen through the separate paste types, with the smallest amount in fiber tempered and the largest amount in Horse Island B and Thoms Creek. However, Thoms Creek also had the highest percentage (68.9%) of reed separate punctate, which Sassaman's seriation placed early (though Sassaman's latest group, Group III, was extremely variable).

This part of Cable's analysis depends upon the assumption that Thoms Creek surface decorations will seriate as Stallings did. This may be true, but there is very little evidence for it. In a study of 8,067 Thoms Creek sherds from 14 coastal South Carolina sites, Trinkley (1980a:19) found more spatial variation in Thoms Creek design assemblages than temporal variation, though he acknowledged that the imprecision of radiocarbon dates could have affected his results. He (1985:103) suggested a seriation in which pottery assemblages in the earliest Thom's Creek components would be dominated by Thom's Creek Reed Punctate (with drag and jab a simple variant of this; [Trinkley 1980a] after which Thom's Creek Shell Punctate became more popular, then Thom's Creek Finger Pinched, followed by the "last gasp" of the Thom's Creek Series, Thom's Creek Finger Impressed.

Spanish Mount was abandoned, Cable speculated, after a period of continuous occupation of some 300 years, in the terminal Late Archaic. He (1993:190-191) speculated further that the site was predominantly domestic, "but served to integrate small Late Archaic populations inhabiting the general environs of Edisto Island." To Cable, the more or less even distribution of shell rings along the coast indicated "a system of interacting, but simple, Late Archaic local populations that were only loosely integrated and lacked an established regional site hierarchy."

New South's 1992 survey of Edisto Beach State Park involved a rigorous cultural resources management survey within the park boundaries. As noted above, this research was explicitly designed to address problems of late Archaic ceramic taxonomy in the area in addition to outlining prehistoric and historic settlement and subsistence adaptations through time (Williams 1993:2). In addition to re-examining the pottery assemblages from the late Archaic Spanish Mount, Edisto Midden, and the Marett Mound sites, and providing data to consider Spanish Mount and Edisto Midden a single site, New South provided updates on the sites previously recorded by Trinkley and recorded seventeen new sites. Thirteen Wilmington components were defined, along with one possible Deptford component. Sixteen components were identified as late Archaic; these sites had the most intensive occupations. Wilmington components appear to represent only "seasonal shellfish collecting stations by small social units" (Cable 1993:203). Commenting on the apparent occupational hiatuses in the Early Woodland and Mississippian periods, Cable (1993:204) hypothesized that, with the recorded sea level fall at the Late Archaic/Early Woodland transition, Early Woodland middens, occupied further seaward, might be inundated. In addition, Cable identified a decrease in midden density in later deposits at Spanish Mount, and suggested that near the end of the intensive occupation of that site, subsistence efforts were beginning to focus more on the interior coastal plain than on the estuary. Thus, Cable (1993:204) believed that if early Woodland middens were present, they would "probably be of a radically different structure and smaller size than those of the late Archaic period, due to the impoverished nature of the recovering oyster bars and due to a subsistence shift toward a greater emphasis on inland resource zones." He (Cable 1993:205) attributed the lack of Mississippi period sites to the presence of a buffer zone between Muskhogean groups in the Port Royal Sound area and Siouan groups to the north.

Previous Research on Late Archaic Shell Rings

There are over 30 known Late Archaic shell ring sites on the lower Atlantic coast; many of these sites contain multiple rings. Shell ring sites extend from the Charleston, South Carolina area to Jupiter Inlet, Florida. These arc- to circular shaped deposits of shell midden, composed predominantly of oyster, range in height from less than half a meter to almost 7 meters. They have interior diameters of between 24 and 200 m. The earliest known ring is the aceramic Oxeye Island site in northeast Florida, which dates to 2 cal

4960-4545 B.P. (Table 2). The latest dates for rings occur around 3000 B.P. in South Carolina. This date is co-incident with an episode of sea level regression that has been documented for South Carolina (Brooks et al. 1989) and Georgia (DePratter and Howard 1980). Brooks et al. (1989) suggested a more dispersed settlement pattern along the South Carolina coast after this time; Sassaman and Anderson (1995:156) observed that this dispersed pattern was manifested in the terminal Late Archaic by small shell rings and middens, which they called "the last vestiges of the period."

Since they were first described, by William McKinley in 1873, shell rings have captured the imagination of avocational and professional archaeologists alike. Against a backdrop of amorphous middens and artifact scatters, rings are impressive structures. Writing of the three rings on Sapelo Island, McKinley was taken by the height of the largest of the three, over six meters of near vertical wall (three meters of shell on three meters of bluff); the apparent sterile interior of each ring; and the relative symmetry of the sites. McKinley (1873:422-428) proposed that the rings were "doubtless for council and games" with the largest operating as a "house of state" and "torture chamber" and the lesser circles as places for dance, sports, and games.

Subsequent work on shell rings has been sporadic at best. C.B. Moore (1897:71-73) conducted excavations at the largest ring on Sapelo, but was unimpressed with the artifacts associated with the structure. He did produce a somewhat idealized (at least with respect to what is present today) topographic map, and commented on the presence of the other two mounds described by McKinley. The first was "indistinct and has by no means the height assigned to it. The other escaped our attention" (Moore 1897:73).

Moore (1898:166) was also disappointed in the archaeological potential of the South Carolina coast. In an oft-cited remark, Moore observed that "On the whole it would seem probable the South Carolina coast has little to offer from an archaeological standpoint." However, he did make observations on the Guerard Point ring. Even in 1897, the "aboriginal enclosure" had "already been greatly lowered by the plow and considerably spread out." He likened it to "the site on Bull Island, South Carolina" (and Irene phase shell structure) and to the Sapelo Shell ring. Ritter and Moorehead worked on the Chester Field Shell Ring in 1932 and 1933, respectively. The work was never reported, though Flannery (1943) made a brief report of the investigations and Griffin (1943) discussed the ceramics. Trinkley (1985:104) has discussed the stratigraphy of the site on the basis of field notes and stressed the "crushing and banding" of the lenses and pockets of shell and burned sand and ash discussed in Ritter's field notes. Trinkley (1985:104) took issue with Flannery's conclusion that the ring interior had been inhabited, again stressing the stratigraphy that suggested activity on the ring surface.

Chester Field would not be revisited until 1970, during the coastal survey by Hemmings and Waddel (1970). Some rings did see excavation between the early and late 20th century (see Marrinan [1975] for synopses of cultural and other materials recovered from shell rings up to 1975). In South Carolina, Edwards (1965) tested the Sewee Shell Ring, and recovered over 10,000 sherds, which he identified as Awendaw. Baked clay objects with central perforations, numerous shell tools, 15 lithic fragments, and five bone pins were also recovered. The site report, however, was very preliminary, and Edwards' interpretation—that the ring functioned as both a habitation site and a fish trap—has been rejected by most archaeologists.

Three rings, Ford's Skull Creek Shell Rings (Large and Small) and Sea Pines, were tested by Calmes (1967, 1968) in 1967. The Ford Shell Ring actually consists of two rings, the larger of which is superimposed over the south end of the smaller, creating a Figure 8. Calmes tested both the Large and Small Ford rings with a 5 ft (1.5 m) square in what was presumably the deepest part of each ring and excavated a five-foot unit in the center of the small ring and a 10 ft unit in the center of the large ring. The Sea Pines shell ring was tested with another 5 ft unit.

Results of these excavations have been published only as a short (four page) report. However, more information is available in a manuscript at SCIAA (Calmes 1967). Calmes' (1968:45-46) published account of the stratigraphy, which made no distinction between the 7 ft high Large Ford ring, the 2 ft high Small Ford ring, and the 1-3 ft high Sea Pines ring, was as follows:

> The alignment of the oyster shells within the rings revealed stratigraphic bands. The stratigraphy of the sites was by no means horizontal, but variable, nearly vertical in places. The successive bands of shell indicated that the tops of the shell-rings were probably constantly being leveled off as they gained in height, because interior secondary ridges or piles interfered with the regularity of symmetry of the accumulated bands of shell. The rings apparently contained numerous small piles about seven or eight feet in diameter, and two feet high. On top of the piles the shell was crushed and contained more pottery sherds and charcoal than the central portions of the piles, which were composed of very loosely packed, unbroken shell. The bands of crushed shell and pottery sherds followed the tops of the successive piles, which were built up on top of one another, indicating human occupation possibly over a long period of time. The Indians possibly lived in a circle or disposed of their refuse in a circle. The pile of debris may have been walked over, or lived upon, causing the shell on top to be crushed and to contain a relatively concentrated amount of charcoal and pottery sherds.

The Ford Shell Rings have been disturbed. The small ring was partially plowed over (Dorroh 1971:42), and the site "was almost entirely destroyed in the 1930's when much of the shell became road beds for the island" (Calmes 1968:45). One might wonder whether crushing on the surface, as well as "interior secondary ridges or piles," are prehistoric or historic in origin.

Nevertheless, Calmes' stratigraphic interpretation is supported by profile drawings in the 1967 report. Particularly at Sea Pines, individual piles of "loose unbroken shell" are covered with lenses of "crushed shell and humus" (Calmes 1967:Figure 4, Figure 5).

Shell at Sea Pines is visibly mounded while deposits appear more linear in the drawing of the Ford ring profile, in which Calmes also noted large areas of loosely packed, unbroken shell and postmolds at the base of the shell in the Small Ford ring. It is notable that both of Calmes' tests in the centers of the rings produced features. In the center of the Large Ford Ring, what Calmes (1967:11) interpreted as a fire pit was located. He also reported several post molds in this unit, but no discernable post pattern. In the smaller ring, a shell-filled pit was encountered (Calmes 1967:9).

Also notable in Calmes'stratigraphic description is that the interior part of the ring was made of "very loosely packed, unbroken shell;" a description that fits the core of the Rollins Shell Ring (Saunders n.d.); of the large shell ring on Sapelo (Waring and Larson 1968:271; see below); of Fig Island 1, Fig Island 2, and portions of Fig Island 3; of Cannon's Point, and of the Joseph Reed Shell Ring.

As noted earlier in this report, the Ford Shell Rings were one of the sites in which fiber tempered pottery was found in a stratigraphically higher position than Thoms Creek. In this case, fiber tempered wares were recovered only from the larger ring, all of which was considered more recent than the smaller ring that contained only sand tempered wares. Radiocarbon dates seemed to confirm this superpositioning (Table 2). A date on charcoal of 3890 ± 110 was recovered from the base of the midden in the small ring, while two dates, one on charcoal from the bottom half of the deposits (3585 ± 115) and one on oyster (3120 ± 110) from the 30 inches of shell above the charcoal. These dates have been regarded as confirming the site history and the superpositioning of fiber tempered over sand tempered. The comparison of charcoal to shell dates causes concern, however. If corrections for isotopic fractionation (assuming that these were not routinely applied until the early to mid-1970s), tree ring calibration, and reservoir effect (for the shell date) are figured in, the relationship holds. The median intercept date for the small ring is 4327 B.P., the base of the large ring dates to 3881 B.P., and the shell date from the upper deposit, where most of the fiber tempered material was recovered (Cable 1993:24) dates to 3358 B.P.

Calmes addressed site function, though his comments were inconclusive. He (1968:46) observed that "the Indians possibly lived in a circle or disposed of their refuse in a circle. The pile of debris may have been walked over, or lived upon, causing the shell on top to be crushed and to contain a relatively concentrated amount of charcoal and pottery sherds."

Shortly after Calmes research, Hemmings excavated two test trenches in Fig Island 2, a circular shell ring associated with a crescentic ring, Fig Island 3, and what has now been mapped as one of the most massive rings known, Fig Island 1. One of Hemmings trenches, the 'East' trench, was 5 X 125 ft, and extended from the center of the ring through the eastern edge. High water levels prohibited excavation in the ring center, however. The 'South' trench was 5 X 40 ft and extended through the shell on the southern portion of the ring. Hemmings was able to reach the original ground surface under the ring, which indicates that the ground surface under the ring was higher than that in the center of the ring. This may suggest either that the interior was routinely

Table 2. Radiocarbon dates from shell rings along the lower Atlantic coast (delta R= -5 ± 20).*

Site Name	Site No.	Lab #	RC	Sigma	material	cal intercept	1cal, B.P.	2cal, B.P.	Reference
Chester Field	38BU29	B-116284	**3660**	**50**	soot	3936	4084 - 3897	4146 - 3833	SCIAA site files
Sea Pines Ring	38BU7	I-2847	3110	110	conch	3385	3530-3274	3662-3137	Calmes 1968
		I-2848	3400	110	clam	3727	3886-3608	4062-3461	Calmes 1968
Yough Hall (Auld)	38CH41	M-1209	3770	130	oyster	4244	4416-4072	4583-3878	Waddell 1965:84
Lighthouse Point	38CH12	Uga-2901	3190	70	charcoal	3433[1]	3472 - 3349	3630 - 3213	Trinkley 1980
		Uga-2902	3275	55	charcoal	3472	3628 - 3405	3686 - 3360	Trinkley 1980
		Uga-2903	3180	65	charcoal	3384	3470 - 3275	3626 - 3213	Trinkley 1980
		Uga-2904	2885	175	charcoal	2995	3323 - 2781	3468 - 2625	Trinkley 1980
		Uga-2905	3345	70	charcoal	3605[2]	3688 - 3471	3827 - 3385	Trinkley 1980
Fig Island 1	38CH42	WK-10103	**3816**	54	oyster	NR	3820 - 3660	3880 - 3570	This report
		Wk-10105	**3953**	47	oyster	NR	3970 - 3870	4070 - 3760	This report
		Wk-9746	**3861**	46	oyster	3861	3890-3730	3960-3680	This report
Fig Island 2 (Hemmings)	38CH42		3585	160	oyster?	3986	4224-3779	4419-3570	SCIAA site files
Fig Island 2		Wk-10102	**4009**	55	oyster	NR	4100-3920	4190-3850	This report
		Wk-9762	**4112**	50	oyster	NR	4240-4080	4340-4000	This report
Fig Island 3	38CH42	Wk-10104	**4074**	48	oyster	NR	4210-4040	4270-3950	This report
		Wk-9747	**3993**	49	oyster	NR	4080-3920	4150-3850	This report
		Wk-9763	**4030**	50	oyster	NR	4090 - 3920	4160 - 3850	This report
Fig Island Marsh	38CH42	Wk-10106	3709	47	oyster	NR	3690-3550	3770-3470	This report
Spanish Mount	38CH62		3820	185	charcoal	4828	5027 - 4451	5311 - 4245	Sutherland 1974:193
Spanish Mount			4150	350	charcoal	5298	5610 - 4826	5991 - 4246	Cable 1993:172, 176, 190
Large Ford Ring	38BU8	I-2849	3120	110	oyster	3396	3543-3305	3675-3152	Calmes 1968
Large Ford Ring		I-2850	3585	115	charcoal	3881[4]	4083 - 3695	4237 - 3572	Calmes 1968
Small Ford Ring		I-3047	3890	110	charcoal	4327[5]	4506 - 4102	4787 - 3933	Calmes 1968
Sapelo Ring 1	9Mc123	M-39	3600	350	oyster	3986	4490-3554	4901-3152	Williams 1968:329
		M-39	3800	350	oyster	4291	4800-3820	5266-3376	Williams 1968:329
Sapelo, southwest of ring	9Mc123	RL580	4120	200	nutshell	4611[3]	4863 - 4409	5289 - 4010	Simpkins 1975:22
Sapelo UID ring	9Mc123	UGa-73	3430	65	oyster	3805	3869-3686	3965-3615	Elliott and Sassaman 1995:123
Sapelo UID ring		UGa-74	3430	70	oyster	3805	3875-3683	3973-3603	Elliott and Sassaman 1995:123
Sapelo UID ring		UGa-75	3545	65	oyster	3925	4050-3838	4131-3755	Elliott and Sassaman 1995:123
A. Busch Krick	9Mc187	UGa-226	3215	80	conch	3512	3623-3414	3707-3337	Elliott and Sassaman 1995:121
A. Busch Krick		UGa-227	3470	85	oyster	3831	3956-3707	4079-3619	Elliott and Sassaman 1995:121

Ring at Cannon's Point	9GN57	UM-521	3765	90	oyster	4238	4387-4102	4496-3974	Marrinan 1975
		UM-520	4190	90	oyster	4817	4871-4704	5031-4543	Marrinan 1975
West Ring (Cannon's Pt)	9GN57	UM-523	3605	110	oyster	4002	4159-3861	4348-3704	Marrinan 1975
		UM-522	3860	90	oyster	4389	4498-4241	4610-4113	Marrinan 1975
Oxeye Island	8DU7478	WK-7437	**4400**	**60**	oyster	4532	4634-4445	4784-4398	Russo and Saunders 1998
		B-119815	**4570**	**70**	oyster	4807	4844-4701	4951-4567	Russo and Saunders 1998
		B-119814	**4580**	**80**	oyster	4812-4701	4976-4559	4918-4514	Russo and Saunders 1998v
Rollins Bird Sanctuary	8DU7510	B-119816	**3670**	**70**	oyster	3580	3675 - 3470	3770 - 3395	Russo and Saunders 1998
		GX-25750	**3730**	**80**	bulk carbon	4089	4227 - 3842	4351 - 3842	Russo and Saunders 1998
		WK-7433	**2690**	**60**	oyster	2350	2460 - 2315	2610 - 2280	Russo and Saunders 1998
		WK-7438	**3600**	**60**	oyster	3475	3570 - 3420	3640 - 3350	Russo and Saunders 1998
		B-119817	**3710**	**70**	oyster	3630	3710 - 3545	3825 - 3445	Russo and Saunders 1998
		B-50155	**3760**	**60**	oyster	3685	3800 - 3620	3855 - 3540	Russo and Saunders 1998
Guana Shell Ring	8SJ2554	B-154816	**3860**	**60**	oyster	3820	3890-3720	3970-3650	Russo, Heide, and Rolland 2002
		B-154817	**3600**	**50**	oyster	3470	3550-3440	3620-3370	Russo, Heide, and Rolland 2002
		B-165598	**3490**	**70**	oyster	3360	3440-3310	3530-3210	Russo, Heide, and Rolland 2002
		B-165599	**3590**	**70**	oyster	3460	3560-3390	3640-3330	Russo, Heide, and Rolland 2002
Joseph Reed Shell Ring	8MT13	GX-26118	**2850**	**130**	charcoal	2951	3206-2784	3354-2746	Russo and Heide 2000, 2002
		Wk-7435	**3280**	**60**	oyster	3131	3208-3022	3306-2933	Russo and Heide 2000, 2002
		GX-25976	**3455**	**80**	oyster	3340	3426-3245	3527-3139	Russo and Heide 2000, 2002
		GX-25977	**3425**	**75**	oyster	3318	3379-3210	3464-3103	Russo and Heide 2000, 2002
		Wk-7436	**3340**	**60**	oyster	3205	3298-3116	3351-3014	Russo and Heide 2000, 2002
		GX-26119	**3280**	**80**	oyster	3131	3232-2989	3335-2875	Russo and Heide 2000, 2002

*Dates in bold are conventional (corrected for isotopic fractionation). Those in plain font are assumed to be measured RC. To calibrate those dates, Calib 4.1.2 was used. An isotopic fractionation of 0% +/- 0 was supplied for shell and 25% +/- 5 for carbon. While the reservoir correction for the lower Atlantic coast has been adjusted to 36 +/- 14 (http://radiocarbon.pa.qu.ac.uk/marine/), all dates have been corrected using –5 +/- 20.

1. Multiple intercepts of 3434, 3433, 3392
2. Multiple intercepts of 3627, 3621, 3605, 3603, 3573
3. Multiple intercepts of 4783, 4768, 4611, 4597, 4574
4. Multiple intercepts of 3885, 3881, 3871
5. Multiple intercepts of 4350, 4327, 4299

swept, producing a lowered surface over time, or that the surface where the ring was to be placed was either naturally higher or was prepared by raising it (see Leigh's comments on this issue in Appendix 1). Neither of these two hypotheses can be supported by the stratigraphic evidence. There is no lens of embanked sands that might result from sweeping—the interior and exterior of the ring look similar in both profiles—and both trenches bottomed out onto sterile yellow sand. Surprisingly, in neither trench floor was there evidence of the abundant features that are commonly found at the base of rings.

Profiles contain macrostratigraphic evidence only. The uppermost zone was one of oyster shell and humus, under which there was "loosely packed whole oyster shell." The prevalence of this kind of shell fill in rings has been remarked on above. The South trench had no other fills or features. However, in the East trench, there were two lenses, one on either side of the apex of the ring, containing "highly organic soil" and abundant periwinkles. The field notes also mention one feature of organic soil and abundant fish remains.

The excavation yielded 30 bone, antler, and shell artifacts and over 2400 sherds (Hemmings 1970:10). These have never been detailed in publication, but Trinkley (1976, 1980a) analyzed 327 sherds from Fig Island 2 for his thesis research (presumably the bulk of the 2400 sherds were too small to analyze for motif). In comparing the results to Sutherland's (1973) analysis of the Spanish Mount ceramics, he found a similar pattern of a gradual increase of Thoms Creek Shell Punctate and a gradual decrease of Reed Punctate and Reed Drag and Jab through time (Trinkley 1976:66). The fact that the Spanish Mount assemblage does resemble that of Fig Island and does show predictable change through time when analyzed by level rather than by horizontal unit casts some doubt on Cable's interpretation of a lateral accretion for that site.

Overall, Fig Island 2 had less drag and jab and reed punctate and proportionately more plain and shell punctate, which may indicate that Fig Island is a younger site than Spanish Mount. This is borne out by the radiocarbon date from the site, an oyster shell date of 3585 ± 160, younger than both dates from Spanish Mount (Table 2). A sample run earlier produced a date of 1635 ± 160 B.P., which Hemmings stated was "entirely too young" (quoted in Judge [1999]).

Trinkley's (1980b, 1985) work at Lighthouse Point and Stratton Place has been very influential in discussions of ring function. As described in 1802, Lighthouse Point was originally a circular ring midden about 58 to 69 m in diameter, 12 to 15 m in width at the base, 8 m in width at the top, and from 2.5 to 3 m high (Trinkley 1985:156). It was borrowed extensively through the years and leveled in 1975. However, one to two feet of undisturbed midden was present. Under the direction of Coe, the site was tested in 1976 and briefly again in 1979. At Lighthouse Point, care was taken to excavate at what was defined as the four principle loci of the site—the sandy ring interior, the interior ring edge, the ring itself, and the ring exterior edge.

Stratton Place had also been heavily borrowed by landowners, though was in better condition than Lighthouse Point (Trinkley 1980b:250). (Two additional shell rings, Buzzards Island and Crows Island are within 2000 ft of the Stratton Place ring [Trinkley 1980b:248]). This ring appeared crecsentic in shape, and just two feet high at its highest point. Excavations at Stratton Place were intended to focus on documentation of activities in the ring center (though the interior ring edge was also tested in some units) and to provide data on material culture, subsistence, and intra-site patterning for comparison with the more extensively excavated Lighthouse Point.

A wealth of data is available from Trinkley's (1980b, 1985) report of excavations at these two sites. Lighthouse Point in particular yielded important information on material culture and on subsistence. Subsistence studies, however, were compromised by the use of ¼ and ½ inch mesh, though feature fill samples were 1/8 or 1/16 inch screened (Trinkley 1980b:145). Particularly intriguing in this respect was the recovery of 36 coprolite fragments—one coprolite had catfish cranium remains and catfish otoliths. Soils analysis indicated that midden soils had a high percentage of silt and clay, suggesting that midden soils were primarily wind blown particles and humus from intentional deposition (Trinkley 1980b:225).

Five radiocarbon dates are available from the site (Table 2). The uncorrected dates are given in Trinkley (1980b:191-192), after which he presents a dendrological correction. It is unclear whether these were corrected for isotopic fractionation. The dates in the calibrated columns of Table 2 have been corrected for fractionation and calibrated. One quite young date (with a relatively large sigma) is called "anomalous" by Trinkley (1980b:192). Leaving out this date, a one sigma range for the occupation extends between 3688 and 3275 B.P. and, at two sigma, the occupation extends between 3827 to 3213 B.P.

Most important for this discussion, Trinkley was adamant about site function. On the basis of the lensing of deposits at Lighthouse Point and Stratton Place, of a literature review that showed similar phenomenon at other sites, of the presence of postholes beneath the shell and the suspicion that more postholes were present but could not be identified in the shelly matrix, of the presence of food processing pits beneath the shell, and of soil Ph and phosphate content that dropped dramatically in the interior and exterior ring areas, Trinkley concluded that habitations existed on the ring itself. Daily refuse was deposited over the sides of the ring, and the ring gradually extended outward from "the occasional flattening of the existing midden" (Trinkley 1985:111). It is difficult, however, to envision how or why rings would grow in height if this were the standard procedure. Trinkley summed up his reconstruction in this manner: "Fundamentally, the circular shape of the shell rings may be related to the egalitarian nature of Early Woodland societies, where a circular clustering of habitations would promote communication and social interaction" (Trinkley 1985:118).

In Georgia, Waring and Larson (1968) provided the baseline data for shell ring research in their excavations at the Sapelo Shell Rings. As noted previously, the site was described as containing three rings by McKinley (1873), but on Moore's (1897) subsequent visit, Rings 2 and 3 (described by McKinley as 210 feet wide and 3 feet high and 150 feet wide and "just like No. 2," respectively) had apparently been plowed or borrowed. Visiting the site in 1949, Waring surmised that they had been borrowed to use in construction of ante-bellum tabby structures. In a profile of an excavation into the surviving Ring 1, done by the landowner's foreman, Waring (Waring and Larson 1968:268) observed three construction phases, with "what appears to be a parched clay surface on at least one of the stages, possibly two." The authors also observed that a section of the wall on the southeast side of Ring 1 was lower than the rest of the ring, and suggested that that "most accessible side" may also have been borrowed (Waring and Larson 1968:268).

Waring excavated a 10 x 10 ft unit in the center of the ring, and found "the surface surprisingly clean." Only 10 or 20 oyster shells were recovered, along with a single fiber tempered ceramic.

Next, the authors tested Sapelo Ring 1 with a 100 ft trench running from the approximate center of the ring north (NWN) to the outer edge of the ring. Excavations were conducted by natural rather than arbitrary horizontal units, so that each of the four units tested discrete locations of the ring: Units 1 and 2 tested different portions of the ring interior, Unit 3 the inner edge of the ring (where the only shell had apparently slumped off the top of the ring), Unit 4 the consolidated ring, and Unit 5, the portion of the outer ring analogous to Unit 3.

Profiles of the ring indicated four distinct fill episodes:

Stratum 1 (Levels 1-4): mixed shell and dark sandy soil.
Stratum 2 (Levels 5-8): a layer of loose shell, in which there was almost a total absence of sand or loam.
Stratum 3 (Levels 9-11): similar to Stratum 1
Stratum 4 (Levels 12-17): "again almost pure shell" resting on sterile yellow sand.

Waring and Larson observed six small (2 ft diameter) pits "excavated before the first midden layer was deposited," but believed that shell deposition started shortly thereafter because shell midden extended into pits. Several ash lenses were identified in the eastern profile of Stratum 3, which also had several pits, one of which was identified as a cooking pit. The authors complained that the shell was so loose in some areas, it was impossible to define fireplaces and pit areas during the excavation.

Two shell samples from the basal levels, which contained only plain pottery (decorated pottery appeared in Level 5 and baked clay objects disappeared in Level 8), yielded dates of 3600 and 3800, both with sigmas of 350 years. These dates were uncorrected but averaged to 3700 ± 250 (see discussion in Williams 1968:329), which seems to indicate that Waring and Larson believed the dates were from a single deposit. Correcting for isotopic fractionation and reservoir effect and calibrating these dates produces calibrated intercepts of 3956 and 4233 B.P.

Waring and Larson (1968:273) concluded that “no matter to what use the ring ultimately may have been put, it was composed of occupational midden in primary position which was deposited as the result of habitation sites located on the ring.” Nevertheless, the shape of the site and the “scrupulously clean” interior of the site was so unusual in their experience, that the authors concluded that the site “very likely represents a ceremonial or social arrangement rather unusual in this geographic location and time horizon” (Waring and Larson 1968:273). In another short discussion on the Archaic period, apparently written between 1952 and 1956, in a succinct formulation of what Hayden (1995) would eventually develop into a model for subsistence strategies for complex foragers, Waring (1968b:245) observed that shell rings, as complex architecture, could exist prior to agriculture because “our Late Archaic population had food on all sides the year round” and continued: “and a mild enough climate so that a minimum of time was required to protect themselves from the rigors of the weather. As for their function, he continued (1968:246) “Lord only knows. They were certainly ceremonial enclosures of some sort and reflect a level of ritual complexity only partially suspected for so remote a period. The group of three on Sapelo surrounded by low shell refuse piles suggests a real community plan, something that most authorities have denied existed in the Archaic.”

Larson directed further excavations at Sapelo in 1974 and 1975 (Simpkins and McMichael 1976; Simpkins 1975). Part of the research design included determining whether there was a major occupation outside of the ring, as the shell middens indicated. These low mounds, of which there were said to be “hundreds” (Waring and Larson 1968a:267), were about three feet high and had bases between 20 and 50 ft in diameter. Simpkins and McMichael (1976) tested several of these “mounds” south of the ring and found fiber tempered wares in lower levels but at least some of the shell appeared to have been deposited in the Irene and Altamaha/San Marcos phases. However, fiber tempered material appeared to be present throughout the site area in both shell and non-shell contexts.

In a 2 X 5 m unit, Larson uncovered what was interpreted as a midden-filled refuse pit associated with a possible house floor. A radiocarbon date on charred hickory nut fragments from the feature produced an uncorrected (Elliott and Sassaman 1995:123) date of 4120 ± 200 B.P. Correcting and calibrating this date produced multiple (5) intercepts; the central date was 4611 ± 204 B.P. This date is still somewhat older than the intercepts for the base of the ring. Given the large sigmas for all three dates from the Sapelo Ring site, all three dates almost overlap at 1 sigma (the minimum range for the charcoal date [4409 B.P.] is only a year younger than the maximum range for the 3600 B.P. date [4410 B.P.]) and all dates overlap at two sigma. Thus, it is unclear whether this hypothetical structure was contemporaneous with the ring. If it was, it suggests habitation off the ring, in addition to or instead of on the ring. If it was not, it suggests that settlement patterns were quite different in the hundred years or so before the ring was built. Additional work by the University of Kentucky is underway at Sapelo and additional excavations and radiocarbon samples (hopefully with smaller sigmas) may clarify this situation.

Some additional dates with smaller sigmas are available. A few years prior to Larson's excavations, three additional samples from the site were submitted by V.J. Henry of the Skidaway Institute of Oceanography. The samples were taken from "a relatively undisturbed ring of ca. 50 m diameter and 2 to 3 m high." Two of these dates, on oyster at 1 and 2 m below surface, returned nearly identical results of 3430 ± 65 and 3430 ± 70 B.P. (Uga-73, 74). The third date, 3545 ± 65 B.P. (Uga-75) was on oyster 2 m deep from a "remnant of one of the neighboring rings that were partially quarried" (Noakes and Brandau 1974:133). It is unclear where the samples were taken. Simpkins (1976:23-24) reported a possible remnant of McKinley's ring No. 2 northeast across a marshy swale from Ring 1. Two units were placed in this area. Late prehistoric and Mission period artifacts were recovered; "St. Simons" sherds increased with depth. The researchers were unable to confirm the presence of a ring in this location. Simpkins reported that there was no evidence of Ring No. 3.

In any event, these unprovenienced dates probably came from across the swale. Because Larson's dates were uncorrected, it is reasonable to suppose that these dates, run a few years earlier, were also not corrected for isotopic fractionation. Correction for isotopic fractionation and reservoir effect, and calibrating, the intercepts are 3715 B.P. for the two 3430 dates and 3875 B.P. for the 3545 date. Again the large sigmas of the ring dates makes comparison difficult and contemporaneity between the ring and the outlying deposit is still unclear.

Waring also did limited work at the Oemler Marsh Midden North (9CH14) ring near Savannah. Waring described two shell rings in proximity, not more than four feet high and seventy-five feet in circumference. Writing in 1940, prior to his work on Sapelo, Waring (1968a:182-183) described the "curious atoll-like ring formation," and theorized that the sites might be fish wiers but more likely represented "midden accumulation around the edges of some pile structure placed near the creeklets as a primary fishing station."

According to Marrinan (1975:125), Oemler Marsh Midden North was initially tested by a WPA crew. Waring (1968a:182-183) excavated what appears to be the standard 10 X 10 foot unit. Contrasting the results of this excavation with the richness of the Bilbo site, Waring noted that only 12 sherds were recovered and that the shell lacked the lenses of dense bone and ash found at Bilbo. DePratter (1979) surface collected at the site, recovering an additional 34 sherds, two possible baked clay objects, and a bone pin fragment. He also recovered six sandy sherds which he likened to Awendaw (DePratter 1979:42).

DePratter also investigated the South Ring (9CH77), the Ring Near Skidaway (9CH111), 9CH203, and 9CH377, all in coastal Chatham County, Georgia. He made surface collections at each and excavated small test units at South Ring. All sites yielded St. Simons Plain and most had a few punctated sherds, though as is common on the Georgia coast, all collections had a preponderance of plain sherds. In Glynn County, DePratter tested Bony Hammock (9GN53), which, in addition to containing a crescentic shell midden with a small amount of St. Simons Plain, had a 1 ft to 1.5 ft earth midden, which also contained pottery, bone, and baked clay objects. DePratter (1979:52) noted that, despite the paucity of pottery in the excavation, and the fact that the majority of it was plain, there were large numbers of decorated sherds from disturbed areas that were reminiscent of Orange wares.

Creighton Island, located between Sapelo Island and the mainland, contains the A. Busch Krick site, a semicircular midden about 38 m in diameter and between 1.2 and 2.1 m in height (Elliott and Sassaman 1995:121, DePratter 1979). This was tested by Crusoe and Depratter (1976; Elliott and Sassaman 1995) with a 3 X 25 ft (0.9 m X 7.6 m) trench and a 6 X 6 ft (1.8 X1.8 m) unit in the shell. Pottery was abundant in the excavations, and predominantly plain. DePratter (1979:50) observed that “crab was especially abundant in some levels, while absent completely in others.” At 1.1 mbs, they encountered a portion of a circular area of crushed shell 23 cm thick and 3.6 m in diameter; a possible hearth was located in the center of this feature. The contact between the crushed shell and unbroken shell was quite distinct, and, because of this, DePratter (1979:50) suggested that the crushed shell was the floor of a structure with permanent walls, though no postholes were found.

Two uncorrected radiocarbon dates are available from the site, one on conch shell from the midden base and one on oyster 30-40 cm above the base. The samples dated to 3215 ± 80 and 3470 ± 85, respectively. Corrected and calibrated, the intercepts for these dates are 3459 and 3804.

Marrinan conducted excavations at the Ring at Cannon’s Point (9Gn57; also the Marsh Ring) and the West Ring 85 m to the southwest, between 1973 and 1975. The West Ring is on high ground, but the Marsh Ring can be completely surrounded by water during higher tides. Three by three meter units were placed in both rings and in non-shell areas in the marsh itself. Two radiocarbon samples from each ring were submitted from the uppermost and lowest levels; all four dates were on oyster. The Marsh Ring dated between 3765 ± 90 and 4190 ± 90 for the upper and lower levels and the West ring between 3605 ± 110 and 3860 ± 09 (Table 2). Calibrated intercepts are 4176 and 4797 for the Marsh Ring and 3961 and 4338 for the West Ring. Correction and calibration increase the temporal distance between the upper and lower levels in both series of samples. Basal dates do not overlap at 1 sigma. They do overlap at two, but only slightly. Upper levels overlap at both 1 and 2 sigma. While conceding that the sigmas for these dates made determination difficult, Marrinan (1975:) suggested that the rings were successively occupied. If so, the Marsh Ring would have been occupied first and longest, and the West Ring later and for a smaller period of time. However, it does not appear that inundation from isostatic or eustatic sea level change was responsible for the shift in settlement location. The youngest radiocarbon dates, ca. 2850 B.P., are from the marsh units, where fiber tempered pottery was found in association with grit tempered pottery. The latter may be Refuge, according to Marrinan (1975:60). Interestingly, the fiber tempered sherds associated with the Refuge pottery contained a “very high frequency of grit inclusions” whereas only occasional grit inclusions were noted in the fiber tempered pottery from the rings (Marrinan 1975:61).

While Marrinan chose not to enter the fray over the proper terminology for fiber tempered pottery on the Georgia coast, she did note that the typical Stallings motif, linear punctated, was not recovered from Cannon's Point. She also noted that some distinctive Orange pottery was present, including the rare Tick Island Incised. These Orange II sherds appear to have had a limited distribution at the site. They were recovered only from the basal levels of the east arc of the West Ring, while the other Orange motifs were from the first three levels of the Marsh Ring.

Little stratigraphic data are available from the site; according to Marrinan, the process of ring deposition was unclear. She did question whether some lower levels of the Marsh ring might have been redeposited borrowed midden on the basis of the looseness of the shell and the presence of disarticulated human skeletal material. On the question of ring function, Marrinan noted only that they were obviously purposeful constructions. She added:

> Regardless of the "obvious waste of energy" involved, ring accumulations of shell are preferred as *the* way midden material should be piled. There are over 30 ring sites—hardly a happenstance situation. Whether people lived on them, in them, or around them, a circular accumulation of shell refuse in the habitation area was required. In at least two instances (Cannon's Point and Hilton Head) two rings were being accumulated simultaneously. The attention to symmetry and the recognition of a collective desire for this sort of edifice is as real as any Midwestern earthen effigy mound or British long barrow.

Shell ring research in Florida lagged behind that in other areas until recently. Until a few years ago, the Rollins Shell Ring and the Joseph Reed Shell Ring were the only two rings known (Russo and Heide 2000:8). Rollins Shell Ring was identified by Goggin in 1957 and Joseph Reed by Sears in 1965. In 1985 Tesar and Baker identified the Guana River Shell Ring near St. Augustine. A concerted effort by those involved in this project, and particularly by Russo and Heide, has resulted in the survey, mapping, and some investigation into these sites and the definition of one more Atlantic coast site, Oxeye Island.

In 1992, Russo (1992; Russo et al. 1993) identified a shell ring near Jacksonville, Florida, on Fort George Island at the mouth of the St. Johns River. The ring was unusual with respect to the configuration of rings previously identified in South Carolina and Georgia. It was much larger than those rings, nearly 250 m in outside diameter, and had as many as 10 smaller rings or enclosures attached to the exterior. These smaller enclosures, which are not present at most ring sites, are thought to represent "exclusionary special activity areas for small groups" (Russo and Heide 2000:12). Similar smaller enclosures have only been mapped at one other site, Fig Island 1.

Russo's 1992 survey of the site included systematic shovel testing, which confirmed a relatively sterile ring interior and an Orange fiber tempered ceramic association for the ring deposits. Exterior to the ring, however, were "large areas with moderate amounts of shell and fiber tempered pottery" and "areas with little or no shell but containing fiber tempered pottery were also found" (Russo et al. 1993:100). The presence of amorphous middens outside the ring recalls the situation at Sapelo. These exterior deposits have not yet been dated, however, so it is unclear whether or not the two different site types were contemporaneous. Russo secured a radiocarbon sample from a 1.5 X 1.5 m unit (one of two excavated on the ring itself) which returned a corrected date of 3760 ± 60 and a calibrated date of 3685 B.P. (Table 2).

Subsequently, Russo and Saunders returned to Rollins as part of a larger research project intended to address the question of site function. Ten 1 X 2 m units were excavated in various areas of the site, including the ring interior, the interior of the "ringlets," and the eastern arm of the ring. Additionally, to explore ring depositional processes, a 16 X 1 m trench was dug in the western arm, extending from the edge of a ringlet through the ring and into the main ring interior. Profiles of the trench revealed what appeared to be three depositional episodes of the main portion of the ring, each consisting of large deposits of loose, whole oyster, abundant small fish bone, and crab claws; there was little to no soil associated with these deposits. Each of these deposits was capped with a thin (1-3 cm) lens of humic sand or clayey sand. Overlying the whole was a 20 cm thick midden composed of moderate whole and broken oyster in a dark grayish-brown to brown humic sand. Saunders (1999; Russo and Saunders 1999; Saunders and Russo 2000) speculated that the loose shell and bone were deposited as part of a feasting ceremonies accompanying macrobanding of the foraging population of the Fort George Island area. Radiocarbon dates on oyster from the western and eastern arm were virtually identical (calibrated intercepts of 3580 ± 70 and 3620 ± 70, respectively), indicating that the ring was a planned construction.

Underlying the ring midden was a 20 cm thick earth midden containing Orange pottery, bone, and shell tools. When that midden was removed, nine features intruding into sterile yellow sand were observed. These were earth-filled and contained little refuse of any kind. Six of these bottomed out onto small (20 cm diameter) circular to subcircular areas of particulate charcoal and sand. These might be postholes with the post bases burned in situ, some kind of smudge, or earthen cooking pits. Whatever their function, temperatures did not get high enough to affect the color or texture of the surrounding sands.

It is unclear whether the earth midden deposits and the features were deposited immediately prior to ring construction or preceded shell deposition by some time. A radiocarbon assay on bulk carbon from the base of Feature 11, one of the aforementioned features with a particulate charcoal base, calibrated significantly earlier (cal intercept 4089 B.P., Table 2) than the base of the ring midden. An OCR date run on soil from the same feature yielded a date of 3839 B.P. ± 115.

Russo et al. (1993; Russo and Saunders 1998) identified a much earlier ring at the nearby Oxeye Island Site. This ring, almost completely submerged in marsh, is the only pre-ceramic ring known on the lower Atlantic coast. Its submergence made mapping and excavation difficult, but using 10 ft probes to locate buried shell, the site was mapped as

170 m in outside diameter. A small (1 X 4 m) trench was excavated on the northwestern side of the ring where shell was subaerially exposed. Using pumps, the excavation could be completed to the base of the midden. The excavation revealed a 1.4 m deep deposit with a corrected basal date of 4570 ± 70. Shell from 10-15 cm below surface of the trench indicated a relatively short-lived occupation. Final shell deposits occurred around 4400 ± 60 B.P..

A shovel test into a submerged portion of the south side of the ring indicated 2 meters of shell in that area. Shell recovered from the base of the shovel test yielded a date of 4580 ± 80 B.P.; quite consistent with that of the base of the terrestrial trench. In addition, preserved, uncarbonized, culturally modified wood fragments, charred nuts, and green palm leaves were recovered from this permanently inundated portion of the site, indicating that there is great potential for cultural reconstruction in submerged sites of the Archaic period along the lower Atlantic coast. Artifacts from the trench consisted solely of amorphous baked clay object fragments, shell tools, and a few bone pin fragments.

As mentioned previously, the Guana River Shell Ring was identified in 1985. The site was probed, mapped and tested by Russo, Heide, and Rolland (2002). Thirteen shovel tests and one 1 x 2 m unit were dug in the ring. Artifacts from these tests indicated that the ring had an Orange cultural association though some St. Johns sherds were also recovered, making this one of the few ring sites to show evidence of post-Archaic deposition on the ring itself. Evidence of the intense activity that generally occurred at ring sites prior to shell deposition was found. At least one, and maybe two features were found at the base of shell in the shovel tests.

Four radiocarbon dates are available from Guana. These samples were taken from widely separated areas at the base of the ring midden. Two are, for all practical purposes, contemporaneous, with calibrated intercepts at 3460 and 3470, and another produced an intercept of 3360, which overlaps with the other two dates at 1 sigma. One somewhat earlier date of 3820 B.P. was recovered from deposits that may have preceded actual ring deposition (Russo, Heide, and Rolland 2002:22-23).

Finally, Russo and Heide (2000, 2002) tested the Joseph Reed Shell Ring (8Mt13) in Hobe Sound National Wildlife Refuge near Cape Canaveral. The ring is large, 250 m in diameter; a size similar to Rollins. Unlike Rollins, the site appears to have been a simple crescent with no additional ring-like appendages. In a three day investigation, four 1 X 1 m test units were placed into the site, one on the ring at the northern side which is considerably lower then the western and southern portions of the site, two on the southern side where the ring was highest, and one in the ring interior on the southern side.

Stratigraphy in each of the shell units was different. In Unit 1, there appeared to be a series of living floors separated by sterile sand, after which 80- 100 m of shell was deposited. No such floors were visible in Unit 2, where two distinct shell deposits contained hardly any soil whatsoever. Russo and Heide (2000:64) speculated that Unit 1 contained a living floor but that the shell in Unit 2 and elsewhere was intentionally mounded. Unit 3, in the ring interior, appeared to test only wind and water deposited soils laid down after the site was abandoned. Unit 4, in the lowest portion of the ring, consisted of three linear depositional episodes, two of which were separated by a thin lens of sand.

Six radiocarbon dates suggested an occupation between 3500 and ca. 3100 B.P. (Russo and Heide 2000:63). Surprisingly, two types of pottery were found; both with only a plain surface treatment. One was a sandy ware not coarse enough to classify as the Belle Glade paste common to the area by about 2500 B.P. The second ware contained abundant sponge spicules similar to St. Johns pottery, but with vessel forms unlike that described for the earliest examples of that pottery, which, again, was not commonly recognized as occurring until about 2500 years ago, and then as originating in the St. Johns River valley. The two basal sherds of this type recovered appeared to be flat bases, perhaps similar to the forms occurring in contemporaneous Orange wares farther north, not the conical bases of the later Early Woodland St. Johns wares.

Russo and Heide (2000:69-70) summarized their findings at Joseph Reed in this manner:

> To recapitulate the building episodes, construction began some 3500 years ago with shell being placed directly upon a sand foundation which either occurred naturally or was brought in for preparation in building the ring. Over the next couple of hundred years, great mounds of shell refuse, the result of feasting activities, were placed directly on the sand in a ring shape. At other areas of the ring, living activities such as food preparation, consumption, and non-mounded discard took place on the sand leaving behind shell, charcoal, and other organic remains as well as pottery, lithic flakes, and bone pins. These living episodes overlain with sand were repeated several times before being sealed permanently by great mounded quantities of shell which make up the majority of the elevated ring.

Discussion

Information has been given on all Late Archaic shell rings of the lower Atlantic coast that have been subjected to subsurface testing. This overview of the results and interpretations of the different investigations indicates that much more research on shell rings is needed before any kind of understanding of the similarities and differences between shell rings as a group and between shell rings and other contemporaneous site types can be reached. For instance, on the basis of comparative information available in 1975 and on her research at Cannon’s Point, Marrinan suggested that, in comparison with amorphous midden sites, shell rings have depauperate artifact assemblages. Michie (1979), working at the Bass Pond Dam site, suggested that sites he defined as base camps, such as Bass Pond, do have a more diversified material cultural assemblage, representing a larger class of activities, than occur at shell rings. Trinkley (1980b:311-313) has taken issue with this argument, demonstrating in a table that much the same artifact classes occur in both amorphous midden and shell ring sites. Both Michie and Trinkley took a presence/absence approach to these data. Looking at quantity rather than presence absence might lead to a different conclusion, but comparisons may be limited due to different approaches to excavation and analysis by different researchers.

A few other aspects of shell ring morphology also cast doubt on the village interpretation. One of these is the evidence for intentional mounding of shell, those large areas, certainly representative of more than a single meal, of clean loose shell noted by researchers at Ford Shell Ring, Sea Pines, Fig Island, Sapelo, Rollins, and Joseph Reed. These may have existed at other sites. Those that are inundated or partially inundated (e.g., Joseph Reed and Oxeye) may have sediments that infilled after midden deposition.

A second aspect is the presence of smaller enclosures at Fig Island 1 and Rollins. At Rollins, these ringlets share characteristics, such as relatively sterile interiors, with their larger counterparts, but their existence hints at activities more complex than simple egalitarian village habitation. At Fig Island, a 1 x 2 m unit into one of the small enclosure banks produced more artifacts than all other test units combined, again suggesting a more heterogenous social system than has been modeled for the village interpretation.

A third aspect is the height of some of these rings. Logistically, it seems difficult to believe that people would regularly ascend and descend the steep slopes of the Sapelo ring or the Fig Island 1 ring without eventually causing severe erosion, and ultimately leveling in some areas. Indeed, the process of ring formation envisioned by Trinkley would seem to lead to lower, flatter areas that expanded outward, away from the ring center, through time. Yet, this is not the configuration of any ring. Most rings are not flat-topped, and height rather than width seems to be emphasized.

Thus, the function of shell rings in the reconstruction of Archaic lifeways, and in the larger arena of the explication of the rise of complex societies, is still a topic worthy of study. These issues are not likely to be resolved in the near future. Current and future excavations and on-going analysis of newly-excavated and older assemblages are necessary to continue to explore these issues.

CHAPTER 5:
RESEARCH DESIGN

As part of a long-term study to understand the origins, forms, and functions of Archaic shell rings over time and space (Russo and Saunders 1999; Saunders and Russo 2000; Saunders 1999), the co-Principal Investigators proposed a multi-disciplinary study of the Fig Island shell ring site. The study included computer mapping; soil chemistry; stratigraphic analysis using deep coring and limited excavation; radiocarbon dating; and faunal analysis. Ultimately, the data generated from this effort can be compared with results of similar work completed in northeast (Russo and Saunders 1999) and southeast (Russo and Heide 2000, 2002; Russo, Heide, and Rolland 2002) Florida. This long-term research program is designed to identify the environmental and sociocultural factors that led to the rise sociocultural complexity on the post-Pleistocene coasts of the southeastern United States.

Until recently, the Middle to late Archaic Stage was considered a time of egalitarian hunter-gatherer societies. The demonstrated presence of monumental architecture among transegalitarian peoples in the Lower Mississippi River Valley (e.g., Saunders et al.) and in Florida (Russo 1996b) has forced a reevaluation of anthropological models of cultural evolution, which, heretofore, had coupled monumental architecture with hereditary ranking and an agricultural subsistence base. In this previous model, agriculture was seen as the only subsistence base capable of providing a food surplus; this surplus freed a part of the society's labor force to engage in civic construction projects. Labor was controlled, possibly under threat of force, by the hereditary leader or chief. Archaic societies were considered to have depended primarily on fishing, gathering, and hunting for subsistence; therefore they were incapable of supplying food surpluses to support large scale public construction efforts. They also lacked the organizational wherewithal, having no permanent leadership to command labor for the projects. While it is now generally recognized that fishing, gathering, and hunting in estuarine environments can produce food surpluses, there is still no evidence for anything other than temporary leadership roles. Anthropological archaeologists are still debating how labor was motivated, organized, and controlled in the construction of monumental architecture in the absence of strong, stable central leadership.

We see the purposeful mounding of subsistence remains, seen at so many ring sites, as evidence that rings were more than the accumulation of daily refuse. Ethnological and archaeological exploration into the avenues towards achieved status indicate that one of most pervasive methods in transegalitarian (and hierarchical) societies is in the organization of feasts (e.g., Friedman and Rowlands 1978; Hayden 1990, 1995a; Junker et al. 1994; Young 1971). The evidence, from the Northwest Coast (Hayden 1990, 1996), New Guinea (Feil 1987; Young 1971), other parts of Melanesia (Chowning 1979; Strathern 1971), and MesoAmerica (Clark and Blake 1994; Hayden and Gargett 1990) is persuasive. Feasts may be intra- or intercommunity, and they may be cooperative or competitive; many contain elements of both. Various admixtures of these attributes can serve to reinforce community cooperation and integration or emphasize differentiation within or between communities (see Potter

2000, and below, for other aspects of variability). Given the ethnographic ubiquity of feasting, it seems entirely reasonable to propose that feasting activities took place among and between peoples of the Late Archaic cultures of the lower Atlantic coast. It also seems possible that intercommunity feasting similar to the macrobanding described by Gould (1980) may have been one of the principal means for mobilizing labor, arranging marriages, and exchanging information. Noting that in Adler and Wilshusen's (1990) cross-cultural examination of "integrative facilities" in tribal societies, virtually all 28 societies studied had a physically separate area for integrative activities, we might look for distinct "feasting" sites on the Late Archaic landscape. Shell rings may be those sites. Indeed, Archaic rings may have functioned something like later earthen enclosures, which, according to Mainfort and Sullivan (1998:11), commemorated and enshrined specific sets of actions. The landscape thus created served as "physical reminders and manifestations of successfully completed rituals." In the case of shell rings, I suggest that the rings themselves were composed of the remains of the feast. The labor involved in their construction represents a classic case of conspicuous consumption (Trigger 1990). When completed, rings were consumption made conspicuous.

The problem, of course, is how to distinguish a hypothetical village refuse heap from purposefully mounded feasting remains (Saunders 1999 reviews possible evidence at length). At first blush, this should be an easy exercise, but isolating convincing criteria is harder when the task is at hand. Trinkley (1985:117) used the "kitchen refuse" nature of the midden remains, and the presence of numerous postholes and steaming and roasting pits at the base of the shell rings, as support for domestic as opposed to a ceremonial function for the sites. We would argue that these data just as easily support the argument for feasting remains. The bulk of the features from ring sites originate *below* the ring; the density of features there suggest a great deal of activity prior to ring deposition that is not repeated once ring deposition began. We suggest this is site preparation for the initial ring construction. We acknowledge that such activities could also precede village construction, but reiterate the lack of evidence for similar activities in the bulk of ring middens excavated. We also suggest that it may be difficult to distinguish feasting remains from daily fare. Only in the more elaborated competitive feasts are special foods incorporated (Hayden 1995a). In cooperative feasts, the distinguishing characteristic is quantity, not quality. Seasonality derived from the remains of the feast, however, might be expected to show strongly seasonal deposits. Material culture might be different. Different vessel forms, more elaborate designs, or simply more decorated vessels might be present, as Michie (1979) suggested.

Our research was designed to develop information to describe the lifeways of the peoples who built the rings and to determine the function of the rings. While we know that a single, short field season and the attendant analysis are unlikely to produce enough information to resolve the debate over ring function, in time we will be able to conjoin the information developed for this report with other data, similarly derived, from other sites for a more thorough understanding of shell ring sites and their creators.

The field season was planned with several, interdependent goals. A detailed map of the site was considered a prerequisite for any understanding of the site. We also needed stratigraphic information, data on subsistence and seasonality, information on material culture, and radiocarbon dates—to place the site in a temporal context and to provide information on the "material correlates" of feasting as described above.

As one of our primary goals, we produced the first detailed maps of all three shell features that comprise the Fig Island shell ring complex. Using a laser transit and a computerized data recorder, Heide produced contour maps that can be manipulated using Surfer and Arcview software to reveal the configuration of the rings. Mapping included subsurface probing for shell in the marsh with 2 m probes so that shell deposits now buried by marsh were included. Mapping using current technology, coupled with probing for subsurface shell, has produced significant new information on the configuration of these rings.

The production and interpretation of the detailed three-dimensional maps is complemented by soils analyses conducted David Leigh of the Department of Geology, University of Georgia. Soils analysis of the stratigraphy of deep cores judgmentally placed on the rings, in the ring interiors, and between the rings, enabled us to reconstruct the environmental setting of the rings at the time they were constructed.

In addition to the mapping and coring, we conducted small test excavations in each of the rings. These excavations provided information on stratigraphy of the rings, including evidence for intentional mounding of shell and other materials; evidence for the rapidity of ring construction via stratigraphy and radiocarbon dates; evidence for contemporaneity between the rings (or sequential construction) using radiocarbon dates and artifacts; evidence for season(s) of site use from fine screened faunal samples from each ring, and evidence of subsistence and inferred subsistence technology.

Ultimately, using all the independently-derived data from the mapping, coring, and excavation, we may be able to adequately assess the degree of sociopolitical complexity of the occupants of the site.

CHAPTER 6:
MAPPING OF THE FIG ISLAND SHELL RINGS

Since the mapping of the Oxeye Island Shell Ring (Russo and Saunders 1999) and Guana River Shell Ring (Russo et al. 2002) it has become a common practice for the author to use stainless steel probes to determine and map shell thickness in conjunction with mapping topographic data. The probing data often reveals the location of shell that is hidden under the ground surface where topographic mapping cannot distinguish its presence. Additionally, using probes to determine shell thickness has allowed for more accurate estimates of shell volume and can give clues as to where disturbance may have occurred at a site. While we had once questioned the accuracy of probing shell, recent work at Guana River Shell Ring has shown that probe data is accurate with an average error of 13 cm (Russo et al. 2002). Since the Fig Island shell ring complex was located in a salt marsh environment which has been slowly encroaching upon the rings since there construction approximately 4000 years ago (cf. Leigh, Appendix 1), it was felt that topographic mapping, in conjunction with shell probing, would be particularly effective in exploring the Fig Island shell rings.

Establishing a permanent datum and baselines

Mapping at Fig Island began with a visual inspection of the site in order to assess the areas to be mapped and to determine if one large grid could be placed around all three rings, or if each ring would need its own grid. After examining the area around the rings it was decided, based on the difficulty of accessing some parts of the salt marsh, that each ring would need to have its own individual grid. However, the coordinates used on each grid would be tied into a common site coordinate system. An arbitrary point was chosen to be the site datum (Figure 3) and was designated with the arbitrary coordinates 1000 North, 2000 East, with an estimated elevation of 1.5 m above mean sea level (amsl). A Trimble Geoexplorer II was used to obtain UTM coordinates for this point (Table3). With the site datum in place, a 280 m long base line, with flagged points placed every 10 meters, was set to the north of 1000N, 2000E. A second base line was extended 140 m to the east of the site datum. With these base lines in place, a transit and pulled tapes were used to place grids around each of the individual rings as discussed below.

Table 3. UTM coordinates for site datum.

UTM Coordinates for Site Datum (1000N,2000E)	UTM NAD 27	UTM NAD83	LAT/LONG WGS84
Easting	576367.695	573652.867	-80.2153
Northing	3603718.206	3603928.369	32.5703

Gridding, Probing, and Mapping the rings

Below is a discussion of the gridding, probing, and mapping of each ring. A discussion of the grid size, the results of the mapping, and any problems that were encountered are included. The order in which the rings are discussed is the order in which each was gridded, probed, and mapped.

Figure 3. Digital Orthophoto Quarter-Quadrangle of the Fig Island Ring Complex showing the rings and the site datum.

Fig Island 2

Fig Island 2 was the first ring that was mapped (Figure 4). It was decided that a 5 m grid, which would provide enough mapping points for the interpolation of the topography of the ring. The grid was extended to at least 5 meters beyond the visual edge of the ring. With the grid flags in place, probing was done at each grid point. Extra grid points were placed along the visual edge of the ring in order to better define the edges and to make sure that any buried shell was recorded. For each probe the following information was recorded on a pin flag: the presence or absence of shell, the starting depth of the shell (if present), and the depth at which the shell ended. In total 831 points were probed (Table 4), 420 of which were predetermined grid points, while 411 were placed where additional information was required, usually at the shell edge. After probing was completed, a Leica Total Station was used to plot in the location and surface height of all of the shell probes. The total station recorded the north and east coordinates and the surface elevation of each probe location, as well as the probing information recorded on the pin flags. Each night the data were downloaded and maps were made. The maps were used to identify problem areas that might need more probing and/or surface elevation readings.

Table 4. Summary of probing data for all three rings.

Probing Statistics	Fig 1	Fig 2	Fig 3	Total
Total Probes	1370	831	657	2858
Probing Interval	5 m	5 m	2.5 m	-
Probes without Shell	591	447	356	1394
Probes with Shell	779	384	301	1464

Probing revealed that the topographically visible edge of the ring was generally also the true ring edge. In other words, the outside edge of the ring had not experienced much burial by the encroaching marsh; very little buried shell was found outside the edges of the ring. As expected, little to no shell was found on the interior (plaza) of the ring. The locations of Hemming's 1970s trenches, whose backfilled had settled, were easily relocated.

Probing in the marsh between Fig Island 2 and 3 revealed a ca. 8 m expanse of shell buried beneath 10 cm of marsh muck between the two structures. The shell was scattered as opposed to dense and ranged in depth between about 5 and 40 cm, with the thickest portions closest to what may be ramps leading up the sides of Fig Island 2 and 3. A shovel test (ST 1; see Chapter 8) placed in the shell area confirmed the presence of shell between the two rings. The probable walkway is now very thin and it is speculated that time, storms, and tides may have eroded the walkway, spreading the shell out and making it thinner and wider than it may once have been (Figure 5).

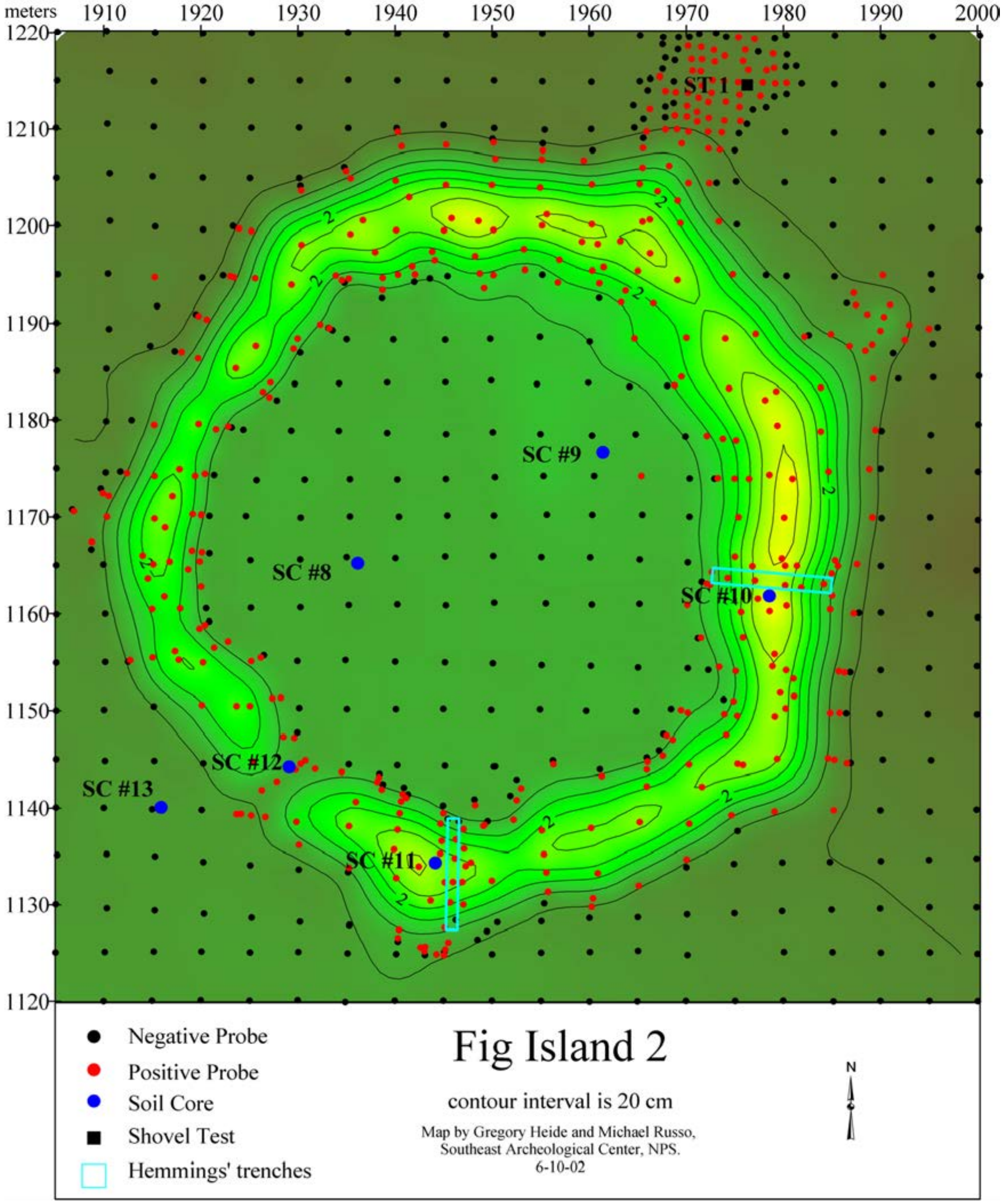


Figure 4. Contour map of Fig Island 2 shoeing the location of shell probes, soil cores, shovel tests, and Hemming's previous excavations.

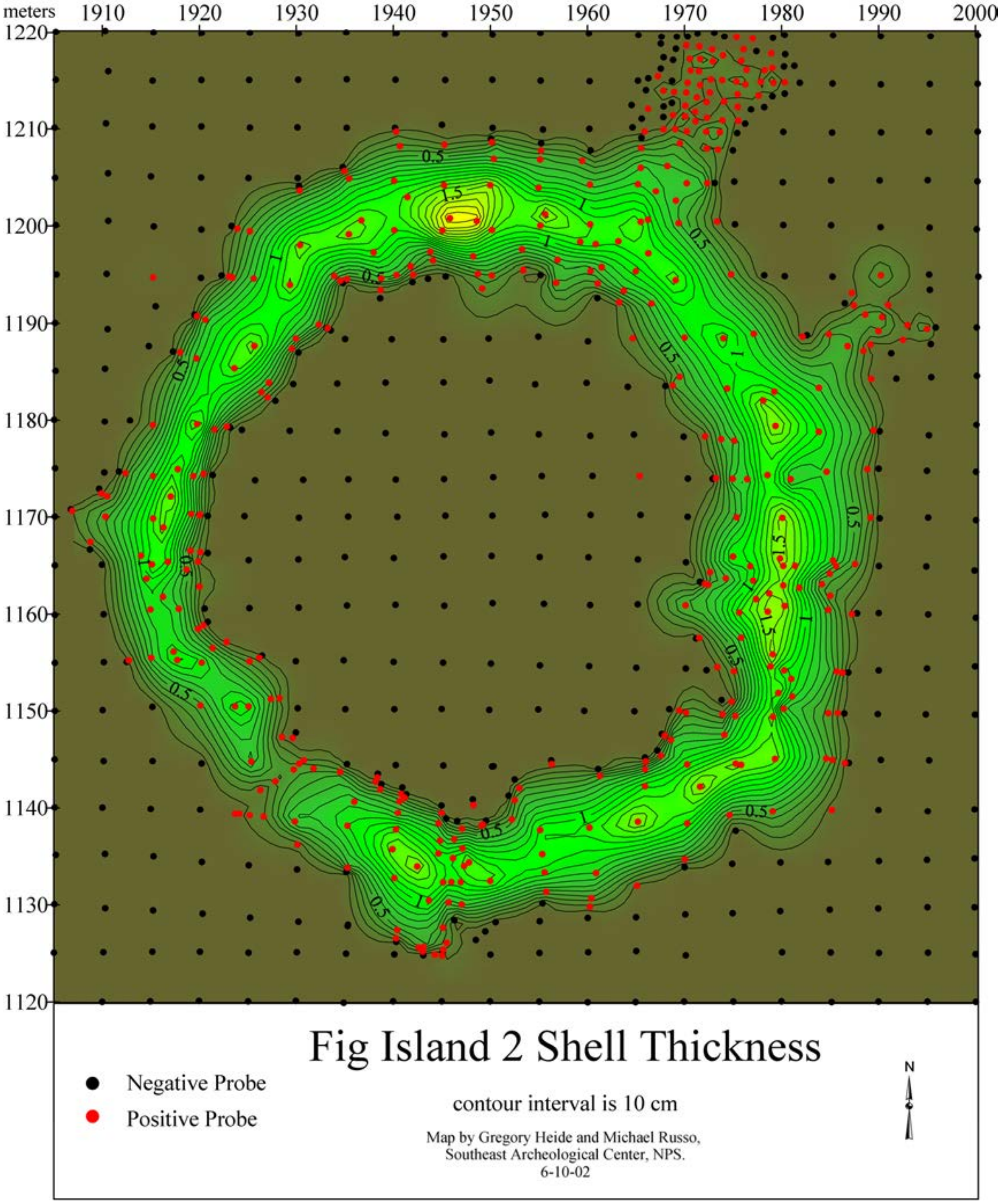


Figure 5. Shell thickness map of Fig Island 2.

One major problem was encountered during the mapping of Fig Island 2 (a problem ultimately encountered at all of the rings) and that was trying to probe and map in deep marsh muck. Most of the interior and immediate ring exterior had a dense sandy substrate with only 10-20 cm of marsh muck on top of it. The area just beyond the northwest portion of the ring, however, had sand at a lower depth and more marsh muck accumulation covering it. Walking in this area generally meant moving through about 1 meter of marsh muck. This caused some problems for both probing and mapping. While probing, it became hard to stand in one spot long enough to push the probe into the ground and still keep your footing. Generally, the longer you stood, the deeper you sank. This sinking became a further problem while trying to hold a range pole with prism to record the point. The range pole immediately sank into the muck, often up to 10 cm, which gave false topographic readings. These problems were dealt with by trying to use marsh grass to stand on to slow the sinking or, alternatively, just sinking in the muck until you hit solid ground. While mapping, the rod man held the range pole as close to the marsh surface as possible but did not actually set the rod on the ground.

Fig Island 3

Fig Island 3 is smaller than Fig Island 2 and is U-shaped rather than circular (Figure 6). Because of the smaller size, it was decided that a closer interval grid was needed to get the appropriate number of mapping points for the ring. In addition, we wanted to see if a smaller grid would decrease the number of judgementally placed edge-defining probes, which were quite numerous at Fig Island 2. Therefore, a 2.5 m grid was used over the majority of Fig Island 3. However, in the northeast and western portions of the grid, a 5 m interval was used. The main reason for the switch to a wider interval was that these areas were in deep marsh muck, causing problems similar to those encountered at Fig Island 2. As with Fig Island 2, probing was done at all grid points, as well as along a limited number of judgementally determined points on the edge of the ring. Probing was done at very close intervals in the presumed walkway area. In total, 657 points were probed.

The edges of the ring as defined by probing matched fairly well with the topographically defined edge of the ring in all places except in the northwest corner. As can be seen in Figure 7, the northwestern arm of the ring extends out underneath the salt marsh. A tidal creek running along the northwestern edge of the ring was positive when probed for shell, suggesting that the ring may have once been present in this area. However, it was unclear whether this shell was midden or a more modern oyster bed. In order to clarify the situation, a 30 x 30 cm shovel test (ST 2) was dug in the marsh in this area. Water screening of the test matrix revealed not only oyster shell, but animal bone and small pottery fragments, indicating that the northwestern arm of this ring used to extend as much as 10 m further north (Figure 7). Subsurface shell on the very edge of the ring, however, was probably either redeposited oyster from erosion of the subaerially exposed ring and/or modern oyster which has settled on the hard substrate provided by the shell ring.

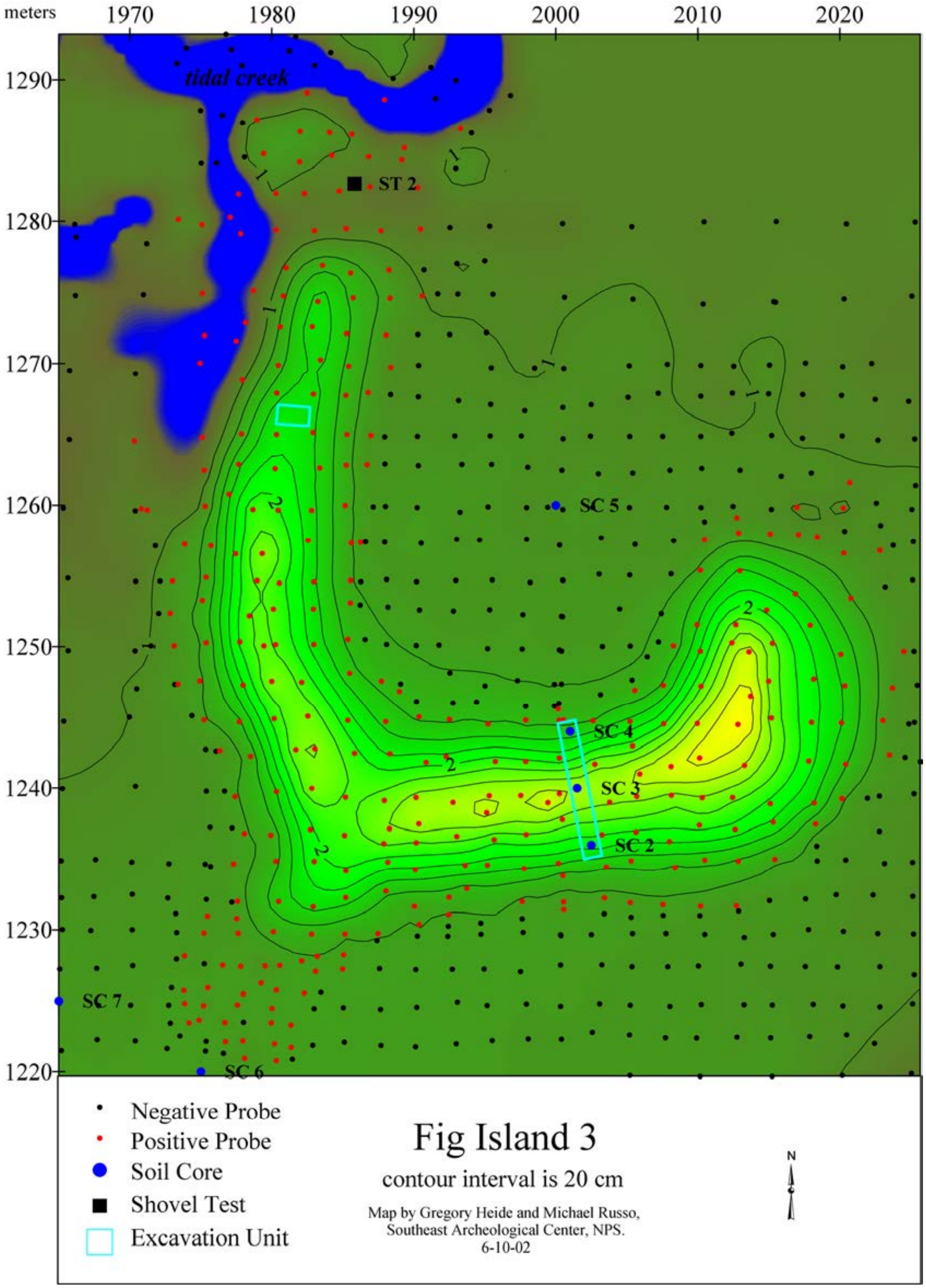


Figure 6. Contour map of Fig Island 3 showing the location of shell probes, soil cores, shovel tests, and excavation units.

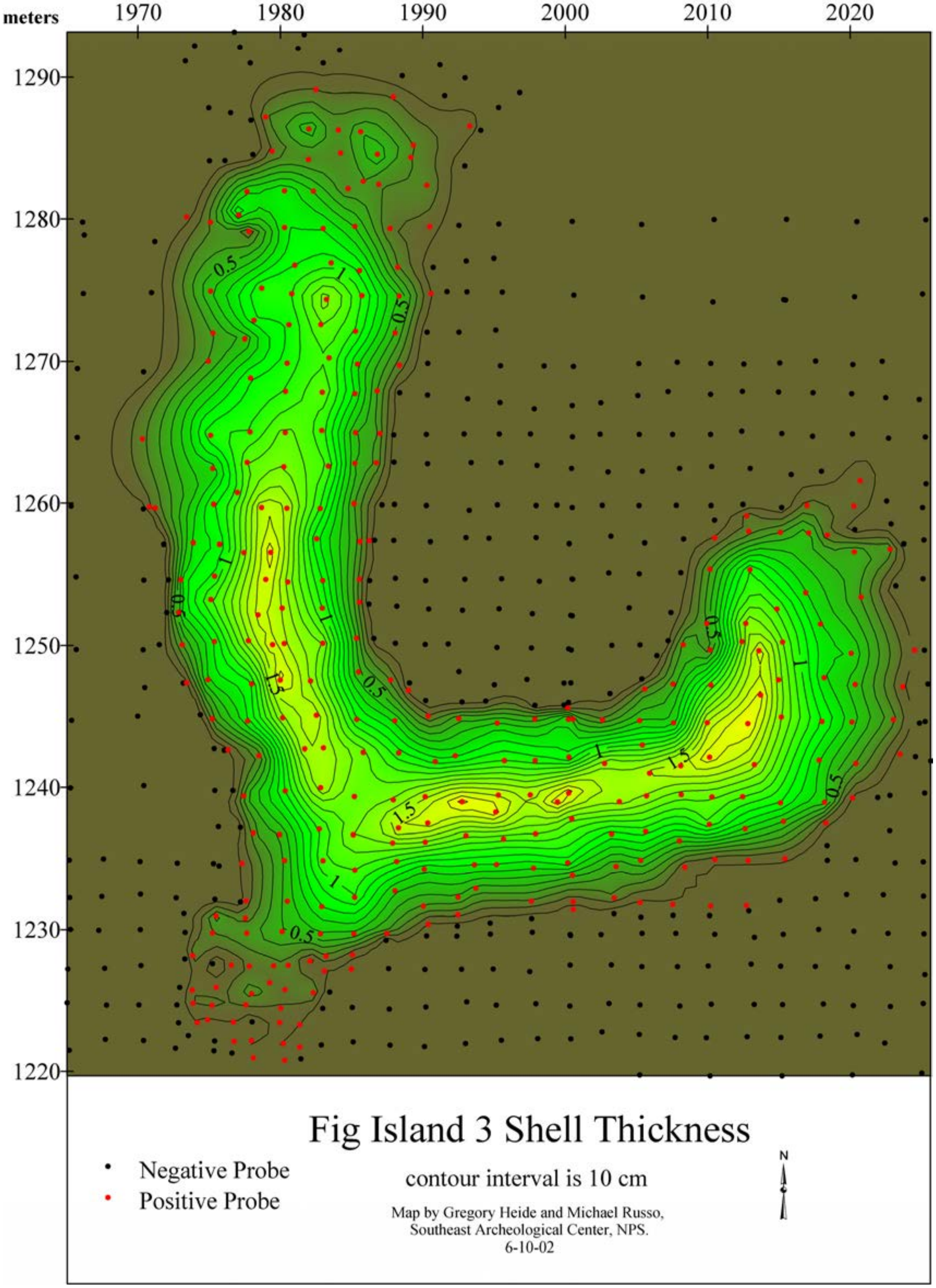


Fig Island 3 Shell Thickness

contour interval is 10 cm

Map by Gregory Heide and Michael Russo,
Southeast Archeological Center, NPS.
6-10-02

Figure 7. Shell thickness map of Fig Island 3.

As noted, the biggest problem encountered while mapping this ring was the thick marsh muck on the northeast and western portions of the grid. At one point, 2 x 2 ft wide pieces of plywood boards were used to "walk" across the thick, deep marsh muck areas in a leapfrog fashion. Again, while mapping, the range pole had a tendency to sink into the marsh and so it had to be held at the surface of the marsh. While this may have introduced a slight error into the data, it was likely less than 5 cm.

Fig Island 1

Fig Island 1 was the largest, most densely vegetated, and most complex ring to map (Figure 8). Because of its large size, a 5 m grid was chosen as a reasonable grid size considering the time it would take to place a grid, to probe, and to map in the available field time. We extended the grid as far to the east as possible, until a tidal creek on the eastern portion of the ring prohibited further advance. Probes on the opposite bank from the eastern edge of the ring and in the bottom of the creek revealed no shell, suggesting that the western side of the creek was as far as the shell had ever been deposited. As with the other rings, probes were placed at each grid position and judgmentally along the edges of the ring. Overall, a total of 1370 points were probed and mapped.

Fig Island 1 had not been previously mapped or even well-described, and it was unclear if this enormous feature was just an unusually large shell heap or prehistoric architecture. The topographic and probing data revealed that the “heap” was actually a large ring, very steep sided, with two (or more) smaller enclosures attached at its base (Figures 8-10). The topographic map also showed what local people suggested was a gun emplacement during the Civil War. The location of this hypothetical emplacement is the topographic high on the northern portion of the ring; it appears to have been created by borrowing shell from the area immediately southeast of the high. This has not been confirmed.

Probing provided corroborative evidence for the island being a ring. The interior "plaza" area was practically sterile of shell, as were the plazas of the ancillary rings (see below). Topography and alignment also suggested a discreet shell mound off the southern end of Fig Island 1, which may have been attached to the main ring via a ramp. No testing has been done in the area to confirm this interpretation, however.

Probing was very helpful in confirming and defining the presumed smaller enclosures (Figure 10). For instance, the northern portion of Enclosure C on the northwestern side of Fig Island 1 appeared as two concentric arms of shell attached to the main shell ring. The arms arched southward, towards the main ring (Figure 10); probing revealed that two parallel arcs of shell were present below the marsh surface and did connect the two upper arms back into the main ring. The lack of shell in the presumed plaza of this ring gave further support that Fig Island 1 Enclosure C functioned as a ring, and that the buried shell completing Enclosure C was in situ and not redeposited by erosion or other natural forces. Another ring,

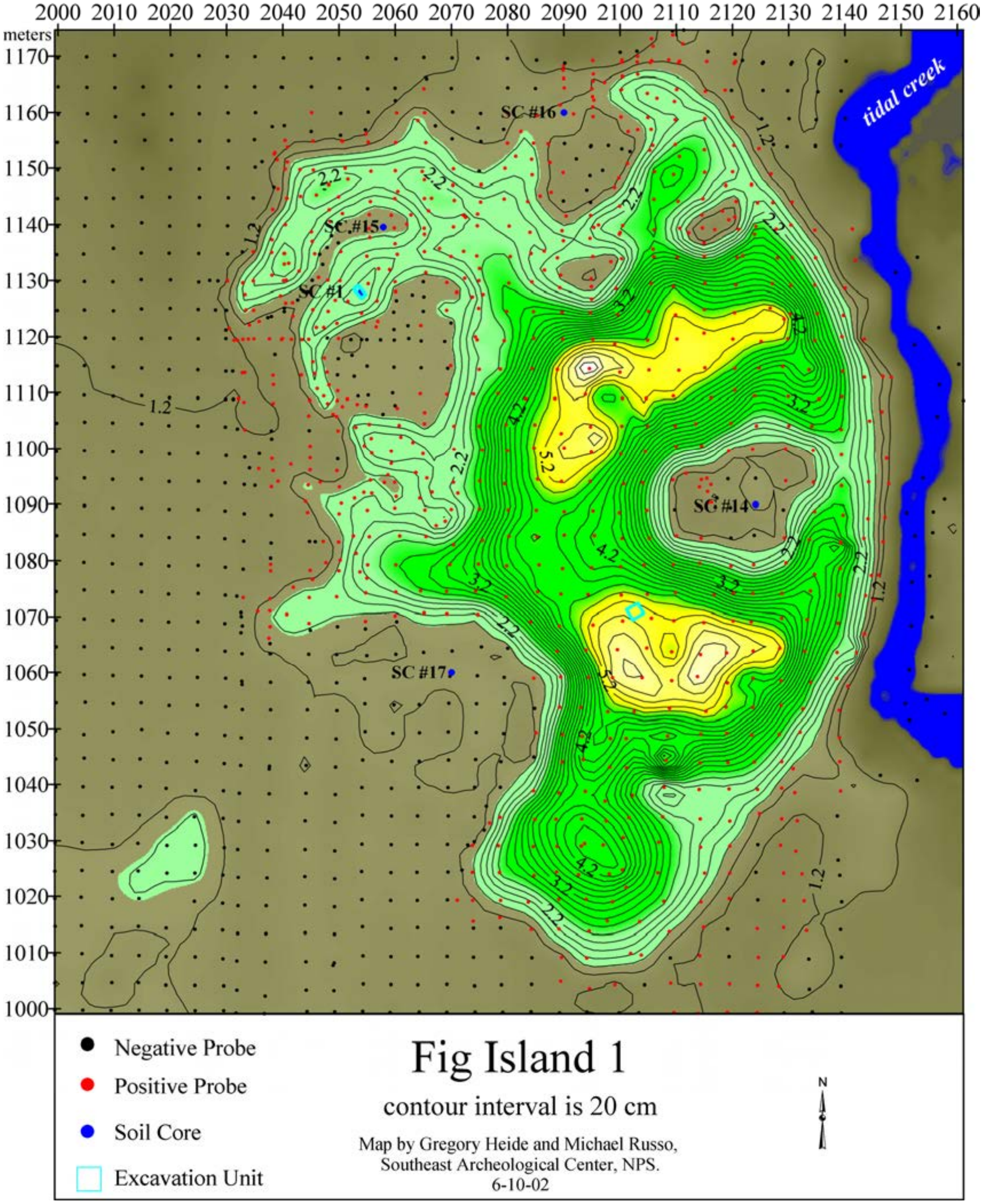


Figure 8. Contour map of Fig Island 1 showing the location of shell probes, soil course, shovel tests, and excavation units.

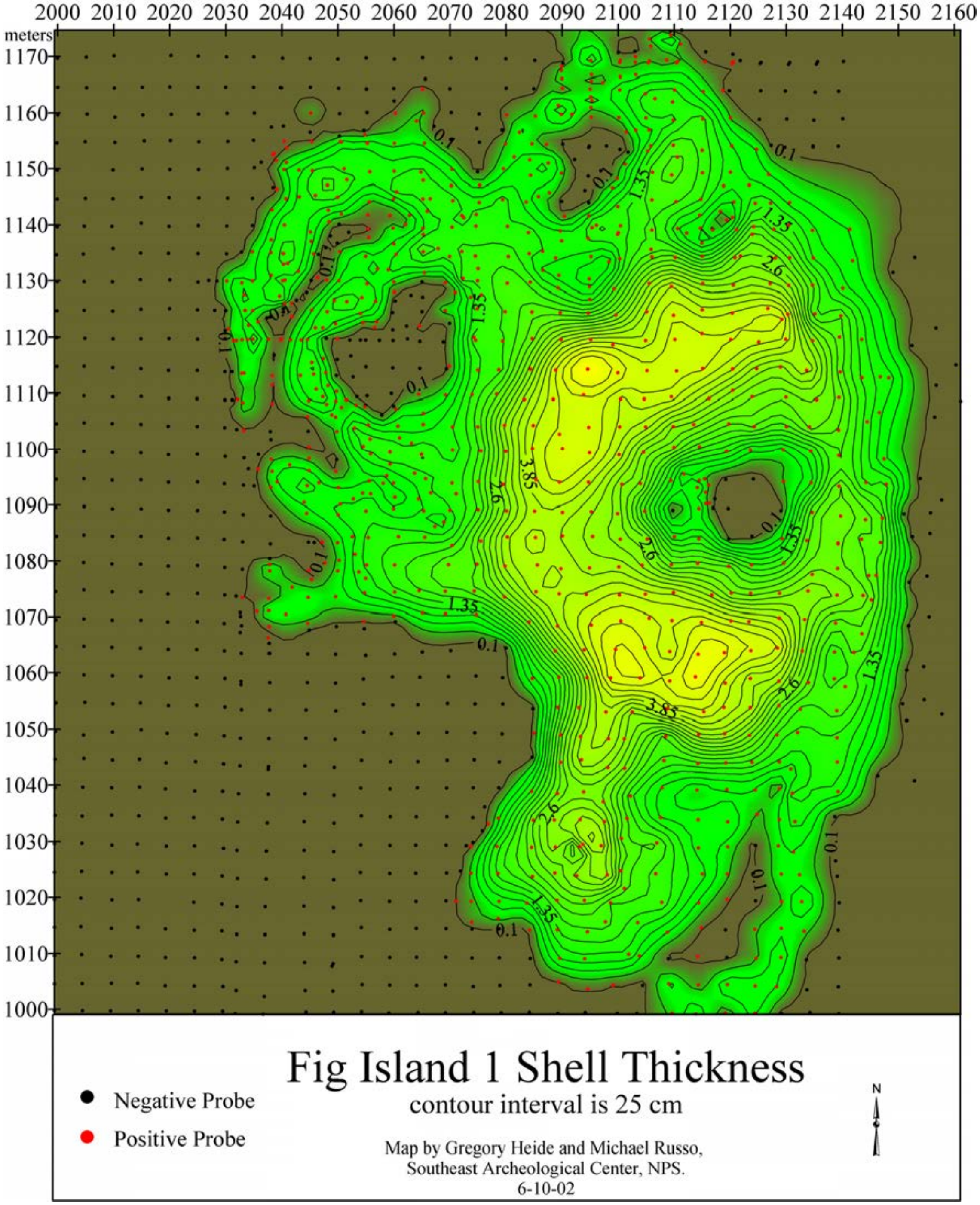


Figure 9. Shell thickness map of Fig Island 1.

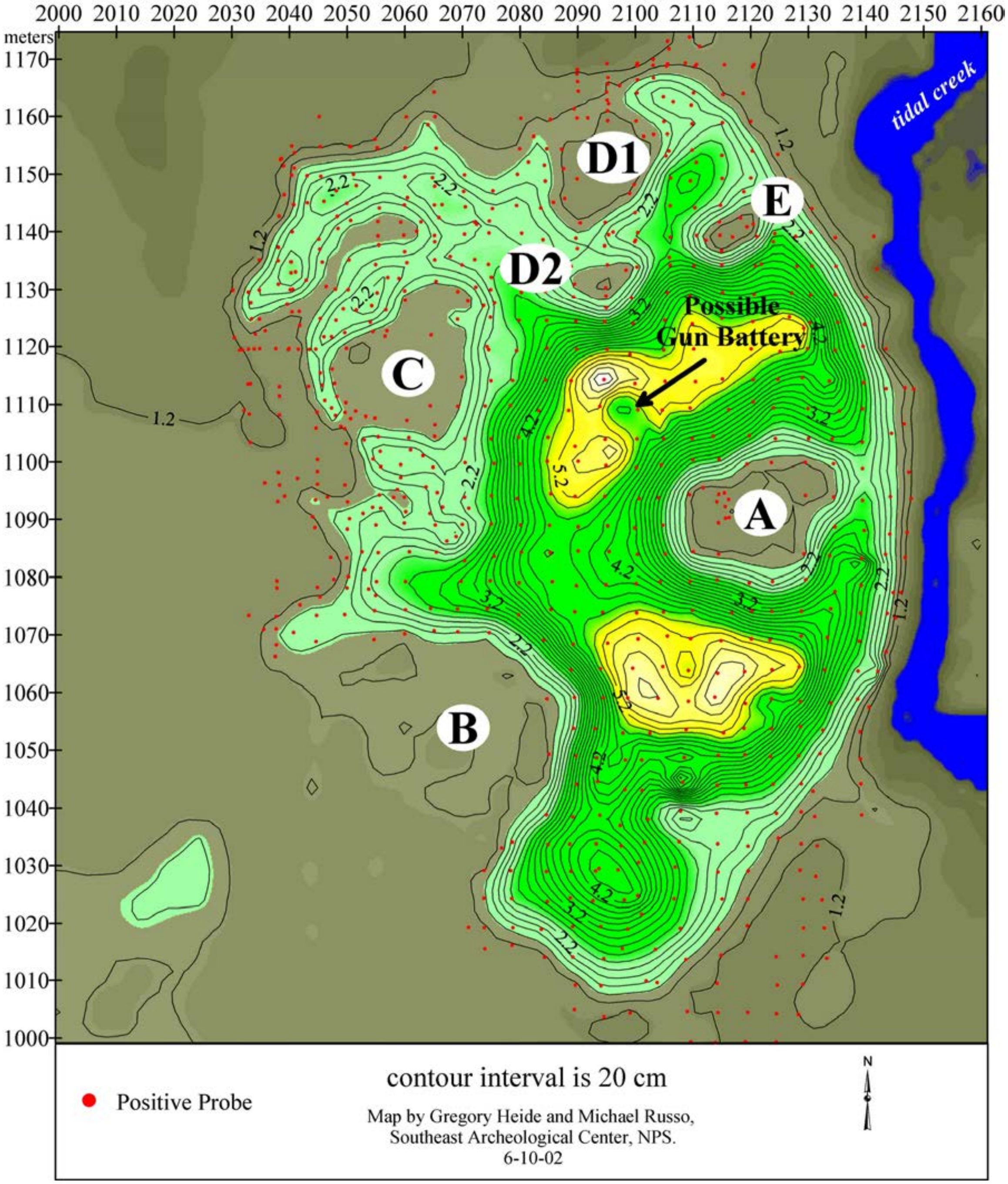


Figure 10. Contour map of Fig Island 1 showing locations of possible smaller enclosures.

Enclosure D1, was smaller in size than Enclsoure C and was attached to the northern end of the main ring. Again, a ridge of buried shell and lack of shell in the presumed plaza suggests that this feature is a ring. While a number of other enclosures have been postulated (see labels B, D2, and E in Figure 10 and Chapter 7), the two discussed above seem to be the most likely candidates for additional enclosures.

Fig Island 1 is not unique in the presence of attached, smaller shell enclosures. At Rollins Shell Ring in North Florida a number of smaller rings were found attached to a larger ring (Russo and Saunders 1999) and in South Carolina, two shell rings, Skull Creek and Coosaw Island Shell Ring, have conjoined rings.

Probing was useful in demonstrating that the eastern edge of the ring was not being drastically affected by the tidal creek. Probing from a boat, we found little shell in the creek. The southeastern corner of the ring, however, may have been affected by post depositional factors. A thin layer of shell is scattered south of the main ring body into the marsh. It is assumed that this shell has been colluvially or alluvially moved from the main ring, although further testing is needed to confirm this. There is the possibility that the shell is a buried oyster bed.

A number of problems were encountered while mapping Fig Island 1. The biggest problem was probing the very thick shell deposits. Much of the upper portion of this ring was higher than the longest probe (3 m). When these points were recorded, a note was added in the data recorder telling that it was >3 m in shell thickness. Shell thickness maps could not be created from these data, however. To deal with this, the following procedure was employed. Using probe data from lower areas of Fig Island 1, where recording the base of shell was possible, the average ground surface elevation was 0.9 amsl. Assuming that the original ground surface for all of Fig Island 1 was on a level plane, the extrapolated ground surface (0.9 m amsl) was subtracted from the recorded elevation of each >3 m probe, producing the shell thickness. For example, if the ground surface of a probe point where shell was > 3 m was recorded with an elevation of 5 m, 0.9 was subtracted, and shell thickness for that point was recorded as 4.1 m.

Another problem, which had been encountered at the other rings, was areas in which there was very deep marsh muck. Exceptionally notable for deep muck was the grid area directly north of the northern edge of Fig Island 1 and the far southeast corner of the grid beyond the edge of the ring itself, where much of the assumed redeposited shell was located. Problems with crew sinking into the mud while probing and the range pole sinking were again encountered, only the marsh muck appeared to be even deeper in this area than in those problem areas encountered at Fig Islands 1 and 2. Many areas could not be probed until a solution was found, and that solution was a product called “Mudders.” Basically mud snowshoes, “Mudders” were plastic overshoes that attached to one’s boots and helped to displace the wearer’s weight while walking across mud, thus minimizing the sinking that occurred while walking through thick marsh muck areas. These shoes proved particularly effective in this salt marsh environment and once we had the ‘Mudders’ we were able to both probe and map the areas of thick marsh muck without much trouble.

The tidal creek that ran up the eastern edge of the site was also problematic. Depending on the tide, the creek could contain up to 2 m of water, making probing or mapping. Because we were concerned with determining the effect the creek was having on Fig Island 1, we felt that this area had to be explored. We decided to wait until high tide and, using a shallow draft boat, we floated through the creek, probing and mapping a few locations to see if shell were present. In fact, little shell was found in the creek, though eroding shell was observed on creek bank throughout the area.

Discussion

One of the main goals of this project was to produce the first detailed maps of the three main features that comprise the Fig Island ring complex (Figures 11-12). We successfully achieved our goals. Using our mapping data, we determined the size of the rings, including all attached rings, to be as follows (Table 5, Figure 13): Fig Island 1 is 157 m long by 111 m wide and is as high as 5.5 m above estimated mean sea level. Fig Island 2 is 77 m in diameter and rises to a maximum of 2.6 m above estimated mean sea level. Finally, Fig Islands 3 is 44 m long by 49 m wide and is extends to at least 2.8 m above estimated mean sea level.

Mapping revealed the Fig Island 1 was not only a shell ring, but a ring complex, with one large, steep-sided shell ring (Figure 10, Ring A) and at least two smaller rings attached (Figure 10, Rings C and D1). A discrete mound may exist on the southern end of this complex of shell features. Probing confirmed that a ramp of shell existed between Fig Islands 2 and 3, that the northwest arm of Fig Island 3 once extended slightly further north. The probing data also showed that while the northwest arm of Fig Island 3 and the southeast corner of Fig Island 1 where being affected by erosion and redeposition, the majority of the shell appears to have remained in place for over 3500 years.

The probing data also allowed us to calculate the volume of shell contained at each ring. Volume calculations for each ring were done as follows. The shell thickness for each probed point was calculated by subtracting the starting shell depth from the ending shell depth. Using the program Surfer, a grid was calculated for each ring using shell thickness as a Z value. We used the Surfer volume calculation function to estimate volume above a user-determined height.

For Fig Islands 2 and 3, the volume estimates were straightforward. The shell ramps were removed from shell thickness consideration and the volume was calculated for all shell equal to or greater than 1 cm in thickness. Volume estimates for the rings were 2178 m^3 of shell at Fig Island 2 and 1202 m^3 of shell at Fig Island 3.

As described above, estimating volume for Fig Island 1 was more problematic. Currently the best estimate of shell volume for all of Fig Island 1 is 22,114 m³. This is almost 10 times the estimated volume of either Fig Islands 2 or 3.

Table 5. Measurements of the Fig Island Shell Rings.

Ring Statistics (in meters)	**Fig 1**	**Fig 2**	**Fig 3**
Diameter (outside edges)	-	77	-
Length (outside edges)	157	-	44
Width (outside edges)	111	-	49
Average Basal Width	-	8	12
Average Thickness	1.47	0.57	0.69
Greatest Thickness	5.5	2.05	1.85
Approximate Volume* (m³)	22,114**	2178	1202
** calculated with Surfer; **determined using estimated thickness values*			

Overall the mapping proved informative on a number of levels and has provided excellent data for our site-specific research, as well as for comparison to other shell rings in the Southeast

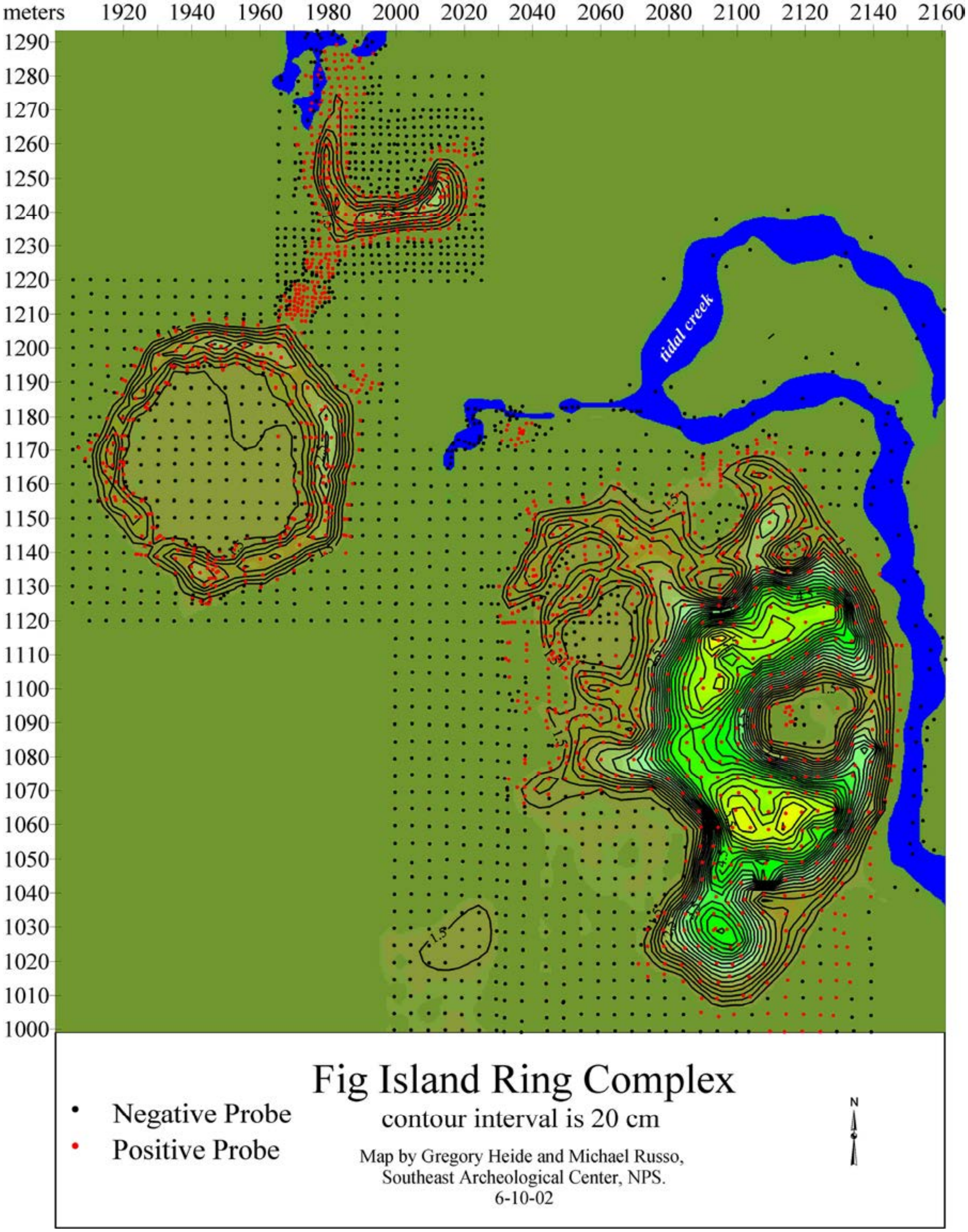


Figure 11. Contour map of the Fig Island site with all probe locations.

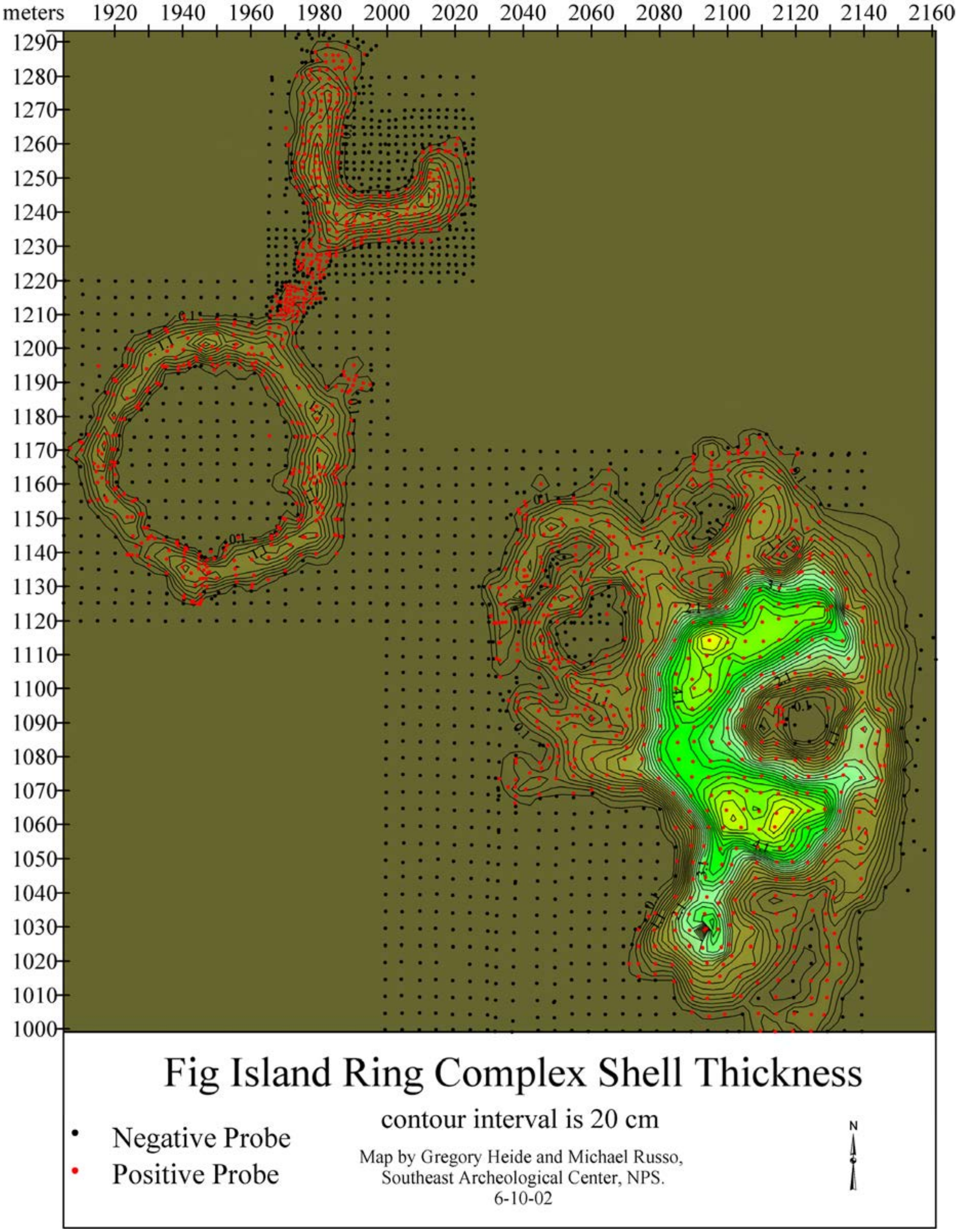


Figure 12. Shell thickness map of the Fig Island site with all probe locations.

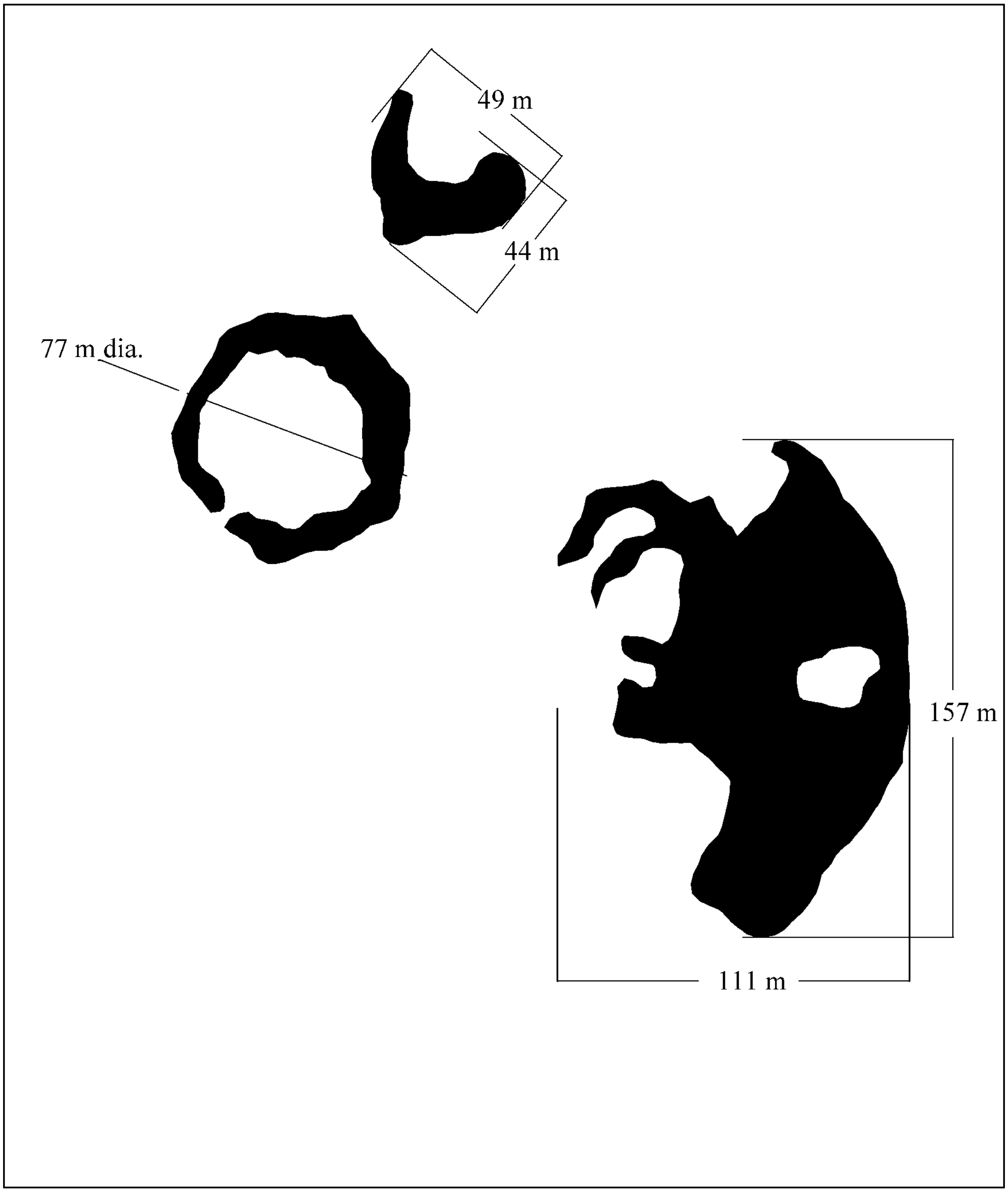


Figure 13. Linear dimensions of the Fig Island shell rings.

CHAPTER 7:
ARCHITECTURAL FEATURES AT FIG ISLAND

Shell rings are the earliest large scale archaeological sites found along southeastern U.S. shorelines, marshes, and maritime hammocks. Primarily located in South Carolina, Georgia, and Florida, they were constructed between 4600 and 3000 years ago. Although three rings in Florida predate the adoption of pottery in North America, shell rings in Georgia and South Carolina are among the earliest ceramic bearing sites in North America. While these traits are important to understanding cultural evolution in the Southeast, it is the startling and geometrically distinctive shapes of shell rings that have most often caught the archaeological imagination.

Shell rings are circular to semicircular mounds of shell enclosing a central plaza. Since first recognized in the1800s, their distinctive shapes have suggested that they functioned differently than other prehistoric midden sites. Arenas for sports, public presentations, dance, and torture were offered as likely uses (McKinley 1873). Places of refuge from hurricanes, monuments, and fish traps have also been suggested (Drayton 1802; Edwards 1965:36; Waring 1968b:246). Aside from hurricane shelters and fish traps (the latter use is not likely due to the fact that most, if not all, rings were originally placed above the high tide line; cf. Leigh, this volume), early theories of ring function typically linked the sites to more social, rather than strictly practical uses. In the sixties, two archaeologists viewed ring construction as being driven, at least in part, for ceremonial purposes (Waring and Larson 1968:273). They noted that although the rings contained “occupational midden in primary position” that indicated “habitation sites” were located on the ring, the shape of the sites indicated ceremonial function.

These two traits, “habitation” (i.e., subsistence) debris and ceremonial shape, are common to all shell rings and currently form the basis for two competing theories of site function. One theory suggests that shell rings are little more than the piled garbage of small communities whose members lived in circular patterns and deposited shell refuse beneath their feet (Trinkley 1997). The other suggests that rings were ceremonial structures, specifically planned and built in circular shapes for unknown reasons (Cable 1997). This theory rejects the idea that the simple “haphazard” discard of garbage could result in the “strikingly symmetrical shape” and “monumental size” of the rings.

Most recently, archaeologists have seen rings as both places of ceremony where public presentations occurred in the central plaza, and as periodically occupied (Saunders 1999) or permanent villages where daily living occurred on or near the shell ring (Russo n.d.; Russo and Heide 2002). Hearkening back to Larson and Waring, I believe that many, if not all, shell rings served both habitation and ceremonial functions, two commonly linked features of tribal and other socially organized village types in the ethnographic record. Shell ring sites, then, can be seen most succinctly as “ceremonial villages” whose duration of annual occupation can only be determined on a site specific basis. That is, “habitation debris” is a concept which may apply equally to deposits found at a site in which “living” occurred once a year at an annual ceremony, as well as to midden found at the location of a household occupied throughout the annual cycle.

Elsewhere I have suggested that the circular shape of shell rings combined with the differential distribution and kinds of midden materials which make the rings can be used to discern the social organization of shell ring communities (Russo 1999; n.d.; Russo and Heide 2002; Russo et al. 2002). Trinkley (1985) first suggested that the circular shape could be linked to egalitarian organization in which no single individual is set apart or above the society, but in which all lived equidistant from and in equal status to other members of the ring community. I have noted, however, that no known shell ring is perfectly circular and have suggested that the asymmetries in shape and the asymmetries in midden constituents found at shell rings *may* reflect asymmetries in social relations of the ring community (Russo n.d.; Russo and Heide 2001, 2002). Below I discuss some of the social implications of ring shape, fauna and artifact distribution, and other traits found at ring sites. While these topics were not aspects of the proposed research at Fig Island, their discussion provides some thoughts for future research at Fig Island and elsewhere.

In terms of the shape of rings, the idea that circular village plans can be linked to social structure was derived, in large part, from Grøn (1991:105), who found that individuals positioning for symbolic and visual communication, rank, and social interaction among small groups and ethnographically observed households could be extended to identify patterns in small circular and arc-shaped archaeological settlements. Patterns of social spacing suggest that the physical distance between, and the location and/or orientation among, households in small circular, oval, and U-shaped communities generally reflects their social relation to one another. Close kin and socially aligned individuals and families tend to place their households adjacent to each other. Such positioning imparts sympathy and interaction among neighbors, while at the same time socially separates less related groups within the community. Related households often place themselves opposite less related or rival groupings. Within each grouping, a central household is typically flanked by households of decreasing relatedness with increasing distance from the center. So, in circular communities, rival sodalities or kin groups may situate themselves opposite each other with the individual or family with the highest status in the center of each sub-group and individuals with less status, distant from them (compare the Cheyenne, Bororo, Omarakan in Fraser 1968).

Small, circular communities of great symmetry can be linked to egalitarian or incipiently ranked (read “transegalitarian” or “intermediate” societies) (Grøn 1991:107). As social complexity and greater rank differences increase in circular communities, these may be reflected in the site settlement plan. A variety of permutations may occur. In some societies the highest ranked individual(s) may locate their residences, displays, meeting houses, or storage facilities in the center of the circle, a visually and symbolically dominant position (e.g., at Cheyenne camp circles, the great council tipis were located in the center [Fraser 1968:21, Figure 22]; see also the Bororo and Massa community plans in Fraser 1968). In other societies, a highly ranked individual and/or family may be situated opposite an opening in the circle, halfway between competing societal factions, the ideal nexus for communication and mediation. Larger and more complex communities often take on a U- or C-shape rather than a strict circular plan. In these, the closed end opposite the entrance into the village may be the highest status position, where the largest and most important public structures or the leader's structures are placed and often elevated to impart visual dominance over the community (Grøn 1991:107; see also the schematic plans of the Lega, Boru, Bawamataluo, and Bali Aga villages in Fraser 1968). Secondary status positions may be located in the central portions of the arms of the U, and, as in circular communities (e.g., Amazonian tribes along the Xingu River, Heckenberger et al. 1999:370), are often occupied by leaders of rival groups or moieties (see the Bororo and Bali Aga villages in Fraser 1968: Figures 72 and 43; the Cheyenne in Fraser 1968:21). Under conditions in which prestige is increasingly gained from outside the village (e.g., through battle glory, the accumulation of valued trade goods, or the development of external exchange networks), status locations in the village plan may actually shift from the above described positions to the ends of the U, the positions closest to the outside sources of status (Grøn 1991:107). For example, Omaha leaders would place themselves at the ends of C-shape village near the entranceway in the camp circle when the camp was set up, in preparation for an outward journey, but reversed the placement relative to the entrance on the inward, return trip (Fraser 1968:21).

In terms of asymmetries in shell rings reflecting differential social status, I (Russo n.d.; Russo and Heide 2002; Russo et al. 2002) have elsewhere interwoven aspects of Hayden's (1995a, b; 1996a; 2001) feasting and prestige technology theory with Grøn's social space theory in order to predict the kinds and amounts of material remains to expect at the theoretical status positions posited above. Essentially, I have suggested that greater amounts of shell, favored resources, and material items may be located at these positions as individuals with higher status would have increased capabilities to accumulate these items. Unfortunately, rare resources imbued with high values are, by definition, rarely encountered at shell rings. In order to identify the distribution of such things as exotic trade items, prestige pottery, or highly valued food items throughout a ring, the greater portion of the ring may need to be tested to find representative distribution patterns. The same does not hold true for shell, however. Simple topographic maps can reveal where the tallest pilings and greatest volumes of shell occur. To date, among the handful of shell rings that have accurate topographic maps, all have exhibited unequal distributions of shell. Most of these rings exhibit the greatest volumes of shell in the predicted high status positions (Russo n.d., Russo et. al 2002). At only one site, however, has sufficient systematic excavation has been undertaken across the shell ring to suggest that the amount of pottery distributed across the site may be directly linked to the amount of shell and to high status positions (Russo et al. 2002). To date, the distribution of rare items relative to predicted status positions has not been determined at any shell ring site.

I have also suggested, and offered for testing, the idea that, at shell ring sites, shellfish, and in particular, oyster, was a preferred and staple food item at feasts that served to feed the masses of guests and participants. Those individuals at these feasts who, through collection of debt obligations, leadership, ownership of shell fishing beds, or other means, collected, received, and/or displayed more oyster at their feasting locations (i.e., the high status positions at shell rings) than other participants and guests gained or maintained their status rank. This social status is reflected in the greater amounts of shell found at theoretical high status locations in rings. Such social feasting is commonplace in the ethnographic record, particularly among societies where food resources are abundant at least seasonally during the annual cycle. Depending on social organization, hosts of such feasts may be permanent leaders, families and individuals vying for marriage and trade advantages from invited guests, or former feast guests socially obligated to return the hosting duties.

In short, the various theories briefly outlined above provide models for analyzing the topographic/architectural data from Fig Island. While it is not yet possible to say with absolute certainty that the rings at the sites were permanent or temporary villages, or even if they represent villages at all, the models do allow for the analysis of features previously viewed as having been built for unknown reasons (e.g., Cable 1997; Waring and Larson 1968) or as not having been "built" at all (Trinkley 1985, 1997). Each ring may have had separate functions, one as dance arenas, another as village, another for sodality functions. They may all represent separate moiety habitation locations in the larger site. Whichever, the models allow for the identification of differential social status at the rings. All the rings hold "habitation refuse" which was placed in circular arrangements. Thus, regardless of the particular function of the rings, the theories related to the feasting and social behavior of small groups can be applied to their analysis.

Fig Island 2

With the mapping completed at Fig Island, we now have a better idea of the community layout of the site and can compare its architectural features to the theoretical models as well as to other shell ring sites. Fig Island 2 is perhaps the quintessential example of shell rings as circles. Horizontally it forms an almost complete circle with only a small opening on its southwest side. We must note, however, that as a building material shell does not lend itself to precision in architectural construction. Lines, angles, arcs, and other geometrical shapes can be approximated, of course, but not precisely controlled. Furthermore, while shell itself is generally durable, the piling of shell is limited in long term stability. Tree falls, roots, and other biological disturbances, tidal and storm currents, and gravity may have acted over the thousands of years since ring construction to reduce the original height of the ring, expand the width, and coarsen any evenness the surface may have once held as the shell degraded, slumped, or otherwise moved. As such, any present day appearance of a shell ring must be viewed with caution.

In actuality, the ring is by no means symmetrical. In width, it varies from 10 to 25 meters at any given point. In shell thickness, the maximum height of the circular ridge varies from nearly two meters on the north and east sides to just one meter on the southwest. The overall form, too, is not a precise circle, but rather a hexagon with straight or nearly straight lines of shell deposits; this is particularly noticeable on the eastern portions of the ring (Figure 4). Whether these features have cultural significance or are simply the results of years of natural breakdown is, of course, the critical question. The differential heights and volumes of shell should be investigated at Fig Island 2 before the site is cursorily dismissed as simply a ring of shell. Apparent features such as the six sides that make up the ring might be fruitfully examined for differences in material culture. If different sodalities, moieties, or other kin groups occupied different areas of the rings, these apparent six sides might provide a useful point of departure from which to examine possible social distinctions.

Other features of the ring also offer potential insight into the greater culture. For one, the opening on the southwest side seems to align opposite a ramp-like feature on the northeast side of the ring (Figure 4). Is the alignment culturally significant? Interestingly, Leigh (this volume) suggests that soil core 12 which was placed in the opening on the southwest side of the ring suggests similarities with other cores taken from beneath the shell ring rather than control samples taken in the marsh. A slight truncation in the soil profile is suggestive that shell may have been removed, or at least cleared away, to make or expand the opening. I conclude from this that we still do not have a clear idea as to whether the opening is a feature or the ring builders or was made by later people.

Does the ramp-like feature have social significance? In many societies, the chief of a village or head of household sits directly opposite the entranceway into the social circle (Grøn 1991). Interestingly too, the ramp-like feature leads northeast to another ramp-like feature along the same line found at Fig Island 3 (Figure 8). Probing has revealed the presence of scattered shell beneath the marsh between these two features, suggesting a purposefully constructed walkway existed between them. However, it is a puzzle as to why a relatively thin scatter of shell would have been added to a walkway and the question arises as to whether or not, perhaps, the transport of shell between the two rings could have caused the deposition of the shell. Was it sufficiently intense to account for the shell as accidental loss over time? If so, it is difficult to explain the lack of similar thin deposits of shell between Fig Island 1 and the other two main rings. Was shell not transported between these rings? Alternatively, as I have suggested for parts of Fig Island 3, tidal action and marsh encroachment may have resulted in the thinning and scattering of shell subsequent to its original deposition.

Fig Island 3

Aside from the ramp-like structure connected to the walkway, Fig Island 3 contains a few features that distinguish it from Fig Island 2. The most obvious, of course, is that it is more of a half circle, or C-shaped ring, than a complete circle. Similar C-shaped rings are common in South Carolina and Georgia (Russo and Heide 2001), and aside from the ramp-like structure and its apparent alignment with, and connection to, the ramp-like structure on Fig Island 2, little sets this ring apart from those. Interestingly, the northeast end of the ring seems to contain the greatest concentration of shell in terms of height, width, and volume. The northwest end, in contrast, lies much lower. I suspect that erosion in the northwest arm has been far more severe, and may account for at least part of the apparent difference. There, a tidal creek directly abuts the ring and its daily flow may have resulted in the diminution of the height of the shell and dispersal of its shell into the marsh to the north. Significantly, probing there has revealed that more shell lies beneath the marsh in this northwest arm of the ring, suggesting that perhaps at one time the two arms of the ring were more symmetrical than they appear today (Figure 9). If we can imagine that this shell found beneath the marsh used to be located closer in and atop the end of the northwest arm currently above sea level, then the ramp-like structure seems to have split the ring in half almost evenly. If the line of the walkway were to continue in the northeast direction, it would have split the ring fairly evenly with equal volumes of shell on either side of the line. This apparent alignment is unlikely to be happenstance, but its cultural significance remains obscure. Certainly, such divisions are common among circular villages, functionally serving to separating kin and other factions from one another (cf. Fraser 1968; Heckenberger et al. 1999). Thus, the architectural traits of the ring might fruitfully be looked at as social epiphenomena.

Fig Island 1

If Fig Island 2 may be viewed as the archetypal shell ring in terms of general simplicity of structure and shape, Fig Island 1 is among the most elaborate of shell rings yet identified. If a shell ring is defined as open area generally lacking shell surrounded by a circle or semi-circle of shell, then Fig Island 1 may be seen as a complex of such structures, consisting of up to eight shell rings, a number of shared walls connecting these features, ramps and openings allowing egress and ingress to the rings and plazas, and possibly, a ceremonial mound.

The largest of the rings at Fig Island 1 surrounds what we have labeled Plaza A. (For the purposes of this report, the label of the plaza will also describe the ring that surrounds it. Thus Plaza A is surrounded by Ring [or Enclosure] A). Depending upon where measures are taken, the ring extends 100 meters north/south and 80 meters east/west. Its size, however, is most phenomenal, not in its breadth but in its height. Reaching 5 to 6 meters above the surrounding marsh, Ring A is the tallest shell ring known in the Southeast. Its great height has resulted in extremely steep sided slopes and a fairly small plaza. Measuring between 20 and 30 meters across, the plaza is the smallest among the three major rings at the site, even smaller than the plazas of some of the Fig Island 1 ancillary rings (e.g., the C and D rings). Part of the small size of the plaza may be attributable to colluvial transgression. That is, shell may have slumped from the steep walls, effectively shrinking the size of the plaza. How much so, of course, requires more study.

However, as with most shell rings, the overall size of Plaza A was largely determined during the initial stages of construction. Once the ring and plaza were begun, changes in horizontal extent of the ring plaza would have been difficult to manage. That is, one cannot make a plaza larger without removing shell in the ring wall. Such logistical limitations on increasing plaza size are particularly true of closed, circular rings. Theoretically, C- or U-shaped rings, of course, could have ever-expandable plazas as the arms of the C could be extended indefinitely, effectively encompassing increasingly larger areas of plaza. The length of those plazas would have been constrained primarily by cultural social factors (e.g., size of populations, viewing distance of audience from plaza events, etc.) But with a closed ring, the addition of shell has only two ways to go—up or out—if the size of the plaza is to remain constant.

At Ring A, the width of the shell ring walls, i.e., the shell from the plaza side to the outside of the ring, is up to 40 meters. The great width, of course, was needed as a foundation to support the great height of the ring walls. It would be interesting to see if the great height of the shell ring was a function of long term use with additional shell having no place to be deposited but upwards, or if the height was a function of wealth, status, or display of powerful individuals or groups. The one excavation unit placed in the top of the ring indicated dense oyster and other shell with a rather depauperate vertebrate faunal assemblage in some levels (no detailed analysis has been undertaken, only field observations) and not much soil associated. While the absence of soil has been suggested to be an indicator of secondary (borrowed shell) deposits from other primary middens (McMichael 1978), it need not necessarily be so interpreted. The dumping of shell after large scale feasts can rapidly seal off thick deposits from wind borne or human addition of soil particles. Similarly, continual, daily deposits of shell in an area chosen for the piling can prevent the accumulation of soil deposition compared to areas left open to nature and human activities that can introduce soils into shell deposits. I have suggested elsewhere (Russo 1991b; Russo and Heide 2002) that Archaic mounds and shell rings were likely purposeful constructions characterized, at least in part, by such rapid, large scale deposits related to feasts or protracted, continual depositions uninterrupted by soil producing events. The lack of evidence of in situ habitation activities (e.g., an absence of vertebrate remains indicating that activities other than shellfish consumption resulted in the midden deposit) in such shell deposits also suggests that building, not living, was the primary goal at those particular places in the ring or mound. Of course, context is critical in interpreting such deposits. So-called "clean" shell deposits can be the result of human activities other than planned ring construction. Oyster processing stations, fortuitous feasting camps, and simple garbage dumps could also result in nearly pure shell deposits. In the contexts of shell rings and shell mounds whose shape alone indicates purposeful construction and ceremony, the deposition of dense amounts of shell into purposefully built, monumentally sized architectural features would, of course, have required leadership and economic or social debt obligations compelling community members to participate in the construction. This suggests that differential power may have existed among the society's members.

Shell volume has been calculated for only two ring sites, Fig Island and Guana. In terms of volume, Fig Island 1 (with all its attendant mounds, ramps, and rings) is five times the size of the Guana Shell Ring (one of the smaller rings in Florida), but the Guana ring contains a plaza 20 times the area of Plaza A. This speaks to the fact that it is unlikely that plazas served identical functions among ring sites. Undoubtedly, all plazas functioned as areas for public ceremony, presentation, and display. However, the percentage of the public that had viewing access to the ceremonies held in Plaza A may have been restricted compared to the larger rings in Florida. Elsewhere I have estimated populations sizes for shell rings in the Southeast (Russo n.d.). If three people were placed every 5 meters around the circumference of a shell ring (perhaps, an adequate estimate for living, but an admittedly conservative estimate for standing room viewing), the three Fig Island rings could have supported a population of 417, with Fig Island 1 capable of holding 186 individuals on top of the ring. In comparison, the Guana ring could entertain 261 individuals. So, while Guana could entertain its entire population (assuming, for the sake of argument only, that all inhabitants of the site lived on the ring—a dubious likelihood considering that a nearby, non-ring part of the site may have housed some portion of the population), Fig Island 1, Ring A could entertain only 60% of the greater site's population. This presents the question of whether or not smaller, specialized ceremonies with restricted audiences were held at each ring at Fig Island. Each ring may have represented a sodality, moiety, or other faction, with no individual ring being a true arena for public presentation for the entire population. (For this scenario, I assume that at least some, if not all the main rings are contemporaneous at Fig Island, a possibility so far supported by the radiocarbon dates from the site [Figure 25] whose standard errors overlap around 3900 B.P.).

Other features that may potentially be considered rings include areas labeled B, C, D, and E (Figure 10). I stress "potential" because Ring A is so tall, that to gain access to its summit, great ramps had to be built. Thus the slopes between B and C, C and D, and D and E, may have principally served as ramps. However, these structures also functioned to help enclose non-shell areas outside of Ring A, some of which appear to have functioned as separate ring plazas. Of these, Enclosure C seems the most ring-like (this was tested by Fig 1, Unit 2). It contains a central plaza largely sterile of shell that is encircled on all sides by dense shell deposits, though some of this is subsurface. An opening exists on its southwest side. Intriguingly, on the western side of this ring lies a concentric "outer ring" of shell separated by from the "inner" ring by a topographic low with little shell. The function of these apparently linked architectural features can only be conjectured. One possibility is that the inner circle may have been the first of the two built, but as needs for space expanded, the outer circle was built as accommodation. This, of course, would have precluded anyone occupying the outer ring from directly viewing any public forums that occurred in the plaza. More likely, the two rings were built contemporaneously and served different functions. Those who occupied the interior ring had access to the public arena of Plaza C, while those who occupied the outer ring did not.

Such a situation is not unknown ethnographically in circular communities. Among the Trobrianders, for example, the outer circle serves as places of residence and food preparation, while the inner circle is largely limited to yam huts tended by men most of the time and other audience members during times of public ceremony in the plaza mention yam huts here (Fraser 1968:31; Figure 34; Malinowski 1929; Schiefenhövel and Bell-Krannhals 1996:240). Figure 14 depicts this analogy. In this Trobriand village settlement pattern, based on Malinowski's 1929 map, the outer circle of residences contrasts with the inner circle of yam huts. The amount of yams placed in display in these huts is directly linked to status among the various community members. The size of each yam hut and its potential yield of yams is dictated culturally. The chief always maintains the largest hut with the most yams, while a hierarchy from those closely related to the chief down to the commoners dictates the allowable sizes of huts and amounts of yams allowed for public display by other community members. I have equated hut size to the relative amount of yams and produced a density (contour) map of the amount of yams allowed for display across the inner circle. By superimposing this map over Malinowski's map of village structures, the amounts of yams and their distribution at locations across the circle mimics the contours reflecting differential distributions of shell at ring sites in the southeast U.S. Note that in compliance with Grøn's model, the central portion of the site is the location of the individual with the highest status, the chief.

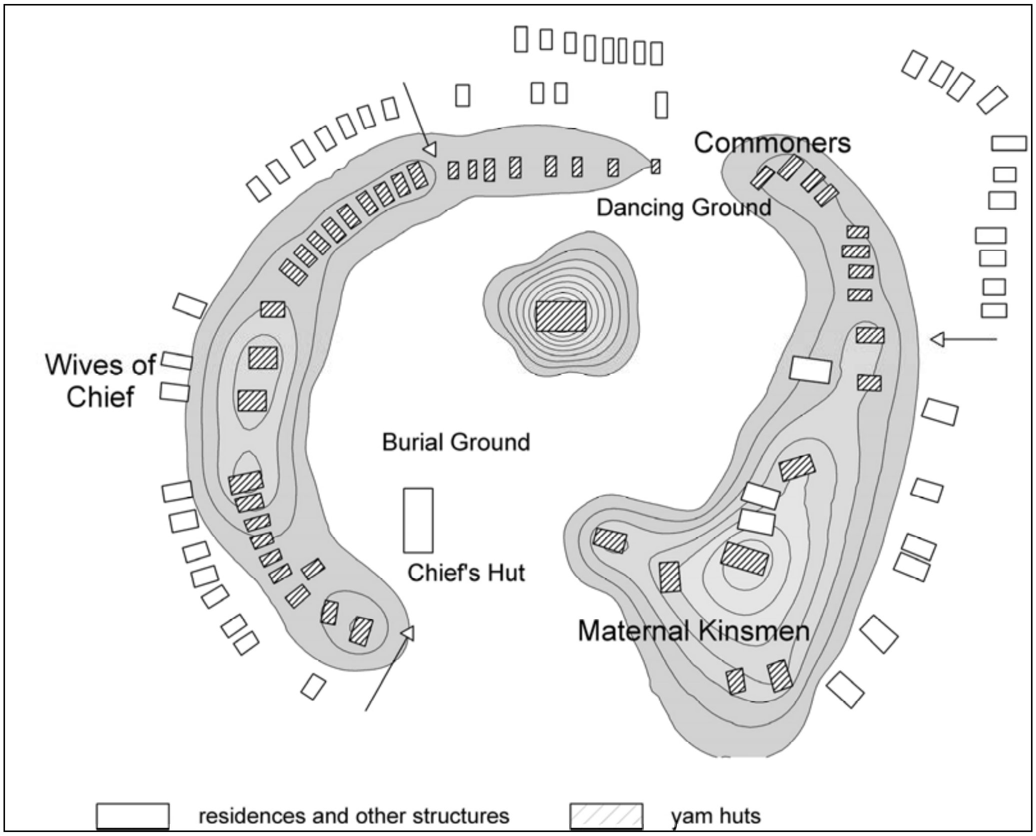


Figure 14. Representation of social status and yam hut volume in a Trobriand village.

At Fig Island 1, Plaza C, given the imprecision of radiocarbon dating, it will be difficult to test whether or not the two concentric rings surrounding it were contemporaneous. Ceramics will likely not be sufficiently distinctive to determine if the rings are contemporaneous or only nearly contemporaneous. One possibility is to test the low-lying area between the rings or where they join at their northeast and southeast sections to see if one ring's strata overlies the other.

The rings D1 and D2 may be connected and have functioned as a single ring at one time. The shell ridge separating them is thin and may, in part, be the result of colluviation. Attached rings such as these and Ring E are not unknown in the world of shell rings. At Rollins Shell Ring in northeast Florida, up to 11 attached rings or "ringlets" have been identified and suggested to have functioned as smaller arenas for public ceremony where sodalities, kin groups, or extended families may have performed rituals not open to the greater public (Russo n.d.; Russo and Saunders 1999). As for "ring" B, the current operating theory is that this area is not a ring, but rather the epiphenomenon of the building of a ramp on the area's north side, the building of Ring A on its northeast side, and the building of a mound on its southeast side. This interpretation is, in part, supported by Leigh's analysis of core 17 which he sees as being similar to soil cores taken from outside plazas in marsh environments.

The possibility that the feature on the extreme southern end of Fig Island 1 is a mound is supported by shell probes that reveal sand nearer the surface directly beneath the center of the mound than in the probe locations surrounding it (Figure 15). I note that the relatively high sand deposit was found in only one probe and may be anomalous.

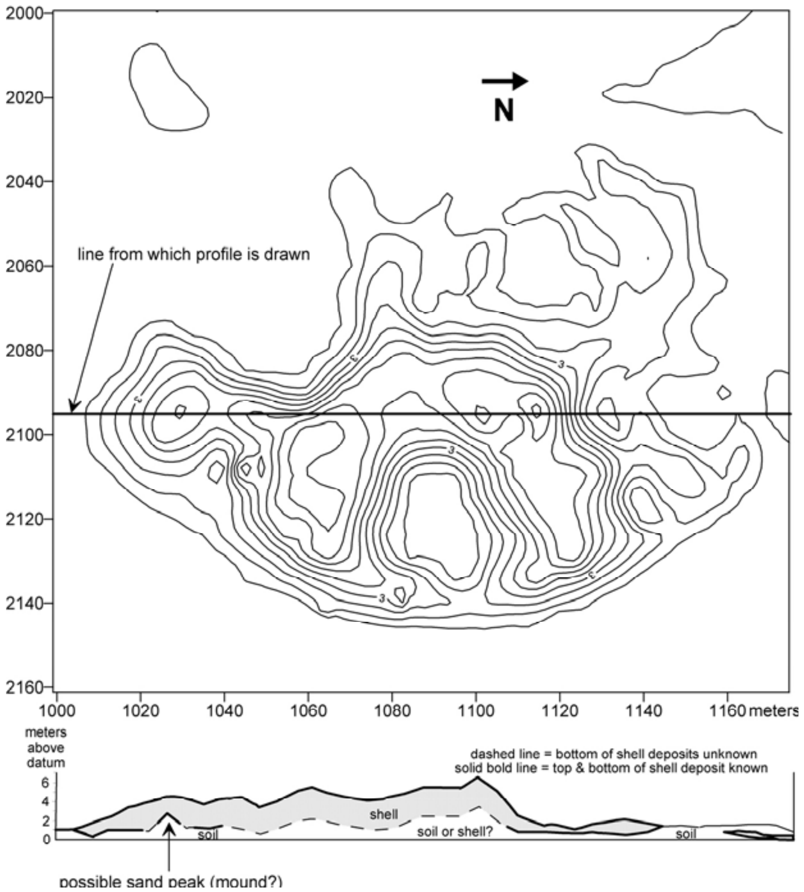


Figure 15. Profile of the base of the shell/top of the sand, Fig Island 1.

Nonetheless, similarly constructed ritual mounds have been identified at a number of Archaic sites in Florida, (Dickel 1992; Russo 1994a, 1994b), and the possibility that one exists at Fig Island should be entertained. At Horr's Island, for example, prior to the construction of Mound A, the ground surface was leveled and ritually burned. Then a sand mound was set in place and covered by alternating layers of shell. If the feature is indeed a mound, Fig Island 1 may contain the only known Archaic mound in South Carolina. It is further distinguished by the fact that a walkway or ridge of shell seems to have been constructed to connect it directly to Ring A. A mound separated from a public arena, of course, is suggestive of a greater degree of social ranking than is commonly associated with shell ring cultures in South Carolina. Distancing and setting apart elite architectural features from the general public is, of course, a hallmark of Mississippian chiefdoms (Anderson 1994:113,119; Muller 1997: 279) and is a common feature of hierarchically organized circular and U-shaped village formations in which the goal is to symbolize rank differences (Grøn 1991:108). Whether this feature is a mound and as such a marker of high rank is a promising question for future research.

The Prehistoric Landscape and Placement of Rings

Leigh's soil study (Appendix 1) offers the intriguing possibility that the land upon which the Fig Island shell rings were placed was, 4000 years ago as it is now, saltwater marsh. Specifically, he sees similarities in particle size and soil chemistry between Soil Core (SC) 10 taken from beneath Fig Island 2 and SC 7 taken from the marsh between Fig Islands 2 and 3 as possible evidence of similar "accretionary sedimentary environments." That is, the soil outside the ring was deposited and pedogenesis occurred at the same time. This suggests the rings were placed upon high sulfur-containing, organically rich marsh soils. Leigh attributes the virtual absence of such organics beneath any of the rings to chemical and mechanical affects of the overlying shell. Simply put, the overlying shell increased oxidation, which reduced sulfur content of the soil.

Alternatively, Saunders' discussion of sea level rise (Chapter 2, this volume) indicates that seas were up to 1.2 m below the current level when the site was occupied. If this were the case, Fig Island shell rings were likely placed on dry, terrestrial soils rather than saltwater marsh lands. With this in mind, the similarities Leigh sees between SC 7 and 10 may, indeed, be due to similar "accretionary sedimentary environments," but rather than increased oxidation accounting for the absence of high sulfur signature beneath the ring, a transgressing sea resulting in an emergent marsh would account for the increased sulfur (i.e., H_2S) content outside the ring in SC 7. That is, I do not argue with Leigh's suggestion the increased Ph and a better oxidizing environment could account for increased oxidation (and redder soils) beneath the shell rings, but question whether marsh sediments high in acidic H_2S compounds existed in the soil immediately prior to shell deposition. The oxidation and redder soils apparent in SC 10 would have occurred whether the foundations soils for the rings were largely anerobic sedimentary environments typical of marshes or dryer, subaerial terrestrial environments.

The determination of the sedimentary environment and surface soils upon which the Fig Island shell rings were deposited is critical to gaining an understanding of their function. As I have stated, I believe one of the keys to determining the function of shell rings lies in their plazas. These are where public feasts and other ceremonies, and displays occurred. Because these are the lowest-lying features at shell rings, if the rings were placed on marshes, the plaza would be in marsh, which would preclude their use as public arenas for the social events. Importantly, most other shell rings do not lie in such ambiguous environments, and the question of whether they were situated on dry land or in wetlands has not arisen.

To account for greater oxidation found beneath the rings, Leigh suggests that either the shell rings were built on “subtle, topographic rise(s)” and drier soils than found in the plazas, or that the addition of the shell changed the sedimentary chemical environment. I favor the idea of slight rises in the soil beneath the rings. Although the data are limited, the first occurrence of soil beneath the Fig Island 2 shell ring, as indicated by Shovel Test 4, occurs 1.5 meters below the surface of the ring. Because the surface of ring at this point is 2.4 meters above the arbitrarily assigned datum for the site, this means the ground surface below the ring is 0.9 meters above datum, or 0.7 meters below the current plaza level. However, Leigh suggests that current plaza surfaces generally consist of from 40 to 50 cm of soil that has accumulated since the plazas were occupied. (Leigh’s Appendix 1 demonstrates that the buried A horizon in SC 8 actually lies 53 to 57 centimeters below the core surface, and in SC 9, 42 to 53 centimeters). Subtracting these figures from 70 centimeters, the uppermost soil beneath the ring sits only 13 to 28 centimeters below the former plaza surface. However, this figure does not take into account the compaction of soils suffered by the cores. Given that compaction of 56 and 42 centimeters occurred in SC 8 and 9, respectively (Table 6), however, the former surface of the soil beneath the ring in Shovel Test 4 may actually have lain 13 to 29 centimeters above the former ground surfaces at SC 8 and 9.

This interpretation does suggest that the rings were placed on prepared (e.g., elevated) surfaces. It is doubtful that any natural “subtle topographic rise” would occur in the shape of rings. Such rises of sand have been found beneath at least one other shell ring (Russo and Saunders 1999), and missing in others (Russo 1991b; Scudder 1993) but testing has been inadequate at most ring sites to resolve the issue. At Fig Island, archaeologists should recognize that the soils data so far are limited and that there is a need to continue to explore the questions soils analyses can help answer.

Summary and Future Research

Fig Island 1 does not look like our standard view of a shell ring. It is bumpy, has appendages, is irregularly shaped, and varies widely in overall height from one part to another. Perhaps “ring” is an inappropriate term to assign to such architectural features. But other generalized terms are no less challenged by field reality. Circles, U-shapes, C-shapes, crescents, half-circles, semi-circles, doughnut- or bagel- shaped shell middens—none quite fit the “things” archeologists are finding in the field. The architectural features that have been described as shell rings might, in geometrical terms, be called toroids or tori. The singular form, torus is described as a doughnut-shaped surface generated by a circle rotated about an axis that does not intersect the

Table 6. Observations on soil cores from Fig Island.

CORE	Grid	Provenience	Top Strata	Color of bottom sand	Core length from surface (cm)	Loss due to compaction (cm)*	Sample Length (cm)
1	1128N2054E	Fig 1, Unit 2	Shell midden	Yellow	105-165cmbd (60cm)	34	26
2	1236N2002.5E	Fig3, Unit 3	Shell midden	Yellow	235-357cmbd (122cm)	40	82
3	1240N2001.5E	Fig 3, Unit 1	Shell midden	Yellow	235-470cmbd (235cm)	35 (10 lost)	190
4	1244N2001E	Fig 3, Unit 4	shell midden	Yellow	235-335cmbd (100cm)	28	72
5	1260N2000E	Fig3, plaza	Marsh muck	Gray	250	65 (10 lost)	175
6	1220N1975E	"walkway"	Marsh muck	Yellow	270	62 (32 lost)	176
7	1225N1965E	w. of "walkway"	Marsh muck	Yellow	234	42	192
8	1165.3N1936.2E	Fig 2, SW plaza	Marsh muck	Blue clay	141	56	85
9	1176.6N1961.4E	Fig 2, NE plaza	Gray sand/shell	Gray	136	42	92
10	1161.8N1978.6E	Fig 2, ST 4	shell midden spoil	Yellow	218	29	189
11	1134.4N1948.1E	Fig 2, ST 5	shell midden spoil	Yellow	76	23	53
12	1144.2N1929.1E	Fig 2, opening	Gray sand/shell	Yellow	243	78	165
13	1140.1N1915.9E	marsh near Fig 2	Marsh muck	Yellow	178	58	120
14	2143.8N1097.6E	Fig 1, plaza A	Marsh muck	Yellow	244	114	130
15	1139.6N2057.8E	Fig 1, F1 plaza	dry marsh muck	Yellow	167	78	89
16	1160N2090E	Fig 1, D1, ring top	dry marsh muck	Yellow	246	113	133
17	1060N2070E	Fig 1, "plaza" B	Marsh muck	Gray	191	79	102

*Compaction equals the amount of pvc pipe pounded into the ground. Sample length equals the amount of solid core of soil recovered from the core. Compaction equala the difference between the two, less any amount that was lost from the bottom of the core during recovery.

circle. The advantage of this term is that it presents a mathematically precise shape and avoids the awkwardness of such hyphenated words as "U-shaped rings" or "doughnut-shaped shell middens." The disadvantage is that it no better describes the actual features archeologists have found than does the term "shell ring." And so, "shell ring" it is.

However, as more shell rings are being mapped, the idea that the they are perfect circles of shell is increasingly being challenged. In fact, few shell rings approach anything like a perfect circle. Fortunately, it is these deviations from symmetry that may hold the key to understanding what shell rings are. Architecture reflects human social organization, relationships, and beliefs. I have presented a few ideas here as to how future research might concentrate on measuring the differences found within and among the large number of known shell rings to gain insight into past human behavior. With the topographic and shell thickness mapping of the Fig Island ring complex, we have begun to identify that site inhabitants organized themselves in complex ways that are reflected in the architecture they left behind. Future research should concentrate on correlating the theorized status positions with the artifact record. If greater amounts of shell reflect greater status, power, prestige, or abilities, then we might expect that such differences could be reflected in some unknown aspect of the material culture of the ring builders.

CHAPTER 8
FIELD EXCAVATION: METHODS AND RESULTS

All excavations were accomplished using standard field methods. Each 1 x 2 m unit, including the four comprising the trench in Fig Island 3, along with the single 2 x 2 m unit excavated at the summit of Fig Island 1, was excavated in 10 cm levels within natural and cultural strata. Artifacts from each provenience were given a Field Specimen (FS) number that provided provenience control throughout excavation, analysis, and curation. In the isolated units, vertical control was maintained with a line level. Vertical control for the trench was maintained with a theodolite, so that a single datum applied to all four units of that trench. The base of each 10 cm level in all units was cleaned, photographed, and mapped, and a level form was filled out for each. Strata were dry or wet screened (depending on the efficiency of each technique as determined in the field) through 1/4 inch hardware cloth. All features and "areas"—defined as subtle changes in soil texture, inclusions, etc. that lack the resolution and discreteness of features—were excavated separately. Areas were screened with 1/4 inch while features were water screened in the field through stacked screens with graduated 1/2, 1/4, and 1/16 inch mesh or bagged for water screening in the future.

A 50 x 50 cm column sample was placed in each unit and either left in situ until excavation was complete or removed by level. The former was preferred as it was felt that better stratigraphic control would be possible after the unit was excavated and the deposits better understood. However, this was not feasible in the case of the trench. Like the features, column sample materials were water screened in the field through stacked screens with graduated 1/2, 1/4, and 1/16 inch mesh or bagged for water screening in the future. Selected samples were also screened 1/32 inch for the recovery of the smallest size class of *Boonea impressa*, a small, parasitic oyster drill for which size is an indication of season of death. It thus serves as a proxy for season of oyster exploitation. In addition to the column samples from the excavation units, one area in each of Hemmings' trenches in Fig Island 2 was re-excavated, and a column sample was taken from the undisturbed profile of his excavations.

At the close of unit excavation, unit walls were cleaned, photographed, and profiled. All units were backfilled at the end of the excavation.

Excavation Results

Excavation was accomplished in all three shell structures that comprise the Fig Island site (Figure 16). In general, unit location was judgementally based. In Fig Island 1, a 2 x 2 m, (Fig Island 1, Unit 1) unit was placed near the summit of one of the two highest areas of the ring. The area was chosen primarily because of its elevation, but also because it was free of obvious tree fall disturbance and was open enough to stage the excavation without much clearing. The other unit (Fig Island 1, Unit 2) on Fig Island 1 was located at its base,

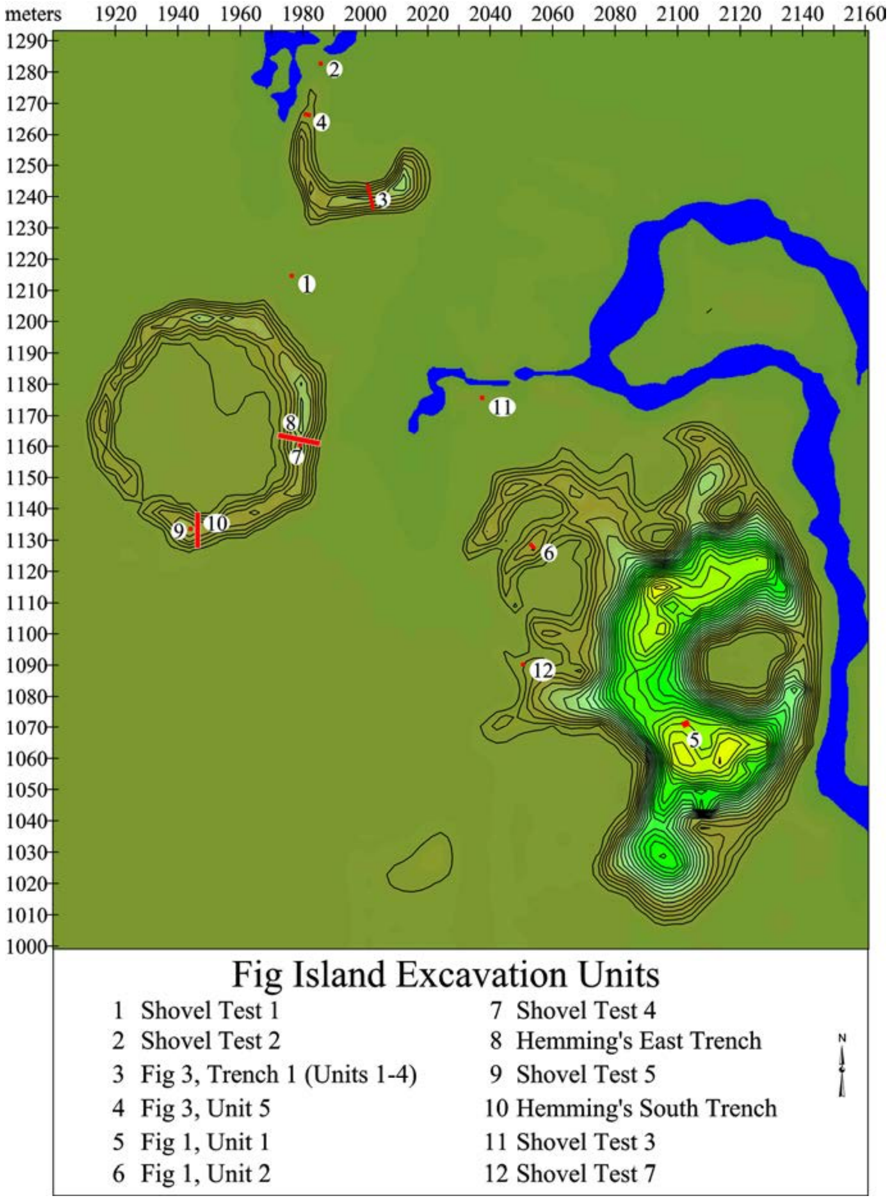


Figure 16. Fig Island site excavation unit locations (ST 6 not shown).

on the inner arm of Enclosure C on the northwest side of the structure. This unit was a 1 x 2 m excavation. This enclosure arm was chosen because pedestrian survey had revealed a relatively large quantity of surface sherds in the area. The unit was located on the highest elevation of this enclosure, perpendicular to the orientation of the topography.

The strategy for the excavation of Fig Island 2 was to obtain additional stratigraphic information, to retrieve faunal samples for seasonality studies, and to acquire additional radiocarbon information. In order to achieve these results, a small area of backfill in Hemmings' East and South Trenches was removed until undisturbed deposits were located. A 50 x 50 cm area of a selected profile of each trench was cleaned and mapped, after which an adjoining 50 x 50 cm unit was laid out—one on the south wall of Hemmings' East trench and one on the west wall of Hemmings South Trench. Each unit was removed as a column sample in 10 cm levels within natural and cultural strata. While the nomenclature may be a bit inappropriate, these columns were referred to as Shovel Test 4 for the East Trench, and Shovel Test 5 for the West Trench.

The most excavation took place in Fig Island 3. An 8 x 1 m (Fig Island 3, Units 1 through 4) trench was excavated into the southeastern arm of this U-shaped feature to provide a profile across the structure. When analyzed microstratigraphically and with relative and absolute dating, this trench was expected to give the most information on site formation processes for this ring in particular and, perhaps, other shell rings in general. Because there appeared to be considerable erosion at the highest point on this ring and there was also very dense vegetation, the trench was located several meters west of the highest area of the ring, but still along a high "plateau" with respect to the rest of the ring. In order to test whether or not there was variation in ring fill or in construction processes from higher to lower areas, another 1 x 2, Unit 5, was placed as close to the lowest portion of the western arm of the ring as possible, while still high enough to excavate without immediately hitting the water table.

In addition to these formal excavations, additional shovel tests were judgementally placed to answer specific questions in areas where larger excavations were unfeasible (ST1, 2, 3), to determine whether larger excavations were necessary (ST6), or to place a benchmark (ST7). ST1 was a 30 x 30 cm excavation located in the marsh, where subsurface probing indicated a lens of shell between Fig Island 2 and Fig Island 3. The shovel test was excavated to determine if there was any depth or integrity to this so-called "walkway." Three natural levels were observed: 10 cm of marsh muck, 25 cm of crushed, muck-stained oyster shell, and another 55 cm of muck prior to abandonment of the unit. The 25 cm of shell was screened as a single provenience. Six Thoms Creek Plain sherds less than 1/2 inch and two slightly larger Thoms Creek Plain sherds were recovered

ST 2, another 30 X 30 cm unit, was located north off the western arm of Fig Island 3 in order to determine whether shell extended off the arm below the marsh. Shell was observed in the marsh from 20-60 cmbs with muck above and below the shell; sand was encountered at 65 cmbs. This indicated that a small portion of the western arm of Fig Island 3 is present under the marsh, but additional probing indicated it did not extend far. Two Thoms Creek Plain (< 1/2 inch) and one eroded sherd were recovered.

ST3 was placed in the marsh (1176N, 2037E) where a small midden breached the marsh surface. Several sherds with fiber vermiculations on the interior and exterior surface were found on top of the midden at ground surface (Surface find #12). This suggested a possibly isolated Stallings midden on the site, but, because the submergence of the midden made any large excavation impossible, a 50 x 50 cm shovel test was placed there and excavated in three levels, 0-10 cm, 10-30 cm, and 30+ cm. A radiocarbon sample was taken from the central level. Including the surface finds, eight sherds larger than 1/2 inch were recovered from the test: one drag and jab Thoms Creek sherd, three Thoms Creek plain sherds, and six Stallings sherds, four plain and two incised. Ten sherds smaller than 1/2 inch were also recovered.

ST6 was located on Fig Island proper, where a small exposure of crushed shell was visible on the surface. A 50 x 50 cm test was excavated in 10 cm levels to 40 cmbs and another 20 cm were taken out as Level 5. Shell was found throughout and one cordmarked sherd was recovered from the first 10 cm and a possible worked bone fragment—it bore some polish—from the final level.

ST 7 was a small, 20 X 30 cm excavation for the placement of a permanent concrete benchmark on Fig Island 1. It was excavated as a single provenience to an unrecorded depth. No further information is available for this test. Three sherds were recovered, one Thoms Plain and two Stallings Plain.

Results

Fig Island 1, Unit 1. This unit was excavated to a depth of .90 m below surface (cleanup of these loose materials resulted in a depth of 95 cm below the NE corner profile), at which point excavation was curtailed due to a lack of time and the instability of the walls. This instability resulted from the fact that the fill consisted primarily of loosely compacted, large, whole oyster, some crushed shell, and shell hash. There was little soil in this deposit, and what was present was extremely dry. Orientation of the large oysters was variable, and ranged from horizontal to vertical and back to horizontal. It was noted that a relatively large percentage (ca. 40%) of the crushed shell in the screen was burned. However, this burning does not appear to have been in situ, as there were no discrete areas of burned shell on the unit floor.

Two strata made up the bulk of the deposit. Stratum 1 was large whole oyster with a small amount of 10YR2/1, black, fine loamy sand. Stratum 2 was identified at the base of Level 4 (40 cmbs). Similar in character to Stratum 1, this deposit contained large whole oyster with sparse crushed or burned shell with a small amount of slightly browner, 10YR2/1, very dark brown sand. It should be noted that this change was not apparent in the unit profile and may be attributable to dampness or lighting conditions. In profile (Figure 17), the shell appeared to be one continuous deposit. An area ('B' in Figure 17) was noted during profile drawing that may have had slightly more bone, but this was not recognized during excavation.

No features were identified in the unit. Several vague “Areas” were defined on the basis of presence or absence of soil, abundance of shell hash or crushed shell, etc., but these seemed more like fill episodes than primary deposits.

Taken together, characteristics of the deposit in this area seem to suggest that the deposits were deliberately mounded—that the shell and other materials were brought from some primary cooking area and dumped on top of Fig Island 1 and were not further disturbed by trampling. Indeed, given the size of Fig Island 1, it may be that much of the shell was borrowed, though there are no other known late Archaic shell sites in the immediate area. While deposits of jumbled, whole clean oyster could have been produced by a number of activities (Russo, Chapter 7), their presence on the top of Fig Island 1 (and in the centers of Fig Island 2 and 3; see below) strongly argues for purposeful mounding. There is no other

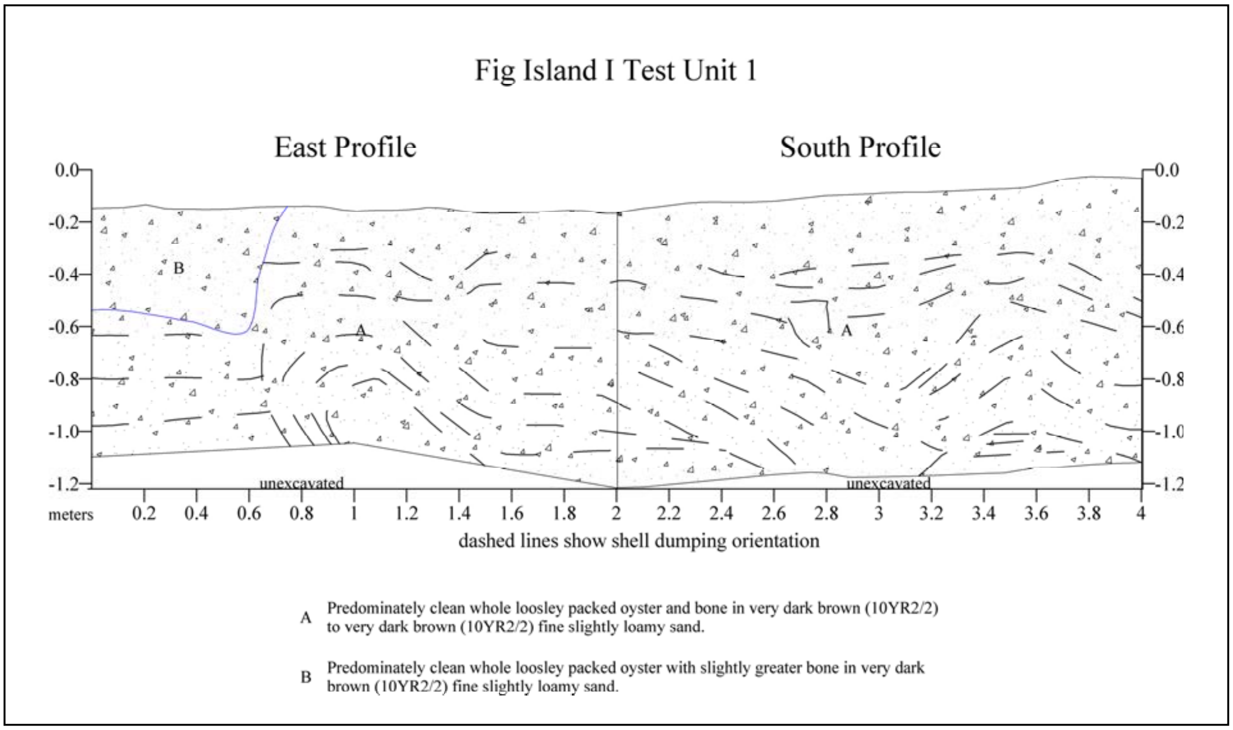


Figure 17. Fig Island 1, Unit 1, East and South profiles.

explanation for the shell orientation, the presence of scattered, burned crushed oyster with no evidence for in situ burning, and the absence of anything that could be considered a living surface in almost 1 m of deposits.

A column sample was located in the NE corner of this unit. This was removed after the unit was excavated, though not without some problems due to the loose nature of the shell. Because redeposition was suspected, no levels of this column sample were submitted for zooarchaeological analysis.

Two oyster shell radiocarbon samples were taken from the walls of this unit after photography and mapping were complete. One was from the east wall and was taken at 50 cmbs (RC # 26); the second was from the deepest part of the completed excavation, from the south wall at 1.10 cmbs (RC #27). Though redeposition was suspected, the higher sample was submitted to provide a *terminus post quem* for construction of the highest portion of this shell ring.

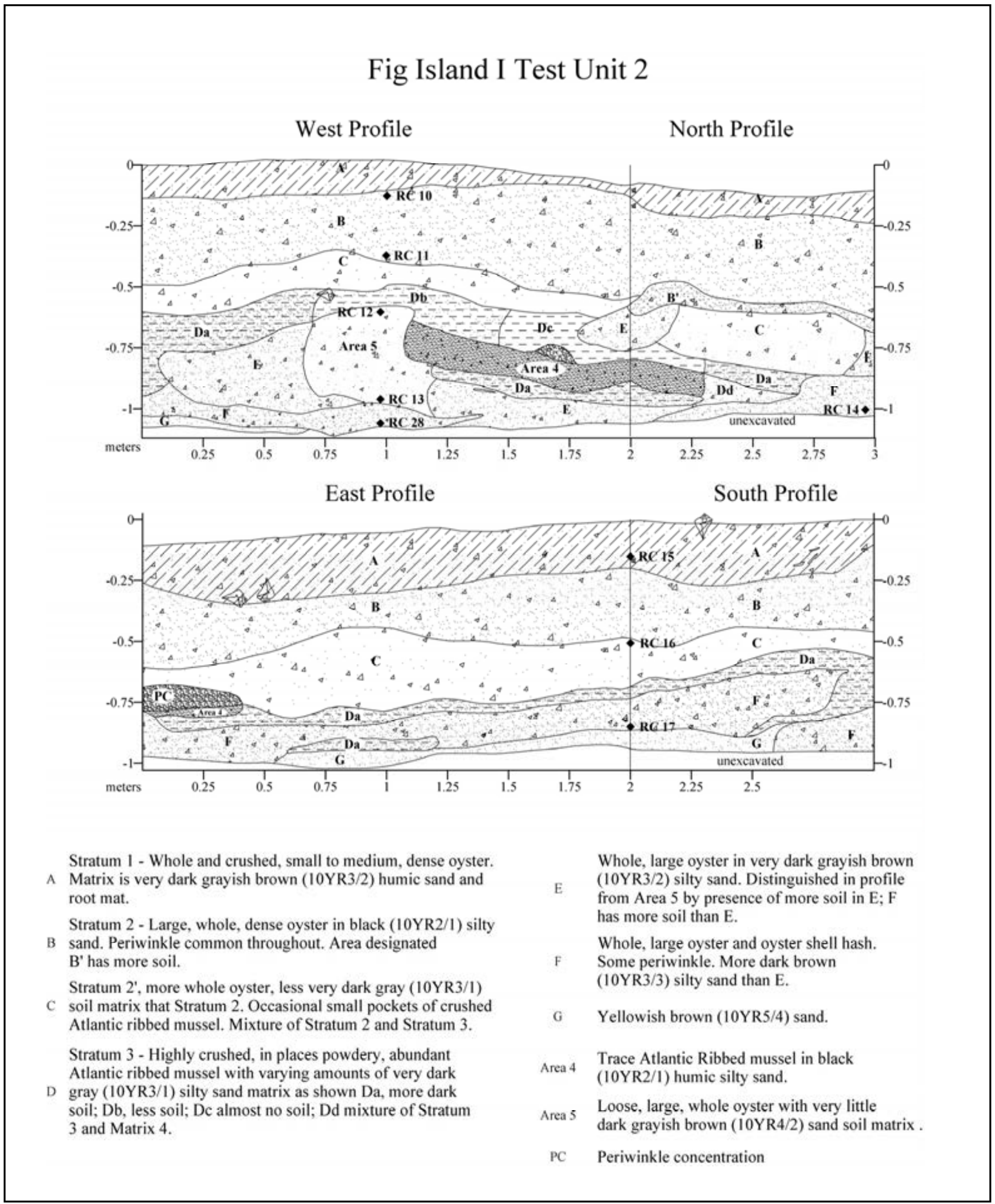
Fig Island 1, Unit 2. Unit 2, a 1 x 2, was quite different, both in the character of the deposits and in the nature and abundance of artifacts. Stratigraphically, the unit was complex (Figure 18), particularly in the lower one half of the unit along the western wall. Here, the unit intersected a series of lenses or features that extended less than 30 cm east into the unit. The basal deposits in this unit were on sterile tan sand, the top of which was slightly below the water table. This was exposed only in the southeastern 1/4 of the unit; the unit became inundated before the last shell deposits could be removed on the northern half of the unit. One sherd was recovered from the surface of the sand in the southeast corner. Though little of the original ground surface was exposed, it is worth noting that no features, leaching of organic materials, or buried A horizon was present.

The deepest deposit excavated consisted of what was called Area 5 during excavation (but was reinterpreted as Stratum 5 in the profile drawing). This was a lens of dense whole oyster in black organic sand. The deepest part of this stratum was in the southwest corner, where it extended 10 to 15 cm below the surface of the sand in the southeast corner. A radiocarbon sample (RC#28) was removed from the western wall below the water table at the base of this deposit and provides the date for the initial shell deposition in this area (Table 7).

Along the eastern wall, there followed a series of more or less horizontal deposits that differed in shell and soil characteristics. The most striking of these was Stratum 3, which was a thin (ca. 5 cm) deposit lying disconformably on the surface of Stratum 5 along the east wall and a much thicker (up to 30 cm), more sloped deposit on the west wall. This stratum was composed of abundant crushed Atlantic Ribbed Mussel with very little to moderate amounts of soil. In the northwest corner, the mussel was ground to a powdery consistency. Because of the interior lining of mother of pearl in this species, on exposure, the floor of the unit glittered in the sunlight. Stratum 3 is all the more remarkable because ribbed mussel is only a trace component in the shell assemblage elsewhere on the site.

One periwinkle dump, designated Feature 5, was found in Stratum 3 in Level 10. Two other dumps, visible in the profiles, were also associated with Stratum 3. One was on the west wall at the base of the higher Stratum 3, and the other was on the east wall, associated with the top of Stratum 3. No discrete periwinkle dumps were found in the 50 cm of deposits above Stratum 3. They were scattered throughout the midden in moderate quantities throughout Stratum 2, and absent or present only in trace amounts in Stratum 1.

As noted above, beginning with Stratum 3, deposits on the west wall were more sloped than they were along the east wall. The slope was the consequence of two large shell deposits (in the profile, Matrix 4 and Area 5) that may or may not be discrete events. The difference between the two was subtle—they were not differentiated in plan during the excavation. Viewed one way, they were a single depositional event (with slightly different fills) with an abrupt northern edge that was stabilized (intentionally or unintentionally) by a series of lenses on the northern side. Alternatively, Matrix 4 could be a continuous deposit and Area 5 an intrusion. The former seems more likely, as the lensing on the northern side contains deposits (Area 4 and a second lens of Stratum 3) that do not occur on the southern side. Area 4 was 10-20 cm thick lens of black (10YR2/1) organic soil; this area has the same relationship to a central feature (Area 5) that is found for a similar deposit in Trench 1 on Fig Island 3 (see below) and similar areas may have been present in Hemming's East Trench. These may be organically-enriched A horizons, and, as such, would indicate a hiatus in shell deposition. Certainly deposits above Stratum 2' appear to represent a different set of activities than those intersected on the western wall. The absence of an A horizon at the apex of Stratum 2' may indicate that part of Area 4 was colluvial—in other words, what may have formed at the apex has eroded away and this area is both a primary A horizon and colluvium.



A	Stratum 1 - Whole and crushed, small to medium, dense oyster. Matrix is very dark grayish brown (10YR3/2) humic sand and root mat.
B	Stratum 2 - Large, whole, dense oyster in black (10YR2/1) silty sand. Periwinkle common throughout. Area designated B' has more soil.
C	Stratum 2', more whole oyster, less very dark gray (10YR3/1) soil matrix that Stratum 2. Occasional small pockets of crushed Atlantic ribbed mussel. Mixture of Stratum 2 and Stratum 3.
D	Stratum 3 - Highly crushed, in places powdery, abundant Atlantic ribbed mussel with varying amounts of very dark gray (10YR3/1) silty sand matrix as shown Da, more dark soil; Db, less soil; Dc almost no soil; Dd mixture of Stratum 3 and Matrix 4.
E	Whole, large oyster in very dark grayish brown (10YR3/2) silty sand. Distinguished in profile from Area 5 by presence of more soil in E; F has more soil than E.
F	Whole, large oyster and oyster shell hash. Some periwinkle. More dark brown (10YR3/3) silty sand than E.
G	Yellowish brown (10YR5/4) sand.
Area 4	Trace Atlantic Ribbed mussel in black (10YR2/1) humic silty sand.
Area 5	Loose, large, whole oyster with very little dark grayish brown (10YR4/2) sand soil matrix .
PC	Periwinkle concentration

Figure 18. Fig Island 1, Unit 2, Profiles.

Alternatively, Area 4 and other deposits like it may just represent dumps of soil; in the case of Area 4, on the backslope of the ring. At the top of Area 4 (89 cmbs) a whole, 10.3 cm long, incised bone pin was recovered. Stratum 3 overlies all these deposits.

This series of obliquely-lying fills, along with the crushed surface of Stratum 3, is consistent with what others (e.g., DePratter 1979; Trinkley 1985) have considered evidence of a living floor (Stratum 3) and a succession of midden dumps behind (away from the ring interior). But it is curious that this hypothetical floor should be composed of what elsewhere was a very minor component of the diet. If such living floors were intentionally constructed, perhaps to provide a smoother, more comfortable surface, it must be explained why lenses of crushed ribbed mussel were absent in all the other tests at the site. It should also be noted that there were no artifact concentrations at the surface of Stratum 3 that might be expected on a living floor.

Stratum 2'overlay Stratum 3, and, on the north wall, provides enough bulk to remove a good deal of the underlying slope. It is unclear whether this "leveling" was intentional. Stratum 2' was considered "transitional" between the underlying deposits that had abundant shell and generally little soil matrix and the overlying Stratum 2 and Stratum 1, both of which contained abundant whole and crushed oyster in brown humic sands. On the north wall, at the intersection of Stratum 2' and Stratum 2, was an area with shell similar to that in Stratum 2 but with more dark (10YR2/1 black) silty soil. The unit intersected only a small portion of this lens; it was not visible in plan.

Deposits in the unit were generally homogenous above Stratum 2' and were composed of more typical (in terms of soil abundance) coastal midden. Stratum 2 contained abundant whole, large oyster and common periwinkle in 10YR 2/1 black loamy sand, while Stratum 1 had a browner, 10YR3/2 very dark grayish brown, humic sand with whole and crushed oyster. Roots were abundant in the upper portions of this stratum.

A 50 x 50 cm column sample was defined in the SW corner of this unit and was removed after excavation was complete. However, Stratum 3 was not well represented in this column. Prior to the excavation of Level 10, a column sample was defined in the NE corner for fine screening to recover a 10 cm bulk sample. This was removed at the end of the excavation of Level 10. This is one of the proveniences chosen for zooarchaeological analysis.

Nine oyster shell samples were taken from various proveniences on the wall profiles as indicated in Figure 18. Two of these, RC # 10 and RC# 28 were sent for processing. These were selected, as were most of the radiocarbon samples, to yield top and bottom dates for the three rings.

Fig Island 2, Hemmings Trenches. Some aspects of Hemmings' research at Fig Island 2 were discussed in the previous research section. Here the focus is on field methods and stratigraphy. Hemmings' excavation strategies may make future artifact comparison difficult. All proveniences were removed in arbitrary 0.5 ft intervals. There were no zone or stratum designations. Thus, in some levels, the overlying oyster shell and humus deposit—the latest stratum—may be mixed with the earlier, loosely packed oyster shell material. Horizontal control was maintained within 10 x 10 ft "blocks" lettered A, B, C, and D in both trenches. Except for East trench Block C and South trench Block B, no screening was done below 2.5-3.0 ft, though matrices were "hand picked [and] examined closely."

Hemmings' profiles, on file at SCIAA, indicated a fairly homogenous fill throughout the trench (Figure 19). In both the South and East trenches, the ring fill was composed of "loosely packed whole oyster shell." Field notes indicated that a few features were defined in the East Block. Feature 1 was defined in Block C and was a circular or subcircular concentration of "fish bone in a fine organic matrix surrounded by oyster shell . . .possibly [the] remains of a few fish used on one occasion." This feature was 1/16" screened, and catalogued materials indicated that fish and turtle bone and crab claws were recovered. Hemmings suggested that this was possibly an inclusive feature.

In the East trench, Block E, Hemmings defined Feature 1a, a periwinkle concentration, also defined as circular and in fine grained organic sands in a matrix of loosely packed oyster shell. This feature was 6 ft from Feature 1, so they were not directly associated , but Hemmings considered them "approximately stratigraphically contemporaneous." A portion of this feature is visible in the north wall of the East Trench (Figure 19).

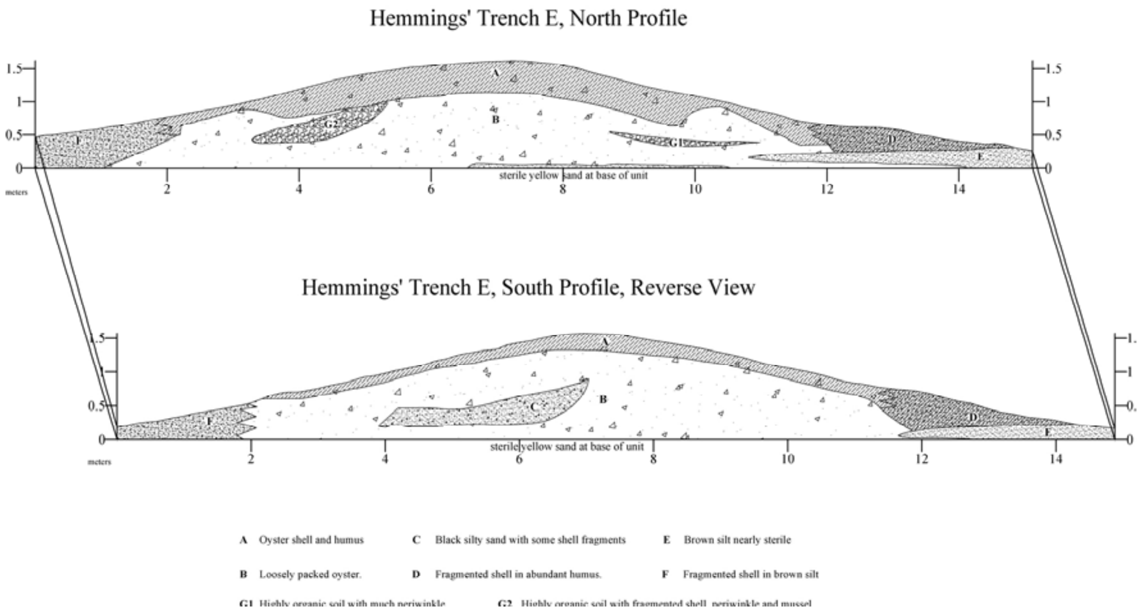


Figure 19. Hemmings East and West Trench Profiles. Redrawn from original on file as SCIAA.

Feature 2, a charcoal concentration, was located in the East trench extension into the interior of the ring. It was located in the first 0.5 ft (13 cm) of the excavation. Excavation had to be halted because of water intrusion and the feature was not removed. Because of the "tough fresh nature" of the charcoal, Hemmings thought that it might be modern. He noted, however, that there were a number of sherds immediately outside the western edge of the feature. These included eight plain "semi-fiber tempered sherds," the most from any single provenience on the site. Five of these, according to the notes, were from the same vessel.

Fig Island 2, column samples. As noted in the section on field methods, small portions of the backfill of Hemmings' East and South trenches were removed and a ca. 50 x 50 cm section was cleaned to the undisturbed profile. This profile was drawn and a 50 x 50 cm column sample was laid out and excavated in 10 cm levels within natural and cultural strata.

Trenches were easily relocated and the walls were visible due to a small amount of settling of backfilled material.

Shovel Test (Column Sample) 4 was located along the south wall of the highest point of Hemmings East Trench. The profile indicated that whole large oyster overlay an oblique lens of black humic soil with oyster, clam, and abundant shell hash. This was designated Feature 4 (Figure 20 depicts Feature 4 after the column sample was removed). Pockets of fish and mammal bone were distributed throughout the feature. As originally mapped, this dark soil was underlain by a grayer humic sand with similar inclusions, but this distinction was not visible once excavation was underway, and Feature 4 as described was excavated from 60 to 130 cmbs. Feature 4 cannot be a continuation of what Hemmings mapped on the western side of the south wall of the East trench as an oblique lens of “high organic content, much periwinkle” because it was too low. However, the soil matrix clearly resembles this and the other areas of organic soil mapped by Hemmings.

Feature 4 bottomed out onto a silty very dark grayish brown (10YR3/2) sand with very little shell. This lens was 15 cm deep and bottomed out onto sterile yellow sand. Hemmings did not record any such a stratum at the base of shell in either of his trenches. The column sample may have come down on the edge of a feature or, because of the high level of organics relatively low in the profile, there may be leachate under Feature 4 that was absent elsewhere. On the other hand, this part of the column quickly became inundated, and the color may come from fine organic particles introduced by during high tides.

Once the column sample was excavated, the newly-exposed south wall was re-profiled as shown in Figure 20. Five radiocarbon samples were recovered. Two of these, RC #2 and RC #5 were sent for processing. Just as for radiocarbon samples submitted from other proveniences throughout the site, the selection of these samples was to obtain top and bottom dates for the deposition of Fig Island 2. They also served to double check the date that Hemmings had secured in 1970.

Procedures for Shovel Test (Column Sample) 5 in the South Trench were similar. However, the first location chosen for the sample, again, at the apex of the ring along the western wall, was abandoned due to root disturbance. The column was moved south to avoid these roots. Thus, there was a larger exposure and more disturbance to the west wall of the South Trench than for the East trench.

The initial profile was very like what Hemmings had drawn. Stratum 1, a whole and crushed shell midden with dry very dark grayish brown (10YR3/1) fine sand overlay Stratum 2, whole and crushed shell and shell has with a small amount of a browner (10YR3/3, dark brown) fine sand. At the extreme southern edge of the column, however, Feature 6 was defined. Feature 6 was an area of very dark gray (10YR3/1), slightly clayey fine sand with less whole and crushed oyster than was visible in Stratum 1 or 2. On excavation, the plan view showed that Feature 6 actually covered most of the unit, and the column was excavated as shown in the profile drawn after the column was removed. The base of the shell was inundated, but appeared to be a brown (10YR4/3) sterile sand. Oyster shell for radiocarbon assays were recovered as shown in Figure 21. None of these have been processed to date.

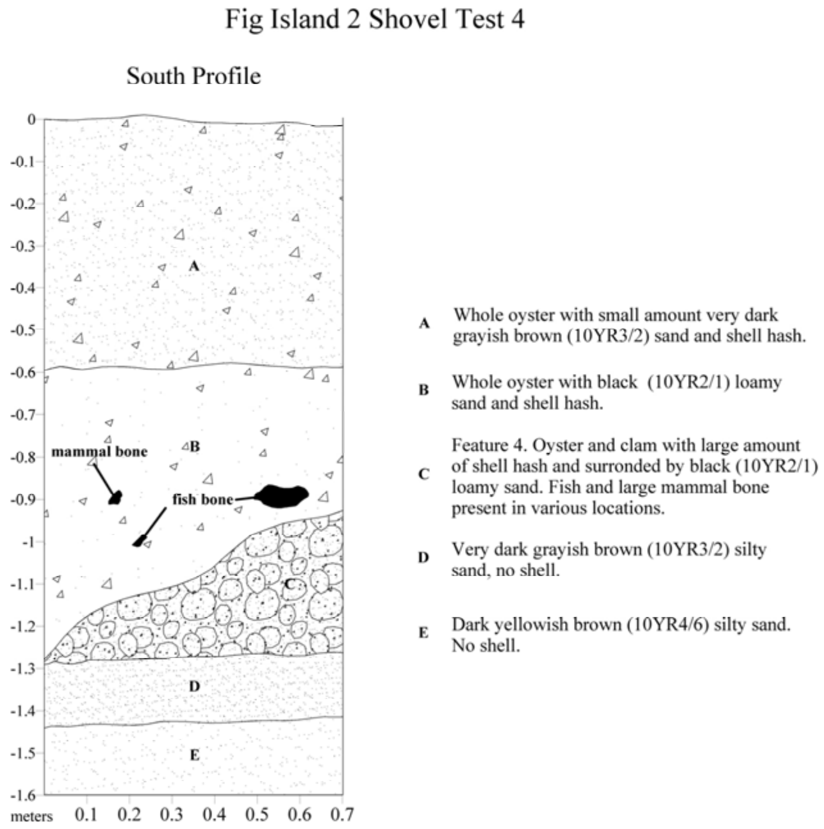


Figure 20. Shovel Test 4 (Column Sample). Profile after column removed.

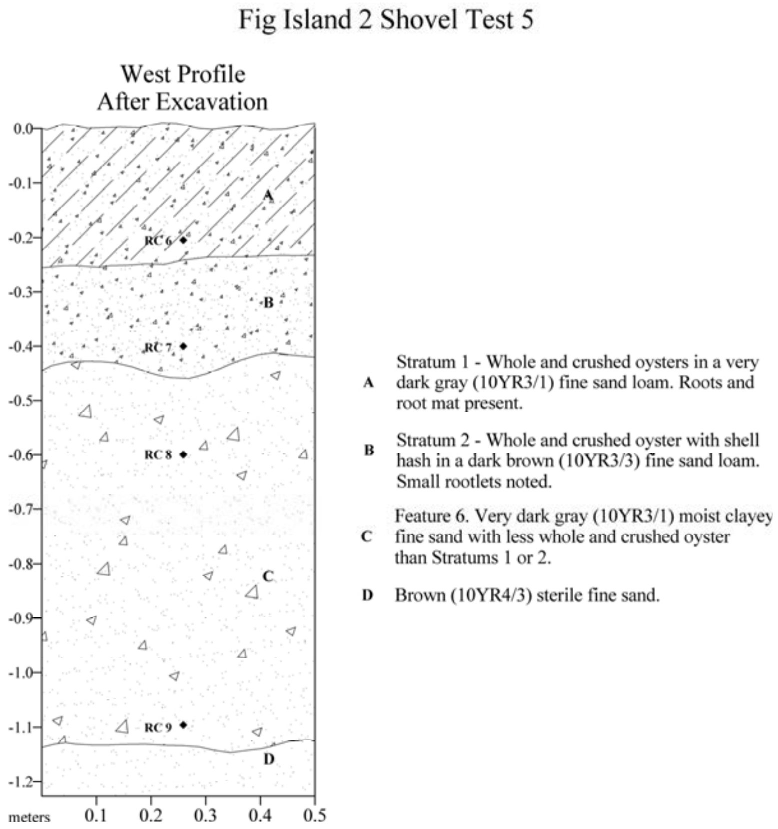


Figure 21. Shovel Test 5 (Column Sample). Profile after column removed.

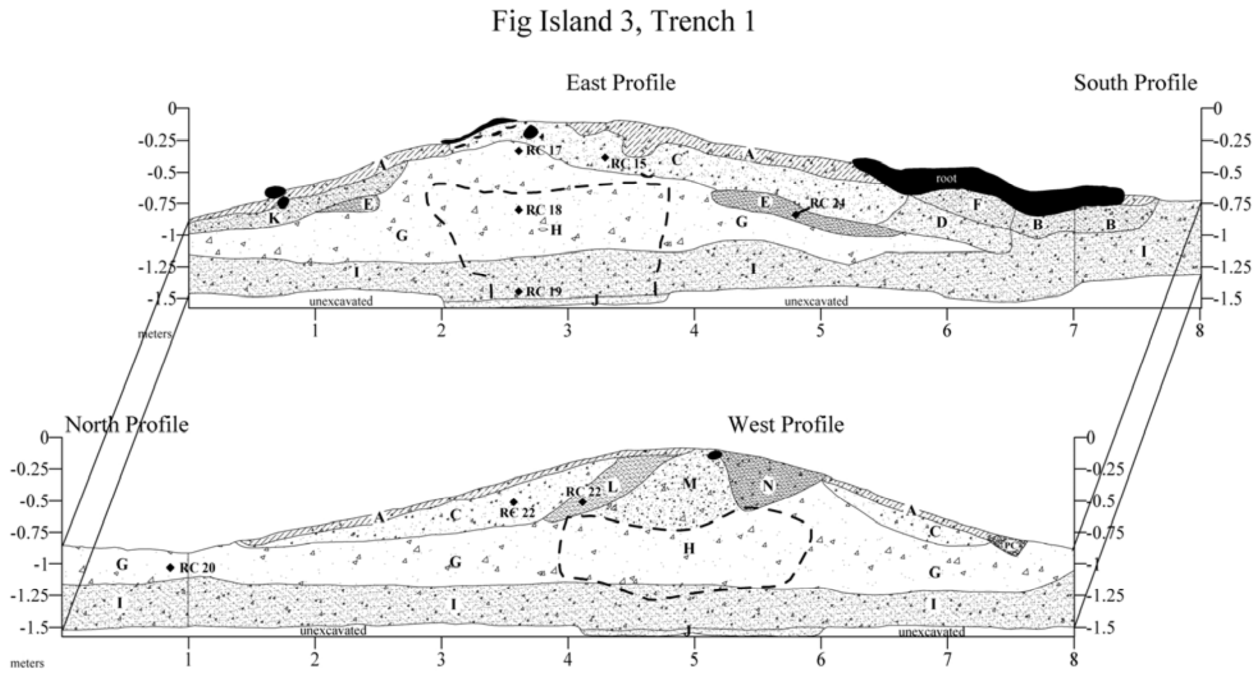
*Fig Island 3, Trench 1.*Though somewhat more detailed than Hemmings' profiles of the Fig Island 2 trenches, the profiles of Trench 1 in Fig Island 3 were quite similar. Though the stratigraphy of Trench 1 was less complex, there were also similarities to the west profile of Fig Island 1, Unit 2. The initial deposit(s) in the trench was what was referred to as Feature 1, a large (1.95 m at its greatest length within the trench) area of predominantly whole oyster, very loose, along with abundant shell hash, and abundant small fish bone. There was almost no soil in this deposit. In most levels, Feature 1 was easily distinguished from the surrounding matrix, Stratum 1, which overlay Feature 1. This stratum was also composed of abundant whole shell and shell hash, but Feature 1 was easily distinguished from it by the abundance of bone in Feature 1. As depth and tidally-intrusive muck increased, the feature became more difficult to distinguish. However, though constricting at the base, the feature did appear to extend to the sterile sand upon which the ring was built. The highest point of Feature 1 was in Unit 2, where it was recognized at 60 cmbs.

A word on the handling of Feature 1 is necessary here. The first level (60-75 cmbs due to excavator error) was bagged for fine screen. However, it was immediately apparent that it was impossible to fine screen and bag all materials for removal from the island. Beginning with Level 9, the feature was screened through nested 1/2 and 1/16 inch screen. The 1/2 inch fraction was sorted for artifacts and bone and the 1/2 inch shell was discarded. The artifacts and bone from the 1/2 inch fraction were placed with the 1/16 inch fraction and bagged for future water screening. To control for the discarded shell, 50 x 50 cm column samples were established in the feature in Level 10, and taken every level until the base of the excavation. Column samples were also taken for Stratum 1 beginning in Level 10.

The profile (Figure 22) indicates a division between predominantly whole oyster in clayey silt (I) and whole oyster, in a sandier matrix (G). This division was likely artificial. The profile was exposed to precisely the depth of this distinction when it rained, cleaning the face of the profile to that depth. The lower levels were never rained on. Additionally, this line is well within the high tide line during extremes of tide or wind. Clayey silts could have been naturally deposited within the shell matrix at this depth. Though the reality of this division was rejected, it was mapped because it shows up well in the photographs and needed to be addressed.

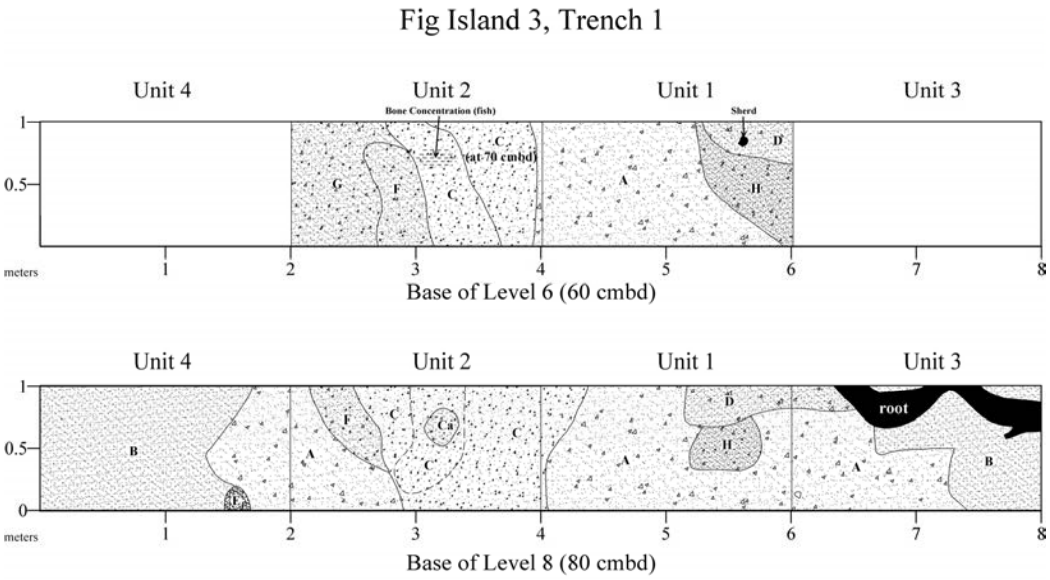
With the exception of Feature 1, there were few divergences from the generalized matrix of Stratum 1. The profile map indicates some observed differences in fill, but none of these may be culturally significant. In plan, five "Areas" were distinguished during excavation. As in other excavations, these were based on amounts of soil, shell character (whole or crushed), and the abundance of shell hash. These areas were ephemeral and difficult to follow from level to level. Indeed, as mapped in plan, Areas 1 and 5 continued into the east profile, but could not be discriminated from the surrounding matrix during profile mapping.

Figure 23 demonstrates the juxtaposition of Areas 1, 4, and 5, the most coherent of these areas. The location of these areas on either side of Feature 1, and the location of



A	Stratum 1 with root mat - Predominately whole loose oyster, moderate shell hash, in very little matrix of very little very dark grayish brown (10YR3/2) sand.
B	Whole, loose, oysters, moderate shell hash in very dark grayish brown (10YR3/2) clayey silt. Probably same as F but not exposed to rain.
C	Predominately whole loose oyster, moderate shell hash in very dark brown (10YR3/1) fine sand and silt.
D	Whole and crushed oyster, moderate shell hash in very dark gray (10YR3/1) clayey loam.
E	Feature 2. Black (10YR2/1) fine sandy loam.
F	Whole, loose, clean oyster, moderate shell hash in very dark grayish brown (10YR3/2) fine sand.
G	Stratum 1 - Predominately whole loose oyster, moderate shell hash, in very little matrix of very little very dark grayish brown (10YR3/2) sand.
H	Feature 1. Predominately whole loose oyster, moderate shell hash, abundant bone, very little very dark grayish brown (10YR3/2) sand matrix. Distinguished from Stratum 1 by abundance of bone.
I	Predominately whole oyster in dark grayish brown (10YR4/2) clayey silt (see text).
J	Brown (10YR4/3) fine sand.
K	Whole and crushed oyster, small amount of shell hash in very dark brown (10YR2/2) slightly loamy fine sand.
L	Compacted shell, predominately whole oyster in very dark brown (10YR2/2) fine silty sand. Compaction evident at base where shell align down slope.
M	Predominately whole loose oyster, shell hash, with little bone.
N	Loose oyster, predominately whole, moderate shell hash in very dark gray (10YR3/1) clayey fine sand. Slightly more soil than surrounding proveniences.
PC	Periwinkle concentration.

Figure 22. Fig Island 3, Trench 1, profiles.



A	Stratum 1 - Abundant whole and crushed oyster and shell hash in dark brown (10YR3/3) fine sand.
B	Stratum 1a - Damp very dark brown (10YR2.5/2) loamy silt.
C	Feature 1 - Extremely abundant small bone, shell hash, moderate whole and crushed oyster. Vey little dark brown (10YR3/3) fine sand.
Ca	Feature 1a - Shell hash, much crushed rib mussel in grayish brown (10YR5/2) fine sand, possibly ashy but does not smear. Charcoal more abundant than elsewhere.
D	Feature 2 - Abundant whole and crushed oyster in very dark brown (10YR2/2) fine sand loam.
E	Feature 3 - Abundant periwinkle in Stratum 1 matrix. Some whole oyster and shell hash.
	Area 1- Abundant shell hash and small bone, whole and crushed oyster is common. Matrix in black (10YR2/1) fine sandy loam.
G	Area 2- Abundant shell hash and small bone, whole and crushed oyster is common. Matrix in black (10YR2/1) fine sandy loam.
H	Area 4 - More soil than surrounding areas, abundant shell hash as well as whole and crushed oyster. Some oyster has very dark grayish brown (10YR3/2) clayey silt.

Figure 23. Fig Island 3, Trench 1, Level 6 and Level 8 floors.

Area 5 between Feature 1, Feature 2 (one of those dark, organic lenses) suggested some patterned behavior, perhaps postholes or some other excavation. However, none of these were convincing. Though it retained a subcircular shape, Area 5 was less than 20 cm deep. Area 1 extended from 60 cmbs to 95 cmbs but was linear in the higher elevations. Area 4 extended for 40 cm, but was also linear in higher levels. The behavior of these deposits suggested that there were simply fill episodes, perhaps indicating some broadcasting of fills, if indeed these were discrete deposits.

As noted, Feature 2 was another dark (10YR2/1, black) organic lens that, in profile, sloped in a configuration that suggested that it overlay a discrete pile of shell. The northern edge of the feature in profile also had a trajectory that conformed to the top of Feature 1. Though not observed during excavation, it appears that a more ephemeral, but complementary lens existed on the other side of Feature 1. However, neither Feature 2 nor its complement were apparent in the west wall profile. Feature 2 was water screened in its entirety, and a sample was selected for zooarchaeological and archaeobotanical inspection.

Feature 3 was a small periwinkle dump located at 80 cmbs in Unit 4. It was bagged for water screening.

During excavation, every attempt was made to segregate what might be envisioned as the final living surface from underlying deposits. This was difficult. Except for the presence of root mat on the exposed surfaces, there was little difference between shell along the slope and that in the ring interior. A Stratum 1a and 1b were ultimately defined at 80 cmbs (from the apex of the trench) on the south and north edges of the trench, respectively, but this 10 cm level was the only location it could be discerned.

Oyster for radiocarbon samples was taken as shown in the profile (Figure 22). Two of these samples (RC # 23 and #19) were assayed to provide dates on the earliest and latest deposit of the ring in this area.

Fig Island 3, Unit 5. Unit 5 was a 1 x 2 m unit excavated at the lowest point on the western arm of the ring where it was thought feasible. Five levels were excavated prior to inundation. However, deposits were so mucky, that even in the first level, field methods had to be adjusted. Sadly, at just about this time, the field pump gave up, which also affected the methods chosen.

In the first level, according to the field forms, the “majority” of bones were not saved. In the second and subsequent levels, deposits were screened for sherds and other obtrusive artifacts. The remainder of the material, the “1/4 inch residue” was bagged for water screening (theoretically, in the field) at a later date. Much of this material was not screened in the field but has now been processed at the Museum of Natural Science. Though bone, shell, and ceramic artifacts have been pulled, 1/4 inch bone from these proveniences has not. Thus, while in all other excavations at the Fig Island site all 1/4 inch bone is crated with the artifacts from that provenience (though see Feature 1 discussion, above), most of the animal bone of Unit 5 is not.

Five levels were ultimately excavated before the unit became inundated. Column samples were begun in Level 3 and the sample was carried down below the base of excavations to an ultimate depth of 1.0 mbs. At this depth it became impossible to maintain integrity between levels so the column sample was abandoned. However, a posthole digger was used to get to the base of the shell in this area. This was reached at ca. 160 cmbs. Shell from this "sondage" was saved for a radiocarbon assay (RC # 29) and processed.

It is somewhat difficult to judge the difference in stratigraphy between Unit 5 and the trench because much of the clayey silt soil in the unit could have been added postdepositionally during higher tides; in other words, if there were deposits of loose, large whole oyster with little soil, the voids have now been filled by marsh muck. However, it appears that there was more soil, more crushed oyster, and there was decidedly more periwinkle randomly distributed throughout the Unit 5 midden than was present in the trench. Periwinkle were particularly abundant in the upper levels.

Two strata were defined in the unit. At 30 cmbs, Stratum 1, a 10YR3/1, very dark gray silty clay with whole and crushed oyster gave way to a browner, 10YR4/3 silty clay. This stratigraphic difference coincided with a difference in artifact density. Stratum 1 had more ceramics and more shell tools than the lower stratum. No areas or features were defined in this unit.

Radiocarbon Dating

Nine radiocarbon samples were submitted for processing to Waikato Radiocarbon Lab in New Zealand. These samples were selected to provided data on contemporaneity within rings and between rings, as well as top and bottom dates for the structures. Results are given in Table 7 and in Figures 24 and 25. Note that, while the intercept date for the radiocarbon sample submitted by Hemmings is generally consistent with the rest of the samples, the large sigma for the date makes it difficult to compare and it is not included in Figures 24 and 25, or in the discussion that follows.

The oldest date recovered came from the base of Feature 4b, which was the basal deposit of the area tested in ST4 on Fig Island 2. This overlaps at one sigma with the date from the uppermost deposit, rendering the occupation relatively short-term. The basal date for Fig Island 2 overlaps at one sigma with that of Fig Island 3, TU5 and just misses overlapping with the basal deposits of the trench at 1 sigma. At two sigma, all would overlap. Note that the date from Fig Island 3, Unit 1 for the top of the ring has a conventional radiocarbon date older than that for the base. Calibrations overlap, however, so interpretively it is not a problem. However, it might suggest that the shell at the top of Fig Island 3 was borrowed from an older midden and redeposited to add

Table 7. Radiocarbon dates from the Fig Island site (Reservoir correction: Delta -5 ± 20).*

Waikato #	**Provenience**	**Material**	**Conventional RC, B.P.**	**cal 1sigma B.C./B.P.**	**cal 2sigma B.C./B.P.**	**Comments**
Wk-9746	F1, TU 2, 90 cmbs	oyster	3861 ± 46	1940-1780 3890-3730	2010-1730 3960-3680	base of shell
Wk-9762	F2, ST4, Fea 4b	oyster	4112 ± 50	2290-2130 4240-4080	2390-2050 4340-4000	base of shell
Wk-9763	F3, TU5, PH test	oyster	4030 ± 50	2180-2020 4130-3970	2270-1940 4220-3890	base of shell
Wk-9747	F3, Fea 1, base	oyster	3993 ± 49	2130-1970 4080-3920	2200-1900 4150-3850	base of shell
Wk-10103	F1, TU2, top	oyster	3816 ± 54	1880-1730 3830-3680	1970-1660 3920-3610	top deposit
Wk-10105	F1, TU1, top	oyster	3953 ± 47	2070-1910 4020-3860	2140-1860 4090-3810	top deposit
Wk-10102	F2, ST4, 30 cmbs	oyster	4009 ± 55	2150-1970 4100-3920	2240-1900 4190-3850	top deposit
Wk-10104	F3, TU1, 23-30 cmbs	oyster	4074 ± 48	2260-2090 4210-4040	2320-2000 4270-3950	top deposit
Wk-10106	ST3 30 cmbs	oyster	3709 ± 47	1740-1600 3690-3550	1820-1520 3770-3470	Large sherds with fiber found on surface
Unknown	Fig 2, East Trench	oyster	3986 ± 160	2274-1829 4224-3779	2469-1620 4419-3570	unclear

F1= Fig Island 1; F2= Fig Island 2; F3= Fig Island 3.
Delta R correction for the lower Atlantic coast is currently set at 36 +/-14 (http://radiocarbon.pa.qub.ac.ik/marine/.) However, to remain consistent with previously dated results, the above correction was used.

height to the ring. Strict interpretation of radiocarbon dating, however, in which the single date is essentially meaningless, makes this a difficult argument to support.

It was not possible to recover a date from the base of the main ring at Fig Island 1. The top deposit was dated with a sample from Unit 1 on that ring, but, as noted above, shell orientation strongly suggested that shell in this area was redeposited. The oyster shell sample returned a slightly younger conventional date than from the aforementioned ring dates, with no overlap at one sigma with the base of Fig Island 2 or with the top of Fig Island 3 (though again, this was thought to have been redeposited).

The samples from the small enclosure, or ringlet, at the base of Fig Island 1, appear significantly younger than the other rings, and possibly, but not probably, younger than the upper shell deposits on the top of the main ring (which, again, could be redeposited). Deposits at the small enclosure at Fig Island 1, where artifact frequencies on the site were almost twice as high as elsewhere on the site, may not

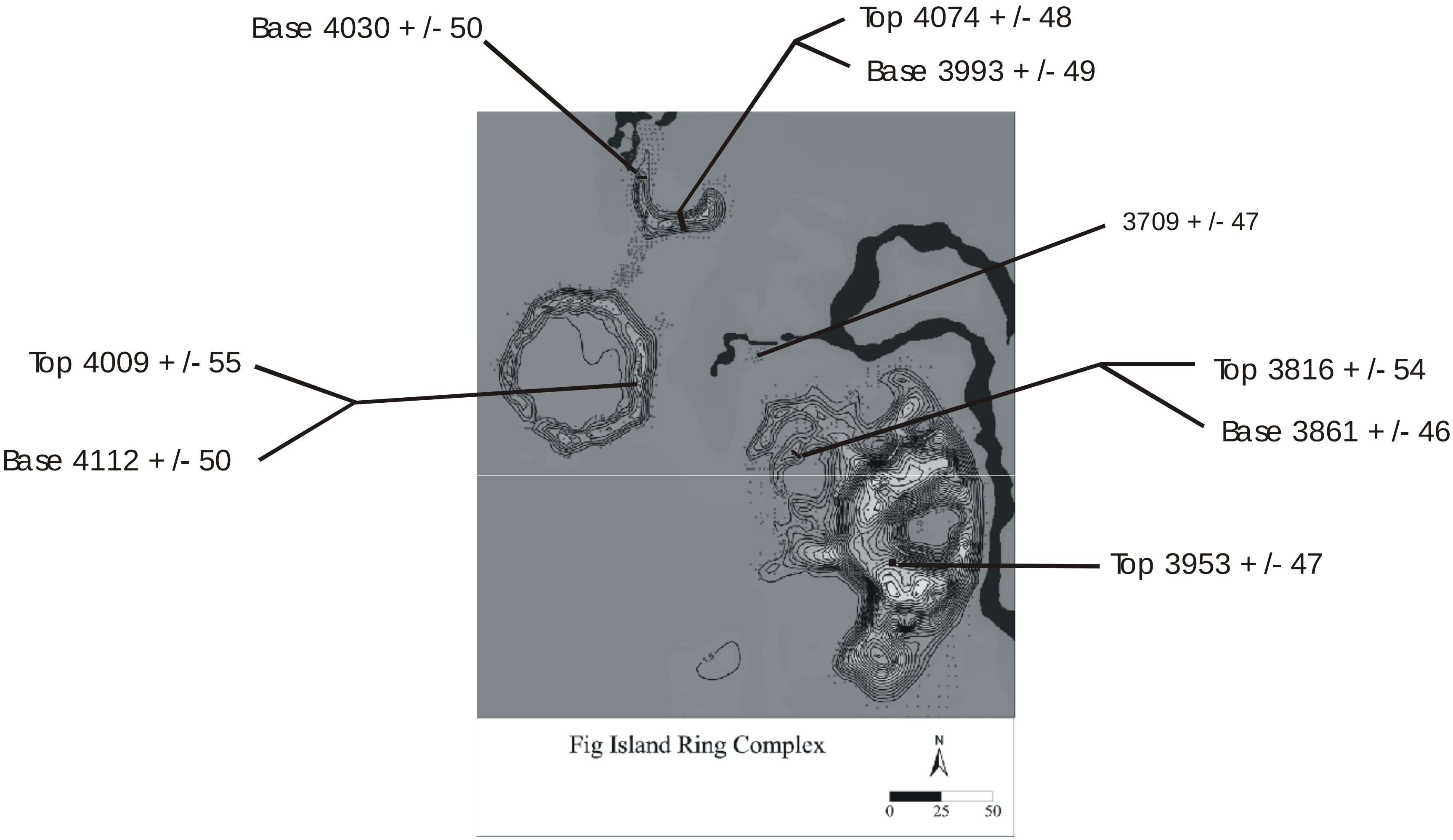


Figure 24. Radiocarbon dates from the Fig Island site, by Island.

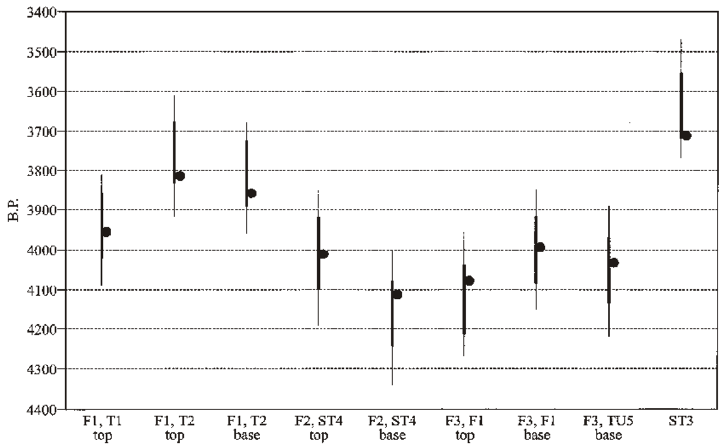


Figure 25. Fig Island site radiocarbon dates. Dot is conventional RC; broad line is to 1 cal, narrower line is to 2 cal.

be contemporaneous with the deposits (which may or may not be synonymous with the use of) Fig Islands 2 and 3.

The youngest deposit on the site appears to be associated with the isolated midden tested with ST3. The single date from this test, taken from approximately 30 cmbs or in the approximate middle of the deposit, overlapped only with the younger extreme of the date from the top of Fig Island 1, Unit 2. As noted, this shovel test was excavated because of the recovery of several sherds with fiber impressions on the exterior. (How Stallings was defined in this report is discussed in the section on pottery analysis.) Additional Stallings sherds were recovered from the shovel test, along with Thoms Creek sherds. At first glance, this might be another instance where Thoms Creek is found associated with Stallings in younger rather than older deposits. However, it should be noted here that Stallings was recovered from both Fig Island 1 units, from ST4, and from the trench (though not all units in the trench). The only major area from which the ware was absent was Unit 5.

Laboratory Analysis

Approximately one-quarter of the artifacts recovered during the field work were cleaned at the field lab. The remainder was transported to the Anthropology Laboratory of the Museum of Natural Science at Louisiana State University, where they were washed, dried, bagged or rebagged as necessary, and analyzed. A computer coding system was used for all materials to aid in analysis. Each unique specimen within each provenience was given a catalog number consisting of the Field Specimen number, a decimal point, and a consecutive number indicating its place in the analysis series. Because of the specificity of the coding system, with the exception of sherds under 1/2 inch, eroded or otherwise unidentifiable sherds over 1/2 inch and the 1/4 inch screen bone, each artifact has a unique number.

Shell Artifacts

A total of 125 worked or possible worked shell objects were recovered from the excavations (Table 8). All but two of these specimens were tools, but two ornamental shell objects (Figure 26) were recovered, both from the Fig 3, Unit 5, Level 3. One of these objects was a disc bead. The bead is 14.2 mm in diameter, 5.0 mm thick, and has a slightly slanting, drilled hole 3.8 mm in diameter. Such beads are often referred to as cut columnella beads, but this specimen could also have been made from the valve of a large clam.

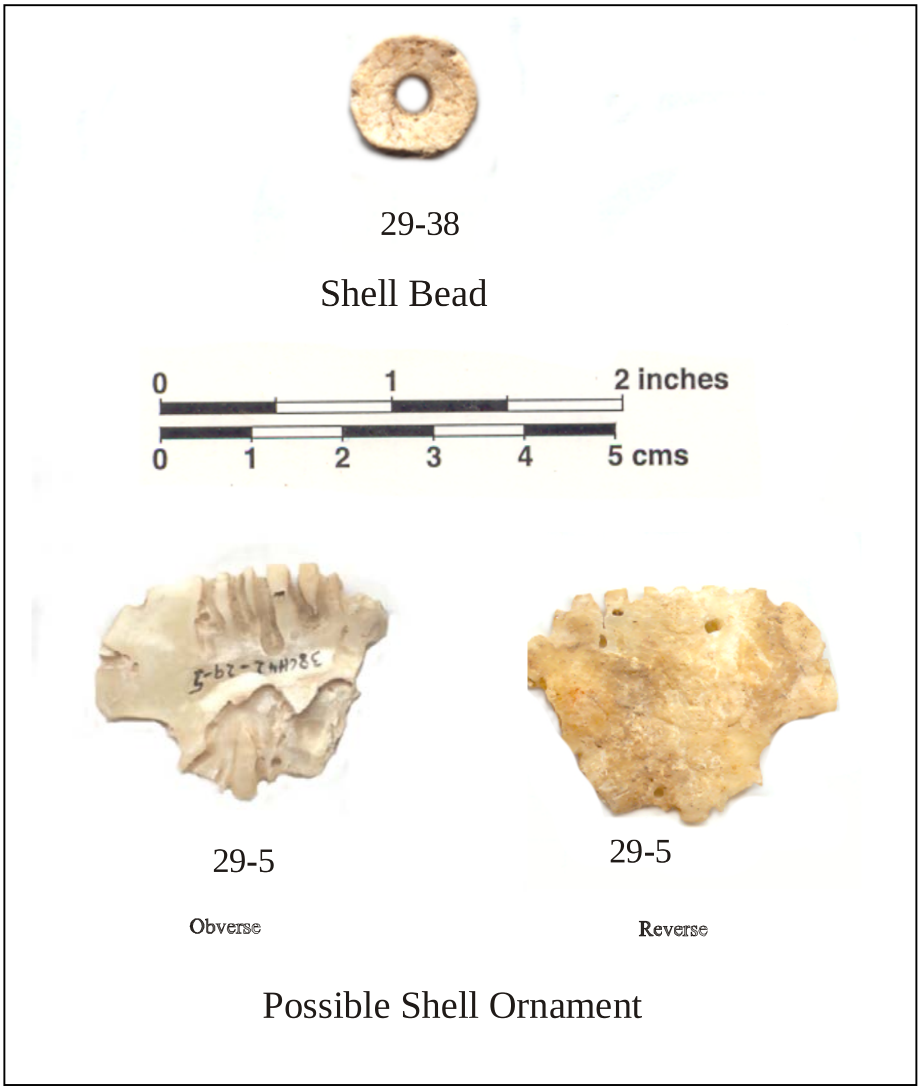


Figure 26. Shell ornaments from the Fig Island site.

The second ornamental object was a cut valve of a naturally eroded bivalve. Incomplete except for the top and one shoulder, where the cut nature of the object is visible, the object appears to have been a disc. Extrapolating from what remains, the disc may have been about 4 cm wide and 3 cm long. Three small holes, whether natural or cultural, extend through the object and could have been used for suspension or for sewing onto a garment.

The location of both these objects—the only two shell ornaments in the assemblage from the Fig Island site—in a single level of a unit is interesting. The sample is too small to consider this a significant difference in a statistical sense, but it does highlight the differences in units tested across the site.

The remaining 123 shell artifacts were tools of some kind (Figures 27-32). These were divided between worked shell and possible worked shell tools. The latter generally had little wear but did appear slightly modified from use. These were probably casual tools. Almost all tools were made from whelk shells (n=118). The majority of these were *Busycon carica*; the remaining gastropods were busycons that were only identified to genus. Tools of other shell species (n=5) included an oyster shell punch, a possible mercenaria punch and another mercenaria spokeshave, a possible periwinkle stylus, and a *Dinocardium robustum* (Giant Atlantic Cockle) gouge.

In order to deal with the large amount of variation in the gastropod tools, a coding system was developed that incorporated both a generic tool type (hammer, gouge, punch) and a description of the artifact modification, or lack thereof, by shell location (spire, shoulder, spines, whorl, etc.). In this report, only the generic tool type codes are discussed, but more detailed information is available. Many tool definitions were taken from Marquardt (1992), though some liberties have been taken to adapt the system to the Fig Island assemblage, and some more common terms have been substituted.

Tool definitions were as follows:

- Punch (or awl): sharp tip, leading edge of whorl cut above columnella or another portion of the whorl to produce tip. Whorl modification can be slight, just enough for columnella to protrude. Three subtypes: Punch 1 has only whorl modification. Punch 2 has an additional modification, a rounded notch in the upper whorl where the thumb rests (Figure 27). Many of these modifications appear to have begun as holes originally made for muscle detachment, after which the hole was broken out to the edge of the whorl and the edges smoothed. None of these appear to have been hafting “knocks” (e.g., see Marquardt 1992: 194, Figure 3) as there is no opposing hole on the shell. Punch 3 consisted of columnellas and shoulders only.
- Gouge: columnella does not protrude in a sharp point, and it often displays evidence of grinding along the anterior, posterior, or distal columnella (Figure 28). Whorl may also be ground to provide broader gouging surface—or this could be a result of gouging. Gouge 1 is as described above. Gouge 2 has the upper whorl modification as described for Punch 2 above, and appears to be

for better thumb purchase of the tool. Gouge 3 is columnella and shoulder only.

- Hammers: hammers have about the lower third of the columnella missing, so that the upper, thicker area of the columnella is the battering surface (Figure 29). Columnella is battered but more or less flat, to distinguish it from a cutting edge tool. There were three subtypes, as described above.
  Cutting edge tools: Like hammers, these have the lower, weaker part of the columnella removed, but the new distal edge is slanted, and, in Marquardt's (1992) examples, also smoothed (Figures 30-31). Two types were distinguished, the second for the thumb modification as described above.
- Spokeshave (arrow straightener, or possibly beamer): tool has a concave working surface (Figure 32).
- Net spacer: rectangular cut shell (Figure 32).

It would not be surprising if different functions were imputed for many of these artifacts by others, but every attempt has been made to keep the modifications for each of these generic types constant.

The first comment that might be made about the busycon assemblage is that most of the 118 shells were relatively small. The three largest, at 239, 301, and 483 g, had the type of predation that indicated that they were dead when collected; they were clearly collected for their size (e.g., Figure 31). One other shell was over 200 g, 22 were between 100 and 200 grams, leaving the majority (n=99, or 79.2%) of the collection of busycon tools at weights under 100 grams. The mean was 73.1 g; there was no clear modal value.

Of the busycons, gouges were the most common tool type (Table 8), the simple Gouge 1 making up 28.0% of the assemblage. Many of these lacked the most distal part of the columnella but displayed little wear on the back of the columnella. These may be casual tools or have been used on soft materials. Hammers, the next most common tool type, tended to have the modification for the thumb more often than other tool types; 13 of 25 hammers, or 52 %, had this modification. Punches round out the most prevalent tool types.

Tools were anything but evenly distributed across the site (Table 8). Though different volumes were excavated in each unit, the vast differences in tool frequency distribution throughout the site speaks volumes. The fewest tools were recovered from the most intensively excavated area. The trench on Fig Island 3 yielded only five shell tools, or 1.6 tools per cubic meter excavated. In order of abundance, Fig Island 1, Unit 1 would come next with 4.25 tools per cubic meter. One of these shells, however, one had only a hole for muscle detachment, and, if not included in the tally, the tools per cubic meter would go down to 4.0. (This is the only busycon with a detachment hole that was not otherwise modified.) The next most abundant tool area would be ST4 on

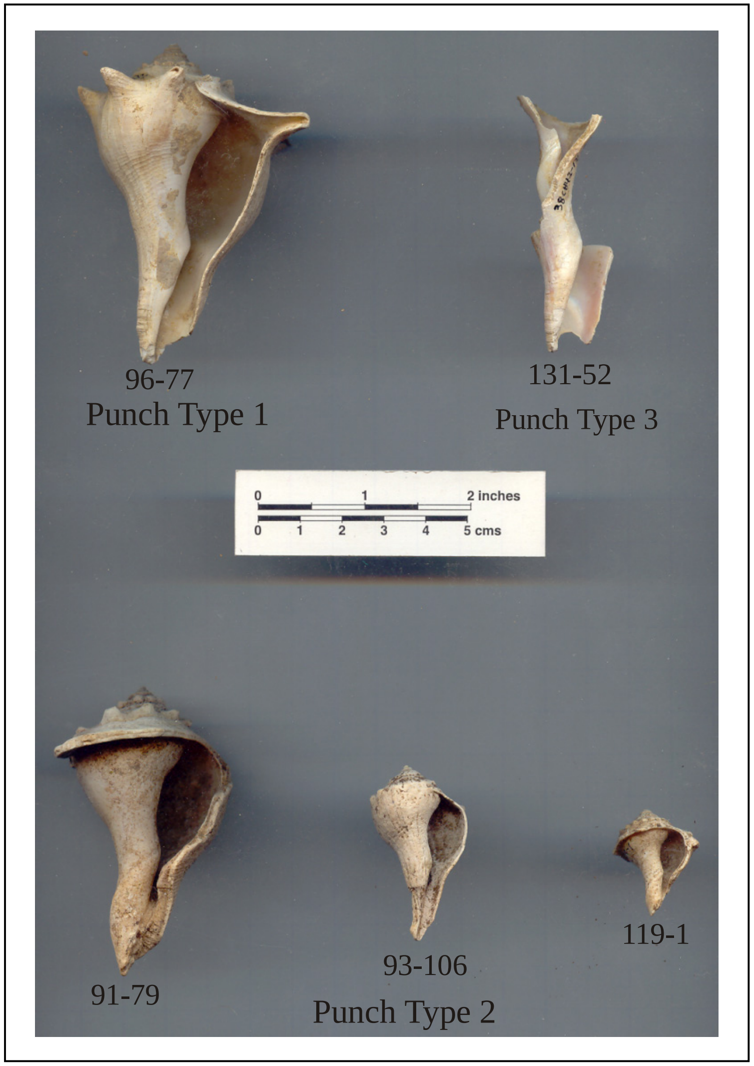


Figure 27: Shell punches from the Fig Island site.

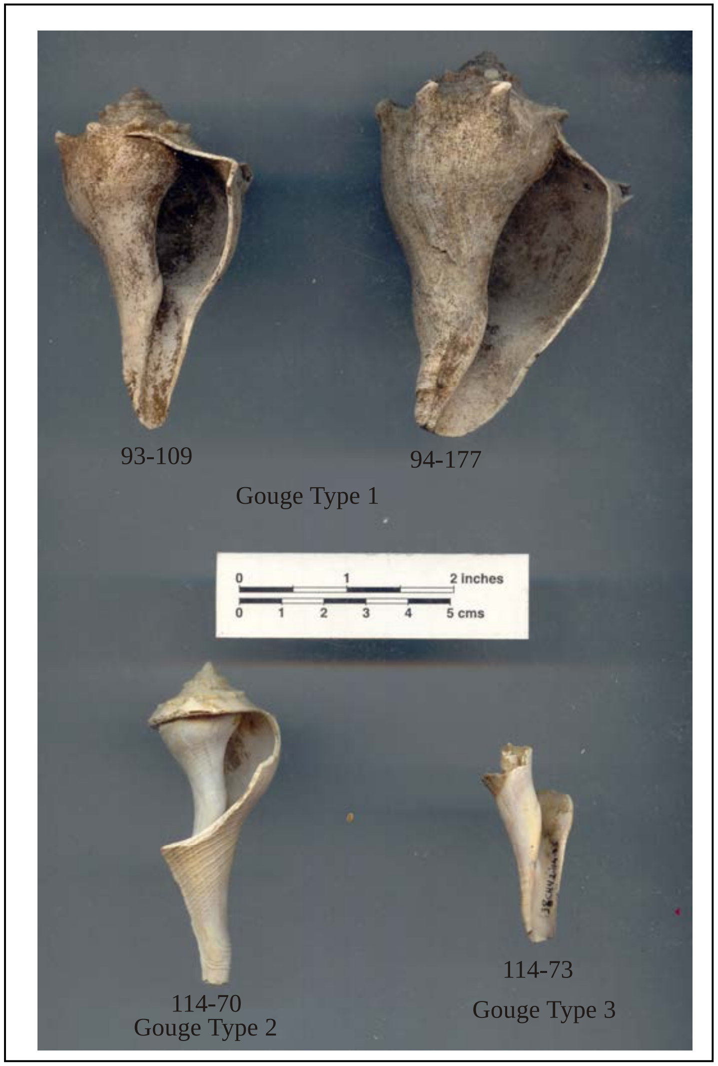


Figure 28: Shell gouges from the Fig Island site.

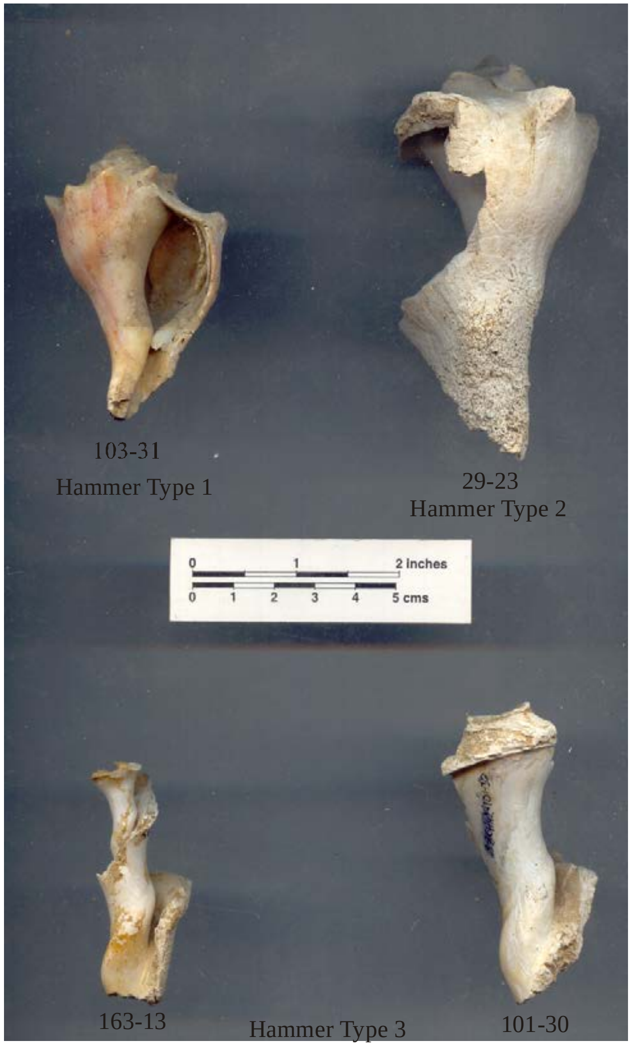


Figure 29. Shell hammers from the Fig Island site.

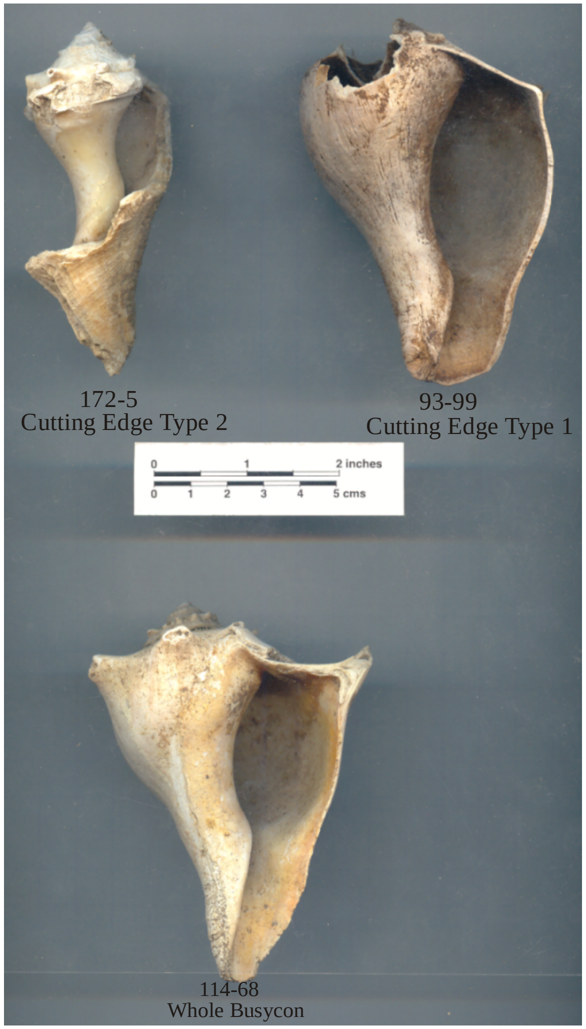
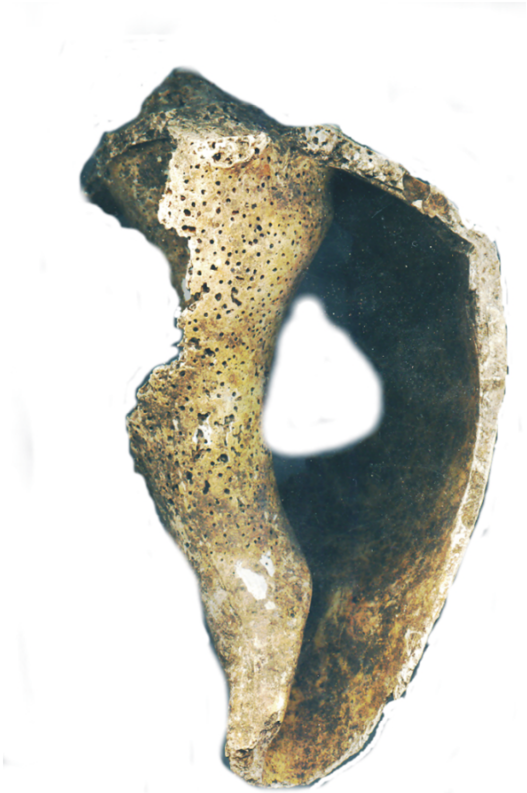


Figure 30. *Busycon carica* cutting edge tools.



111-6
Cutting Edge Type 1

Figure 31. *Busycon carica*, dead when collected.

25-17

Net Spacer

Working Edge

161-5

Spoke Shave

Figure 32. Net spacer and spoke shave.

Table 8. Shell by Unit

Unit #	GOG1	GOG2	GOG3	HMR1	HMR2	HMR3	PNC1	PNC2	PNC3	STYL	UIWS
Fig 1,1	6	2		3	1			3			2
Fig 1,2	26	15	1	6	6	2	16	4	1	2	3
ST 4	1										
Fig 3,1											
Fig 3,2	1			1							
Fig 3,3	1										
Fig 3,4											
Fig 3,5		2			6						
ST 6											
Total	35	19	1	10	13	2	16	7	1	2	5

GOG1= Plain gouge, no thumb modification
GOG2= Gouge with thumb modification
GOG3= gouge with columnella only
HMR1= Hammer, no angle, no thumb modification
HMR2= Hammer with thumb modification
HMR3= Hammer with columnella only

PNC1= Punch or awl without thumb modification
PNC2= Punch or awl with thumb modification
PNC3= Punch or awl, columnella only
STYL= Stylus
UIWS= Unidentified worked shell

Table 8 (cont.)

Unit #	CUT1	CUT2	MSCL	SPCR	SPOK	BEAD	ORNM	HORL	TOTAL	Freq/1m^3
Fig 1,1									17	4.25
Fig 1,2	5	1	1						89	46.8
ST 4		1							2	5
Fig 3,1									0	0
Fig 3,2									2	1
Fig 3,3				1	1				3	1.9
Fig 3,4									0	0
Fig 3,5		1				1	1	1	12	12
Total	5	3	1	1	1	1	1	1	125	

CUT1= Cutting edge tool without thumb modification
CUT2= Cutting edge tool with thumb modification
MSCL= Battered hole to remove muscle attachment
SPCR= Net spacer

ORNM= Ornament
HORL= Whorl
SPOK= Spokeshave
BEAD= Bead

Fig Island 2. Only 0.4m^3 was excavated, but two tools were recovered, which would yield five tools per cubic meter. (No tools were recovered from ST5.) Finally, Fig Island 3, Unit 5, with 10 tools and 1 m^3 excavated, had 10 tools per cubic meter and Fig Island 1, Unit 2 had a whopping 46.8 tools per cubic meter, 89 shell tools in all.

In Fig Island 1, Unit 2, tools were most abundant in Levels 2 and 3 in Stratum 1. There were 20 and 21 tools in each of these 10 cm levels, respectively (two of these, Map Specimens 4 and 5, can be seen in the South Wall profile—the busycon at ground surface was unmodified). All other levels had 10 tools or less, with the smallest number, two, coming from Level 6. The overwhelming quantity of shell tools in this unit is consistent with the large quantity of other artifacts recovered, but it remains difficult to explain the abundance of material in this unit.

To determine if there were differences in the shell tool assemblages from ring to ring, the frequency of generalized gouges, hammers, and punches for units Fig Island 1, Unit 1 and Unit 2, and Fig Island 3, Unit 5 was compared. A chi-square test of no association was run, and, because Unit 5 had no punches and a preponderance of hammers, there was a significant difference (Table 9). However, over 50% of the cells had expected counts of less than 5, and some statisticians consider this an unreliable test under these circumstances. A comparison of the frequencies of tool types between the two Fig Island 1 units showed no significant difference (Table 10). Again, some cell frequencies were too low, but a glance at the row percentages confirms that gouges are evenly distributed and that there is a difference, though not a significant one, in the frequency of hammers and punches, with slightly more punches in Unit 2 and a corresponding increase in hammers in Unit 1.

Table 9. Distribution of selected tool types by excavation area.

Frequency Percent Row % Column %	GOG	HMR	PNC	Total
Fig 1.1	8 7.92 53.33 15.09	4 3.96 26.67 16.67	3 2.97 20.00 12.50	15 14.85
Fig 1.2	43 42.57 55.13 81.13	14 13.86 17.95 58.33	21 20.79 26.92 87.50	78 77.23
Fig 3.5	2 1.98 25.00 3.77	6 5.94 75.00 25.00	0 0.00 0.00 0.00	8 7.92
Total	53 52.48	24 23.76	24 23.76	101 100.00

Statistic	DF	Value	Prob
Chi-Square	4	13.5770	0.0088

Table 10. Shell Types by Excavation Unit, Fig Island 1.

Frequency Percent Row % Column %	GOG	HMR	PNC	Total
Fig 1.1	8 8.60 53.33 15.69	4 4.30 26.67 22.22	3 3.23 20.00 12.50	15 16.13
Fig 1.2	43 46.24 55.13 84.31	14 15.05 17.95 77.78	21 22.58 26.92 87.50	78 83.87
Total	51 54.84	18 19.35	24 25.81	93 100.00

Statistic	DF	Value	Prob
Chi-Square	2	0.7351	0.6924

Bone Artifacts

Bone tools were identified to two major categories, worked bone and possible worked bone. The former were obviously worked or had extensive polish from use; the latter were less obviously so, but had small areas of polish or wear on areas of the artifact similar to the more obvious tools.

Seventy-three bone artifacts were recovered (Tables 11-12; Figures 33-34). These fall into three broad categories: ornamental, tool, and butchered bone. Ornamental artifacts consist of bone pins and bone pin fragments. Only one whole bone pin was found (135.010; Figure 26). It was recovered from Level 9, Area 4 in Fig Island 1, Unit 2. In profile (see Figure 18), Area 4 was revealed to be an oblique lens of dark, organic, silty soil that overlay similarly oriented lenses, all of which abutted a large deposit of predominantly whole oyster with little soil. The pin, made of a splinter of deer metapodial, was incised with zoned plain and fine-line filled triangles in three opposing bands. In one of these, the fine-line incising is hatched. Below the third band, towards the point of the pin, on the same side of the artifact as the hatched band, there are two to three faint, additional incisions, but the design does not appear to have been completed. The head of the pin is plain (i.e., not expanded), but a series of four to six bands (two lines merge with others) “encircle” the neck of the pin (the back of the pin, where the pronounced groove of the metapodial is, is not incised). The pin, 10.3 cm long, is well polished. A small portion of one side of the tip is missing.

Two other incised bone pin fragments were found, both also from Fig Island 1, Unit 2; in other words, all incised bone pin fragments were from the same unit. The first incised pin fragment (131.053) is a ca. 5 cm long bird bone shaft; the proximal and distal ends of the pin are missing. However, the artifact may be near completion on the proximal end, as one of the crossmending fragments (see Figure 26) has two horizontal bands. These may signal the top of the pin, as in the previously discussed example. This pin was incised completely around the shaft. The incised design is nested diamonds on the obverse side. The elements of the top part of the nested diamond are carried over to the back and resolve into an ‘X’, the upper part of which is filled with ‘V.' The pin was recovered from Stratum 2 in Level 7.

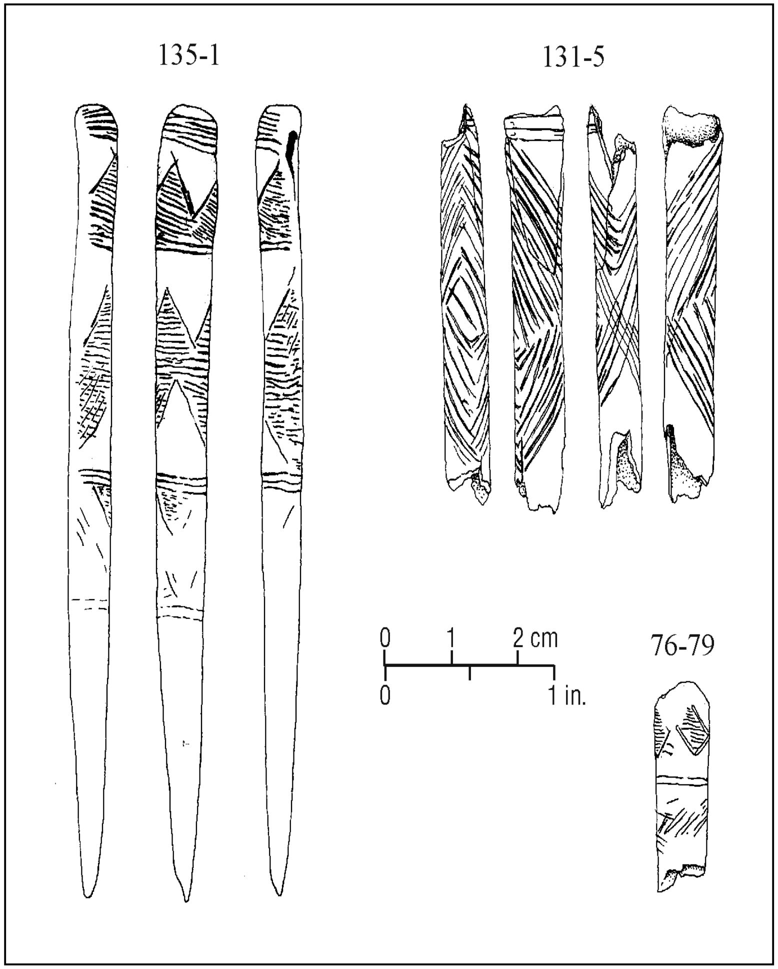


Figure 33. Incised bone pins from the Fig Island site.

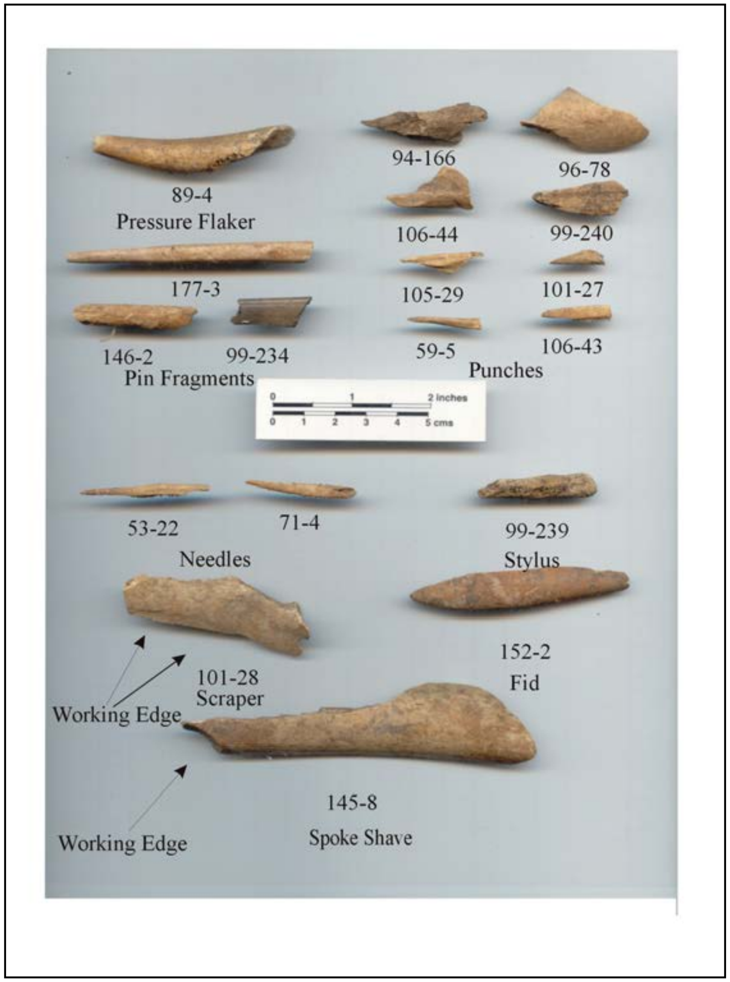


Figure 34. Bone tools from the Fig Island site.

The second incised pin fragment (96.079) was recovered from Stratum 2 in Level 5. It is 3.1 cm long and made from the split longbone of a mammal. Only the lamellar bone of the external half of the artifact is incised. The proximal end appears to have been chipped and then repolished. On the upper half of the fragment, on either edge of the pin, are incised what appear to be a small, line-filled rectangle and a small, line filled parallelogram. Both are missing the last side on the proximal end of the pin. There are three less closely spaced lines incised outside of the "parallelogram." Two bands border this design at the base. There are additional faint, fine line incisions below this, but they do not resolve into a design.

It is worth noting that the designs on these bone pins are reminiscent of Orange Incised pottery designs. This is particularly true of the nested diamond and multiple-line 'X' of 135.053. They are quite different from the curvilinear and geometric designs on pins pictured by Waring (1968a:170, Figure 63) from the Bilbo site on the Georgia coast near Savannah or from Ossabaw Island (Waring 1968a:171, Figure 64). They are more similar to pins from Chester Field (Waring 1968a:171, Figure 64, especially c and d). One wonders whether these incised designs may reflect some clan or other social affiliation, or trade ties, such that Orange designs might occur in Stallings territory either by marriage or by trade.

As noted above, all incised bone pins were from Fig 1, Unit 2. Plain bone pin distribution was more equal (Table 11). There were four plain bone pin fragments in Fig Island 1, Unit 2, and three pin fragments apiece in Fig Island 1, Unit 1, and in Fig 3, Units 1 and 2. Single bone pin fragments were recovered from ST4 on Fig Island 2 and Fig Island 3, Unit 3. By volume excavated, however, the most plain pin fragments were recovered from the shovel test, extrapolated to 2.5 pin fragments per cubic meter, followed by Fig 1, Unit 2 with 2.1. Other totals were between 1.5 and 0.6. However, if the incised pins are added to the total, Fig Island 1, Unit 2 had 3.7 pin fragments per cubic meter, far and away the highest frequency.

Table 11. Bone pin distribution at the Fig Island site.

Fig #	**Plain Fragments**	**Incised Fragments**	**Total Fragments**	**Freq/Vol**	**Volume**
1.1	3	0	3	0.75	$4m^3$
1.2	4	3 (1 whole)	7	3.7	$1.9m^3$
2, ST4	1	0	1	2.5	$0.4m^3$
3.1	3	0	3	1.1	$2.8m^3$
3.2	3	0	3	1.5	$2.0m^3$
3.3	1	0	1	1.6	$.6m^3$
3.4	0	0	0	0	$.6m^3$
3.5	0	0	0	0	$1.0m^3$
ST6	0	0	0	0	$.15m^3$

Bone tools consisted predominantly of punches (n=36), made of mammal longbone fragments (n=21) worked to a point, catfish spines (n=14) with one side of the barbs whittled away, or, in a single case, of bird bone worked to a point (Table 12, Figure 34). Less common worked bone artifacts included five possible styluses (see also Sassaman 1993a:192, Figure 39), two needles, one fid, one spokeshave, one scraper, two possible bone points, an antler pressure flaker, and four bone fragments with polish and an unknown function.

It will come as no surprise that Fig Island 1, Unit 2 had more tools than any other unit; in fact, twice as many (Table 12), with 14 punches, a scraper, four of the five possible styluses, and one small mammal longbone fragment with polish on the tip. Fig Island 1, Unit 1 had the next largest bone tool assemblage, with 10. These included eight punches, the fifth possible stylus, and one of the two bone points recovered. In both these units, the artifacts appear more or less equally distributed throughout the levels. A possible fid was recovered from ST4, along with a spokeshave. The antler pressure flaker was recovered from Fig Island 3, Unit 1, from Stratum 1, Level 12, about 15 cm above the base of the shell, and two punches were from Level 13. In fact, all the worked bone from the trench came from the lower levels, with no worked bone recovered from levels higher than Level 9. The second bone point in the site assemblage was recovered from Unit 3, Level 10; two examples of butchered mammal bone were also recovered from this provenience. Level 11 in this unit produced a catfish spine needle, as did Unit 4, Level 9. Unit 2 had the highest frequency of bone tools in the trench, with four punches made of catfish elements. Unit 5 contained six tools, though three of these were fragments of polished, large mammal longbone. Three punches were also recovered from this unit. An additional 3 punches were recovered from the shovel test done in the marsh where a large, sand and fiber tempered sherd was recovered on a small area of shell midden off the northwestern edge of Fig Island 1 and another was recovered from a shovel test on Fig Island proper, which produced a cordmarked sherd and two <1/2 inch Thoms Creek plain sherds.

Table 12. Bone tool distribution at the Fig Island site.

Fig #	FD	ND	PF	PN	PT	SC	SP	ST	UK	BB	Total	freq/vol
1.1				8	1			1			10	2.5
1.2				14		1		4	1		20	10.5
2	1						1				2	5
3			1	2						1	5	1.8
3				4							4	2
3		1		1	1					2	5	8.3
3		1									1	1.6
3				3					3		6	6
4				1							1	6.7

FD= Fid, ND= Needle, PF= Pressure Flaker, PN= Punch, PT= Point, SC= Scraper, SP= Spokeshave, ST=Stylus, UK= Unknown, BB= Butchered Bone

Frequency distribution of bone tools (butchered bone is not included in this discussion) normalized for volume, again demonstrates that Fig Island 1, Unit 2 was the most productive unit on the site, followed in this instance by ST4, then Fig Island 3, Unit 5. The trench was the least productive area on the site for bone tools.

Lithics

Lithic artifacts were very rare; a commonality among Late Archaic coastal occupations and one that separates them from their Middle Archaic progenitors. By the Late Archaic, with coastal adaptation well underway, little effort was expended in acquiring lithics, all of which would be non-local.

Four lithic objects were found (Figure 35). Two fragments of what appeared to be worked silicified coral with evidence of drilling were probably bead fragments. One piece of coral debitage was also recovered. All of the coral was recovered from Fig 3, Unit 2, Stratum 1, with the bead fragments in Level 6 and the debitage in Level 7. A small piece of ferruginous sandstone (not pictured) was also recovered.

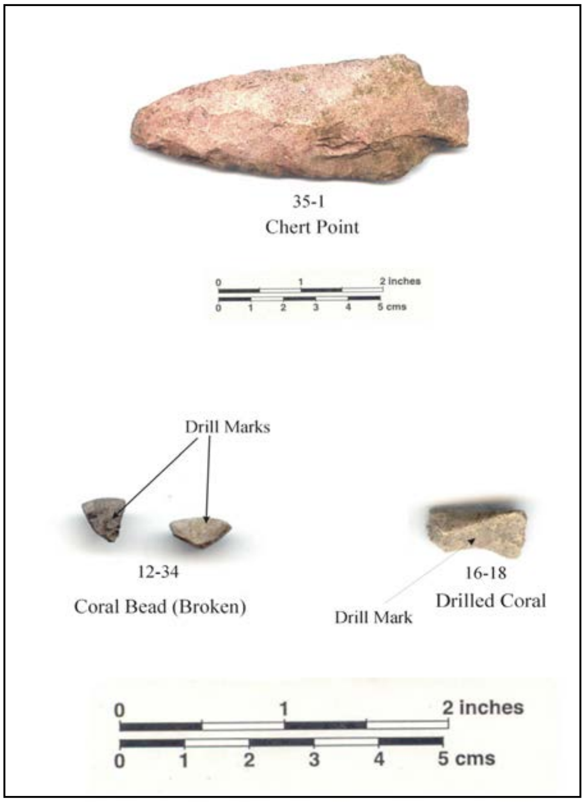


Figure 35: Lithic artifacts from the Fig Island site

One PPK was found (Figure 35), a reworked Savannah River Stemmed point made from heat-treated Allendale chert (Goodyear, personal communication, 2002). The PPK was a surface find, found at 1127.3 N 2039.0 E, on the interior edge of the enclosure at the base of the northern edge of Fig Island 1. The point is 10.7 cm long and 4.05 cm wide at the shoulders. There is reworking along at least one edge, and perhaps the other, suggesting use as a knife, and the tip is reworked such that it could have been used as a gouge.

Ceramic Analysis

A number of questions guided our analysis of the pottery at the Fig Island site. Particular attention was paid to paste characteristics, because there is still disagreement over whether variations in inclusion size and the resulting paste texture is temporally diagnostic. Surface decoration was also studied in detail.

The first step in the ceramic analysis was to code a sherd recovered for class (body, rim, base, or less than 1/2 inch in size). Sherds less than 1/2 inch were only coded for decorated vs plain surface treatment, number, and weight. The remainder of the sherds were then typed as either Thom's Creek Plain, Punctated, Drag and Jab, Incised, Pinched, Mixed Element, or Unidentified Surface. Stallings wares (see discussion in results section for the definition of Stallings) were coded similarly. Then the sherd was coded for subtype. This category ultimately contained 166 distinct designs on the surfaces of 1731 sherds. These "subtypes" vary in method of application (drag and jab, punctate, incising, pinched, etc.), zoning, stylus (if this can be determined), punctation shape, stylus size, and the type of motif achieved through repeated stylus use (linear, random, curvilinear, geometric, mixed linear and curvilinear, etc.). To reduce variation in subtype in order to make more general statements about the assemblage, five of these attributes (method of application, zoning, stylus, punctation shape, and motif) were incorporated into a master coding system that could be manipulated to determine relative frequencies of values on these attributes.

The next step was paste analysis. A fresh break was made on a sherd edge parallel with the coil orientation if this could be determined. Under a binocular microscope at 2X, a rough quantification of paste inclusions was coded following Rice (1987). Relative quantities (none, rare, common, abundant) were estimated for fiber vermiculations, medium sand (up to 0.5 mm), coarse sand (0.5 – 1.0 mm), and very coarse to granule sized inclusions (>1.00 mm). A finer sand category was included at the beginning of the analysis but was never used—apparently no sherds had the fine sand inclusions that some have typed Horse Island (e.g., Cable 1993). Size category descriptors generally follow the Wentworth scale (Rice 1987:Figure 2.2), though the granule category begins at a larger size (2.5 mm vs 2.0 mm).

Firing characteristics, recorded in sherd coring, were analyzed next. Again, all observations were on a fresh break. Interior and exterior surface color were also recorded.

Vessel finishing was recorded for the interior and exterior as either smoothed, hard tooled, burnished, shell scraped, or brushed. Smoothed surfaces were exactly that, smoothed, probably using a soft, yielding tool such as leather, or the potter's hand (Rice 1987:138). Smoothing a surface does not create the separate, compact surface that results when the friction of a hard tool, such as a pebble, draws up fine clay particles (through plastic flow), reorients them into alignment, and compacts them over the surface of the sherd. When thoroughly applied, this compact, hard tooled layer is usually visible in the sherd profile. Incomplete hard tooling can leave a "streaky" appearance. These were still counted as hard tooled in this study. Though the gloss of burnishing can be lost through vessel drying, vessel use, or post-depositional processes (Rice 1987:138), the term burnished was reserved for those sherds with a hard tooled *and* a reflective or glossy surface.

Following Trinkley (1980a), recognized vessel forms included shallow, unrestricted bowls, shallow restricted bowls, and deep jars. Anticipating the possibility of more forms, vessel form and orifice type were coded separately; however, no additional forms appeared. A vessel was categorized as shallow if the sherd curved in towards the base before reaching a depth of 10 cm; a vessel was defined as deep if the vessel wall did not constrict towards the base in 10 cm. An unidentified form category, unidentified bowl/jar was applied to many small sherds for which depth could not be determined.

Rim shape was coded as rounded, flattened, beveled to the interior or exterior, thinned, or direct (the interior vessel wall was straight up to the top of the rim). Rim decoration (e.g., ticking) was very rare, but was also coded.

Miscellaneous observations were recorded, including the presence of fiber impressions on the vessel interior or exterior, the presence of sooting, coil breaks, spalling, and the presence of drilled holes. Sherd thickness was recorded, as was rim width, and, in a very few instances, sherds were large enough to record vessel diameter.

Results

A total of 1788 Late Archaic sherds greater than 1/2 inch were recovered from the site (Table 13; Figures 36-38). An additional 2087 sherds were less than 1/2 inch. One cordmarked sherd was recovered from a shovel test (ST 4) on Fig Island proper, bringing the total sherds recovered to 3876. Only the 1788 Late Archaic sherds greater than 1/2 inch are discussed further in this chapter; the 57 Thoms Creek sherds that were too eroded to identify surface treatment are not included in any table except Table 13.

The pottery analysis presented here will not be an exhaustive analysis of all attributes described above. Rather, for this report, the focus is on diagnostics that can be used with the radiocarbon information to help address some of the outstanding questions on the evolution of Thoms Creek pottery through time as well as to determine differences in ring pottery assemblages and to relate them to chronology or to social groups or, possibly, function. Though other attributes can speak to these questions, surface decoration is emphasized here. The site assemblage is discussed briefly, then assemblages by ring, and finally, where sherd counts are sufficient, pottery attributes by stratum or level.

Prior to discussion of the pottery assemblage, a word about “Stallings” sherds is necessary. The type definition is hedged here because it was very difficult to determine which, among the 648 sherds containing varying frequencies of fiber vermiculations, should actually be considered Stallings. It was noticed during paste analysis that many sherds with fiber vermiculations had them on the interior and exterior only,

Figure 36. Thoms Creek punctated designs from the Fig Island site.

Figure 37. Thoms Creek sherds from the Fig Island site.

Figure 38. Thoms Creek drag and jab sherds from the Fig Island site.

(especially if the surfaces were eroded) but not in the sherd core—as if fibers were incorporated during vessel formation rather than during paste preparation. During initial coding, if there were vermiculations on the interior and exterior, a sherd was coded as Stallings, regardless of the frequency of vermiculations in the sherd cross-section (though all sherds with common or abundant fiber frequencies had such vermiculations on the interior or exterior) with the intent of coming as close as possible to what other researchers would call these types. However, ultimately a thorough paste analysis is preferable, and one would assume that the definition of a Stallings paste should be one in which fiber vesicles are present throughout the sherd rather than just on vessel surfaces.

To determine how such a definition would affect the assemblage composition, the data were recoded so that only sherds with common to abundant fibers in the sherd cross-section were considered Stallings. This resulted in a change of type for 75 sherds (from Stallings to Thoms Creek or vice versa; or over 90% of the original 80 “Stallings” sherds), a net change in relative type frequency of 38 sherds, a not insignificant proportion of the total, and a net increase in Stallings sherds from 80 to 98. However, the total percentage of Stallings in the assemblage changed only a percentage point, from 4.5% in the original analysis to 5.5% in the recoding. A comparison of the results by unit and provenience demonstrated that there was little effect on interpretation. In Fig 1, Unit 2, for instance, where, not surprisingly, the most pottery with fiber inclusions was found, no change affected percentages by more than 1%.

Much violence was done to individual sherds, however. The “Stallings” sherds that prompted the excavation of ST3 were no longer considered Stallings under this coding system. Despite the relatively heavy fiber vermiculations on the surface, vermiculations in the paste of these sherds were exceedingly rare. This was somewhat disconcerting, and a third data set was developed, one that coded for “maximum Stallings” and that included all common and abundant fiber pastes *and* all sherds with fiber vermiculations on the interior and exterior, regardless of whether fiber vermiculations appeared in the core. In this way, at least this analysis should be comparable to those of others in the area.

Because sand size and abundance in these pastes with fiber inclusions were little different from the Thoms Creek, the fiber vessels were assumed to be locally made and the abundant sand a natural inclusion. Indeed, sand was so abundant in the majority of the sherds—it was pushing the limits of the amount of temper that can be included in a paste and still produce a viable pot (about 30% of the paste)—that if fibers were added and well mixed it is doubtful that the vessel would fire or would have much integrity if it did. It almost seemed that the so-called Stallings was “faked” with a veneer of clay with fiber inclusions on an otherwise Thoms Creek paste. Further investigation, including thin sectioning and petrographic analysis, is planned for the Stallings assemblage.

Table 13 contains the sherd counts by surface decoration of all pottery larger than 1/2 inch recovered from the site. Note that in this discussion, Thoms Creek wares and Stallings wares have been summed and their percentages figured independently of one another (in the Percent Ware column). Percentages of the different types for the total assemblage are also presented (in the Percent Total column). While a determination of covariation in surface decoration of the two wares was unlikely to emerge at this level of analysis, it seemed best to remove the Stallings from computations of relative abundance of Thoms Creek surface decorations.

Thoms Creek Plain sherds comprised 51.3% of the assemblage with, not surprisingly, Thoms Creek Punctated the next most frequent decorative type (38.0%). Other surface decorations were present in only minor amounts in the assemblage: drag and jab at 6.8%; finger pinching and incising in nearly equal amounts of 1.4% and 1.5%, respectively; and mixed motifs at 0.6%. Three sherds with brushed or shell scraped exteriors on a Thoms Creek paste were also recovered. Some sherds (3.2%), mostly from surface collection, were too eroded to identify either whether they were plain or decorated or, if decorated, what that decoration might be. Removing these, and the Stallings, the contribution of the different surface treatments were as presented in the Percent Ware column of Table 13.

Table 13. Pottery types recovered from the Fig Island site.

Type	Number	% Ware Decoration	% Total
TC Plain	852	51.4%	46.1%
TC Punctated	632	38.1%	34.1%
TC Drag and Jab	108	6.5%	5.8%
TC Finger Pinched	28	1.7%	1.5%
TC Incised	26	1.6%	1.4%
TC Mixed	10	0.6%	0.5%
TC Brushed	3	0.2%	0.2%
TC UID	(58)*		3.1%
TC Subtotal	1659	100.0%	92.7%
S Plain	116	85.9	6.3%
S Punctated	14	10.4	0.8%
S Drag and Jab	2	1.5	0.1%
S Incised	3	2.2	0.2%
S Subtotal	135	100.0	7.3%
Total	1852		100.0%

*Eroded and other unidentifiable sherds not included in percentage ware decoration.

TC = Thoms Creek

S = Stallings

The "maximum" Stallings approach brought the total Stallings sherds to 112, or 6.5% of the sample total. Surface decorations included plain, at 6.5% of the sherd assemblage, and 85.5% of the Stallings assemblage. Punctated designs comprised 0.8% (10.7%); incising and drag and jab were rare at 0.2% (2.3%) and 0.1% (1.5%), respectively. It might be reiterated here that Stallings ware was not restricted to any particular location at the site. It was found in every ring and, not surprisingly, was most abundant in Fig Island 1, Unit 2.

The site assemblage may represent pottery produced from as early as ca. 4200 B.P. and as late as 3600 B.P., so there is little point in looking for chronological information at the level of the site assemblage. Comparison of units is difficult because of the paucity of material in some of them. Nevertheless, the exercise was attempted for the total assemblages from Fig Island 1, Unit 1 and Unit 2, the trench in Fig Island 3, and Fig Island 3, Unit 5.

Several observations are immediately apparent in the table (Table 14). The abundance of artifacts in Fig Island 1, Unit 2 can be reiterated. As noted above, Stallings was present in minor quantities in most areas, with the exception again of Fig Island 1, Unit 2, where it was relatively abundant. Stallings wares were absent from Fig 3, Unit 5. In general, there is little more to say about the Stallings at this level of analysis.

Table 14. Comparison of pottery decoration by excavation area.*

Type	F1, U1		F1, U2		F3, Trench		Fig 3, U5		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
TC Plain	220	58.5	457	48.9	142	55.3	28	37.84	798	51.1
TC Punctated	87	23.1	392	42.0	91	35.4	43	58.11	596	38.2
TC Drag and Jab	61	16.2	44	4.7	4	1.6	0	0.00	105	6.7
TC Finger Pinched	4	1.1	19	2.0	9	3.5	2	2.70	27	1.7
TC Incised	2	0.5	18	1.9	6	2.3	1	1.35	26	1.7
TC Mixed	0	0.0	3	0.3	5	1.9	0	0.00	7	0.4
TC Brushed	2	0.5	1	0.1	0	0.0	0	0.00	3	0.2
TC Subtotal	376	100.0	934	100.0	257	100.0	74	100.00	1562	100.0
S Plain	11	91.7	85	84.2	5	71.4	0	0.00	98	85.2
S Punctated	1	8.3	13	12.9	2	28.6	0	0.00	14	12.2
S Drag and Jab	0	0.0	2	2.0	0	0.0	0	0.00	2	1.7
S Incised	0	0.0	1	1.0	0	0.0	0	0.00	1	0.9
S Subtotal	12	100.0	101	100.0	7	100.0	0	0.00	115	100.0
Total	388	23.2	1035	61.9	264	15.8	74	4.4	1672	

*Eroded or otherwise unidentifiable surfaces not included.
TC = Thoms Creek
S = Stallings

In terms of Thoms Creek wares, there were some interesting differences between units, but the temporal significance is unclear. The incidence of Thoms Creek Plain to Thoms Creek punctated varies quite a bit. Fig Island 1, Unit 1 and the trench had decidedly more plain, the percentages in Fig Island 1, Unit 2 were more equal, and Fig Island 3, Unit 5 reversed the averages, with significantly more punctated than plain. The highest percentage of drag and jab, a purportedly earlier type of treatment, came from Fig Island 1, Unit 1, which also had the most plain sherds, and one of the lowest incidences of finger pinching. It was suggested that borrowed midden was used in the construction of the upper levels of Fig Island 1, and this result may provide some independent evidence, though Thoms Creek sequences are so poorly defined at present that this is not a strong argument. Fig Island 1, Unit 2 had the next highest frequency and percentage of drag and jab and the same percentage of finger pinching, but nearly equal percentages of plain and punctated wares. On the basis of the radiocarbon dates, Fig Island 1, Unit 2 should have the youngest pottery assemblage at the site, but this is not evident in this comparison.

Other minority wares had interesting distributions. Mixed motifs occurred only in Fig 1, Unit 2 and in the trench, two contexts separated by 100 years according to the radiocarbon dates. Brushed wares (or possibly shell scraped) wares occurred only on Fig Island 1. It occurred in Level 6 of Unit 1 and in Stratum 2 (Level 5) of Unit 2. This may suggest that the latter ware was a relatively late introduction.

As Cable (1993) recognized for Spanish Mount, comparison of pottery attributes by level is a dubious exercise for most units at the Fig Island site because of the suspicion of purposeful mounding in many contexts. If the midden materials in Fig Island 1, Unit 1, Fig Island 2, and Fig Island 3, Trench 1 were deliberately mounded, perhaps as part of feasting ceremonies, level data will not necessarily show temporal trends except in the broadest sense (through multiple depositions to increase ring height over a very long period of time). If borrowed shell were added, as suggested for the immense construction that is Fig Island 1, the problem is magnified. Fig Island 1, Unit 2, however, had what appeared to be accretional midden deposits. It also yielded a large pottery assemblage (n=928) and a relatively large assemblage of Stallings (Table 15).

Three proveniences in Unit 2 had sufficient pottery to contribute to a discussion of chronological change in Thoms Creek pottery and those were, from highest deposit to lowest, Stratum 1 (0-40 cmbs), Stratum 2 (40-70), and Stratum 3 (70-100 cmbs) (Table 14). Stratum 1 had more volume, but not enough to account for the great differences in the quantity of pottery recovered from that stratum—67.9% of the sherds recovered from the three strata were in Stratum 1.

Table 15 reveals that plain Thoms Creek sherds decreased slightly through time, while punctation increased. Drag and jab decreased while incising increased. Interestingly, finger pinching was not recovered from the highest levels of Unit 2; in fact, not until Level 6, well into Stratum 2. Mixed motifs also were not present in Stratum 1.

Table 15. Pottery from three strata in Fig Island 1, Unit 2.*

Type	Stratum 1		Stratum 2		Stratum 3		Total	
	No.	%	No.	%	No.	%	No.	%
TC Plain	220	44.2	100	53.8	57	53.8	377	47.7
TC Punctated	249	50.0	64	34.4	34	32.1	347	43.9
TC Drag and Jab	16	3.2	15	8.1	10	9.4	41	5.2
TC Finger Pinched	0	0.0	3	1.6	4	3.8	7	0.9
TC Incised	13	2.6	1	0.5	1	0.9	15	1.9
TC Mixed	0	0.0	2	1.1	0	0.0	2	0.3
TC Brushed	0	0.0	1	0.5	0	0.0	1	0.1
TC Subtotal	498	100.0	186	100.0	106	100.0	790	100.0
S Plain	65	85.5	11	91.7	4	80.0	80	86.0
S Punctated	9	11.8	1	8.3	1	20.0	11	11.8
S Drag and Jab	2	2.6	0	0.0	0	0.0	2	2.2
S Incised	0	0.0	0	0.0	0	0.0	0	0.0
S Subtotal	76	100.0	12	100.0	5	100.0	93	100.0
Total	574	65.0	198	22.4	111	12.6	883	100.0

*Eroded or otherwise unidentifiable surfaces not included.

Stallings wares had a different pattern. Stallings plain fluctuated, with the most recovered from the middle deposit, Stratum 2. Other surface decorations were so rare that patterning may be an artifact of sample size. Nevertheless, punctation increased, while Stallings drag and jab was recovered only in the youngest deposit.

In terms of styluses used to decorate the Thoms Creek wares, periwinkle shell was the overwhelming favorite. Indeed, by the time the analysis was complete, it was felt that modifications to periwinkles could have produced the entire design shape assemblage (n=29 distinct shapes) except finger pinching. “Reed” punctate, for instance, was easily produced by removing the spire of the periwinkle shell. Nevertheless, assuming that “donut-shaped” impressions were created by reeds, reed punctate was very rare, occurring once in Stratum 1 and twice in Stratum 3. If half-donuts were also produced by reeds, the count does not go up significantly; two sherds with this design were recovered from Stratum 2 and one was recovered from Stratum 3. The consensus is that reed punctate declines through time (e.g., Trinkley 1976:66; 1989:74) (though Trinkley’s analysis of 327 sherds from Hemmings Fig Island 2 excavation showed a resurgence in the frequency of reed punctate in the highest level). If this is so, the assemblage in the strata in Unit 2 appears relatively late, which is consistent with the radiocarbon data.

For comparative purposes, pottery type frequencies by level are also presented for Fig Island 1, Unit 1 (Table 16). Pottery was unequally distributed throughout the unit, with Levels 6 and 1 having the majority of the pottery, a fact that was appreciated in the field. Because intervening levels had relatively small amounts of pottery, trends in the data may be biased due to small sample size. For what it is worth, Thoms Creek Plain increased in the higher levels, while punctation was present in higher percentages in the lower levels (where sample sizes were small). This is the reverse of the trends observed in Unit 2. On the other hand, drag and jab increased in lower levels and Stallings was recovered only from the higher levels—both results replicated in the data from Unit 2. These contradictory data highlight the danger of comparing purposefully mounded deposits with those from accretional middens.

A few other observations can be made on the pottery assemblage at this juncture. These address vessel function. All identifiable vessel forms were shallow, slightly outslanting bowls (n=71 of 135 rims). This may be a function of sherd size, with no sherds large enough to indicate jars, but it is an interesting observation nonetheless. Rim diameters were between 12 and 46 cm with no clear modal value(s). Most surprising, only one sherd had a sooted exterior (FS# 15.001) and sooting on that sherd was very light. This suggests a different trajectory for coastal Thoms Creek pottery compared to coastal Stallings, on which Sassaman (1993a:157-161) found heavy sooting during all time periods. Alternatively, this assemblage may have had a different function than pottery from other coastal sites. The lack of sooting and the vessel form suggests that these vessels may have been serving rather than cooking vessels and this emphasis on serving may be another indication of feasting.

Table 16. Pottery by Level in Fig 1, Unit 1, Frequency and Percentage Ware by Level*

Type	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10	Total
	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %
TC Plain	51 78.5%	40 83.3%	4 100.0%	28 75.7%	15 68.2%	37 43.0%	14 48.3%	11 44.0%	13 33.3%	5 31.3%	218 58.8%
TC Punctated	10 15.4%	7 14.6%	0 0.0%	8 21.6%	5 22.7%	21 24.4%	4 13.8%	8 32.0%	18 46.2%	4 25.0%	85 22.9%
TC Drag and Jab	4 6.2%	0 0.0%	0 0.0%	1 2.7%	2 9.1%	24 27.9%	11 37.9%	6 24.0%	7 17.9%	5 31.3%	60 16.2%
TC Finger Pinched	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	2 2.3%	0 0.0%	0 0.0%	1 2.6%	1 6.3%	4 1.1%
TC Incised	0 0.0%	1 2.1%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1 6.3%	2 0.5%
TC Mixed	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
TC Brushed	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	2 2.3%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	2 0.5%
TC Subtotal	65 17.5%	48 12.9%	4 1.1%	37 10.0%	22 5.9%	86 23.2%	29 7.8%	25 6.7%	39 10.5%	16 4.3%	371 100.0%
S Plain	6 100.0%	4 80.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1 100.0%	11 84.6%
S Punctated	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1 100.0%	0 0.0%	0 0.0%	1 7.7%
S Drag and Jab	0 0.0%	1 20.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1 7.7%
S Incised	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
S Subtotal	6 100.0%	5	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1 100.0%	0 0.0%	1 100.0%	13 100.0%
Total	71 18.5%	53 13.8%	4 1.0%	37 9.6%	22 5.7%	86 22.4%	29 7.6%	26 6.8%	39 10.2%	17 4.4%	384 100.0%

*Eroded and otherwise unidentifiable sherds not included.

TC = Thoms Creek

S = Stallings

Human Bone

A single human skeletal element was recovered. This was the shaft portion of an adult left proximal femur. It was recovered from 40-50 cmbs in the column sample (ST 5) in Hemming's South trench. Breaks to the bone were not fresh, indicating that the bone was broken prior to excavation. Isolated disarticulated human remains are fairly common finds in shell rings, but no complete or even partially complete burials have ever been encountered. The behaviors leading to the incorporation of human remains into the rings are unknown. The bone will be re-interred at Fig Island at the earliest opportunity.

Summary

Preliminary artifact analysis indicated similarities and differences between the Fig Island site and other ring sites. Throughout most of the site, the artifact assemblage, in particular, the pottery, conformed to observations made for other sites (e.g., Marrinan 1975); to wit, that artifact assemblages at ring sites tend to be low. On the other hand, more shell and bone tools were found than were commonly reported for ring sites, and one area of the site, Enclosure C, the ringlet at the base of Fig Island 1, was an extremely productive area by any measure.

The artifact assemblage as a whole indicates a well-developed coastal tool assemblage bespeaking activities involving hammering, gouging, net making or possibly basketry, and sewing and punching, probably of leather. The pottery assemblage emphasized serving rather than cooking activities in the contexts examined. All of these activities took place throughout the occupation of the site. While it is difficult to make concrete statements from these newly-minted and limited data, it would appear that a different level of intensity of activities was occurring at the site during its latest incarnation, and it may be that the enclosures at the base represent living areas or possibly workshop areas oriented around the base of the massive Fig Island 1 ring.

CHAPTER 9:
FAUNAL ANALYSIS AT FIG ISLAND

Methodology

During excavation, 50 x 50 cm column samples of shell midden were removed in 10 cm levels for zooarchaeological analysis. If features or midden with abundant bone were encountered, additional zooarchaeological samples were taken as time allowed. Samples were washed through a series of nested screens 1/2, 1/4, 1/16, and, in some cases, 3/32 inches in size. The 3/32 inch fractions of the samples were sorted only for *Boonea impressa*, a small snail parasitic to oysters (*Crassostrea virginica*) whose size may be related to the season of collection of oyster. All other fractions were sorted to the most specific level attainable by the zooarchaeologist. Due to the large numbers of fragmented, unidentifiable faunal remains in the 1/16 inch screens, these were subsampled and the data derived from the subsample were extrapolated to the larger sample.

Two primary measures of abundance were taken for each taxon identified, the number of identifiable specimens (NISP) and the weight in grams. The minimum numbers of individuals (MNI) were also determined using the minimum distinction method; that is, the most frequently occurring unique element found in the taxon equaled the MNI. In some cases where numbers of elements were few, the maximum distinction method was used. That is, non-unique elements were compared for size and morphological characteristics. If these did not appear to match any of the most frequently occurring elements, their numbers were added to the MNI. In sample F.S. 74, the MNI from the 1/4 and 1/16 inch fractions of oyster were not determined. All oysters with umbos (determinant element for MNI) in these fractions were commensal and of too small a size to have been used for subsistence. Biomass was calculated using allometric regression between skeletal weight and soft tissue weight. Constants for these relationships were obtained from Reitz and Wing (1999:72) and Quitmyer (1985:40).

Samples

Three samples were chosen for relative abundance analyses. All contained abundant oyster, and as such, held the promise that *Boonea impressa* would be present that would provide data on the season of oyster collection. F.S. 74 was obtained from a 110 cm deep column sample placed in Feature 1 at Fig Island 3. In the field, Feature 1 appeared as a large deposit of oyster with abundant small fish bone and little soil. These traits distinguished it from the rest of the ring midden above and beside it. Fine screened samples are available from all levels of this feature, though the sheer bulk of this deposit required a shift in processing procedures as described in Chapter 8.

F.S. 79 was obtained from 50 cmbs in Test Unit 5 on the western arm of Fig Island 3. Unlike the shell in F.S. 74, shell in Test Unit 5 lay in a matrix of abundant dark, mucky soil, and consisted of tightly packed whole and broken oyster, less bone, and more periwinkle (*Littorina irrorata*). The sample was selected for analysis, in part, to compare its contents to those of F.S. 74. Specifically, the investigators wanted to see how the abundance and species composition of the fish bone differed from that in F.S. 74. We hoped to see if the two samples revealed a consistent pattern of resource exploitation at the ring. Unfortunately, time and money allowed only for the analysis of the vertebrate fauna from this sample.

F.S. 101 was obtained near the bottom (level 10) of Test Unit 2 at Fig Island 1 where large numbers of mussel shell (*Geukensia demissa*) were observed. Not a lot of fish bone was apparent in the field, but the large amounts of crushed mussel suggested that this provenience may have functioned as a living surface (unlike F.S. 74 which appeared as a dump). Thus it was hoped that analysis might shed light on whether fauna consumed and deposited in large dumps (possibly feasting episodes) differed from those deposited underfoot in, presumably, quotidian activities.

Results

Tables 17 through 19 show the fauna identified to the lowest taxonomic levels in the three zooarchaeological samples, while Tables 20 and 21 summarize the data into broader categories. Table 17 does confirm that the abundant fish bones observed in Feature 1 in the field are reflected in the detailed analysis. F.S. 74 contains the remains of at least 63 fish, while F.S. 79 and 101 yielded remains of 37 and 33 individuals (MNI), respectively, for the same volume of midden. Significantly, the observed crushing in the field for F.S. 79 and 101 is reflected in the numbers of fragments of bone in the three samples. While F.S. 79 had approximately 80 NISP per gram of bone recovered, and F.S. 101 had 60, the bone from Feature 1 (F.S. 74) experienced far less breakage, approximately 2 bone fragments per gram of bone recovered. This supports the idea that the feature represents a relatively quick deposit isolated in time or space from subsequent activity at the ring, rather than a longer term living surface. Another measure of the degree of fragmentation is reflected in the comparison of NISP in relation to screen size. In the crushed proveniences, 94% of the bone (NISP) came from the 1/16 inch fraction of F.S. 79 (Table 18), while 98% was found in the 1/16 inch fraction of F.S. 101 (Table 19). In comparison, in F.S. 74, only 86% of the bone fragments came from the 1/16 inch fraction in Feature 1 (Table 17). In general, most fish bone, regardless of the degree of crushing, was collected in 1/16 inch mesh.

Turning to the invertebrate fraction of the samples, the same trends can be seen. Nearly three times as many fragments per gram (based on all three mesh fraction sizes) were recovered from the crushed zone of F.S. 101 as were identified from the largely non-crushed feature (F.S. 74). However, the 1/16 inch fraction in both samples contained over 96% of the total NISP invertebrate remains (Tables 17 and 18). If crushing from living activities on the surface of the midden was occurring where F.S. 101 was taken, the increased fragmentation of shell might be expected to be reflected in a greater percentage of the entire molluscan assemblage recovered in the 1/16 inch fraction. However, looking at the three most abundant species, this does not hold true. For the mussel, arguably the most fragile of the shellfish subsistence items, 99% of the remains were recovered in the 1/16 inch fractions of both proveniences. In addition, 50% of the periwinkle, oyster, and tagelus were recovered from the 1/16 inch fractions in *both* samples. This suggests that although species fragment differentially, the relative percentages of fragmentation in the two samples is nearly identical. In short, this single aspect of fragmentation, alone, do not support the field observation that the shell in Feature 1 experienced any less fragmentation than that hypothesized to be a living surface.

Table 17. Faunal remains from Fig Island 3, Feature 1, Level 11, Column Sample, F.S. 74.

Taxa	**Number of Identified Specimens**			**Weight in Grams**			**Minimum Numbers of Individuals**			**NISP**	**Weight (g)**	**MNI**	**Biomass (g)**
	1/16"	1/4"	1/2"	1/16"	1/4"	1/2"	1/16"	1/4"	1/2"	Total	Total	Total	Total
Mammalia	**7**	**5**	**0**	**0.72**	**2.63**	**0**	**0**	**1**	**0**	**12**	**3.35**	**1**	**39.13**
Amphibia	13	0	0	0.1	0	0	1	0	0	13	0.1	1	
TOTAL AMPHIBIA	**13**	**0**	**0**	**0.1**	**0**	**0**	**1**	**0**	**0**	**13**	**0.1**	**1**	
Osteichthyes	10,052	977	0	303.37	38.15	0	0	0	0	11,029	341.57	0	
UID Osteichthyes	2	0	0	0.1	0	0	2	0	0	2	0.1	2	
Lepisosteus sp.	81	50	0	2.9	6	0	1	1	0	131	8.82	1	
Clupeidae	65	0	0	0.26	0	0	3	0	0	65	0.26	3	
Siluriformes	706	507	2	39	97.2	1.91	12	25	1	1215	138.1	10	1524.70
Arius felis	18	27	0	1.2	5.6	0	2	4	0	45	6.8	4	87.27
Bagre marinus	64	241	21	4.5	45.9	15.8	1	6	5	326	66.2	11	758.25
Sciaenidae	120	0	0	0.9	0	0	6	0	0	120	0	0	
Bairdiella chrysoura	27	0	0	0.56	0	0	10	0	0	27	0.56	10	
Micropogonias undulates	10	0	0	0.66	0	0	7	0	0	10	0.66	7	
Sciaenops ocellatus	1	0	0	1.6	0	0	1	0	0	1	1.6	1	
Stellifer lanceolatus	36	0	0	1.55	0	0	12	0	0	36	1.55	12	
Mugil sp.	1	0	0	0.04	0	0	1	0	0	1	0.04	1	
Chondrichthyes	21	0	0	0.19	0	0	1	0	0	21	0.19	1	11.47
TOTAL FISH	**11204**	**1802**	**23**	**356.83**	**192.85**	**17.71**	**59**	**36**	**6**	**13029**	**566.45**	**63**	**3306.37**
Vertebrata	52	2	0	1.07	0.55	0	0	0	0	54	1.62	0	
TOTAL VERTEBRATA	**11276**	**1809**	**23**	**358.72**	**196.03**	**17.71**	**60**	**37**	**6**	**13108**	**571.52**	**65**	**3345.50**
Decapodia	20	7	0	0.45	0.73	0	2	2	0	27	1.18	3	
Balanus sp.	16,051	3	4	113.23	0.97	4.57	2	1	4	16,058	118.77	2,680	
TOTAL CRUSTACEA	**16071**	**10**	**4**	**113.68**	**1.7**	**4.57**	**4**	**3**	**4**	**16085**	**119.95**	**2683**	
Littorina irrorata	0	44	10	0	36.75	10.24	0	43	10	54	46.99	53	17.05
UID gastropod	15	0	0	0.12	0	0	15	0	0	15	0.12	15	
Stylommatophora	206	12	0	0.31	0.97	0	202	12	0	218	1.28	214	
UID bivalve #1	2	0	0	0.07	0	0	2	0	0	2	0.07	2	
Geukensia demissa	12,836	41	5	26.8	10.74	7.55	1	1	1	12,882	45.09	2	78.43
Crassostrea virginica	1,363	340	1616	23.23	106.7	11,652.2	0	0	595	3,319	11,782.13	595	1,510.38
Tagelus sp.	7	43	73	0.45	11.3	55.3	1	3	26	123	67.05	29	115.24
TOTAL MOLLUSCA	**14429**	**480**	**1704**	**50.98**	**166.46**	**11,725.29**	**221**	**59**	**632**	**16,613**	**11,942.73**	**910**	**1,721.1**
Invertebrata	29,341	0	0	323.2	0	0	0	0	0	29,431	323.2	0	
TOTAL INVERTEBRATA	**59841**	**490**	**1708**	**487.86**	**168.16**	**11,729.86**	**225**	**62**	**636**	**62,129**	**12,385.88**	**3593**	**1,721.1**
TOTAL FAUNA	**71117**	**2299**	**1731**	**846.58**	**364.19**	**11,747.57**	**285**	**99**	**642**	**75,237**	**12,957.4**	**3658**	**5,066.3**

However, as mentioned above and below, other aspects of fragmentation do support the observation. For example, the recovery of 40% of the periwinkle fragments in the 1/16 inch fraction of F.S. 101 and the recovery 0% in F.S. 74, do support the idea that more crushing was occurring in the F.S. 101deposit. Periwinkles are generally hearty shells not subject to as much fragmentation through archaeological processing as more delicate shells. Most periwinkles are usually recovered in 1/4 inch screens.

Table 18. Vertebrate faunal remains from Fig Island 3, Test Unit 5, Level 5, Column Sample, F.S. 79.

Taxa	**Number Identified Specimens**			**Weight in grams**			**Minimum Numbers of Individuals**			**NISP**	**Wt. (g)**	**MNI**	**Biomass (g)**
	1/16"	1/4"	1/2"	1/16"	1/4"	1/2"	1/16"	1/4"	1/2"	Total			
Kinosternidae	1	0	0	0.1	0	0	1	0	0	1	0.1	1	
Malaclemys terrapin	0	2	0	0	1.1	0	0	1	0	2	1.1	1	
TOTAL REPTILIA	**1**	**2**	**0**	**0.1**	**1.1**	**0**	**1**	**1**	**0**	**3**	**1.2**	**2**	**12.94**
Osteichthyes	9,635	371	0	61	15.1	0	1	0	0	10,006	74.3	1	
UID Osteichthyes	11	0	0	0.1	0	0	6	0	0	11	0.1	6	
Lepisosteus sp.	0	3	0	0	0.4	0	0	1	0	3	0.4	1	
Clupeidae	23	0	0	0.1	0	0	1	0	0	23	0.1	1	
Siluriformes	227	180	0	8.2	21.6	0	2	6	0	407	29.8	6	355.23
Bagre marinus	108	109	0	3.5	15.4	0	1	1	0	217	18.9	1	230.48
Sparidae/Sciaenidae	13	1	0	0.1	0.3	0	1	1	0	14	0.4	0	
Archosargus probatocephalus	6	0	0	0.2	0	0	1	0	0	6	0.2	1	
Sciaenidae	65	0	0	0.9	0	0	0	0	0	65	0.9	0	
Bairdiella chrysoura	2	0	0	0.1	0	0	1	0	0	2	0.1	1	
Cynoscion sp.	35	1	0	0.8	0.1	0	1	1	0	36	0.9	1	
Micropogonias undulatus	1	0	0	0.2	0	0	1	0	0	1	0.2	1	
Sciaenops ocellatus	12	0	0	0.1	0	0	6	0	0	12	0.1	6	
Stellifer lanceolatus	25	0	0	0.3	0	0	9	0	0	25	0.3	9	
Mugil sp.	4	0	0	0.1	0	0	1	0	0	4	0.1	1	
Bothidae	9	0	0	0.8	0	0	1	0	0	9	0.8	1	
TOTAL FISH	**10,176**	**665**	**0**	**76.5**	**52.9**	**0**	**33**	**10**	**0**	**10,841**	**127.6**	**37**	**859.00**
VERTEBRATA	**10,177**	**667**	**0**	**76.6**	**54**	**0**	**34**	**11**	**0**	**10,844**	**128.8**	**39**	**871.94**

One final observation of the screen size data exhibited in Tables 17-19 suggests that most remains of oysters of edible size are recovered with 1/2 inch mesh. Those MNI recovered in the 1/4 and 1/16 inch fractions were of sizes indicating they were commensals, or otherwise not subsistence items. In contrast, virtually all the fish remains recovered came from the 1/16 inch fractions. This supports the argument that in terms of relative abundance, faunal analyses from shell midden samples recovered with mesh sizes larger than 1/16 inch are suspect in terms of the representativeness of the entire faunal assemblage. Fauna recovered from Southeastern U.S. coastal middens only with large mesh screen will almost always underestimate the importance of fish in the diet.

In terms of relative importance of fauna, it cannot be stated with any degree of precision that one taxon is any more abundant than another. The nature of zooarchaeological measures of abundance are such that relative rankings will change depending upon which measure is used for comparison and how it was affected. The strengths and weaknesses of each measure used here have been widely discussed elsewhere (e.g. Reitz and Wing 1999; Wing and Brown 1979)

Table 19. Faunal remains from Fig Island 1, Test Unit 2, Column Sample, FS 101.

Taxa	**Numbers of Identified Specimens**			**Weight in grams**			**Minimum Numbers of Individuals**			**NISP**	**Weight (g)**	**MNI**	**Biomass (g)**
	1/16"	1/4"	1/2"	1/16"	1/4"	1/2"	1/16"	1/4"	1/2"	Total	Total	Total	Total
Mammalia	**10**	**5**		**3.25**	**1.27**		**2**	**1**		**15**	**4.52**	**2**	**51.24**
AVES	**23**	**5**		**2.68**	**0.92**		**1**	**1**		**28**	**3.60**	**1**	**35.18**
Kinosternidae		6			0.91			1		6	0.91	1	
Malaclemys terrapin	3			1.02			1			3	1.02	1	
Testudines	20			5.66			1			20	5.66	0	
TOTAL REPTILIA	**23**	**6**		**6.68**	**0.91**		**2**	**1**		**29**	**7.59**	**2**	**12.58**
Anura	4			0.12			1			4	0.12	1	
Amphibia	9			0.05			2			9	0.05	2	
AMPHIBIA	**13**			**0.17**			**3**	**0**		**13**	**0.17**	**3**	**2.47**
Osteichthyes	1,762	3		18.92	0.42		2			1765	19.34	2	
Lepisosteus sp.	10			0.48			1			10	0.48	1	
Clupeidae	4			0.02			1			4	0.02	1	
Siluriformes	194	8		8.16	1.97		2	2		202	10.13	2	127.45
Arius felis	11			0.45			1			11	0.45	1	6.62
Bagre marinus	90			4.10			1			90	4.10	1	53.97
Bothidae	1			0.07			1			1	0.07	1	
Urophycis sp.	1			0.01			1			1	0.01	1	
Sparidae/Sciaenidae	1			0.17			1			1	0.17	1	
Sciaenidae	81			0.71			0			81	0.71	0	
Bairdiella chrysoura	9			0.15			5			9	0.15	5	
Micropogonias undulatus	3			0.18			3			3	0.18	3	
Stellifer lanceolatus	36			1.40			12			36	1.40	12	
Mugil sp.	4			0.04			1			4	0.04	1	
Chondrichthyes	2			0.01			1			2	0.01	1	0.91
TOTAL FISH	**2,209**	**11**		**34.87**	**2.39**		**33**	**2**		**2220**	**37.26**	**33**	**288.11**
Vertebrata	74	15		3.41	2.86		0	0		89	6.27	0	
VERTEBRATA	**2,352**	**42**	**0**	**51.06**	**8.35**		**41**	**5**		**2394**	**59.41**	**41**	**339.05**
Decapodia	31			3.02			5			31	3.02	5	
Balanus sp.	24,100	9	4	110.50	1.37	0.46	4,500	2	3	24113	112.33	4505	
TOTAL CRUSTACEA	**24131**	**9**		**113.52**	**1.37**	**0.46**	**4505**	**2**	**3**	**24144**	**115.35**	**4510**	
Littorina irrorata	300	170	280	13.00	74.51	268.62	0	131	276	750	356.13	407	114.42
Gastropoda	6	3	4	0.04	1.64	9.51	6	3	4	13	11.19	13	
Busycon sp.			7		26.71				1	7	26.71	1	12.97
Stylommatophora	1,051	10		7.51	0.62		951	10		1061	8.13	961	
Bivalvia	2	10	4	0.01	3.98	3.03	2	4	2	16	7.02	8	
Geukensia demissa	68,400	680	95	904.00	97.21	24.6	100	19	4	69175	1025.81	123	1624.56
Crassostrea virginica	1,700	1025	1259	257.00	248.39	8158.38	450	143	777	3984	8663.77	1370	1120.92
Mercenaria mercenaria			7			20.78			1	7	20.78	1	5.48
Tagelus plebeius	850	143	27	29.50	17.24	8.48	0	12	5	1020	55.22	17	95.46
MOLLUSCA	**72309**	**2041**	**1683**	**1211.06**	**470.30**	**8493.40**	**1509**	**322**	**1070**	**76033**	**10174.76**	**2901**	**3006.61**
Invertebrata	43,200			258.00			0			43200	258.00	0	
INVERTEBRATA	**139,640**	**2,050**	**1,683**	**1,582.58**	**471.67**	**8,493.86**	**6014**	**324**	**1073**	**143377**	**10548.11**	**7411**	**3006.61**
TOTAL FAUNA	**141,992**	**2,092**	**1,683**	**1,633.64**	**480.02**	**8,493.86**	**6,055**	**329**	**1,073**	**145,771**	**10,607.52**	**7452**	**3345.66**

Table 20. Percentages of primary subsistence fauna at Fig Island, 38Ch42, comparison of taxa within each class and class (vertebrates) to class (invertebrates).

Taxa	**NISP**			**Weight (g)**			**MNI**			**Biomass (g)**		
	FS 74	FS79	FS 101	FS 74	FS 79	FS 101	FS74	FS79	FS 101	FS74	FS79	FS 101
Mammal	0.092	0	0.627	0.586	0	7.608	1.5	5.1	4.9	1.2	0	15.1
Bird	0	0	1.170	0	0	6.060	0	0	2.4	0	0	10.4
Reptile	0	0.028	1.211	0	0.932	12.776	0	0	4.9	0	1.5	3.7
Amphibian	0.099	0	0.0543	0.017	0	0.286	1.5	0	7.3	0	0	0.73
Fish	99.397	99.972	92.732	99.113	99.068	62.616	96.9	94.9	80.5	98.9	98.5	85.0
Vertebrata	**17.598**	**-**	**1.642**	**5.118**	**-**	**0.560**	**1.8**		**0.55**	**68.1**	**-**	**10.1**
Periwinkle	0.088	-	0.523	0.985	-	3.376	1.5	-	5.5	1.1	-	3.8
Mussel	20.988	-	48.246	0.370	-	9.725	0.06	-	1.7	5.0	-	54.0
Oyster	4.185	-	2.779	96.362	-	82.136	16.6	-	18.5	86.6	-	37.3
Tagelus	0.200	-	0.711	0.550	-	0.524	0.8	-	0.23	7.3	-	3.2
Invertebrata	**82.402**	**-**	**98.358**	**95.131**	**-**	**99.440**	**98.2**	**-**	**99.4**	**31.9**	**-**	**89.9**

Table 21. Percentages of primary subsistence molluscan fauna at Fig Island, 38Ch42.

Taxa	**NISP (%)**		**Weight in grams (%)**		**MNI (%)**		**Biomass in grams (%)**	
	FS 74	FS 101	FS 74	FS 101	FS 74	FS 101	FS 74	FS 101
Periwinkle	54 (<1)	750 (1)	46.99 (<1)	356.13 (4)	53 (8)	407 (21)	17.05 (1)	114.42 (4)
Mussel	12,882 (82)	69175 (92)	45.09 (<1)	1025.81 (10)	2 (<1)	123 (6)	78.43 (5)	1624.56 (54)
Oyster	2,569 (16)	3984 (5)	10,562.83 (99)	8663.77 (85)	595 (88)	1370 (71)	1358.52 (87)	1120.92 (37)
Tagelus	123 (1)	1020 (1)	67.05 (1)	55.22 (1)	29 (4)	17 (1)	115.24 (7)	95.46 (3)
Other	-	14 (<1)	-	47.49 (<1)	-	2 (<1)	-	18.45 (1)
Total molluscs	**15,628**	**74,943**	**10,721.96**	**10,148.42**	**679**	**1919**	**1,569.24**	**3006.61**

and will not be discussed in detail. Suffice it to say that, at best, only ordinal rankings should be used as zooarchaeological measures of abundance. For the purposes of this study, comparisons of both primary (NISP and weight) and secondary measures (MNI and biomass) were used to determine ordinal rankings of taxa dietary importance. If relative abundances were consistent across all these measures, a greater degree of confidence was obtained for their ranking. With this in mind, Table 20 indicates the relative abundances of the primary taxa for each class of animals from the three proveniences. These data indicate that among shellfish, oyster was one of the most abundant of exploited species regardless of the measure used. In the one sample chosen for its unusually large amount of mussel (F.S. 101), mussel edged out the abundance of oyster only in the biomass category.

In terms of vertebrates, fish were far more numerous than any other family of animals under all four measures of abundance. Mammals, amphibians, birds, and reptiles were insignificant contributors in two of the assemblages, and it is likely that these particular amphibians (probably very small frogs) were likely non-culturally deposited. That is, they came into the midden naturally and post-depositionally. This is not to say that vertebrates other than fish were not important to the diet. In terms of preference, variety, and other uses, they undoubtedly played a role in the subsistence economy. However, in terms of stable, consistent resources, fish were the primary contributors among vertebrates. Of these, nearly all the taxa are from estuarine environments. Saltwater catfish were consistently the most abundant taxa identified in all three samples, with various Sciaenids (e.g., *Stellifer lanceolatus, Micropogonias undulatus, Bairdiella chrysoura*) providing the second greatest numbers. Of these, species and individuals were consistently of small sizes (less than a half a kilogram) suggesting mass capture techniques (e.g., nets) were used in their collection. The only fish of substantial size collected were the saltwater catfish, and only a few of these likely exceeded sizes greater than a kilogram (2.2 pounds). However, the investigators note that in samples outside of those analyzed here, great numbers of large catfish otoliths suggest that capture of large catfish was a common occurrence at the site, which, as happenstance would have it, was not reflected in the particular samples chosen for analysis.

To determine the seasons of capture of fish, two methods are typically followed. One involves cutting otoliths to identify increments connected to seasonal growth patterns. For this procedure, the biological measure of modern fish otoliths of the same species is required for comparison; and the archeological specimens have to be well preserved and come from fish that were at least 2 to 3 years in age. The second method necessitates allometric regressions, which link the size of elements used to determine MNI to fish size (i.e., biomass or length). The fish sizes are then compared to modern fisheries data linking the modal size of young-of-the year fish to seasons. That is, certain sizes of young-of-the-year fish are found to be more seasonally abundant than at other times. Problems with this method include the need for large numbers of fish to obtain statistical rigor (preferably a hundred of the chosen species of study, but at least 30), and the need for modern fisheries data demonstrating a clear seasonal pattern for the sizes of young-of-the-year in the species under study, (some fish species are multiple seasonal breeders and are not good subjects of study under this method). Unfortunately, in our samples, although fish were the most abundant vertebrates, no more than 12 of any one species was collected, precluding my ability to compare them with modern young-of-the-year data.

As for the second method commonly used to measure fish seasonality, large samples of each species under study are beneficial, but, not necessary. Each otolith is measured for an increment of growth that links it to a season. Unlike the size class measures dependent on young-of-the-year fish, however, the otoliths used for seasonality determinations need come from fish two or more years of age in order to compare the growth increment to the previous year's growth. Unfortunately, except for catfish, the otoliths recovered in the samples, particularly those of Sciaenids, came from individual fish too young to use for incremental otolith analysis. Catfish otoliths were the most abundant otolith, and the investigators are seeking grant funds for analysis, the results of which will be published in a separate report. In lieu of more precise seasonal measure for fish, I suggest that the three most abundant Sciaenids, croaker, silver perch, and star drum, as well as the sea catfish, are likely summer catches. That is when they are most abundant in the estuaries of South Carolina (Trinkley 1986:31).

In terms of invertebrate seasonality, a common mollusc, the hard clam, is often used in seasonality studies due to the presence of discernible growth increments in its shell. Unfortunately, hard clams were rarely encountered in any of the midden excavated at the site, and only small fragments were identified in the samples chosen for detailed analysis. However, seasonality of oyster collection was determined in four samples from the site (Figure 9). The greatest modal sizes of *Boonea impressa*, the parasitic snail of oysters, ranged between 4.5 and 5.5 mm. in length, indicating a late autumn/winter collection of the oysters upon which the snails were attached at time of collection (Russo 1991a). Only one sample of *Boonea* came from a provenience in close proximity to one of the three analyzed for more detailed faunal analysis. The Fig Island 3, Trench 1, Feature 1, Level 13 sample of *Boonea* comes from two levels below F.S. 74 (Table 17). There the fish are suggestive of a summer collection, while the *Boonea* two levels below indicate a winter season of collection. Since the feature has been identified as a relatively short-term deposit of shell and other faunal remains, there is an apparent contradiction in season of deposition. However, it must be remembered that the fish seasonality is only a best guess, and that precise seasonality measures await undertaking. Too, "a short-term" deposit is a relative term. What is indicated in the profile of the feature is that no episode interrupting the visual aspect of loosely packed oysters with little to no soil and abundant bone fragments was observable in the feature. This means that episodes of crushing, the deposition of soil, or other cultural activities or natural processes did not intervene in the deposit of shell within the feature. Whether this deposition of shell took a week or more than a year cannot be determined at this point, but multiple seasons is a real possibility. In terms of the time all the shell took to be deposited into the feature, I do note that land snails were numerous in level 10. The presence of land snails of all ages and sizes does suggest that the shell deposited at this level was open to the air for an extended period. In other words, there was little activity (e.g., living on the site, or burial of the shell rapidly beneath more shell) capable of precluding the invasion into the deposit by snails. This duration of time the deposit was open to exploitation by land snails was, presumably, longer than just a few weeks.

What can be concluded, then, about the annual occupation of the site based on faunal seasonality data? Extrapolation too broadly from the limited data should be cautioned against. Out of at least a million equally sized samples (see below) which make up the site, only four samples have yielded seasonal data on oyster. These suggested a fall to winter collection. The fish suggest summer collection, but the data upon which the determinations are based need to be more rigorously tested. It is not prudent to conclude that fish were a summer resource nor that oyster were a winter resource. The samples collected just happen to indicate these seasons. Many more studies of seasonality are required before site-wide patterns can be discerned. Analysts should be wary of mythic, untested propositions such as oysters cannot be eaten in the summer, or fish are caught only during the best fishing seasons. These are modern preconceptions that have consistently been shown to be inapplicable to prehistoric societies (e.g., Russo 1991a, 1991b).

Discussion

Architecturally, the primary faunal constituent at 38Ch42 is oyster. From the simple observations of the great pilings of shell at Fig Island, it is obvious that oyster played important roles not only in construction but in subsistence, and likely, in ceremony also. Through detailed faunal analysis, the relative importance of other fauna has been compared to oyster in two samples. In these oyster was a significant, if not the most significant, faunal resource in the diet. Unfortunately, with limited funding for zooarchaeology, only three samples of midden could be examined. Considering that the volume of shell of the three rings at Fig Island is over 25,000 cubic meters, the samples selected for study may seem too small to be representative of the site as a whole. Each sample consisted of a 0.025 cubic meter of midden and together represent less than 0.000003% of the volume of shell and other fauna deposited at the site. As such, I do not suggest that the fauna identified represent all species exploited at the site or that the relative amounts of each species are representative of all subsistence remains at the site.

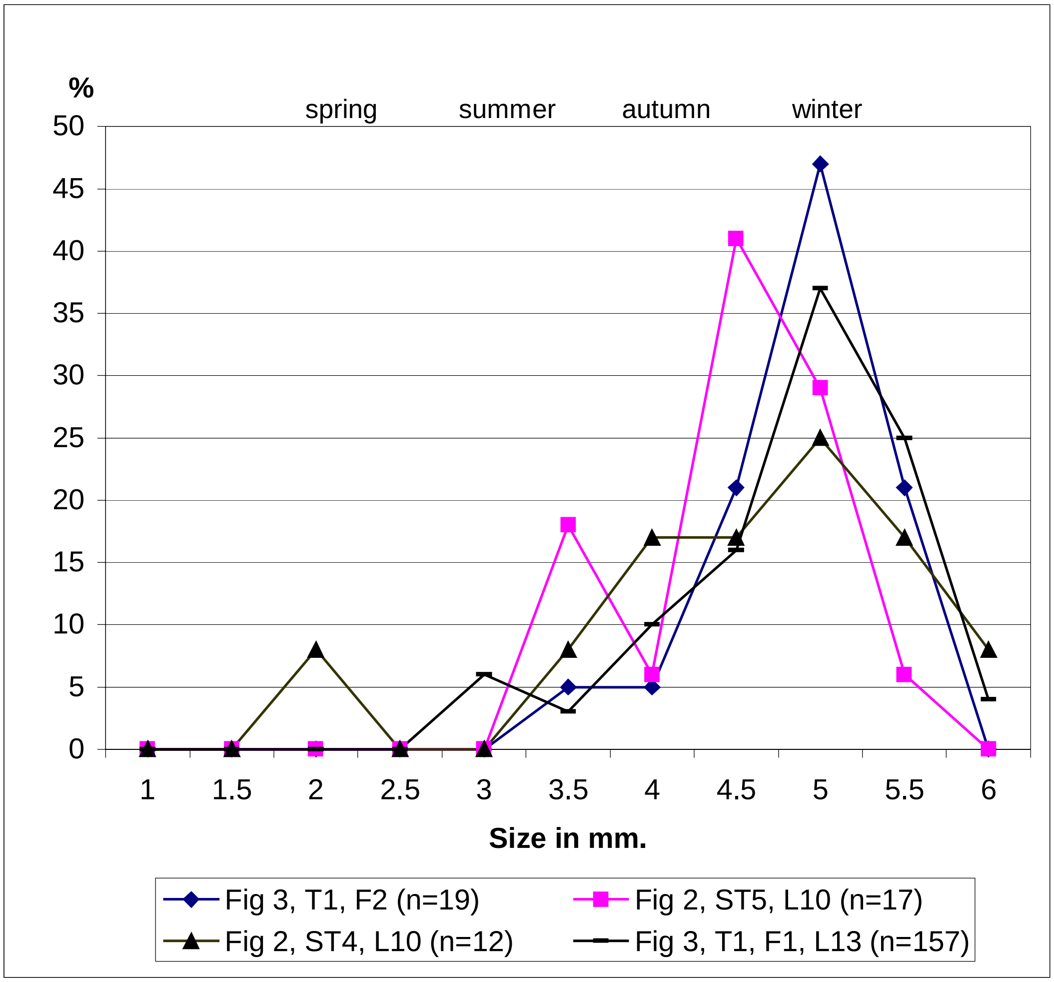


Figure 39. *Boonea impressa* size class relative to season of collection.

In fact, a number of factors worked against the collection of samples that might prove indicative of the site as a whole. Because of the enormous amounts of time and money required for fine-grained faunal analysis, typically, conclusions concerning site economy are drawn from very small samples. To extrapolate broad conclusions from limited data is, perhaps, a necessary compromise accepted by archaeologists strapped with time and money constraints. However, making the compromise often results in the bias in analysis and interpretation. Archaeologists often choose those samples from shell middens which contain more bone than is average for the site. This is, in part, because the identification of bone provides more data than simply data on oyster alone. Too, because zooarchaeological analysis is undertaken by specialists, their time is better utilized analyzing material (such as bone) that less expensive technicians cannot normally handle as well. Common tactics in dealing with massive amounts of oyster in the field include noting it and discarding it, weighing it and discarding it, and measuring the volume and discarding it. Bone, on the other hand, is often “hand-picked” from the screens (Russo and Heide 2002; Trinkley 1980) assuring that it receives more attention in the lab and final reports than the attention that is assigned to shell.

When supposed systematic zooarchaeological samples are taken for more objective assessments of total fauna at a site, the randomness of their selection is questionable (randomness being a scientific necessity if extrapolation from the sample to the sampling universe is to be achieved). The actual placement of columns for sampling, given the constraints of money and data needs, are often dictated, not through random selection, but by the presence in the midden of abundant bone remains. Columns are often placed where midden is the thickest and bone the densest. Once back in the labs, the levels chosen for study are usually those with the most bone—more bang for the buck. Or only bone is analyzed, and shell ignored in quantification (e.g., Marrinan 1975; Russo 1991b; Trinkley 1980b). One result of this kind of neglect or secondary status is that invariably the relative abundance of shell, and in the Southeast coastal zones, oyster in particular, is underestimated for a site when abundances are extrapolated from such prejudicially collected and small samples.

In our study, biomass calculations provide the best measure when comparing invertebrate with vertebrate remains to determine relative abundances of all fauna (although such calculations are far from perfect for such purposes [Reitz and Wing 1999]), and these show that either shellfish (mostly oyster and/or mussel) or vertebrates (mostly fish) may be more abundant. However, because some of our samples were chosen in part, because they held more bone remains than other samples of midden, this suggests that oyster and other shell may be underrepresented relative to vertebrate fauna in those particular samples. I mention this here to stress the real possibility that the relative value of shellfish in our samples may not reflect their value in the site as a whole; and because analysis of fauna at other rings in the region have stressed a peculiar point—that deer may be the most abundant source of animal protein at shell rings sites (Trinkley 1980b), and a more defensible, but still debatable point, that fish were far more important than shellfish due their better nutritional value per unit of weight (Marrinan 1975).

Along the Carolina Bight only one other shell ring has had extensive faunal analysis undertaken using 1/16 inch mesh. At Lighthouse Point, Trinkley (1980b:145) measured samples of faunal remains from features using 1/8 and 1/16 inch mesh recovery. Unfortunately, it is not clear which samples were recovered with which specific screen size (Trinkley 1980b:237); because of this, the results of the analysis are difficult to assess. Fish remains were not quantified and measures (such as biomass) were not consistently undertaken to allow for the comparison of vertebrates to invertebrates. Trinkley (1980b:240) concludes that deer yielded the most bone remains and likely most meat in his samples, and extrapolates from his sample that occupants of the ring were “heavily dependent on deer, fish, turtle, and raccoon” with nary a mention of shellfish (Trinkley 1980b:244).

At Cannon’s Point Marsh Ring, Marrinan (1975) employed 1/8 inch screen and recovered abundant fish remains. Unfortunately, she did not quantify molluscan data. Consequently, although she suggests that per unit weight, crustaceans (crabs) and vertebrates (mostly fish) are more nutritious than molluscs (Marrinan 1975:74), no data from the site are provided that offers insight into the relative contribution of shellfish to the diet of the ring builders.

In Florida extensive zooarchaeological analysis of fauna recovered with 1/16 inch mesh has been undertaken on two shell rings, Rollins Shell Ring near the Georgia border on the east coast, and Horr’s Island in the extreme southwest corner of the state. At Rollins, Russo (1992) presented subsistence data from two proveniences in the ring. While oyster was by far the most dominant invertebrate consumed at the site, and fish the most common vertebrate, only MNI data was presented. MNI is not the best measure to use in comparing the relative value of meat to the diet between fish and oysters. However, it can be used to determine if the relative amounts of oyster to fish differed between midden samples (see Table 22 below).

At Horr’s Island, zooarchaeological samples from the shell ring were recovered with 1/16 inch mesh and were analyzed for resource abundance. Oysters were, by far, the dominant shellfish, while fish were the most abundant vertebrates. Unfortunately, no biomass estimates were taken to facilitate the comparison of relative values of meat to the diet between molluscs and fish. In addition, samples were intentionally selected for their abundances of fish bone in order to facilitate seasonality determinations. So although biomass calculations could be undertaken from the reported data, the bias of selection of the samples would favor fish over oyster despite the fact that most midden deposits at the site were depauperate of fish. Because the research was oriented towards the determination of seasonality, the relationship of oyster to fish in the samples may be lower relative to the likely contribution of oyster to the overall site subsistence strategy (Table 22).

While MNI is not the best unit of measure to compare the relative value oyster to fish, it is the most useful measure consistently available from shell ring sites. These data demonstrate that a high degree of variability exists in the ratio of oyster to fish among shell rings, but the reasons for this variability may be due as much to the sampling problems discussed above, as to prehistoric cultural decisions relative to resource exploitation. In short, the relative contribution of oyster to the diet of shell ring builders is largely unknown due to limited studies of overall subsistence, biases inherent in choosing samples for study, biases in measuring samples, and preconceived notions of the food value of molluscs.

Table 22. Ratio of oyster MNI to fish MNI from shell ring zooarchaeological samples.

ollins		Horr’s Island										Fig Island	
FS# 42	FS# 43	ZA# 188	ZA# 198	ZA# 215	ZA# 225	ZA3 226	ZA# 227	ZA# 240	ZA# 305	ZA# 306	ZA# 479	FS# 74	FS# 101
3:1	23: 1	18:1	0.1: 1	1:1	0.02:1	0.01:1	0.04:1	0.26:1	1:1	0.6:1	2:1	9.4:1	42:1

Recently a small sample of fauna recovered with 1/16 inch mesh was analyzed from the Joseph Reed Shell Ring on Florida’s southeast coast (Russo and Heide 2002). As is found at all shell rings, this sample suggests that oyster were the dominant shellfish and fish the dominant class of vertebrates in the sampled diet. Beyond this, the authors suggest that oyster was the primary, staple resource used in ceremonial feasting at the site. It is plausible that at all shell rings, oyster was the staple in both quotidian and ceremonial fare. Without oyster it is doubtful that shell rings would have been constructed or the activities occurring at the rings economically supported. With more data, this idea can be tested. At Fig Island, a glimpse into the economic basis upon which the site was built has been obtained. Regardless of the measures used, and with the acknowledgment of likely bias in the sampling strategies used, oyster consistently ranks high on the list of abundance.

Future Research

The identification and analysis of fauna from shell rings is in its infancy, yet, already a number of issues have arisen that beg for investigation and resolution.

1. What are rings made of? Unlike the common situation at most shell middens in the Southeast, faunal analysis to determine what was eaten is no longer the dominant zooarchaeological issue at shell rings sites. At all known rings oyster is the dominant architectural building block. Archaeologists will be compelled to determine how these blocks were obtained, deposited, and structured. Were people collecting oyster specifically to build shell rings without their use first as subsistence items. Were the oysters used in feasting activities and then discarded in ring formations? Or was oyster shell deposition the result of daily meals? Developing theories and methods to identify and resolve these questions is critical to gaining an understanding of the social organization and activities that compelled shell ring occupants to build these monumental structures.

2. What were the most important foods in the subsistence diet at shell rings? Various theories suggest terrestrial mammals, fish, or shell were the significant resources at shell rings. Due to the vagaries and biases of sampling and interpretation, however, there are no comparable data sets to determine if subsistence strategies were similar at all shell ring sites or if they differed significantly. Different strategies may have been used at different shell ring sites. Here and elsewhere I have suggested that at all shell ring sites oyster is the most import species as both an architectural element and subsistence item. I have also suggested methods that may help determine the subsistence importance. Primary among these is the elimination, or at least, the clear acknowledgement of biases in sampling strategies that consistently underestimate the value of shellfish. The analysis of more samples applicable to site level analysis need also be undertaken. This may entail site stratification in which each ring and parts of each ring are identified as containing different numbers and kinds of subsistence elements and then each of these elements are sampled to constitute a more representative sample of the site as whole. That is, some areas of shell rings were identified in our limited sampling as having more fish, more mussel, and almost exclusively only oyster. The random collection of samples that give all these strata an equal chance of being chosen for analysis relative to their abundance needs to be undertaken if we are ever to determine what fed the population at the site, and, perhaps, what enticed them to eat and feast at the sites.

3. On a small scale, researchers need to identify and delimit specific feasts, dumping episodes, and other activities at sites if we are to determine how the sites were used. In other words, the identification of features and their interpretation of social activities which resulted in their construction need to be made. The investigators at Fig Island have begun this by positing the possible identification of living surfaces, simple shell refuse piles deposited over short terms, and those deposited over longer times. One issue that is critical is determining the size of such features. If family units were eating small meals at the site, we should expect small, identifiable features. I would suggest these features would exhibit a higher diversity of animals than larger scale feasts in which large masses of people would have had to have been fed with the most abundant resource – oysters (Russo and Heide 2002). The discernment and interpretability of features relative to human behavior is critical if we are to determine if the

sites were used as villages only, ceremonial feasting centers only, or a combination of these and other activities (cf. Cable 1997; Trinkley 1997; Russo and Heide 2002).

4. Were the sites occupied throughout the year or only seasonally or periodically? The need to identify features as state above is critical to resolving this question. The recovery of faunal/seasonal data from large numbers of short-term features is the key. Seasonal analysis of a few features only will not be sufficient. Such analysis will provide the time of deposition of those features. But it is the totality of large numbers of these features covering all strata of the site that needs to be undertaken. There is real possibility that certain portions were occupied for longer annual periods than others.

There are apparent contradictions involved in achieving the goals outlined above. For example, the stratification of the site is required and the random choice of sampling among the strata is needed to resolve the question of the relative importance of faunal species to the diet. Yet, the sampling strategy to determine the seasonal occupation must target those areas of site with the most fish bone, the most otoliths, the most *Boonea*, and the most clam, regardless of the randomness of the selection of those samples. This requires that research be goal oriented. Not all samples can provide adequate data to answer all critical questions. Long term and varied studies are need to resolve these issues.

Based on this study, we now have a better idea on how to sample in the future. For one, seasonal analysis must be undertaken on much larger samples. Rather than 0.025 cubic meters, at least 0.1 to 0.25 cubic meters are need to recover enough fish bone, otoliths, and *Boonea*. Analysis of these sized samples for relative abundances of fauna, however, may be prohibitively expensive. One solution may be to collect the large samples, but limit abundance analysis to smaller subsamples.

Ranking the immediate needs for zooarchaeological analysis at shell ring sites would place the collection of seasonality data first. From these samples, abundance studies can be undertaken. The collection of the samples would also provide data on the location of features and the relative homogeneity/heterogeneity of the shell rings that can be used later to develop sampling strategies that would provide representative samples of the rings and site as entireties. Short of large scale excavation, such a stratified view of the contents of shell rings can only be gained in such an incremental approach.

CHAPTER 10:
SUMMARY AND CONCLUSIONS

As proposed, the Fig Island project had three primary goals. The first was to map all three shell structures at the site. Two of these had been previously mapped by Hemmings (1970), but the largest structure, Fig Island 1, had been all but ignored by previous researchers. The second goal was to examine stratigraphy and soils throughout the site in order to determine if portions of the rings were disturbed and to attempt limited paleoenvironmental reconstruction. Finally, through limited subsurface testing, we hoped to generate more information about the lifeways at the site, including using zooarchaeological analysis for settlement and subsistence information, artifact analysis to describe activities at the site, and radiocarbon dates to capture the time period of site occupation.

The overwhelming amount of data derived from the fieldwork and the analysis will take years to digest. However, preliminary data indicate that the site was occupied between about 4240-3680 B.P. (the one sigma, calibrated radiocarbon date range). As discussed by Heide (Chapter 6) and Russo (Chapter 7), mapping refined Hemmings' (1970) depiction of Fig Island 2 and 3. As Russo noted, Fig Island 2 appears more hexagonal than circular, which may have implications for further research into social units at the site (see e.g., Figure 12). The western arm of Fig Island 3 appeared, through subsurface probing for submerged shell, to have extended somewhat farther north than its present surface expression indicates. The subsurface probing also revealed a possible shell walkway stretching between two heretofore unexplained protuberances on Fig Island 2 and 3. This indicated that the two shell structures were in use at the same time. Radiocarbon dates (Chapter 8, Table 7, Figures 24 -25) also indicated that shell deposits were more or less contemporaneous. The earliest date in the suite of five dates from the top and bottom of these two shell structures was from the base of Fig Island 2 (4112 ± 50 B.P.), but all dates overlaped at one sigma (though in one case just barely).

Mapping of Fig Island 1 disclosed an enormous ring. At between 5 and 6 m above the marsh, it is the tallest shell ring known. It has a relatively small interior plaza, between 20 and 30 cm in diameter, though some of this apparent constriction may be due to slumping of shell off the steep inner sides of the ring. The radiocarbon date from the top of Fig Island 1, on what may be borrowed shell, is slightly younger than those from Fig Island 2 and 3, but all could have been under construction at the same time.

Fig Island 1 had a series of smaller rings attached to the exterior of the central ring on the north and west sides (Chapter 6, Figure 10). Similar enclosures were also described for Rollins Shell Ring in northeast Florida, where they were even more elaborated. (Rollins Shell Ring, associated with the Orange culture, has some dates that overlap with Fig Island, but basal dates for the Rollins ring itself indicates it may be about 100 years younger than Fig Island 1.) Saunders (1999) speculated that the smaller enclosures at Rollins were younger than the main ring. Though the Rollins "ringlets" have not been dated, dates from the top and bottom of shell in Enclosure C at Fig 1 were significantly younger than all other dated contexts at the site with the exception of the “Stallings” midden dated in Shovel Test 3. It could be 100-200 years younger than the earliest contexts on the site, though if two sigmas are considered, they could be contemporaneous.

Additional elaborations at Fig Island 1 include the possible presence of ramps necessitated by the steep slopes to access the summit and a shell mound with a sand core off the southern side of Fig Island (Russo, Chapter 7, this volume). These features have not been dated.

Soils analysis raised more questions than it answered. Most surprising was Leigh's (Appendix 1) assertion that most of the site was in marsh when it was inhabited. Russo (Chapter 7) addressed the evidence acquired to date, but clearly more research is needed into the paleoenvironment during and after the Late Archaic activity at the site. Also noteworthy in Leigh's analysis was the conclusion that shell may have been removed from the opening on the southwestern side of Fig Island 2.

Stratigraphy in excavation units in many places tested in the site conformed with the stratigraphy observed at other shell ring sites, though the authors’ interpretation of that stratigraphy differs from that of many other researchers. In Chapter 4, previous shell ring excavations were examined and the frequency with which investigators described the ring fill as composed of loose, clean, whole oyster was highlighted. While some researchers, notably Trinkley (1985, 1997), insist that rings are composed of midden where houses were built and daily refuse discarded, an equally good case can be made that the clean, unbroken, but jumbled and loose shell of the inner cores of many rings indicate that these shells were intentionally mounded in large piles. It is maintained here that these large deposits represent ceremonial deposits, perhaps of feasting remains. Such deposits were encountered at the top of Fig Island 1, in Hemming’s trench’s in Fig Island 2, as well as in the two column sample excavations there, in the trench in Fig Island 3, and possibly in Unit 5 on Fig Island 3, though deposits there had been infilled with marsh muck, so it was difficult to be sure. In many cases, these large deposits were associated with thin, dark, organic-rich soil lenses, for instance, Feature 2 in the trench on Fig Island 3, which appeared to lie over the slopes of the “feasting” deposits. The activity that produced these soil lenses is unclear, but they do not appear continuous enough or deep enough to represent living surfaces.

The stratigraphy in Unit 2 on Fig Island 1 serendipitously highlighted the distinction made between these large deposits of clean shell and what we recognize as more typical habitation debris—typical, that is, of most shell middens deposited over four millennia along the lower Atlantic coast. Along the western wall in that unit, Strata 1 and 2 were examples of this characteristic “sheet midden,” and were composed of whole and broken shell in brown to grayish brown silty sand with a high organic component. These strata overlay what we consider a feasting deposit that was composed of whole, clean, jumbled oyster with very little soil matrix. These distinct deposits were separated by a 5 to 30 cm thick stratum of crushed mussel, Stratum 3. While oyster actually outnumbered mussel in this lens (Russo, Chapter 9), the crushed mussel gave this lens a sparkling appearance in the sunlight. Other remains in this lens included other species of predominantly crushed shell, a relatively large quantity of crushed crab, the remains of small, probably netted fish, and a smattering of turtle, bird, and amphibian bones. This lens could be a living floor, though no postholes were found, but could also be a ceremonial deposit. In either event, it was unique in our excavations.

Fine screened zooarchaeological analysis provided information on subsistence focus and limited information on seasonality. The three samples chosen for analysis were chosen in part because of their contrast. Samples included one from a hypothetical feasting deposit—Feature 1 in the trench on Fig Island 3; one from the crushed mussel lens just described; and one from Unit 5 on Fig Island 3, where the muckiness of the deposit made conclusions about midden character and content difficult without fine screening. Unfortunately, only the vertebrate portion of the latter sample could be completed for this report.

As Russo related in Chapter 9, by measures of NISP, MNI, and biomass, oysters and small estuarine fishes were the primary subsistence items (though in Stratum 3 in Fig Island 1, Unit 2, mussel NISP exceeded that of oyster, in terms of weight, MNI, and biomass oyster still predominated in that stratum). Saltwater catfish were most abundant, and, when identifiable, *Bagre marinus* outnumbered *Arius felis* by a ratio of 3.5 to 1 in Feature 1, and 8.2 to 1 in Unit 5. Both are common in estuaries. It might be noted that modern fisheries consider *Bagre* edible and *Arius* inedible (Hoese and Moore 1977) and the preponderance of *Bagre* might reflect similar taste preferences in the past, though the late Archaic denizens of Fig Island were not so persnickety as to disregard *Arius* completely. It might be noted here that catfish spines provided the raw material for needles, a common bone tool at the site.

The sizes of the catfishes, as well as most of the other fishes examined in the fine screened samples (principally Sciaenids) indicated capture by nets and/or wiers. While this is not a surprising finding—by the late Archaic, a more or less complete adaptation to coastal resources had been made by most populations along the lower Atlantic coast—it can give one pause to consider how nets were owned and maintained by the community; how access to resource areas, tidal creeks in this case, was controlled; and how resources were distributed (see e.g., Hayden 1996b for a discussion of control of such resources for the Lillooet of the Northwest Coast). We cannot answer these questions as yet, and maybe never will be able to, but the social aspects of the subsistence technology are far more complex than the practical aspects.

On the basis of modern capture data, which indicates that the catfishes and Sciaenids are presently most abundant in the summer, Russo tentatively suggested a summer occupation. However, he cautioned that these fishes are available year round and that this result needed to be tested with more robust data.

Somewhat better data were available from the oyster parasite *Boonea impressa*. These excellent proxies for oyster seasonality are puzzlingly rare in late Archaic oyster middens. Four fine screened contexts have been found so far that contain *Boonea*. Two were from the trench on Fig Island 3. One of these was from Feature 1, the hypothetical feasting deposit, but from two levels lower than the fine screened zooarchaeological sample analyzed, which contained no *Boonea*. Another came from Feature 2, one of the organic-rich soil deposits commonly associated with the slopes of those large deposits. The other samples came from Fig Island 2, one from Shovel Test (column sample) 4, Level 10, in Hemmings' East Trench, and the other from the same level in Shovel Test (column sample) 5, in Hemmings' West Trench. As Russo demonstrated (Figure 9), all samples indicated a late autumn to winter oyster collection season. Russo went on to note, however, that the results of the analysis of these few samples, which represent a minute percentage of the volume of shell at the site, cannot be taken to characterize the site as a whole.

More information on seasonality is being sought. Green and Saunders are seeking funds to section otoliths from the site. The 1/4 in screen material is still being sorted, but all mercenaria (which is present in useful numbers so far only in Fig Island 1, Unit 2) that can be cut will be cut to provide additional information. The addition of this information will provide more raw data on season(s) of site occupation and will also broaden the number of contexts examined.

Artifacts, including pottery, bone and shell tools, and a very few lithics, indicated a lively community with activities involving, besides pottery-making, hammering; gouging or carving; punching, perhaps of leather; sewing with the aforementioned catfish spine needles, and net working or loose basket weaving. Some bone tools may have been sharpened on sherd abraders. These activities were not restricted to any one area of the site, but appeared much more intensive in Fig Island 1, Unit 2. As noted above, Fig 1, Unit 2 tested the inner arm of Enclosure C at the base of the massive Fig Island 1 shell ring (Figure 12), and radiocarbon dates indicate that artifacts from this unit may be younger than those from Fig Island 2 and 3. The sheer quantity of all classes of artifacts and ecofacts in this unit—Fig Island 1, Unit 2 often had significantly more artifacts in one class than *all other units put together*—indicated an intensification of productivity at that time and/or in that location. By and large, the tool classes were the same (see discussion in Chapter 8), though the only incised bone pins came from this unit, but the quantity was extraordinary. It might be noted that food bone recovered from the 1/4 in screen in the field is still being analyzed. However, some contexts from Unit 2 have been analyzed and the analysis indicates that bone, and in contrast to other contexts at the site, abundant large mammal bone (probably deer but some bear may be present), is present in that unit.

Fig Island 1, Unit 2 had another analytical advantage. It was the only excavated provenience with more or less linear, well-stratified deposits. It was noted in Chapter 8 that many of the analyses on pottery change through time involving Thoms Creek and Stallings wares from coastal sites were done on deposits that were deliberately mounded; analyses of this material using level data cannot produce reliable results. This may be why there is so much confusion surrounding the relationship of these two types and why there are so few consistent results in Thoms Creek design evolution. Cable's (1993) valiant attempt to isolate mounded deposits horizontally also cannot be expected to completely isolate discrete deposits.

Thus, pottery analysis at Fig Island emphasized the abundant (n=869) sherds from Strata 1, 2, and 3 in Fig Island 1, Unit 2 (Tables 13-16). On the basis of the 778 Thoms Creek sherds analyzed from those three proveniences, plain and drag and jab decoration decreased slightly through time, while punctation and incising increased. However, all treatments besides plain and punctated comprised a very small proportion of surface treatments in Fig 1 Unit 2 and at the site as a whole—just under 10% for the former and just over 10% for the latter.

Stallings wares showed a different pattern in Fig Island 1, Unit 2, where 91 sherds with fiber vermiculations were recovered (see Chapter 8 for a torturous discussion on what constituted Stallings in this report). Only 13 Stallings sherds were not plain; 11 were punctated and two were drag and jab. Most of these decorated sherds (n=11) were recovered from the youngest stratum, Stratum 1.

Notably, all identifiable vessels were shallow, slightly outslanting bowls. Only one sherd was sooted. One explanation for this assemblage is that it emphasized serving vessels, which is consistent with the hypothesis that feasting was a primary activity at the Fig Island site.

Conclusions

The Fig Island project accomplished the descriptive goals initially proposed. Heide's maps provide a wealth of data on intra-site structure. The soils analysis by Leigh indicated little disturbance to the site and, unexpectedly, the proposition that the site may have been in marsh when inhabited. Radiocarbon data bracketed the site occupation with good resolution and artifact analysis indicated a bustling community at the site 4000 years ago, particularly in the later days of site occupation as portrayed by the deposits around Enclosure C.

The question remains: how do the data derived from this project contribute to the discrimination of site function? Are rings egalitarian village sites, ceremonial sites, or, as Russo suggested in Chapter 7, a bit of both? It seems to this author that, more than any other ring yet explored, the Fig Island site can be used to dismiss the argument that all rings are simple village sites. The map of Fig Island 1 is eloquent enough. With its enormous height and the probable presence of ramps, a conical mound, and several smaller enclosures, it is not indicative of a simple egalitarian village. In addition, the argument that the large deposits of jumbled, loose, clean shell were deliberately mounded at Fig Island and at numerous other shell ring sites, and not further disturbed by day to day trampling, seems incontestable. And, everywhere but Enclosure C, there is nothing to suggest living surfaces within or on top of these deposits at Fig Island. (Note however, that Russo reminds us that even in ceremonial sites one can expect day-to-day debris from family groups preparing for festivities.) The shell rings at Fig Island are architecture composed of midden, not midden mistaken as architecture.

Russo’s thought-provoking essay on the shape of shell rings (Chapter 7) included the possibility that ring shape is a reflection of the social divisions of the population that used the site. If even some of his ideas can be demonstrated by excavation and analysis, shell ring sites could provide unparalleled information for reconstructing prehistoric social systems on the coast—far more informative than sheet middens or the apparently randomly placed house middens that succeeded rings.

The importance of the Fig Island site as research laboratory into coastal adaptations of the past cannot be overstated. The site is now protected as a South Carolina Heritage Site. A public interpretation program is encouraged, though access to the site should probably be limited. As this report demonstrates, additional research by archaeologists, geologists, botanists, and others will no doubt ensue and should be encouraged. Much more research is necessary to understand these important monuments (not middens) of the past.

REFERENCES CITED

Alder, M.A. and R.H. Wilshusen
1990 Large-scale Integrative Facilities in Tribal Societies: Cross-cultural and Southwestern US Examples. *World Archaeology* 22(2):133-146.

Anderson, David G.
1982 The Mattassee Lake Ceramic Artifact Assemblage. In *Mattassee Lake: Archaeological Investigations Along the Lower Santee River in the Coastal Plain of South Carolina,* by David G. Anderson, Charles E. Cantley, and A. Lee Novick, pp. 207-322. Atlanta Interagency Archeological Services Division, Special Publication 1982.

1985 Middle Woodland Societies in the Lower South Atlantic Slope: A View from Georgia and South Carolina. *Early Georgia* 13(1–2):29–66.

1990a The Paleoindian Colonization of Eastern North America: A View from the Southeastern United States. In *Early Paleoindian Economies of Eastern North America,* edited by Kenneth B. Tankersley and Barry L. Isaac, pp. 163-216. Research in Economic Anthropology, A Research Annual, Supplement 5. JAI Press, Inc., Greenwich, CN.

1990b Political Change in Cheifdom Societies: Cycling in the Late Prehistoric Southeastern United States. Unpublished Ph.D. Dissertation, Department of Anthropology, University of Michigan, Ann Arbor.

1994 *The Savannah River Chiefdoms: Political Change in the Late Prehistoric Southeast.* University of Alabama Press, Tuscaloosa.

1994 Paleoindian Interaction Networks in the Eastern Woodlands. *Native American Interactions: Multiscaler Analysis and Interpretations in the Eastern Woodlands,* edited by Michael S. Nassaney and Kenneth E. Sassaman. University of Tennessee, Knoxville.

Anderson, David G. and Virginia Horak, eds.
1995 *Archaeological Site File Management: A Southeastern Perspective.* Readings in Archeological Resource Protection 3. Atlanta: Interagency Archeological Service Division, National Park Service.

Anderson, David G., R. Jerald Ledbetter, and Lisa D. O'Steen
1990 *Paleoindian Period Archaeology of Georgia.* Georgia Archaeological Research Design Paper No. 6. University of Georgia, Athens.

Anderson, David G., Kenneth E. Sassaman, and Christopher Judge, eds.
1992 *Paleoindian and Early Archaic Period Research in the Lower Southeast: A South Carolina Perspective.* Council of South Carolina Professional Archaeologists in conjunction with Savannah River Archaeological Research Program, South Carolina Institute of Archaeology and Anthropology, University of South Carolina, Columbia.

Anderson, David G. and Glen T. Hanson
1988 Early Archaic Settlement in the Southeastern United States: A Case Study from the Savannah River Valley. *American Antiquity* 53:262–286.

Anderson, David G. and J. Joseph
1988 *Richard B. Russell Reservoir Technical Synthesis of Cultural Resource Investigations.* The Russell Papers. TRC Garrow Associates, Inc.and Interagency Archaeological Services, National Park Service, Atlanta.

Anderson, David G. and Joseph Schuldenrein, eds.
1985 *Prehistoric Human Ecology Along the Upper Savannah River: Excavations at the Rucker's Bottom, Abbeville, and Bullard Site Groups.* Commonwealth Associates, Inc., Jackson, Michigan. National Park Service, Archeological Services Branch, Atlanta.

Blanton, Dennis B. and Kenneth E. Sassaman
1989 Pattern and Process in the Middle Archaic Period in South Carolina. In *Studies of South Carolina Archaeology,* edited by Albert C. Goodyear III and Glen T. Hanson, pp. 53–72. University of South Carolina Institute of Archaeology and Anthropology Anthropological Studies No. 9, Columbia.

Braley, Chad O.
1990 Georgia/South Carolina Coast. In *Lamar Archaeology: Mississippian Chiefdoms in the Deep South*, edited by Mark Williams and Gary Shapiro, p. 35. University of Alabama Press, Tuscaloosa.

Braley, Chad O., L.D. O'Steen, and I.R. Quitmyer
1985 *Archaeological Investigation at 9McI41, Harris Neck National Wildlife Refuge, McINtosh County, Georgia*. Southeastern Archaeological Services, Inc., Athens, Georgia.

Brooks, M.J., P.A. Stone, D.J. Colquhoun, J.G. Brown, and K.B. Steele
1986 Geoarchaeological Research in the Coastal Plain Portion of the Savannah River Valley. *Geoarchaeology: An International Journal* 1(3):293-307.

Brooks, Mark J., P. A. Stone, D. J. Colquhoun, and J. G. Brown
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 of South Carolina Archaeology,* edited by Albert C. Goodyear III and Glen T. Hanson, pp. 91–100. University of South Carolina Institute of Archaeology and Anthropology Anthropological Studies No. 9, Columbia.

Brooks, Mark J., K. E. Sassaman, and G. T. Hanson
1990 Environmental Background and Models. In *Native American Prehistory and History in the Middle Savannah River Valley: Synthesis of Archaeological Investigations on the Savannah River, Aiken and Barnwell Counties, South Carolina,* by Kenneth E. Sassaman, Mark J. Brooks, Glen T. Hanson, and David G. Anderson, pp. 19–66. Savannah River Archaeological Research Papers 1.

Brooks, Mark J. and Donald J. Colquhoun
1991 Late Pleistocene-Holocene Depositional Change in the Coastal Plain of the Savannah Valley: A Geoarchaeological Perspective. *Early Georgia* 19(2):1-20

Bullen, Ripley P. and H. B. Greene
1970 Stratigraphic Tests at Stallings Island, Georgia. *Florida Anthropologist* 23:8–28.

Cable, John S.
1992 Prehistoric Adaptations to the Interior Uplands Environment of the Central South Carolina Coast: Test Excavations at Four Sites (38BK769, 38BK1176, 38CH1045, and 38CH1189) in the Francis Marion National Forest. New South Associates, Stone Mountain, Georgia. Report submitted to the USDA Forest Service, McClellanville, South Carolina.

1993 Prehistoric Chronology and Settlement Patterns of Edisto Beach State Park. In Cultural Resources Survey and Archaeological Site Evaluation of the Edisto Beach State Park, Colleton County, South Carolina, pp. 158-205. Report prepared by New South Associates, Stone Mountain, Georgia. Report on file with South Carolina Department of Parks, Recreation, and Tourism, Columbia, South Carolina.

1997 The Ceremonial Mound Theory: New Evidence for the Possible Ceremonial Function of Shell Rings. From South Carolina Archaeology Week poster, *Shell Rings of the Late Archaic*. South Carolina Institute of Archaeology and Anthropology, University of South Carolina. Columbia.

Cable, John S. and G. Ishmael Williams
1993 Prehistoric Background. In Cultural Resources Survey and Archaeological Site Evaluation of the Edisto Beach State Park, Colleton County, South Carolina, pp.9-51. Report prepared by New South Associates, Stone Mountain, Georgia. Report on file, South Carolina Department of Parks, Recreation, and Tourism, Columbia, South Carolina.

Caldwell, Joseph R.
1958 *Trend and Tradition in the Prehistory of the Eastern United States.* American Anthropological Association, Memoir No. 88. Menasha.

1971 Chronology of the Georgia Coast. *Southeastern Archaeological Conference Bulletin* 13:89–91.

Caldwell, Joseph R. and Catherine McCann
1941 *Irene Mound Site*. University of Georgia Press, Athens.

Caldwell, Joseph R. and Antonio J. Waring, Jr.
1939 Some Chatham County Pottery Types and Their Sequence. *Southeastern Archaeological Conference Newsletter* 1:5-6.

Calmes, Alan
1967 Test Excavation at Three Late-Archaic Shell-ring Mounds on Hilton Head Island Beaufort County, South Carolina. *Southeastern Archaeological Conference Bulletin* 8:1-22

1968 Test Excavations at Three Late-Archaic Shell-Ring Mounds on Hilton Head Island Beaufort County, South Carolina. *Southeastern Archaeological Conference Bulletin* 8:45-48.

Cambron, James W. and David C. Hulse
1983 *Handbook of Alabama Archaeology: Part 1, Point Types.* Archaeological Research Association of Alabama.

Chapman, Jefferson
1981 *The Bacon Bend and Iddins Sites. The Late Archaic Period in the Lower Tennessee River Valley*. University of Tennessee, Department of Anthropology, Report of Investigations 31, Knoxville.

Chowning, A.
1979 Leadership in Melanesia. *Journal of Pacific History* 14:66-84.

Claassen, Cheryl P.
1996 A Consideration of the Social Organization of the Shell Mound Archaic. In *Archaeology of the Mid-Holocene Southeast,* edited by Kenneth E. Sassaman and David G. Anderson, pp. 235-258. University Press of Florida, Gainesville.

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

Clausen, Carl J., A. D. Cohen, Cesare Emiliani, J. A. Holman, and J. J. Stipp
1979 Little Salt Spring, Florida: A Unique Underwater Site. *Science* 203:603–614.

Clark, J. and M. Blake
1994 The Power of Prestige: Competitive Generosity and the Emergence of Rank Societies in Lowland Mesoamerica. In *Factional Competition and Political Development in the New World,* edited by E. Brumfiel and J. Fox, pp. 17-80. Cambridge University Press, Cambridge.

Cockerell, Wilburn A. and Larry Murphy
1978 Pleistocene Man in Florida. *Archaeology of Eastern North America* 6:1-12.

Coe, Joffre L.
1964 *The Formative Cultures of the Carolina Piedmont*. Transactions of the American Philosophical Society 54(5). Philadelphia.

Colquhoun, Donald R. and Mark J. Brooks
1986 New Evidence for Eustatic Components in Late Holocene Sea Levels. *Geoarchaeology* 3:275–291.

Cook, Fred C. and Charles E. Pearson
1989 The Southeastern Ceremonial Complex on the Georgia Coast. In *The Southeastern Ceremonial Complex: Artifacts and Analysis*, edited by Patricia Galloway, pp. 147-65. University of Nebraska Press, Lincoln.

Crook, Morgan R., Jr.
1978 Mississippian Period Community Organizations on the Georgia Coast. Unpublished Ph.D. Dissertation, Department of Anthropology, University of Florida, Gainesville.

1986 *Mississippi Period Archaeology of the Georgia Coastal Zone.* Laboratory of Archaeology Series, Report No. 23, University of Georgia, Athens.

1990 Georgia/South Carolina Coast Section. In *Lamar Archaeology: Mississippian Chiefdoms in the Deep South*, edited by Mark Williams and Gary Shapiro, pg. 36. University of Alabama Press, Tuscaloosa.

Crusoe, Donald L. and Chester B. DePratter
1976 A New Look at the Georgia Coastal Shellmound Archaic. *Florida Anthropologist* 29(1):1–23.

Cubie, Doreen
2001 A Seaside Plant Hangs on by its Roots. *National Wildlife* 39(4):12-13.

Cushman, Kathleen A.
1982 Floral Remains from Meadowcroft Rockshelter, Washington County, Southwestern Pennsylvania. In *Meadowcroft: Collected Papers on the Archaeology of Meadowcroft Rockshelter and the Cross Creek Drainage*, edited by Ronald C. Carlisle and James M. Adovasio, pp. 207–209. Department of Anthropology, University of Pittsburgh.

Daniel, I. Randolph, Jr.
2001 Stone Raw Material Availability and Early Archaic Settlements in the Southeastern United States. *American Antiquity* 66(2):237–265.

Daniel, I.R. and M. Wisenbaker
1987 *Harney Flats: A Florida Paleo-Indian Site*. Baywood Publishing, Amityville, New York.

Delcourt, P. A. and H. A. Delcourt
1985 Quaternary Palynology and Vegetational History of the Southeastern United States. In *Pollen Records of Late-Quaternary North American Sediments,* edited by V. M. Bryant Jr. and R.G. Holloway, pp.1-37. American Association of Stratigraphic Palynologists Foundation.

DePratter, Chester B.
1976 The Refuge Phase on the Coastal Plain of Georgia. *Early Georgia* 4(1–2):1–13.

1977 Environmental Changes on the Georgia Coast during the Prehistoric Period. *Early Georgia* 5:1–14.

1979 Ceramics. In *The Anthropology of St. Catherines Island 2: The Refuge-Deptford Mortuary Complex,* edited by D. H. Thomas and C. S. Larson, pp. 109–132. Anthropological Papers of the American Museum of Natural History 56(1).

1984 Irene Manifestations on the Northern Gulf Coast. *Early Georgia* 12:44–58.

1991 *W.P.A. Archaeological Excavations in Chatham County, Georgia: 1937–1942*. Laboratory of Archaeology Series, Report No. 29. University of Georgia, Athens.

DePratter, Chester B. and James D. Howard
1977 History of Shoreline Changes Determined by Archaeological Dating: Georgia Coast, United states of America. *Transactions of the Gulf Coast Association of Geological Societies* XXVII:251-258

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

Dickel, David
1992 *An Archaeological and Historical Survey of Bonita Springs, Parcel Three, Lee County, Florida.* AHC Technical Report 43, Archaeological and Historical Conservancy, Inc., Miami.

Dillehay, T. C.
1989 *Monte Verde: A Late Pleistocene Settlement in Chile*. Smithsonian Institution Press, Washington, D.C.

Dorroh, Rita J.
1971 *The Vegetation of Indian Shell Mounds and Rings of the South Carolina Coast*. Unpublished Masters Thesis, University of South Carolina, Columbia.

Drayton, John
1802 A View of South Carolina, as Respects Her Natural and Civil Concerns. W.P. Young, Charleston. Reprinted in 1972 by The Reprint Company, Spartanburg, South Carolina.

Dunbar, James S.
1991 Resource Orientation of Clovis and Suwannee Age Paleoindian Sites in Florida. In *Clovis: Origins and Adaptations,* edited by R. Bonnichsen and K. Turnmire, pp. 185-213. Center for the Study of the First Americans, Oregon State University, Corvallis.

Dunbar, James S., S. David Webb, and Michael K. Faught
1992 Inundated Prehistoric Sites in Apalachee Bay, Florida, and the Search for the Clovis Shoreline. In *Paleoshores and Prehistory,* edited by L. Johnson and M. Stright, pp. 117–146. CRC Press, Boca Raton, Florida.

Edwards, William E.
1965 A Preliminary Report on the Sewee Mound Shell Ring, Charleston County, South Carolina. Manuscript on file, Institute of Archaeology and Anthropology, University of South Carolina, Columbia.

Elliott, Daniel and Roy Doyon
1981 *Archaeology and Historical Geography of the Savannah River Floodplain near Augusta, Georgia.* University of Georgia Laboratory of Archaeology Series Report No. 22, Athens.

Elliott, Daniel T., R. Jerald Ledbetter, and Elizabeth A. Gordon
1994 *Data Recovery at Lovers Lane, Phinizy Swamp and the Old Dike Sites Bobby Jones Expressway Extension Corridor Augusta, Georgia.* Occasional Papers in Cultural Resource Management No. 7. Georgia Department of Transportation Office of Environmental Analysis, Atlanta

Elliott, Daniel T. and Kenneth E. Sassaman
1995 *Archaic Period Archaeology of the Georgia Coastal Plain and Coastal Zone.* University of Georgia Laboratory of Archaeology Series Report Number 35, Georgia Archaeological Research Design Paper No. 11, Athens.

Espenshade, Christopher T. and Paul E. Brockington
1989 An Archaeological Study of the Minim Island Site: Early Woodland Dynamics in Coastal South Carolina. Report submitted to the U.S. Army Corps of Engineers by Brockington and Associates, Atlanta, Georgia.

Espenshade, Christopher T., Linda Kennedy, and Bobby G. Southerlin
1993 What is a Shell Midden? Data Recovery Excavations of Thom's Creek and Deptford Shell Middens, 38BU2, Spring Island, South Carolina. Brockington and Associates, Atlanta. Report submitted to Spring Island Plantation, Spring Island, South Carolina.

Fairbanks, Charles
1942 The Taxonomic Position of Stallings Island Georgia. *American Antiquity* 7:223–231.

Fairbridge, Rhodes W.
1992 Holocene Marine Coastal Evolution of the United States. In *Quaternary Coasts of the United States: Marine and Lacustrine Systems*, edited by Charles H. Fletcher, III and John F. Wehmiller, pp. 9-22. Society for Sedimentary Geology Special Publication No. 48.

Feil, David
1987 *The Evolution of Highland Papua New Guinea Societies*. Cambridge University Press, Cambridge.

Flannery, Regina
1943 Some Notes on a Few Sites in Beaufort County, South Carolina. *Bureau of American Ethnology, Bulletin* 123:143-155.

Fraser, Douglas
1968 *Village Planning in the Primitive World.* George Braziller, New York.

Friedman, J. and M. Rowlands
1978 *The Evolution of Social Systems.* Duckworth, London.

Gagliano, Sherwood M., Charles E. Pearson, Richard A. Weinstein, Diane E. Wiseman, and Christopher M McClendon
1982 *Sedimentary Studies of Prehistoric Archaeological Sites: Criteria for the Identification of Submerged Archaeological Sites of the Northern Gulf of Mexico Continental Shelf.* U.S. Department of the Interior, National Park Service, Division of State Plans and Grants, Contract No. C35003(79). Baton Rouge: Coastal Environments, Inc.

Gardner, William M.
1983 Stop Me If You've Heard This One Before: The Flint Run PaleoIndian Complex Revisited. *Archaeology of Northeastern North America.* 11:49–59.

Gayes, Paul T., David B. Scott, Eric S. Collins, and Douglas D. Nelson
1992 A Late Holocene Sea-Level Fluctuation in South Carolina. In *Quaternary Coasts of the United States: Marine and Lacustrine Systems*, edited by Charles H. Fletcher, III and John F. Wehmiller, pp. 155-160. Society for Sedimentary Geology Special Publication No. 48.

Goodyear, Albert C. III, James L. Michie, and Tommy Charles
1989 The Earliest South Carolinians. In *Studies in South Carolina Archaeology: Essays in Honor of Robert L. Stephenson*, edited by Albert C. Goodyear, III and Glen T. Hanson, pp. 19-52. Anthropological Studies 9, Occasional Papers of the South Carolina Institute of Archaeology and Anthropology. The University of South Carolina.

Goodyear, Albert C., Sam B. Upchurch, Mark J. Brooks, and Nancy N. Goodyear
1983 Paleoindian Manifestations in the Tampa Bay Region, Florida. *The Florida Anthropologist* 36: 40-66.

Gould, R. A.
1980 *Living Archaeology.* Cambridge University Press, Cambridge

Griffin, James B.
1943 An Analysis and Interpretation of the Ceramic Remains from Two Sites near Beaufort, South Carolina. *Bulletin of the Bureau of American Ethnology Anthropological Papers* 22:155-68. Bureau of American Ethnology, Smithsonian Institution, Washington.

Green, William
1992 *The Search for Altamaha: The Archaeology and Ethnohistory of an Early Eighteenth Century Yamasee Indian Town.* Volumes in Historical Archaeology, No. 21, edited by S. South. South Carolina Institute of Archaeology and Anthropology, Columbia.

Grøn, Ole
1991 A Method for Reconstruction of Social Structure in Prehistoric Societies and Examples of Practical Application. In *Social Space: Human Spatial Behavior in Dwellings and Settlements, Proceedings of an Interdisciplinary Conference*, edited by Ole Grøn, Ericka Engelstad, and Inge Lindblom, pp. 100-117. Odense University Press.

Hayden, Brian
1990 Nimrods, Piscators, Pluckers and Planters: The Emergence of Food Production. *Journal of Anthropological Archaeology* 9:31-69.

1995a Pathways to Power: Principles for Creating Socioeconomic Inequalities. In *Foundations of Social Inequality*, edited by T. Douglas Price and Gary M. Feinman, pp.15-86. Plenum Press, New York.

1995b The Emergence of Prestige Technologies and Pottery. In *The Emergence of Pottery: Technology and Innovation in Ancient Societies*, edited by William K. Barnett and John W. Hoopes, pp. 257-265. Smithsonian Institution Press, Washington D.C.

1996a Feasting in Prehistoric and Traditional Societies. In *Food and Status Quest: an Interdisciplinary Perspective*, edited by Polly Weissner and Wulf Schiefenhovel, pp. 127-148. Berghahn Books, Providence.

1996b Thresholds of Power in Emergent Complex Societies. In *Emergent Complexity: The Evolution of Intermediate Societies*, edited by Jeane Arnold, pp. 50-58. International Monographs in Prehistory, Ann Arbor, Michigan.

2001 Fabulous Feasts: A Prolegomenon to the Importance of Feasting. In *Feasts: Archaeological and Ethnographic Perspectives on Food, Politics, and Power,* edited by Michael Dietler and Brian Hayden, pp. 23-64. Smithsonian Institution Press, Washington D.C.

Hayden, Brian and Ruth Garget
1990 Big Man, Big Heart? A Mesoamerican View of the Emergence of Complex Society. *Ancient Mesoamerica* 1:3-20.

Hanson, Glen T.
1985 The G. S. Lewis Site: Deptford Component. Paper presented at the Annual Meeting of the Archaeological Society of South Carolina, Columbia.

Hanson, Glen T. and Chester B. DePratter
1985 The Early and Middle Woodland Periods in the Savannah River Valley. Paper Presented at the 42nd Annual Meeting of the Southeastern Archaeological Conference, Birmingham.

Hanson, Glen T., Richard D. Brooks, and John W. White
1981 *The Human Occupation along the Steel Creek Floodplain: Results of an Intensive Survey for the L-Area Reactivation Project, Savannah River Plant, Barnwell County, South Carolina.* Research Manuscript Series No. 173. South Carolina Institute of Archaeology and Anthropology, University of South Carolina, Columbia.

Heckenberger, Michael J., James B. Peterson, and Eduardo Goés Neves
1999 Village Size and Permanence in Amazonia: Two Archaeological Examples from Brazil. *Latin American Antiquity* 10(4):353-376.

Hemmings, E. Thomas
1972 Early Man in the South Atlantic States. *South Carolina Antiquities* 4:1-9.

1970 Preliminary Report of Excavations at Fig Island, South Carolina. *The Notebook* 2(9):9–15. South Carolina Institute of Archaeology and Anthropology, University of South Carolina, Columbia.

Hemmings, E. Thomas and Eugene Waddell
1970 Notes from the Shell Rings Survey. Notes on file at the South Carolina Institute of Archaeology and Anthropology, University of South Carolina, Columbia.

Hoese, H. Dickson and Richard H. Moore
1977 *Fishes of the Gulf of Mexico: Texas, Louisiana, and Adjacent Waters*. Texas A&M University Press, College Station.

Hoffman, Paul
1984 The Chicora Legend and Franco-Spanish Rivalry in *La Florida. Florida Historical Quarterly* 62:419-438

1990 *A New Andalucia and a Way to the Orient: The American Southeast During the Sixteenth Century*. Louisiana State University Press, Baton Rouge.

House, J. H. and D. L. Ballenger
1976 *An Archaeological Survey of the Interstate 77 Route in the South Carolina Piedmont.* Research Manuscript Series No. 104, South Carolina Institute of Archeology and Anthropology, University of South Carolina, Columbia.

Huger-Smith, Alice
1917 *The Dwelling Houses of Charleston*. J.B. Lippincott, Philadelphia.

Hulbert, Richard C., Jr. and Ann E. Pratt
1998 New Pleistocene (Rancholabrean) Vertebrate Faunas From Coastal Georgia. *The Journal of Vertebrate Paleontology* 18(2):412-429.

Hutchinson, Dale L., Clark Spencer Larsen, Margaret J. Schoeninger, and Lynette Norr
1998 Regional Variation in the Pattern of Maize Adoption and Use in Florida and Georgia. *American Antiquity* 63 (2):183-93.

Jakes, Kathryn A. and Annette G. Erickson
2001 Prehistoric Use of Sumac and Bedstraw as Dye: Plants in Eastern North America. *Southeastern Archaeology* 20(1): 56-66.

Jeffries, Richard W.
1996 The Emergence of Long-Distance Exchange Networks in the Southeastern United States. In *Archaeology of the Mid-Holocene Southeast,* edited by Kenneth E. Sassaman and David G. Anderson, pp. 222-258. University Press of Florida, Gainesville.

Johnson, Jay K. and S.O. Brookes
1989 Benton Points, Turkey Tails, and Cache Blades: Middle Archaic Exchange in the Southeast. *Southeastern Archaeology* 8:134-45.

Jones, C. C.
1873 *Antiquities of the Southern Indians, Particularly of the Georgia Tribes*. Appleton, New York.

Judge, Christopher
1999 An Overview of the Cultural Resources of Botany Bay Plantation, Edisto Island, South Carolina With Considerations for Dedication Under the Heritage Trust Act and Long Term Management. Report on file, South Carolina Department of Natural Resources, Columbia.

Junker, L.L., K. Mudar, and M. Schwaller
1994 Social Stratification, Household Wealth, and Competitive Feasting in 15th/16th Century Philippine Chiefdoms. *Research in Economic Anthropology* 15:307-358.

Justice, Noel D.
1987 *Stone Age Spear and Arrow Points of the Midcontinental and Eastern United States*. Indiana University Press, Bloomington.

Keel, Bennie C.
1976 *Cherokee Archaeology: A Study of the Appalachian Summit.* University of Tennessee Press, Knoxville.

Kelly, A.R.
1938 *A Preliminary Report on Archaeological Excavation at Macon, Georgia. Smithsonian Institution,* Bureau of American Ethnology, Bulletin 119, Anthropological Papers, No. 1, Washington.

Kelly, Robert L. and Lawrence C. Todd
1988 Coming into the Country: Early PaleoIndian Hunting and Mobility. *American Antiquity* 53:231–244.

Larson, Lewis H., Jr.
1972 Functional Consideration of Warfare in the Southeast during the Mississippian Period. *American Antiquity* 37:383-92

1980 *Aboriginal Subsistence Technology on the Southeastern Coastal Plain During the Late Prehistoric Period.* Ripley P. Bullen Monographs in Anthropology and History 2. University Press of Florida, Gainesville.

Larsen, Clark Spencer, Margaret J. Schoeninger, Nikolaas J. van der Merwe, Katherine M. More and Julia A. Lee-Thorpe
1992 Carbon and Nitrogen Stable Isotopic Signatures of Human Dietary Change in the Georgia Bight. *American Journal of Physical Anthropology* 89:197-214.

Ledbetter, R. Jerald
1991 Archaeological Investigations at Mill Branch Sites 9WR4 and 9WR11 Warren County, Georgia. Southeastern Archeological Services, Inc., Athens, Georgia. Report submitted to J. M. Huber Corporation, Wrens, Georgia.

1994 Archaeological Data Recovery at 9JO6 the Arthur Tarver Site, Jones County, Georgia. Southeastern Archeological Services, Inc., Athens, Georgia. Report submitted to the Macon Water Authority and Tribble and Richardson, Inc.

Lepionka, Larry, Donald Colquhoun, Rochelle Marrinan, David McCollum, Mark Brooks, John Foss, William Abbott, and Ramona Grunden
1983 *The Second Refuge Site: Location 22 (38JA61), Savannah National Wildlife Refuge, Jasper County, South Carolina.* University of South Carolina at Beaufort, Beaufort.

Littman, Sherri Lynn
2000 Pleistocene/Holocene Sea Level Change in The Georgia Bight: A Paleoenvironmental Reconstruction of Gray's Reef National Marine Sanctuary and J Reef. Unpublished Masters Thesis, Department of Geology, University of Georgia, Athens.

Mainfort, R.C. and L.P. Sullivan
1998 Explaining Earthen Enclosures. In *Ancient Earthen Enclosures of the Eastern Woodlands,* edited by R.C. Mainfort and L.P. Sullivan, pp.1-16. University Press of Florida, Gainesville.

Malinowski, Bronislaw
1929 *The Sexual Life of Savages in North-Western Melanesia.* Horace Liveright, New York.

Markewich, Helaine W., Charles M. Hacke, and Paul F. Huddlestun
1992 Emergent Pliocene and Pleistocene Sediments of Southeastern Georgia: An Anomalous, Fossil-Poor, Clastic Section. In *Quaternary Coasts of the United States: Marine and Lacustrine Systems,* edited by Charles H. Fletcher, III and John F. Wehmiller, pp. 173-189. Society For Sedimentary Geology Special Publication No. 48.

Marshall, Elliot
2001 Pre-Clovis Sites Fight for Acceptance. *Science* 291(5509):1730-1732.

Marrinan, Rochelle A.
1975 Ceramics, Molluscs, and Sedentism: The Late Archaic Period on the Georgia Coast. Unpublished Ph.D. Dissertation, Department of Anthropology, University of Florida, Gainesville.

Martin, Paul S.
1973 The Discovery of America. *Science* 179:969–974.

Martin, Paul S. and Richard G. Klein, editors
1984 *Quaternary Extinctions, A Prehistoric Revolution*. University of Arizona Press, Tucson.

Marquardt, William H.
1992 Recent Archaeological and Paleoenvironmental Investigations in Southwest Florida. In *Culture and Environment in the Domain of the Calusa,* edited by W.H. Marquardt, pp. 9-57. Monograph 1. Institute of Archaeology and Paleoenvironmental Studies, University of Florida, Gainesville.

McKinley, William
1873 *Mounds in Georgia*. Annual Report to the Board of Regents, Smithsonian Institution 22:422-428.

McMichael, Alan E.
1978 A Cultural Resource Assessment of Horr's Island, Collier County, Florida. Unpublished Master's Thesis, Department of Anthropology, University of Florida, Gainesville.

McTeer, J. Ed
1971 *Beaufort Now and Then.* Beaufort Book Company, Inc., Beaufort, South Carolina.

Michie, James L.
1968 The Brier Creek Lanceolate. *Chesopiean* 4(5–6):76.

1979 *The Bass Pond Site: Intensive Archaeological Testing at a Formative Period Base Camp on Kiawah Island, South Carolina.* Research Manuscript Series 154. Institute of Archaeology and Anthropology, University of South Carolina, Columbia.

Milanich, Jerald T.
1973 The Southeastern Deptford Culture: A Preliminary Definition. *Florida Bureau of Historic Sites and Properties Bulletin* 3. Tallahassee.

1994 *Archaeology of Precolumbian Florida.* University Press of Florida, Gainesville.

Moore, Clarence B.
1897 Certain Aboriginal Mounds of the Georgia Coast. *Journal of the Philadelphia Academy of Natural Sciences* 2:71-73.

1898 Certain Aboriginal Mounds of the Coast of South Carolina. *Journal of the Academy of Natural Sciences* 11:146-162.

Morse, D. F. and Phyllis A. Morse
1983 *Archaeology of the Central Mississippi Valley*. Academic Press, New York.

Muller, Jon
1997 *Mississippian Political Economy*. Plenum Press, New York.

Noakes, John E. and Betty Lee Brandau
1974 University of Georgia Radiocarbon Dates III. *Radiocarbon* 16:131-141.

Obermeier, Stephen F., Gregory S. Gohn, Robert E. Weems, Robert L. Gelinas, and Meyer Rubin
1985 Geologic Evidence for Recurrent Moderate to Large Earthquakes Near Charleston, South Carolina. *Science* 227:408-411.

O'Steen, Lisa D.
1994 The Bear Creek Site (38FA204/205): Paleoindian and Archaic Occupation in the Lower Piedmont of South Carolina. Report submitted by Southeastern Archeological Services, Inc., Athens, Georgia, to Kennecott-Ridgeway Mining Company, Ridgeway, South Carolina.

O'Steen, Lisa D., R. Jerald Ledbetter, Daniel T. Elliott, and William W. Barker
1986 Paleo-Indian Sites of the Inner Piedmont of Georgia: Observations of Settlement in the Oconee Watershed. *Early Georgia* 14(1, 2):1–63.

Pearson, Charles E.
1977 *Analysis of Late Prehistoric Settlement on Ossabaw Island, Georgia.* Laboratory of Archaeology Series No. 12. University of Georgia, Athens.

1979 Patterns of Mississippian Period Adaptations in Coastal Georgia. Unpublished Ph.D. Dissertation, Department of Anthropology, University of Georgia, Athens.

1980 Late Prehistoric Settlement Systems on Ossabaw Island, Georgia. In *Excursions in Southeastern Geology: The Archaeology-Geology of the Georgia Coast,* edited by J.D. Howard, C.B. DePratter, and R.W. Frey, pp.179-91. Geological Society of America, Guidebook 20. Georgia Department of Natural Resources, Atlanta.

Phelps, David S.
1983 Archaeology of the North Carolina Coast and Coastal Plain: Problems and Hypotheses. In *The Prehistory of North Carolina, An Archaeological Symposium,* edited by M.A. Mathis and J.J. Crow. North Carolina Division of Archives and History, Department of Cultural Resources, Raleigh.

Potter, James M.
2000 Pots, Parties, and Politics: Communal Feasting in the American Southwest. A*merican Antiquity* 65(3):471-492.

Quitmyer, Irvy R.
1985 Zooarchaeological Methods for the Analysis of Shell Middens at Kings Bay. In *Aboriginal Subsistence and Settlement Archaeology of the Kings Bay Locality, Volume 2:*

Zooarchaeology, edited by William Hampton Adams, pp.33-48. Reports of Investigations 2, University of Florida, Department of Anthropology, Gainesville

Reitz, Elizabeth J. and Elizabeth S. Wing
1999 *Zooarchaeology*. Cambridge University Press, Cambridge.

Rhea, Susan
1989 Evidence of Uplift Near Charleston, South Carolina. *Geology* vol. 17, pp. 311-315.

Rice, Prudence
1987 *Pottery Analysis: A Sourcebook*. The University of Chicago Press, Chicago.

Russo, Michael
1991a A Method for the Measurement of Season and Duration of Oyster Collection: Two Case Studies from the Prehistoric Southeast U.S. Coast. *Journal of Archaeological Science* 18:205-211

1991b Archaic Sedentism on the Florida Coast: A Case Study from Horr's Island. Unpublished Ph.D. Dissertation, Department of Anthropology, University of Florida, Gainesville.

1992 Chronologies and Cultures of the St. Marys Region of Northeast Florida and Southern Georgia. *Florida Anthropologist* 45:107-26.

1994a Why We Don't Believe in Archaic Ceremonial Mounds and Why We Should: The Case from Florida. *Southeastern Archaeology* 11:95-108.

1994b A Brief Introduction to the Study of Archaic Mounds in the Southeast. *Southeastern Archaeology* 11:89- 93.

1996a Southeastern Mid-Holocene Coastal Settlements. In *Archaeology of the Mid-Holocene Southeast,* edited by Kenneth E. Sassaman and David G. Anderson, pp 177-199. University Press of Florida, Gainesville.

1996b Southeastern Archaic Mounds. In *Archaeology of the Mid-Holocene Southeast,* edited by Kenneth E. Sassaman and David G. Anderson, pp. 259-287. University Press of Florida, Gainesville.

Russo, Michael, Ann S. Cordell, and Donna L. Ruhl
1993 The Timucuan Ecological and Historic Preserve, Phase III Final Report. Report submitted to the Southeast Archeological Research Center, National Park Service, Tallahassee. Contract CA-50000-9-8011

1999 Non-Symmetrical Traits in Shell Rings: Towards an Understanding of Circular Community Dynamics. Paper presented at the 56th Annual Southeastern Archaeological

Conference Symposium: Big Mound Power! Or, Power, Who Needs It? Midlevel Societies in the Real Old South. Pensacola.

Russo, Michael and Gregory Heide
2000 Joseph Reed Shell Ring, Draft Report. Report submitted to the Southeast Archeological Center, National Park Service. Tallahassee. Contract 08-25-2000.

2001 Shell Rings of the Southeast US. *Antiquity* 75(289):491-492.

2002 The Joseph Reed Shell Ring. *Florida Anthropologist* 55(2):67-88.

Russo, Michael and Rebecca Saunders
1999 Identifying the Early Use of Coastal Fisheries and the Rise of Social Complexity in Shell Rings and Arcuate Middens on Florida's Northeast Coast. Report submitted to the National Geographic Society, Grant #6018-97.

Russo, Michael, Gregory Heide, and Vicki Rolland
2002 The Guana Shell Ring. Report submitted to The Florida Department of State Division of Historical Resources, Historic Preservation Grant No. F0126.

Sassaman, Kenneth E.
1983 Middle and Late Archaic Settlement in the South Carolina Piedmont. Unpublished Master’s Thesis, Department of Anthropology, University of South Carolina, Columbia.

1985 A Preliminary Typological Assessment of MALA Hafted Bifaces from the Pen Point Site, Barnwell County, South Carolina. *South Carolina Antiquities* 17:1–17.

1991 Economic and Social Contexts of Early Ceramic Vessel Technology in the American Southeast. Unpublished Ph.D. Dissertation, Department of Anthropology, University of Massachusetts. University Microfilms, Ann Arbor.

1993a *Early Pottery in the Southeast: Tradition 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.

1993c *Early Woodland Settlement in the Aiken Plateau: Archaeological Investigations at 38AK157, Savannah River Site, Aiken County, South Carolina.* Savannah River Archaeological Research Papers No. 3. Occasional Papers of the Savannah River Archaeological Research Program, South Carolina Institute of Archaeology and Anthropology, University of South Carolina, Columbia.

1994 Production for Exchange in the Mid-Holocene Southeast: A Savannah River Valley Example. *Lithic Technology* 19:42-51.

1995 The Cultural Diversity of Interactions among Mid-Holocene Societies of the American Southeast. In *Native American Interactions: Multiscalar Analyses and Interpretations in the Eastern* Woodlands, edited by Michael S. Nassaney and Kenneth E. Sassaman, pp.174-204. University of Tennessee Press, Chattanooga.

1996 Hunter-Gatherers and Traditions of Resistance. In *The Archaeology of Traditions: Agency and History Before and After Columbus*, edited by Timothy R. Pauketat, pp.218-236. University Press of Florida, Gainesville.

Sassaman, Kenneth E. and David G. Anderson
1995 *Middle and Late Archaic Archaeological Records of South Carolina: A Synthesis for Research and Resource Management.* Council of South Carolina Professional Archaeologists, Columbia.

1996 Preface. In *Archaeology of the Mid-Holocene Southeast*, edited by Kenneth E. Sassaman and David G. Anderson, pp. xv-xx. University Press of Florida, Gainesville.

Sassaman, Kenneth E., Mark J. Brooks, Glen T. Hanson, and David G. Anderson
1990 *Native American Prehistory of the Middle Savannah River Valley.* Savannah River Archaeological Research Papers No. 1. Occasional Papers of the Savannah River Archaeological Research Program, South Carolina Institute of Archaeology and Anthropology, University of South Carolina, Columbia.

Sassaman, Kenneth E. and R. Jerald Ledbetter
1996 Middle and Late Archaic Architecture. In *Archaeology of the Mid-Holocene Southeast,* edited by Kenneth E. Sassaman and David G. Anderson, pp. 75-95. University Press of Florida, Gainesville.

Saucier, Roger T.
1994 *Geomorphology and Quaternary Geological History of the Lower Mississippi Valley*. U.S. Army Engineer Waterways Experiment Station, Vicksburg.

Saunders, Rebecca
1998 Forced Relocation, Power Relations, and Culture Contact in the Missions of La Florida. In *Studies in Culture Contact: Interaction, Culture Change, and Archaeology,* edited by J.G. Cusick, pp. 402-429. Center for Archaeological Investigations, Occasional Paper no. 25. Southern Illinois University, Carbondale.

1999 Feast or Quotidian Fare?: Rollins Shell Ring and the Question of Site Function. Paper presented at the 56th Annual Meeting of the Southeastern Archaeological Society, Pensacola, Florida.

2000 The Guale Indians of the Lower Atlantic Coast: Change and Continuity. In *Indians of the Greater Southeast During the Historic Period,* edited by Bonnie G. McEwan, pp. 26-56. University of Florida Press, Gainesville.

2000 Negotiated Tradition? Native American Pottery in the Mission Period in La Florida. In *The Archaeology of Traditions: Agency and History Before and After Columbus,* edited by Timothy R. Pauketat, pp.77-93. University Press of Florida, Gainesville.

n.d. Spatial Variation in Orange Culture Pottery: Interaction and Function. In *Early Pottery: Technology, Style, and Interaction in the Lower Southeast,* edited by Rebecca Saunders and Christopher Hays. University of Alabama Press, Tuscaloosa, (in preparation).

Saunders, Rebecca and Michael Russo
2000 Late Archaic Monumental Architecture on the Lower Atlantic Coast. Paper presented in the symposium Monuments in Intermediate-Scale Societies: New World and Old World Perspectives at the Annual Meeting of the Society for American Archaeology, Philadelphia, Pennsylvania.

Schiefenhövel, Wulf and Ingrid Bell-Krannhals
1996 Of Harvests and Hierarchies: Securing Staple Food and Social Position in the Trobriand Islands. In *Food and Status Quest: an Interdisciplinary Perspective,* edited by Polly Weissner and Wulf Schiefenhövel, pp. 235-251. Berghahn Books, Providence.

Scudder, Sylvia J.
1993 Human Influence on Pedogenesis: Midden Soils on a Southwest Florida Pleistocene Dune Island. Unpublished Master's Thesis, University of Florida, Gainesville.

Sears, William H. and James B. Griffin
1950 Fiber-Tempered Pottery of the Southeast. In *Prehistoric Man in the New World,* edited by James B. Griffin, pp. 2-20. Museum of Anthropology, University of Michigan, Ann Arbor.

Sexton, Walter J., Miles O. Hayes, and Donald J. Colquhoun

1992 Evolution of Quaternary Shoal Complexes off the Central South Carolina Coast. In *Quaternary Coasts of the United States: Marine and Lacustrine Systems,* edited by Charles H. Fletcher, III and John F. Wehmiller, pp. 161-172. Society for Sedimentary Geology Special Publication No. 48.

Sharitz, R.R.

1975 Forest Communities of Kiawah Island. In *Environmental Inventory of Kiawah Island,* edited by W.M. Campbell, J.M. Dean, and W.D. Chamberlain, pp. F1-F39. Environmental Research Center, Inc., Columbia.

Simpkins, Daniel L.

1975 A Preliminary Report on Test Excavations at the Sapelo Island Shell Ring. *Early Georgia* 3(2):15–37.

1976 Sapelo Island: A Preliminary Report. *Southeastern Archaeological Conference Bulletin* 19:95-99.

Simpkins, Daniel L. and Alan E. McMichael

1976 Sapelo Island: A Preliminary Report: *Southeastern Archaeological Conference Bulletin* 19:95-99.

Stanyard, William F.

1993 The Mann Site: An Upland Savannah Period, Hollywood Phase Occupation in the Middle Savannah River Drainage. Paper presented at the Spring Meeting of the Society for Georgia Archaeology, Cartersville, Georgia.

1997 The Big Haynes Reservoir Archaeological Project: A Perspective on the Native American History of North-Central Georgia between 8000 B.C. and A.D. 1838. TRC Garrow Associates, Inc., Atlanta. Report submitted to Conyers-Rockdale-Big Haynes Impoundment Authority, Conyers, Georgia.

Stanyard, William F. and Richard W. Stoops

1995 The Archaeology of the Chase Site (9RO53), Rockdale County, Georgia. Garrow & Associates, Inc., Atlanta. Report submitted to the City of Conyers, Georgia.

Starr, Rebecca K.

1984 A Place Called Daufuskie: Island Bridge to Georgia 1520–1830. Unpublished Master's Thesis, Department of History, University of South Carolina, Columbia.

Stoltman, James B.

1966 New Radiocarbon Dates for Southeastern Fiber-Tempered Pottery. *American Antiquity* 31:872–874.

1972 The Late Archaic in the Savannah River Region. In *Fiber-Tempered Pottery in the Southeastern United States and Northern Columbia: Its Origins, Context, and Significance*, edited by Ripley P. Bullen and James B. Stoltman, pp. 37-62. Florida Anthropological Society Publications 6. Florida Anthropological Society, Gainesville.

1974 *Groton Plantation, an Archaeological Study of South Carolina Locality.* Monographs of the Peabody Museum No. 1. Harvard University, Cambridge, Massachusetts.

Strathern, A.
1971 *The Rope of Moka: Big-Men and Ceremonial Exchange in Mount Hagen, New Guinea*. Cambridge University Press, Cambridge.

Sutherland, Donald R.
1973 Preliminary Analysis of Ceramic Materials Recovered from the Spanish Mount Site, Edisto Island, S.C. *South Carolina Antiquities* 5:46-50.

1974 Excavations at the Spanish Mount Shell Midden, Edisto Island, S.C. *South Carolina Antiquities* 6:25-36.

Swanton, John R.
1946 *The Indians of the Southeastern United States.* Smithsonian Institution Press,Washington, D.C.

Thomas, David H. and Clark S. Larsen
1979 *The Anthropology of St. Catherines Island 2: The Refuge-Deptford Mortuary Complex*. Anthropological Papers of the American Museum of Natural History 56(1).

Townsend, Johnny
2000 Botany on the Half-Shell. *South Carolina Wildlife* 47(3):16-21.

Trigger, Bruce G.
1990 Monumental Architecture: A Thermodynamic Explanation of Symbolic Behavior. *World Archaeology* 22(2):121-132.

Trinkley, Michael
1973 A Preliminary Site Survey of South Edisto Island, Charleston County, South Carolina. Manuscript on file, Institute of Archaeology and Anthropology, University of South Carolina, Columbia.

1976 A Typology of Thom's Creek Pottery for the South Carolina Coast. Unpublished Master's Thesis, Department of Anthropology, University of North Carolina, Chapel Hill.

1980a A Typology of Thom’s Creek Pottery for the South Carolina Coast. *South Carolina Antiquities* 12(1): 1-31

1980b Investigation of the Woodland Period Along the South Carolina Coast. Unpublished Ph.D.Dissertation, Department of Anthropology, University of North Carolina, Chapel Hill.

1981 Studies of Three Woodland Period Sites in Beaufort County, South Carolina. Report submitted to the South Carolina Department of Highways and Public Transportation, Columbia, South Carolina.

1983 Ceramics of the Central South Carolina Coast. *South Carolina Antiquities* 15:43-54.

1985 The Form and Function of South Carolina's Early Woodland Shell Rings. In *Structure and Process in Southeastern Archaeology,* edited by Roy S. Dickens, Jr., pp. 102-118. The University of Alabama Press, Tuscaloosa.

1986 *Indian and Freedman Occupation of the Fish Haul Site (38BU805), Beaufort County, South Carolina.* Chicora Foundation Research Series No. 7. Columbia, South Carolina.

1989 An Archaeological Overview of the South Carolina Woodland Period: It's the Same Old Riddle. In *Studies in South Carolina Archaeology: Essays in Honor of Robert L. Stephenson, e*dited by Albert C. Goodyear, III and Glen T. Hanson, pp. 73-90. Anthropological Studies 9, Occasional Papers of the South Carolina Institute of Archaeology and Anthropology. The University of South Carolina.

1991 *Further Investigations of Prehistoric and Historic Lifeways on Callawassie and Spring Islands, Beaufort County, South Carolina.* Chicora Foundation Research Series No. 23. Chicora Foundation, Columbia.

1997 The Gradual Accumulation Theory: the Lighthouse Point and Stratton Place Shell Rings. From South Carolina Archaeology Week poster, *Shell Rings of the Late Archaic*. South Carolina Institute of Archaeology and Anthropology, University of South Carolina. Columbia.

USDA
1971 *Soil Survey of Charleston County, South Carolina.* United State Department of Agriculture Soil. Conservation Service and Forest Service in cooperation with South Carolina Agricultural Experiment Station.

Waddell, Eugene
1971 A Ceramic Sequence of the Coastal Plain of South Carolina. *South Carolina Antiquities* 1:45-61.

1980 *Indians of the South Carolina Low Country, 1562–1751*. The Reprint Company, Spartanburg, South Carolina.

Waring, Antonio J., Jr.

1968a The Bilbo Site, Chatham County, Georgia. In *The Waring Papers: The Collected Works of Antonio J. Waring, Jr.,* edited by Stephen Williams, pp.152-97. Papers of the Peabody Museum of Archaeology and Ethnology 58, Cambridge, Mass.

1968b The Archaic Hunting and Gathering Cultures: the Archaic and Some Shell Rings. In *The Waring Papers: The Collected Works of Antonio J. Waring Jr.,* edited by Stephen B. Williams, pp.243-246. Papers of the Peabody Museum of Archaeology and Ethnology 58, Cambridge, Mass.

1968c The Refuge Site, Jasper County, South Carolina. In *The Waring Papers: The Collected Works of Antonio J. Waring Jr.,* edited by Stephen B. Williams, pp.198-207. Papers of the Peabody Museum of Archaeology and Ethnology 58, Cambridge, Massachusetts.

Waring, Antonio J., Jr. and Preston Holder

1968 A Prehistoric Ceremonial Complex in the Southeastern United States. In *The Waring Papers: The Collected Works of Antonio J. Waring, Jr.*, edited by Stephen Williams, pp. 9–30. Papers of the Peabody Museum of American Archaeology and Ethnology 58, Cambridge, Mass.

Waring, Antonio J., Jr. and Lewis Larson

1968 The Shell Ring on Sapelo Island. In *The Waring Papers: The Collected Works of Antonio J. Waring Jr.,* edited by Stephan B. Williams, pp. 263-278. Papers of the Peabody Museum of Archaeology and Ethnology 58, Cambridge, Mass.

Watts, W. A.

1980 Late-Quaternary Vegetation History at White Pond on the Inner Coastal Plain of South Carolina. *Quaternary Research* 13:187–199.

Watts, William A., Eric C. Grimm, and T. C. Hussey

1996 Mid-Holocene Forest History of Florida and the Coastal Plain of Georgia and South Carolina. In *Archaeology of the Mid-Holocene Southeast*, edited by Kenneth E. Sassaman and David G. Anderson, pp.28-38. University Press of Florida, Gainesville.

Webb, S. David

1981 A Cultural Resources Survey of the Continental Shelf from Cape Hatteras to Key West. Volume I: Introduction and Physical Environment, pp. I-73-I-112. Report submitted by Science Applications, Inc., to the Bureau of Land Management.

Whatley, John, Jr.
1985 The Possible Extension of the Paris Island Stemmed Point to the Georgia Coastal Plain. *The Profile* 47:11–13.

Williams, G. Ishmael
1993 Introduction. In Cultural Resources Survey and Archaeological Site Evaluation of the Edisto Beach State Park, Colleton County, South Carolina, pp. 1-3. New South Associates, Stone Mountain, Georgia. On file with South Carolina Department of Parks, Recreation, and Tourism, Columbia, South Carolina.

Williams, Stephen
1968 Appendix: Radiocarbon Dates from the Georgia Coast. In *The Waring Papers: The Collected Works of Antonio J. Waring, Jr*, edited by Stephen Williams, pp. 329-332. Papers of the Peabody Museum of Archaeology and Ethnology Vol. 58, Cambridge, Mass.

Willis, William S., Jr.
1971 Divide and Rule: Red, White, and Black in the Southeast. In *Red, White, and Black: Symposium on Indians in the Old South*, edited by Charles M. Hudson, pp. 99-115. Southern Anthropological Society.

Wing, Elizabeth S. and Antoinette Brown
1979 *Paleonutrition: Method and Theory in Prehistoric Foodways*. Academic Press, New York.

Wolf, Eric R.
1982 *Europe and the People Without History*. University of California Press, Berkeley.

Wood, W. D., D. Elliott, T. Rudolph, and D. Blanton
1986 *Prehistory in the Richard B. Russell Reservoir: The Archaic and Woodland Periods of the Upper Savannah River. Russell Papers*. Interagency Archaeological Services, National Park Service, Atlanta.

Young, M.
1971 *Fighting With Food*. Cambridge University Press, Cambridge.

APPENDIX 1:

SOILS AT FIG ISLAND

by

David S. Leigh, Ph.D.

Report submitted to Dr. Rebecca Saunders on July 2, 2002.

Introduction

Fig Island is a shell mound complex on the South Carolina coast where Drs. Russo and Saunders have extracted 17 cores by pounding 4.5 cm diameter plastic pipe (PVC) into the ground. The purpose of this study was to describe the cores and measure particle size and chemical attributes of selected samples in order to develop an understanding of mound building, sedimentation, and soil development at the site.

Methods

All seventeen cores were delivered to Athens, Georgia and analyzed by Dr. David S. Leigh. Core descriptions followed the terminology of the USDA Soil Survey Manual (USDA Soil Survey Division Staff, 1993), and the descriptions are presented in Table 4. Soil redness was quantified with the Buntley-Westin color index, which expresses redder soil color with higher numbers (Buntley and Westin, 1965). Samples were obtained from selected cores at intervals that corresponded to soil horizon boundaries by taking a representative composite from the horizon. No attempt was made to account for compression of the cores incurred during the coring process. The maximum sample interval was 20 cm. If a soil horizon was more than 20 cm thick, then the horizon was subdivided to make multiple samples from the same horizon. Both cores 7 and 10 were sampled in their entirety for particle size, pH, and extractable element analyses in order to compare and contrast soil beneath a shell mound (core 10) with soil outside of a shell mound (core 7). Particle size analysis was done by the sieve and hydrometer method of Gee and Bauder (1986) after pretreating the samples to remove soluble salts by dissolution in hot water, centrifuging, and decanting. Soil pH measurements were made on a 1:1 soil:water paste using a high-precision pH meter as described in the USDA Soil Survey Manual (1992). Chemical analysis was done by digesting samples in a bath of concentrated nitric and hydrochloric acid (1:1) for about 1 hour and analyzing the extractions by inductively coupled plasma spectrometry (ICP). This extraction is sufficient to yield total phosphorus (P) and the extractable portion of a wide range of other elements. The extractable portion includes carbonate minerals (including shells), adsorbed elements, elements in soil solution, and elements bound in sesquioxides. The chemical elements of interest for this study were Ca, Fe, P, and S, but all of the extractable elements measured are in a report on file at the LSU Museum of Natural Science. In addition to cores 7 and 10, chemical analysis also was done on core 6, 12, and 14 in order to help discern anthropogenic influences on those soil profiles.

Results and Discussion

Soil Morphology

The soils at Fig Island exhibit a distinct dichotomy of oxidized profiles beneath the shell mounds and gleyed soils outside of the shell mounds (Figure 1). Soil profiles within the circular rings exhibit intermediate oxidation states that may indicate gleying of previously oxidized soils (Table 1). The soil oxidation state is the most variable element in soil morphology at the site.

The dichotomy in the oxidation states can result from either changes in the soil pH that favor oxidation of iron (high pH favors oxidation), by differences in the oxidation potential (Eh) in the soil environment, or by both processes. It is uncertain which process or processes are dominant at the site, but further discussion of this is provided with the results of chemical analysis.

In addition to oxidation characteristics, the soils beneath the shell mounds contrast with those outside because of the presence of a weakly expressed buried argillic horizon (Btb). A stark contrast between the cores beneath the mounds versus outside the mounds is reflected by the presence of the Btb. This Btb horizon is redder in color and significantly finer textured than the overlying and underlying sediment. It is a marginal Bt horizon and represents a slightly more active soil forming environment beneath the shell rings versus outside of the shell rings, which again could be produced by subtle differences in the soil chemical environment induced by shell mounds.

In general, all of the soil profiles at the site exhibit incipient levels of pedogenic development with a predominance of unweathered C horizons in the gleyed sediment and only weakly developed B horizons in the oxidized sediment beneath the shells. Structural development is generally weak to moderate in all profiles. Faintly expressed thin strata and laminations are present in many of the cores (Figure 1, Table 4). All of the soils are compatible with an Holocene age for the parent material.

Particle Size

Particle size analysis (Table 2) indicates that the sediment at the site was not a sand dune, because there is far too much silt and clay (15-25%) mixed into the soil matrix. Thus, the site probably was formed as an estuary channel bank or flood plain in a salt marsh depositional environment.

The particle size composition reveals a well expressed fining-upward trend in both cores 7 and 10, which is especially apparent in the sand/silt ratio (Figure 2). The sand/silt ratio allows a pedogenic-free look at the sedimentary environment that eliminates post-depositional effects of weathering and pedogenic clay translocation. The sand/silt ratio indicates great similarity between core 7 (outside the shell mound) and core 10 (beneath the shell mound), and the particle size fractions of sand, silt, and clay also indicate very similar

Figure 1. Photographs of soil cores retrieved from Fig Island.

trends for the two cores (Figure 2). In addition, a pronounced clay bulge is noted in core 10 in the Btb horizon at about 20-40 cm above mean sea level, which is matched by a less pronounced clay bulge in core 7.

The vertical trends in particle size composition between cores 7 and 10 indicate very similar sedimentary environments as well as similar changes through time within the accretionary sedimentary environment. Although it is possible that such similar sedimentary processes could be operating during different time periods, these data suggest that cores 7 and 10 accreted at the same time within the same sedimentary environment, and that the differences in soil morphology and oxidation states are simply due to a changes in the pedogenic environment produced by the presence of calcium-rich shells. Better age control would be needed to answer the question of whether sedimentation was synchronous across the site, or whether the soils outside the mounds are younger than those beneath the mounds. A case for chemical alteration of the soil environment, assuming similar age of parent materials, is presented below in the results and discussion of soil chemistry.

Soil Chemistry

Soil pH analyses reveal that core 7 has slightly lower pH values than core 10, especially in the upper meter of the soil profiles, and while the differences do not correspond very well to calcium concentrations, they do correspond to sulfur concentrations that are much higher in the upper part of core 7 versus core 10 (Figure 3, Table 3). Similarly, the only other core that is outside the ring, core 6, shows relatively high sulfur concentrations, whereas the other cores associated with the shell ring (cores 12 and 14) exhibit low sulfur values (Figure 4). This suggests that the soils outside the shell rings have greater concentrations of acidic hydrogen-sulfur compounds (i.e. H_2S) in the soil solutions, whereas those acidic compounds have been neutralized or leached from the more oxidized soil environment beneath the shell mounds.

The slightly higher pH values in core 10 versus core 7 could suggest that slight changes in pH are driving the changes in oxidation states apparent at the site. Upon examination of a pH-Eh phase diagram for iron and manganese (Collins and Buol, 1981) it is apparent that solid iron oxide compounds precipitate at almost any oxidation state (even very low Eh values) in cases where pH values are slightly greater than 7.5 (Figure 5). Also, oxidation of iron occurs even at negative Eh levels of 0 to -0.2 pH values in the pH range of 6.5 to 7.5. Thus, it is reasonable to think that the oxidation of soils beneath the shell mounds could be entirely driven by subtle variations in the pH and Eh that are induced by the presence or absence of shells on top of the soil profile. The calcium-rich shells would obviously raise the pH of soil solutions percolating downward through the soil profile, and Eh levels beneath the shell mounds may also be higher because of a more elevated and more aerated environment through which rainwater percolates after it falls on the shell mound.

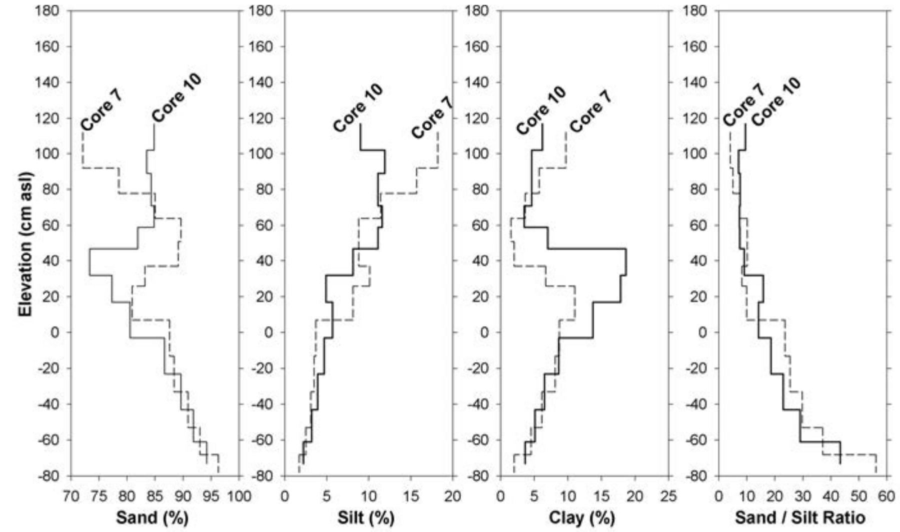


Figure 2. Particle size composition (percent sand, silt, clay, and sand/silt ratio) of soil cores 7 and 10 from Fig Island

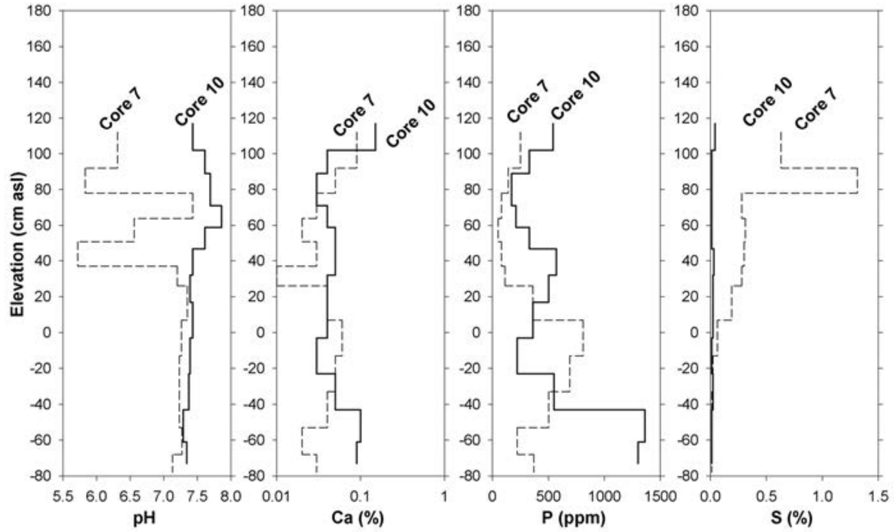


Figure 3. Chemical pH and concentrations of Ca, P, and S from soil cores 7 and 10 from Fig Island.

Alternatively, upon examination of the Eh-pH phase diagram for iron and manganese (Figure 5) it is also apparent that the differences in oxidation states of the soils could also be produced solely by differences in the Eh condition (oxidation potential). More oxidized soil conditions will favor oxidation of iron and redder soil color. This would support the hypothesis that the shell mound was built on a subtle high spot in the marsh that favored slightly better drainage and oxidation conditions than outside of the shell mounds.

Phosphorus trends (Figures 3 and 4) show no diagnostic patterns with respect to cores outside versus inside the shell ring. However, the phosphorus trend in core 14 (within the central ring of the largest mound) shows a distinct signature of human influence in the top 50 cm of that core. This indicates that the central ring filled with about 50 cm of sediment during and after the period of occupation at the site. This conclusion also is supported by relatively high calcium concentrations that probably represent detritus from the shell mound washing off of the ring and into the central depression. Both phosphorus and calcium concentrations tend to exhibit a slight increases toward the surface in most cores (Figures 3 and 4), which is consistent with the occupation leaving a phosphorus and calcium signature near the ground surface. This also may indicate that the present ground surface outside of the mounds had accreted to its present level prior to the time of mound building (circa 4000 BP). Phosphorus also tends to increase with depth beneath the deep weathering profiles of cores 6, 7, and 10, which is probably indicative of the weathering profile. Cores 6 and 7 do not exhibit subsoil concentrations of Ca and P that exceed subsoil peaks in core 10 or 14, which suggests that the ground surface outside the shell midden is chronologically equivalent to the ground surface beneath the mound, thus supporting the pH-driven model of soil oxidation beneath the shell middens.

Responses to General Questions Posed by Russo

1. Is the sediment below the midden the same as sediment in the marsh outside the ring?

The detrital sediment beneath the shell midden is very similar to that outside the ring as indicated by the particle size diagram (Figure 2), perhaps suggesting that the two areas accreted over the same time period. However, the soil profiles are very different. Generally speaking the soil below the shell rings consists of moderately well oxidized soil profiles whose colors fall on the 10YR page, whereas the soils outside the rings are much more poorly drained and have colors on the 5GY, 5Y, and 2.5Y Munsell page. Also, soils beneath the shell mounds have distinct Btb horizons that are not apparent outside the rings, and soils outside the rings show relatively less pedogenic development than those beneath the rings. These differences in soil profile development could have been driven by soil chemistry differences induced by the shell mounds, but this hypothesis is uncertain and the differences could also be due to subtle topographic variation at the site

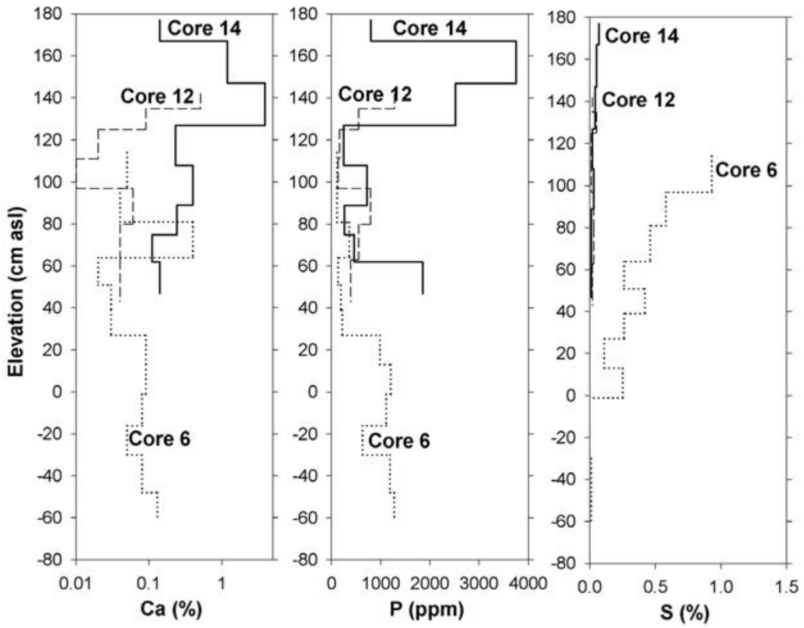


Figure 4. Chemical concentrations of Ca, P, and S from soil cores 6, 12, and 14 from Fig Island.

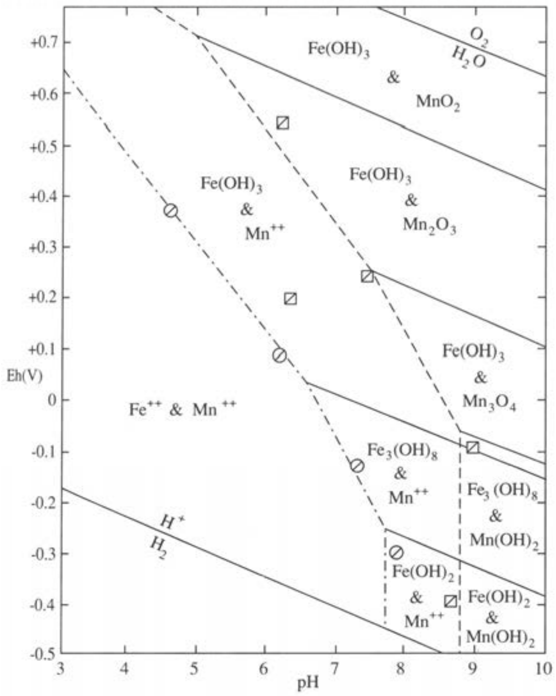


Figure 5. Eh-pH phase diagram for iron and manganese in cores 10 and 7.

2. Is the sediment alluvial or eolian?

Soil profile descriptions found that most of the soil is a very fine loamy sand, which contains too much silt and clay to classify as eolian. It is probable that sedimentation at the site occurred as vertical accretion by tidal flooding of estuaries.

3. Was the shell ring placed on a prepared or natural surface?

There is no indication that the sub-shell surface was prepared in any way. There is an intact A-Bw-C horizon profile in each of the cores beneath the shell (2, 3, 4, 10), and no indication that the A or B horizon had been truncated. However, there is a strong possibility that soil profiles within the central depressions of shell rings were anthropogenically altered, as indicated by the very high phosphorus and calcium concentrations in the central depression at core 14.

Responses to Core-Specific Questions

1. In core 6 is the "causeway" on top of a natural soil horizon or a man-made soil? Core 7 is the control.

Large shells at 40-44 cm noted in the core and the youthfulness of the profile indicate that the soil is relatively young. High calcium concentrations were noted in core 6 at 33-50 cm below ground surface. However, phosphorus concentrations are relatively low in the upper part of core 6, failing to suggest a strong anthropogenic signal. It is possible that the shell at 40-44 cm is intrusive, and is not an indicator of an exposed land surface at the time of occupation. Sulfur contents are relatively high in the upper part of core 6, which is consistent with the anoxic conditions of core 7 and lack of human influence. In general, core 6 appears to be a natural soil profile.

2. In core 8 why is there "blue clay", instead of sandy sediment?

It is not really "clay". In fact, it is fine sandy clay loam. Core 8 is very unusual, because it is stratified and has very abrupt boundaries separating all of the horizons. The top elevation of core 8 is relatively high (144 cm), and it is probable that the upper 40-50 cm of this core is post-occupation sedimentary fill, as in core 14.

3. In core 9 why is there shell in the bottom with sand?

The shell must be an isolated occurrence (maybe burrow fill?). Only very small isolated fragments were noted there.

4. In core 12 is the soil "natural" or has a horizon been removed and replaced by cutting and filling? Core 13 is the 'control'.

Core 12 may have been truncated a little bit, because it exhibits an A-C profile, whereas comparable cores (like 10) show a well intact A-Bw-C. Core 13 is not a good "control", because it is more indicative of soils that are outside of the mound, whereas core 12 resembles other profiles under the shell rings. If core 12 were truncated, then only a small increment was graded off.

5. In core 14 can it be deduced that this was a "dry plaza", and is there any evidence of compaction from human activity? Is core 14 different from outside the ring?

No, core 14 was not dry. It consists of somewhat laminated sediment that is loaded with shell (maybe from storm-wash during post-occupation) and this shelly sediment is on top of a very poorly drained soil. Phosphorus concentrations are also very high in the upper 50 cm of core 14, indicating sedimentation during and after the period of occupation.

6. In core 17 can it be deduced that this was a "dry plaza", and is there any evidence of compaction from human activity? Is core 17 different from outside the ring.

No, core 17 consists of a very poorly sorted profile throughout. The upper part is somewhat laminated and it is very poorly drained throughout. There is no clear evidence that it was once oxidized and got reduced later. Core 17 differs from 14, because 17 is not as well stratified and 17 looks more like other cores that are outside the rings. There is no clear evidence of compaction.

Conclusions and Recommendations

The soils data indicate a significant difference between the oxidation status of profiles beneath the shell mounds versus outside the shell mounds. There are two viable hypotheses that explain the variation in soil oxidation states. One is that the shell mounds were build on top of a subtle topographic rise that was somewhat better drained and more oxidized than surrounding wetlands. The other hypothesis is that changes in soil pH induced by the shell midden were sufficient to drive precipitation of iron oxides beneath the shell midden. Both hypotheses are possible, but the fact that core 7 and core 10 have very similar particle size composition and that core 10 has higher pH than core 7 may favor the pH-driven hypothesis. However, a systematic transect across the mounds and more pH and particle size data would be needed to resolve this problem. In addition, chronological control on the age of sediment outside versus beneath the mounds would help to solve this problem. Radiocarbon dating would probably be difficult due to low concentrations of dateable carbon. As an alternative optically stimulated luminescence (OSL) dating may be a viable alternative method of dating the sediments. The University of Georgia Department of Geography is fully equipped for OSL dating.

Phosphorus data strongly suggest that the central depressions of the shell rings experienced about 40-50 cm of sediment accretion during and after the time of occupation. Much of this accretion may have been produced during storm events when the shell rings acted as small sediment traps on the coastal marsh.

References Cited

Buntley, G. J. and Westin, F. C. (1965). A comparative study of developmental color in a Chestnut-Chernozem-Brunizem soil climosequence. Soil Science Society of America Proceedings 29, pp. 579-582.

Collins, J. F., and Buol, S. W. (1981). Effects of fluctuations in the Eh-pH environment on iron and/or manganese equilibria. Soil Science 110, pp. 111-118.

Gee, G. W., and Bauder, J. W. (1986) Particle size analysis, in Klute, A., ed., Methods of Soil Analysis: Part 1, Physical and Mineralogical Methods, Second Edition, Madison, WI, Soil Science Society of America, p. 383-411.

USDA Soil Survey Division Staff (1993). Soil Survey Manual. USDA Handbook No. 14. U.S. Government Printing Office, Washington.

USDA Soil Survey Laboratory Staff (1992). Soil Survey Laboratory Manual. USDA Soil Survey Investigations Report No. 42, Version 2.0, National Soil Survey Center, Lincoln, Nebraska.

Table 1. Positions, oxidation/reduction states, and elevations of soil cores at Fig Island.

Core #	Position	Redox	Core top	Elevation (m)	Shell Above
14	central depression within	OX-GLEY	1.77	1.77	0.00
9	central depression within	OX-GLEY	1.49	1.49	0.00
8	central depression within	OX-GLEY	1.44	1.44	0.00
15	minor depression within ring	OX	1.56	1.56	0.00
16	minor depression aside the	OX	1.50	1.50	0.00
12	minor depression along the	OX	1.42	1.42	0.00
11	beneath shell ring	OX	1.35	2.45	1.10
1	beneath shell ring	OX	1.30	2.35	1.05
3	beneath shell ring	OX	1.20	2.60	1.40
2	beneath shell ring	OX	1.20	2.00	0.80
4	beneath shell ring	OX	1.20	1.96	0.76
10	beneath shell ring	OX	1.17	2.76	1.59
17	outside the ring	GLEY	1.44	1.44	0.00
13	outside the ring	GLEY	1.33	1.33	0.00
6	outside the ring	GLEY	1.14	1.14	0.00
7	outside the ring	GLEY	1.12	1.12	0.00
5	outside the ring	GLEY	1.08	1.08	0.00

Table 2. Particle size data for cores 7 and 10 from Fig Island.

Core #	Horizon	Depth (cm)	% Sand	% Silt	% Clay	Sand/Silt
7	A	0-20	72.1	18.2	9.7	4.0
7	C2	20-34	78.5	15.7	5.7	5.0
7	C1	34-48	85.0	11.4	3.6	7.4
7	C2	48-61	89.6	8.8	1.5	10.1
7	C2	61-75	89.1	8.8	2.0	10.1
7	C3	75-86	83.2	10.1	6.7	8.2
7	C4	86-105	80.9	8.1	11.0	9.9
7	C5	105-125	87.6	3.7	8.7	23.6
7	C5	125-145	88.4	3.5	8.1	25.4
7	C5	145-165	90.9	3.1	6.1	29.7
7	C5	165-180	93.0	2.5	4.5	37.1
7	C6	180-190	96.3	1.7	2.0	56.1
10	A	0-15	84.8	9.0	6.2	9.4
10	Bw	15-28	83.5	11.9	4.6	7.0
10	BC	28-46	84.3	11.1	4.6	7.6
10	C	46-58	84.8	11.6	3.5	7.3
10	C	58-70	81.9	11.1	7.0	7.4
10	Btb	70-85	73.3	8.1	18.6	9.0
10	Btb	85-100	77.3	4.9	17.8	15.8
10	C1b	100-120	80.5	5.7	13.7	14.1
10	C1b	120-140	86.7	4.7	8.6	18.6
10	C1b	140-160	89.6	3.9	6.5	22.9
10	C1b	160-178	91.8	3.2	5.1	29.0
10	C2b	178-190	94.2	2.2	3.6	43.3

Table 3. Descriptive and Ca, Fe, P, S chemical data for cores analyzed for chemical content at Fig Island

Core #	Horizon	Depth (cm)	Top Elev. (cm asl)	Bot. Elev. (cm als)	Munsell Color	USDA Texture	BW Index	Ca %	Fe %	P ppm	S %
6	A	0-17	114	97	5GY 3/1	silty clay	0.5	0.05	0.93	110	0.93
6	C1	17-33	97	81	5GY 4/1	fine loamy sand	0.5	0.04	0.56	110	0.58
6	C1	33-50	81	64	5GY 4/1	fine loamy sand	0.5	0.4	0.48	360	0.46
6	C2	50-63	64	51	5GY 6/1	fine loamy sand	0.5	0.02	0.45	130	0.26
6	C3	63-75	51	39	5GY 5/1	fine sandy loam	0.5	0.03	0.77	190	0.42
6	C3	75-87	39	27	5GY 5/1	fine sandy loam	0.5	0.03	0.61	220	0.26
6	C4	87-101	27	13	10GY 5/1	fine loamy sand	0.5	0.09	0.47	980	0.11
6	C4	101-115	13	-1	10GY 5/1	fine loamy sand	0.5	0.09	0.6	1200	0.25
6	C5	115-130	-1	-16	5Y 5/4	fine loamy sand	4	0.08	0.74	1110	0.01
6	C5	130-144	-16	-30	5Y 5/4	fine loamy sand	4	0.05	0.52	630	<0.01
6	C6	144-162	-30	-48	5Y 2.5/1	fine loamy sand	1	0.08	0.53	1190	0.01
6	C7	162-175	-48	-61	2.5Y 6/6	fine sand	12	0.13	0.42	1270	0.01
7	A	0-20	112	92	2.5Y 3/1	silty clay loam	2	0.09	0.75	250	0.63
7	C2	20-34	92	78	2.5Y 5/1	fine loamy sand	2	0.05	1.41	140	1.31

7	C1	34-48	78	64	2.5Y 5/1	fine loamy sand	2	0.03	0.43	80	0.28
7	C2	48-61	64	51	2.5Y 4/1	fine loamy sand	2	0.02	0.34	50	0.31
7	C2	61-75	51	37	2.5Y 4/1	fine loamy sand	2	0.03	0.36	80	0.3
7	C3	75-86	37	26	2.5Y 6/1	fine loamy sand	2	0.01	0.39	110	0.28
7	C4	86-105	26	7	5Y 5/2	fine loamy sand	2	0.04	0.54	360	0.19
7	C5	105-125	7	-13	5GY 5/1	fine loamy sand	0.5	0.06	0.54	810	0.06
7	C5	125-145	-13	-33	5GY 5/1	fine loamy sand	0.5	0.05	0.52	690	0.02
7	C5	145-165	-33	-53	5GY 5/1	fine loamy sand	0.5	0.04	0.45	500	0.01
7	C5	165-180	-53	-68	5GY 5/1	fine loamy sand	0.5	0.02	0.36	220	0.01
7	C6	180-190	-68	-78	2.5Y 6/3	fine sand	6	0.03	0.21	370	0.01
10	A	0-15	117	102	2.5Y 2/1	fine loamy sand	2	0.15	0.45	540	0.04
10	Bw	15-28	102	89	10YR 5/4	fine loamy sand	12	0.04	0.41	330	0.01
10	BC	28-46	89	71	2.5Y 6/5	fine loamy sand	10	0.03	0.32	170	0.01
10	C	46-58	71	59	2.5Y 6/6	fine loamy sand	12	0.04	0.23	210	0.01
10	C	58-70	59	47	2.5Y 6/6	fine loamy sand	12	0.05	0.58	330	0.01
10	Btb	70-85	47	32	10YR 4.5/6	fine sandy loam	18	0.05	1.46	570	0.03
10	Btb	85-100	32	17	10YR	fine sandy	18	0.04	1.37	500	0.02

					4.5/6	loam					
10	C1b	100-120	17	-3	2.5Y 6/5	fine sandy loam	10	0.04	1.02	360	0.02
10	C1b	120-140	-3	-23	2.5Y 6/5	fine loamy sand	10	0.03	0.6	220	0.01
10	C1b	140-160	-23	-43	2.5Y 6/5	fine loamy sand	10	0.05	0.62	550	0.02
10	C1b	160-178	-43	-61	2.5Y 6/5	fine loamy sand	10	0.1	0.48	1360	0.01
10	C2b	178-190	-61	-73	10YR 5/8	fine loamy sand	24	0.09	0.5	1300	0.01
12	A1	0-7	142	135	2.5Y 2/1	fine loamy sand	2	0.51	0.52	1280	0.02
12	A2	7-17	135	125	2.5Y 2/1	fine loamy sand	2	0.09	0.35	550	0.05
12	C1	17-31	125	111	2.5Y 5/2	fine loamy sand	4	0.02	0.25	160	0.01
12	C1	31-45	111	97	2.5Y 5/2	fine loamy sand	4	0.01	0.27	130	0.01
12	Btb	45-62	97	80	10YR 4/6	fine sandy loam	18	0.06	1.79	790	0.03
12	Btb	62-79	80	63	10YR 4/6	fine sandy loam	18	0.04	1.4	550	0.03
12	C1b	79-99	63	43	2.5Y 5/5	fine loamy sand	10	0.04	0.99	390	0.02
14	A	0-10	177	167	2.5Y 2/1	fine loamy sand	2	0.14	0.43	800	0.07
14	AB	10-30	167	147	10YR 2.5/2	fine sandy loam	6	1.19	0.69	3750	0.05
14	AB	30-50	147	127	2.5Y 6/2	fine sandy loam	4	3.87	0.39	2520	0.04
14	C1	50-69	127	108	5Y 4/2	fine loamy	2	0.23	0.19	250	0.02

						sand					
14	C1	69-88	108	89	5Y 4/2	fine sandy loam	2	0.4	0.81	720	0.03
14	C3	88-102	89	75	5Y 6/2	fine loamy sand	2	0.24	0.36	260	0.01
14	C3	102-115	75	62	5Y 6/2	fine loamy sand	2	0.11	0.43	460	0.01
14	C4	115-130	62	47	5Y 5/1	fine loamy sand	1	0.14	0.44	1850	0.01

Table 4. Soil Profile Descriptions from Fig Island.

Core #	Depth (cm)	Horiz. or Zone	Moist Munsell Matrix Color	Mottles / Redox Features	USDA Texture	Structure Code	Lower Boundary	Additional Remarks (mottles, clay films, cultural features, etc.)
1	0-6	A1	2.5Y 4/2	none	fine loamy sand	1msbk	very abrupt	abundant shell fragments / anthropic-disturbed
1	6-9	A2	2.5Y 4/2	none	fine loamy sand	1msbk	very abrupt	without shell, but otherwise like above / antrhropic
1	9-15	A3	2.5Y 3/2	none	fine loamy sand	1msbk	abrupt	intact "original" A horizon
1	15-21	BA	10YR 4/3	none	fine loamy sand	1msbk	abrupt	
1	21-25	Bw	10YR 4.5/4	none	fine loamy sand	1msbk	base of core	
2	0-9	A	2.5Y 3/1	few	fine loamy sand	massive	very abrupt	
2	9-32	Bw	10YR 4.5/1	few	fine loamy sand	1msbk	gradual	
2	32-56	C	2.5Y 6/4	few	fine loamy sand	massive	abrupt	
2	56-82	Btb	10YR 4/5	few	fine sandy loam	2msbk	base of core	
3	0-14	Shell	n.a.	n.a.	n.a.	n.a.	very abrupt	shell zone that is largely missing from the core
3	14-25	Bw1	10YR 4/4	none	fine loamy sand	1msbk	gradual	
3	25-47	Bw2	10YR 4.5/4	none	fine loamy sand	1msbk	diffuse	
3	47-78	C	2.5Y 6/4	few	fine loamy sand	1msbk	clear	
3	78-104	Btb	10YR 4/5	none	fine sandy loam	2msbk	abrupt	
3	104-121	C1b	2.5Y 6/4	many	fine loamy sand	massive	gradual	
3	121-144	C2b	10YR 5/6	common	fine loamy sand	massive	diffuse	
3	144-169	C2b	2.5Y 6/5	common	fine loamy sand	massive	diffuse	
3	169-189	C4b	2.5Y 6/4	none	fine loamy sand	massive	base of core	
4	0-6	A	10YR 4/3	none	fine loamy sand	1msbk	abrupt	top o A horizon may have been truncated
4	6-35	Bw	10YR 4.5/4	few	fine loamy sand	massive	gradual	
4	35-47	C	2.5Y 6/5	none	fine loamy sand	massive	clear	
4	47-71	Btb	10YR 4/5	few	fine sandy loam	1msbk	base of core	

5	0-14	A	5GY 3/1	none	silty clay	2msbk	abrupt	1/3 of volume is roots
5	14-54	C1	5GY 4/1	none	fine loamy sand	laminated	abrupt	
5	54-90	C2	5GY 6/1	none	fine loamy sand	massive	clear	
5	90-104	C3	5GY 5/1	none	fine sandy loam	massive	clear	
5	104-131	C4	10GY 5/1	none	fine loamy sand	laminated	diffuse	
5	131-176	C5	10GY 6/1	none	fine sand	laminated	base of core	
6	0-17	A	5GY 3/1	none	silty clay	2msbk	abrupt	1/3 of volume is roots
6	17-50	C1	5GY 4/1	none	fine loamy sand	laminated	clear	few large shells at 40-44 cm
6	50-63	C2	5GY 6/1	none	fine loamy sand	massive	clear	
6	63-87	C3	5GY 5/1	none	fine sandy loam	massive	gradual	
6	87-115	C4	10GY 5/1	none	fine loamy sand	laminated	gradual	
6	115-144	C5	5Y 5/4	few	fine loamy sand	laminated	abrupt	
6	144-162	C6	5Y 2.5N	none	fine loamy sand	laminated	abrupt	
6	162-175	C7	2.5Y 6/6	none	fine sand	massive	base of core	
7	0-20	A	2.5Y 3/1	none	silty clay loam	2msbk	clear	1/3 of volume is roots
7	22-48	C1	2.5Y 5/1	none	fine loamy sand	laminated	abrupt	burrowed
7	48-75	C2	2.5Y 4/1	none	fine loamy sand	laminated	abrupt	burrowed
7	75-86	C3	2.5Y 6/1	none	fine loamy sand	massive	clear	
7	86-105	C4	5Y 5/2	none	fine loamy sand	massive	gradual	
7	105-180	C5	5GY 5/1	none	fine loamy sand	laminated	abrupt	black zone at 160-172 cm
7	180-190	C6	2.5Y 6/3	none	fine sand	massive	base of core	
8	0-15	A	2.5Y 5/2	none	fine loamy sand	1msbk	very abrupt	
8	15-29	C1	2.5Y 2.5/1	none	fine loamy sand	massive	very abrupt	
8	29-53	C2	2.5Y 5/1	few	fine loamy sand	massive	very abrupt	
8	53-57	Ab	2.5Y 3/1	none	fine loamy sand	massive	very abrupt	possibly is a krotovina rather than buried A
8	57-71	C3	2.5Y 6/1	none	f. sandy clay loam	massive	very abrupt	also has black coloration
8	71-85	C4	5Y 6/2	common	f. sandy clay loam	massive	very abrupt	
9	0-8	C	2.5Y 5/2	none	fine loamy sand	massive	abrupt	

9	8-24	A	2.5Y 3/1	none	fine loamy sand	1msbk	abrupt	many shells in this zone
9	24-42	AB	2.5Y 4/2	common	fine sandy loam	1msbk	clear	
9	42-53	C1	2.5Y 6/3	none	fine loamy sand	massive	clear	
9	53-73	C3	5Y 5/2	many	fine sandy loam	1msbk	clear	
9	73-92	C4	5Y 5/3	none	fine loamy sand	massive	base of core	
10	0-15	A	2.5Y 2/1	none	fine loamy sand	massive	very abrupt	
10	15-28	Bw	10YR 5/4	none	fine loamy sand	1msbk	gradual	
10	28-46	BC	2.5Y 6/5	few	fine loamy sand	1msbk	gradual	
10	46-70	C	2.5Y 6/6	few	fine loamy sand	massive	abrupt	
10	70-100	Btb	10YR 4.5/6	few	fine sandy loam	1msbk	gradual	
10	100-178	C1b	2.5Y 6/5	few	fine loamy sand	massive	abrupt	
10	178-190	C2b	10YR 5/8	few	fine loamy sand	massive	base of core	
11	0-21	C	10YR 6/5	none	fine loamy sand	massive	clear	few shells in this zone
11	21-53	Btb	10YR 5/6	common	fine sandy loam	1msbk	base of core	
12	0-7	A1	2.5Y 2/1	none	fine loamy sand	1msbk	very abrupt	many shells in this zone
12	7-17	A2	2.5Y 2/1	none	fine loamy sand	1msbk	clear	young looking sediment
12	17-45	C1	2.5Y 5/2	none	fine loamy sand	massive	clear	young looking sediment
12	45-79	Btb	10YR 4/6	many	fine sandy loam	1msbk	gradual	
12	79-120	C1b	2.5Y 5/5	none	fine loamy sand	massive	diffuse	faintly laminated
12	120-142	C2b	2.5Y 6/2	few	fine loamy sand	massive	clear	
12	142-157	C3b/Bh	2.5Y 2.5/1	few	fine loamy sand	massive	very abrupt	
12	157-165	C4b	10YR 5/8	none	fine loamy sand	massive	base of core	
13	0-11	A	5Y 4/1	none	silty clay loam	2msbk	abrupt	1/3 of volume is roots
13	11-25	C	2.5Y 6/1	none	fine loamy sand	1msbk	very abrupt	
13	25-32	Ab	2.5Y 2.5/1	none	fine loamy sand	1msbk	very abrupt	
13	32-64	Abb	2.5Y 4/2	none	fine loamy sand	1msbk	clear	
13	64-78	C1b	2.5Y 5/3	none	fine loamy sand	massive	clear	
13	78-119	C2b	5Y 5/2	many	fine sandy loam	massive	base of core	

14	0-10	A	2.5Y 2/1	none	fine loamy sand	1msbk	clear	
14	10-50	AB	10YR 2.5/2	none	fine sandy loam	1msbk	clear	faintly laminated and pot sherd at 13 cm
14	50-69	C1	2.5Y 6/2	none	fine loamy sand	massive	very abrupt	
14	69-88	C2	5Y 4/2	common	fine sandy loam	massive	very abrupt	
14	88-115	C3	5Y 6/2	none	fine loamy sand	laminated	very abrupt	
14	115-130	C4	5Y 5/1	none	fine loamy sand	massive	base of core	black zone at top 115-120 cm
15	0-19	A	2.5Y 3/1	none	silty clay loam	2msbk	very abrupt	many shells in this zone
15	19-27	AB	2.5Y 4/2	none	fine loamy sand	2msbk	clear	many shells in this zone
15	27-53	Bw	10YR 5/6	few	fine loamy sand	1msbk	diffuse	
15	53-76	BC	2.5Y 5/4	many	fine loamy sand	1msbk	clear	
15	76-89	Btb	10YR 5/7	few	fine sandy loam	2msbk	base of core	
16	0-16	A	2.5Y 3/1	none	silty clay loam	1msbk	very abrupt	many shells in this zone
16	16-28	AB	10YR 4/3	none	fine loamy sand	1msbk	clear	few shells in this zone
16	28-51	BC	2.5Y 6/3	many	fine loamy sand	massive	clear	krotovina at 33-36 cm
16	51-87	Btgb	10YR 4.5/4	many	fine sandy loam	2msbk	diffuse	
16	87-132	Cb	2.5Y 6/3	few	fine loamy sand	massive	base of core	black zone at 93-100 cm
17	0-20	A	2.5Y 4/1	none	f. sandy clay loam	2msbk	gradual	roots make up 1/3 of volume
17	20-49	AC	5Y 5/1	none	fine sandy loam	massive	clear	faintly laminated
17	49-71	C1	5GY 5/1	none	f. sandy clay loam	massive	gradual	
17	71-101	C2	10GY 5/1	none	fine loamy sand	massive	base of core	