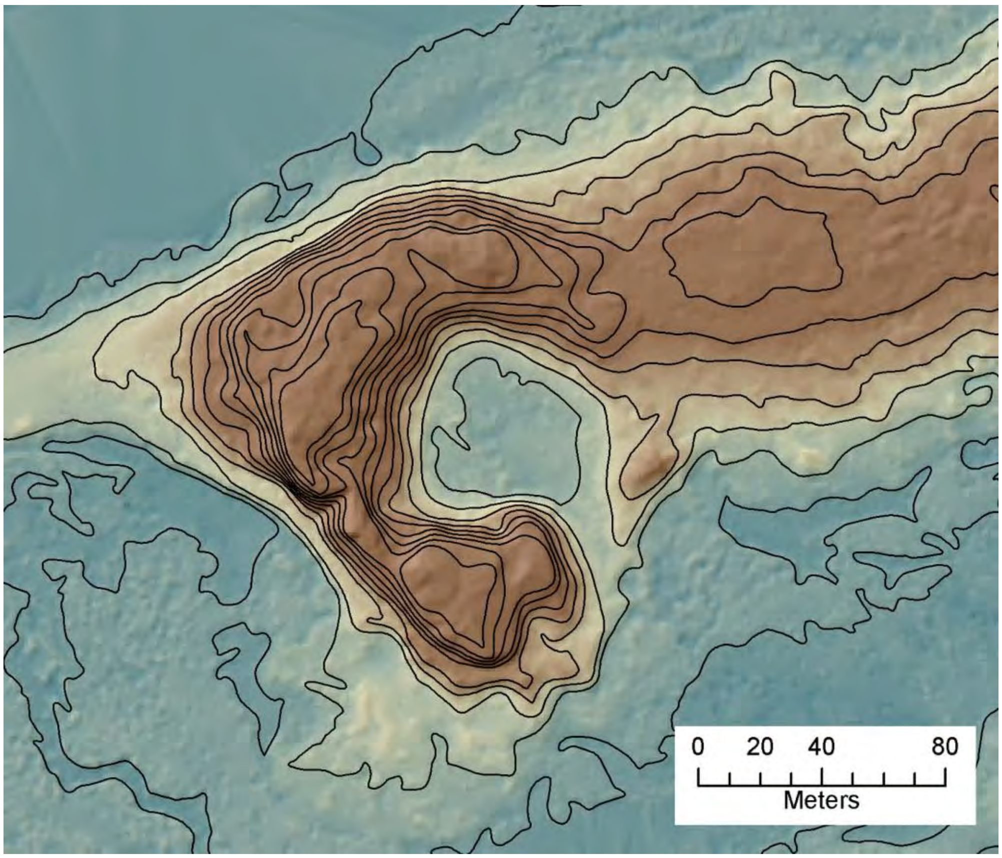
ARCHAEOLOGICAL INVESTIGATIONS AT SHELL MOUND (8LV42), LEVY COUNTY, FLORIDA: 2012 TESTING



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Technical Report 16
Laboratory of Southeastern Archaeology
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May 2013

Cover illustration: LiDAR topographic projection of Shell Mound (8LV42) courtesy of Asa Randall.

MANAGEMENT SUMMARY

Under Archaeological Resources Protection Act permit LSUWNWR021612 and through cooperation of U.S. Fish and Wildlife (USF&W), staff of the Laboratory of Southeastern Archaeology, Department of Anthropology, University of Florida conducted limited archaeological testing at Shell Mound (8LV42), Levy County, Florida on April 6-8, 2012. The most salient result of this work is that the U-shaped configuration of Shell Mound is true to its original form and not a consequence of shell mining. Shell Mound is thus a site worthy of additional investigation, long-term preservation, and development for enhanced public visitation. Two 1 x 2-m test units into the southern outside slope of the shell ridge exposed about 3 m of unconsolidated oyster shell midden overlying a buried ground surface and a buried shell midden. Massive quantities of oyster shell began to be piled at Shell Mound about 1,400 years ago (cal A.D. 430–660), perhaps earlier in places yet to the tested, notably the core of the ridge. Associated with mounded oyster shell along the south slope is limestone-tempered pottery of the Pasco tradition, along with the remains of shellfish other than oyster, vertebrate fauna, and occasional shell and stone artifacts. These same items are associated with a thin, near-surface midden in the interior opening of the shell ridge, which was tested with bucket augering and a 1 x 1-m unit. The single radiocarbon assay from the interior midden gives an age estimate slightly younger (cal A.D. 650–760) than the strata of the shell ridge that have been dated. A Late Archaic midden and feature assemblage dating to ca. cal 2480–2300 B.C. lies beneath the shell of the south ridge, and a small assemblage of Deptford pottery above the Late Archaic midden attests to probable occupation in the range of 500 B.C. through A.D. 200. The multicimponent nature of Shell Mound provides good opportunity to examine site history in the context of broad-scale environmental change, notably sea-level rise.

ACKNOWLEDGMENTS

Fieldwork at 8LV42 was executed by an outstanding crew from the Laboratory of Southeastern Archaeology: Elyse Anderson, Zack Gilmore, Kristen Hall, Erin Harris-Parks, Paulette McFadden, Micah Monés, Andrea Palmiotto, and Sydney Roberson, assisted by Meggan Blessing, Mark Donop, and Isaac Shearn. The crew was especially grateful for the help of a large and effective cadre of volunteers from the local community, organized by Ranger Pam Darty of U.S. Fish and Wildlife Service, who likewise lent her help and enthusiasm to the project throughout. Special thanks goes to members of the Friends of the Lower Suwannee and Cedar Keys National Wildlife Refuges, whose help with screening several cubic meters of shell midden was indispensable. The administrative support of Refuge Manager Andrew Gude and Regional Archaeologist Rick Kanaski is also greatly appreciated. Funding for investigations at 8LV42 was provided by the Hyatt and Cici Brown Endowment for Florida Archaeology.

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CHAPTER 1
BACKGROUND AND SCOPE OF WORK

In April 2012 staff of the Laboratory of Southeastern Archaeology, Department of Anthropology, University of Florida conducted limited test excavations at Shell Mound (8LV42) on the Lower Suwannee National Wildlife Refuge in Levy County, Florida. The site is one of several arcuate- or U-shaped shell ridges in an area ~10 km north of Cedar Key, Florida, and the only one accessible by land (Figure 1-1). Under jurisdiction of U.S. Fish and Wildlife Service (FWS), Shell Mound is a popular visitor destination in the area, but little is actually known about the site. Prior archaeological investigation was limited to one test excavation in the summit of the ridge (Bullen and Dolan 1960). Illicit digging, modest shell mining, and other impacts have compromised portions of the site, but generally the arcuate ridge and its open interior remain intact. The effort to document the integrity and research potential of Shell Mound in 2012 was part of an ongoing project in the greater region to investigate pre-Columbian archaeological sites for both management and research purposes (Sassaman et al. 2011). This report summarizes the method and results of the April 2012 testing program as a basis for future investigations and ultimately improved publicly accessible knowledge about the history and archaeology of Shell Mound. The work reported here was conducted under Archaeological Resources Protection Act permit LSUWNWR021612.

BACKGROUND

Shell Mound (8LV42) is a U-shaped ridge of mostly oyster shell measuring roughly 190 x 180 m in plan, and nearly 7 m tall (Figure 1-2). A 60 x 70-m central area largely devoid of shell is open to the southeast, where a 2-m-tall sand-and-shell mound measuring 10 x 20 m in plan is located. The site lies at the southwest end of a 2-km-long peninsula that is apparently the relict arm of a massive paleodune. A second sand-and-shell mound similar to the one at the opening of the U-shaped deposit lies ~200 m to the northeast of 8LV42, on the peninsula. Recorded as 8LV41, this feature was severely impacted by early excavation (Moore 1902:349), later looting, and road construction.

The U-shaped configuration of 8LV42 was assumed to be a product of shell-mining prior to acquisition by FWS. This assumption is no longer plausible. For a variety of reasons, we are now convinced that the configuration of 8LV42 is original and more-or-less intact. Certainly the site has been impacted by construction of a circumferential road, minor shell mining, occasional looting, and ongoing erosion. However, the central interior of the mound, as well as its opening to the southeast, is true to its form when it was abandoned no earlier than 1,200 years ago. A local informant who visited us in the field on April 7, 2012 witnessed the construction of the road in late 1976. He described how shell was removed from a trench on the south exterior of the U-shaped ridge with a front-end loader and spread across the margin of the marsh to the south to widen the road bed. No other appreciable shell removal took place and the informant verified that the central area was left completely untouched. A spate of looting after the road was constructed in 1976 did not return the results looters expected, leading, according to the informant, to the suspension of illicit digging.

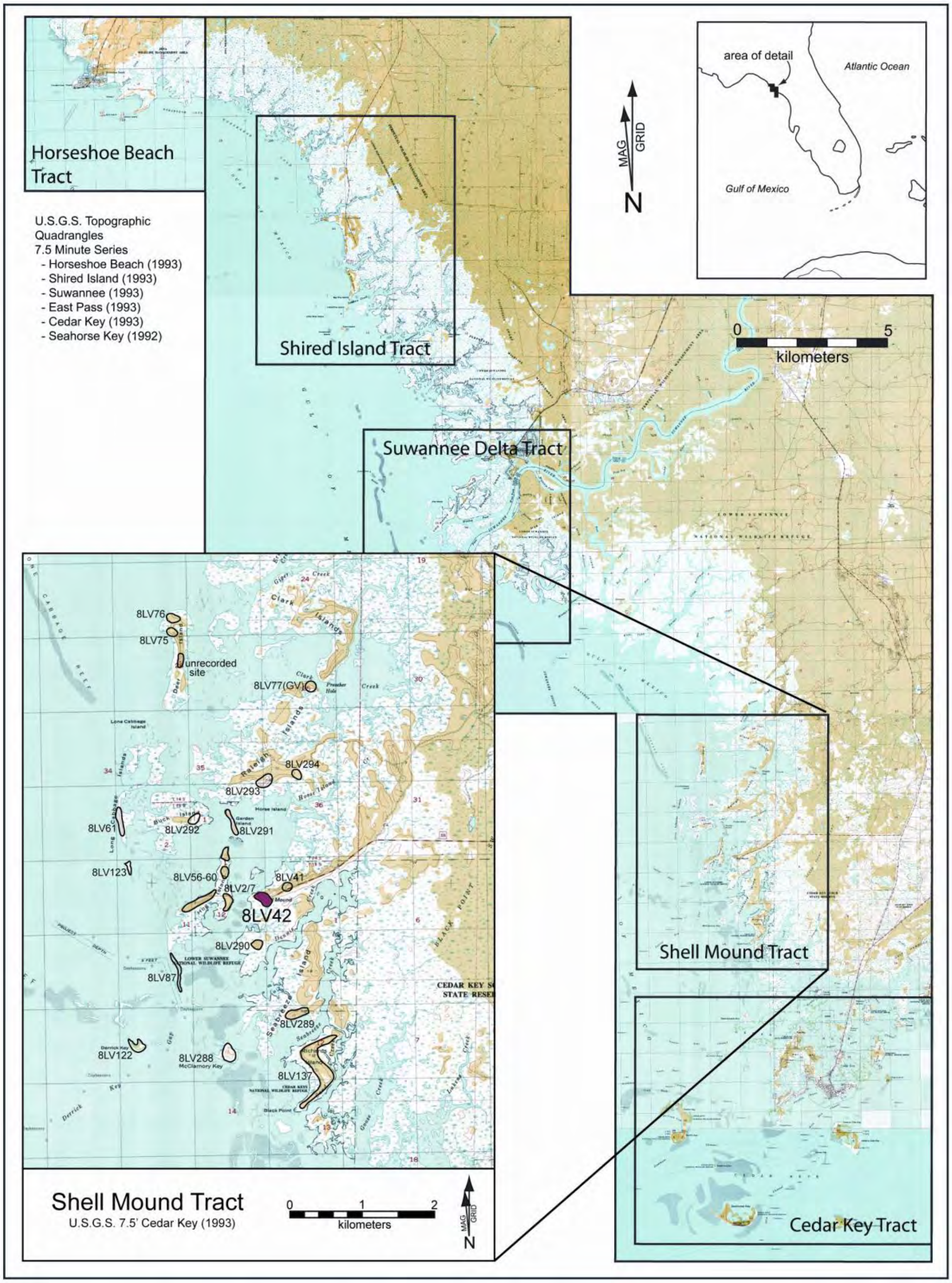

Figure 1-1. Topographic map of the project area of the Lower Suwannee Archaeological Survey, with an inset for the Shell Mound tract, showing the location of Shell Mound (8LV42) and other sites on file with the Florida Master Site Files, Bureau of Archaeological Research.

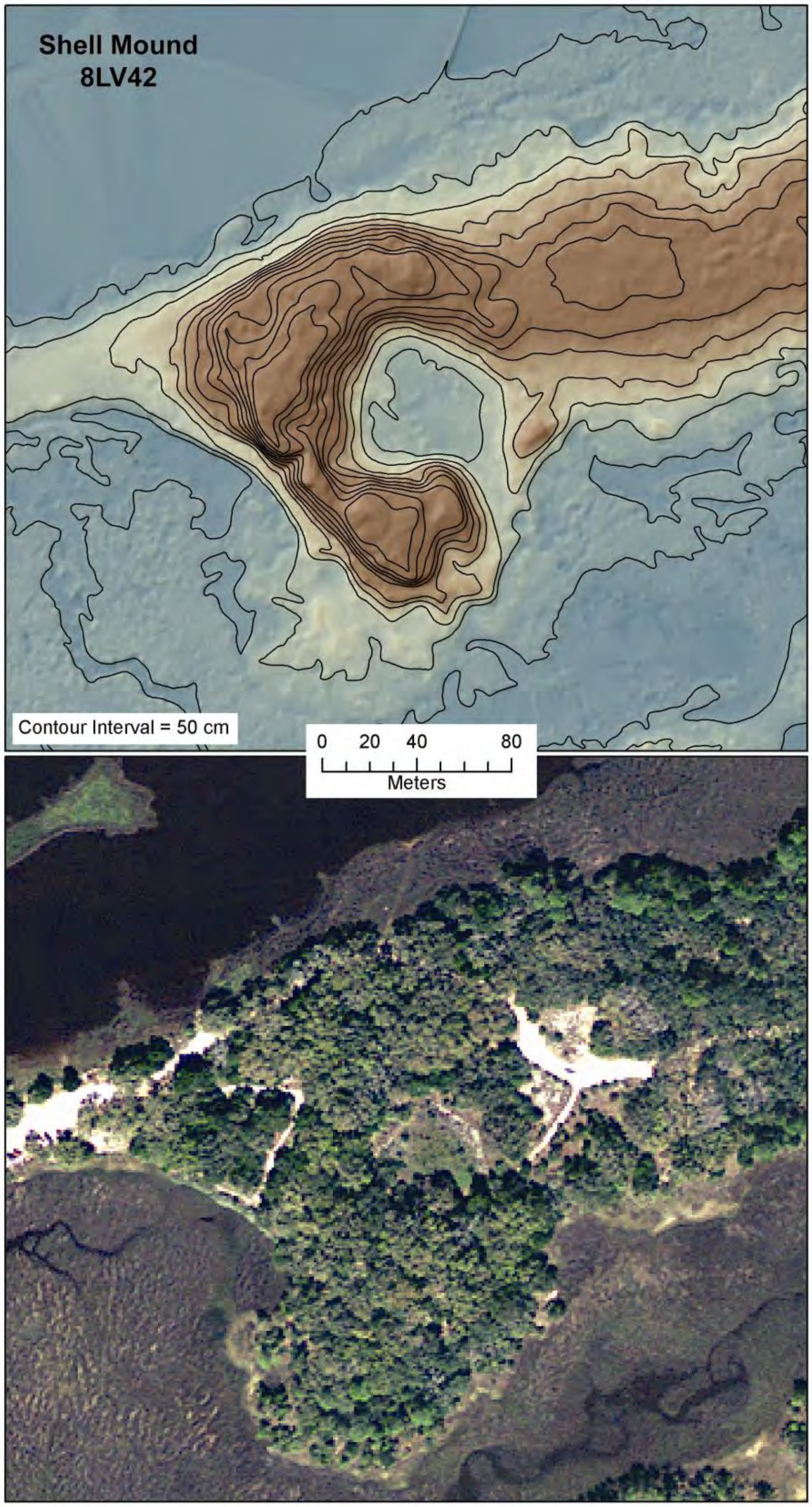

Figure 1-2. LiDAR topographic projection (top) and aerial photo (bottom) of Shell Mound (8LV42) (courtesy of Asa Randall) (Note: LiDAR projections not yet verified with ground survey).

A summary of previous archaeological investigations at 8LV42 was provided in the inaugural report of the Lower Suwannee Archaeological Survey (Sassaman et al. 2011:41-44) and need not be repeated here other than to note that the only systematic testing was a single 10 x 10-ft (~3 x 3-m) sounding placed at the summit of the mound, as reported in Bullen and Dolan (1960). Pottery sherds recovered in this work indicate that the upper 2 m of the shell ridge likely formed no earlier than ~2,000 years ago and that in addition to abundant oyster shell, the deposit contained vertebrate fauna, shell tools, and organic soil matrix in a well-stratified sequence. Deposits exceeding ~3 m in depth were not exposed in this work, so the primary goal of the present effort was to examine deeper strata of the mound. A secondary goal was to document the subsurface composition of the interior of 8LV42, notably to verify that it was never subject to shell mining or related land alteration.

Aside from Shell Mound, nearly two dozen archaeological sites are recorded in the area designated as the Shell Mound Tract (Figure 1-1). Among them are many arcuate shell ridges with topographic relief, most in the range of 50–75 m in maximum dimension, less than 3 m tall, and generally asymmetrical in plan (Figure 1-3). Shell Mound is apparently the largest of the sites, if the unit of comparison is the arcuate ridge. However, sites on several of the islands consist of amalgams of arcuate and linear ridges that cover area as great, if not greater, than Shell Mound, and several exceed 3 m in height. The full extent of shell ridges in the tract awaits systematic survey and testing. For now we note simply that Shell Mound is situated in the center of this distribution and would appear to among the most formalized, if not also the largest, arcuate shell ridge in the tract.

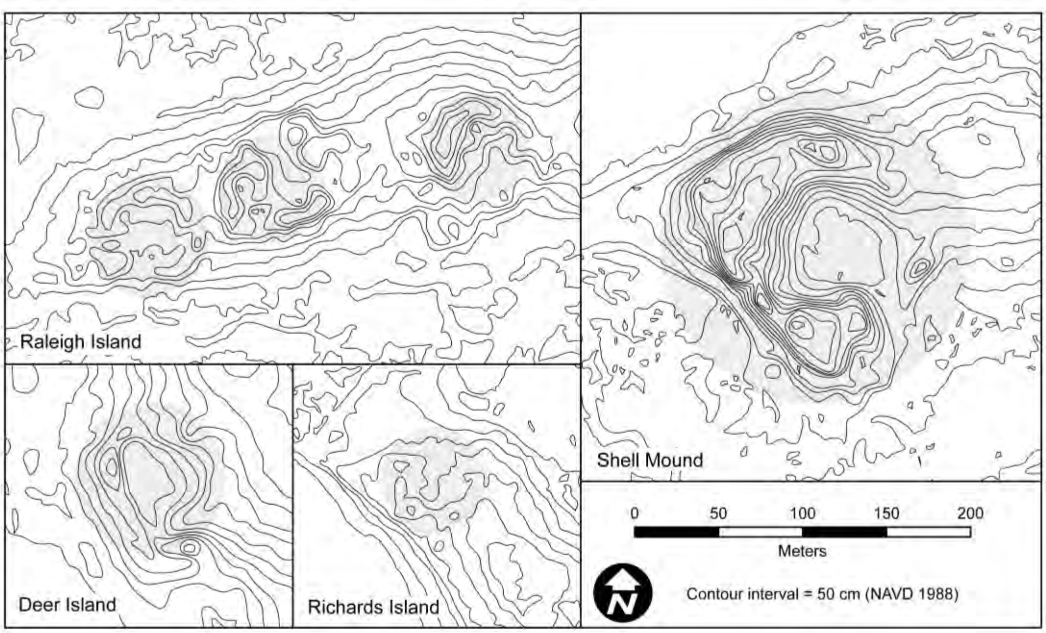

Figure 1-3. LiDAR topographic projections of several arcuate shell deposits in the Shell Mound tract, including Shell Mound (right) (LiDAR projections courtesy of Asa Randall). (Note: LiDAR projections not yet verified with ground survey).

The relative importance of Shell Mound is accentuated by its proximity to one of the more complex mortuary facilities in the greater Lower Suwannee region. The mortuary on Hog Island, just to the west of Shell Mound, was the target of repeated and aggressive digging since at least the mid-19th century. Also known as Graveyard Island, Palmetto Island, Rattlesnake Island, Pine Island, and Pine Key (Mitchem 1999:7), Hog Island was the locus of a cemetery and/or burial mound recorded variously in the site files as 8LV2, 7, and 40. Moore (1902:348-349) lists the locus as "Mound on Pine Key," and describes it as a "sort of burial place, or cemetery." Moore was preceded by Decatur Pittman in the 1880s, whose large collection of pottery at the Florida Museum of Natural History (FLMNH) was described by Willey (1949:311-312), and is currently being re-analyzed by FLMNH staff. Swift Creek and Weeden Island wares dominate the assemblage, but they are associated with sherds of the St. Johns, Papys Bayou, and Pasco series.

One additional early investigation of note at Hog Island is the unpublished work of Montague Tallant (Willey 1949:308). A few decades after Moore's visit, Tallant dug into what Willey states was a sand mound. Tallant located secondary burials accompanied by pottery caches in marginal fill of the mound, as well as skulls inside of large vessels. Some of the burials apparently came from a submound pit, and Tallant found stone celts, pendants, a copper gorget, and lump galena in pit burials. Much of Tallant's collection and notes on his work are curated at the South Florida Museum in Bradenton.

Micah Monés of LSA visited the South Florida Museum in 2011 to view the Hog Island assemblage and make copies of Tallant's photos and field notes. Among the photographs he copied were two images that show the interior opening of Shell Mound (Figure 1-4). One shot was taken from atop the shell ridge, apparently facing southeast, across the interior opening. The other shot appears to be a view from roughly the opposite direction, to the northwest. Both photographs clearly show that the site had an open interior area that is substantially lower in elevation than the surrounding shell ridge. The ground surface of the interior area appears to be free of any evidence of mining or other large-scale land alteration, although these are admittedly limited views and the photographic resolution is poor. Still, if the site had been mined for shell, leaving an interior "mining pit" in the wake of this activity, it had to have occurred prior to the late 1930s, when Tallant was active in the area. He noted in the caption of one of the photos "the amphitheatre-like center of very large village site," what he called the "Shell Mound village site." Coupled with the fact that the site for Moore and his predecessors was accessible only by boat, for lack of a road, it is highly unlikely that Shell Mound was ever mined for shell at a scale commensurate with the size of its interior opening.

SCOPE OF 2012 TESTING AND BEYOND

Given the limited information available on the internal composition and condition of Shell Mound, our testing in April 2012 aimed to expose at least one stratigraphic profile of the ridge and to verify that the open interior of the ridge was intact and not merely the consequence of massive mining.

Figure 1-4. Two of the photographs in the Tallant album curated at the South Florida Museum showing the open interior of Shell Mound (8LV42). The album caption for the photograph at the top reads: “Shell Mound village site, Levy Co,” and the caption of the bottom photograph reads: “Showing the amphitheatre-like center of a very large village site, 7 miles north of Cedar Keys.” (courtesy of South Florida Museum, Bradenton).

For the first goal we hoped to excavate a stratigraphic unit into the ridge that would neither inflect unnecessary damage to the site nor impose safety risks for the crew. Because the ridge is both tall and broad at the base, we had little hope of penetrating the entire shell deposit, from top to bottom, no matter the excavation strategy. If we approached the effort using the same strategy as Dolen (i.e., digging down from the top), we would have to open a unit sufficiently large to enable progressively smaller, nested units to a depth of at least 6 m. Contracting 1 m each side for every meter of depth, such a unit would have to begin at 11 m on a side in order to have a 1 x 1-m unit at the bottom, 6 m deep. Alternatively, a trench cut into the outside edge of the ridge would have to be at least 10 m and up to 30 m long to reach the center of the ridge, and again we would have to step-off the unit for depths exceeding about 2 m. Neither of these strategies squares with our interest in minimizing destruction, nor the realities of time and labor.

The compromise is to construct a composite profile of the entire sequence from small test units positioned in places where upper deposits are already denuded. The south outer margin of Shell Mound is just such a place. It was here, we were told by our informant, that shell was removed to construct the bed for a circumferential road. The scar of this activity is evident in the surface topography of the mound, at the very end of the south ridge (Figure 1-2). Not knowing how much shell was removed we could not be certain, before excavation, how much of the basal strata were left intact, but we reasoned that it was in this location that we would be able to reach basal strata without having to open broad excavation units.

Of course, mounded shell accreted outward as it accreted upward, so even if shell removal made it possible to reach basal strata around the perimeter, we would still be missing the base of the deepest (i.e., tallest) deposits. Moreover, the plan view of the mound shows multiple nodes and summits, suggesting that the mound may be divided into components with distinct stratigraphic sequences. Extensive testing around the entire perimeter of the shell ridge, along both the interior and exterior margins, is needed to reconstruct the entire history of the deposit. This initial testing along the southern outer margin of the ridge is thus a modest start to a long-term, multi-phase program. Even after all testing is complete and we can assemblage a composite profile of the ridge, its inner core(s) will remain unexamined. Remotely sensed data (e.g., ground penetrating radar) on the structure of the core(s) may have to be developed to examine places that are virtually impossible to excavate by hand.

Our second goal was to verify that the interior opening of Shell Mound is true to its original form and not simply the scar of massive shell mining. With little effort we were able to meet this goal. Augering was sufficient to characterize variability in subsurface profiles, and a controlled test unit provided the first samples of midden from what appears to be a circular village. Building on these results, future excavation in the interior opening should target evidence for architecture and associated features. It should be possible with some judicious block excavation, to determine if the remains of houses and other buildings are present, and, if so, the size, shape, and arrangement of structures. Remote sensing may prove useful in detailing the subsurface character of the entire area with only limited excavation.

Before proceeding with the results of our initial investigations a caution on mapping is in order. All of the topographic maps in this report are projections of LiDAR data made available by NOAA. On site we used a surveying instrument (Nikon Total Station) to establish two permanent datums as a baseline for a site-wide grid and the locations of all excavation units, auger locations, and miscellaneous features were referenced to this grid. A hand-held GPS unit was used to locate the two permanent data and these readings were used to georeference our grid to the LiDAR coverage. Two errors present themselves when comparing our on-the-ground survey data with LiDAR and GPS data. First, the planar distance of the two datums according to the Total Station deviates from GPS readings by about 3 m (10.02 m distance with Total Station, only about 7 m with GPS). We therefore cannot rely on the GPS readings for tying our Total Station readings to the coordinate system used for LiDAR. Second, the elevations of the LiDAR data underestimate actual elevations by a couple of meters. The relative elevation between the low-point of the interior opening and the south summit is about 8 m according to Total Station readings but only about 6 m according to LiDAR data. We trust the internal consistency of the Total Station readings and relied on the GPS readings to position the Total Station points in LiDAR-projected space. We cannot, apparently, trust the LiDAR topography, at least not in absolute terms, and may have to map Shell Mound in its entirety with the Total Station. There may be ways to reconcile the three sources (Total Station, LiDAR, GPS) without physically mapping the entire mound, but for now we simply note that the maps and the cross-sectional views provided in this report must not be taken as accurate. Future field work at Shell Mound will require more on-the-ground surveying and more reliable GPS readings.

CONCLUSION

Shell Mound (8LV42) is one of the largest and best-preserved shell sites of the northern Gulf coast of Florida, but little is known about its age, content, and internal configuration. Archaeological investigations initiated in April 2012 by staff of the Laboratory of Southeastern Archaeology aimed to expose stratigraphic profiles of the shell ridge and collect samples for radiometric dating and other analyses. The results of this initial effort, reported herein, show that Shell Mound accreted over at least a two-century period (~1500–1300 cal B.P. or ~cal A.D. 450–650). We are mindful that this age estimate pertains to only the southern portion of the ridge and that shell likely accumulated over a longer period of time. In addition, testing in 2012 showed that the southern portion of the ridge is underlain by a Late Archaic stratum with an age estimate of ~4440–4250 cal B.P. (~2450–2300 cal B.C.). Additional testing in other portions of the ridge is needed to determine the extent of this earlier, submound component.

Augering and a single test unit emplaced in the interior opening of the shell ridge verified that Shell Mound is indeed an arcuate ridge, not the victim of shell mining that gutted its core. A single AMS assay of charcoal from a near-surface midden returned an age estimate of ~1300–1200 cal B.P. (~cal A.D. 650-750), just after the period during which shell accumulated in the southern portion of the ridge. Additional testing is needed before we can determine how the two contexts are related. For now we can be certain that the interior opening holds great archaeological potential and we expect to be able to uncover evidence for the architecture of residences and hopefully an entire residential community.

Shell Mound is a complex site that will require a multistage program of testing to document. As testing proceeds in years to come, information about the history and internal configuration of the site will provide not only valuable data for research, but also the sort of information needed to present Shell Mound to the public as a time capsule of ancient dwelling on the northern Gulf coast. The occupants of Shell Mound witnessed a variety of changes in coastal environment that bear directly on the challenges facing modern coastal residents. Likewise, changes in society, economy, and politics elapsing over centuries and millennia give long-term perspective on the interplay between culture and nature, perspectives that resonate now more than ever as the rate of both natural and cultural change continues to accelerate.

CHAPTER 2
METHODS AND RESULTS OF 2012 TEST EXCAVATIONS

Testing at Shell Mound in April 2012 was limited to the excavation of two 1 x 2-m test units in the outside slope of the south ridge, bucket augering in the interior opening, and excavation of one 1 x 1-m unit in the interior opening. This chapter reports the results of these investigations, reserving the description of material culture for Chapter 3 and the analysis of faunal remains for Chapter 4. Before proceeding with the results of field investigations we review first the sampling rationale and spatial controls for the work.

SAMPLING AND MAPPING

Our proposal for archaeological investigations at 8LV42 issued in February 2012 called for the excavation of three 1 x 2-m units in the southwest sideslope of the mound, and for bucket augering across its open, interior area. The area chosen for excavation was determined by LiDAR-derived contour mapping that showed a distinctive crease in the southwest slope (Figure 2-1). Upon visiting the site on April 4 to prepare for excavation, an alternative area presented itself as a location of prior impact, namely the area mined for shell when the road was constructed in 1978 (the crease to the southwest proved to be a well-worn foot path up the slope). At the location of shell mining, two datums (4-ft sections of 1/2-inch rebar driven flush with the ground) were established (A and B) on an azimuth approximating magnetic north. Along a baseline running with the slope, along the western margin of the mined area (Figure 2-2), three 1 x 2-m test units were laid out. A Nikon DTM-310 Total Station was used to determine the precise location and surface elevations of the units, and a hand-held GPS was used to georeference the two datums. As noted in Chapter 1, the accuracy of the GPS readings and its projection on LiDAR coverage are suspect and will require additional on-the-ground surveying to rectify.

Ultimately, only the lower two units (TU1 and TU2) were excavated; the third, upslope unit proved impossible to excavate without cutting deep into the marginal escarpment, which would have required much more time and/or labor. The lack of a third unit would hardly matter, however, as the results of testing in TU1 and TU2 proved to be very productive and more than sufficient to characterize the lower two to three meters of the shell ridge.

Investigations of the open, central area of Shell Mound began with a series of 4-inch bucket augers (Figure 2-1) along two transects. Four augers were sunk roughly 10 m apart along an axis linking the western summit of the ridge to the sand mound at the opening of the ridge. Three additional augers were placed on a transect oblique to the first transect. All augers revealed an upper, organically enriched stratum with variable densities of oyster and occasional traces of vertebrate fauna and pottery, but those closest to the inside perimeter of the shell ridge expressed the greatest density and diversity of material. These results lend some credence to the hypothesis that the open, central area of Shell Mound was the locus of a village, with households placed in semi-circular

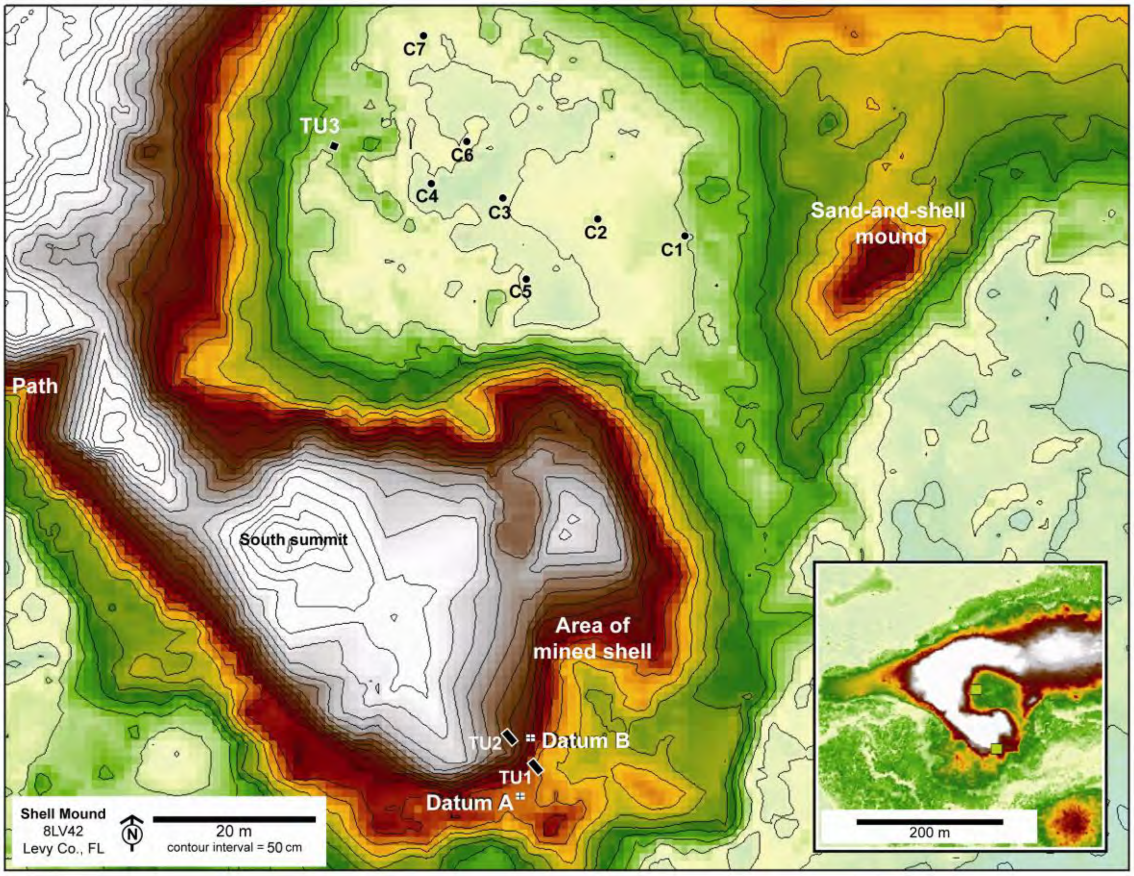

Figure 2-1. LiDAR topographic map of southern portion of Shell Mound (8LV42), with inset map (lower right) of the entire mound and vicinity. Features noted in text include test units along the southern sideslope (TU1 and TU2); a test unit in the open, interior area (TU3); bucket augers (C1-C7) in that same area; a path along southwest sideslope; an area of mined shell to the southeast; and a sand-and-shell mound at the opening of the U-shaped ridge (LiDAR base map with GPR-projected datums provided courtesy of Andrea Palmiotto). (Note: LiDAR projections not yet verified with ground survey).

fashion around the inside of the ridge, perhaps surrounding a public plaza. To begin the process of testing this hypothesis, a single 1 x 1-m unit (TU3) was excavated at the northwest end of the interior opening.

The method of excavating each test unit was roughly the same, although adjustments had to be made for excavating into the steep slope of the south ridge. Test Unit 1 (TU1) was located at the outside foot of the south ridge slope and oriented with its long dimension along the slope (Figure 2-3). It was excavated in 20-cm arbitrary levels down to the base of bedded oyster shell, roughly 100 cm below local datum (cmbd). Excavation below the shell continued with 10-cm arbitrary levels down to ~165 cmbd, where "sterile" sand was reached. Using trowels, shovels, and hoes, all matrix from the excavation was removed and passed through ¼-inch hardware cloth. Artifacts and vertebrate faunal remains captured in the screen were bagged per level and labeled with provenience information. Unmodified shell was not collected at this stage.

Figure 2-2. View facing northwest of outside slope of south ridge, Shell Mound (8LV42), showing escarpment at the top from shell removal and erosion. Test Unit 1 was placed in the foreground of this photograph, at the base of the slope; Test Unit 2 was placed about midslope in this view.

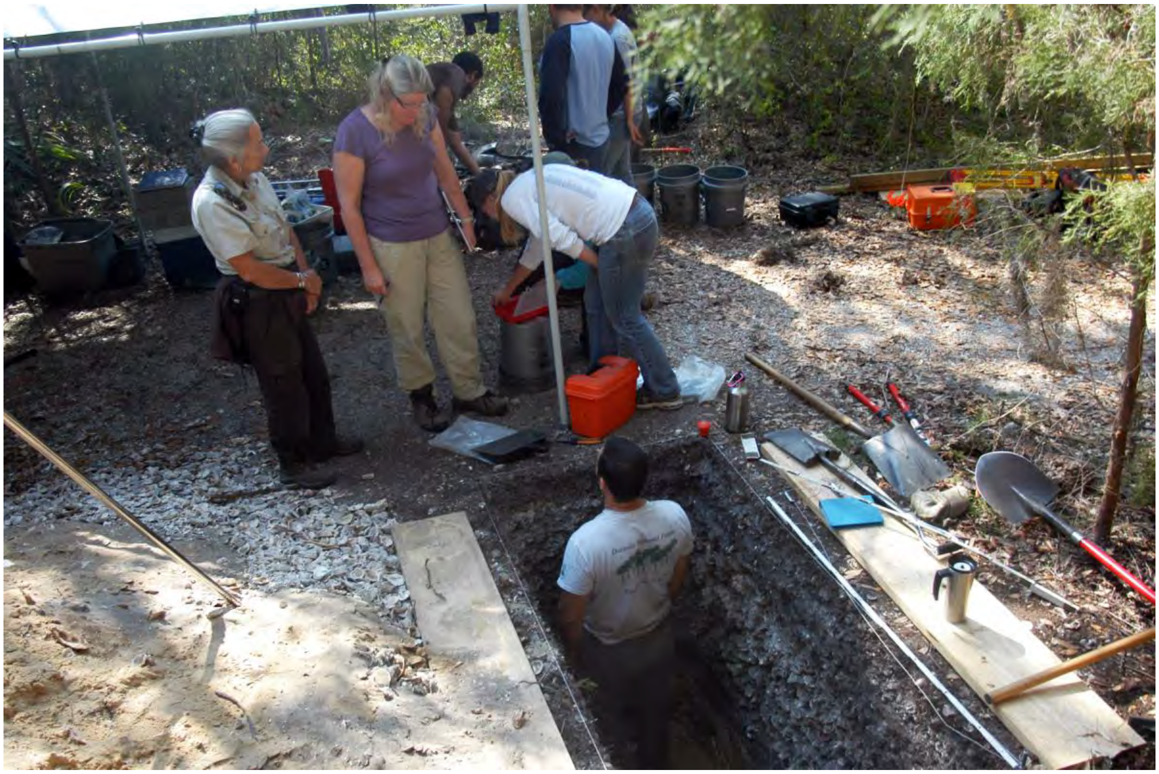

Figure 2-3. View facing south of excavation of Test Unit 1, Shell Mound (8LV42).

Observations on the matrix and artifact content of each level was recorded on standardized forms, along with sketch plan maps showing variations in the color and texture of matrix, as well as the locations of any natural disturbances and cultural features. Feature forms were used to record information on the size, shape, and content of cultural features.

Upon completion of TU1, as well as the other units, all walls were cleaned, photographed, and then drawn to scale. Before backfilling, bulk samples were collected from representative strata and returned to the LSA for processing with a Dausman flotation machine.

Positioned upslope 3 m from TU1, Test Unit 2 (TU2) was a bit of a technical challenge. The drop in elevation from the upslope to downslope corners of this 1 x 2-m unit was 1.31 m. The method of excavating it was similar to that used for TU1 except that the first two levels were "wedges" about 70-cm thick each to bring the unit flat. Excavation thereafter proceeded in 20-cm increments through unconsolidated oyster shell with little inorganic matrix. The unit was terminated at about 210 cmbd before encountering submound strata. Based on the results of TU1, shell is likely to continue for at least 1 m below the maximum excavated depth of TU2.

In order to accommodate the back-filling of the unit, a bulkhead was constructed upslope of TU2 to create a platform for screening (Figure 2-4). Upon completion of excavation, the bulkhead was removed to allow the shell to fall back into the hole through gravity alone. As it turned out, gravity had to be coaxed into compliance with some human inducement, but ultimately the upslope method of screening worked well.

Figure 2-5 provides some perspective on the position of TUs 1 and 2 in a cross-sectional view of the south ridge. Again, the LiDAR topography is not to be accepted uncritically, particularly as regards absolute elevations. Nonetheless, this view shows how much farther into the mound we would have to excavate to get at basal strata below the summit. As it stands, our best chance of exposing basal strata near the summit would be from units placed on the inside of the ridge, to the northwest of TUs 1 and 2. To the extent the more proximate high point of the ridge is a secondary summit, or a sort of terrace, the area we tested may well reflect an addition to an existing mound. As noted in Chapter 1, Shell Mound may have formed through a series of distinct depositional events that resulted in the U-shaped configuration we see today. We remain mindful, of course, that shell removal and erosion has sculpted the surface of this aspect of the site, and so the seemingly multi-nodal nature of the south ridge may be deceptive. Only more testing will tell.

Figure 2-4. View facing south of the excavation of Test Unit 2, Shell Mound (8LV42), showing bulkhead constructed for the upslope screening of matrix.

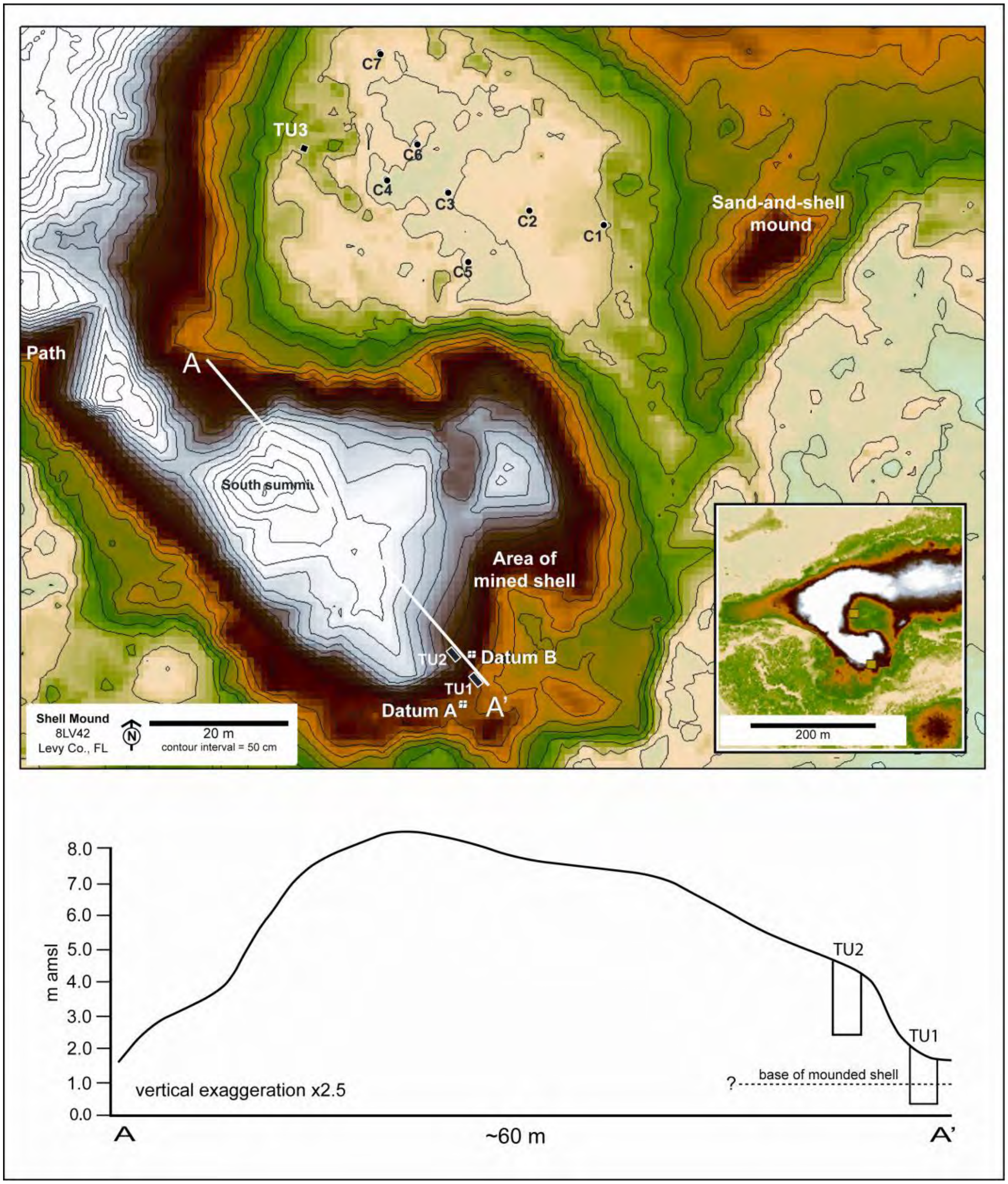

Figure 2-5. Cross-sectional view of the south ridge of Shell Mound (8LV42), showing locations of Test Units 1 and 2 (vertical exaggeration x2.5).

Finally, the excavation of Test Unit 3 (TU3), a 1 x 1-m unit, was conducted through removal of 10-cm arbitrary levels. Exposed in the unit was a 20-cm-thick, buried anthropogenic soil (i.e., midden), roughly 15-35 cmbd, underlain by "sterile" sand. The unit was terminated at 50 cmbd, approximately 20–30 cm above the water table.

SOUTH RIDGE TEST EXCAVATIONS

The results of excavation in the south ridge are reported here by the respective units of testing, first Test Unit 1, then Test Unit 2. These results are integrated in a summary at the end of this section.

Test Unit 1

Positioned at the base of the outside slope of the south ridge, TU1 successfully penetrated mounded shell to expose submound strata that includes a buried midden dating to the Late Archaic period (Figure 2-6). Shown in Figure 2-7 are photographs of the four profiles of the unit, and Figure 2-8 provides scaled drawings of the same. Descriptions of the strata mapped in Figure 2-8 are provided in Table 2-1, and an artifact inventory in Table 2-2.

At least four stratigraphic macrounits are evident in the 180-cm-deep profile of TU1. The upper ~40 cm of the profile (Strata I-IV) consists of redeposited oyster shell and organically-enriched sand, with moderate amounts of vertebrate fauna (mostly marine fish), Pasco and sand-tempered plain sherds, and *Melongena corona* shell hammers. The source of this stratum is evident in the margin of the mining pit, where shell midden is actively eroding from steep escarpments. The strata that comprise this macrounit in TU1 are generally discontinuous and irregular in thickness, with some intrusive elements (e.g., Str. XII). As might be expected, the redeposited fill is thinnest along the east margin of the unit, which is farthest from the erosional escarpment.

Figure 2-6. View facing northwest of Test Unit 1 after excavation, Shell Mound (8LV42).

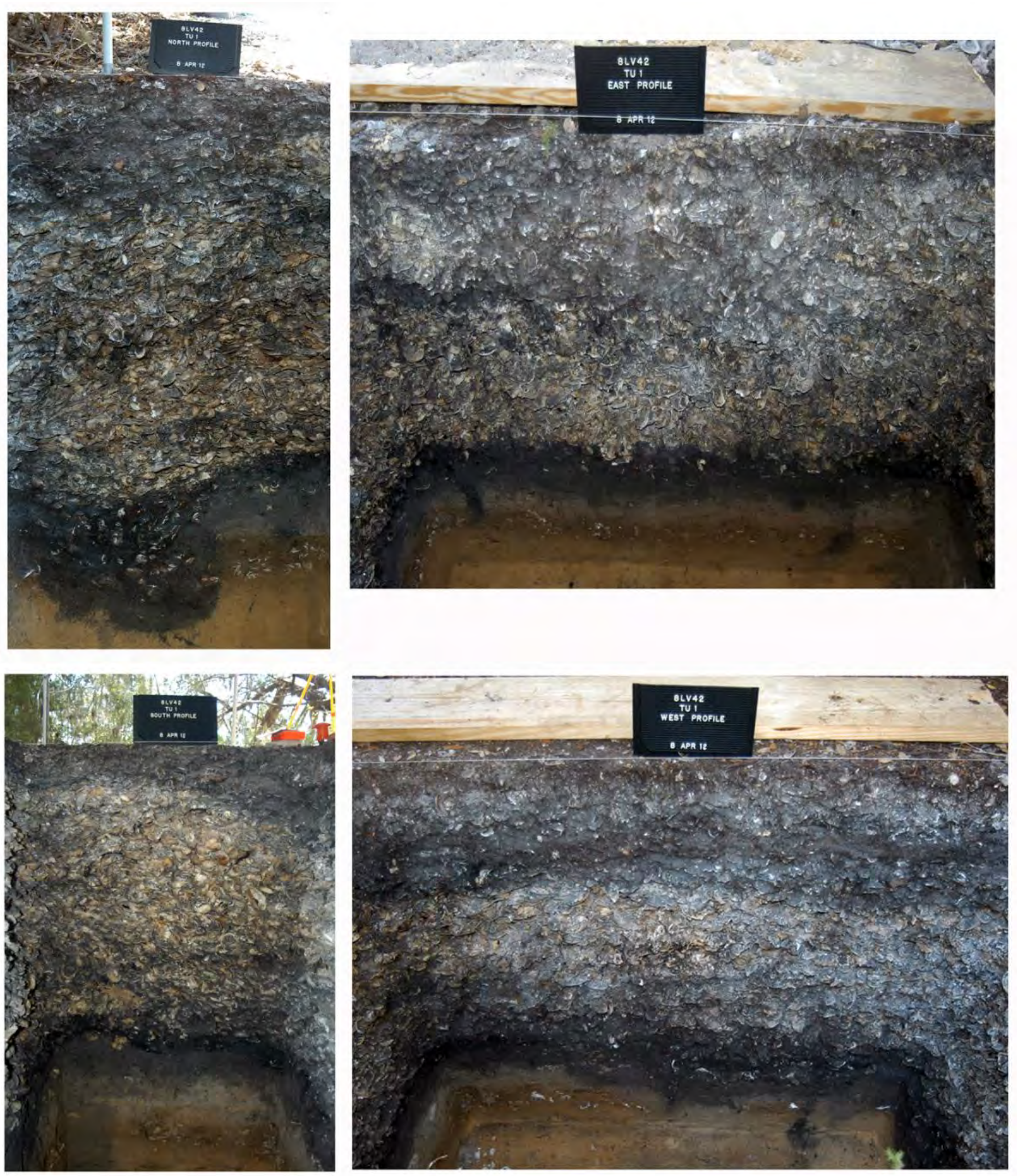

Figure 2-7. Photographs of the four profiles of Test Unit 1, Shell Mound (8LV42), from upper left and moving clockwise: north, east, west, and south. Note that the east and west profiles were photographed at an oblique angle from the ground surface, whereas the north and south profiles were photographed from a direct perspective, inside the unit.

Below this upper, redeposited stratum is a 75–80-cm-thick stratum of bedded oyster shell (Stratum V) with generally uniform dip and strike oriented "against the grain" of the surface slope. This macrounit contains an assemblage of shell, vertebrate fauna, and artifacts consistent with the overlying stratum, but with variations in the density and content of subunits, demarcated best by lenses of enhanced organic matter in

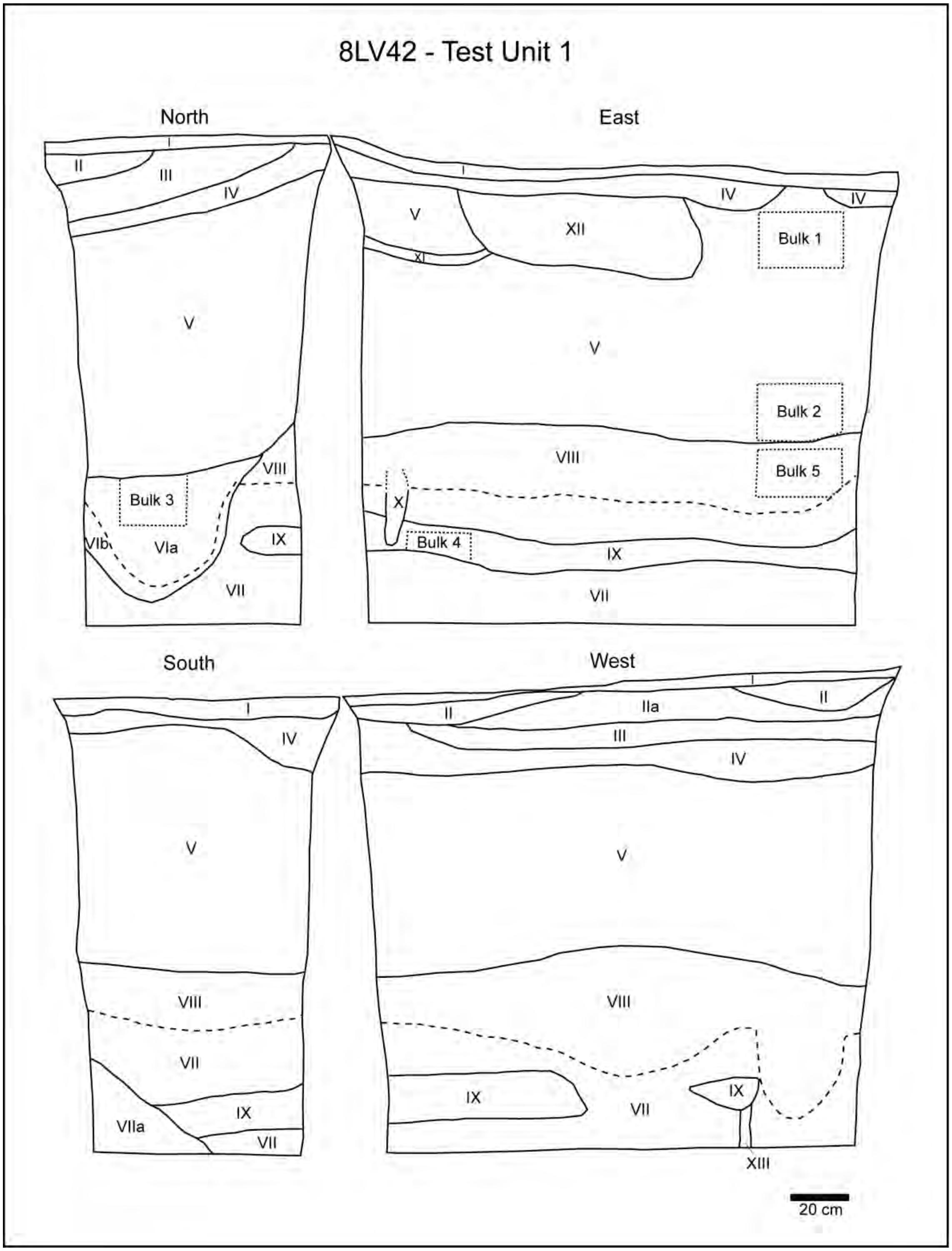

Figure 2-8. Stratigraphic drawings of the profiles of Test Unit 1, Shell Mound (8LV42).

Table 2-1. Stratigraphic Units of Test Unit 1.

Stratum	Max. Depth (cm BD)	Munsell Color	Description
I	18	10YR2/2	Very dark brown loam with abundant rootlets and crushed and whole oyster shell
II	20	-	Crushed oyster shell with no soil matrix
III	30	10YR4/1	Dark gray silty fine sand
IV	41	10YR4/1	Dark gray silty fine sand with dense whole and crushed oyster shell
V	118	-	Bedded oyster shell with limited soil matrix (Bulk 2: 1530 ± 30 B.P.)
VIa	156	10YR3/1	Very dark grey silty fine sand with dense, mostly whole oyster shell (Bulk 3: 1420 ± 30 B.P.)
VIb	161	10YR3/1	Very dark grey silty fine sand with sparse oyster shell
VII	169	10YR6/6	Brownish yellow fine sand with infrequent shell
VIII	160	10YR4/1-6/3	Dark gray fine sand grading to pale brown fine sand
IX	165	10YR5/4	Yellowish brown fine sand with moderate density of degraded oyster shell
X	142	10YR4/2	Dark grayish brown fine sand with flecks of charcoal
XI	44	10YR3/1	Very dark grey silty sand with abundant rootlets and oyster shell
XII	48	10YR5/1	Grey fine silty sand with dense oyster shell
XIII	168	10YR3/2	Very dark grayish brown fine sand with flecks of charcoal

sandy matrix. In various places in this unit (most apparent in the north profile) it would appear that the upper and lower halves can be distinguished on the basis of color and structure, but this does not apply across the board. Two bulk samples were recovered from this stratum, one near the top (Bulk 1), and one near the bottom (Bulk 2). The latter provided a sample of charcoal that was submitted for an AMS assay and returned an age estimate of 1530 ± 30 B.P. (two-sigma calibrated range of A.D. 430-600).

Table 2-2. Artifact and Vertebrate Fauna Inventory by Level for Test Unit 1, Shell Mound (8LV42).

Level	Pottery Sherd (n)	Lithic Flake (n)	Shell Tool (n)	Vertebrate Fauna (g)
A	38		5	130.1
B	35	1	11	227.7
C	19		16	187.5
D	16		5	440.2
E	14		8	277.4
F	10		3	132.9
G	9		3	136.5
H	18		1	15.2
I	2			41.4
J			4	26.6
K			3	31.4
Total	161	1	59	1646.9

At ~120 cmbd, shell-rich strata give way to an organic sand stratum (Str. VIII) with intrusive pit features, such as the shell-filled pit seen in the north profile (Str. VIa). This stratum would appear to be a buried A horizon, enhanced with considerable anthropogenic input of organic matter, plus artifacts. Recovered at about this depth were several small sherds of Deptford Linear Check-Stamped pottery, and at the contact with inorganic sand below a large rim sherd of the same type. These associations would suggest that the initiation of shell accumulation post dates 2500 B.P., the onset of the Deptford period. The pit feature seen in the north profile (Str. VIa) is apparently a good bit younger however. From Bulk 3 of this feature came charcoal that was AMS assayed for an age estimate of 1420 ± 30 B.P. (two-sigma calibrated range of A.D. 600–660). This puts this feature roughly coeval but likely a few centuries younger than the charcoal from the bottom of Stratum V, the mantle of oyster shell. From the north profile of TU1 it is clear that the feature penetrating Str. VIII likely originated well into Str. V.

Two other aspects of the buried A/midden bear mentioning. First, the top of this stratum is especially dark, apparently from burning. Because the stratum is intercepted by so many features emanating from above, it is not altogether clear if the presumed burned surface extended across the entire test unit. The second aspect worth mentioning is that the buried A/midden grades from dark to light brown sand, but inconsistently, owing to both intrusive features and the differential effects of percolation from the overlying shell midden.

About 10 cm into the pale brown fine sand beneath the buried A is a ~15-cm-thick stratum of degraded oyster shell and associated vertebrate fauna, but no pottery (Str. IX). Charcoal from a feature associated with this stratum (Feature 1, see below) returned an AMS age estimate of 3920 ± 30 B.P. (two-sigma calibrated range of B.C. 2470–2300), putting it in the Late Archaic period. Strata of this age and composition have been observed at several other sites in the greater Lower Suwannee region (Deer Island

[Monés et al 2012], Cat Island [Sassaman et al. 2011], and Bird Island [McFadden and Palmiotto 2012]). As with these other sites, the Late Archaic stratum observed in TU1 is overlain by inorganic fine sand. To the extent the overlying A horizon formed in this same sand, its variations of color and texture are partly pedogenic. The actual genesis of the sand remains in question, but it too may be a product of soil formation (in this case bioturbation that delivered sand from below the Late Archaic stratum to the surface) if the location was depositionally stable in the time between occupations, a minimum of 1500 years (~4000–2500 B.P.). A depositional source for the sand is possible although we hasten to note that it occurs at variable elevations in the study area and is thus unlikely to be a product of the same depositional event(s).

Another perspective of strata beneath mounded shell is seen in a close-up of the lower half of the south profile of TU1 (Figure 2-9). We can be certain that the two strata of shell in this profile (Late Archaic at bottom and Middle Woodland at top) were laid down on surfaces (as opposed to pits). The nature of the intervening sands—with organic enrichment that clearly involved human input—remains to be determined. If the sands were depositional (alluvial, eolian), then it was eventful; if the sands are result of bioturbation associated with a stable surface that was abandoned for 1500+ years by humans, then the process was gradual. Either way, reoccupation of the site after about

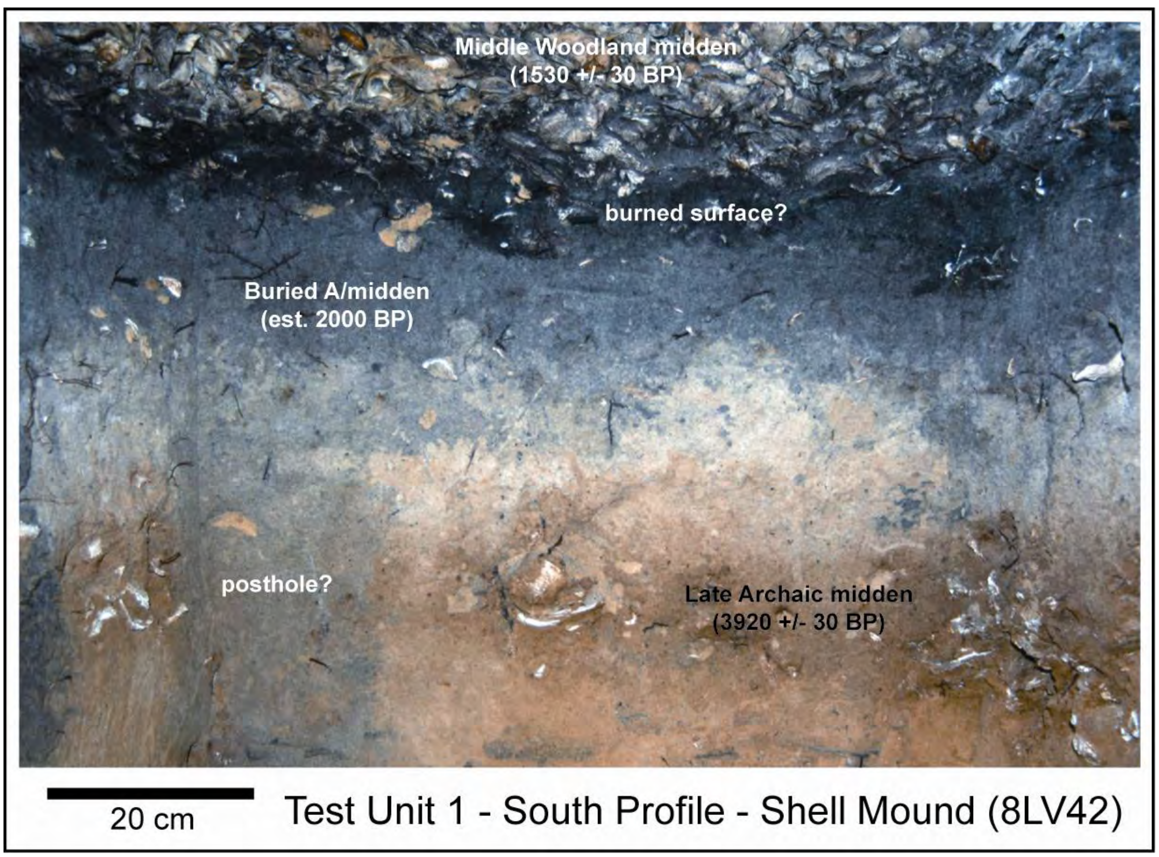

Figure 2-9. Close-up view of the lower half of the south profile of Test Unit 1, Shell Mound, showing stratigraphic features discussesd in text. Note that the left and right margins of this view show the east and west profiles, respectively, of TU1.

2500 B.P. contributed organic matter to the surface, and some subsurface features, such as the probable posthole seen in Figure 2-9. The burning of this surface, however, must have proceeded immediately the deposition of shell midden on the surface, which appears to date no earlier than ~A.D. 400, because it is so well preserved (i.e., not subject to a lengthy period of surface exposure). To be clear, the buried A horizon and its associated material culture includes Deptford pottery, which puts occupation on this surface as early as 2500 B.P., but the burning of this surface and subsequent shell midden deposition is at least a few centuries later. The actual age of the Deptford component exposed in TU1 is needed to determine the duration between occupation, burning, and deposition of this surface. Unfortunately, secure contexts for dating the Deptford component were not observed in TU1.

Several pit features were encountered in the excavation of TU1, but only below the buried A horizon, in the light brown sand, were they recognized in plan. Most others were recognized in profiles, such as the probable posthole in the south profile (Figure 2-9), and the shell-filled pit in the north profile (Figure 2-7).

Two features observed in plan at the base of excavation are shown in Figure 2-10. Feature 1 is a shallow, flat-bottomed basin filled with large, degraded oyster shell, some whole scallop, and occasional gastropod, as well as a small bit of vertebrate fauna. In plan the feature measures about 40 x 70 cm and is about 15 cm deep from base of Level K (165 cmbd). The fine sandy matrix of the feature fill is a yellowish brown (10YR5/4), similar to the matrix of Str. IX, the Late Archaic midden. It seems likely that Feature 1 originated at the top of this stratum (~140 cmbd), putting its actual depth at about 40 cm below the buried surface. Wood charcoal from a bulk sample of this feature returned an AMS age estimate of 3920 ± 30 B.P. (two-sigma calibrated range of B.C. 2470–2300). The feature contained no diagnostic material culture.

Feature 2 is possible posthole measuring 13 x 17 cm in plan at the base of Level K (165 cmbd) filled with a grey (10YR5/1) fine sand with oyster shell and vertebrate fauna. Diagnostic material culture was not recovered from this feature, nor was it radiometrically dated. Feature 2 extends only 10 cm into the substrate (~175 cmbd), but it likely originated from the buried A horizon above, giving it a possible depth of ~40 cm. Stratum XIII in the west profile of TU1 may in fact be a marginal remnant of this feature. If it originated from the buried A, Feature 2 would be Deptford age, perhaps younger. However, because this feature penetrated the Late Archaic stratum below, some of the oyster shell and vertebrate fauna in its backfill may have been displaced from this earlier deposit. Thus, the content of Feature 2 should not be regarded as a reliable sample of any particular component.

Test Unit 2

Positioned about half-way up the slope of the mining cut, Test Unit 2 (TU2) consisted entirely of unconsolidated, bedded oyster shell with moderate amounts of Pasco pottery, vertebrate fauna, and *Melongena corona* shell hammers throughout. Given the steepness of the slope into which TU2 was excavated, the first two levels were taken out

Figure 2-10. Plan view of Feature 1 and 2 at base of excavation of Test Unit 1, Shell Mound (8LV42).

in wedge-like fashion to bring the upslope elevation down to that of the downslope surface (Figure 2-11). Excavation thereafter continued in 20-cm arbitrary levels to depth of ~210 cmbd. Figure 2-12 provides photographs of the profiles of this unit, and Figure 2-13 provides scaled drawings of the same. Descriptions of the strata mapped in Figure 2-13 are provided in Table 2-3, and an artifact inventory in Table 2-4.

Figure 2-11. View facing west of excavation of Test Unit 2, Shell Mound (8LV42).

The upper stratum (Str. I) across the entire unit consisted of redeposited oyster shell in a very dark grey fine sand matrix. Below that the matrix consists of bedded oyster shell with little to no soil matrix except in Str. III, which contained dark brown fine sand. Bulk samples were taken from this stratum and the strata above (Str. II) and below (Str. IV). Charcoal samples from Str. II (Bulk 2) and III (Bulk 3) returned virtually identical age estimates of 1480 ± 30 B.P. (two-sigma calibrated range of 540–640 A.D.) and 1440 ± 30 B.P. (two-sigma calibrated range of 570–650 A.D.), respectively. These estimates are in accord with that obtained from charcoal in the shell-filled pit in the north profile of TU1, and only slightly later than the age estimate from charcoal of Str. V in TU1. Taken together, the four assays on charcoal from shell strata fall within a roughly two-century period (A.D. 430-660) at the two-sigma range of variation. A line connecting the maximum depth of the excavation of TU2 to the bottom of shell in TU1 parallels the current surface slope, so a common age for these buried strata is not surprising. It remains to be seen if shell strata below the depth of excavation of TU2 predate this date range, although they should barring any reverse stratigraphy.

Figure 2-12. Photographs of the four profiles of Test Unit 2, Shell Mound (8LV42), from upper left and moving clockwise: north, east, west, and south. Note that the east and west profiles were photographed at an oblique angle from the ground surface, whereas the north and south profiles were photographed from a direct perspective, inside the unit.

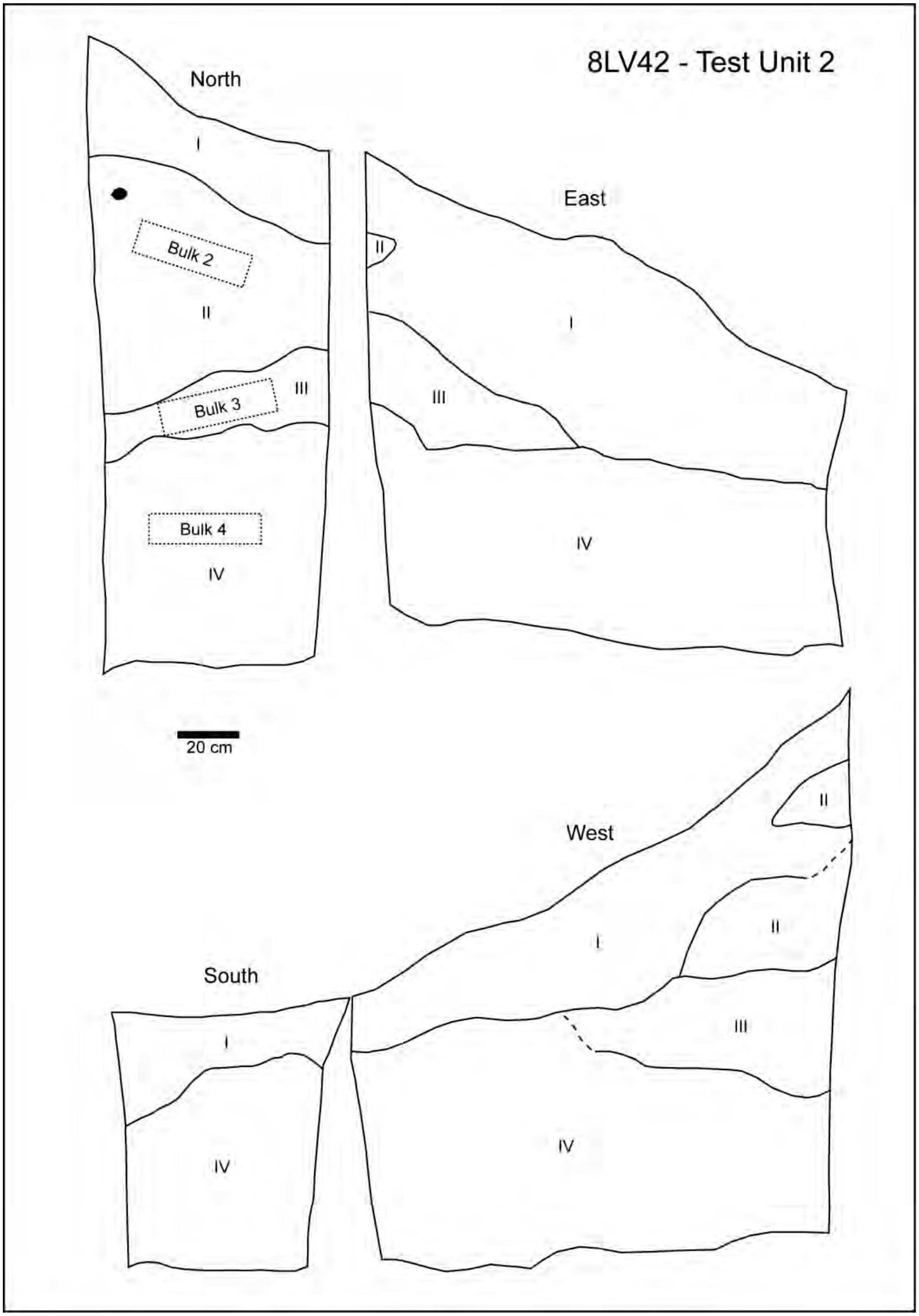

Figure 2-13. Stratigraphic drawings of the profiles of Test Unit 2, Shell Mound (8LV42).

Table 2-3. Stratigraphic Units of Test Unit 2.

Stratum	Max. Depth (cm BD)	Munsell Color	Description
I	153	10YR3/1	Very dark grey fine sand with abundant oyster shell
II	141	-	Bedded oyster shell with little to no soil matrix (Bulk 2: 1480 ± 30 B.P.)
III	143	10YR4/2	Dark gray brown fine sand with abundant oyster shell (Bulk 3: 1440 ± 30 B.P.)
IV	213	-	Bedded oyster shell with little to no soil matrix

Table 2-4. Artifact and Vertebrate Fauna Inventory by Level for Test Unit 2, Shell Mound (8LV42).

Test Unit 2 Level	Pottery Sherd (n)	Lithic Flake (n)	Shell Tool (n)	Vertebrate Fauna (g)
A	5			82.8
B	33	1	6	560.1
C	9		4	197.2
D	7		2	115.5
E	4		6	186.1
F	12		5	203.2
G	1			0.0
Total	71	1	23	1344.9

The only other observation worth noting at this point is that the bedding planes of shell observed in the north profile of TU2 generally dip to the west, as they do in TU1. In some portions of the profile shell appears to be cross-bedded, although in some cases these may be relatively minor post-depositional disturbances, such as tree roots or animal burrows. No matter the orientation of deposition, it would appear that the rate of deposition was relatively quick. With the exception of clastic material in Str. III, oyster shell and associated artifacts and faunal remains accumulated without the addition of significant sediment or the formation of soils.

Discussion

Two small windows into the massive deposit of shell that is Shell Mound are hardly grounds for making definitive statements about the depositional history of the site. Nonetheless, TU1 successfully intercepted both mounded shell and a submound sequence that includes a buried A horizon/midden and a deeper Late Archaic stratum. An annotated version of the north profile of TU1 is useful in summarizing the sequence (Figure 2-14).

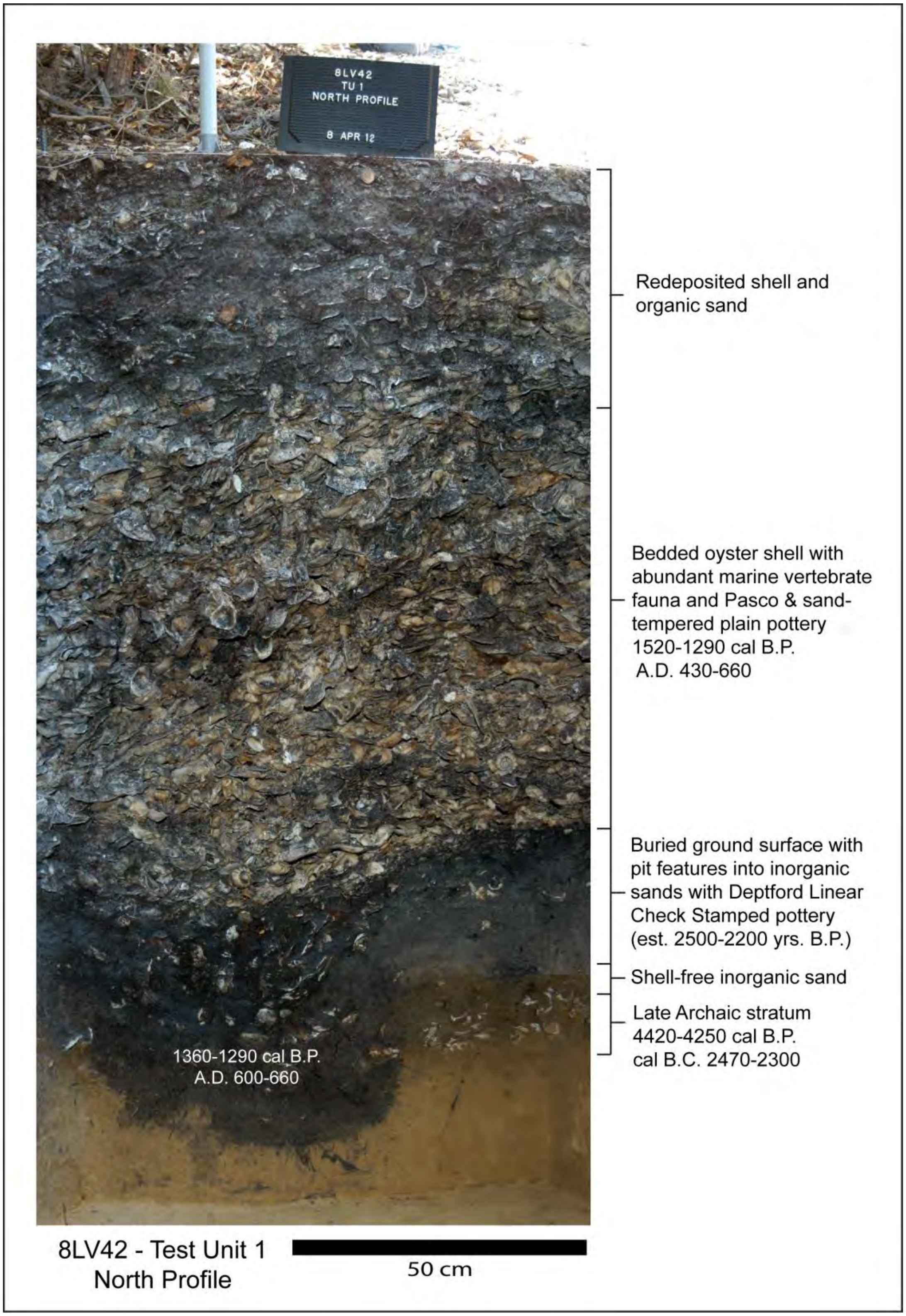

Figure 2-14. Composite photograph of the north profile of Test Unit 1, with notations on stratigraphic structure and estimated age in radiocarbon years before present. Depth of profile is ~180 cm below the surface.

Starting at the bottom of the sequence and working upwards, towards the present, TU1 reveals a Late Archaic stratum in excess of 4,200 years old, with large oyster shell, some scallop shell, and no pottery. Strata of this age and composition have been observed at other sites in the study area, and they are consistently capped with sand. The genesis of this sand remains to be determined, but it is likely pedogenic, and thus indicative of a long period of landform stability. The degraded nature of oyster shell and largely inorganic sandy matrix in which it is contained likewise attest to prolonged, near-surface weathering, and most likely well-drained soil conditions. Much more sampling of this stratum is needed before we can begin to characterize the occupation, although the presence of at least one subterranean feature (Feature 1) suggests more than just transient use of the site.

The sand overlying the Late Archaic stratum in TU1 contains Deptford pottery and thus evidence for a second occupation estimated to date 2500–2200 B.P. Secure contexts for radiometrically dating this occupation did not present themselves in TU1, but are likely to be found with additional excavation. Some of the features apparent in the sand may date to the Deptford period. Others, like the shell-filled pit in the north profile, emanate from the base of the shell, if not higher, and postdate the Deptford period by several centuries. Just prior to the onset of shell deposition, the surface of this sandy stratum was either burned (and presumably vegetated), or the recipient of charcoal from burning elsewhere. We do not know how well developed, if at all, the soil column was in this sand stratum before shell was deposited on top, although it has the appearance of an A horizon, and thus we refer to it as a "buried A." Because this horizon was enhanced by anthropogenic organic inputs, we are justified in calling it a buried midden as well. What remains to be determined is if any of this anthropogenic input took place during the Deptford period, after the sand was in place, or if it comes from the percolation of overlying midden, which formed several centuries after Deptford times.

Oyster shell with other faunal remains and Pasco pottery began to accumulate on the surface at about A.D. 400 or slightly later and continued over at least a couple of centuries to form the mantle of mounded shell that comprises the outer and upper portion of the south ridge. Mounded shell midden in the north profile of TU1 is bedded consistently with a dip to the west. The entire profile of TU2 consists of bedded oyster shell, much of which conforms to the dip of shell in TU1. Pottery recovered throughout the bedded shell in both units consists largely of Pasco pottery, along with a trace of St. Johns and sand-tempered plain wares.

In sum, testing of the exterior slope of the southern aspect of the shell ridge succeeded in exposing the lower 3 m of the outer margin. Mounded shell, nearly all oyster, exists in large macrounits with subunits divisible on the basis of variation in sand, organic matter, and vertebrate fauna. Associated diagnostic artifacts consist exclusively of Pasco and sand-tempered plain sherds estimated to date ca. 1520-1290 yrs. B.P. It would appear that the shell and associated materials accumulated in lobes several meters in plan, and perhaps up to 1.5 meters in height. Sufficient densities of vertebrate fauna, charcoal, ashy sediment, and broken artifacts exist to support the inference that the shell ridge matrix consists of the residues of intensive habitation. However, no thermal features, living surfaces, or architecture features were observed in the upper shell. In contrast, strata beneath the shell contain an assemblage of diverse features, some apparently dating to the Deptford period, but others Late Archaic in age. Testing in the interior opening of Shell Mound, to which we now turn, suggests that evidence for occupation dating to the time shell accumulated over these earlier components may be found elsewhere.

TESTING OF INTERIOR OPENING OF SHELL MOUND

Seven bucket augers and a single 1 x 1-m test unit initiated the testing of the interior opening of Shell Mound in 2012. As discussed in Chapter 1, this opening was long regarded as the consequence of shell mining: that literally the heart of Shell Mound was dug out and carted away. This is hardly the case as the results of augering and excavation—even at this early stage of testing—document an intact interior midden that actually postdates by a short period the accumulation of shell at the south ridge.

Augering

Four augers were sunk roughly 10 m apart along a transect connecting the apex of Shell Mound with the small sand-and-shell mound located at the southeast opening of the arcuate ridge (Figure 2-1). Another three augers were sunk in a transect oriented oblique to the first, following a crease in the surface topography of the opening. Elevations in this area range about 1.5–2 m lower than the surface elevation of TU1. The depth of the water table in all augers was ~60–70 cm below the surface.

As noted earlier, all augers sunk in the interior opening encountered an upper, organically enriched stratum with sparse oyster and occasional traces of vertebrate fauna and pottery. Augers positioned closest to the inside perimeter of the shell ridge expressed the greatest density and diversity of material, although we hasten to add that our sample at this stage is small. We suspect that houses and household middens were distributed along the interior edge of the opening. The central portion of the interior opening may have been devoid of structural evidence and associated middens, although none of the augers in this space was entirely bereft of cultural material.

Given the consistency of the profiles of each of the augers, it is highly unlikely that the interior opening of Shell Mound was once part of a massive core that was later mined for shell. None of the augers expressed stratigraphic unconformities consistent with truncation, and all contained a near-surface horizon with sufficient pedogenic development to attest to relatively long-term stability. Certainly the interior opening of Shell Mound has been flooded by storm surge, but it has not been scoured by erosion.

Test Unit 3

To examine a portion of the interior edge with relatively high density of archaeological materials, a single 1 x 1-m unit was excavated at the northwest end of the opening (Figure 2-15). An annotated photograph of the east profile of Test Unit 3 (TU3) is shown in Figure 2-16. Scaled drawings of all four profiles of TU3 are provided in Figure 2-17, and descriptions of the strata of these profiles are provided in Table 2-5. An inventory of artifact and vertebrate fauna recovered from TU3 can be found in Table 2-6.

As seen in the east profile of TU3 (Figure 2-15), a ~25-cm-thick anthropogenic soil (i.e., midden) lies just below the surface and is underlain by a medium gray-brown sand substrate. The density of pottery and lithic artifacts (flakes, a core) in this small test unit is far greater than in either of the test units in the shell ridge. As with the shell ridge, Pasco plain pottery is common, suggesting that the formation of anthropogenic soil in the interior was roughly coeval with the accumulation of shell. Deptford pottery was absent in TU3. A recent disturbance in the southeast corner of TU3 (outlined by dashed line in Figure 2-15) contained some blue plastic material. Most of the unit appears intact, however, and a bulk sample from the northeast corner contained charcoal that produced an AMS age estimate of 1340 ± 30 B.P. (two-sigma calibrated range of A.D. 650–760).

Figure 2-15. View facing north of Test Unit 3, Shell Mound (8LV42).

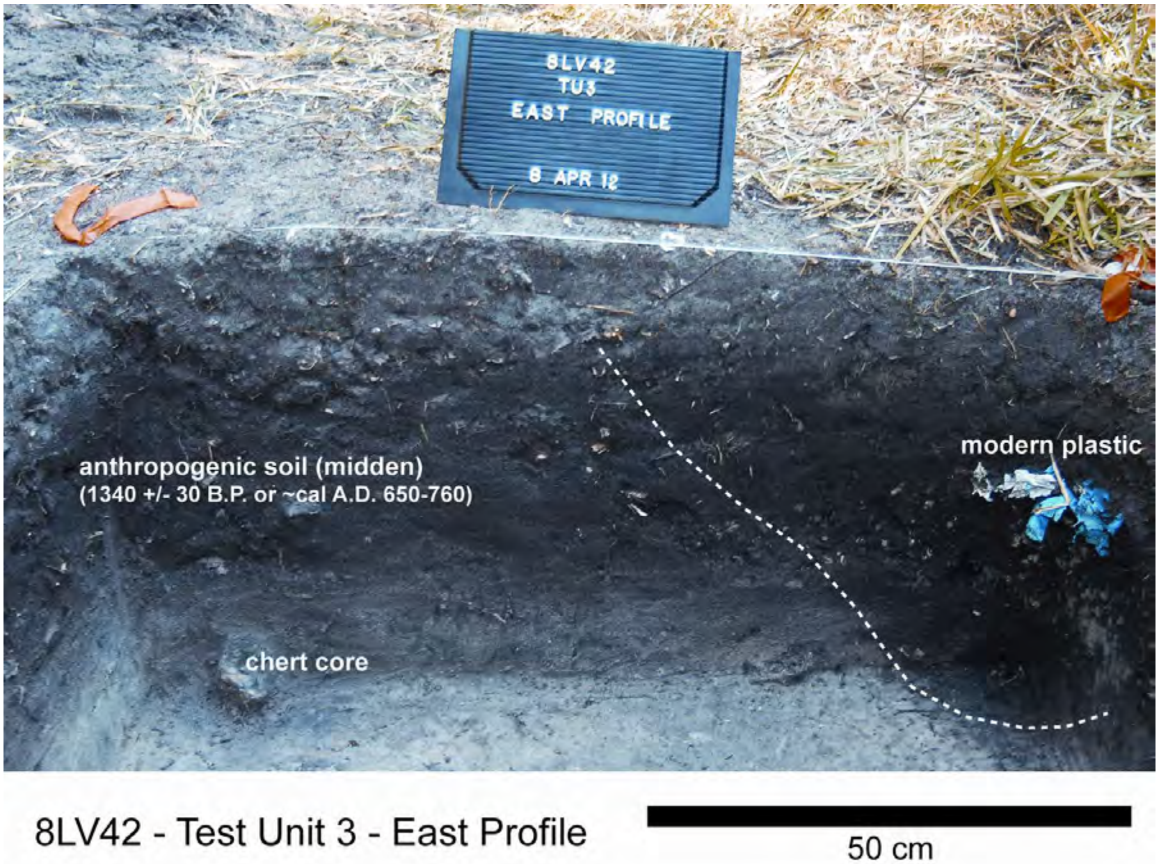

Figure 2-16. Photograph of east profile of Test Unit 3, in the interior opening of Shell Mound (8LV42). An apparent intrusive feature in the southeast corner contained modern refuse (plastic) in its fill. A chert core is shown at the base of the unit in the northeast corner, just below an anthropogenic soil (i.e., midden).

Additional testing and radiometric assays are needed before we can assess the chronological relationship of this midden to the shell ridge, but for now it would appear to be on the latter end of the time range represented by radiometric assays from charcoal in the shell ridge. Unlike stratigraphy under the south ridge, the TU3 profile contains only one archaeostratigraphic unit. This unit is the equivalent of the buried A horizon under the ridge. Evidence that this surface was burned or received large quantities of shell—as in the manner of the south ridge—was not observed in any of the augers or in TU3.

Short of the modern disturbance involving blue plastic, no cultural features were observed in the excavation of TU3. However, concreted sand and shell in the southwest corner of the unit (Str. IIIa), starting about ~40 cmbd, may prove to be the outcome of thermal activity (e.g., a hearth) from above. Likewise, other structural anomalies in the profiles of the midden soil may signal the presence of pit features. Clearly the midden itself attests to intensive human activity, and, again, the density of material culture in this stratum is the highest yet observed at Shell Mound. Additional testing of the interior opening of the site is certainly warranted.

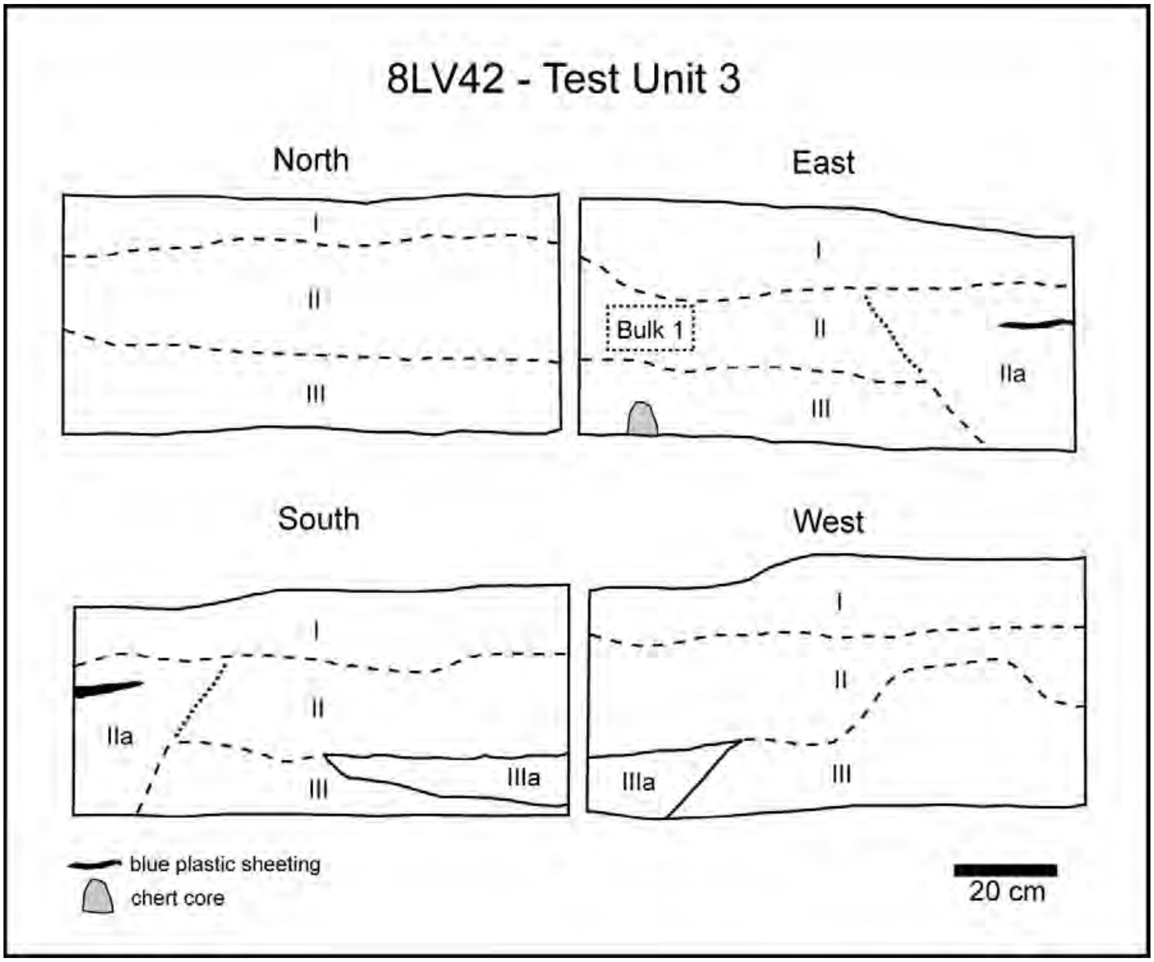

Figure 2-17. Stratigraphic drawings of the profiles of Test Unit 3, Shell Mound (8LV42).

Table 2-5. Stratigraphic Units of Test Unit 3.

Stratum	Max. Depth (cm BD)	Munsell Color	Description
I	22	10YR3/1	Very dark grey fine sand with abundant small roots
II	41	10YR2/2	Very dark brown fine sand with low density oyster shell (Bulk 1: 1340 ± 30 B.P.)
IIa	55	-	Recent intrusive feature with modern plastics
III	55	10YR6/3	Pale brown fine sand without shell
IIIa	55	-	Concreted fine sand and oyster shell

Table 2-6. Artifact and Vertebrate Fauna Inventory by Level for Test Unit 3, Shell Mound (8LV42).

Test Unit 3 Level	Pottery Sherd (n)	Lithic Artifact (n)	Shell Tool (n)	Vertebrate Fauna (g)
A	41			9.4
B	70	5	2	38.8
C	41	3	4	78.6
D	19	2	3	90.8
E	8	2	1	44.0
Total	179	12	23	261.6

In sum, nothing observed in limited testing of the interior opening of Shell Mound would suggest that this portion of the site has been impacted by anything other than small-scale digging and the natural disturbances of vegetation, burrowing creatures, and perhaps erosion. The density of cultural material in TU3 lends support to the argument that houses, or at least household middens, were situated in semicircular fashion around the interior edge of the U-shaped shell deposit. If indeed this were the case, occupation of the open interior must have taken place during times of lower sea level. In augers across this area, the water table was observed as shallow as 60 cm below the surface, and near-surface soils in the lowest portion of the area (i.e., the very center) were very moist.

CONCLUSION

Shell Mound is a large site with complex above-ground shell deposits; buried, submound middens; and an interior near-surface midden of a probable village. No doubt a site of this size and complexity has much more archaeological variation to reveal. Our modest look into one small part of the shell ridge and one small place in the interior opening can only begin to document the variation in content, structure, and age of archaeological deposits this site encases. As closure to this chapter we provide some preliminary insights on the results to date as a basis for expanding operations in the near term.

Focusing first on the defining features of the site—the shell ridge and its interior opening—we reiterate our confidence that the site is more-or-less intact, or at least not severely compromised by modern land use and alteration. The interior opening, in particular, is not the consequence of shell mining. Certainly the shell ridge has been impacted by shell removal, but apparently at a small scale. In plan, the shell ridge has decidedly nodal qualities, although each of the creases in the sideslopes of the ridge must be evaluated for modern disturbance before we begin to subdivide the mound into components. For now we can only comment on the mounded shell on the outer edge of the south ridge, which indeed was compromised. As we had hoped, portions of the mound surviving shell removal in the 1970s offered a view deeper into the mound than would otherwise be possible with small test units. The stratified, mounded shell of both units that we placed in this impacted area of the south ridge was not only intact, but rife with material culture and vertebrate fauna. That we did not find any evidence of architecture or surface features in the mounded shell is perhaps no surprise given the slope we dug into. The sort of stratigraphic breaks that Bullen and Dolan (1960) observed may be restricted to mound-top surfaces that were more-or-less level. Notably, the upper 2 m of shell midden Dolan unearthed conforms in general description to the dipping, bedded shell midden we uncovered in the south ridge.

Are those sideslope deposits we observed the gradually accumulated midden of ridge/mound-top dwelling? Perhaps, but we also have good reason to believe that the interior opening of Shell Mound housed a village. The two scenarios for dwelling are not mutually exclusive, of course. No matter the arrangement, the archaeological content of the shell ridge and interior opening middens we have sampled vary wildly in density and diversity. As seen in Table 2-7, the small test unit in the interior opening (TU3) yielded a density of pottery sherds at least six and as much as 10 times the density of sherds in the shell ridge units (TUs 1 and 2). The difference here, of course, is the high volume of shell in the ridge. If we take away the shell and collapse the pottery into an equivalent density as seen in TU3, then ~8 m^3 of oyster shell accumulated in the ridge during the time it took pottery to accumulate in the TU3 midden. Multiply that equivalent by the total area of the interior village and we would have tens of thousands of cubic meters of shell. Such extrapolations, though promising, must await better data.

Almost all of the lithic artifacts we found came from the interior opening. Shell tools are equally dense in the two contexts, as is the density of vertebrate fauna by weight. In this latter case, the lesser preservation potential of the interior opening may be biasing these figures. On balance the two contexts are distinct enough to warrant hypotheses about functional differentiation. As the data now allow, an interior village dating to about A.D. 700 would postdate the deposition of shell along the outer slope of the south ridge by about a century. We are mindful that the south ridge was partially mined, so the seemingly earlier age for its shell may speak more to a prior chapter in mound accretion that to the final form and incidence of ridge deposition.

The strata beneath mounded shell of the south ridge are especially intriguing for what they have to say about conditions at the site before shell was mounded. Were prior occupations arranged in a circular or semi-circular fashion, in anticipation of what was to later become a ridge? What do the respective occupations of Shell Mound over a ~3,000-year period say about changes in the local environment, and the regional landscape?

Table 2-7. Comparison of Density of Archaeological Materials in Test Units of Shell Mound (8LV42).

Unit	Pottery Sherd (n/m^3)	Lithic Artifact (n/m^3)	Shell Tool (n/m^3)	Vertebrate Fauna (g/m^3)
TU1 (3.30 m^3)	48.8	0.3	17.9	499.1
TU2 (2.50 m^3)	28.4	0.4	9.2	538.0
TU3 (0.55 m^3)	325.5	21.8	18.2	475.6

The first challenge in addressing these questions is to establish the full horizontal extent of the submound deposits. As detailed in the closing chapter of this report, we intend to conduct a program of stratigraphic excavation around the entire perimeter of the shell ridge, inside and out. Depending on these results, we may have to expand excavation outward from the shell ridge. We have seen enough of the subsurface of the interior opening of Shell Mound to suggest that Deptford and Late Archaic deposits are not to be found there. If the final form of Shell Mound was anticipated by a semicircular pattern of settlement, then its history was contingent of a seemingly "discontinuous" sequence of occupation, a matter of social memory, not literal practice.

Our radiometric dating of Shell Mound, thus far, has been without great surprise. Documenting the older presence beneath the mound brings something new to narratives about the site, but the Middle Woodland age for the ridge and the presumed interior village squares with evidence elsewhere in the immediate area for intensive occupation of the Shell Mound tract ca. A.D. 200–600. As we discuss further in Chapter 5, the mounding of shell and interior village at Shell Mound may actually trace to a consolidation of settlement around this largest of arcuate sites after about A.D. 400. With a history that traces back many centuries before, Shell Mound may have been something of a gravitational field of cultural capital.

CHAPTER 3
MATERIAL CULTURE

Shell Mound is not rich in elaborate material culture, which helps to explain why it is still standing. The nearby Hog Island mortuary has been largely destroyed by haphazard digging. Its inventory of human remains, hundreds of whole and broken pots, and exotic materials like galena, copper, and greenstone provided strong incentive for antiquarians and looters alike to dig with reckless abandon. Perhaps spurred by the "rewards" of Hog Island, a spate of looting at Shell Mound reportedly ensued after limited shell mining in the late 1970s, but, thankfully, those involved must have been disappointed.

Test excavations into Shell Mound in 2012 shows that despite the lack of elaborate or exotic material culture, the site encases an appreciable inventory of artifacts indicative of everyday living. Plain pottery, shell tools, and the by-products of flaked stone technology were recovered from all test units. The frequency of these materials in the shell ridge is swamped by the sheer volume of oyster shell, but the interior opening of the ridge, which contains little shell, exhibits a relatively high density of material.

This chapter provides a review of artifacts collected in all tests units excavated in 2012 at Shell Mound. The review is divided by material, starting with pottery, then stone, and finally shell. Because the ¼-inch fraction of vertebrate faunal remains has yet to be analyzed, we may be overlooking at this point modifications to bone for technological purposes. Future analyses will aim to rectify this shortcoming.

POTTERY ASSEMBLAGE

An assemblage of 411 pottery sherds was recovered from our 2012 test units at Shell Mound. About one-quarter (*n* = 106) of the assemblage consists of sherds less than ½-inch in maximum dimension, listed in Table 3-1 as "crumb" sherds. The balance of the assemblage can be classified by a number of criteria, such as culture-historical type (e.g., Deptford, Weeden Island), or surface treatment (e.g., check stamped, punctuated). Our recent experience with pottery assemblages in the study area compels us to privilege temper type as the primary sorting criterion. Common temper types in the study area include fiber, sand, limestone, and sponge spicule. In many cases, temper types covary with attributes such as surface treatment and vessel form, and certain tempers have limited temporal spans and are thus good time markers. However, there is also considerable independence among some of these attributes, and some temper types were so long-lived as to make their chronological value limited. Despite these caveats, the advantage of using temper to sort pottery is that it is readily identified, despite the size and condition of sherds. Even crumb sherds can classified by temper type, making them useful for comparisons of taphonomic variables, like degree of communition.

As seen in Table 3-1, the vast majority of sherds in the assemblage (*n* = 359 or 87.3%) are tempered with limestone. Forty-seven sherds (11.4%) are sand tempered, and a spicule-tempered sherds occur in trace quantities (*n* = 7 or 0.2%). Each of these groups is described in turn below.

Table 3-1. Absolute Frequency of Pottery Sherds Recovered in Test Excavations of Shell Mound (8LV42), by Unit Level, Temper Type, and Condition.

	------Limestone------		--------Sand--------		Spicule	
Unit/Level	Sherd	Crumb	Sherd	Crumb	Sherd	Total
Test Unit 1						
A	15	14	2	7		38
B	21	13	1			35
C	18		1			19
D	9	4	3			16
E	7	7				14
F	6	4				10
G	7	1	1			9
H	2		10[a]	6		18
I		1		1		2
Total	*85*	*44*	*18*	*14*		*161*
Test Unit 2						
A	5					5
B	24	9			2	33
C	5	3	1			9
D	6	1				7
E	4					4
F	10	2				12
General	1					1
Total	*55*	*15*	*1*		*2*	*71*
Test Unit 3						
A	25	14			2	41
B	55	10	3		2	70
C	29	5	5	2		41
D	16		2	1		19
E	5	1	1		1	8
Total	*130*	*30*	*11*	*3*	*5*	*179*
TOTAL	270	89	30	17	7	411

[a] nine Deptford sherds, including one large rim sherd; possibly from same vessel

Limestone-Tempered Sherds

Limestone was used as temper in various parts of the southeastern U.S. In Florida, limestone tempered pottery is found primarily at sites along the peninsular gulf coast north of Tampa Bay. Defined as Pasco by Goggin (1948), limestone-tempered pottery has been found at virtually all sites in the project area. Another pottery series known as Perico (Willey 1948:364-365) is found at sites from Tampa Bay southward along the gulf coast, and is distinguished from Pasco by the addition of sand, as well as limestone, and surface treatments that include incising and punctuation. The chronological position of both of these wares is not well documented.

Figure 3-1. Examples of pottery sherds recovered from test excavation of Shell Mound (8LV42): limestone-tempered Pasco Plain (a-k), spiculate-tempered St. Johns Plain (l), and sand-tempered Deptford Linear Check-Stamped (m). (a-g. TU3, Level B; h, k. TU1-Level G; i, j. TU1, Level C; l. TU3, Level B; m. TU1-Level H).

Examples of Pasco sherds from Shell Mound are shown in Figure 3-1. Apparent in the photograph of these sherd are the characteristic white inclusions of Pasco pottery. Because they are subject to chemical weathering and hydration, limestone inclusions are sometimes missing from Pasco sherds, leaving a porous body such as the example in Figure 3-1c. Researchers have commented on the liabilities of using limestone for temper (e.g., Mitchem 1986:70), and suggested that limestone inclusions may have been incidental to clays. It is true that inclusions are often irregular in size and shape, but that is only a disadvantage in shaping a vessel and smoothing its walls. That limestone dissolves or even "pops" when heated to high temperature (Rye 1976:120-121) is only a disadvantage if vessels were used routinely for liquid-based cooking. Citing Joan Deming (1975), Mitchem (1986:70-71) suggested that much of the presumed limestone of Pasco pottery is actually Fuller's earth, a silicate clay. He notes that inclusions of many Pasco sherds from Florida sites did not effloresce with 5-10% hydrochloric acid, which would be expected of the calcium carbonate of limestone. However, in a recent study of Pasco sherds from sites in the Lower Suwannee region, O'Donoughue (2009) observed reactions on 28 of 30 sherds treated with acid. It would appear that the vast majority of Pasco pottery in the study area, including that from Shell Mound, was indeed tempered with limestone.

Little can be said of the size and shape of Pasco vessels from Shell Mound due to the generally small size of the sherds. In his study of collections from across the study area, O'Donoughue (2009) documented an average vessel wall thickness of 8.6 ± 1.5 cm (*n* = 103) and an average vessel orifice of 25.2 ± 8.0 cm (*n* = 29) inside diameter. Vessels almost always have direct rims, and very few show signs of use over fire. Surface treatments are plain, with many only barely smoothed to remove the irregularities of forming. Coil breaks are not uncommon. Lips are simple, usually rounded and sometimes flattened.

The assemblage of Pasco sherds from Shell Mound fits comfortably in the range of metric and technological variation documented by O'Donoughue (2009). Larger assemblages of sherds from Shell Mound are needed before we can infer anything definitive about vessel size and shape, but for now it appears that direct rim bowls and/or jars of moderate size are common. Aside from the usual coil breaks of body sherds, one small basal sherd from Level A of TU2 shows that coiling was used to initiate wall construction. None of the Pasco sherds in the collection bear surface treatments other than smoothing, although a few are barely smoothed and still retain evidence of coil manufacture. None of the Pasco sherds from Shell Mound bears traces of exterior soot or interior residues.

Pasco sherds at Shell Mound are distributed widely across excavation units and levels within units. No levels containing pottery are absent of Pasco sherds, and with the exception of Level H in TU1 (which produced mostly sand-tempered sherds), Pasco sherds are always the dominant type. Bullen and Dolan (1960) likewise report a dominance of Pasco sherds (*n* = 352 or 94.1%) in the 10 x 10-ft unit Dolan excavated at the summit of the shell ridge. Three Pasco sherds in the assemblage he recovered had surface treatments other than plain or smoothed: one burnished, one cordmarked, and one "scored" (Bullen and Dolan 1960:21). As noted in Chapter 2, Bullen and Dolan (1960:20) report a stratigraphic break at 50–60 inches below the surface in the profile, indicative, they suggest, of a possible "occupation zone." The density of Pasco pottery in the 4-5-ft level (~270 sherds/m^3) is comparable to the density we observed in TU3, in the interior opening (although we hasten to add that it is unknown whether Dolan screened any of the fill of his test unit).

The dating of Pasco pottery remains problematic, but we are beginning to appreciate that it lasted a long time in the region. Age estimates for strata at Shell Mound with Pasco sherds puts the ware in the range of cal. A.D. 400–760. At Little Bradford Island at the mouth of the Suwannee River, we have observed Pasco pottery in association with Deptford, Swift Creek, and early Weeden Island wares in a 40-cm-thick midden with a calibrated basal age range of cal. A.D. 20–330 (Sassaman et al. 2011). Pasco pottery appears to increase in frequency towards the top of this midden. At the shell ring at the north end of Deer Island (8LV75), Pasco sherds were found in association with Deptford pottery in strata estimated to date cal. 180 B.C.–A.D. 80 (Monés et al. 2012).

In a report of survey in Dixie County, Kohler and Johnson (1986) opined that Pasco pottery was out of vogue by the end of Deptford time and beginning of early Weeden Island times (~A.D. 200), but this clearly was not the case in the study area. In fact, as Wallis and McFadden (2013) have observed at Garden Patch, near Horseshoe Beach, Pasco pottery appears to increase in frequency *after* the Deptford period. Our results to date from Shell Mound corroborate that assessment, but work elsewhere in the study area also shows that Pasco dates back to at least ~100 B.C. and thus may have been made and used for nearly a millennium.

Sand-Tempered Sherds

Sand occurs in the pastes of many pottery types in Florida, even in wares with other, more distinctive tempers, such as fiber and limestone. It is thus not very diagnostic, especially when occurring on vessels with plain surface treatments. A total of 37 sherds in the Shell Mound assemblage from 2012 test units have sand temper to the exclusion of other temper types, and they were found in all units, although TU2 produced only a single example. All but nine sand-tempered sherds in Level H of TU1 are either plain or eroded on exterior surfaces.

The nine exceptions are sherds of Deptford Linear Check Stamped. Contained in the inorganic sands immediately above the Late Archaic shell stratum in TU1, all the Deptford sherds in Level H may have come from a single vessel. The large rim sherd shown in Figure 3-1m is from a vessel with a direct rim and inside orifice diameter of 26 cm. Wall thickness at 3 cm below the lip is 9.3 mm. The definitive style of linear check-stamping was applied to this vessel oblique to the rim, and the lip is also stamped. Although the rim is not tall enough to estimate the height of the vessel, it is most likely a straight-walled jar.

The Deptford period in the greater northern Gulf Coast area is thought to date from roughly 500 B.C. to A.D. 200. However, we simply do not have many radiometric dates for this type of pottery, and the similarity between certain varieties of Deptford and later Wakulla Check Stamped renders the temporal specificity of check stamping suspect. When Deptford is found in the absence of Swift Creek pottery, it most likely predates A.D. 1. Its association with either Pasco or St. Johns wares is not very insightful, however, because these types may actually predate, as well as postdate the Deptford era. On stratigraphic grounds alone, the recovery of Deptford pottery at the base of Shell Mound attests to an earlier timeframe than the overlying Pasco pottery.

Spiculate-Tempered Sherds

Sherds with sponge spicules in the paste define the St. Johns tradition of northeast Florida. Occurrences of St. Johns pottery outside this region have long-been regarded as evidence of trade, but that is not necessarily the case, especially in places like the central and northern Gulf coast of Florida, where St. Johns pottery is common (Mitchem 1986).

Only seven sherds of spiculate-tempered pottery were recovered from the 2012 test units of Shell Mound; Bullen and Dolan (1960) report another 13 St. Johns sherds from the unit at the summit. Despite the limited number of specimens in both projects, St. Johns sherds appear to be associated with late-period strata. In the mound summit excavation they were restricted to the upper levels, above the stratigraphic break that Bullen and Dolan (1960:20) regard as an "occupation zone." The only St. Johns sherds we recovered from the shell ridge units were from Level B of TU2. They were most frequent (although still a minority) in the TU3 midden, the latest archaeological deposit thus far dated at Shell Mound. The only sizeable sherd of St. Johns ware recovered in 2012 came from Level B of TU3 (Figure 3-11). Like all other St. Johns sherds recovered in 2012, this rim sherd is plain. Bullen and Dolan (1960:21) report two "painted" sherds with spiculate paste: single examples each of Dunns Creek Red and St. Johns Red on Buff. These varieties are relatively late in the sequence, whereas plain St. Johns pottery can be as old as 1500 B.C. and as late as the 16th century. Given its consistently superior stratigraphic position, St. Johns pottery at Shell Mound postdates A.D. 400, but we have other contexts in the study area that suggest much earlier occurrences for this ware too.

LITHIC ASSEMBLAGE

A small assemblage of flaked stone artifacts was recovered from the 2012 test excavations of Shell Mound (Table 3-2). Ten chert flakes, two pieces of chert shatter, and two chert cores were all that was recovered. Most of these items came from TU3, which lacked the volume of shell seen in TUs 1 and 2. Small flakes no doubt were often missed in the screening of shell matrix. Bullen and Dolan (1960:21) report 23 chert flakes in the assemblage from the mound summit, but all but two of these were found in the lower portion of the unit, which contained less shell and more soil.

Irrespective of recovery bias, Shell Mound does not contain an abundance of flaked stone artifacts, and most of what we have seen to date comes not from formal tools such as hafted bifaces, but from amorphous flake cores, such as the one found in Level E in TU3 (Figure 3-2).

Table 3-2. Absolute Frequency of Flaked Stone (Chert) Artifacts Recovered in Test Excavations of Shell Mound (8LV42), by Unit Level and Morphological Type.

Unit/Level	Flake	Shatter	Flake Core	Total
Test Unit 1				
B	1			1
Test Unit 2				
B		1		1
Test Unit 3				
B	4		1	5
C	2	1		3
D	2			2
E	1		1	2
Total	10	2	2	14

Figure 3-2. Amorphous chert flake core (494.1 g) from Level E of Test Unit 3, Shell Mound (8LV42).

Like most of the flaked stone recovered from Shell Mound, the large core from TU3 is a low-grade chert with limestone cortex and numerous irregularities in the fabric of the rock. Material such as this is not terribly conducive to the production of formalized flaked stone tools, at least not large ones. Flakes struck from amorphous cores are generally short, wide, and thick. Amorphous flakes are useful as expedient tools and they serve perfectly fine as blanks for small bifacial and unifacial tools. The core shown in Figure 3-2 may have been subjected to heat to improve its flaking quality, but definitive evidence for heat-treating was not observed. Of the remaining flakes and shatter in the inventory, at least three and possibly two more were heat treated, as seen in the reddening and glossy sheen of flake scars. Several of the smaller flakes may have been removed from bifacial blanks, preforms, or tools, although none exhibit the distinction platform or flake morphology of a formal biface.

The only other lithic artifacts in the inventory from Shell Mound consist of occasional fragments of limestone with no apparent modification. These items may have been drafted into various uses on site, including the production of temper for Pasco pottery. They may have also been used as abraders and thermal media, although definitive evidence of any particular application was not observed. Limestone fragments were not routinely collected from the screen and have not been tabulated for this report. In general, the incidence of limestone in test units was low.

SHELL TOOL ASEMBLAGE

Inhabitants of the northern Gulf coast made a variety of tools from marine shell. Common to Shell Mound are “hammers” made from the shells of the crown conch (*Melongena corona*). Hafted adzes and hammers were also made from shells of *Busycon*, and a variety of nonspecific tools were crafted from shells of hard clams (*Mercenaria*), when available. Because the raw materials for these various tools come from species that were presumably collected to be eaten, we cannot always determine if any particular shell was drafted into use as a tool. Modifications such as perforation and the use wear of battering or cutting provide definitive evidence of use, but many such modifications are nonspecific and some relate to the extracting and processing of the shellfish for consumption.

An inventory of modified shell from test units at Shell Mound is given in Table 3-3. The columns labeled “Gastropod” are dominated by shells of the crown conch, all of which have at least one perforation of the whorl ands/or a notch in the margin of the aperture and most with substantial battering of the siphon end. Figure 3-3 provides some examples of this tool type. Luer et al. (1986) and Marquardt (1992) are credited with the typology that describes such crown conch tools as “Type G Shell Hammers.” A recent experimental study by Menz (2012) aimed to test the idea put forth by Marquardt (1992) that Type G hammers were expedient tools. Menz concluded that the majority of Type G hammers analyzed from the Roberts Island site near Crystal River were used to process oyster, and that they were not expedient but instead maintained and even recycled for alternative uses.

The degree of wear on the siphon end of crown conchs from Shell Mound is consistent with the notion that shells were modified for hafting and used to pound/hammer other shell, and perhaps bone and wood. However, the sheer number of such tools runs somewhat counter to the conclusion of Menz (2012) that tools were curated and thus enjoyed a relatively long use life. If indeed the tools were modified for hafting and maintained for effective use, we would not expect them to have short use lives and a high rate of replacement. Perhaps, as Menz notes, such tools may have been curated for longer periods of time when crown conch was not readily available, and in this sense the degree of curation would correlate positively with rarity of material. Like so many sites in the greater Lower Suwannee area, crown conch is abundant in middens, even if swamped by the more numerous oyster shell. Crown conch is a relatively high salinity species, like scallop, and thus not without habitat restrictions.

Type G hammers were recovered from virtually all levels of all units excavated at Shell Mound in 2012. Bullen and Dolan (1960:21) likewise report Type G hammers from all but the deepest level of their excavation. The tool type is truly ubiquitous at Shell Mound, as it is at many other sites in the area. It would appear to be most numerous in Woodland contexts, although it is known as well from Late Archaic sites.

Table 3-3. Absolute Frequency of Modified Marine Shell Recovered in Test Excavations of Shell Mound (8LV42), by Unit Level and Type.

	----------Gastropod----------		*Mercenaria*	
Unit/Level	Tool	Possible Tool	Possible Tool	Total
Test Unit 1				
A	4		1	5
B	11			11
C	14		2	16
D	5			5
E	8			8
F	3			3
G	3			3
H		1		1
J		4		4
K	3			3
Total	*51*	*5*	*3*	*59*
Test Unit 2				
B	6			6
C	4			4
D	2			2
E	4	1	1	6
F	5			5
Total	*21*	*1*	*1*	*23*
Test Unit 3				
B	1	1		2
C	2	2		4
D	1	2		3
E	1			1
Total	*5*	*5*		*10*
TOTAL	77	11	4	92

There would appear to be little doubt that Type G hammers were indeed used as hafted tools to hammer or pound other material. Menz's (2012) conclusion that they were used primarily to process oyster shell certainly squares with the obvious fact that these tools are associated with large quantities of oyster shell. But in addition to this common application, perhaps crown conch shells were used for entirely different purposes, such weights for gill or seine nets. This hypothesis is entirely testable with archaeological data on not only the modification and use alteration of shell but in nonrandom patterning of the spatial distribution of shells of similar size and condition. That is, if crown conch shells were used as net weights we might expect a greater degree of consistency in the size and condition of shells that are spatially clustered, whether this were due to the discard of nets with weights attached or the replacement of damaged weights as nets were repaired. With ongoing work at Shell Mound and other sites in the study area, this hypothesis can be tested.

Figure 3-3. Examples of Type G Shell Hammers made from the shells of crown conch (*Melongena corona*), Shell Mound (8LV42).

A few of the gastropods listed as "tool" and all of the items listed as "possible tool" in Table consists of portions of whelk (*Busycon* spp.) shell, either portions of the whorl or columella. The four *Mercenaria* items listed as "possible tools" consist of valves that have been flaked or broken along its margins, perhaps due to use as an impact tool, but perhaps as a consequence of removing portions of the shell for later modification, that is, as a core. Little more can be added to this description without better samples and some systematic use-wear analysis, which we hope to do in the near future.

CONCLUSION

The modest inventory of material culture from Shell Mound reflects many of the activities of day-to-day living, such as food capture, preparation, and serving; cutting, pounding, and scraping, and perhaps the production of items of nonutilitarian import. Thus far we have little evidence for the sorts of technologies used during the Late Archaic and Deptford occupations of the site, but the subsequent occupation, accounting for both the mounded shell and the interior village, is well represented by pottery and shell tools. The density of material culture is greatest in the interior opening, where we presume a village was situated, and at the summit of the mound, a second location of inhabitation, judging from the work of Bullen and Dolan (1960). As we expand operations at Shell Mound in years to come we expect the diversity of material culture to increase. We are especially optimistic that larger samples of vertebrate faunal remains will reveal a diversity of bone tools and related items. It is to the bulk samples of vertebrate faunal collected in 2012 that we now turn.

CHAPTER 4
VERTEBRATE AND INVERTEBRATE FAUNA

Andrea Palmiotto

This chapter details the analyses of faunal materials collected from eight bulk samples from three test units excavated at Shell Mound (8LV42) in April 2012. Samples from the shell ridge were collected from two strata of Test Unit 1 (Str. V Upper [Bulk 1] and Str. V Lower [Bulk 2] and three strata of Test Unit 2 (Str. II, III, and IV). A third bulk sample was analyzed from the shell-filled pit in the north profile of TU1 (Str. VIa [Bulk 3]), and a fourth from Feature 2 of TU1. Finally, a single bulk sample was analyzed from Stratum II of Test Unit 3, in the interior opening. With the exception of the sample from Feature 2, all of the bulk samples date to the Woodland occupation of Shell Mound, with the TU3 sample dating ca. A.D. 650–760 and the others ranging ca. A.D. 430–660. At ca. 2470–2300 B.C., Feature 2 is Late Archaic in age. The proveniences of bulk samples are provided in Chapter 2.

Eastern oysters comprise nearly the entire invertebrate assemblage of each bulk sample. They are the main constituent of the shell ridge and are found in varying densities in the submound and interior opening samples. The same types of fishes occur within the samples of the shell ridge, the midden of the interior opening, and the submound feature. A shift is observed in the major TU1 shell-bearing stratum (Str. V), wherein fish quantities decrease from the bottom to the top. This decreased or more selective use of vertebrate resources appears to have continued over time, although functional or depositional distinctions between the ridge and interior opening may account in part for this apparent shift.

Overall taxa abundances are on the low side, especially when compared with other sites in the region. Diversity is similar to sites that are interpreted as "seasonally" occupied and lower than sites that are interpreted as continuously occupied, which suggests that Shell Mound was used for specialized purposes and/or during particular times of the year. Future excavations and analyses will determine if these observations hold true across other contexts of Shell Mound.

METHODS

Bulk samples varying from 3.5 to 14.0 liters in volume were collected from profiles of test units after archaeostratigraphic units were defined, photographed, and drawn. The sample from Feature 2 was extracted in plan from feature fill. All bulk samples were returned to the Laboratory of Southeastern Archaeology, where they were measured for volume and then processed with a Dausman flotation machine to separate soil from faunal materials and other archaeological remains. The heavy fractions of the sample were dried and then passed through an 1/8-inch screen. All faunal remains greater than 1/8-inch in size were analyzed. None of the vertebrate materials recovered from level excavation (1/4-inch screening) has yet been analyzed.

Both invertebrate and vertebrate remains in the bulk samples were examined. Fauna were identified to the lowest possible taxonomic level using the Environmental Archaeology comparative collections at the Florida Museum of Natural History (FLMNH). The number of identified specimen (NISP), minimum number of individuals (MNI), and bone/shell weight per taxon were recorded. MNI was determined based on element size and siding. Diversity and equitability values were calculated using vertebrate remains so as to be comparable with other sites in the region.

Diversity estimates provide a means of comparing the range of taxa represented in a sample. The following formula (from Reitz and Wing 2008:235) was used to calculate diversity:

$$H' = -\Sigma [(pi) (\ln (pi))],$$

where H' is the diversity value and pi is calculated by dividing the MNI of each taxon by the total MNI of the sample. The diversity value is the absolute value of the sum of pi multiplied by the natural log (ln) of pi. Diversity values range between 0 and 5, where the higher the value, the higher the diversity.

Equitability measures how evenly a taxon is represented relative to other taxa in a sample. The following formula (from Reitz and Wing 2008:235) was used to calculate equitability:

$$V' = H' / \ln (S),$$

where V' is the equitability estimate, H' is the diversity value, and S represents the number of taxa for which MNI was determined. Equitability is the diversity value divided by the natural log (ln) of S. Equitability values range between 0 and 1, where the higher the value, the more evenly all taxa are represented. An equitability value closer to 0 indicates an intense focus on one or few taxa.

Allometry is a means of relating the size of an animal with specific elements in an animal via regression plots (Reitz and Wing 2008:68). For example, the vertebra of a fish grows at a rate that is in relative proportion with the rate that the entire fish grows; therefore, the fish vertebra may be used to predict the length of the fish. Allometric equations were compiled to predict the standard lengths (SL) of sea catfishes, carangids, sciaenids, and mullet based on thoracic (pre-caudal for mullet) vertebra, atlas, and/or otolith maximum-width measurements using available FLMNH zooarchaeological comparative specimens. The following equation was used to determine predicted SL:

$$Y = aX + b, \text{ or}$$

$$Y = 10 \wedge (\text{Log} (X) * (\text{Y-intercept} + \text{Slope})),$$

where Y is the standard length, X is the width of the measured element, *a* is the slope, and *b* is the Y-intercept. Y-intercept and slope were calculated by measuring element widths of comparative specimens with known lengths. Regression analyses were computed in Microsoft Excel. The second equation is the same as the first, only rewritten for use in Microsoft Excel to predict standard length. The predicted SL values of archaeological specimens are examined between strata and sites to examine relative differences in fish sizes to support seasonal and environmental inferences.

Total lengths (TL) of fishes are often listed in biological studies to describe fish sizes rather than SL. Total length refers to the length of the fish from tip of the head to tip of the tail fins. Standard length refers to the length of the fish from tip of the head to tip of the last vertebra (but does not include fins). There is a slight incongruity because often SL was not reported in biological studies.

RESULTS

Results are presented in terms of MNI. Broadly, samples are divided among those from the shell ridge (TUs 1 and 2), the one collected from TU3 of the interior opening, and the sample from the Late Archaic pit (Feature 2) (Table 4-1). Eastern oysters were the most common non-incidental invertebrate remains. They accounted for nearly the entire invertebrate contribution. Generally, less than 10 MNI were identified of other large invertebrate species. Allometric results are discussed by fish family, rather than by context.

Table 4-1. Inventory of Faunal Remains by Bulk Sample, with Values for Diversity and Equitability, Shell Mound (8LV42).

	-------------TU 1------------			--------------TU2---------------				
	Str. V Lower (14.0 *l*)	Str. V Upper (14.0 *l*)	Str. VIa (5.0 *l*)	Str.II (12.5 *l*)	Str.III (13.0 *l*)	Str. IV (14.0 *l*)	TU3 Str. II (3.5 *l*)	TU1 Feat. 2 (6.5 *l*)
Invertebrate								
NISP	3,311	2,900	757	3,095	1,417	2,424	16	793
MNI	1,272	1,043	221	1,176	650	931	7	285
Wt (g)	7,754.6	6,778.2	2,059.6	6,474.7	7,227.2	7,749.1	114.0	3,037.7
Vertebrate								
NISP	2,322	978	660	500	906	419	193	90
MNI	26	13	10	12	14	10	6	7
Wt (g)	54.1	24.8	12.6	23.1	21.7	8.9	5.5	2.4
Total								
NISP	5,633	3,878	1,417	3,595	2,232	2,843	209	883
MNI	1,298	1,056	231	1,118	664	941	13	292
Wt (g)	7808.7	6803.0	2072.2	6497.8	7248.9	7758.0	119.5	3,040.1
Total # of Taxa	24	28	19	26	19	18	7	15
Total # of Vert. Taxa (MNI)	11(26)	11(13)	9(10)	12(12)	11(14)	9(10)	6(6)	7(7)
Diversity	2.05	2.35	2.16	2.48	2.30	2.16	1.79	1.95
Equitability	0.86	0.98	0.98	1.00	0.96	0.98	1.00	1.00

Results of Samples from Shell Ridge

From TU1, Stratum V Lower, a total of 24 taxa and 1,298 individuals were identified (Table 4-2). Pinfish, sea catfish, and jack were the most commonly identified fishes. Ladyfish, toadfish, silver perch, sea trout, spot, and mullet were also identified, as well as a bird and a mud/musk turtle. Using 11 vertebrate taxa, diversity was calculated as 2.05 and equitability was 0.86 (Table 4-1).

From TU1, Stratum V Upper, a total of 28 taxa and 1,056 individuals were identified (Table 4-3). Ladyfish, sea catfish, toadfish, killifish, jack, pinfish, sea trout, black drum, mullet, and boxfishes were identified. Using 11 vertebrate taxa, diversity was calculated as 2.35 and equitability was 0.98 (Table 4-1).

Table 4-2. Species List for >1/8-in Faunal Materials from Test Unit 1, Stratum V Lower, Shell Mound (8LV42).

		NISP		MNI		Weight	
Scientific Name	Common Name	n	%	n	%	g	%
Invertebrata	Invertebrates					1143.2	14.7
Mytilidae	Mussels	21	0.6	6	0.5	0.6	
Argopecten sp.	Scallop	1		1	0.1	<0.1	
Crassostrea virginica	Eastern oyster	1,018	30.7	409	32.2	6,353.9	81.9
Ostrea equestrus	Crested oyster	85	2.6	44	3.5	92.5	1.2
Cerithium sp.	Cerith	4	0.1	4	0.3	<0.1	
Crepidula sp.	Slippersnail	342	10.3	342	26.9	7.6	0.1
Urosalpinx perrugata	Gulf oyster drill	3	0.1	3	0.2	1.2	
Melongena corona	Crown conch	3	0.1	3	0.2	63.9	0.8
Boonea impressa	Impressed odostome	5	0.2	5	0.4	<0.1	
Polygyra sp.	Land snail	10	0.3	10	0.8	0.1	
Hawaii miniscula	Minute gem snail	4	0.1	4	0.3	<0.1	
Balanidae	Barnacles	1,809	54.6	440	34.6	91.5	1.2
Decapoda	Crabs	6	0.2	1	0.1	0.1	
Total Invertebrata		3,311	100.0	1,272	100.0	7,754.6	100.0
Vertebrata	Vertebrates					1.8	3.3
Aves	Birds	1		1	3.8	0.5	0.9
Kinosternidae	Mud/Musk turtles	1		1	3.8	0.2	0.4
Actinopterygii	Fishes	2,211	95.2			40.9	75.6
Elop saurus	Ladyfish	13	0.6	1	3.8	0.2	0.4
Ariopsis felis	Hardhead catfish	16	0.7	4	15.4	1.3	2.4
Opsanus sp.	Toadfish	2	0.1	1	3.8	<0.1	
Caranx hippos	Crevalle jack	39	1.7	3	11.5	6.5	12.0
Lagodon rhomboides	Pinfish	14	0.6	9	34.6	0.1	0.2
Bairdiella chrysoura	Silver perch	3	0.1	2	7.7	0.2	0.4
Cynoscion nebulosus	Spotted seatrout	3	0.1	2	7.7	1.0	1.8
Leiostomus xanthurus	Spot	1		1	3.8	<0.1	
Mugil cephalus	Striped mullet	18	0.8	1	3.8	1.4	2.6
Total Vertebrata		2,322	100.0	26	100.0	54.1	100.0
Grand Total		5,633		1,298		7,808.7	

From TU1, Stratum VIa, a total of 19 taxa and 241 individuals were identified (Table 4-4). Silver perch, jack, shark, pinfish, gar, mullet, and toadfish were identified, as well as a bird and turtle. Using nine vertebrate taxa, diversity was calculated as 2.16 and equitability was 0.98 (Table 4-1).

From TU2, Stratum II, a total of 26 taxa and 1,188 individuals were identified (Table 4-5). Sea catfish, jack, sea trout, lady fish, killifish, pinfish, mullet, and black drum were identified, as well as a turtle and unidentified mammal. Using vertebrate 12 taxa, diversity was calculated as 2.48 and equitability was 1.0 (Table 4-1).

Table 4-3. Species List for >1/8-in Faunal Materials from Test Unit 1, Stratum V Upper, Shell Mound (8LV42).

		NISP		MNI		Weight	
Scientific Name	Common Name	n	%	n	%	g	%
Invertebrata	Invertebrates					1,524.0	22.5
Mytilidae	Mussels	21	0.7	3	0.3	1.3	
Argopecten sp.	Scallop	3	0.1	3	0.3	11.1	0.2
Crassostrea virginica	Eastern oyster	957	33.0	426	40.8	4,940.0	72.9
Ostrea equestrus	Crested oyster	30	1.0	17	1.6	16.4	0.2
Dinocardium robustum	Giant Atlantic cockle	3	0.1	1	0.1	5.6	0.1
Gastropoda	Gastropods	3	0.1	1	0.1	9.3	0.1
Crepidula sp.	Slippersnail	104	3.6	104	10.0	3.1	
Vermetidae	Worm snails	1		1	0.1	<0.1	
Urosalpinx perrugata	Gulf oyster drill	1		1	0.1	0.3	
Melongena corona	Crown conch	8	0.3	5	0.5	158.6	2.3
Busycon sinistrum	Lightning whelk	4	0.1	1	0.1	10.3	0.2
Fasciolaris sp.	Tulip	6	0.2	5	0.5	27.1	0.4
Anachis sp.	Dovesnail	2	0.1	2	0.2	<0.1	
Boonea impressa	Impressed odostome	1		1	0.1	<0.1	
Polygyroidea	Land snails	10	0.3	10	1.0	0.1	
Balanidae	Barnacles	1,735	59.8	459	44.0	69.9	1.0
Decapoda	Crabs	11	0.4	3	0.3	1.1	
Total Invertebrata		2,900	100.0	1043	100.0	6,778.2	100.0
Vertebrata	Vertebrates					0.4	1.6
Actinopterygii	Fishes	946	96.7			18.7	75.4
Elop saurus	Ladyfish	2	0.2	1	7.7	<0.1	
Ariidae	Sea catfishes	3	0.3	2	15.4	0.3	1.2
Opsanus sp.	Toadfish	1	0.1	1	7.7	0.1	0.4
Fundulus sp.	Killifish	1	0.1	1	7.7	<0.1	
Caranx cryos	Blue runner	3	0.3	1	7.7	0.2	0.8
Caranx hippos	Crevalle jack	4	0.4	1	7.7	0.9	3.6
Lagodon rhomboides	Pinfish	7	0.7	2	15.4	0.1	0.4
Cynoscion sp.	Sea trout	2	0.2	1	7.7	<0.1	
Pogonias cromis	Black drum	1	0.1	1	7.7	3.8	15.3
Mugil sp.	Mullet	7	0.7	1	7.7	0.3	1.2
Ostraciidae	Boxfishes	1	0.1	1	7.7	<0.1	
Total Vertebrata		978	100.0	13	100.0	24.8	100.0
Grand Total		3,878		1,056		6,803.0	

From TU2, Stratum III, a total of 19 taxa and 664 individuals were identified (Table 4-6). Sea catfish, silver perch, jack, sea trout, killifish, pinfish, mullet, pig fish, and red drum were identified, as well as one turtle. Using 11 vertebrate taxa, diversity was calculated as 2.30 and equitability was 0.96 (Table 4-1).

From TU2, Stratum IV, a total of 18 taxa and 941 individuals were identified (Table 4-7). Sea catfish, silver perch, jack, mullet, and flounder were identified, as well as a bird and turtle. Using nine vertebrate taxa, diversity was calculated as 2.16 and equitability was 0.98 (Table 4-1).

Results of Sample from Interior Opening (Test Unit 3)

From TU3, Stratum II, a total of seven taxa and 13 individuals were identified (Table 4-8). Jack, lady fish, and mullet were identified, as well as a mammal and turtle. Using six vertebrate taxa, diversity was calculated as 1.79 and equitability was 1.00 (Table 4-1).

Table 4-4. Species List for >1/8-in Faunal Materials from Test Unit 1, Stratum VIa, Shell Mound (8LV42).

		NISP		MNI		Weight	
Scientific Name	Common Name	n	%	n	%	g	%
Invertebrata	Invertebrates					320.7	15.6
Mytilidae	Mussels	1	0.1	1	0.5	<0.1	
Crassostrea virginica	Eastern oyster	525	69.4	147	66.5	1,666.4	80.9
Ostrea equestrus	Crested oyster	14	1.9	7	3.2	3.6	0.2
Crytopleura costata	Angel wing clam	1	0.1	1	0.5	0.4	
Mercenaria sp.	Quahog clam	1	0.1	1	0.5	38.3	1.9
Littorina irrorata	Marsh periwinkle	1	0.1	1	0.5	0.3	
Crepidula sp.	Slippersnail	8	1.1	8	3.6	0.1	
Melongena corona	Crown conch	3	0.4	2	0.9	24.1	1.2
Polygyroidea	Land snails	2	0.3	2	0.9	<0.1	
Balanidae	Barnacles	201	26.6	51	23.1	5.7	0.3
Total Invertebrata		757	100.0	221	100.0	2,059.6	100.0
Vertebrata	Vertebrates					0.8	6.4
Aves	Birds	3	0.5	1	10.0		
Testudines	Turtles	5	0.8	1	10.0	0.9	7.1
Chondrichthyes	Sharks/rays	5	0.8	1	10.0	0.2	1.6
Actinopterygii	Fishes	629	95.3			10.5	83.3
Lepisosteus sp.	Gar	2	0.3	1	10.0	<0.1	
Opsanus sp.	Toadfish	2	0.3	1	10.0	<0.1	
Carangidae	Jacks	1	0.2	1	10.0	<0.1	
Lagodon rhomboides	Pinfish	4	0.6	2	20.0	<0.1	
Bairdiella chrysoura	Silver perch	1	0.2	1	10.0	<0.1	
Mugil sp.	Mullet	8	1.2	1	10.0	0.2	1.6
Total Vertebrata		660	100.0	10	100.0	12.6	100.0
Grand Total		1,417		231		2,072.2	

Table 4-5. Species List for >1/8-in Faunal Materials from Test Unit 2, Stratum II, Shell Mound (8LV42).

		NISP		MNI		Weight	
Scientific Name	Common Name	n	%	n	%	g	%
Invertebrata	Invertebrates					466.7	7.2
Mytilidae	Mussels	30	1.0	5	0.4	1.4	
Crassostrea virginica	Eastern oyster	723	23.4	410	34.9	5,751.8	88.8
Ostrea equestrus	Crested oyster	19	0.6	9	0.8	6.8	0.1
Crytopleura costata	Angel wing clam	2	0.1	1	0.1	2.2	
Mercenaria sp.	Quahog clam	2	0.1	1	0.1	57.4	0.9
Cerithium eburneum	Ivory cerith	1		1	0.1	0.7	
Crepidula sp.	Slippersnail	101	3.3	101	8.6	2.5	
Busycon sinistrum	Lightning whelk	2	0.1	2	0.2	61.3	1.0
Melongena corona	Crown cronch	6	0.2	4	0.3	9.2	0.1
Anachis floridana	Florida dovesnail	4	0.1	4	0.3	<0.1	
Boonea impressa	Impressed odostome	5	0.2	5	0.4	<0.1	
Polygyroidea	Land snails	7	0.2	7	0.6	<0.1	
Balanidae	Barnacles	2,189	70.7	624	53.1	113.9	1.8
Menippe sp.	Stone crab	4	0.1	2	0.2	0.8	
Total Invertebrata		3,095	100.0	1176	100.0	6,474.7	100.0
Vertebrata	Vertebrates					0.9	3.9
cf. Mammalia	Mammal	1	0.2	1	8.3		
cf. Kinosternidae	Mud/musk turtle	5	1.0	1	8.3	2.7	11.7
Chondrichthyes	Sharks/rays	3	0.6	1	8.3	0.3	1.3
Actinopterygii	Fishes	438	87.6			11.6	50.2
Elop saurus	Lady fish	7	1.4	1	8.3	<0.1	
Ariopsis felis	Hardhead catfish	7	1.4	1	8.3	0.8	3.5
Fundulus sp.	Killifish	2	0.4	1	8.3	<0.1	
Caranx crysos	Blue runner	2	0.4	1	8.3	0.3	1.3
Caranx hippos	Crevalle jack	9	1.8	1	8.3	1.4	6.1
Lagodon rhomboides	Pinfish	1	0.2	1	8.3	<0.1	
Cynoscion sp.	Sea trout	2	0.4	1	8.3	0.2	0.9
Pogonias cromis	Black drum	19	3.8	1	8.3	4.1	17.7
Mugil sp.	Mullet	4	0.8	1	8.3	0.8	3.5
Total Vertebrate		500	100.0	12	100.0	23.1	100.0
Grand Total		3,595		1188		6,497.8	

Results from Submound Late Archaic Feature

From TU1, Feature 2, a total of 15 taxa and 292 individuals were identified (Table 4-9). Sea catfish, silver perch, pinfish, gar, mullet, and toadfish were identified. Using seven vertebrate taxa, diversity was calculated as 1.95 and equitability was 1.00 (Table 4-1).

Results of Allometry

Several taxa had elements that were intact enough to measure for allometric predictions (Table 4-10 through 4-13). Maximum widths of intact vertebral centrums were measured and plugged into equations derived using known element widths and standard lengths of specimens in the comparative collection.

Sea Catfishes. Young-of-the-year sea catfish measure between 118 and 133 mm TL and are sexually mature between 126 and 265 mm TL. Spawning occurs between May and August in estuarine areas (SMS 2011). Sagittal otoliths and thoracic vertebrae were measured from 23 FLMNH specimens. For otoliths, the allometric equation was calculated as Y=1.05X+1.31 with an R^2 confidence interval of 0.94. For vertebrae, the allometric equation was calculated as Y=0.73X+1.87 with an R^2 of 0.90.

Two otoliths and two vertebrae were measured from Shell Mound (Table 4-10). From TU1, Stratum V Lower, two otoliths yielded an average predicted SL of 168 mm. From TU1, Feature 2, two vertebrae yielded an average predicted SL of 295 mm.

Jacks. Juvenile jacks measure less than 130 mm TL, while mature jack have been measured at over 668 mm TL (DNR 2011; Wiggers n.d.). Vertebrae were measured from 22 FLMNH specimens. The allometric equation was calculated as Y=0.88X+1.71 with an R^2 of 0.99.

Table 4-6. Species List for >1/8-in Faunal Materials from Test Unit 2, Stratum III, Shell Mound (8LV42).

		NISP		MNI		Weight	
Scientific Name	Common Name	n	%	n	%	g	%
Invertebrata	Invertebrates					589.6	8.2
Mytilidae	Mussels	18	1.3	3	0.5	2.3	
Crassostrea virginica	Eastern oyster	731	51.6	437	67.2	6,359.8	88.0
Ostrea equestrus	Crested oyster	31	2.2	19	2.9	21.7	0.3
Crepidula sp.	Slippersnail	17	1.2	17	2.6	0.5	
Melongena corona	Crown conch	19	1.3	11	1.7	228.3	3.2
Balanidae	Barnacles	592	41.8	159	24.5	24.6	0.3
Decapoda	Crabs	9	0.6	4	0.6	0.4	
Total Invertebrata		1,417	100.0	650	100.0	7,227.2	100.0
Serpentes	Snakes	1	0.1	1	7.1	0.1	0.5
Testudines	Turtles	4	0.4	1	7.1	0.2	0.9
Actinopterygii	Fishes	847	93.5			16.7	77.0
Ariopsis felis	Hardhead catfish	7	0.8	1	7.1	1.0	4.6
Fundulus sp.	Killifish	5	0.6	3	21.4	<0.1	
Caranx hippos	Crevalle jack	23	2.5	1	7.1	2.3	10.6
Orthopristis chrysoptera	Pigfish	1	0.1	1	7.1	<0.1	
Lagodon rhomboides	Pinfish	1	0.1	1	7.1	<0.1	
Bairdiella chrysoura	Silver perch	1	0.1	1	7.1	<0.1	
Sciaenops ocellata	Red drum	3	0.3	1	7.1	0.3	1.4
Cynoscion sp.	Sea trout	3	0.3	1	7.1	0.7	3.2
Mugil sp.	Mullet	10	1.1	2	14.3	0.4	1.8
Total Vertebrata		906	100.0	14	100.0	21.7	100.0
Grand Total		2,323		664		7,248.9	

Table 4-7. Species List for >1/8-in Faunal Materials from Test Unit 2, Stratum IV, Shell Mound (8LV42).

		NISP		MNI		Weight	
Scientific Name	Common Name	n	%	n	%	g	%
Invertebrata	Invertebrates					355.9	4.6
Crassostrea virginica	Eastern oyster	995	41.1	459	49.3	7,162.2	92.4
Ostrea equestrus	Crested oyster	11	0.5	6	0.6	3.5	0.1
Littorina irrorata	Marsh periwinkle	2	0.1	2	0.2	<0.1	
Crepidula sp.	Slippersnail	45	1.9	45	4.8	2.7	
Neverita duplicata	Shark eye	1		1	0.1	16.6	0.2
Seila adamsi	Adam's miniature cerith	2	0.1	2	0.2	<0.1	
Melongena corona	Crown conch	4	0.2	4	0.4	137.5	1.8
Balanidae	Barnacles	1,361	56.2	410	44.0	70.6	0.9
Decapoda	Crabs	3	0.1	2	0.2	0.1	
Total Invertebrates		2,424	100.0	931	100.0	7,749.1	100.0
Aves	Birds	4	1.0	1	10.0	0.4	4.5
Serpentes	Snakes	1	0.2	1	10.0	<0.1	
Testudines	Turtles	2	0.5	2	20.0	0.6	6.7
Actinopterygii	Fishes	398	95.0			5.9	66.3
Ariidae	Sea catfishes	3	0.7	1	10.0	0.2	2.3
Caranx crysos	Blue runner	2	0.5	1	10.0	0.1	1.1
Caranx hippos	Crevalle jack	4	1.0	1	10.0	0.2	2.3
Carangidae	Jacks	1	0.2			1.4	15.7
Bairdiella chrysoura	Silver perch	1	0.2	1	10.0	<0.1	
Mugil sp.	Mullet	2	0.5	1	10.0	0.1	1.1
Paralichthyidae	Flounders	1	0.2	1	10.0	<0.1	
Total Vertebrates		419	100.0	10	100.0	8.9	100.0
Grand Total		2,843		941		7,758.0	

Table 4-8. Species List for >1/8-in Faunal Materials from Test Unit 3, Stratum II, Shell Mound (8LV42).

		NISP		MNI		Weight	
Scientific Name	Common Name	n	%	n	%	g	%
Invertebrata	Invertebrates					8.9	7.8
Crassostrea virginica	Eastern oyster	16	100.0	7	100.0	105.1	92.2
Total Invertebrata		16	100.0	7	100.0	114.0	100.0
Vertebrata	Vertebrates					1.0	18.2
Mammalia	Mammals	1	0.5	1	16.7	0.6	10.9
Serpentes	Snakes	1	0.5	1	16.7	0.1	1.8
Testudines	Turtles	2	1.	1	16.7	0.2	3.6
Actinopterygii	Fishes	186	96.4			3.6	65.5
Elop saurus	Lady fish	1	0.5	1	16.7	<0.1	
Carangidae	Jacks	1	0.5	1	16.7	<0.1	
Mugil sp.	Mullet	1	0.5	1	16.7	<0.1	
Total Vertebrata		193	100.0	6	100.0	5.5	100.0
Grand Total		209		13		119.5	

Table 4-9. Species List for >1/8-in Faunal Materials from Test Unit 1, Feature 2, Shell Mound (8LV42).

		NISP		MNI		Weight	
Scientific Name	Common Name	n	%	n	%	g	%
Invertebrata	Invertebrates					266.9	8.8
Argopecten sp.	Scallop	11	1.4	1	0.4	14.4	0.5
Crassostrea virginica	Eastern Oyster	243	30.6	91	31.9	2,707.4	89.1
Ostrea equestrus	Crested Oyster	27	3.4	16	5.6	9.2	0.3
Crepidula aculeata	Spiny Slippersnail	9	1.1	9	3.2	1.1	
Crepidula sp.	Slippersnail	52	6.6	52	18.3	1.4	0.1
Melongena corona	Crown conch	1	0.1	1	0.4	1.1	
Polygyroidea	Land snails	2	0.3	2	0.7	<0.1	
Balanidae	Barnacles	448	56.5	113	39.7	36.2	1.2
Total Invertebrata		793	100.0	285	100.0	3,037.7	100.0
Serpentes	Snakes	5	5.6	1	14.3	0.2	8.3
Actinopterygii	Fishes	71	78.9			1.6	66.7
Lepisosteus sp.	Gar	7	7.8	1	14.3	0.4	16.7
Ariopsis felis	Hardhead catfish	3	3.3	1	14.3	0.2	8.3
Opsanus sp.	Toadfish	1	1.1	1	14.3	<0.1	
Lagodon rhomboides	Pinfish	1	1.1	1	14.3	<0.1	
Bairdiella chrysoura	Silver perch	1	1.1	1	14.3	<0.1	
Mugil sp.	Mullet	1	1.1	1	14.3	<0.1	
Total Vertebrata		90	100.0	7	100.0	2.4	100.0
Grand Total		883		292		3,040.1	

Thirteen vertebrae were measured from Shell Mound (Table 4-11). From TU1, Stratum V Lower, five vertebrae yielded an average predicted SL of 305 mm. From TU 1, Stratum V Upper, two vertebrae yielded an average predicted SL of 183 mm. From TU 2, Stratum II, six vertebrae yielded an average predicted SL of 285 mm.

Silver Perch. Adult silver perch have been recorded as 95 mm SL or larger (Grammer et al. 2009; Hale 1994). Sagittal otoliths were measured from 55 FLMNH sciaenid specimens. For otoliths, the allometric equation was calculated as Y=0.82X+1.52 with an R^2 of 0.76. Atli were measured from 67 FLMNH sciaenid specimens. For atli, the allometric equation was calculated as Y=0.94X+1.74 with an R^2 of 0.96. From TU 1, Feature 2, one silver perch atlas yielded a predicted SL of 150 mm (Table XX-12).

Mullet. Young-of-the-year mullet measure between 178 and 222 mm TL, and reach adult size at 460 mm TL (SMS 2011). Atli were measured from 22 FLMNH specimens. For atli, the allometric equation was calculated as Y=0.66X+1.96 with an R^2 of 0.90. Vertebrae were measured from 27 FLMNH specimens. For vertebrae, the allometric equation was calculated as Y=0.79X+1.83 with an R^2 of 0.97.

Fourteen vertebrae were measured from Shell Mound (Table 4-13). From TU1, Stratum V Lower, one vertebra yielded a predicted SL of 218 mm. From TU 1, Stratum V Upper, three vertebrae yielded an average predicted SL of 227 mm. From TU 1,

Table 4-10. Allometric Data Used to Predict Sea Catfish (Family: Ariidae) Standard Length (SL).

Provenience	Cultural Period	Taxon	Element[1]	Measure-ment (mm)	Predicated SL (mm)
8LV42					
TU 1 Str V Lower	Woodland	*Ariopsis felis*	Otolith	3.52	78.46
TU 1 Str V Lower	Woodland	*Ariopsis felis*	Otolith	10.86	258.06
TU 1 Fea 2	Late Archaic	Ariidae	Vertebra	5.68	267.82
TU 1 Fea 2	Late Archaic	Ariidae	Vertebra	7.35	323.55
8DI29					
TU 1 Str VC	Woodland	*Ariopsis felis*	Otolith	8.08	188.81
TU 1 Str VC	Woodland	*Ariopsis felis*	Otolith	9.30	219.06
TU 1 Str VC	Woodland	*Ariopsis felis*	Otolith	10.37	245.78
TU 1 Str VC	Woodland	*Ariopsis felis*	Otolith	11.06	263.09
8DI52					
TU 1 Str II	Woodland	Ariidae	Vertebra	5.73	269.55
TU 1 Str II	Woodland	Ariidae	Vertebra	5.35	256.32
TU 1 Str II	Woodland	Ariidae	Vertebra	6.62	299.66
TU 1 Str II	Woodland	Ariidae	Vertebra	4.62	230.18
TU 1 Str II	Woodland	Ariidae	Vertebra	7.38	324.52
TU 1 Str II	Woodland	Ariidae	Vertebra	6.31	289.30
TU 1 Str II	Woodland	Ariidae	Vertebra	4.76	235.27
TU 1 Str II	Woodland	Ariidae	Vertebra	7.85	339.55
TU 1 Str II	Woodland	Ariidae	Vertebra	5.06	246.06
TU 1 Str II	Woodland	Ariidae	Otolith	10.95	260.32
TU 1 Str II	Woodland	Ariidae	Otolith	11.88	283.75
TU 1 Str II	Woodland	Ariidae	Otolith	6.66	153.93
TU 1 Str II	Woodland	Ariidae	Otolith	11.54	275.17
TU 1 Str II	Woodland	Ariidae	Otolith	12.52	299.92
TU 1 Str II	Woodland	Ariidae	Otolith	12.79	306.76
TU 1 Str V	Late Archaic	Ariidae	Otolith	6.46	149.05
TU 1 Str V	Late Archaic	Ariidae	Otolith	8.59	201.42
TU 1 Str V	Late Archaic	Ariidae	Otolith	10.72	254.55
8LV282					
TU 1 Str IID	Late Archaic	*Ariopsis felis*	Vertebra	3.49	187.38
TU 1 Str IID	Late Archaic	*Ariopsis felis*	Vertebra	7.34	323.23
TU 1 Str IID	Late Archaic	*Ariopsis felis*	Otolith	6.28	144.66
TU 1 Str IID	Late Archaic	*Ariopsis felis*	Otolith	9.79	231.27
TU 2 Str IIID	Late Archaic	*Ariopsis felis*	Otolith	7.03	162.98
TU 2 Str IIID	Late Archaic	*Ariopsis felis*	Otolith	8.21	192.02
TU 2 Str IIID	Late Archaic	Ariidae	Otolith	4.06	91.23

[1]The widths of 23 sagittal otoliths were used to determine an Ariidae otolith-based allometric equation with Y-intercept of 1.31, slope of 1.05, and R^2 of 0.94. The widths of 23 vertebrae were used to determine an Ariidae vertebrae-based allometric equation with Y-intercept of 1.87, slope of 0.73, and R^2 of 0.90.

Table 4-11. Allometric Data Used to Predict Jack (Family: Carangidae) Standard Length (SL).

Provenience	Cultural Period	Taxon	Element[1]	Measure-ment (mm)	Predicated SL (mm)
8LV42					
TU 1 Str V Lower	Woodland	*Caranx hippos*	Vertebra	3.92	172.78
TU 1 Str V Lower	Woodland	*Caranx hippos*	Vertebra	4.49	194.90
TU 1 Str V Lower	Woodland	*Caranx hippos*	Vertebra	8.06	327.57
TU 1 Str V Lower	Woodland	*Caranx hippos*	Vertebra	9.27	370.87
TU 1 Str V Lower	Woodland	*Caranx hippos*	Vertebra	11.85	461.17
TU 1 Str V Upper	Woodland	*Caranx cryos*	Vertebra	3.50	156.24
TU 1 Str V Upper	Woodland	*Caranx cryos*	Vertebra	4.87	209.47
TU 2 Str II	Woodland	*Caranx cryos*	Vertebra	5.62	237.86
TU 2 Str II	Woodland	*Caranx cryos*	Vertebra	5.90	248.35
TU 2 Str II	Woodland	*Caranx hippos*	Vertebra	6.01	252.46
TU 2 Str II	Woodland	*Caranx hippos*	Vertebra	7.49	306.93
TU 2 Str II	Woodland	*Caranx hippos*	Vertebra	8.03	326.49
TU 2 Str II	Woodland	*Caranx hippos*	Vertebra	8.38	339.09
8DI52					
TU 1 Str II	Woodland	*Caranx hippos*	Vertebra	5.61	237.49
TU 1 Str II	Woodland	*Caranx hippos*	Vertebra	5.95	250.22
TU 1 Str II	Woodland	*Caranx hippos*	Vertebra	5.13	219.37

[1]The widths of 22 vertebrae centrums were used to determine a Carangidae vertebrae-based allometric equation with Y-intercept of 1.71, slope of 0.88, and R^2 of 0.99.

Stratum VI, five vertebrae yielded an average predicted SL of 286 mm. From TU 2, Stratum II, four vertebrae yielded an average predicted SL of 337 mm. From TU 3, Stratum II, one vertebra yielded a predicted SL of 194 mm.

DISCUSSION

The shell ridge itself likely was purposefully accumulated as more than simple refuse disposal. The medium diversity, low abundance, and high equitability suggest that this site was not used to target specific taxa. Eastern oysters comprise the bulk of the invertebrate assemblage. Only taxa such as barnacles, slippersnails, and crested oysters approach the quantity of eastern oysters. These specimens are often found growing on the hard substrate of eastern oyster shells; therefore, they are likely incidental inclusions. Very few other large invertebrate species (e.g., conches and whelks) are represented in the bulk samples except in the case of modified gastropod tools (see Chapter 3). Unmodified large gastropods generally number less than 10 MNI per sample.

The earliest among the Woodland samples, TU1, Stratum V Lower, contained higher quantities of fishes, while 1 or 2 MNI per taxon was commonly observed among other samples. This may suggest a shift in practice occurred after Stratum V accumulated that resulted in lower quantities and more selective fish accumulation in the shell ridge. However, because multiple bulk samples were not collected from the other strata,

Table 4-12. Allometric Data Used to Predict Silver Perch (Family: Sciaenidae) Standard Length (SL).

Provenience	Cultural Period	Taxon	Element[1]	Measure-ment (mm)	Predicated SL (mm)
8LV42					
TU 1 Fea 2	Late Archaic	*Bairdiella chrysoura*	Atlas	2.87	149.72
8DI52					
TU 1 Str II	Weeden	*Bairdiella chrysoura*	Atlas	2.89	150.70
TU 1 Str V	Late Archaic	*Bairdiella chrysoura*	Atlas	2.87	149.72
TU 1 Str V	Late Archaic	*Bairdiella chrysoura*	Atlas	2.85	148.74
TU 1 Str V	Late Archaic	*Bairdiella chrysoura*	Atlas	2.89	150.70
TU 1 Str V	Late Archaic	*Bairdiella chrysoura*	Atlas	2.72	142.35
TU 1 Str V	Late Archaic	*Bairdiella chrysoura*	Atlas	2.57	134.95
TU 1 STR V	Late Archaic	*Bairdiella chrysoura*	Otolith	5.14	130.59
TU 1 STR V	Late Archaic	*Bairdiella chrysoura*	Otolith	3.18	87.66
TU 1 STR V	Late Archaic	*Bairdiella chrysoura*	Otolith	4.79	123.17
TU 1 STR V	Late Archaic	*Bairdiella chrysoura*	Otolith	5.67	141.68
8LV282					
TU 1 Str IID	Late Archaic	*Bairdiella chrysoura*	Atlas	2.25	119.08
TU 1 Str IID	Late Archaic	*Bairdiella chrysoura*	Atlas	2.39	126.04
TU 1 Str IID	Late Archaic	*Bairdiella chrysoura*	Atlas	2.74	143.33
TU 1 Str IID	Late Archaic	*Bairdiella chrysoura*	Atlas	2.76	144.32
TU 2 Str IIID	Late Archaic	*Bairdiella chrysoura*	Atlas	1.81	97.03
TU 2 Str IIID	Late Archaic	*Bairdiella chrysoura*	Atlas	2.68	140.38
TU 2 Str IIID	Late Archaic	*Bairdiella chrysoura*	Atlas	3.25	168.31
TU2 Str IIID	Late Archaic	*Bairdiella chrysoura*	Otolith	5.65	141.26

[1]The widths of 55 sagittal otoliths were used to determine a Sciaenidae otolith-based allometric equation with Y-intercept of 1.52, slope of 0.82, and R^2 of 0.76. The widths of 67 atli were used to determine a Sciaenidae atli-based allometric equation with Y-intercept of 1.74, slope of 0.94, and R^2 of 0.96.

any other potential intrastratum variation was not observed.

The mullet measured from the interior opening (TU3) is much smaller than those measured from the shell ridge; however, one single mullet is not enough to draw conclusions about the sizes of fishes used in the interior of the ridge. Similarly, the lower diversity calculated from the interior sample requires future analyses to confirm.

Results from Shell Mound faunal analyses can be compared with faunal assemblages from three other coeval sites (Table 4-14). The overall vertebrate faunal abundance from Shell Mound is surprisingly small compared to other samples analyzed from sites in the region (e.g., Bird Island, 8DI52, [McFadden and Palmiotto 2012], Ehrbar, 8LV282 [McFadden and Palmiotto 2013], and Cat Island, 8DI29 [Palmiotto 2012]).

Table 4-13. Allometric Data Used to Predict Mullet (Family: Mugilidae) Standard Length (SL).

Provenience	Cultural Period	Taxon	Element[1]	Measure-ment (mm)	Predicated SL (mm)
8LV42					
TU 1 Str V Lower	Woodland	*Mugil* sp.	Vertebra	4.38	218.32
TU 1 Str V Upper	Woodland	*Mugil* sp.	Vertebra	4.21	211.58
TU 1 Str V Upper	Woodland	*Mugil* sp.	Vertebra	4.40	219.11
TU 1 Str V Upper	Woodland	*Mugil* sp.	Vertebra	5.24	251.65
TU 1 Str Via	Woodland	*Mugil* sp.	Vertebra	5.97	279.06
TU 1 Str Via	Woodland	*Mugil* sp.	Vertebra	6.04	281.65
TU 1 Str Via	Woodland	*Mugil* sp.	Vertebra	6.06	282.38
TU 1 Str Via	Woodland	*Mugil* sp.	Vertebra	6.36	293.41
TU 1 Str Via	Woodland	*Mugil* sp.	Vertebra	6.45	296.69
TU 2 Str II	Woodland	*Mugil* sp.	Vertebra	5.76	271.25
TU 2 Str II	Woodland	*Mugil* sp.	Vertebra	7.03	317.65
TU 2 Str II	Woodland	*Mugil* sp.	Vertebra	8.30	362.33
TU 2 Str II	Woodland	*Mugil* sp.	Vertebra	9.32	397.20
TU 3 Str II	Woodland	*Mugil* sp.	Vertebra	3.78	194.26
8DI52					
TU 1 Str II	Woodland	*Mugil* sp.	Vertebra	6.14	285.33
TU 1 Str II	Woodland	*Mugil* sp.	Vertebra	6.04	281.65
TU 1 Str II	Woodland	*Mugil* sp.	Vertebra	5.59	264.88
8LV282					
TU 1 Str IID	Late Archaic	*Mugil* sp.	Atlas	5.79	290.42
TU 1 Str IID	Late Archaic	*Mugil* sp.	Vertebra	4.04	204.78
TU 1 Str IID	Late Archaic	*Mugil* sp.	Vertebra	4.99	242.09
TU 1 Str IID	Late Archaic	*Mugil* sp.	Vertebra	5.04	244.01
TU 1 Str IID	Late Archaic	*Mugil* sp.	Vertebra	5.73	270.13
TU 1 Str IID	Late Archaic	*Mugil* sp.	Vertebra	6.12	284.60
TU 1 Str IID	Late Archaic	*Mugil* sp.	Vertebra	6.35	293.04
TU 1 Str IID	Late Archaic	*Mugil* sp.	Vertebra	6.43	295.96
TU 1 Str IID	Late Archaic	*Mugil* sp.	Vertebra	7.59	337.54
TU 1 Str IID	Late Archaic	*Mugil* sp.	Vertebra	7.78	344.22
TU 2 Str IIID	Late Archaic	*Mugil* sp.	Vertebra	6.10	283.86
TU 2 Str IIID	Late Archaic	*Mugil* sp.	Vertebra	6.18	286.81
TU 2 Str IIID	Late Archaic	*Mugil* sp.	Vertebra	6.32	291.94

[1]The widths of 22 atli were used to determine a Mugilidae atli-based allometric equation with Y-intercept of 1.96, slope of 0.66, and R^2 of 0.90. The widths of 27 vertebrae centrums were used to determine a Mugilidae vertebrae-based allometric equation with Y-intercept of 1.83, slope of 0.79, and R^2 of 0.97.

With regards to diversity and equitability values, Shell Mound contexts have similar diversity values as contexts from Cat Island and Ehrbar. These sites are preliminarily interpreted as seasonally occupied sites—Cat Island during warmer, rainy times and Ehrbar during warmer, drier times—as opposed to Bird Island, which has a higher diversity and is interpreted as being occupied continually throughout the year (Palmiotto 2012). However, the low abundance of vertebrate faunal remains and absence of any markedly seasonal invertebrate remains suggest that season was not a primary influence on site occupation at Shell Mound.

Table 4-14. Diversity and Equitability Values for Vertebrate Faunal Assemblages from Sites in the Lower Suwannee Region that are Coeval with Shell Mound (8LV42).

Site/Provenience	Diversity	Equitability	C14 Age Range (2-sigma cal)
Cat Island (8DI29)			
TU1 Str V	2.42	0.82	A.D. 610–680
TU2 Str V	2.48	0.97	2630–2470 B.C.
Bird Island (8DI52)			
TU1 Str II	3.29	0.94	A.D. 810–980
TU1 Str V	3.06	0.88	2480–2290 B.C.
Ehrbar (8LV282)			
TU1 Str IID	2.15	0.69	2560–2340 B.C.
TU2 Str IIID	2.57	0.94	2560–2350 B.C.

Among Woodland contexts, several observations can be made. First, Shell Mound's TU1, Stratum V and TU3, Stratum II contained more examples of young-of-year fishes (sea catfish and mullet) than contexts from Cat Island or Bird Island (Tables 4-10 and 4-13). Second, Bird Island consistently contains larger fishes (sea catfish, jack, and mullet) on average than either Shell Mound or Cat Island. This suggests that the vertebrate fauna at Shell Mound accumulated during spring and early summer, when young-of-year fishes migrate into estuaries. Wet/dry seasons may have affected occupation at Shell Mound less than occupation at Cat Island.

Among Late Archaic samples, larger sea catfish and silver perch were found in the Shell Mound feature than in Ehrbar contexts, which contained smaller adult/young-of-year fishes (Table 4-10 and 4-12). Another interesting observation which may relate to relative environmental conditions is that high-salinity estuarine/oceanic jack have so far been identified predominantly in Woodland contexts at Shell Mound and Bird Island, while high-salinity tidal-creek-based silver perch have so far been identified predominantly in Late Archaic contexts at Bird Island and Ehrbar.

SUMMARY

Low quantities of vertebrate fauna and almost exclusive eastern oyster presence in invertebrate assemblages within Shell Mound stand in contrast to other sites analyzed so far in the Lower Suwannee region (Bird Island, Cat Island, and Ehrbar). These comparisons suggest that Shell Mound was the site of select activities or occupied during specific seasons (possibly early spring/summer when young-of-year fishes migrate into estuaries) that involved the use of particular resources. Future analyses will examine if these patterns continue across the site, including more analyses from both the shell ridge and interior areas. It is worth noting again that the vertebrate fauna from general level excavation of Shell Mound awaits analysis. Among the bones of these assemblages are elements of relatively large jack, among other fishes. Certainly the small bulk samples reported and analyzed to date must be bolstered with larger samples before definitive results will be obtained.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

Limited test excavations at Shell Mound in April 2012 substantiated the integrity and complexity of this important site. Despite damage inflicted by the construction of a circumferential road and some shell mining in the late 1970s, Shell Mound is more-or-less intact and worthy of long-term preservation. Additional testing will improve our ability to interpret this site in the context of ongoing investigations in the greater Lower Suwannee region. We thus provide in this chapter recommendations for future work after summarizing some of the major findings of our initial investigation.

SUMMARY OF 2012 INVESTIGATIONS

Two 1 x 2-m test units into the southern outside slope of the shell ridge exposed about 3 m of unconsolidated oyster shell midden overlying a buried ground surface and a buried shell midden. Massive quantities of oyster shell began to be piled at Shell Mound about 1,400 years ago (cal A.D. 430–660), perhaps earlier in places yet to the tested, notably the core of the ridge. Associated with mounded oyster shell along the south slope is limestone-tempered pottery of the Pasco tradition, along with the remains of shellfish other than oyster, vertebrate fauna, and occasional shell and stone artifacts. These same items are associated with a thin, near-surface midden in the interior opening of the shell ridge. The single radiocarbon assay from the interior midden gives an age estimate slightly younger (cal A.D. 650–760) than the strata of the shell ridge that have been dated, but additional dating may bring the two contexts into contemporaneity, as the respective artifact assemblages would suggest.

The difference in artifact density between the shell ridge and the interior opening most likely owes to intrasite differences in midden formation. Specifically, the sloping surfaces of the margins of the shell ridge were hardly conducive to human occupation. Certainly the residues of everyday living are encased in the midden of the ridge slopes, but perhaps as secondary refuse, that is, refuse collected and removed to the ridge from places of occupation. The interior opening would be one such place, but given the results of summit excavation reported by Bullen and Dolan (1960) the top of the ridge may have likewise been the location of habitation. In this respect, refuse thrown off the summit of the ridge would accumulate as talus slopes, with an angle of repose between 30 and 45 degrees, depending on matrix composition and the height of the ridge.

We are not yet in a position to draw definitive conclusions about the rate of midden accumulation for the ridge, or whether some or all of the ridge was constructed intentionally, rather than accumulated gradually, and without architectural purpose. The data we have thus far from both Shell Mound and the greater study area would suggest that ridges went up rather quickly. The nodal quality of the Shell Mound ridge(s) suggests that its formation may have been staged or sequenced such that individual shell deposits eventually converged into a U-shaped form. If the ridge was constructed intentionally, even if sequentially, then some of its shell midden may have been mined from primary contexts elsewhere. We must bear this possibility in mind as we continue to sample the shell ridge for radiometric dating and other analytical purposes.

As regards the timing of shell accumulation at Shell Mound relative to other arcuate shell ridges in the vicinity, it would appear that Shell Mound is late in the sequence, although many more radiometric assays are needed to substantiate this pattern. The only small shell ridge with absolute age estimates is from the north end of Deer Island, dated to about 2,000 years ago (cal 180 B.C. through A.D. 80), but with a basal feature a few centuries older (cal 760-410 B.C.) (Monés et al. 2012). This is the time of the Deptford ceramic tradition in the region, but also that of people who made and used Pasco and St. Johns pottery wares. By the time the Deer Island ridge was abandoned, Deptford pottery was on the wane, but Pasco and perhaps St. Johns pottery persisted, to be accompanied in parallel contexts by Swift Creek and later Weeden Island wares.

The only Deptford pottery observed in situ at Shell Mound was at the base of shell in Test Unit 1, in submound sands. All other pottery in test units of the shell ridge, as well as interior plaza, was Pasco, sand-tempered plain, or occasionally St. Johns. Swift Creek or Weeden Island pottery was noticeably absent. Notably, the mortuary complex on Hog Island, only a few hundred meters west of Shell Mound, was laden with pottery of these two elaborate traditions, as well as St. Johns and Pasco wares.

If the late timing of Shell Mound is supported with additional dating, then we are perhaps seeing evidence for the consolidation of a dispersed community into one large village. This did not necessitate the permanent relocation of all local groups to Shell Mound, but if it were strictly a place of occasional gathering for large groups, then we are pressed to locate the residential places of participating subgroups. The only other shell ridge thus far dated (Deer Island) was apparently abandoned centuries before shell accumulated in ridges at Shell Mound. Future survey and testing at the many other shell ridges in the vicinity will tell if this timing applies elsewhere. But again, if it does holds up, the sequence suggests a major restructuring of settlement after about A.D. 400-500. We will be thus driven to document the circumstances under which such a change in settlement ensued.

The inventory of vertebrate faunal remains we have available thus far from Shell Mound is too small to warrant conclusions about the intensity and seasonality of occupation. As reported in Chapter 4, the frequency and diversity of taxa at Shell Mound are less than we have observed at other sites in the area, but none of the other sites has the volume of oyster shell as Shell Mound. Oyster clearly overwhelms other taxa, so volumetrically, faunal remains other than oyster are under-represented. Before we can make confident comparisons between the food remains at Shell Mound and other sites we have to collect far more bulk samples from Shell Mound and control for the bias of voluminous oyster shell.

Notably, the deposition of shell at Shell Mound took place over a Late Archaic stratum, nearly 2,000 years older. Separating the Late Archaic stratum from mounded shell is a thin stratum of sand. We have observed this sand stratum at several other sites in the area. Whether depositional or pedogenic, the sand stratum signals a long span of time between occupations. We suspect (but do not know with certainty) that sea level dropped during this time, then returned to an overall transgressive stage after about 500 B.C. The presumed consolidation of settlement at Shell Mound is one possible outcome of adapting to rising sea and its attendant ecological changes.

Finally, the Late Archaic component beneath Shell Mound includes pit features and sheet midden. Presumably, these signal more than transient use of the site. It remains to be seen how extensive the Late Archaic occupation beneath Shell Mound may be; it was not observed in interior opening, beneath the Woodland midden, but may extend beneath much, if not all of the shell ridge. To the extent that the shell ridge maps onto the Late Archaic deposit, we will be pressed to document continuities in practice or the medium of social memory that invited such isomorphic land use. The intervening Deptford component made hold the key to this puzzle. Deptford sherds at the base of Shell Mound provide encouragement that we can link the Late Archaic occupation with the subsequent shell ridge formation, but it will take more than a few isolated sherds to make this case. Arguably, the rich feature assemblage at the base of the south ridge includes postholes and pits of Deptford age.

RECOMMENDATION FOR FUTURE INVESTIGATIONS

Archaeological investigations summarized here are but a small, first step toward documenting the internal structure of Shell Mound, and for providing information on the timing, duration, scale, and organization of habitation and related activities at the site.

The method of excavating a 1 x 2-m unit at the base of the sideslope was highly effective in exposing the basal strata of the shell ridge without compromising upslope shell deposits. As damaging as the road encircling the mound may have been, it provided ready access to basal strata because it dropped the elevation of the sideslope by a meter or two. Additional 1 x 2-m units spaced 30–40 m apart along the outside perimeter (6–7 units total) would provide a good sample of basal strata around the entire mound. Test Unit 1 showed that basal sands contain a diverse and dense assemblage of features, all predating the inferred age of deposits in the interior opening. It would thus appear that the site underwent a shift from marsh-edge habitation during the Deptford period (and possibly earlier) to the formation of a circular village-plaza complex in ensuing centuries, coupled with the formation of the shell ridge. Timing of the emplacement of sand-and-shell mounds at the opening of the ridge and some 200 m to the east remains unknown but is unlikely to predate the formation of the shell ridge. The presence of a Late Archaic stratum beneath the Deptford stratum adds even greater time depth to the occupational history of the site, and thus greater opportunity to examine how communities dealt with changes in environment that are registered in abundant food remains and other paleoenvironmental data, all nicely stratified and/or encased in pit features.

Substantiating the subsurface content and structure of archaeological remains in the interior opening of the shell ridge requires a different strategy. Additional excavation around the interior perimeter of the shell ridge is recommended, but this might be effectively coupled with remote sensing (ground-penetrating radar and/or resistivity) to locate subsurface anomalies. If houses and house middens are distributed around the interior margin of the shell ridge, then clusters of features, including architectural features, are expected. If such clusters can be delimited with judicious testing and remotely sensed data, then larger block excavations would be warranted to fully expose one or more houses and associated middens.

Additional testing at Shell Mound should be staggered over several stages to allow for timely analysis and reporting, and to enable the results at each stage to inform the design of subsequent stages. Public involvement should be intensified with each stage of investigation.

Finally, the long-term future of Shell Mound could be enhanced by some physical modifications to the topography. Each of the several sideslope cuts should be filled with earth, capped with geocloth, and vegetated to prevent further erosion. Trails across the ridge should be limited to one, ideally with a raised boardwalk to prevent straying off the trail, which exacerbates erosion. A circumferential boardwalk over the existing road would likewise help curtail erosion. Well-placed signage and or even kiosks with benches would enhance the educational value of the site. Assuming an interior village can be substantiated with further testing, a sanctioned pathway should follow the interior edge of the ridge. A reconstructed house or two in this location would go even further by providing visual impact.

One could imagine Shell Mound being developed into an attraction much like Crystal River, but with greater emphasis on the "natural" condition of the site (and avoiding the golf course look of manicured lawns and asphalt pathways). Thematically, Shell Mound is an ideal place to develop publicly accessible information about long-term environmental change and its impact on human communities. Much like the historic communities of Cedar Key, those of Shell Mound witnessed hurricanes, rising sea, and ever-changing marine habitats. They likewise made adjustments, like those of Cedar Key, to sustain themselves as a community despite threats to their survival. Showing how ancient communities were proactive in sustaining their livelihoods should resonate strongly with those again facing similar threats in the near-term future.

PUBLIC PARTICIPATION AND VISITATION

Refuge Ranger Pam Darty mobilized local citizens to assist with our field work at Shell Mound. Many volunteers were members of the Friends of the Lower Suwannee and Cedar Keys National Wildlife Refuges (http://www.friendsofrefuges.org/), which promotes advocacy and support for the stewardship of refuge habitat through assistance in research, management, and public education. The assistance of Friends with archaeological testing at Shell Mound was both indispensable and thoroughly enjoyable.

In addition to coordinated volunteerism, field work at Shell Mound benefited from a steady stream of passers-by. Impromptu tours of the site enabled project staff to engage the public in the importance of Shell Mound, while also galvanizing our understanding of the public's perception of value in archaeological resources. Likewise, occasional visitors offered useful information about the history of the site, such as the details of 1970's road construction noted earlier.

Shell Mound is a ready-made opportunity for expanding public involvement in archaeology on the Refuge and, especially, for linking together ancient human experiences of the area with contemporary and future challenges. Moreover, the site could be enhanced to provide an even better experience for visitors with updated information, a more structured pathway, and perhaps reconstructions of houses and related features. Of course, all such improvements would depend directly on the storehouse of archaeological knowledge that can be gleaned from additional investigations.

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APPENDIX A:

CATALOG

NOTE: Catalog below contains entries for only the ¼-inch fraction of test units; bulk sample analysis to date is limited to the faunal analyses reported Chapter 4.

Catalog Number	Prov.	Level	Material	Material Type	Form	Surface Treatment	Decoration	Count (n)	Weight (g)
8LV42.1.1	TU1	A	Pottery	Limestone Temp	Body	Plain	Plain	15	82.0
8LV42.1.2	TU1	A	Pottery	Limestone Temp	Crumb	Plain	Plain	14	22.2
8LV42.1.3	TU1	A	Pottery	Sand Tempered	Body	Plain	Plain	2	11.5
8LV42.1.4	TU1	A	Pottery	Sand Tempered	Crumb	Plain	Plain	7	8.3
8LV42.1.5	TU1	A	Historic	Glass	UID	UID		4	5.5
8LV42.1.6	TU1	A	Invertebrate	Conch/Whelk	Tool			4	129.2
8LV42.1.7	TU1	A	Invertebrate	*Merceneria*	Modified Shell			1	135.7
8LV42.1.8	TU1	A	Misc. Rock					1	87.9
8LV42.1.9	TU1	A	Vert. Fauna	Bone					130.1
8LV42.2.1	TU1	B	Pottery	Limestone Temp	Body	Plain	Plain	19	85.4
8LV42.2.2	TU1	B	Pottery	Limestone Temp	Crumb	Plain	Plain	13	17.9
8LV42.2.3	TU1	B	Pottery	Limestone Temp	Rim	Plain	Plain	2	7.8
8LV42.2.4	TU1	B	Pottery	Sand Tempered	Rim	Plain	Plain	1	4.5
8LV42.2.5	TU1	B	Lithic	Chert	Flake			1	3.8
8LV42.2.6	TU1	B	Invertebrate	Conch/Whelk	Tool			11	560.9
8LV42.2.7	TU1	B	Vert. Fauna	Bone					227.7
8LV42.3.1	TU1	C	Pottery	Limestone Temp	Body			15	101.8
8LV42.3.2	TU1	C	Pottery	Limestone Temp	Rim			2	13.6
8LV42.3.3	TU1	C	Pottery	Limestone Temp	Base			1	14.2
8LV42.3.4	TU1	C	Pottery	Sand Tempered	Body			1	2.2
8LV42.3.5	TU1	C	Invertebrate	Conch/Whelk	Tool			14	606.5
8LV42.3.6	TU1	C	Invertebrate	*Merceneria*	Modified Shell			2	178.5
8LV42.3.7	TU1	C	Misc. Rock					1	244.1
8LV42.3.8	TU1	C	Vert. Fauna	Bone					187.5
8LV42.4.1	TU1	D	Pottery	Limestone Temp	Body	Plain	Plain	9	60.2
8LV42.4.2	TU1	D	Pottery	Limestone Temp	Crumb	Plain	Plain	4	7.0
8LV42.4.3	TU1	D	Pottery	Sand Tempered	Body	Plain	Plain	3	4.6
8LV42.4.4	TU1	D	Vert. Fauna	Bone					440.2
8LV42.4.5	TU1	D	Invertebrate	Conch/Whelk	Tool			5	180.7
8LV42.5.1	TU1	E	Pottery	Limestone Temp	Body	Plain	Plain	6	31.5
8LV42.5.2	TU1	E	Pottery	Limestone Temp	Crumb	Plain	Plain	7	9.6
8LV42.5.3	TU1	E	Pottery	Limestone Temp	Body	Plain	Plain	1	13.1
8LV42.5.4	TU1	E	Misc. Rock					2	161.6
8LV42.5.5	TU1	E	Invertebrate	Conch/Whelk	Tool			8	413.3
8LV42.5.6	TU1	E	Vert. Fauna	Bone					277.4
8LV42.6.1	TU1	F	Pottery	Limestone Temp	Body			2	4.7
8LV42.6.2	TU1	F	Pottery	Limestone Temp	Rim			3	25.5
8LV42.6.3	TU1	F	Pottery	Limestone Temp	Crumb			4	4.3
8LV42.6.4	TU1	F	Pottery	Limestone Temp	Rim			1	12.5
8LV42.6.5	TU1	F	Invertebrate	Conch/Whelk	Tool			3	92.9
8LV42.6.6	TU1	F	Invertebrate	Oyster				1	54.9
8LV42.6.7	TU1	F	Vert. Fauna	Bone					132.9

Catalog Number	Prov.	Level	Material	Material Type	Form	Surface Treatment	Decoration	Count (n)	Weight (g)
8LV42.6.8	TU1	F	Misc. Rock					1	12.2
8LV42.7.1	TU1	G	Pottery	Limestone Temp	Rim	Plain	Plain	1	35.9
8LV42.7.2	TU1	G	Pottery	Limestone Temp	Body	Plain	Plain	5	51.5
8LV42.7.3	TU1	G	Pottery	Limestone Temp	Crumb	Plain	Plain	1	1.4
8LV42.7.4	TU1	G	Pottery	Sand Tempered	Rim	Plain	Plain	1	2.0
8LV42.7.5	TU1	G	Invertebrate	Conch/Whelk	Tool			3	113.5
8LV42.7.6	TU1	G	Misc. Rock					2	89.3
8LV42.7.7	TU1	G	Pottery	Limestone Temp	Body	Plain	Slip	1	3.0
8LV42.7.8	TU1	G	Vert. Fauna	Bone					136.5
8LV42.8.2	TU1	H	Pottery	Sand Tempered	Body	Stamped	Lin. Check Stmp.	8	99.9
8LV42.8.3	TU1	H	Pottery	Sand Tempered	Crumb			6	12.0
8LV42.8.4	TU1	H	Pottery	Sand Tempered	Body	Plain	Plain	1	14.0
8LV42.8.5	TU1	H	Pottery	Limestone Temp	Body	Plain	Plain	2	12.0
8LV42.8.6	TU1	H	Invertebrate	Conch/Whelk	Columella			1	1.8
8LV42.8.1	TU1	H	Vert. Fauna	Bone					15.2
8LV42.9.1	TU1	I	Pottery	Sand Tempered	Crumb			1	1.4
8LV42.9.2	TU1	I	Pottery	Limestone Temp	Crumb			1	1.3
8LV42.9.3	TU1	I	Vert. Fauna	Bone					41.4
8LV42.10.1	TU1	J	Invertebrate	Conch/Whelk	Modified Shell			4	160.9
8LV42.10.2	TU1	J	Vert. Fauna	Bone					26.6
8LV42.11.1	TU1	K	Invertebrate	Conch/Whelk	Tool			3	67.1
8LV42.11.2	TU1	K	Vert. Fauna	Bone					31.4
8LV42.42.1	TU1	H	Pottery	Sand Tempered	Rim	Stamped	Lin. Check Stmp.	1	101.7
8LV42.19.1	TU2	A	Pottery	Limestone Temp	Body			4	16.7
8LV42.19.2	TU2	A	Pottery	Limestone Temp	Body			1	5.4
8LV42.19.3	TU2	A	Vert. Fauna	Bone					82.8
8LV42.20.1	TU2	B	Pottery	Limestone Temp	Body	Plain	Plain	20	87.6
8LV42.20.2	TU2	B	Pottery	Limestone Temp	Crumb	Plain	Plain	9	7.8
8LV42.20.3	TU2	B	Pottery	Spicule Tempered	Body	Plain	Plain	2	8.6
8LV42.20.4	TU2	B	Misc. Rock					2	123.7
8LV42.20.5	TU2	B	Invertebrate	Conch/Whelk	Hammer			6	355.6
8LV42.20.6	TU2	B	Invertebrate	Conch/Whelk	Modified Shell			1	46.8
8LV42.20.7	TU2	B	Lithic	Chert	Shatter			1	0.9
8LV42.20.8	TU2	B	Vert. Fauna	Bone					560.1
8LV42.21.1	TU2	Clean up	Pottery	Limestone Temp	Body	Plain	Plain	4	20.6
8LV42.21.2	TU2	C	Pottery	Limestone Temp	Body	Plain	Plain	1	6.4
8LV42.21.3	TU2	C	Pottery	Limestone Temp	Crumb	Plain	Plain	3	4.1
8LV42.21.4	TU2	C	Pottery	Sand Tempered	Body	Plain	Plain	1	5.6
8LV42.21.5	TU2	C	Misc. Rock					1	49.1
8LV42.21.6	TU2	C	Invertebrate	Oyster				1	8.9
8LV42.21.7	TU2	C	Invertebrate	Conch/Whelk	Tool			4	197.2
8LV42.21.8	TU2	C	Vert. Fauna	Bone					189.0
8LV42.22.1	TU2	D	Pottery	Limestone Temp	Body			5	18.6
8LV42.22.2	TU2	D	Pottery	Limestone Temp	Crumb			1	0.3
8LV42.22.3	TU2	D	Pottery	Limestone Temp	Body			1	7.6

Catalog Number	Prov.	Level	Material	Material Type	Form	Surface Treatment	Decoration	Count (n)	Weight (g)
8LV42.22.4	TU2	D	Invertebrate	Conch/Whelk	Tool			2	83.7
8LV42.22.5	TU2	D	Invertebrate	Conch/Whelk				2	45.7
8LV42.22.6	TU2	D	Misc. Rock					1	21.4
8LV42.22.7	TU2	D	Vert. Fauna	Bone					115.5
8LV42.23.1	TU2	E	Pottery	Limestone Temp	Body	Plain	Plain	4	29.1
8LV42.23.2	TU2	E	Invertebrate	Conch/Whelk	Tool			4	160.7
8LV42.23.3	TU2	E	Invertebrate	Conch/Whelk	Hammer			1	95.2
8LV42.23.4	TU2	E	Invertebrate	*Merceneria*				1	231.2
8LV42.23.5	TU2	E	Misc. Rock					1	66.1
8LV42.23.6	TU2	E	Vert. Fauna	Bone					186.1
8LV42.24.1	TU2	F	Pottery	Limestone Temp	Body	Plain	Plain	7	37.4
8LV42.24.2	TU2	F	Pottery	Limestone Temp	Crumb	Plain	Plain	2	2.2
8LV42.24.3	TU2	F	Pottery	Limestone Temp	Rim	Plain	Plain	3	23.4
8LV42.24.4	TU2	F	Invertebrate	Conch/Whelk	Tool			5	221.0
8LV42.24.5	TU2	F	Concretion					1	149.0
8LV42.24.6	TU2	F	Vert. Fauna	Bone					203.2
8LV42.25.1	TU2	B Clean Up	Pottery	Limestone Temp	Rim	Plain	Plain	1	13.9
8LV42.25.2	TU2	B Clean Up	Pottery	Limestone Temp	Body	Plain	Plain	3	15.2
8LV42.26.1	TU2	Clean up	Pottery	Limestone Temp	Body	Plain	Plain	1	2.2
8LV42.26.2	TU2	Clean up	Vert. Fauna	Bone					8.2
8LV42.27.1	TU3	A	Pottery	Limestone Temp	Body	Plain	Plain	23	47.2
8LV42.27.2	TU3	A	Pottery	Limestone Temp	Rim	Plain	Plain	1	1.1
8LV42.27.3	TU3	A	Pottery	Limestone Temp	Crumb	Plain	Plain	14	9.4
8LV42.27.4	TU3	A	Pottery	Spicule Tempered	Base	Plain	Plain	2	4.6
8LV42.27.5	TU3	A	Pottery	Limestone Temp	Base	Plain	Scraped Interior	1	8.4
8LV42.27.6	TU3	A	Historic	Metal (Iron)	UID	UID		6	4.1
8LV42.27.7	TU3	A	Historic	Glass	UID	UID		3	8.8
8LV42.27.8	TU3	A	Vert. Fauna	Bone					9.4
8LV42.28.1	TU3	B	Pottery	Limestone Temp	Body	Plain	Plain	52	274.4
8LV42.28.2	TU3	B	Pottery	Limestone Temp	Rim	Plain	Plain	3	14.2
8LV42.28.3	TU3	B	Pottery	Limestone Temp	Crumb	Plain	Plain	10	9.9
8LV42.28.4	TU3	B	Pottery	Sand Tempered	Rim	Plain	Plain	1	0.7
8LV42.28.5	TU3	B	Pottery	Sand Tempered	Body	Plain	Plain	2	3.8
8LV42.28.6	TU3	B	Pottery	Spicule Tempered	Body	Plain	Plain	1	2.8
8LV42.28.7	TU3	B	Lithic	Chert	Flake			2	15.9
8LV42.28.8	TU3	B	Lithic	Chert	Shatter			3	57.5
8LV42.28.9	TU3	B	Pottery	Spicule Tempered	Rim	Plain	Plain	1	23.9
8LV42.28.10	TU3	B	Historic	Brick	UID	UID		1	7.5
8LV42.28.11	TU3	B	Invertebrate	Conch/Whelk	Tool			1	65.2
8LV42.28.12	TU3	B	Invertebrate	Conch/Whelk	Columella			1	2.0
8LV42.28.13	TU3	B	Vert. Fauna	Bone					38.8
8LV42.29.1	TU3	C	Pottery	Limestone Temp	Body	Plain	Plain	26	129.2
8LV42.29.2	TU3	C	Pottery	Limestone Temp	Rim	Plain	Plain	3	40.8
8LV42.29.3	TU3	C	Pottery	Limestone Temp	Crumb	Plain	Plain	5	4.8
8LV42.29.4	TU3	C	Pottery	Sand Tempered	Rim	Plain	Plain	1	1.7

Catalog Number	Prov.	Level	Material	Material Type	Form	Surface Treatment	Decoration	Count (n)	Weight (g)
8LV42.29.5	TU3	C	Pottery	Sand Tempered	Body	Plain	Plain	4	13.8
8LV42.29.6	TU3	C	Pottery	Sand Tempered	Crumb	Plain	Plain	2	1.7
8LV42.29.7	TU3	C	Lithic	Chert	Flake			1	0.4
8LV42.29.8	TU3	C	Lithic	Chert	Shatter			2	23.2
8LV42.29.9	TU3	C	Invertebrate	Conch/Whelk	Tool			2	82.3
8LV42.29.10	TU3	C	Invertebrate	Conch/Whelk	Columella			2	12.1
8LV42.29.11	TU3	C	Vert. Fauna	Bone					78.6
8LV42.30.1	TU3	D	Pottery	Limestone Temp	Rim	Plain	Plain	3	23.8
8LV42.30.2	TU3	D	Pottery	Limestone Temp	Body	Plain	Plain	13	93.4
8LV42.30.3	TU3	D	Pottery	Sand Tempered	Body	Plain	Plain	2	10.5
8LV42.30.4	TU3	D	Pottery	Sand Tempered	Crumb	Plain	Plain	1	0.3
8LV42.30.5	TU3	D	Lithic	Chert	Flake			2	2.6
8LV42.30.6	TU3	D	Invertebrate	Conch/Whelk	Tool			1	33.4
8LV42.30.7	TU3	D	Invertebrate	Conch/Whelk	Columella			2	4.2
8LV42.30.8	TU3	D	Vert. Fauna	Bone					90.8
8LV42.31.1	TU3	E	Pottery	Limestone Temp	Body	Plain	Plain	4	13.6
8LV42.31.2	TU3	E	Pottery	Limestone Temp	Crumb	Plain	Plain	1	0.5
8LV42.31.3	TU3	E	Pottery	Sand Tempered	Body	Plain	Plain	1	6.5
8LV42.31.4	TU3	E	Pottery	Spicule Tempered	Body	Plain	Plain	1	3.0
8LV42.31.5	TU3	E	Lithic	Chert	Flake			1	0.5
8LV42.31.6	TU3	E	Invertebrate	Conch/Whelk	Tool			1	73.4
8LV42.31.7	TU3	E	Vert. Fauna	Bone					39.0
8LV42.32.1	TU3	E Clean up	Pottery	Limestone Temp	Body	Plain	Plain	1	6.3
8LV42.32.2	TU3	E Clean up	Concretion					8	68.5
8LV42.32.3	TU3	E Clean up	Vert. Fauna	Bone				2	5.0
8LV42.33.1	TU3	E	Lithic	Chert	Core			1	494.2

APPENDIX B:

RADIOCARBON DATA

Prov.	Material	Beta Lab Number	Measured 14C Age BP	13C/12C Ratio (o/oo)	Conventional 14C Age BP	2-sigma Cal AD/BC	2-sigma Cal BP
TU3 – STR II	wood charcoal	321186	1350 ± 30	-25.5	1340 ± 30	AD 650-690 AD 750-760	1300-1260 1200-1190
TU2-STR II	wood charcoal	321184	1510 ± 30	-26.6	1480 ± 30	AD 540-640	1410-1310
TU2-STR III	wood charcoal	321185	1450 ± 30	-25.7	1440 ± 30	AD 570-650	1380-1300
TU1-STR V	wood charcoal	321182	1540 ± 30	-25.8	1530 ± 30	AD 430-600	1520-1350
TU1-STR VIa	wood charcoal	321183	1410 ± 30	-24.6	1420 ± 30	AD 600-660	1360-1290
TU1-FEAT 1	wood charcoal	321181	3940 ± 30	-26.0	3920 ± 30	BC 2480-2330 BC 2320-2300	4420-4280 4270-4250