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CULTURAL RESOURCES SURVEY AND TESTING FOR DAVIS POND FRESHWATER DIVERSION, ST. CHARLES PARISH, LOUISIANA (VOLUME II)

Final Report

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EARTH SEARCH, INC.
P.O. Box 850319
New Orleans, LA 70185-0319

Prepared for

U.S. Army Corps of Engineers
New Orleans District
P.O. Box 60267
New Orleans, LA 70160-0267

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EXCAVATIONS AT THE PUMP CANAL SITE (16SC27)

Introduction

The Pump Canal site (16SC27) is located within the western portion of Lake Cataouatche. The site was included in the investigations of the Davis Pond Freshwater Diversion Project. The actual site location is not shown on any maps in this report in order to avoid facilitating illegal digging at this significant site. The site lies on the northern bank of the Pump Canal, an east-west channel excavated during the second decade of the twentieth century to drain marshland west of Lake Cataouatche. Material from the canal was placed on top of the *in situ* archeological deposits at the site.

Historic Setting of the Pump Canal Site (by Michael Comardelle and Marco Giardino)

A large number of historic maps, dated from the early-eighteenth through the early-twentieth centuries, were examined to determine whether the Pump Canal site was ever depicted. None of the maps had any notations in the vicinity of the site that might be related to it. Also, a comprehensive search was made of the WPA abstracts of French Colonial and Spanish Colonial documents housed at the Louisiana Historical Center in the Louisiana State Museum. No reference to the site could be identified.

The first documented activity at the site began in 1911 when a group of investors from Holland started the Winter Garden Experimental Farm. Maps and photographs of the area once occupied by the farm show clearly the square layout of the village and fields that were drained but are now completely flooded by Lake Cataouatche.

The farm was located on the west shore of Lake Cataouatche, the name of which was changed briefly to Lake Netherlands in recognition of the newly arrived Dutch farmers. Brochures and promotional materials were distributed by the New Orleans Netherlands Company, located at 810 Maison Blanche Building, in New Orleans. The promotional literature provided glowing descriptions of the area and of the farming experiment in an attempt to recruit farmers, investors, and businessmen. The New Orleans Netherlands Company was formed under a trust agreement with the Chicago Title and Trust Company, which also held title to the land, to protect investors and to operate the Winter Garden Farm from its inception to its failure in 1914. The demise of the farming experiment was hastened by flooding and hurricanes, culminating in a rather severe storm in 1914.

The farm operated as a unit along cooperative lines. Its investors, whether stock or certificate holders, shared in the net profit of the crop sales derived from the entire Winter Garden tract. Crops which the farm was to grow included potatoes, cabbages, onions, corn, and beans.

The area destined to become the Winter Garden was leveed and drained after 1911. Fifteen miles of canals were dug. They varied in depth from seven to 14 feet, and ranged from 22 to 60 feet wide. The canals were used to drain the farm and the spoil was used to build levees. Portions of one such levee are still visible on the Pump Canal site and served to protect the last remnants of the site (below). Nearly one million cubic yards of earth were used to build the levees and other earthen dykes.

The farm was accessible from New Orleans by company-operated boats as well as by steamboat excursions operated by two transportation companies. The stern wheeler *Houma* was one of the boats that transported farm workers from Westwego, where most lived, to the farm for daily labor. The round trip to the farm took about four hours. A different boat, the 35-foot *Hilda*, was often used to ferry farm workers to and from the farm. Laborers were paid about 50 cents a day (Forrest Comardelle, personal communication 1991).

A concrete pumping station with the total capacity of 130,000 gpm was built. The pumping station slab, which is still extant within Lake Cataouatche, measures approximately 50 x 15 feet. The motor foundations are approximately 10 feet apart. The two pumps were relocated to the Westwego pumping stations after the failure of the farm experiment. They were moved again in 1965 and continued to be used after that date (Morris Terrebone, personal communication 1991). The pumping station also housed the power plant that provided electricity to the farm buildings, and to the town of Winter Garden located to the west of the farm and along the farm's harbor.

Farm and town buildings included a men's dormitory, replete with recreation parlor, library, and dining room for farm employees. The farm superintendent, Jacob Vanderbilt, and his assistant, Henry Buser, occupied houses in the town. A hotel was also built and operated at the Winter Garden Farm. The company warehouse and commissary were built on the harbor front. Wharfs extended into the lake in the harbor. Numerous small outbuildings were located around the farm. A bulkhead approximately 8,000 feet long was built along the entire length of the farm facing Lake Cataouatche. A large concrete cistern is present today under the lake's surface. This cistern poses a serious hazard to navigation.

Ten buildings were erected near the pumping station. The site of these buildings is presently denoted as 16SC29, the Pontoons. The houses were built on wooden pilings which are still visible within Lake Cataouatche at low tide. Three of these houses were moved by barge to Westwego in 1915. One house presently is located in Westwego at 217 Larouessini Street. This house is two stories, with three rooms upstairs and five downstairs. The floors are made of cypress. The house measures 28 x 42 feet. During later repairs of this house, several nickels dating to 1912 were found behind a portion of the baseboard molding. This local custom of placing money behind baseboards was thought to assure that the houses' occupants would never go broke. The second house is presently near LaPalco Boulevard in Marrero. The third house which was moved from Winter Garden was demolished during the expansion of the Westwego cemetery.

The farm was not a successful venture. In less than three years, the Winter Garden Experimental Farm was defunct. A potential cause of the farm's demise may have been the difficulty of keeping the land dry. The pumps seemingly could not keep the lake waters from seeping into the farmland. Mrs. Georgia Abadie (personal communication 1981) remembers a time when the pumps were used constantly but still could not keep the farmland dry. Sediment compaction followed the draining of the marshes, and accelerated the flooding problem. Additional factors, such as burrowing in the levees by muskrats, may have contributed to the rapid flooding of farmland (Ray Comardelle, personal communication 1991).

In 1921, following the abandonment and subsequent flooding of the Winter Garden Farm, the Cataouatche Hunting Club of New Orleans, acquired the marshland and built a fence west of the bulkhead to keep hunters out of the flooded areas that once were farmland. Several camps and a large dormitory were built at the mouth of the Louisiana Cypress Lumber Company canal. Ponds were named and numbered by the club to assign hunting spots to club members. Lots were drawn for the rights to each pond. Mr. Bob Lockett (personal communication 1991), a member of the club, tells of hunting from a blind located on a so-called "shell pile," which probably was the Pump Canal site (16SC27).

Site Description

Due to the subsidence of the drained marshland since the abandonment of the reclamation project discussed above, Lake Cataouatche now covers the former fields in the vicinity of 16SC27. A small portion of the site is buried beneath an island spoil bank that is associated with the actual Pump Canal. However, 16SC27 extends north beyond the edge of the spoil deposit, and is identifiable as a shallow wave-washed bank of *Rangia* shells on the flank of the island. In addition, artifacts lie at shallow depths on the bottom of the lake for some distance from the spoil bank.

The areal extent of this spoil bank island has decreased dramatically since the first archeological excavations were undertaken in 1979. At present, it measures approximately 33 m EW x 9 m NS (Figure 32). Based on the present erosion rate, wave action from Lake Cataouatche and the Pump Canal may destroy the island within a decade.

A single large oak tree survives at the center of the island. Other vegetation consists only of tangled underbrush and small trees. Open water in the canal and lake reaches the base of the spoil bank on all sides of the island at normal lake levels.

Archeological Investigations at Pump Canal (16SC27), 1979-1983 (by Marco Giardino and Michael Comardelle)

The Pump Canal Site (16SC27) was recorded in 1976 by Mr. Michael Comardelle of Boutte, Louisiana. At that time, it appeared that the site was being rapidly eroded and would soon disappear.

The draining of the marshlands during a large-scale, early-twentieth-century farming operation accelerated the subsidence and erosion of the site. The rate of destruction at Pump Canal from 1976 to 1979 was estimated as 10 meters per year, on average. By 1985, the site was reported to be only about 15 meters square. Only a linear spoil deposit, derived from the dredging of the Pump Canal in the early 1900s, and a few meters of reworked *Rangia* beach were observable.

Responding to the rapid loss of the site and its contents, members of the Louisiana Archeological Society (LAS) Delta Chapter, obtained permission to collect and test the Pump Canal site. They were assisted in obtaining the permit by Dr. Kathleen Byrd, State Archeologist, and Mr. Tom

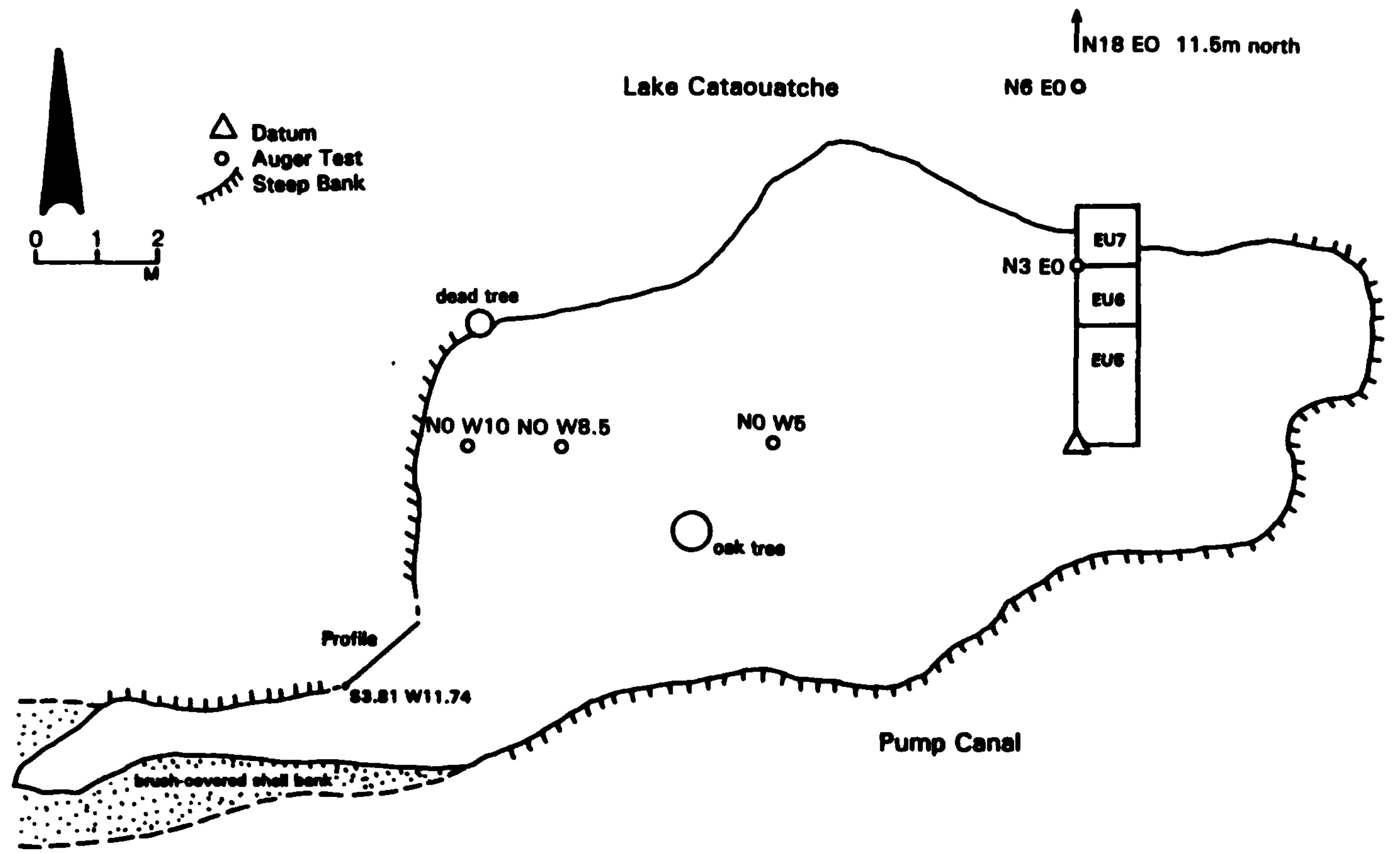


Figure 32. Site map of 16SC27 in 1991-1992.

Ryan, then with the U.S. Army Corps of Engineers. The permit was issued in February, 1980, and Mr. Robert Neuman, then Curator of Archeology at Louisiana State University, initially served as Principal Investigator. Shortly thereafter, Dr. Marco Giardino, then with Tulane University, became the professional advisor to the LAS during the work at Pump Canal.

In 1980, members of the LAS Delta Chapter began the fieldwork at 16SC27. The first task was to undertake a controlled surface collection of the site. The surface of the site was subdivided into a series of two-meter squares, and all materials from the surface were collected from each square and assigned the appropriate unit number. At the time of the surface collection, the *Rangia* beach extended approximately 75 meters along the EW axis and about 30 meters NS (Figure 33). Additional shell deposits and artifacts were visible below the water surface on the north and west portions of the site. These materials were not collected systematically.

Analysis of the surface collection revealed that the Pump Canal site contained artifacts dating from the fifth to the twentieth century A.D. The last significant occupation of the Pump Canal site occurred in the early-twentieth century when the farm mentioned above was located on and around the Pump Canal site. From around 1920 to the late-1950s, hunting camps were built on Pump Canal levees, but no remains of these structures are present today. At present, the site and the surrounding area are located within the Salvador Wildlife Refuge.

During the farming operations of the early-twentieth century, canals were dredged in the study area, resulting in deposition of spoil banks on the site. In 1983, the spoil bank atop the site itself was one to two meters high, 46 meters in length, and 22 meters in width. This feature has temporarily protected a small portion of the archeological deposits at 16SC27 from the wave erosion that has claimed the remainder of the site. At the time of these excavations, a brick feature which appeared to be *in situ* was observed to be eroding out of one portion of the site. Artifacts associated with the feature dated to the early-nineteenth century. Also, some human osteological remains were discovered eroding from the north edge of the site. Most of these had been damaged by wave action.

Early in 1979, auger testing of the Pump Canal site revealed potentially significant, *in situ* deposits below the marsh soils and the shell beach. Subsequently, the LAS Delta Chapter excavated four 1 x 1 m test units near the

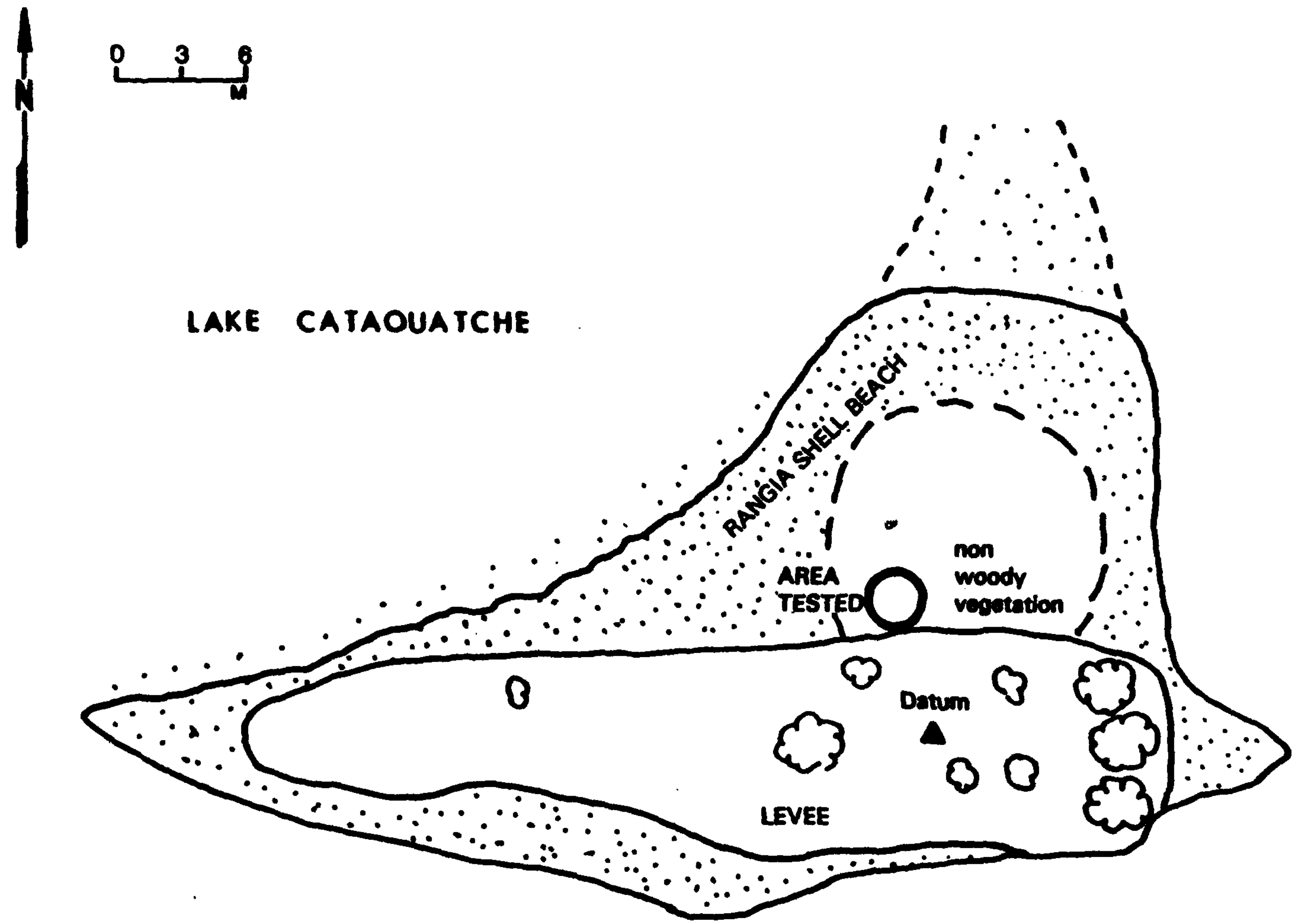


Figure 33. Site map of 16SC27 in 1980.

center of the site (Figure 33). The excavation units were located along the highest, extant portion of the site, adjacent to but not including the spoil bank. Most excavations were conducted to a depth that was well below water level, and pumps were employed in draining the test pits during all archeological operations. Three of the units extended into sterile subsoil.

All test units were placed contiguously. The contiguous placement of the test pits allowed close stratigraphic control of all excavations, which occurred over the course of four years. Test units were numbered in order of excavation. Test Unit 1, begun in 1979, was excavated in 10 cm arbitrary levels. As the natural stratigraphy of the Pump Canal deposits became clearer, subsequent test units were excavated in natural levels.

The on-going destruction of the Pump Canal site required field strategies common in "salvage" operations. Since the erosion of the site was imminent and the available work crews were small and made up mostly of volunteers, the research methodology that was employed during site excavation sought to maximize the recovery of information deemed unique and most relevant at the site. Table 30 summarizes the levels excavated scientifically in each test unit. Material from other levels was discarded without screening.

Excavation of Test Unit 1 suggested that Level A was disturbed. Therefore, soil from this level was screened only in Test Unit 1. Level B, a Plaquemine occupation, was relatively thin and contained some admixture from the overlying level. The level was removed without careful control from Units 3 and 4. Excavation of Unit 3 uncovered a large log extending beyond the unit's perimeter in Level D. Test Unit 4 was excavated solely to remove the log. No controlled recovery of materials from the other levels in this unit was attempted. All of these strategic choices were necessitated by the rapid destruction of the site and the lack of the necessary manpower to fully excavate each unit.

Excavation of the Pump Canal site required constant control of water seepage since most levels were below lake level. During the first year, Test Unit 1 was drained by a bilge pump attached to a battery and located in a sump. This pump was insufficient to maintain controlled excavations, so it was replaced by a two-horsepower gasoline-powered pump. The larger pump and the sump placed in the southeast corner of the test units allowed controlled excavations to depths greater than one meter below lake

Table 30. Stratigraphic Levels That Were "Scientifically" Excavated by LAS in Test Units 1 Through 4.

Test Unit	Levels	Year
1	A,B,C,D	1979
2	B,C,D,E,F	1980
3	Ca,Cb,D,E,F	1982
4	Recovery of log only	1983

level. Contents of the sump were monitored carefully throughout the excavations to prevent the mixing of artifacts. Materials that washed into the sump hole were catalogued with the surface collection. All artifacts recovered from the surface and the test units were bagged separately by test unit and level. Beginning in 1982 and continuing throughout the field work, water screening was employed to recover materials 1/4" and larger.

Artifacts and ecofacts from the site were washed, catalogued, and analyzed. Each object recovered from test excavations was assigned an individual number, as well as a unit and level designation. Surface materials were catalogued as 16SC27-S. Level elevations were taken from the northeast corners of each unit and correlated with the site's datum, which was established in 1981 during a survey of the site.

A total of eight stratigraphic levels were recorded during excavation of the four test units. All tests, numbered 1 through 4 in order of excavation, revealed the same basic stratigraphic sequence (Table 30). Several features were discovered during excavations, including a portion of a hearth and numerous post molds of varying sizes. The east profiles from Test Units 1 and 2 are representative of all wall profiles (Figure 34).

Level A is approximately 20 cm thick and consists of marsh "muck" and marsh plant roots, mostly reeds. Much of this organic material consists of decomposing marsh grasses and plant remains washed in by the lake waters. Silt lenses were encountered in Level A. These are probably the result of lake flooding during storms and tidal surges. The Level A matrix is dark brown (7.5YR 3/2), with a high water and clay content. The soil within Level A exhibited some characteristics of a plow zone. This may be the result of farming activity during the early-twentieth century.

Very few artifacts were recovered from the excavation of this level, which appeared to be a recent deposit. These artifacts are included in the analysis of the surface collection (Table 31). Although ceramics dating from the Bayou Petre phase (A.D. 1200-1700) of the Mississippi period are common in the surface collections, no *in situ* deposits from this phase were found during excavations. Level A was systematically excavated only in Test Unit 1.

Level B consists of small fragments of *Rangia* shells and silty clay soil, including rootlets from marsh vegetation. It is approximately 20 cm thick. Ceramics

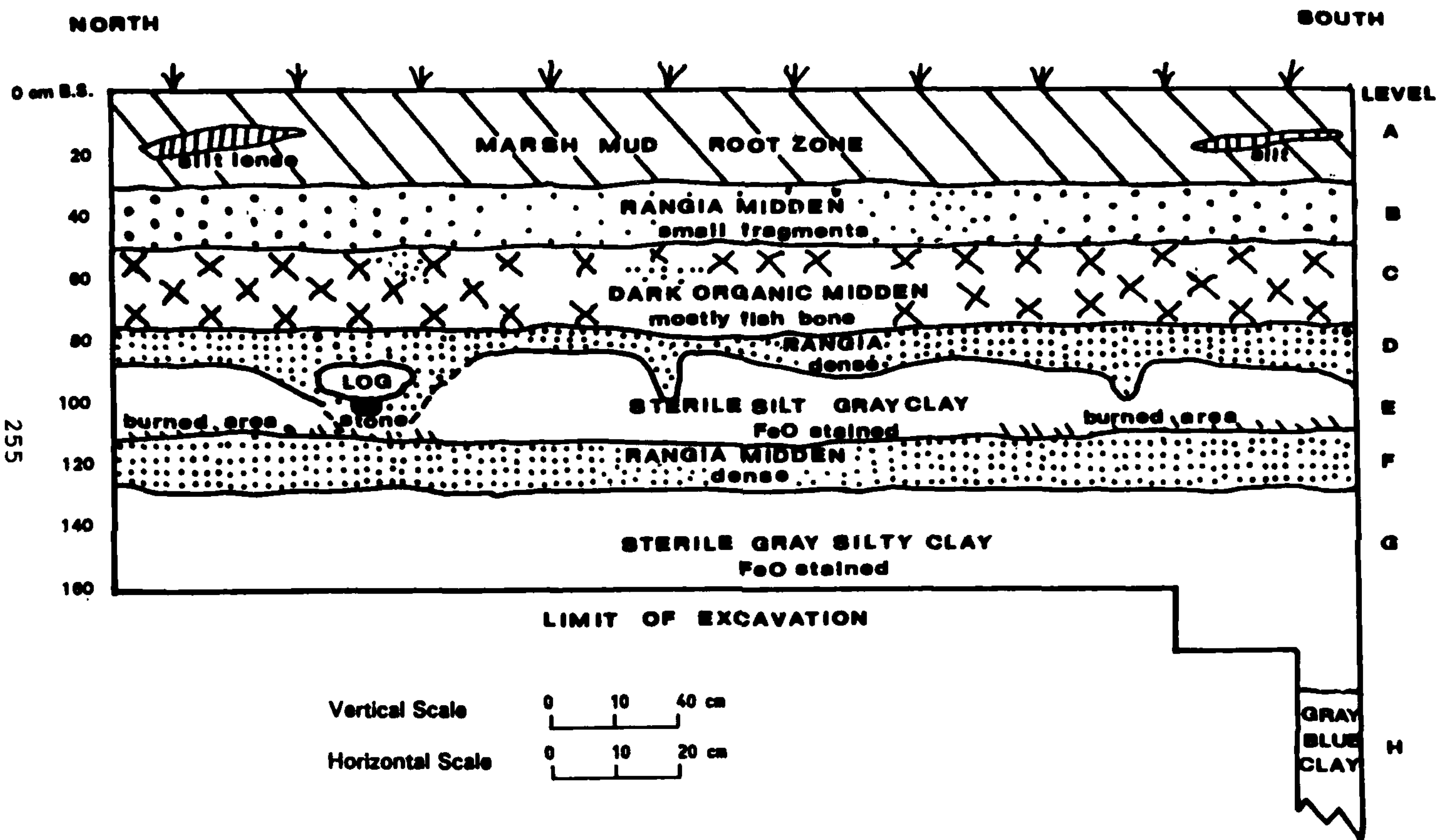


Figure 34. East profile of EU1 and EU2.

Table 31. Artifacts from Surface Collection and Level A.

Alligator Incised, var. *Oxbow*	6
Alligator Incised, var. *unspecified*	1
Beldeau Incised, var. *Beldeau*	15
Beldeau Incised, var. *unspecified*	1
Buras Incised, var. *Buras*	4
Coles Creek Incised, var. *Athanasio*	28
Coles Creek Incised, var. *Roseau*	7
Coles Creek Incised, var. *Hardy*	43
Coles Creek Incised, var. *Lone Oak*	30
Coles Creek Incised, var. *Macedonia*	3
Coles Creek Incised, var. *Blakely*	15
Coles Creek Incised, var. *Chase*	8
Coles Creek Incised, var. *Hunt*	21
Coles Creek Incised, var. *Coles Creek*	30
Coles Creek Incised, var. *Mott*	6
Coles Creek Incised, var. *Wade*	2
Coles Creek Incised, var. *Stoner*	3
Complicated Stamped Category A	1
Complicated Stamped Category E	1
Evansville Punctated, var. *Braxton*	36
Evansville Punctated, var. *Evansville*	33
Evansville Punctated, var. *Rhinehart*	7
Evansville Punctated, var. *unspecified*	1
Harrison Bayou Incised, var. *Harrison Bayou*	5
Harrison Bayou Incised, var. *unspecified*	5
Marksville Incised, var. *Goose Lake*	1
Marksville Stamped, var. *Manny*	1
Mazique Incised, var. *Barataria*	10
Mazique Incised, var. *Bruly*	8
Mazique Incised, var. *Comardelle*	1
Mazique Incised, var. *Kings Point*	4
Mazique Incised, var. *Manchac*	10
Mazique Incised, var. *Mazique*	23
Medora Incised, var. *Medora*	5
Moundville Incised, var. *unspecified*	8
Pontchartrain Check Stamped, var. *Crawford Point*	5
Pontchartrain Check Stamped, var. *Lambert Ridge*	1
Pontchartrain Check Stamped, var. *Pontchartrain*	129
Pontchartrain Check Stamped, var. *Tiger Island*	42
Pontchartrain Check Stamped, var. *unspecified*	7
Pontchartrain Check Stamped, var. *unspecified*	20
Shellwood Cord Impressed, var. *unspecified*	1
TOTAL DECORATED, SURFACE COLLECTION AND LEVEL A	588

recovered from Level B in Test Units 1 and 2 (Tables 32 and 33) appeared to represent styles typical of a late Coles Creek/early Plaquemine component, either the Bayou Ramos or St. Gabriel phase (ca. A.D. 850-1200). Level B midden in Test Units 3 and 4 was discarded. Although some sherds were collected from the level, the collection was made in a non-systematic manner so that statistical characterization of the sample would be invalid.

Level C is a very rich midden level, composed in large part of fish bones. The large quantity of faunal remains led to the designation "fish midden" for this level. It averages 35 cm in thickness. The matrix is black (7.5YR 2/0). The level was the richest encountered in terms of artifacts and faunal remains. Artifacts from this level, summarized in Tables 34, 35, 36, and 37, reflect styles representative of the Bayou Cutler phase of the Coles Creek period (A.D. 700-850). A hearth was located in this level. At least one post mold was discovered extending from this level into Level D. One carbon date was obtained for material from Level C. This date of 545 ± 65 BP (UGa-4675) [cal. A.D. 1405] is much too recent for the associated ceramics, which represent the remains of a Coles Creek period occupation.

The hearth from Level C (Figure 35) consisted of three stratified lenses. The bottom layer of this feature consisted of charcoal, and was overlain by dark red burned clay with charred wood fragments. This clay was in turn covered by a level of reddish-white ash.

During excavations, it became clear that the contents of Level C were quite extensive. After excavation of Test Unit 2, a decision was made to subdivide the level into two sublevels to explore possible cultural/temporal differences within it. The hearth was utilized in Test Unit 3 as the break point. Materials above the hearth were labelled as Level Ca, and those below were designated Level Cb. Since the excavation in Test Unit 1 had proceeded by arbitrary 10 cm levels, it was possible to correlate material from that unit with Sublevels Ca and Cb. Such differentiation was not possible for materials from Test Unit 2 because Level C had been excavated as a single unit. Analysis of artifacts from Sublevels Ca and Cb demonstrated that ceramic differences reflect the development of the Coles Creek period ceramic industries through time. Consequently, cultural materials recovered from Level C in Test Units 1 and 3 were described and discussed in terms of Sublevels Ca and Cb.

A clearly distinguishable *Rangia* midden is present below Level C. This midden, designated Level D, is

Table 32. Artifacts from Test Unit 1, Level B.

Anna Incised, var. *Australia*	1
Baytown Plain, var. *Addis*	465
Beldeau Incised, var. *Beldeau*	1
Buras Incised, var. *Buras*	1
Coles Creek Incised, var. *Coles Creek*	1
Coles Creek Incised, var. *unspecified*	1
Evansville Punctated, var. *unspecified*	1
Incised Rim	1
Medora Incised, var. *unspecified*	1
"Onion Lake" Rims	6
Plaquemine Brushed, var. *Plaquemine*	1
Pontchartrain Check Stamped, var. *Tiger Island*	1
Pontchartrain Check Stamped, var. *unspecified*	13
Unclassified Brushed	1
Unclassified Incised	6
Unclassified Incised and Punctated	2
Unclassified Interior Incised	1
Winterville Incised, var. *Angola*	1
TOTAL	505

Table 33. Artifacts from Test 2, Level B.

Baytown Plain, *var. Addis*	750
Evansville Punctated, *var. Braxton*	3
Mazique Incised, *var. Manchac*	2
Mazique Incised, *var. unspecified*	3
Mississippi Plain, *var. unspecified*	1
Mound Place Incised, *var. unspecified*	1
Solomon Brushed, *var. Fant*	1
Unclassified Punctated	3
Unclassified Incised	2
Unclassified Interior Incised	1
TOTAL	767
Conch Shell Pendant Fragment	1
Sandstone Abrader	1
Amorphous Clay Object	1
Burned Cane Fragment	1
Bone Point Tips, Base, Rejects	10
Deer Cannon Splinter	1
Deer Cannon Awl	1
Worked Reptile Bone	1
Worked Fish Bone	1

Table 34. Artifacts from Test Unit 1, Level C.

Avoyelles Punctated, *var. Avoyelles*	1
Baytown Plain, *var. Addis*	566
Beldeau Incised, *var. Beldeau*	1
Coles Creek Incised, *var. unspecified*	1
Evansville Punctated, *var. unspecified*	2
Mazique Incised, *var. unspecified*	2
Medora Incised, *var. unspecified*	3
Mississippi Plain, *var. unspecified*	1
"Onion Lake" Rim	6
Pontchartrain Check Stamped, *var. unspecified*	22
"Six Mile" Treatment	1
Unclassified Brushed	1
Unclassified Incised	4
Unclassified Incised and Punctated	1
Unclassified Punctated	4
TOTAL	616

Table 35. Artifacts from Test Unit 2, Level C.

Baytown Plain, var. *Addis*	511
Coles Creek Incised, var. *Athanasio*	1
Coles Creek Incised, var. *unspecified*	3
Evansville Punctated, var. *Braxton*	5
Evansville Punctated, var. *unspecified*	3
Harrison Bayou Incised, var. *Harrison Bayou*	3
Lake Borgne Incised, var. *unspecified*	1
L'Eau Noire Incised, var. *Evangeline*	1
Mazique Incised, var. *Kings Point*	1
Mazique Incised, var. *Manchac*	1
Mazique Incised, var. *unspecified*	4
"Onion Lake" Rim	4
Pontchartrain Check Stamped, var. *unspecified*	44
"Six Mile" Treatment	1
Solomon Brushed, var. *Solomon*	1
Unclassified Decorated	2
Unclassified Engraved	1
Unclassified Incised	4
Unclassified Punctated	3
Yates Net Impressed, var. *unspecified*	1
TOTAL	595

Table 36. Artifacts from Test Unit 3, Level Ca (Above Hearth).

Alligator Incised, *var. unspecified*	1
Avoyelles Punctated, *var. Avoyelles*	2
Beldeau Incised, *var. Beldeau*	3
Chinchuba Brushed, *var. unspecified*	1
Coles Creek Incised, *var. Blakely*	1
Coles Creek Incised, *var. Hardy*	2
Coles Creek Incised, *var. Hunt*	1
Coles Creek Incised, *var. Mott*	1
Coles Creek Incised, *var. unspecified*	5
Evansville Punctated, *var. Braxton*	5
Evansville Punctated, *var. Rhinehart*	1
Evansville Punctated, *var. unspecified*	4
French Fork Incised, *var. Larkin*	2
French Fork Incised, *var. McNutt*	1
French Fork Incised, *var. unspecified*	2
Harrison Bayou Incised, *var. Harrison Bayou*	1
"Onion Lake" Rims	23
Pontchartrain Check Stamped, *var. unspecified*	68
"Six Mile" Treatment	4
Unclassified Brushed	1
Unclassified Incised	16
Unclassified Incised and Punctated	2
Unclassified Punctated	2
TOTAL	149

Table 37. Artifacts from Test Unit 3, Level Cb (Below Hearth)

Avoyelles Punctated, var. *Avoyelles*	1
Coles Creek Incised, var. *Athanasio*	1
Coles Creek Incised, var. *Hardy*	1
Coles Creek Incised, var. *Stoner*	1
Evansville Punctated, var. *Braxton*	2
Evansville Punctated, var. *Rhinehart*	1
Evansville Punctated, var. *unspecified*	1
French Fork Incised, var. *Larkin*	1
French Fork Incised, var. *unspecified*	1
Harrison Bayou Incised, var. *Harrison Bayou*	1
Mazique Incised, var. *Bruly*	1
"Onion Lake" Rims	7
Pontchartrain Check Stamped, var. *unspecified*	20
"Six Mile" Treatment	5
Unclassified Brushed	1
Unclassified Incised	23
Unclassified Punctated	3
TOTAL	71

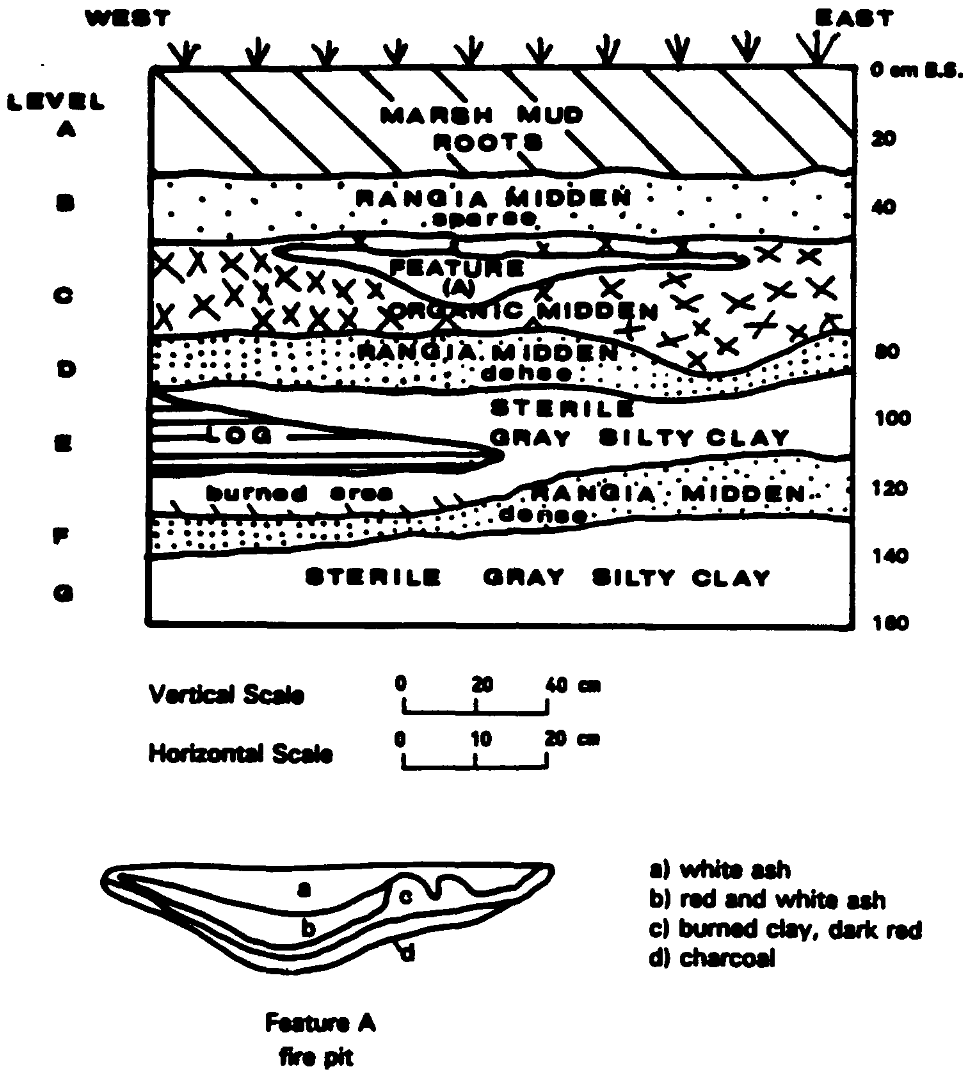


Figure 35. Profile of EU3 showing hearth in Level C and log in Levels D and E.

approximately 20 cm thick. Numerous post molds and other features, including a large pit (Figure 35) and an associated quartered section of a cypress log were encountered within Level D. This log provided a carbon date of cal. A.D. 539 (1540 ± 110 BP, UGa-4676).

The log was tapered at one end. The tapered or pointed end of the log lay within the associated pit. Shell underlay the log. It appears that the log originated in Level D, although a large portion of the log extended into Level E, which was sterile. The weight of the log apparently caused it to intrude into the underlying sterile level once it began to topple.

At the bottom of the large pit, a fragment of polished igneous stone was discovered in close spatial association with the tapered portion of the log. Their co-occurrence appears to represent a principal structural member of a structure erected during the occupation represented by Level D. Ceramics recovered from Level D are summarized in Table 38.

The sterile deposits of Level E are approximately 15-20 cm thick. Level E is composed of a silty clay which is light gray in color. Post molds, as well as the large pit feature associated with the cypress log, intrude into Level E from Level D. No artifacts or faunal remains were encountered in this level. At the bottom of this sterile level was a very thin lens of burned clay which appears to represent the upper surface of Level F.

Level F lies below the lens of burned clay. It represents the earliest occupation of the site discovered to date. This level was excavated in Test Units 2, 3, and 4. Due to water seepage problems, Test Unit 1 was not excavated to a depth sufficient to encounter Level F.

Level F contained mostly large, unbroken *Rangia* shell. The size and preservation of these shells contrasted sharply with shell from Level B. In Level B, shells were small and fragmented. Also, shells in Levels C and D, although unbroken, were smaller than those in Level F. Few ceramics were recovered from Level F (Table 39). However, the sherds appeared to be typical of ceramic styles dating from the Whitehall phase (A.D. 400-700) (Phillips 1970). Level F probably represents the first *in situ* Whitehall phase component so far excavated in the lower Louisiana delta.

Wood samples recovered from the top of the sterile layer underlying Level F yielded a C-14 date of 1640 ± 65 BP (cal. A.D. 411, UGa-4675). This level, designated Level G,

Table 38. Artifacts from Test 3, Level D.

Alligator Incised, *var. unspecified*	4
Baytown Plain, *var. unspecified*	554
Churupa Punctated, *var. unspecified*	1
Coles Creek Incised, *var. Coles Creek*	1
Coles Creek Incised, *var. unspecified*	1
French Fork Incised, *var. LaBorde*	1
French Fork Incised, *var. unspecified*	2
"Onion Lake" Rim	1
Pontchartrain Check Stamped, *var. unspecified*	1
"Six Mile" Treatment	5
Unclassified Incised	1
Unclassified Punctated	2
TOTAL	574

Table 39. Artifacts from Tests 2 and 3, Level F.

Baytown Plain (Polished Interior)	1
Baytown Plain, *var. Troyville*	72
Larto Red, *var. Silver Creek*	2
Larto Red, *var. unspecified*	3
Marksville Incised, *var. Goose Lake*	1
Unclassified Incised	2
Unclassified Incised (sandy paste)	1
TOTAL	82

is composed of oxidized tan silts and clay interspersed with horizontal lenses of blue clay. This situation is typical of naturally deposited levee materials. Auguring to a depth of 200 cm below the excavated portion of Level F revealed similar sterile levee sediments. However, at approximately 60 cm below Level F, the clay content of the soil increases considerably and the tan-brown coloring is gradually replaced by blue and gray hues. An auger test indicated that this soil is present to a depth at least 300 cm below the deepest cultural deposits.

Initial Series of Auger Tests, 1990

The wooden stake marking the original site datum as established by LAS could not be relocated when investigations were initiated during 1990. The site map showing the 1979-1983 excavations placed the datum relative to the single large oak tree in the center of the spoil bank island (Figure 33). Using that tree, a new datum stake was placed at the approximate location of the earlier datum to facilitate mapping. Site datum is on the top of the east-west ridge of spoil material parallel to the Pump Canal (Figure 32).

On December 10, 1990, a series of auger tests were excavated at the site. Auger tests were excavated at N3 E0, N6 E0, and N18 E0. The test at N3 E0 went through the spoil overburden and cultural strata to penetrate the underlying sterile clay. The auger tests at N6 E0 and N18 E0 were placed atop wave-washed *Rangia* shells exposed by the low lake level on the date of this visit. The test at N6 E0 penetrated a level of dense *Rangia* shell at depth 52 cm below ground surface. Rapid inflow of the shells and the soil matrix into the auger hole rendered excavation below a depth of 66 cm impossible. This auger test was located in the area of the 1979-1983 excavation units. The auger test at N18 E0 was near the water's edge. This auger test was similarly hampered by the inflow of shells and soil matrix below a depth of 45 cm and was halted at a depth of 55 cm.

Auger testing revealed the severity of the inflow problem that would be encountered during the excavation of units at the Pump Canal site. Those cultural strata composed primarily of *Rangia* shell in a loose soil matrix act as aquifers, allowing the rapid flow of water into units excavated below lake level. The results of the auger testing regime, with the information supplied by the earlier excavations, made it clear that the new units should be placed on the spoil bank deposit rather than in the area where the LAS units had been placed.

Logistics and Procedures for Excavation Units

Excavation at 16SC27 is, even under the best conditions, difficult. The logistics of excavation are discussed briefly here because this information may prove useful to archeologists who work at the site in the future. The 1979-1983 excavation area is exposed only periodically, during low lake levels caused by north winds during the winter. The relative infrequency of such conditions prevents any sustained research effort in that area without the erection of a protective barrier against wave erosion. This was an additional reason for placing units on the spoil bank. That location also made it possible to leave a sill of unexcavated spoil between the open units and the lake. This low earth barrier was reinforced on the lake side with sand bags as a precaution against wave action during periods when the water was rising.

Placing the new units within the spoil bank also offered research opportunities not provided by the LAS location. It was presumed that the overburden of spoil had sealed the 1911 ground surface, thereby protecting it in place. Barring historic disturbances prior to 1911, the full range of stratigraphic components including any historic period component at the site was therefore expected to be present below the canal spoil. During the 1979-1983 excavations, Giardino and Comardelle noted the presence of bricks and historic material eroding from the northeastern end of the spoil bank island, just below the base of the spoil. It was hoped that intact historic features, or at least undisturbed historic deposits, were preserved below the canal spoil.

Unit excavations at the Pump Canal site began on January 14, 1991 and continued through March 5, 1991. Initially, the crew travelled to the site from the Pier 90 boat launch on the south side of U.S. Highway 90. Subsequently, the boat was launched from the Bayou Segnette State Park public boat launch in Westwego. The boat ride averaged 35 to 40 minutes each way, totalling about 1.25 hours per day. When added to transport time from the office in uptown New Orleans, travel time averaged three hours per day. This is a considerable loss of excavation time during the winter, which unfortunately, is the only time that north winds prevail, thereby lowering lake levels sufficiently to allow digging.

In addition to standard excavation tools, equipment included two three-horsepower, four-cylinder Gorman-Rupp pumps with 1.5" intake and discharge hoses. They were powered by gasoline engines. One of these pumps was utilized for drainage of water in the excavation units and the other for water screening of the material excavated.

The only drawback to the pumps that were used was that the power could not be lowered sufficiently to allow continuous pumping action under conditions of low inflow. When water inflow was low, the pump would lose its suction after completely draining the unit and would have to be reprimed. During repriming, the unit would flood. This problem was solved in Excavation Unit 5 (EU5) by use of a sump hole. The sump hole was dug into the underlying sterile clay (Stratum J) at approximately N1.8-2.0 E0-0.2. It was later expanded into an east-west trench across the unit which then served as a sump for the other units.

During excavation, there was a steady seepage of water through the various strata of organic-rich and *Rangia*-laden midden, but the seepage was not rapid enough to impede excavation. The clay strata were relatively impervious to water flow and displayed the greatest stability. Although minor water flow problems persisted throughout fieldwork, the unit walls remained relatively stable. Several minor falls of wall material from the less stable cultural strata occurred after standing water was removed from the unit. Also, the water-saturated soil was partially undermined by erosion along the wall faces between episodes of excavation, when water inside the excavation rose to the surrounding lake level.

Even though damage to the unit walls was limited and created no significant problems during the fieldwork, it was recognized that the instability could result in the contamination of stratigraphic levels below water table. In order to avoid contamination of cultural material from these strata by the admixture of artifacts from overlying strata, the material that fell from the walls onto the floor of the unit was carefully discarded. Also, after the initial pumping of the unit at the beginning of each new day of excavation, material on the floor of the unit was discarded for the same reason.

All soil from cultural strata in EU5 and EU7 was water screened through 1/4-inch mesh. Soil from EU6 was water screened through nested 1/4-, 1/8-, and 1/16-inch mesh. The mesh was mounted in trays which could be stacked in a wooden stand designed by Michael Comardelle. When only 1/4-inch mesh was in use, two trays were used. This allowed one person to clean the shell and cultural material out of a tray while a second person continued to water screen new material.

The midden at 16SC27 is extremely rich. In overview, the midden consists of several strata in which *Rangia* shell is densely concentrated. These *Rangia*-laden strata alternate with strata containing *Rangia* in much lower densities. These latter strata consist largely of silt, clay, and organic material, including large amounts of bone. It was impossible to remove and discard shell in the field because of the density of either shell, cultural material, bone, or all three. This necessitated placing all solid material, including *Rangia* shell, in labelled bags after water-screening. The volume of material recovered and transported in this manner, in combination with crew and equipment and soil samples for flotation, completely filled the boat.

The bags of shell, bone, and artifacts were later re-washed in the same mounted screens at the laboratory. After drying, ceramics, shell, bone, and other artifacts were sorted. Shell, with the exception of shell in Excavation Unit 6 (Chapter 14), was discarded at that time.

A series of features were encountered in the course of excavations. These consisted primarily of postmolds and ash lenses, but various other kinds of features were also present. Features were numbered sequentially in the order in which they were discovered. Table 40 is a summary table of features.

The 1991-1992 site map (Figure 32) shows that Excavation Units 5, 6, and 7 were configured in such a way that they form a 1 x 4 m trench oriented N/S. Water screening was conducted at some distance from the unit. Material from the excavated midden was placed in buckets, and then carried to the screening area. The buckets were usually lifted out of the unit on the north side, because the spoil bank was highest to the south. To facilitate this transport, partial steps were cut into the spoil overlying the cultural strata in EU6 and EU7. Buckets of soil from the lower strata were handed up to crew members on the steps by the excavators. The procedure for entering and leaving the unit was somewhat different. Access was by ladder at the south end of the trench (i.e., the south end of EU5) in order to avoid damaging or contaminating unexcavated midden.

Excavation proceeded from south (EU5) to north (EU7). After EU5 was completed, all of the walls were profiled. After the excavation of the southern half of EU6 was completed, the north, east, and west walls were profiled. After the two northern quarters of EU6 were fully excavated, the same three walls were profiled. Finally, these walls were profiled within EU7. The south wall profile of EU5 is

Table 40. Features Associated with Strata Observed at 16SC27.

ASSOCIATED WITH STRATUM C

Feature No.	Description	Provenience
35	Postmold	E wall of EU7; within Str. D but appears intrusive from Str. C (Figs. 41 and 44)

ASSOCIATED WITH STRATUM D

Feature No.	Description	Provenience
31	Ash lens	In E-1/2 of Str. D (Figs. 41 and 44)
36	Postmold	W wall of EU7; within Str. E but appears intrusive from Str. D (Fig. 42)
37	Postmold	W wall of EU7; within Str. E but appears intrusive from Str. D (Fig. 42)

ASSOCIATED WITH STRATUM E

Feature No.	Description	Provenience
1	Ash lens	Top of Str. E, E wall of EU5 (Fig. 41)
3	Postmold	Within Str. F but probably intrusive from Str. E; N wall of EU5 (Fig. 37)
8	Ash lens	Within upper 10 cm of Str. E; SE-1/4 of EU6
9	Postmold	Within F8 within Str. E; SE-1/4 of EU6

Table 40. Features Associated with Strata Observed at 16SC27 (continued).

ASSOCIATED WITH STRATUM E (CONTINUED)

Feature No.	Description	Provenience
10	Postmold	Within Str. F but probably intrusive from Str. E.; S-1/2 of EU6
11	Postmold	Within Str. F but probably intrusive from Str. E; S-1/2 of EU6
12	Postmold	Within Str. F but probably intrusive from Str. E; S-1/2 of EU6
13	Postmold	Within Str. F but probably intrusive from Str. E; S-1/2 of EU6
14	Pocket of dark soil	Within Str. F but probably intrusive from Str. E; S-1/2 of EU6
19	Ash lens	Upper portion of Str. E; NE-1/4 of EU6 (Fig. 45)
20	Postmold	Str. E below compact surface; N-1/2 of EU6; probably intrusive from upper E (Fig. 46)
21	Postmold	Str. E below compact surface; N-1/2 of EU6; probably intrusive from upper E (Fig. 46)
22	Postmold	Str. E below compact surface; N-1/2 of EU6; probably intrusive from upper E (Fig. 46)

Table 40. Features Associated with Strata Observed at 16SC27 (continued).

ASSOCIATED WITH STRATUM E (CONTINUED)

Feature No.	Description	Provenience
23	Postmold	Str. E below compact surface; N-1/2 of EU6; probably intrusive from upper E (Fig. 46)
24	Postmold	Str. E below compact surface; N-1/2 of EU6; probably intrusive from upper E (Fig. 46)
25	Postmold	Str. E below compact surface; N-1/2 of EU6; probably intrusive from upper E (Fig. 46)
26	Postmold	Str. E below compact surface; N-1/2 of EU6; probably intrusive from upper E (Fig. 46)
32	Postmold	Str. E below compact surface; N-1/2 of EU6; probably intrusive from upper E
33	Postmold	Str. E below compact surface; NE corner of EU7; probably intrusive from upper E (Fig. 41)
34	Ash lens	Str. E below compact surface; NE corner of EU7 (Fig. 41)
38	Postmold	Str. F but intrusive from Str. E; S-1/2 of EU7

Table 40. Features Associated with Strata Observed at 16SC27 (continued).

ASSOCIATED WITH STRATUM F

Feature No.	Description	Provenience
2	Horizontal wood "post"	Within Str. G but intrusive from Str. F; includes surrounding fill; EU5, EU6, and EU7 (Figs. 37, 38, & 47)
4	Postmold	West wall of EU5 (Fig. 42)
5	Postmold	West wall of EU5 (Fig. 42)
15	Postmold	At top of Str. G but intrusive from Str. F S-1/2 of EU6 (Fig. 47)
16	Postmold	At top of Str. G but intrusive from Str. F; S-1/2 of EU6 (Fig. 47)
17	Pocket of dark soil	At top of Str. G but intrusive from Str. F; S-1/2 of EU6 (Fig. 47)
18	Horizontal wood "plank"	In Str. G but with surrounding fill is intrusive from Str. F; EU6 & EU7 (Fig. 47)
27	Postmold	In Str. G but intrusive from Str. F; N-1/2 of EU6 (Fig. 47)
28	Postmold	In Str. G but intrusive from Str. F; N-1/2 of EU6 (Fig. 47)
29	Postmold	In Str. G but intrusive from Str. F; N-1/2 of EU6 (Fig. 47)
39	Postmold	In Str. G but intrusive from Str. F; S-1/2 of EU7 (Fig. 47)

Table 40. Features Associated with Strata Observed at 16SC27 (continued).

40	Postmold	In Str. G but intrusive from Str. F; N-1/2 of EU7 (Fig. 47)
41	Postmold	In Str. G but intrusive from Str. F; S-1/2 of EU7 (Fig. 47)
42	Postmold	In Str. G but intrusive from Str. F; N-1/2 of EU7 (Fig. 47)
43	Pocket of dark soil with *Rangia*	In Str. G but probably intrusive from Str. F; SW-1/4 of EU7

ASSOCIATED WITH STRATUM G

Feature No.	**Description**	**Provenience**
7	Ash lens	Within Str. G, near bottom of level; cultural association unknown because overlying stratigraphy unclear but may be intrusive from Str. F; SW corner EU5 (Fig. 42)

ASSOCIATED WITH STRATUM I

Feature No.	**Description**	**Provenience**
6	Postmold	Within Str. J but intrusive from Str. I; NW corner EU5
30	Postmold	Within Str. J but intrusive from Str. I; N-1/2 of EU6
44	Postmold	Within Str. J but intrusive from Str. I; SW-1/4 of EU7

shown in Figure 36. The four north walls, seen at the various stages of excavation, are shown in Figures 37-40. The composite profiles of the east and west walls are shown in Figures 41 and 42.

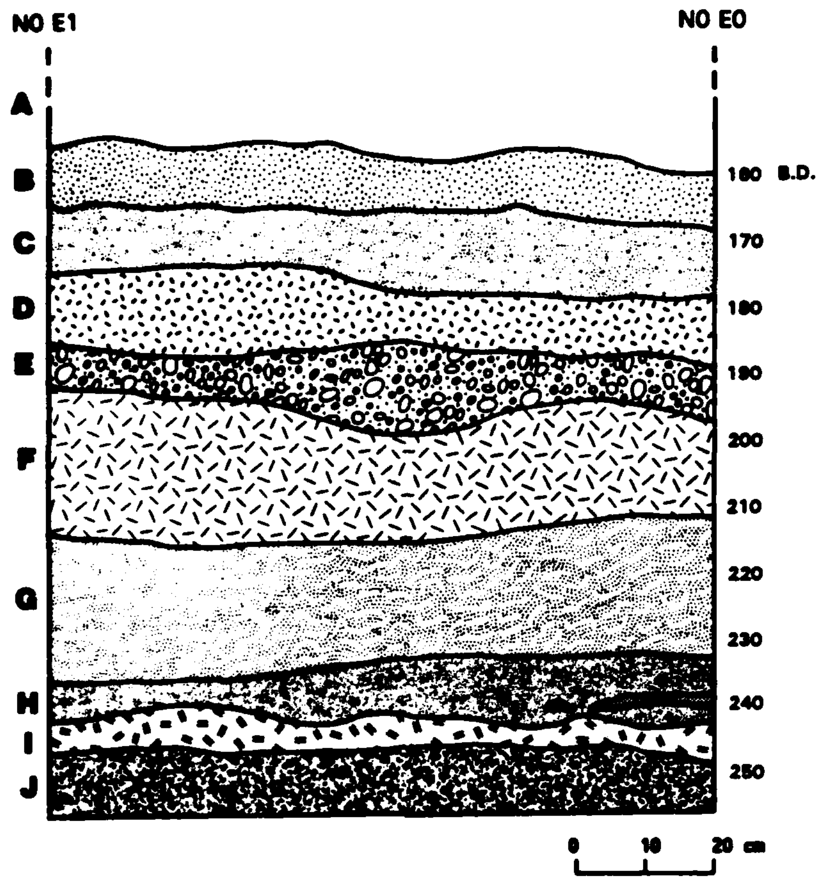
At the end of excavation, phytolith and flotation samples were collected from the east wall of EU7. Stratigraphy at the center of EU7 was clearly defined. Samples of the entire stratigraphic column (of cultural strata C-I) were removed in sequence from bottom to top in order to avoid contamination of the lower strata by dislodged material from above. A similar column of samples was also removed from the north wall of EU7. Following the completion of all recording and of sample collection in the excavation units, the trench was refilled with the spoil backdirt originally placed east of the trench. The backdirt was supplemented with dead wood collected on the island, as so much of the soil had been removed for water screening. The wooden stake at site datum was left in place for future reference. All equipment was removed from the spoil bank island at the termination of fieldwork on March 5, 1991.

Details of Excavation Procedures in Each Unit

A site grid was established on the first day of fieldwork, keyed to the datum stake placed in December 1990. Elevations for excavations were all recorded relative to a string tied onto the datum stake at 10 cm above ground surface. All depths presented in the discussion below are given in cm below this vertical datum reference unless otherwise stated in the text. As was noted above, datum was near the highest portion of the spoil mound and was therefore well above lake level.

EU5. The initial excavation unit was a 1 x 2 m north-south unit, with its southwest corner at the site datum (N0 E0) (Figure 32). This unit was termed Excavation Unit 5 (EU5) to distinguish it from the four 1 x 1 m units excavated during 1979-1983. EU5, extending from N0 to N2 and E0 to E1, ran perpendicular to the linear spoil bank. The south end of EU5 was near the highest portion of the spoil deposit on the site. Two subsequent northward extensions, EU6 (N2-N3 E0-E1), and EU7 (N3-N4 E0-E1) expanded the excavation into a north-south trench one meter wide and four meters long. The northern end of the trench reached almost to the lakeside foot of the spoil deposit (Figure 32).

At the beginning of excavation in EU5, the upper 40 cm of canal spoil, designated Stratum A, were excavated by a combination of arbitrary 10 and 20 cm levels, and the

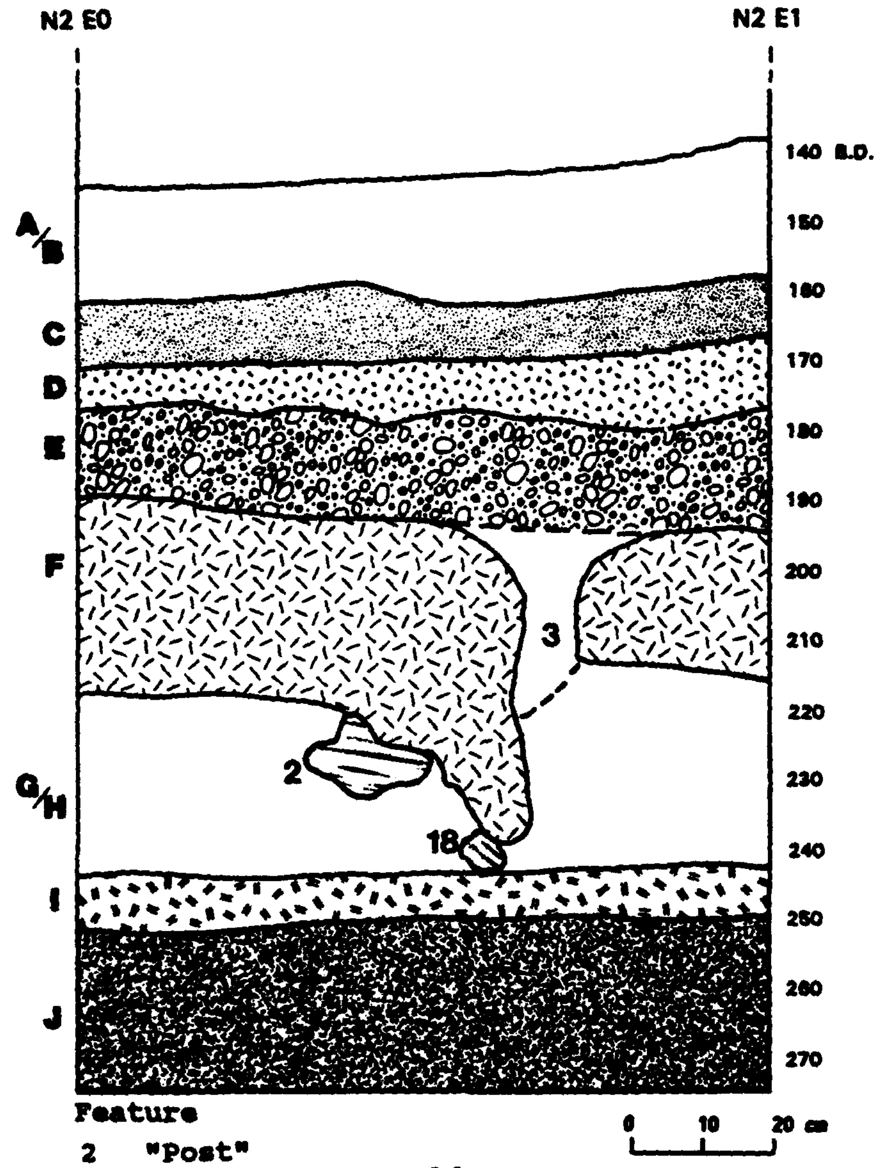


Feature

7 Ash lens

Stratum A	10YR 3/3 (dark brown) silty clay, 2.5Y 5/4 (light olive brown) silty clay, 2.5Y 4/4 (olive brown) sandy loam, and 2.5Y 4/2 (dark grayish brown) clay
Stratum B	2.5Y 4/2 (dark grayish brown) stiff plastic clay
Stratum C	10YR 2/1 (black) organic-rich friable silt containing small *Rangia* shell fragments
Stratum D	dense *Rangia* shell midden in a matrix of 10YR 2/1 (black) blocky silt
Stratum E	bone-rich midden of 10YR 2/1 (black) clayey silt
Stratum F	dense *Rangia* shell midden in a matrix of 10YR 2/1 (black) clayey silt
Stratum G	5Y 4/2 (dark gray) plastic clay with small amounts of *Rangia* shell
Stratum H	5Y 4/1 (dark gray) plastic clay
Stratum I	*Rangia* midden in a 10YR 2/1 (black) clayey silt matrix
Stratum J	5Y 4/1 (dark gray) plastic silty clay

Figure 36. Profile of the south wall of EU5.

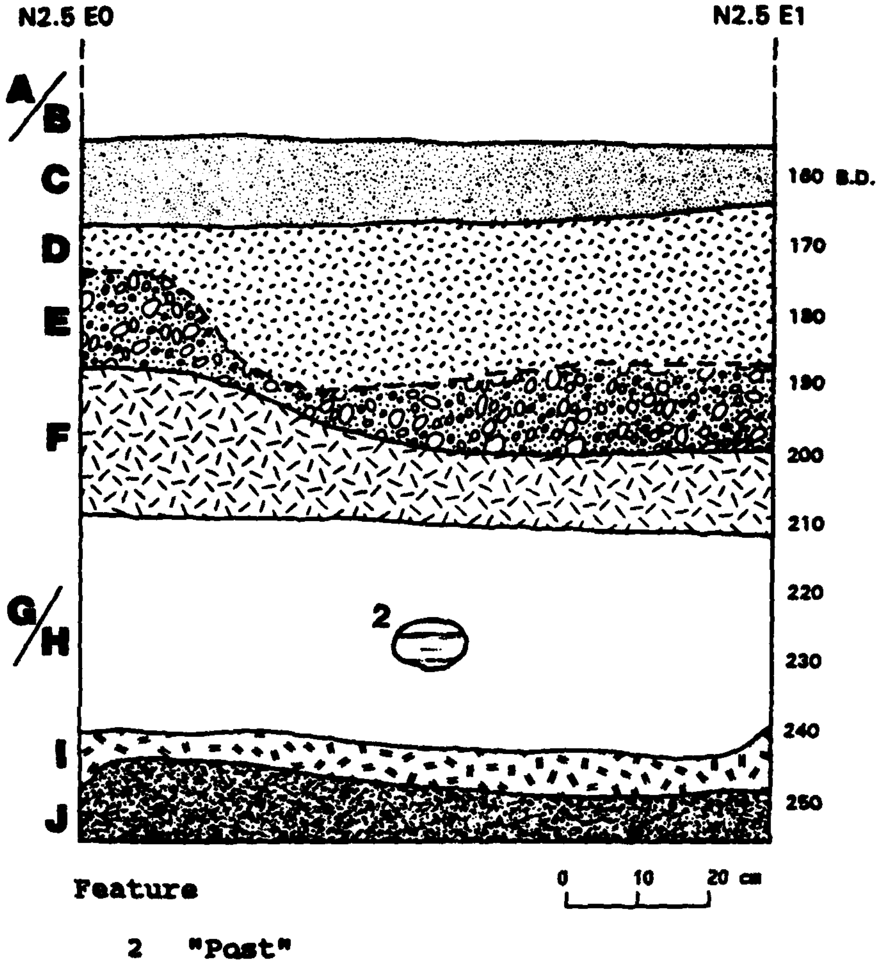


Feature

2 "Post"
3 Collapsed postmold
18 "Plank"

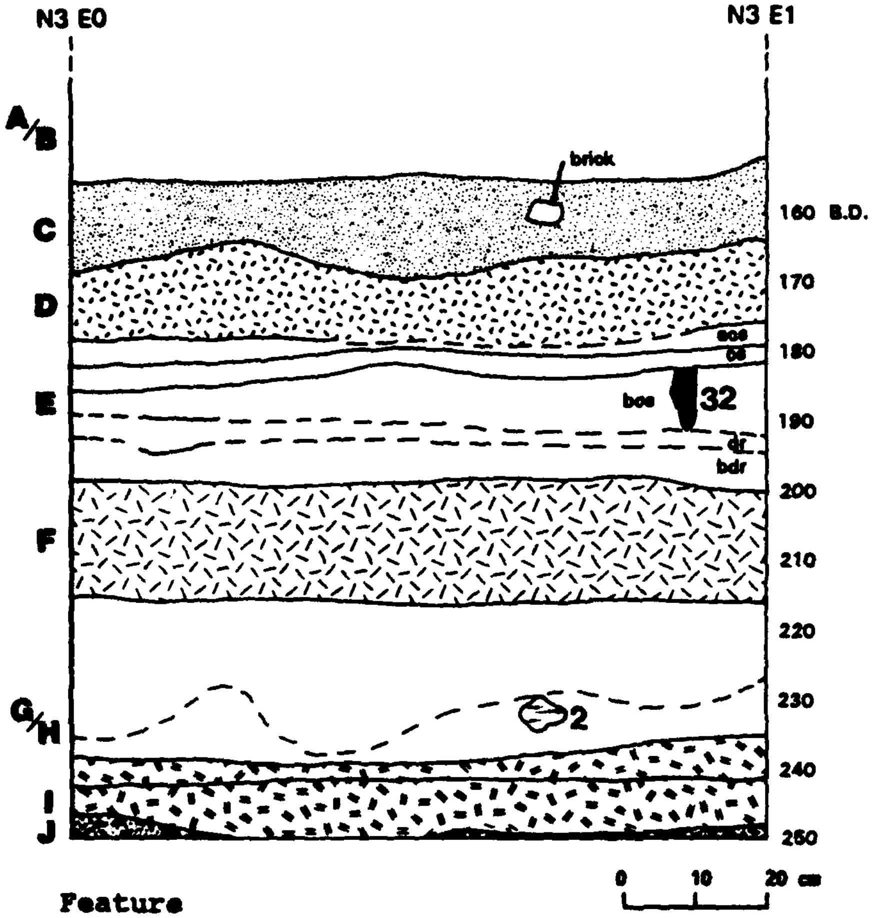
Stratum A	10YR 3/3 (dark brown) silty clay, 2.5Y 5/4 (light olive brown) silty clay, 2.5Y 4/4 (olive brown) sandy loam, and 2.5Y 4/2 (dark grayish brown) clay
Stratum B	2.5Y 4/2 (dark grayish brown) stiff plastic clay
Stratum C	10YR 2/1 (black) organic-rich friable silt containing small *Rangia* shell fragments
Stratum D	dense *Rangia* shell midden in a matrix of 10YR 2/1 (black) blocky silt
Stratum E	bone-rich midden of 10YR 2/1 (black) clayey silt
Stratum F	dense *Rangia* shell midden in a matrix of 10YR 2/1 (black) clayey silt
Stratum G	5Y 4/2 (dark gray) plastic clay with small amounts of *Rangia* shell
Stratum H	5Y 4/1 (dark gray) plastic clay
Stratum I	*Rangia* midden in a 10YR 2/1 (black) clayey silt matrix
Stratum J	5Y 4/1 (dark gray) plastic silty clay

Figure 37. Profile of the north wall of EU5.



Stratum A	10YR 3/3 (dark brown) silty clay, 2.5Y 5/4 (light olive brown) silty clay, 2.5Y 4/4 (olive brown) sandy loam, and 2.5Y 4/2 (dark grayish brown) clay
Stratum B	2.5Y 4/2 (dark grayish brown) stiff plastic clay
Stratum C	10YR 2/1 (black) organic-rich friable silt containing small *Rangia* shell fragments
Stratum D	dense *Rangia* shell midden in a matrix of 10YR 2/1 (black) blocky silt
Stratum E	bone-rich midden of 10YR 2/1 (black) clayey silt
Stratum F	dense *Rangia* shell midden in a matrix of 10YR 2/1 (black) clayey silt
Stratum G	5Y 4/2 (dark gray) plastic clay with small amounts of *Rangia* shell
Stratum H	5Y 4/1 (dark gray) plastic clay
Stratum I	*Rangia* midden in a 10YR 2/1 (black) clayey silt matrix
Stratum J	5Y 4/1 (dark gray) plastic silty clay

Figure 38. Profile of the north wall of the south half of EU6.

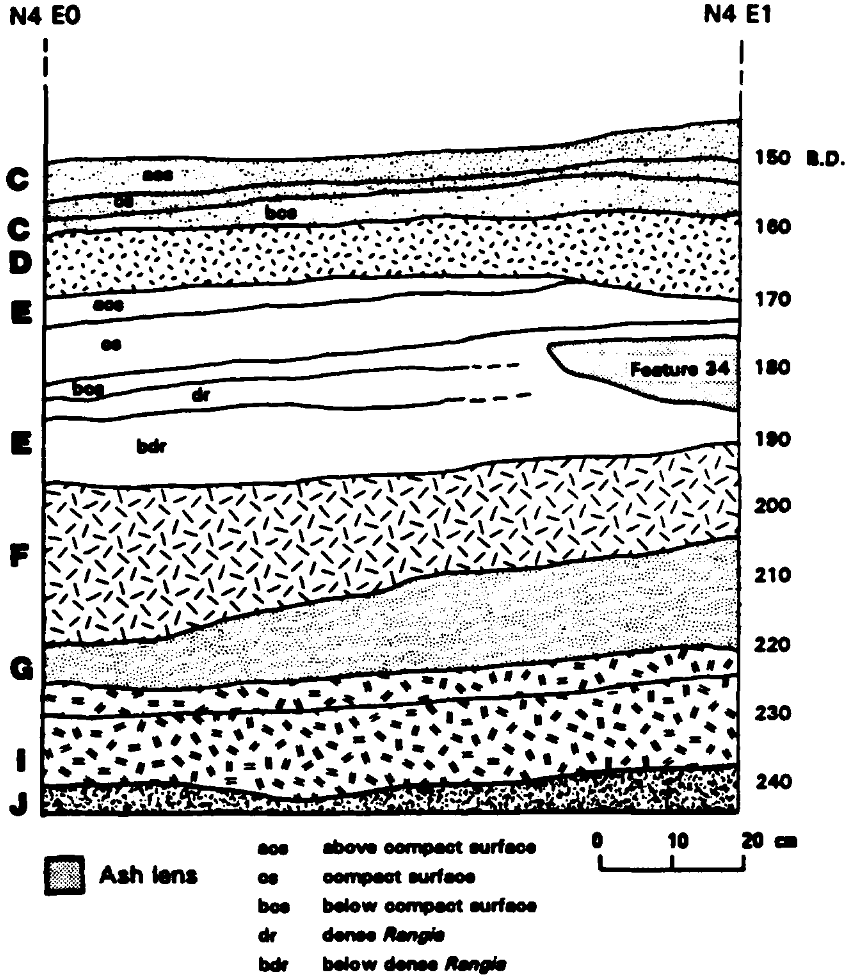


Feature

2	"Post"	aos	above compact surface
32	Postmold	cs	compact surface
		bcs	below compact surface
		dr	dense *Rangia*
		bdr	below dense *Rangia*

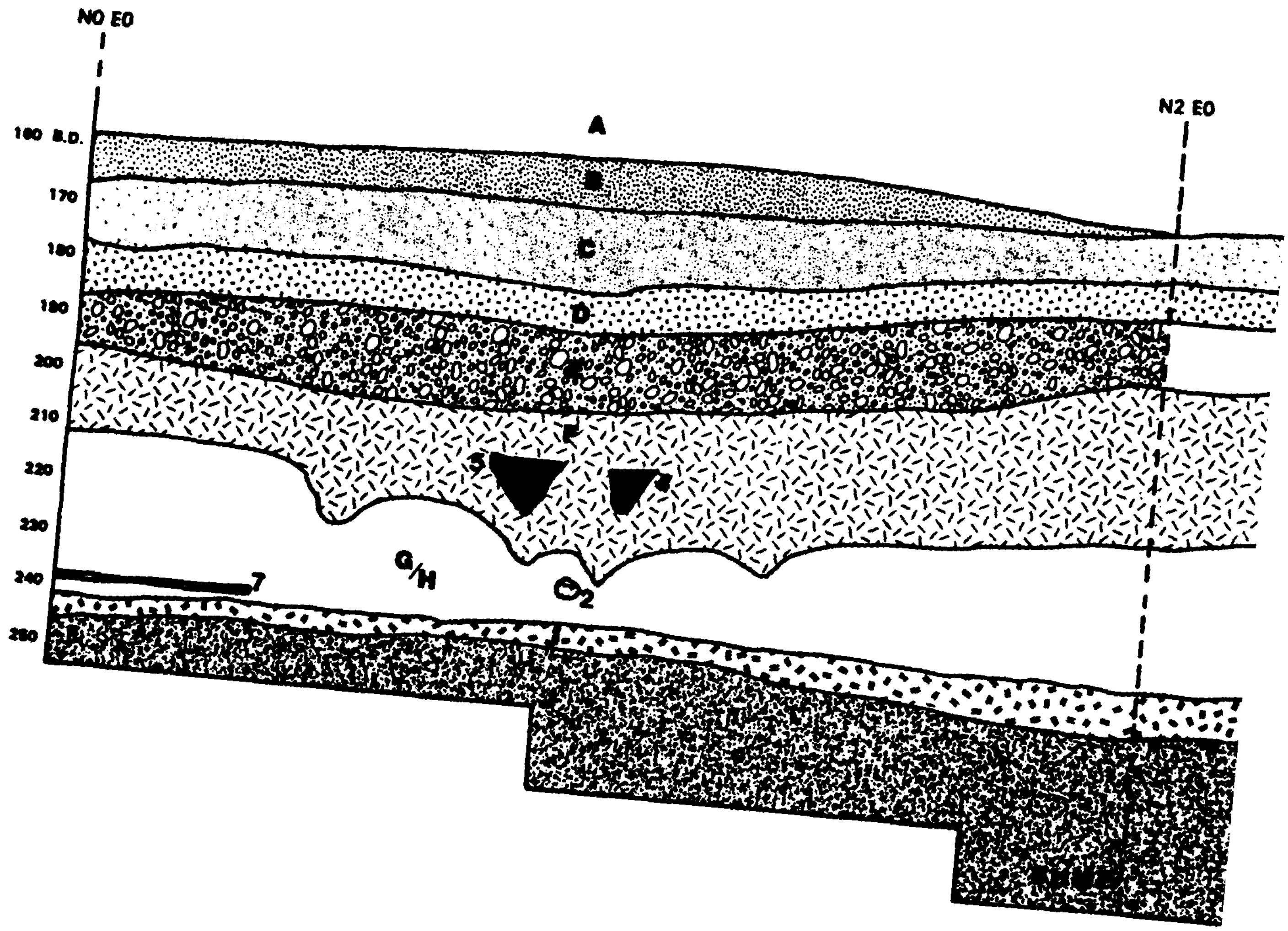
Stratum A	10YR 3/3 (dark brown) silty clay, 2.5Y 5/4 (light olive brown) silty clay, 2.5Y 4/4 (olive brown) sandy loam, and 2.5Y 4/2 (dark grayish brown) clay
Stratum B	2.5Y 4/2 (dark grayish brown) stiff plastic clay
Stratum C	10YR 2/1 (black) organic-rich friable silt containing small *Rangia* shell fragments
Stratum D	dense *Rangia* shell midden in a matrix of 10YR 2/1 (black) blocky silt
Stratum E	bone-rich midden of 10YR 2/1 (black) clayey silt
Stratum F	dense *Rangia* shell midden in a matrix of 10YR 2/1 (black) clayey silt
Stratum G	5Y 4/2 (dark gray) plastic clay with small amounts of *Rangia* shell
Stratum H	5Y 4/1 (dark gray) plastic clay
Stratum I	*Rangia* midden in a 10YR 2/1 (black) clayey silt matrix
Stratum J	5Y 4/1 (dark gray) plastic silty clay

Figure 39. Profile of the north wall of the north half of EU6.



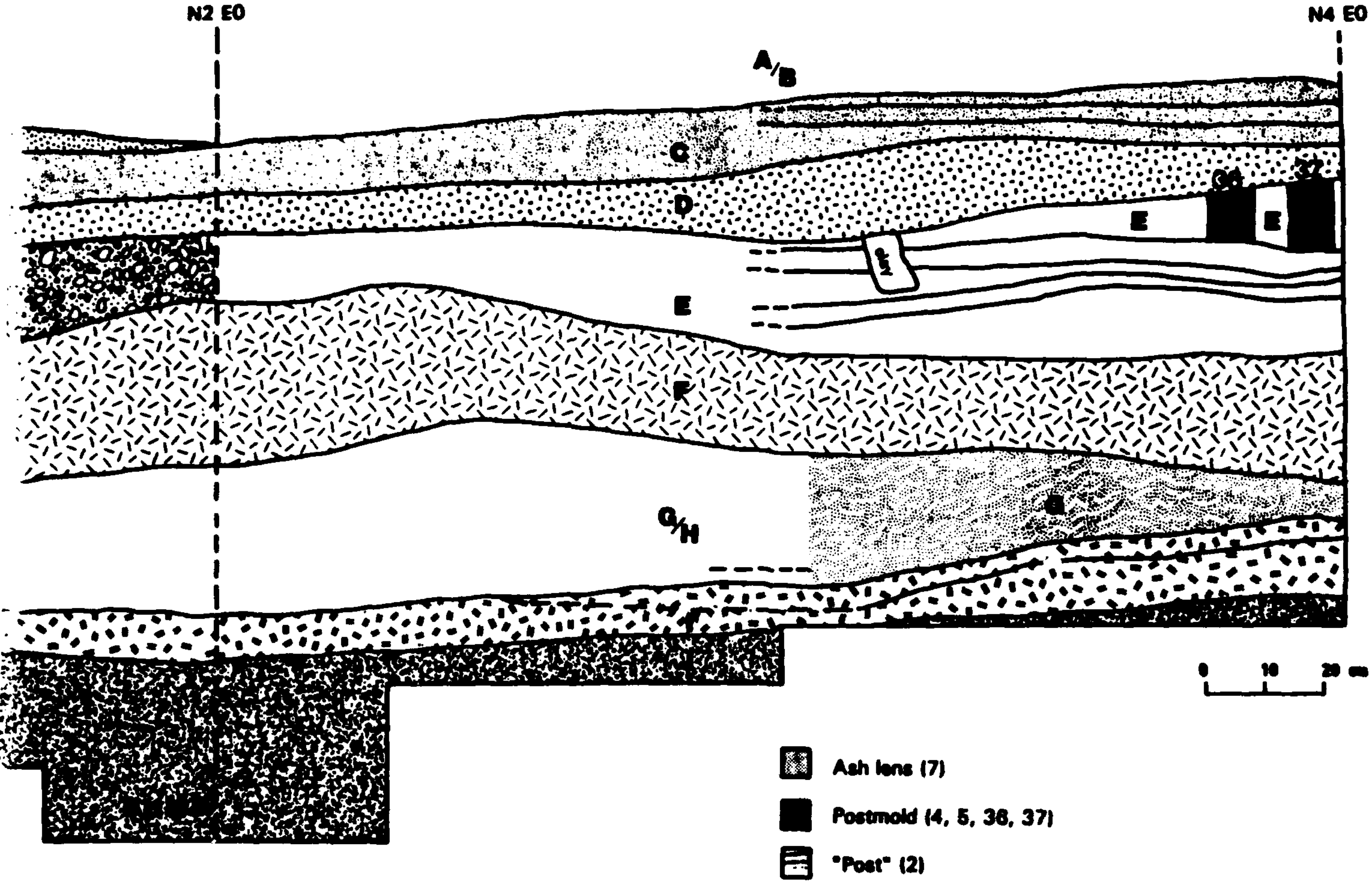
Stratum A	10YR 3/3 (dark brown) silty clay, 2.5Y 5/4 (light olive brown) silty clay, 2.5Y 4/4 (olive brown) sandy loam, and 2.5Y 4/2 (dark grayish brown) clay
Stratum B	2.5Y 4/2 (dark grayish brown) stiff plastic clay
Stratum C	10YR 2/1 (black) organic-rich friable silt containing small *Rangia* shell fragments
Stratum D	dense *Rangia* shell midden in a matrix of 10YR 2/1 (black) blocky silt
Stratum E	bone-rich midden of 10YR 2/1 (black) clayey silt
Stratum F	dense *Rangia* shell midden in a matrix of 10YR 2/1 (black) clayey silt
Stratum G	5Y 4/2 (dark gray) plastic clay with small amounts of *Rangia* shell
Stratum H	5Y 4/1 (dark gray) plastic clay
Stratum I	*Rangia* midden in a 10YR 2/1 (black) clayey silt matrix
Stratum J	5Y 4/1 (dark gray) plastic silty clay

Figure 40. Profile of the north wall of EU7.



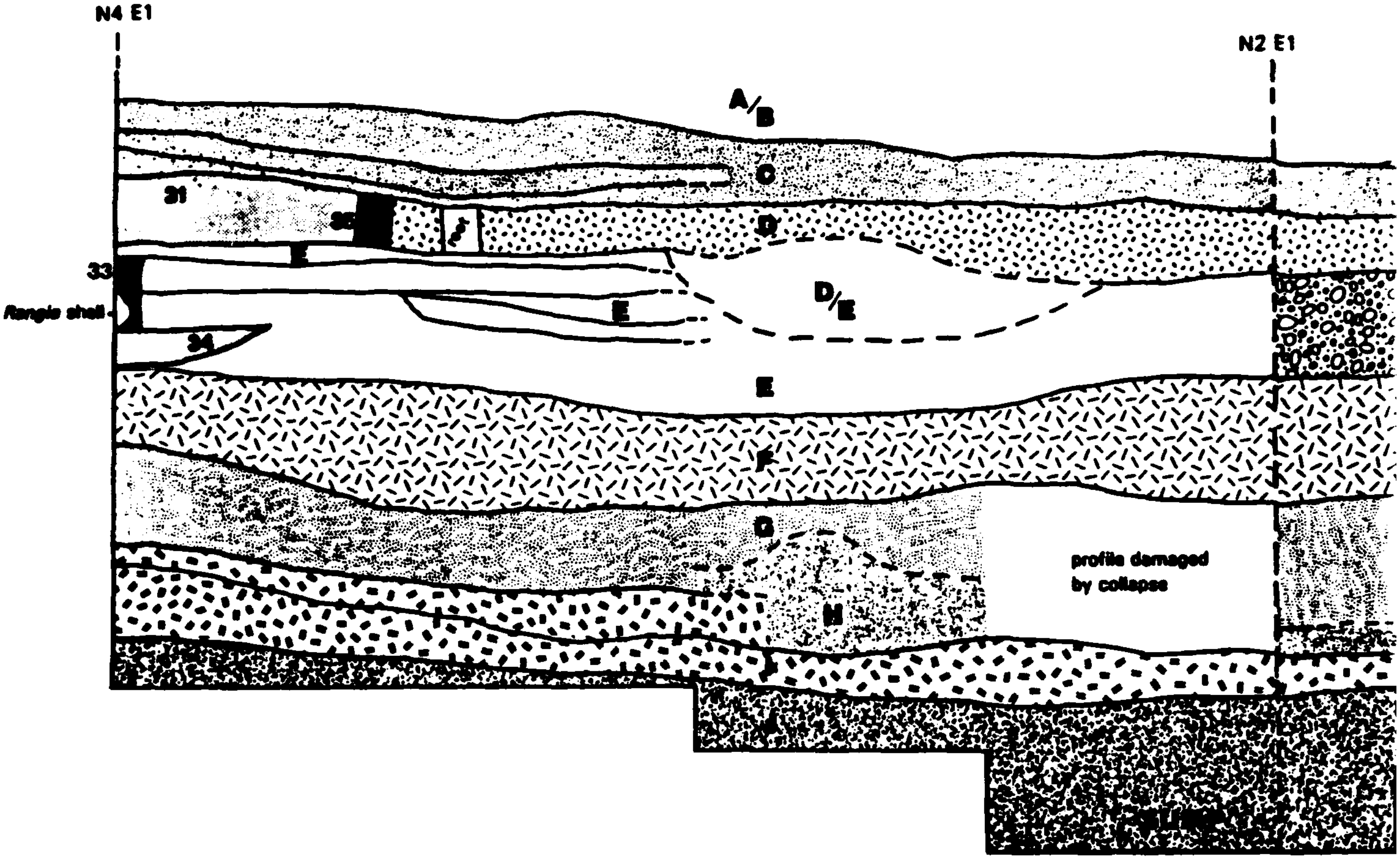
Stratum A	10YR 3/3 (dark brown) silty clay, 2.5Y 5/4 (light olive bro loam, and 2.5Y 4/2 (dark grayish brown) clay
Stratum B	2.5Y 4/2 (dark grayish brown) stiff plastic clay
Stratum C	10YR 2/1 (black) organic-rich friable silt containing small
Stratum D	dense *Rangia* shell midden in a matrix of 10YR 2/1 (black)
Stratum E	bone-rich midden of 10YR 2/1 (black) clayey silt
Stratum F	dense *Rangia* shell midden in a matrix of 10YR 2/1 (black)
Stratum G	5Y 4/2 (dark gray) plastic clay with small amounts of *Rang*
Stratum H	5Y 4/1 (dark gray) plastic clay
Stratum I	*Rangia* midden in a 10YR 2/1 (black) clayey silt matrix
Stratum J	5Y 4/1 (dark gray) plastic silty clay

Figure 41. East wall profile of EU5-E
Features 1, 31, and 33-35.



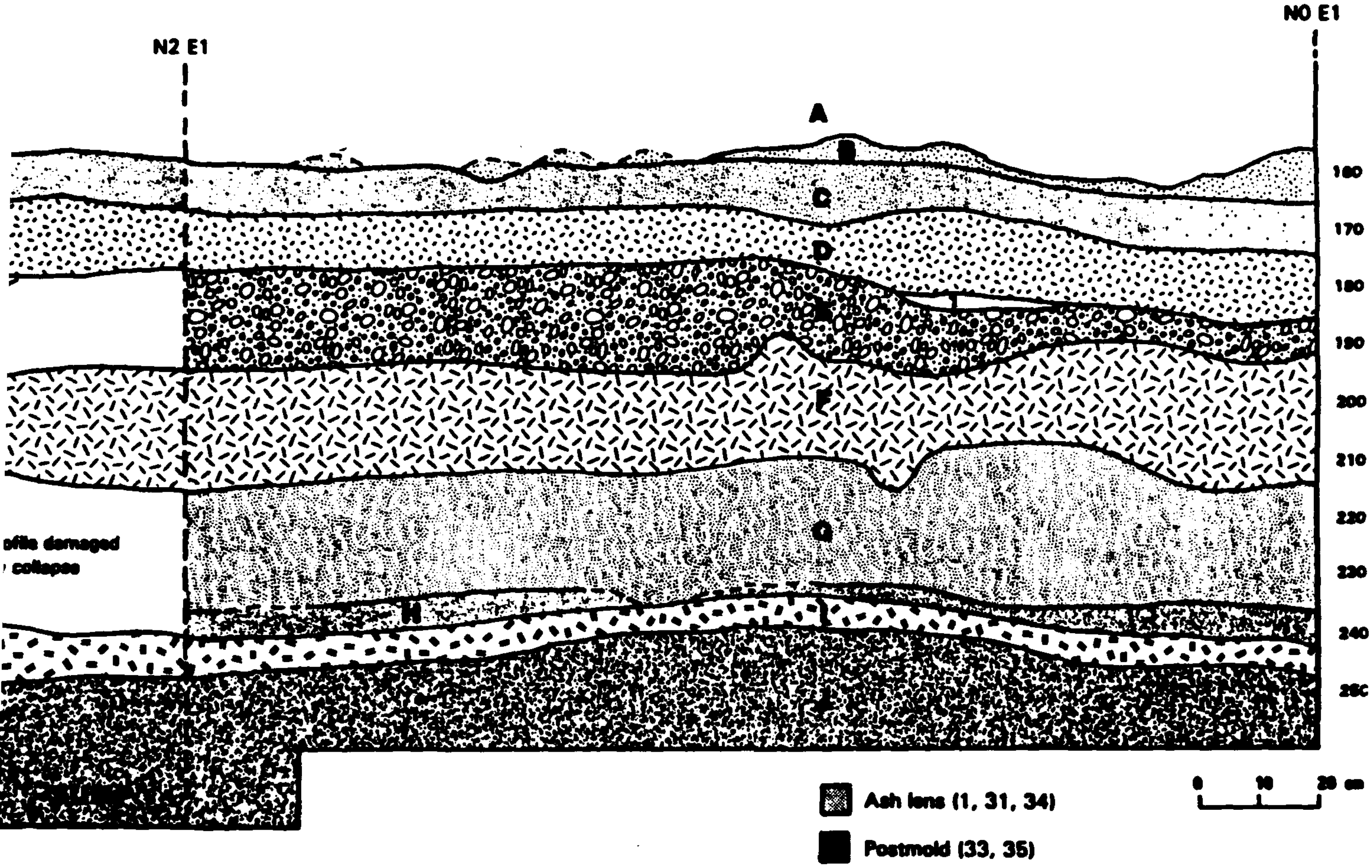
own) silty clay, 2.5Y 5/4 (light olive brown) silty clay, 2.5Y 4/4 (olive brown) sandy
2 (dark grayish brown) clay
yish brown) stiff plastic clay
organic-rich friable silt containing small *Rangia* shell fragments
midden in a matrix of 10YR 2/1 (black) blocky silt
of 10YR 2/1 (black) clayey silt
midden in a matrix of 10YR 2/1 (black) clayey silt
plastic clay with small amounts of *Rangia* shell
plastic clay
a 10YR 2/1 (black) clayey silt matrix
plastic silty clay

1 profile of EU5-EU7. The profile shows
33-35.



Stratum A	10YR 3/3 (dark brown) silty clay, 2.5Y 5/4 (light olive loam, and 2.5Y 4/2 (dark grayish brown) clay
Stratum B	2.5Y 4/2 (dark grayish brown) stiff plastic clay
Stratum C	10YR 2/1 (black) organic-rich friable silt containing sm
Stratum D	dense *Rangia* shell midden in a matrix of 10YR 2/1 (bl
Stratum E	bone-rich midden of 10YR 2/1 (black) clayey silt
Stratum F	dense *Rangia* shell midden in a matrix of 10YR 2/1 (bl
Stratum G	5Y 4/2 (dark gray) plastic clay with small amounts of *R*
Stratum H	5Y 4/1 (dark gray) plastic clay
Stratum I	*Rangia* midden in a 10YR 2/1 (black) clayey silt matrix
Stratum J	5Y 4/1 (dark gray) plastic silty clay

Figure 42. West wall profile of EU5-E
Features 2, 4, 5, 7, 36, and 37.



brown) silty clay, 2.5Y 5/4 (light olive brown) silty clay, 2.5Y 4/4 (olive brown) sandy
4/2 (dark grayish brown) clay
grayish brown) stiff plastic clay
) organic-rich friable silt containing small *Rangia* shell fragments
ll midden in a matrix of 10YR 2/1 (black) blocky silt
of 10YR 2/1 (black) clayey silt
ll midden in a matrix of 10YR 2/1 (black) clayey silt
y) plastic clay with small amounts of *Rangia* shell
y) plastic clay
n a 10YR 2/1 (black) clayey silt matrix
y) plastic silty clay

l profile of EU5-EU7. The profile shows
36, and 37.

excavated soil was water screened through 1/4-inch mesh. A small number of artifacts and *Rangia* shells were recovered. The walls of the unit exhibited pockets of dense *Rangia*, probably from individual bucket loads of canal spoil dredged from the shell midden strata. Irregular bands of loam, clay and scattered *Rangia* were present throughout Stratum A.

Subsequently, an auger test was excavated immediately adjacent to the unit (at N0 E0.5) to determine the depth of spoil at this location. The auger showed spoil to 173 cm b.d. The variations in soil color and texture within the spoil and the presence of cultural material were clearly due to the admixture of strata from the dredging of the canal. The remainder of Stratum A, therefore, was removed without screening.

Stratum B is a layer of darker plastic clay below the mixed spoil of Stratum A. This dark clay may represent puddled clay from the excavation of the Pump Canal. It was difficult to separate from the overlying Stratum A spoil. Therefore, A/B was removed unscreened as a combined stratigraphic unit. All soil below A/B was removed by natural strata.

Prior to the excavation of the cultural strata within EU5, part of the A/B spoil was removed within a one meter square northern extension of the trench (EU6: N2-N3, E0-E1). This allowed easier removal of excavated soil.

During excavation of EU5, there was a steady inflow of water through Stratum C and several other strata below it. The water within the unit rose to the elevation of the nearby lake level (150 cm b.d. or higher during the 1991 fieldwork). The problem necessitated excavation of a small sump pit (ca. 20 cm diameter) in the northwest corner of EU5 for the placement of a suction hose and thus the continuous operation of the drainage pump during the remainder of the excavation. The sump hole was progressively deepened during excavation of EU5.

The sump hole in the northwestern corner of EU5 was deepened and expanded into an east-west channel across the trench to improve drainage after the completion of EU5. During the deepening of this trench, over 20 cm were removed from the top of Stratum J. All recorded cultural material found during the excavations, EU6 and EU7 were not excavated below Stratum I because this stratum corresponded to sterile deposits below.

EU6. After completing wall profiles in EU5, excavation of EU6 began. This was the unit from which faunal material was to be obtained in nested screens. A decision was made to subdivide the unit into a series of smaller proveniences in order to control the volume of soil, and because the density of faunal remains in small-sized mesh was unknown. The largest of these was the southern one-half of the unit. The northern one-half was excavated as a northeast- and a northwest-quarter.

Prior to excavating in EU6, most of the A/B spoil was removed from an additional one meter square northward extension of the trench, designated EU7. This provided an access platform for removal of excavated material within EU6. During the excavation of EU5, some erosion of the north wall occurred. As a result of that erosion, some features (Features 8, 9, 11, 15, 17, and 18, discussed below) were not identified until excavation of EU6 even though they appeared to have extended into EU5.

As the excavators were now able to stand within EU5 (which served as a massive sump hole) and observe the natural levels in profile, they were able to distinguish finer stratigraphic subunits in EU6 than had been recognized in EU5. The improved excavation conditions as well as prior experience with the conditions at 16SC27, enabled the excavators to peel away these subunits with a reasonable degree of control. Beginning with Stratum C, all soil was processed by water screening through 1/4-, 1/8-, and 1/16-inch mesh.

Adverse weather conditions, consisting of south winds which raised lake levels to the extent that excavation was not possible. These factors necessitated breaks in the fieldwork between the completion of the north and south halves of EU6, and between the time of excavating EU6 and EU7. The floor plans of the units exhibit gaps in their coverage because of unavoidable erosion to the walls of the water-filled open units. No attempt was made to interpolate between plotted points on shared features.

Excavation of the northern half of EU6 began with the removal of the northeast and northwest quarters of the unit as separate subunits. The northwest quarter of the unit ultimately provided the material used for faunal analysis. Excavation proceeded by first removing the northeast quarter of EU6 in each stratum, thus allowing identification of the stratigraphic subunits within the northwest quarter more precisely. After removal of each stratum within the northwest quarter, the next lowest stratum in the northeast quarter would be removed, followed by the same stratum in the northwest quarter until sterile soil was reached.

EU7. EU7 was excavated as a single one meter square unit. Sand bags were placed immediately north of EU7 along the foot of the spoil bank because a higher lake level threatened the stability of the unit's northern walls. After discarding the spoil overburden (Stratum A/B), removal of the top 5 cm of Stratum C began. This approximated the level of the largest brick fragments in the north wall of EU6 and nearby smaller brick fragments in the east wall of that unit. It was hoped that dividing C at this position would separate any purely historic component at or above the bricks from a potentially mixed historic/prehistoric component below the bricks. With that exception, excavation of EU7 proceeded by divisions similar to those used in EU6.

As noted above, greater control was achieved in the course of excavations. This was a result of experience with conditions at the site and of a greater ability to recognize subdivisions in the various natural strata. As a result, excavated proveniences within the various units are not identical. Figure 43 is a schematic illustration of the relative stratigraphic positions of the proveniences in the three units.

Description of the Natural Levels and Associated Features

Strata A, B, and A/B. Stratum A is composed of 10YR 3/3 (dark brown) silty clay, 2.5Y 5/4 (light olive brown) silty clay, 2.5Y 4/4 (olive brown) sandy loam, and 2.5Y 4/2 (dark grayish brown) clay. It consisted in its entirety of spoil that resulted from the dredging of the Pump Canal. The uppermost 40 cm of Stratum A were screened in EU5 only. No historic material was recovered from the spoil, and there was no evidence of structural remains or construction episodes above the *in situ* buried ground surface at the top of Stratum C. Therefore, the remaining Stratum A spoil was removed without screening. It was then discarded east of the excavation unit, on top of the spoil bank. Artifacts from the spoil are from a severely disturbed context and thus have no greater information value than would artifacts recovered from a general surface collection at the site. This limited information value did not justify water screening the spoil.

Stratum B in EU5 is a 2.5Y 4/2 (dark grayish brown) stiff plastic clay directly below the mixed spoil components of Stratum A. The top of Stratum B was identified in the south wall of EU5 at 155 to 159 cm b.d. The bottom of Stratum B was at 164 to 168 cm b.d. It may represent puddled clay from the initial stages in the excavation of the Pump Canal ca. 1911, or a natural clay sediment deposited directly above organic-rich silt. The absence of

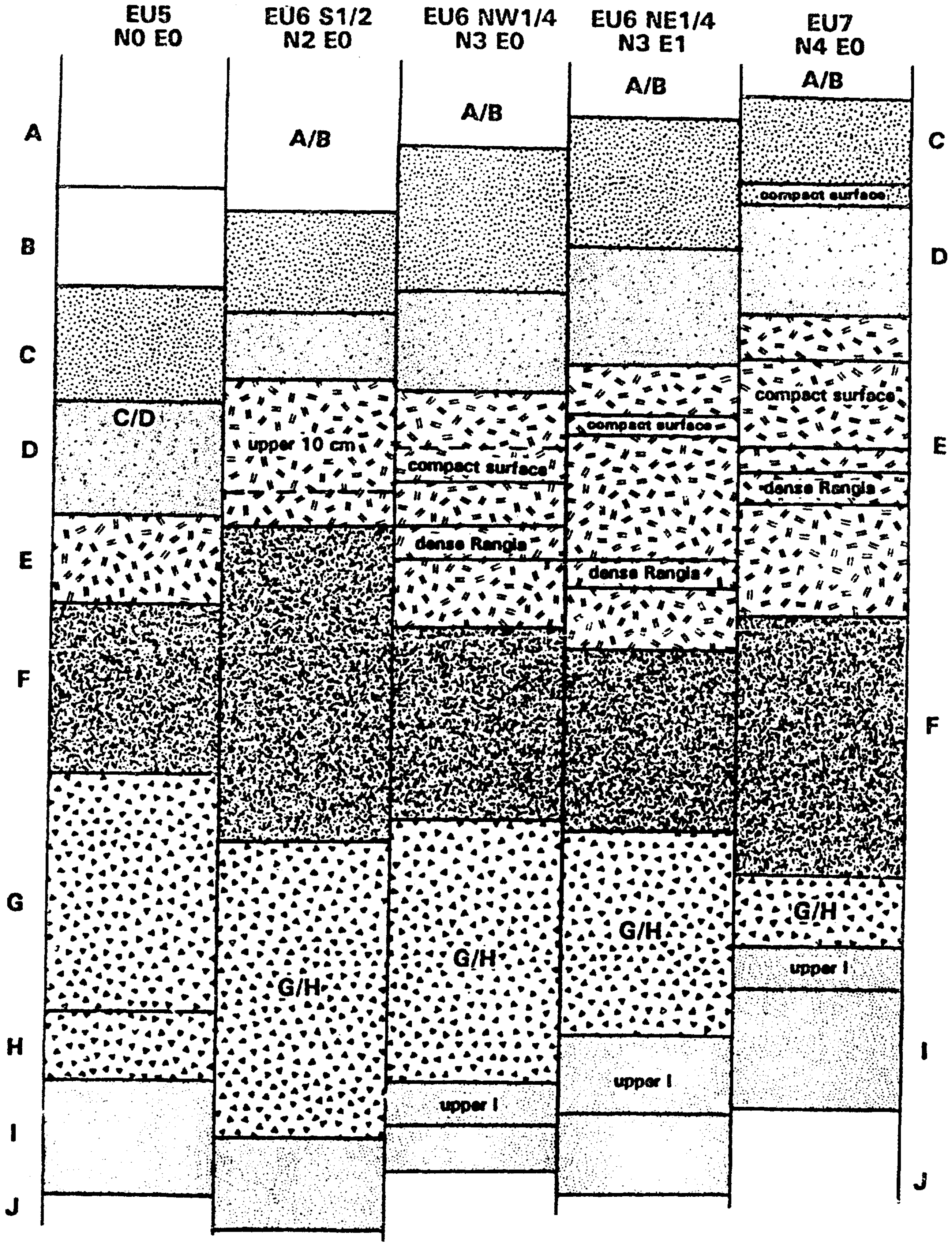


Figure 43. Schematic showing the relationship of various excavated proveniences based on depth b.d.

organic remains suggests that Stratum B is probably not a naturally deposited layer, but rather is associated with the canal spoil. This clay stratum is difficult to separate from the overlying soil. It pinches out between N1 and N2 and was not identifiable as a separate stratum in EU6 and EU7. In those units, the combined stratigraphic unit A/B therefore was removed completely from the excavation units without screening.

Stratum C. Within EU5, Stratum C was recognized as a 10YR 2/1 (black) organics-rich friable silt containing small *Rangia* shell fragments. This stratum, which was referred to in the field as "coffee grounds silt" because of its consistency, was approximately 10 cm thick. It had a somewhat gritty feel probably caused by the large number of small shell fragments within it.

Its upper surface probably represents the top of the natural ground surface at the initiation of the marshland reclamation project in this area ca. 1911. No features were noted in Stratum C during the excavation of EU5. The top of Stratum C was identified at 168 cm b.d. and its bottom at 178 cm b.d. at N0 E0, which was the southeastern corner of the unit and which was used as unit datum.

A few oyster shells were collected during the excavation of Stratum C in the southern half of EU6. It is possible that these, like the small numbers of bone buttons and brick fragments recovered from Stratum C, reflect historic period activity at the site. All of the *Rangia* shells in the upper portion of the stratum were fragmented. Some of the ceramics from Stratum C were lying immediately above Stratum D, and may have been associated with that lower stratum.

A bone button and a relatively large brick fragment were recovered from Stratum C in the northeast quarter of EU6. Small brick fragments and *Rangia* fragments were noted in the northern half of the unit.

It was only within EU7 that features were recognized in Stratum C. The first of these is a compact surface at an approximate depth of 5 cm within the stratum. The feature is shown in the profiles in Figures 40, 41, and 42. *Rangia* density increased below that surface. Aboriginal ceramics were first noted at this level, i.e., atop the "compact surface." Within EU7, Stratum C was excavated as two separate levels which were separated by the compact surface.

"Upper C" in EU7 contained a large amount of fragile decayed wood, which was not observed in "Lower C." Brick fragments (<0.25 lb) were recovered from Stratum C both above and below the compact surface. However, oyster shells and irregular pockets of gray clay (possibly caused by bioturbation) were present only below that surface. Brick fragments and oyster shells actually lying on the compact surface were collected with the material below the surface. The total thickness of Stratum C in EU7 was 10 to 15 cm. The thickness of "Lower C" below the compact surface was 5 to 8 cm. The only other feature associated with Stratum C was Feature 35 (F35) shown in profile in Figure 41. It was a postmold that was recognized in the east wall within Stratum D, but it appeared to be intrusive from Stratum C.

Stratum D. *Stratum D was recognized within EU5 as* dense ***Rangia*** shell midden in a soil matrix of 10YR 2/1 (black) blocky silt. This stratum is approximately 10 cm thick in EU5, and at N0 E0 was identified at depths of 178 to 188 cm b.d. Because of severe problems with water inflow during the excavation of EU5, only a small amount of "uncontaminated" Stratum D material was recovered from that unit. The contamination was the result of intermittent suction which allowed water to accumulate in the unit. The result was that a mixed "C/D" component was removed from the working floor of EU5 after the water level was lowered to the sump hole. This mixed provenience consisted largely of ***Rangia*** and artifacts from Stratum D with some admixture from the lower portion of Stratum C. No features were identified within Stratum D in EU5.

Stratum D yielded a large fragment of deer antler in the southern half of EU6. Large ceramics were present throughout the stratum in the two northern quarters of the unit. The shells were generally in the medium size range.

Largely due to an extensive lens of ash and burned ***Rangia*** (Feature 31) in the east half of the unit, the stratigraphic break between Strata C and D was less pronounced than in EU5 and EU6. This irregular lens was concentrated in the northeast corner of EU7. The plan of the unit at the top of Stratum D shows the feature after 1 or 2 cm was removed with a trowel from the top of it to delineate its outline (Figure 44). The feature originates *near the top of Stratum D.*

The plan of Stratum D also shows the irregular clay pockets which continued downward from Stratum C (Figure 44). These were judged to be noncultural in origin and were not assigned feature numbers. One postmold in Stratum D was identified in the east wall profile (Figure 41). This feature (Feature 35) was more regular in outline and was filled with Stratum C silty midden. Presumably Feature 35

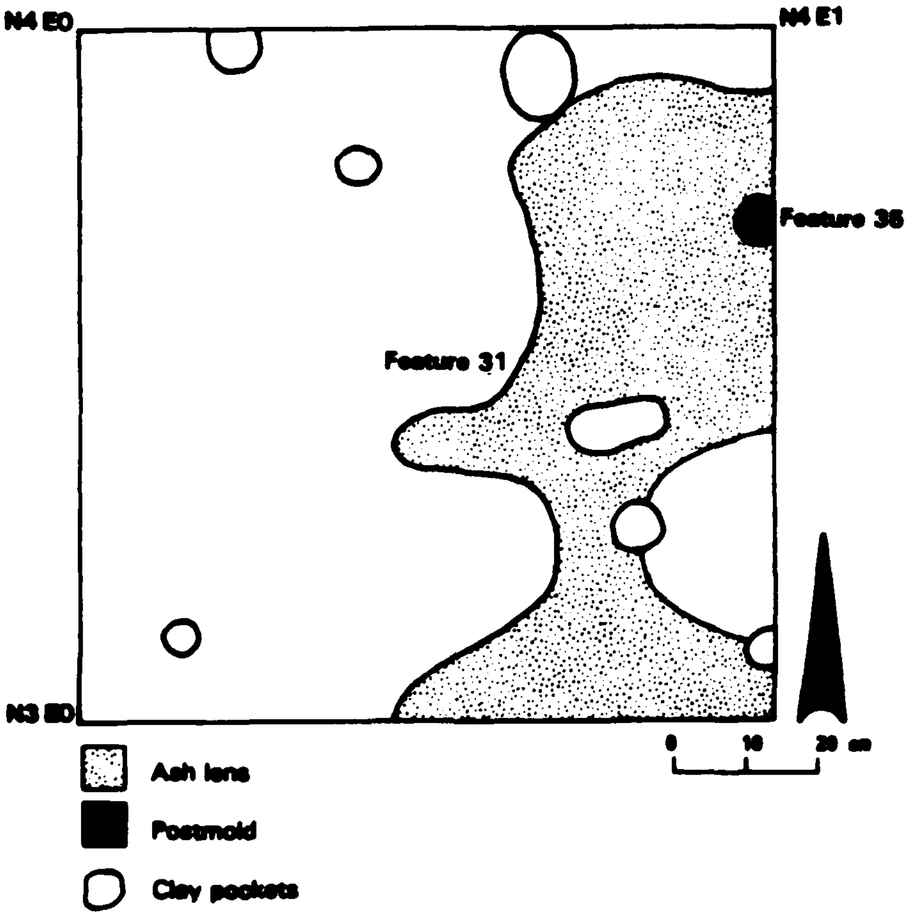


Figure 44. Plan of EU7 Stratum D showing Features 31 and 35 at 165 cm b.d.

originated in Stratum C and is intrusive into Stratum D. Feature 35 has a diameter of about 7 cm.

Stratum E. Stratum E exhibited more features and was more complex than other strata encountered in the units at 16SC27. For this reason, most of the following discussion is organized in the order of excavation: EU5, the southern half of EU6, the northeast and northwest quarters of EU6, and EU7. Various features were observed at different levels in each of these unit proveniences.

Stratum E was recognized in EU5 as a bone-rich midden of 10YR 2/1 (black) clayey silt. In this unit, the thickness of the stratum ranged from 6 to 20 cm. At N0 E0, it was identified at depth 188 cm b.d. to 196 cm b.d. The top of the stratum generally slopes to the southwest in the south half of EU5, and the average thickness decreased from 15 cm at N2 to 10 cm at N0. Feature 1 represents an ash lens identified at the top of Stratum E. It appears in the east wall of EU5 at N0.43-N0.78 (Figure 41).

The top of Stratum E was demarcated in the southeast corner of EU6 by a thin ash lens, designated Feature 8. This ash lens lay entirely within the top 10 cm of Stratum E. Its western limit was at E0.68 and its northern limit at N2.18. Its southern limit was truncated by the excavation of EU5, in which it had not been recognized. A slight amount of Stratum E material (less than 1 cm) overlaid the ash lens, which itself was an irregular scatter only 2 to 3 cm thick. The top of E at the location of this feature was 176 to 171 cm b.d. Calcined *Rangia* fragments lay beneath Feature 8, and medium to large *Rangia* shells were scattered around the perimeter of the lens.

A possible posthole occurred within Feature 8. Its center was at N2 E0.84. This posthole, designated Feature 9, was approximately 8 cm in diameter and slanted down to the south into EU5. It was identified on the basis of fill material consisting of slightly darker midden than was present in the surrounding ash lens.

The top 10 cm of Stratum E in the southern half of EU6 was screened separately from the lower part of the stratum. This stratigraphic break was arbitrary. It included all of the Feature 8 and Feature 9 material within EU6 which was not removed separately for flotation. Among the abundant faunal remains, the lower portion of Stratum E (8-10 cm average thickness) yielded relatively large pieces of alligator bone. Small fragments of gray clay were noted in the lower portion of Stratum E.

Feature 19, an irregular ash lens, was identified near the top of Stratum E in the northeast quarter (Figure 45). This extremely thin layer of ash could not be clearly identified in the profiles, but it appeared to extend into the southeast quarter of EU6 and into the southeast quarter of EU7. However, it was not identified during the excavation of those units. The top of Feature 19 was at 175 cm b.d., 3 to 4 cm below the top of Stratum E. Feature 8 (above) in the southeast quarter of EU6, was at a comparable stratigraphic position, but it was recorded as a discrete ash concentration. A continuous ash lens was not discernible between these features although their stratigraphic positions were comparable.

In the northeast quarter of EU6, Stratum E above the Feature 19 ash lens was removed as a separate stratigraphic subunit. In order to maintain stratigraphic comparability, the top 5 cm of Stratum E in the northwest quarter of EU6 was also removed as a discrete level.

It was within the northeast quarter of EU6 that a compact surface was first recognized within Stratum E. It occurred at a depth of 9 to 10 cm below the Feature 19 ash lens. Within this quadrant of the unit, that part of Stratum E from the top of the Feature 19 ash lens to the compacted surface was removed as a discrete subunit. However, because most of Feature 19 had already been collected for phytolith and flotation samples, the fill from this provenience consisted almost entirely of Stratum E midden located between the Feature 19 ash lens and the top of the compact surface. The thickness of this layer between the ash lens and the compacted surface varies from 2 to 10 cm thick. The top of the compacted surface sloped down to the southwest, from 178 cm b.d. at N3 E1 to 185 cm b.d. at N2 E0.

The compacted surface was not assigned a feature number. It was simply referred to as the Stratum E "compact surface" both in notes and in provenience designations. It consists of 5YR 2.5/2 (dark reddish brown) non-cohesive silt. This contrasts with the 10YR 2/1 (black) clayey silt midden soil of Stratum E. The compact surface was observed to have loose, fine bone fragments on top of it. The numerous bone fragments on top of and within it produced a gritty feel. The compact surface is most clearly defined along the east wall of the unit (Figure 41). Several large sherds were recovered from the top of the surface. These sherds were pressed down into the surface slightly by the weight of the overlying strata.

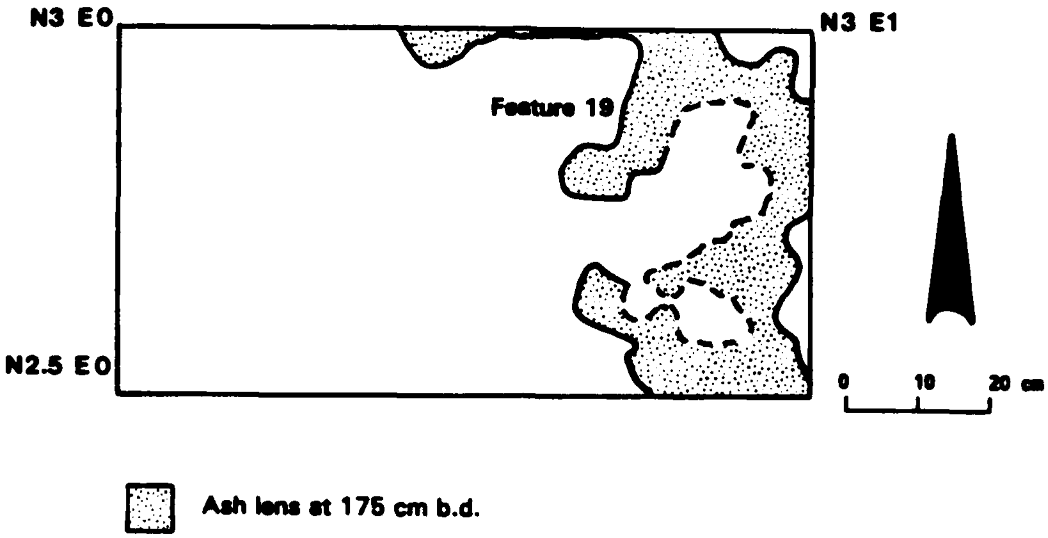


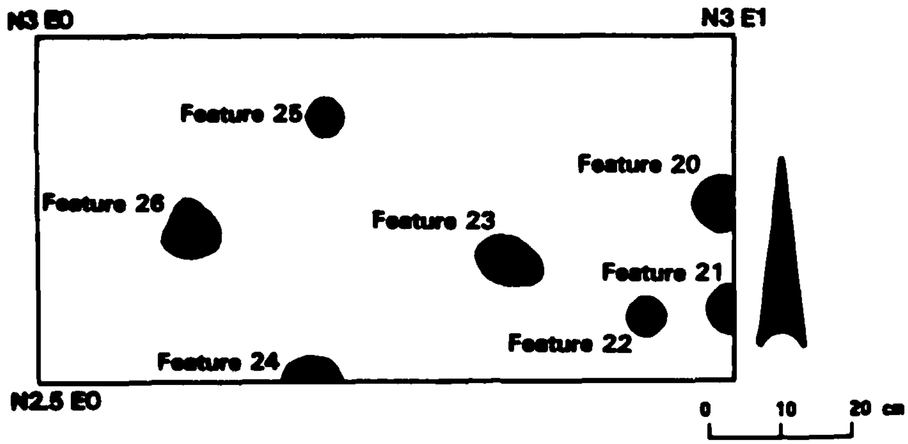
Figure 45. Plan of the north half of EU6 Stratum E showing Feature 19.

As was noted above, the compact surface was first recognized during the excavation of the northeast quarter of EU6. It was also recognized and used as a stratigraphic landmark during excavation of the northwest quarter of EU6 and the excavation of EU7.

Seven postmolds (Features 20-26) were observed within the compact surface in the northern half of EU6. Depths were obtained for the bases of each of these postmolds. They were at 185 cm b.d. (Feature 20), 182 cm b.d. (Feature 21), 187 cm b.d. (Feature 22), 190 cm b.d. (Feature 23), 190 cm b.d. (Feature 24), 191 cm b.d. (Feature 25), and 192 cm b.d. (Feature 26) (Figure 46). These postmolds were first recognized at the level of the compact surface in Stratum E, and their bases were all at comparable depths. The diameters of these features ranged from 4 to 8 cm. The fill of the postmolds was darker and less gritty than was the brown surface. Another postmold (Feature 32) in the same stratigraphic context was identified in the northeastern quarter during the cleaning of the north wall profile (Figure 39). It was a narrow ash- and midden-filled hole at N3 E0.88. Feature 32 extended down for approximately 9 cm from the compact surface to the top of a resistant shell layer below the compacted surface but still within Stratum E.

Within the northwest quarter of EU6, a thin bed of *Rangia* shell was observed below the compact surface. The top of this bed was at 190 cm b.d., and its base was at 194 cm b.d. in the northwest corner of EU6. It was 8-10 cm below the compact surface. Midden soil from the compact surface to this thin bed of *Rangia* shell within Stratum E was removed next as a separate provenience. It consisted of approximately 8-10 cm of midden below the brown surface. It was not identified early enough to serve as a stratigraphic break in the northeast quarter of EU6. However, it was recognized within EU7 (below).

The division between Strata D and E was unclear in most of EU7. The layer initially identified as the lowest part of D contained a few large *Rangia* and a high proportion of silt matrix. This was more characteristic of upper Stratum E material in EU5 and EU6. To avoid falsely equating this with other stratigraphic units, it was designated as "D/E" material. Artifacts from the lower portion of Stratum D and the upper portion of Stratum E predominated in the "D/E" material. As the following paragraph shows, the "D/E" provenience apparently extended from somewhere near the bottom of Stratum D to the Stratum E compact surface discussed in the context of EU6 (above).



Feature	Depth (below datum) of bottoms of Features
20	185 cm
21	182 cm
22	187 cm
23	190 cm
24	190 cm
25	191 cm
26	192 cm

Figure 46. Plan of postmolds in the north half of EU6 Stratum E, top of compacted surface (178 cm b.d.-185 cm b.d.).

Stratum E was first identified in EU7 as midden soil containing very few *Rangia* shells. In the course of excavation, several very large *Rangia* shells were observed lying flat, atop a possible surface that was fairly compact. This could be identified as the Stratum E compact surface recorded in EU6. In the northwest corner of EU7 the surface was at 173 cm b.d. Elsewhere in the unit, the top of the surface ranged from 171 to 179 cm b.d. Once again, the compact surface was used as a stratigraphic break. Material from the surface and extending down to the next break was collected as a separate provenience. Within EU7, Stratum E below the compact surface appeared to be far richer in bone, including many minute fragments, than the part of the stratum above the compact surface. Small flecks of charcoal were present throughout the stratum in EU7, but no large fragments or concentrations were noted.

A lower, somewhat compacted surface within Stratum E in EU7 was defined by numerous medium to large *Rangia* lying flat in a resistant, bedded plane. This lower surface was designated "Stratum E - *Rangia* bed." Within EU7, the top of this bedded *Rangia* layer slopes down from northeast to southwest, from 180 cm b.d. at N4 to 189 cm b.d. at N3. As was discussed above, this bed had not been previously noted until work within the northwest quarter of EU6, within which it was located at a depth of 190 cm b.d. This measurement was taken between N2.5 and N3, and demonstrates that the *Rangia* bed recognized within the northwest quarter of EU6 was the same as that which is being discussed here.

Very large *Rangia* shells, one or two deep, lay at the very top of this bed, which was only about 3 cm thick. Decorated sherds that are indicative of the Coles Creek period, including check-stamped varieties, rested atop the "*Rangia* bed." During excavation of EU7, the soil below the bedded shell to the top of the Stratum F *Rangia* midden was removed as a single provenience.

In the northeast quarter of EU7, the edge of a deep ash feature, extending northeast beyond the excavation trench, was encountered below the compacted surface in Stratum E (Figure 40). This ash lens, designated Feature 34 (F34), was a hard clay-like lump of 10YR 7/1 (light gray) dense compacted ash, roughly square in plan view. The exposed portion of Feature 34 measured 24 cm EW x 30 cm NS. The clay-like lump was gritty with small fragments of calcined shell. The top of Feature 34 was at 184 cm b.d. and the bottom was at 194 cm b.d., wholly within Stratum E. A thin layer of Stratum E midden separated the bottom of Feature 34 from Stratum F. The ashy area designated Feature 34 occupied roughly the same stratigraphic position as the

"Stratum E *Rangia* Bed" which was present in other portions of EU7 (Figure 40).

Three postmolds were identified in Stratum E while the various profiles were being cleaned and drawn within EU7. Two of these, Feature 36 at N3.8 E0 and Feature 37 at N3.95 E0, were observed in the west wall profile (Figure 42). These each had a diameter of approximately 8 cm and contained Stratum D *Rangia* fill. They were intrusive into the upper layer of Stratum E. The bases of these postmolds were at the top of the compacted surface within Stratum E, at 177 cm and 179 cm, respectively.

Another postmold, Feature 33, was partially exposed in the northeast corner of the unit (N4 E1). Feature 33 extended downward through the compact surface within Stratum E and could be recognized by darker fill material. The bottom of Feature 33 was at the top of the hard ash lump in Feature 34.

Strata F and G. These two strata are discussed together because a large number of features that originate in Stratum F extended into Stratum G. With the exception of these features, Stratum G appeared to be largely sterile. It may represent a flood deposit that occurred immediately prior to the occupation in Stratum F. More features were recognized in Stratum F than in any other stratum except Stratum E. Also, Stratum F was more complex than other strata with the exception of Stratum E. Therefore, this discussion is organized to some extent according to the order of excavation.

Stratum F was recognized in EU5 as a dense shell midden composed of medium to large *Rangia* shells in a 10YR 2/1 (black) clayey silt matrix. A few *Unio* shell fragments were also noted within the stratum. It was also distinguished by a considerably decreased amount of bone relative to Stratum E.

At N0 E0, Stratum F in EU5 was identified at depth 196 to 211 cm b.d. The thickness of Stratum F ranged from 15 to 30 cm within EU5. It was generally thinner in the southern half of the unit. A postmold cavity, its loose fill eroded by water agitation, was identified in the north wall of EU5 at E0.65 to E0.72. This cavity in the surrounding *Rangia* shell was 7 cm wide at its top and tapered toward its bottom. It was designated Feature 3.

A few maize kernels and cupules were recovered from Stratum F in the northern half of EU5 while excavating with a trowel on the working floor of the unit. These were saved for botanical identification (Chapter 15). They represents the only maize recovered during the excavations (Chapters 15 and 16).

Stratum G within EU5 was recognized as a 5Y 4/2 (dark gray) plastic clay containing a small amount of *Rangia* shells. This stratum was between 21 and 26 cm thick in EU5, and decreased in thickness from north to south. The top and bottom of Stratum G were identified at 211 and 232 cm b.d., respectively, at N0 E0.

A large fragment of wood was noted at the top of Stratum G in the northwest corner of EU5. It was referred to in the field as a horizontal wood "post." It extended northeast into EU6 and EU7, and was designated Feature 2. Large pieces of Feature 2 were removed for C-14 dating and for botanical identification. The wood was located at the bottom of a depression within Stratum G which was filled with looser soil containing a large amount of *Rangia* shell. This soil matrix adjacent to the wood appeared to represent Stratum F material. The radiocarbon dates provided by the wood fragments from Feature 2, which lay within the depression at the top of Stratum G, are probably associated with Stratum F. Feature 2, which was later identified as cypress (*Taxodium disitichum*), can be seen in Figures 38, 39, and 47.

No signs of deliberate shaping of the wood "post" were recognized, nor could the depression within Stratum G occupied by the "post" and adjacent soil matrix be identified as a purposeful construction. Thus, Feature 2 cannot definitely be classified as a cultural artifact on the basis of the presently available evidence, although it may have served as a member of some sort of structure.

Two postmolds (Features 4 and 5) were identified within Stratum F in the west wall of EU5 (Figure 42). Each of the postmolds was approximately 4 cm wide at the top, and tapered towards the bottom. Feature 4 and Feature 5 were identified at N1.03-N1.07 and N0.84-N0.88, respectively. Their bases were at 230 cm b.d. and 228 cm b.d., respectively. Feature 4 and Feature 5 bracketed the position of the Feature 2 wood "post" in the west wall of EU5, at N0.94. This can be seen in Figure 42. However, the juxtaposition of these features may be coincidental. Feature 4 and Feature 5 probably contained intrusive Stratum F material.

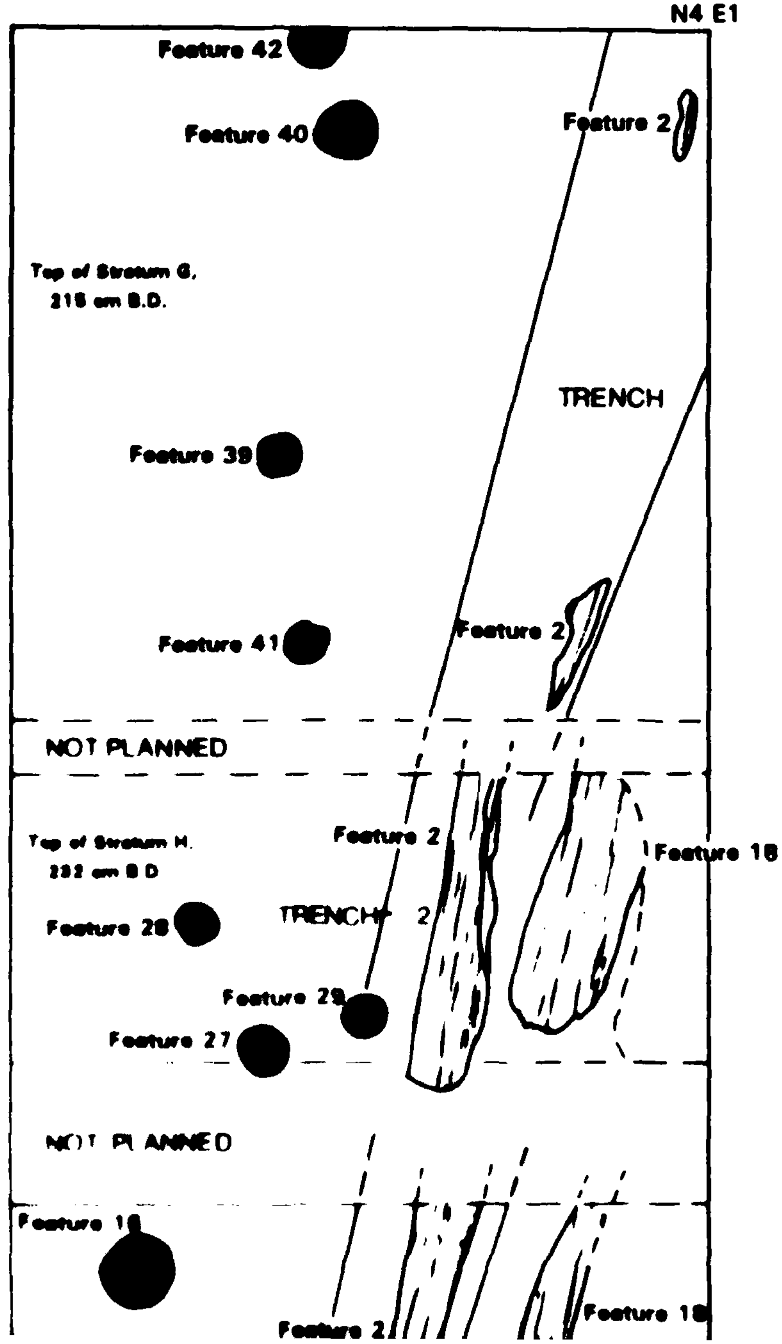
While using a trowel near the top of Stratum F within the southern half of EU6, a pattern of small postmolds appeared at a depth of 1 to 3 cm below the top of Stratum F.

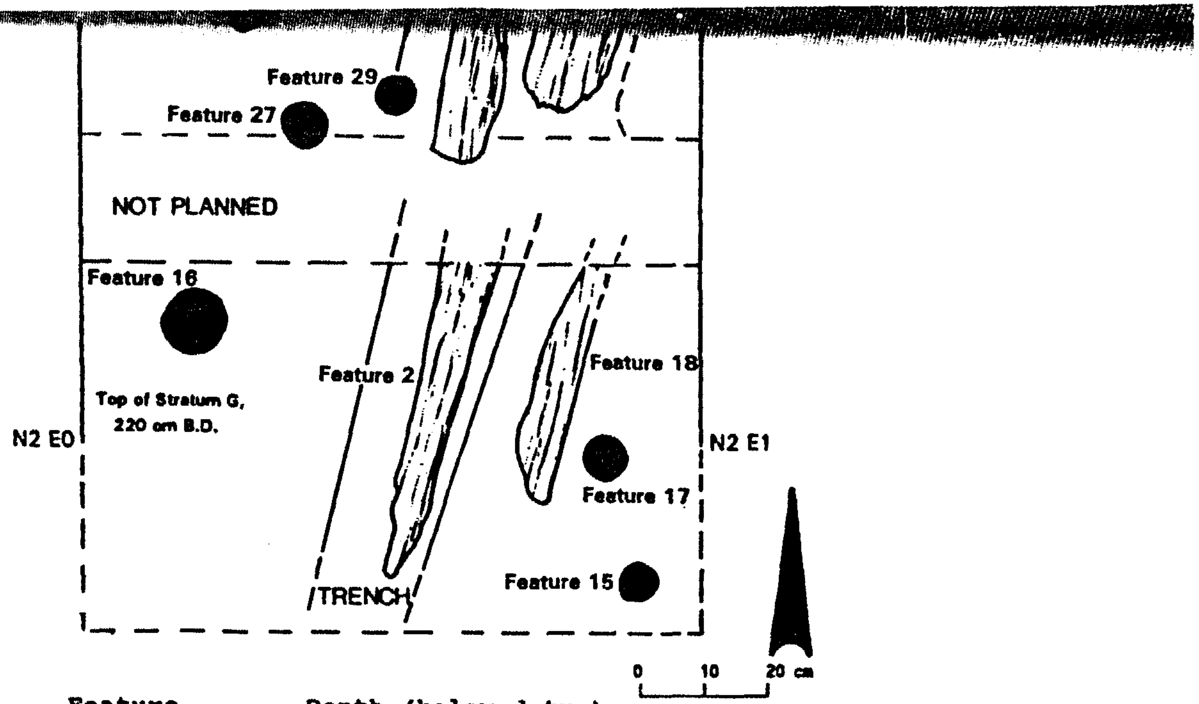
These postmolds, Features 10-13, and a pocket of dark earth designated Feature 14, were drawn in plan at a depth of 190 cm b.d., i.e., approximately 3 cm below the top of Stratum F (Figure 48). Features 10-13 all had diameters of approximately 6 cm at their mapped positions. The bases of these postmolds were: Feature 10, 194 cm b.d.; Feature 11, 208 cm b.d.; Feature 12, 199 cm b.d.; and Feature 13, 195 cm b.d. Feature 14 exhibited about 9 cm of depth, and extended into the northeast quarter of EU6. The fill within Features 10-14 appeared to be the darker, bone-rich midden of Stratum E. These features are considered intrusive from Stratum E into Stratum F because of their location at the top of Stratum F and because of the nature of the material with which they were filled.

Within the southern half of EU6, three additional postmolds (Feature 15, Feature 16, and Feature 17) were recognized at the top of the Stratum G clay (Figure 47). Feature 15 was first recognized at 222 cm b.d., and its base was at 236 cm b.d. It was 5 cm in diameter. The center of this feature was at N1.78 E0.89, near the irregular north wall of EU5. Feature 16 and Feature 17 were each about 6 cm in diameter at the top of Stratum G. They were first recognized at 217 cm b.d. and 218 cm b.d. respectively. They did not extend downward very far below those depths. Feature 15, Feature 16, and Feature 17 all were characterized by dark, loose fill with some *Rangia*, and probably represent Stratum F material intrusive into Stratum G. The fact that they were first recognized at the upper surface of Stratum G is further evidence for this interpretation.

The horizontal cypress wood "post" designated Feature 2 in EU5 was exposed as excavation of Stratum G began within the southern half of EU6. The loose, *Rangia*-rich fill surrounding the wood was more characteristic of Stratum F than of the remainder of Stratum G. It was removed separately and processed separately as part of Feature 2. This fill is almost certainly intrusive material from the overlying Stratum F *Rangia* midden. The appearance of this area of dark earth fill suggests the former presence of a trench or depression at the top of Stratum G (Figure 47).

A separate wood "plank" near the bottom of the loose, dark fill associated with Feature 2 was designated Feature 18 (F18). This wood fragment was referred to as a "plank" because of the somewhat flattened configuration of its surface. However, it is uncertain whether it was deliberately shaped. It had been drawn in the north wall profile of EU5 (Figure 37) but had not been assigned a separate feature number at that time. It is shown in plan


N4 E1
Feature 42
Feature 40
Feature 2
Top of Stratum G,
215 cm B.D.
TRENCH
Feature 39
Feature 2
Feature 41
NOT PLANNED
Top of Stratum H,
232 cm B D
Feature 2
Feature 18
Feature 28
TRENCH
2
Feature 29
Feature 27
NOT PLANNED
Feature 1
Feature 2
Feature 18



Feature	Depth (below datum)
2	214-225 cm
15	222 cm
16	217 cm
17	218 cm
18	231-235 cm
27	216 cm
28	213 cm
29	216 cm
39	210 cm
40	215 cm
41	210 cm
42	215 cm

Figure 47. Plan view of portions of EU6 and EU7. The plan shows Features 2, 15-18, 27-29, and 39-42.

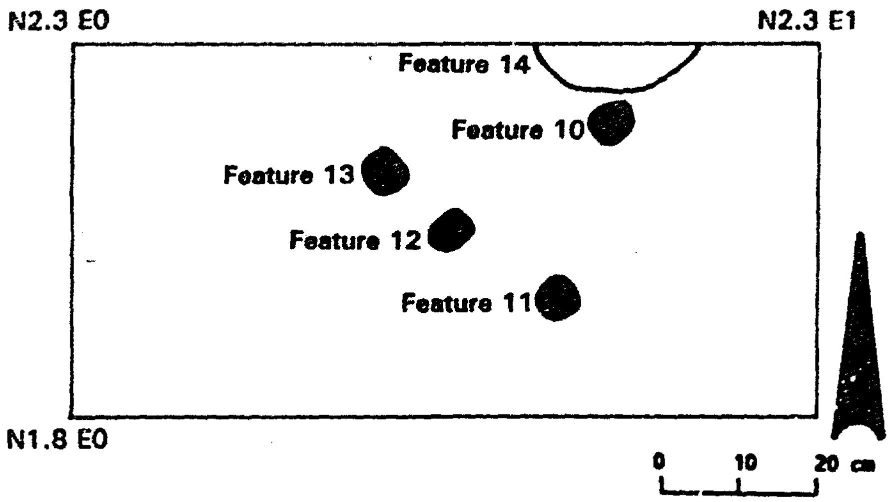


Figure 48. Plan of the south half of EU6 Stratum F at 190 cm b.d. showing postmolds (Features 10-13) and a soil pocket (Feature 14).

view in Figure 47. Like Feature 2, Feature 18 was present in both EU5 and the southern half of EU6. The Feature 2 "post" and Feature 18 "plank" were roughly parallel but exhibit slightly divergent orientations. Feature 18 had a more easterly bearing than did Feature 2.

A thin area of the relatively sterile clay characteristic of Stratum G clay separated Feature 2 and Feature 18 in the southern half of EU6. In this area, the Feature 18 plank appeared to rest directly upon the underlying Stratum I *Rangia* bed. In the southern half of EU6, the top of the Feature 2 "post" was at 214 cm b.d. and the top of the Feature 18 plank was at 231 to 235 cm b.d. The top of the underlying Stratum I was at variable depths, ranging from 235 to 244 cm b.d. Farther north, in the north half of EU6 as well as in EU7, Feature 18 lay at the same depth as the Feature 2 "post," and was located within a broad depression filled with loose dark fill. Based on these observations, it appears that the southern end of the Feature 18 "plank" was forced downward to the top of the resistant Stratum I *Rangia*. Thus, the Feature 18 "plank," like the Feature 2 "post," was more directly associated with intrusive Stratum F material than with Stratum G *per se*. It is unclear whether the lower end of the Feature 18 "plank" was forced down by human action during a construction episode or by processes associated with natural deposition. Stratum G itself appeared to be almost sterile in the southern half of EU6.

Stratum F within the two northern quadrants of EU6 exhibited the same characteristics as in the proveniences described above. It consisted of medium to large *Rangia*. Fragments of large *Unio* were noted at the base of Stratum F, and a small amount of charcoal flecking was observed throughout the stratum.

The Stratum G clay within the two northern quadrants of EU6 included several *Rangia* shells, but apart from fill associated with Feature 2 and Feature 18 in the northeast corner, it appeared to be virtually sterile. Sherds recovered from this stratum were probably intrusive as a result of the large number of features, including the trench-like area of fill surrounding the Feature 2 "post."

Portions of the surface of the Feature 2 "post" within this part of the unit appeared charred. This dark charring was shallow (less than 2 mm) on most of the object but appeared deeper along the top and east side of the "post." There was no discoloration or hardening of the adjacent soil, suggesting that any charring of the wood occurred prior to its deposition.

Three postmolds (Features 27, 28, and 29) were identified in the northwest quarter of EU6 at the top of Stratum G (Figure 47). These features were filled with Stratum F material and were intrusive into Stratum G. Thus, they are similar to Features 15, 16, and 17, described above. Feature 29 overlapped with the western edge of the depression associated with Feature 2.

Within the northwest quarter of EU6, a slight concentration of small shell fragments was noted at the same depth as the top of the Feature 18 "plank." This concentration was noted within a layer of 2.5Y 2/0 (black) plastic clay. The top of this shell concentration was at 232 cm b.d.

As was the case in the other units, Stratum F within EU7 was comprised of medium to large *Rangia* shells that were generally unbroken except at the top of the stratum. The top of Stratum F within this unit generally sloped down from northeast to southwest in EU7, from 191 to 198 cm b.d. One postmold (Feature 38) was identified at the south end of EU7 (N3 E0.80). The postmold was first recognized at 200 cm b.d., which was the top of the Stratum F shell, and its bottom was at 215 cm b.d. Its diameter was 7 cm. It was recognized as dark organic-rich Stratum E material intrusive into the Stratum F shell, as was the case with the postmolds designated Features 10-13 in the southern half of EU6 (above).

Stratum G was difficult to excavate in EU7 because of rapid inflow of water through the Stratum F shell midden. The problem was exacerbated here by the proximity of the unit to the edge of the lake and by a higher lake level during the final phase of the excavation. The top of Stratum G generally sloped down from northeast to southwest in EU7 from 204 cm b.d. at N4 E1 to 215 cm b.d. at N3 E0.

Within EU7, a few large wood fragments were present in the depression associated with the Feature 2 "post" and the Feature 18 "plank" discussed above (Figure 47). No large pieces of the Feature 2 "post" or the Feature 18 "plank" were present in EU7. The contours of the depression could be traced by the darker, softer fill (probably intrusive from Stratum F midden) within the gray clay of Stratum G.

One shallow pocket of loose silt and clay with a moderate amount of *Rangia* was noted in Stratum G within the southwest quarter of EU7. The fill within this feature (Feature 43) has more silt than the immediately overlying Stratum F midden; nevertheless, it probably represents

Stratum F material that is intrusive into Stratum G. Feature 43 extended south into the northwest quarter of EU6 but it was not identified during the removal of that stratigraphic column. The bottom of Feature 43 ranged from 229 to 232 cm b.d.

Four postmolds (Features 39-42) also were identified at the top of Stratum G within EU7 (Figure 47). They were distinguished by the looser, darker fill containing varying amounts of *Rangia*. All probably consist of Stratum F material intrusive into Stratum G. If this interpretation is correct, then they are analogous to postmolds designated Features 15, 16, and 17 within the southern half of EU6, and those designated Features 27, 28, and 29 within the northwest quarter of EU6. The depths from the top of Stratum G of postmolds designated Features 39-42 ranged from 5 to 10 cm. The bases of Features 39-42 were at 220, 224, 215, and 220 cm b.d., respectively.

Stratum H. Within EU5, Stratum H was identified as 5Y 4/1 (dark gray) plastic clay. It was essentially the same soil matrix as in Stratum G, but it was totally devoid of *Rangia* shells. It appeared to be entirely sterile. The stratum has an average thickness of 6 cm, and at N0 E0 extends from 232 to 238 cm b.d. This stratum was identified in the southern half of EU5 but was difficult to distinguish farther north in the unit. Stratum H was not identified within EU6 or EU7.

Stratum I. Stratum I was the lowest natural stratum observed in EU5-EU7. It was identified within EU5 as a *Rangia* midden with a 10YR 2/1 (black) clayey silt matrix. It also included a thin layer of this same soil matrix immediately above the dense *Rangia*. The upper part of Stratum I was rich in organics, including wood fragments. It broke into small, blocky fragments. The lower part of Stratum I contained a few oyster and *Unio* shell fragments in addition to *Rangia*. Small charcoal flecks were present in the dense *Rangia* layer. The thickness of Stratum I within EU5 ranged from 5 to 8 cm. At N0 E0, it extends from 240 cm to 248 cm b.d.

An ash lens designated Feature 7 was identified in the southwest corner of EU5. The top of the ash lens was at depths of 238 to 240 cm b.d., or at the top of the upper level of Stratum I. Whole and fragmentary *Rangia* continued downwards from Stratum F to the top of Feature 7. The ash lens, therefore, may represent the bottom of a firepit intrusive from Stratum F.

The presence of Feature 7 obscured the distinction between the upper and lower layers of Stratum I in the southern half of EU5. The upper and lower layers of Stratum I were not separated during the excavation of EU5, because of this factor and recurrent problems with maintaining a clean working floor in the periodically flooded unit. However, these two layers were removed as discrete stratigraphic units in the northern portions of EU6 and in EU7.

A projectile point was recovered from Stratum I in the northwestern corner of EU5, but it could not be assigned specifically to the upper or lower layer of the stratum. This lithic artifact, which was the only one recovered from an undisturbed stratigraphic context, is discussed further in Chapter 12.

Stratum I, within the southern half of EU6, was essentially the same as in EU5. It included fairly large shells. Small charcoal flecks and some burned *Rangia* were scattered throughout the stratum. A number of sherds were noted directly above the dense *Rangia*. Upper (less *Rangia*) and lower (dense *Rangia*) layers within Stratum I were not identified in the southern half of EU6 because the discrete character of these stratigraphic subunits was obscured by intrusive material associated with Feature 2 and Feature 18. The Feature 18 "plank" rested on the Stratum I *Rangia* bed in this unit.

It was within the northern quadrants of EU6 that Stratum I was subdivided during excavation. The upper layer of Stratum I, a 2.5Y 2/0 (black), organic-rich midden above the dense *Rangia* was removed separately. Very small amounts of the overlying G/H clay adhered too tightly to be completely removed, but the remains recovered in water screening originated almost entirely within the upper portion of Stratum I. The presence of wood fragments and plant remains was noted in Upper Stratum I.

The lower portion of Stratum I within the northern quadrants of EU6 was composed of medium to large *Rangia* in the same 2.5Y 2/0 (black) silty clay matrix present in Upper Stratum I (above). One postmold (Feature 30) was identified at the top of the underlying Stratum J clay in the northeast quarter of EU6. The center of Feature 30 was at N2.65, E0.86. The feature was 8 cm in diameter at the level where it was first identified (248 cm b.d.). Its base was at 260 cm b.d. The postmold was filled with *Rangia* from Stratum I and clearly was intrusive in Stratum J.

Upper Stratum I, above the dense *Rangia*, was 2-3 cm thick in EU7. The Stratum I *Rangia* midden was thicker in the northwest quarter of EU7. Its thickness varied from 13 cm at N4 E1 to 4 cm at N3 E0. The top of lower Stratum I generally sloped down from northeast to southwest, from 224 cm b.d. at N4 E1 to 242 cm b.d. at N3 E0.

Stratum J. Stratum J within EU5 consisted of 5Y 4/1 (dark grey) plastic silty clay. A slight admixture of *Rangia* fragments and cultural material occurs near the top of the stratum, and several *Rangia*-filled postmolds were identified at the top of Stratum J (above). These features were intrusive into Stratum J from Stratum I. The small amount of *Rangia* recovered near the top of Stratum J probably also derived from Stratum I. Stratum J, when screened within EU5, proved to be sterile.

The silty clay of Stratum J exhibited extensive iron oxide staining and contained small rootlets. Within EU5, the top of Stratum J was at a depth of 237 cm to 251 cm b.d. The range was due to a general slope down to the south. At N0 E0, the top of Stratum J was recorded at a depth 248 cm b.d.

Two postmolds were observed and excavated within Stratum J. Based on their stratigraphic locations and on the fill within them, both of these features appeared to be intrusive from Stratum I. The first of these was designated Feature 6. It was a postmold 8 cm in diameter at the top of Stratum J and penetrated 15 cm into the stratum. The base of the postmold was at 266 cm b.d., and its center was at N1.95 E0.05.

The second postmold, designated Feature 44 (F44), was identified within EU7 at the top of the Stratum J sterile clay. This large postmold, [illegible] cm in diameter, extended from the top of Stratum J at 243 cm b.d. to 280 cm b.d. It was filled with intrusive Stratum I *Rangia*.

Stratigraphic Correlations with the 1979-1983 LAS Excavations

The stratigraphy discussed above can be correlated with strata recognized by Giardino and Comardelle in 1979-1983. The correlations are summarized in Table 41. Stratum C represents the "marsh mud" root zone designated "Level A" during the earlier LAS excavations. Stratum C is thinner than Level A, probably due to the compression of organic remains by the spoil overburden in EU5-EU7. During the LAS excavations, material from Level A was not screened.

Table 41. Correlations Between the 1979-1983 Excavation "Levels" and the Strata Recognized in 1991.

1979-1983 Level	1991 Stratum
A	C
B	D
C	E
D	F
E	G
F	I

Recovered artifacts were analyzed with the surface collection.

The compact surface recorded within Stratum C may correspond to the concentration of bricks noted by the LAS field crew in the early 1980s at the eastern end of the spoil island. That area had been destroyed by erosion by the time of the 1991 fieldwork.

Stratum D in EU5-EU7 corresponds with Level B in the LAS excavations. In both instances, the stratum/level was characterized as a *Rangia* midden. Stratum E, the bone-rich midden which exhibited the fullest expression of Coles Creek culture at the Pump Canal site, corresponds to Level C in the LAS excavations. During the 1979-1983 work, Level C was referred to as the "fish bone midden" which is consistent with the 1991 observations.

During both the LAS and the 1991 excavations, a number of ash lenses were recorded within Level C/Stratum E. The upper part of Level C, above a hearth in LAS EU3, was designated sublevel Ca and that below the hearth as Cb. During 1991 excavations, Stratum E was divided into a series of sub-levels in EU6 and EU7. Ceramic analyses (Chapter 11) indicate that two of the LAS subdivisions are comparable to two of the 1991 divisions.

Stratum F in 1991 appeared as a *Rangia* shell midden and corresponds to the Level D shell midden in the LAS units. Stratum G corresponds to Level E in the LAS units. During the excavation of Units 3 and 4 by LAS in 1982-1983, a quartered section of a cypress log was recovered partly within the Level D *Rangia* midden and partly within the underlying Level E sterile clay. Giardino suggested that the weight of the log pressed it into the clay after it had fallen. This position is analogous to that of Feature 2 and Feature 18 in the 1991 excavation trench.

The 1991 Stratum I corresponds to Level F in the LAS units. Most of the faunal remains collected from this stratum in EU5-7 probably came from the thin band of silty clay lying above the dense *Rangia*. The presence of a thin layer of burned clay directly above LAS' Level F, noted in some areas of units 1-4, probably corresponds to upper Stratum I.

Stratum J was the deepest stratum excavated in 1991. Deep auguring in the LAS units revealed a massive blue-gray clay designated Level H, far below the lowest cultural strata.

Carbon-14 Dates

Table 42 summarizes the fifteen C-14 dates that were obtained from charcoal, wood, and shell at 16SC27, and provides a list of radiocarbon dates from other sites in the Louisiana coastal zone. These dates are plotted in graphic form in Figure 49. Samples were analyzed by Beta Laboratories, Inc., in Miami, Florida, and the University of Georgia. The C-14 dates in terms of Years BP as provided by the laboratories were input into a computer program that gave a calibrated A.D. and BP date, a calibrated range, and the relative area under the probability distribution (Table 42). For the calibrated ranges, the dates provided in Table 42 are those accurate within two standard deviations rather than one. These correction factors were developed by Stuiver and Pearson (1986:805-838).

As anticipated, Stratum C provided the most recent dates. One sample of wood provided a calibrated date of A.D. 1657 and a range of 1480-1890. The other wood sample from Stratum C provided multiple calibrated intercepts, but a similar calibrated range (A.D. 1651-1955). However, a sample of *Rangia* shell from Stratum C yielded a date (calibrated A.D. 1230) that is considerably earlier than the two wood dates. It is however, comparable to the date (calibrated A.D. 1285) obtained from a sample of shell in Stratum D. In any event, artifacts from Stratum C indicate activity during both the prehistoric and historic period, so that the range of dates obtained may accurately reflect the various occupations.

A series of dates were obtained for Stratum E. These are presented in their stratigraphic sequence in Table 42. Shell samples from the uppermost and lowermost divisions within Stratum E yielded calibrated dates of A.D. 785 and 554 respectively. Charcoal from Feature 8, located in the uppermost 10 cm of Stratum E, yielded a calibrated date of A.D. 605. This sample is associated with a very large error factor, but the calibrated age range of this date overlaps with the shell dates from this level. Ceramics indicate that Stratum E represents a Coles Creek period occupation (Chapter 11). The shell and charcoal C-14 dates obtained from Stratum E are slightly earlier than those recorded for the early Coles Creek period elsewhere in the Lower Mississippi Valley (in Kidder 1990:86).

The calibrated C-14 date yielded by a shell sample from Stratum F was A.D. 425. This date, however, may be too old given the ceramic chronology and the dates from Features 2 and 18 in the underlying Stratum G. As was discussed above, Feature 2 and Feature 18 are large wood features within

Table 42. Summary of C-14 Dates.

Site	Lab No.	Material	Provenience	Years B.P.	Cal. A.D. (B.P.)	Cal. A.D. (B.P.) Ranges (2 S.D.)	Rel. Area Under Prob. Dist.	C13/C12	C13 Adjusted Age B.P.
16SC27 Pump Canal	UGa-4675	charcoal	Str C	545±65	1405 (545)	1287-1447 (663-503)	1.00	Not Obtained	Not Obtained
16SC27 Pump Canal	Beta-43783	wood	Str C S 1/2 EU6	160±70	1679 (271) 1743 (207) 1802 (148) 1938 (12), 1955 (0)	1651-1955 (299-0)	1.00	Not Obtained	Not Obtained
16SC27 Pump Canal	UGa-4676	cypress charcoal	Str D	1540±110	539 (1411)	250-670 (1700-1280)	1.00	Not Obtained	Not Obtained
16SC27 Pump Canal	Beta-52654	wood	Str C EU5	230±100	1657 (293)	1480-1890 (470-60)	0.89	-28.5	170±100
16SC27 Pump Canal	Beta-52646	shell	Str C NW 1/4 EU6	810±50	1230 (720)	1154-1279 (796-671)	0.90	-5.3	1130±50
16SC27 Pump Canal	Beta-52647	shell	Str D NW 1/4 EU6	670±50	1285 (665)	1264-1396 (686-554)	1.00	-5.8	980±50
16SC27 Pump Canal	Beta-52648	shell	Str E Top 5 cm NW 1/4 EU6	1220±60	785 (1165)	670-899 (1280-1051)	0.95	-5.5	1540±60
16SC27 Pump Canal	Beta-52655	charcoal	Feature 8 Str E S 1/2 EU6	1460±150	605 (1345)	250-890 (1700-1060)	1.00	-24.3	1470±150
16SC27 Pump Canal	Beta-52649	shell	Str E Below Rangia NW 1/4 EU6	1510±60	554 (1396)	424-642 (1526-1308)	1.00	-5.8	1820±60
16SC27 Pump Canal	Beta-52650	shell	Str F NW 1/4 EU6	1610±60	425 (1525)	326-569 (1624-1381)	0.94	-6.0	1920±60
16SC27 Pump Canal	UGa-5298	charcoal	Top of Str G	1640±65	411 (1539)	246-552 (1704-1398)	1.00	Not Obtained	Not Obtained
16SC27 Pump Canal	Beta-52653	wood	Feature 18 Str G S 1/2 EU6	1430±60	632 (1318)	494-683 (1456-1267)	0.96	-25.9	1420±60
16SC27 Pump Canal	Beta-43784	wood	Feature 2 Str G EU5	1280±50	689 (1261)	657-861 (1293-1087)	1.00	Not Obtained	Not Obtained
16SC27 Pump Canal	Beta-52652	wood	Feature 2 Str G S 1/2 EU6	1670±60	391 (1559)	237-532 (1713-1418)	1.00	-24.9	1670±60

Table 42. Summary of C-14 Dates.

Site	Lab No.	Material	Provenience	Years B.P.	Cal. A.D. (B.P.)	Cal. A.D. (B.P.) Ranges (2 S.D.)	Rel. Area Under Prob. Dist.	C13/C12	C13 Adjusted Age B.P.
16SC27 Pump Canal	Beta-52651	shell	Str I NW 1/4 EU6	1350±60	663 (1287)	565-797 (1385-1153)	1.00	-5.5	1670±60
16SC2 Sims	UGa-3062	charcoal	Hearth, Base of Mound C	490±180	1427 (523)	1170-1700 (780-250)	0.91	Not Obtained	Not Obtained
16SC2 Sims	UGa-3059	charcoal	Base of North Bank	210±65	1663 (287)	1622-1893 (328-57)	0.76	Not Obtained	Not Obtained
16TR5 Gibson Mound	UGa-1616	charcoal	Base of Mound C	1075±60	977 (973)	793-1038 (157-912)	1.00	Not Obtained	Not Obtained
16AS35 Thibodaux	UGa-1743	shell	Occupation Level I, 95-105 cm	1070±55	980 (970)	853-1038 (1097-912)	0.97	Not Obtained	Not Obtained
16AS35 Thibodaux	UGa-1742	shell	Occupation Level II, 60-90 cm	975±60	1026 (924)	958-1214 (992-736)	1.00	Not Obtained	Not Obtained
16AS35 Thibodaux	UGa-1741	shell	Occupation Level III, 40-60 cm	460±60	1437 (513)	1386-1525 (564-425)	0.85	Not Obtained	Not Obtained
16AS35 Thibodaux	UGa-1740	shell	Occupation Level IV, 60-80 cm	515±60	1416 (534)	1294-1469 (656-481)	1.00	Not Obtained	Not Obtained
16SMY133 Bayou Ramos	UGa-1954	shell	Test Pit 1, 10-20 cm	1215±70	787 (1163)	670-957 (1280-993)	1.00	Not Obtained	Not Obtained
16SMY133 Bayou Ramos	UGa-1593	shell	Test Pit 2, 10-20 cm	1020±60	1012 (938)	892-1129 (1058-821)	0.94	Not Obtained	Not Obtained
16SMY133 Bayou Ramos	UGa-1596	shell	Test Pit 2, 20-30 cm	1155±55	887 (1063)	760-996 (1190-954)	0.98	Not Obtained	Not Obtained
16LF36 Fleming	UGa-1084	charcoal	Unit 7 Lvl 10 (Area A)	1095±60	964 (986)	792-1024 (1158-926)	1.00	Not Obtained	Not Obtained
16VM9 Morgan	I-11, 987	charcoal	Post under Mound 1 slope wash (Zone II)	1130±75	894 (1056)	752-1023 (1198-927)	0.96	Not Obtained	Not Obtained
16VM9 Morgan	I-11, 988	charcoal	Post under Mound 1 slope wash (Zone II)	1210±75	790 (1160)	670-966 (1280-984)	1.00	Not Obtained	Not Obtained
16VM9 Morgan	I-11, 995	charcoal	Post under Mound 1 slope wash (Zone II)	1055±150	988 (962)	680-1240 (1270-710)	1.00	Not Obtained	Not Obtained

Table 42. Summary of C-14 Dates.

Site	Lab No.	Material	Provenience	Years B.P.	Cal. A.D. (B.P.)	Cal. A.D. (B.P.) Ranges (2 S.D.)	Rel. Area Under Prob. Dist.	C13/C12	C13 Adjusted Age B.P.
16VM9 Morgan	I-11, 986	charcoal	Mound 1 slope wash (Upper Zone III)	775±125	1261 (689)	1020-1410 (930-540)	1.00	Not Obtained	Not Obtained
16VM9 Morgan	Beta-19166	charcoal	Floor of summit structure Mound 1 (Zone 4a)	1000±80	1018 (932)	884-1219 (1066-731)	1.00	Not Obtained	Not Obtained
16VM9 Morgan	Beta-19167	charcoal	Hearth in floor of summit structure Mound 1 (Zone 4a)	1010±80	1015 (935)	869-1219 (1081-731)	1.00	Not Obtained	Not Obtained
16VM9 Morgan	Beta-19168	charcoal	Post in floor of summit structure Mound 1 (Zone 4a)	760±70	1265 (685)	1153-1318 (797-632)	0.86	Not Obtained	Not Obtained
16VM9 Morgan	Beta-19169	charcoal	Hearth in base of summit structure Mound 1 (Zone 4a)	1180±160	880 (1070)	560-1180 (1390-770)	1.00	Not Obtained	Not Obtained
16VM9 Morgan	I-11, 997	charcoal	Midden b/t Mounds 1&2 (Lower Zone V)	1190±125	830 (1120) 859 (1091)	610-1050 (1340-900)	0.99	Not Obtained	Not Obtained
16VM9 Morgan	I-11, 998	charcoal	Midden b/t Mounds 1&2 (Lower Zone V)	980±120	1024 (926)	805-1270 (1145-680)	1.00	Not Obtained	Not Obtained
16VM9 Morgan	I-11, 999	charcoal	Midden b/t Mounds 1&2 (Lower Zone V)	1210±140	790 (1160)	560-1050 (1390-900)	0.98	Not Obtained	Not Obtained
16VM9 Morgan	Beta-19170	charcoal	Hearth on top of midden under Mound 1 (Zone 6)	780±110	1259 (691)	1020-1330 (930-620)	0.91	Not Obtained	Not Obtained
16VM9 Morgan	Beta-19165	charcoal	Ash in midden under Mound 1 (Zone 6)	1010±100	1015 (935)	800-1230 (1150-720)	1.00	Not Obtained	Not Obtained
16VM9 Morgan	Beta-19171	charcoal	Post in component under Mound 1 (Zone 6)	1040±70	999 (951)	856-1164 (1094-786)	0.99	Not Obtained	Not Obtained

Table 42. Summary of C-14 Dates.									
Site	Lab No.	Material	Provenience	Years B.P.	Cal A.D. (B.P.)	Cal A.D. (B.P.) Ranges (2 S.D.)	Rel Area Under Prob Dist	C13/C12	C13 Adjusted Age B.P.
16VM9 Morgan	Beta-19172	charcoal	Pit feature in component under Mound 1 (Zone 6)	1180±90	880 (1070)	672 1001 (1278 949)	1.00	Not Obtained	Not Obtained
16IV6 Bruly St. Martin	UGa-329	charcoal	S10-20 W10-20 1.4-1.6 ft bd	1240±65	777 (1173)	659 898 (1291 1052)	0.9[illegible]	Not Obtained	Not Obtained
16IV6 Bruly St. Martin	UGa-331	charcoal	S0-10 W10-20 2.0-2.2 ft bd	1380±105	654 (1296)	310 1020 (1640 930)	0.98	Not Obtained	Not Obtained
16IV6 Bruly St. Martin	UGa-330	charcoal	S0-10 W10-20 3.1-3.4 ft bd	1555±70	532 (1418)	372 616 (1578 1334)	[illegible].98	Not Obtained	Not Obtained
16IV6 Bruly St. Martin	UGa-335	charcoal	S0-10 W10-20 3.6-3.9 ft bd	1275±60	712 (1238) 740 (1202) 753 (1197)	656 882 (1294 1068)	1.00	Not Obtained	Not Obtained
16SB12 Mulatto Bayou	UGa-2632	charcoal	Submerged midden	1055±120	988 (962)	750 1225 (1200 725)	0.9[illegible]	Not Obtained	Not Obtained
16SB39 Shell Beach Bayou	Beta-55111	shell	Midden adjacent to burial, Lvl 3 EU1	1380±80	654 (1296)	500 838 (1450 1112)	[illegible]	Not Obtained	Not Obtained
16SB39 Shell Beach Bayou	Beta-55112	shell	Feature 2, Lvl 5 EU3	1760±60	249 (1701)	125 4[illegible] (1825 154[illegible])	[illegible]	Not Obtained	Not Obtained

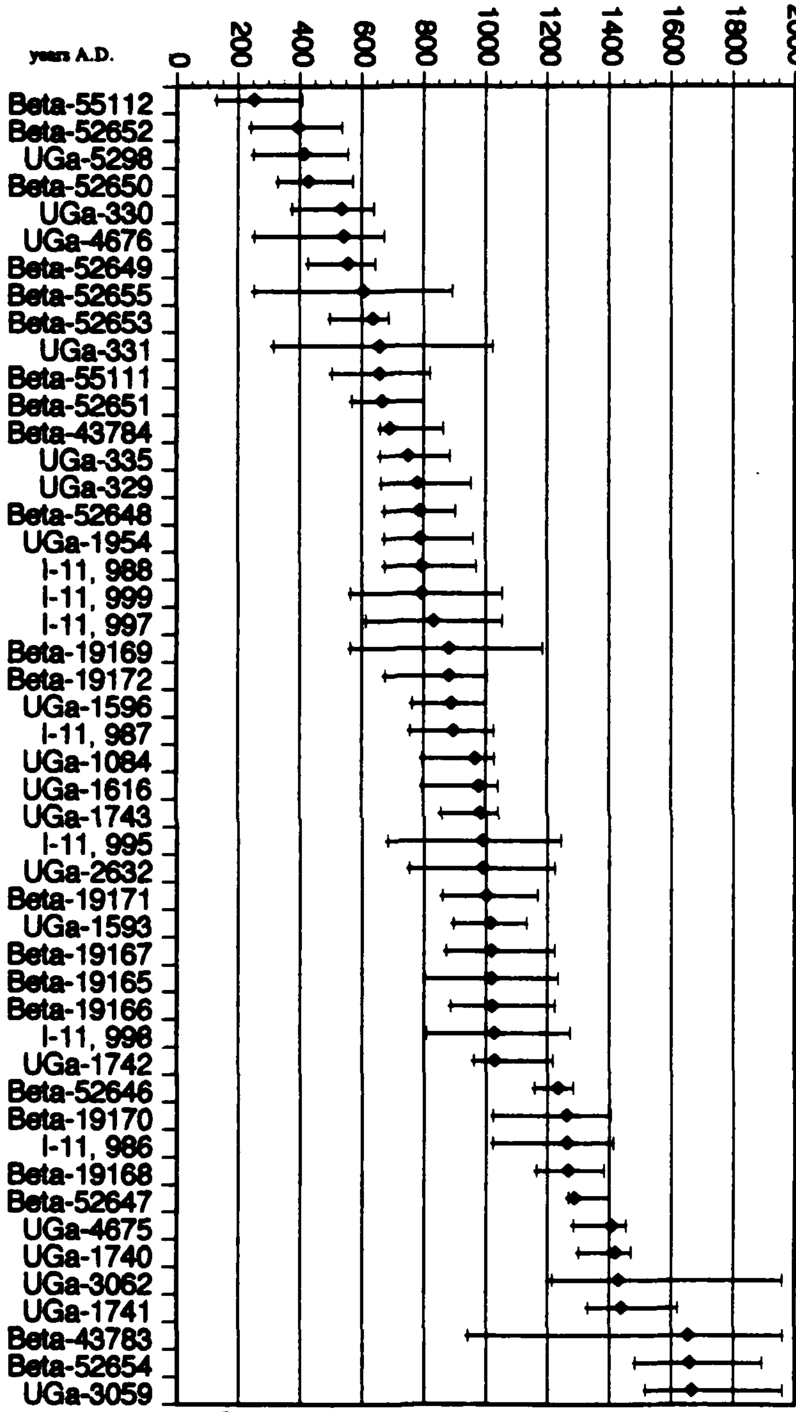


Figure 49. C-14 dates from 16SC27 and other sites in the Louisiana coastal zone.

Stratum G but which appear to be intrusive from Stratum F. Two different samples of Feature 2 were dated. The calibrated ages were A.D. 391 and A.D. 689. The calibrated ranges do not overlap. This discrepancy is likely the result of dating different parts of the wood, suggesting that the later date is more likely to reflect the age of the cultural context. The calibrated date obtained from Feature 18, which appears to be associated with Feature 2, was A.D. 632. This is consistent with the later of the Feature 2 dates. The general consistency of the dates from Features 2 and 18 (assuming that sample Beta-52652 is dating the earlier growth portion of Feature 2), and their overlap with the dates from Stratum E, suggest that the Stratum F shell date is likely to be erroneous. We suspect that some non-archeological shell may have been incorporated into Stratum F, thus leading to a date earlier than the cultural contexts would indicate.

During the excavation of Units 3 and 4 by LAS in 1982-1983, a quartered section of a cypress log was recovered partly within the Level D *Rangia* midden and partly within the underlying Level E sterile clay. This position is analogous to that of Feature 2 and Feature 18. The log excavated by LAS yielded an uncorrected C-14 date of 1540 ± 110 BP (A.D. 410) (UGa 4676). The calibrated date is A.D. 539, with a range of A.D. 250-670. That date is consistent with the later dates obtained from the fragments of Feature 2 and Feature 18.

A sample of shell from Stratum I yielded a calibrated date of A.D. 663, and the calibrated range was A.D. 565-797, which lies entirely within the range of dates obtained for Strata F and G. If these dates are accepted, they would indicate that little time intervened between the Stratum I and the Stratum F occupation despite changes in the ceramic industry. Similarly, the range of dates obtained indicates that little time elapsed between the Stratum F and the Stratum E occupation. Finally, the dates would seem to indicate that Coles Creek period activity ceased at 16SC27 prior to the accepted end of the period, which is A.D. 1000 to 1200 (Phillips 1970:Figure 2; Williams and Brain 1983:Figure 11.4).

Supplemental Auger Tests and Bankline Investigations

In addition to the excavation of the north-south trench (EU5-7), supplemental auger tests were placed at N0 W5, N0 W8.5, and N0 W10 (Figure 32). An attempted auger test at N0 W7.5 was halted when it struck a large tree root in the spoil overburden. The auger tests were utilized to examine the cross-island stratigraphy, although the auger columns were sometimes ambiguous.

A water-washed bank of exposed shell and midden along the northern side of the island was cleaned and the profile was recorded. As shown in Figure 32, the western end of this profile face was at S3.81 W11.74: the ground surface at 12 cm b.d. The uppermost stratum at this profile is spoil from the canal composed of 10YR 3/3 (dark brown) clay and 10YR 4/4 (dark yellowish brown) silt. Here the spoil overburden is only 15 to 34 cm thick, in contrast to the combined A/B thickness of 158 cm (10 to 168 cm b.d.) at N0 E0 and 163 cm (24 to 187 cm b.d.) of spoil at N0 W5. At N0 W10 the spoil is only 67 cm thick (30 to 97 cm b.d.). It appears that a shell mound is present below the canal spoil overburden west of N0 W5. The existence of this postulated shell mound had been obscured by the placement of spoil over it, but the heavy concentration of *Rangia* shells and ceramics along the narrow western arm of the spoil midden island, from approximately 80 cm b.d. to below the exposed bankline, can be attributed to the erosion of *in situ* material. The presence of such elevated concentrations of material in that locale was at first attributed to the erosion of higher spoil in the same area, but this explanation did not account for the absence of elevated outcrops of shell and artifacts on the eastern end of the island. The discovery of much higher cultural strata in the center and western end of the island than were encountered in the trench affords a more probable explanation for the observed distribution of surface material at the Pump Canal site. The strata recorded in the isolated bankline profile and in the auger tests cannot be directly correlated with the trench stratigraphy, as too little information is yet available about the extent and anatomy of the mound to interpolate over that distance

The next stratum in the bankline profile (II) is 10YR 2/1 (black) greasy silt midden up to 10 cm thick. Prehistoric sherds and fragments of daub are present. This is probably an old ground surface. It pinches out in the western end of the profile. Stratum III is 10YR 3/2 (very dark grayish brown) silt with dense *Rangia* and *Rangia* fragments. Pockets of 10YR 4/2 (dark grayish brown) silt are present in this stratum. Stratum IV is 10YR 3/1 (very dark gray) silty clay with *Rangia*. Strata III and IV both pinch out at the western end of the profile. Stratum V is 10YR 5/3 (brown) clayey silt with pockets of 10YR 3/1 (very dark gray) silty clay. This stratum varies in thickness from 32 to 48 cm. Stratum VI is 10YR 3/1 (very dark gray) silty clay with *Rangia*. The top of Stratum VI varied between 85 and 100 cm b.d. in the profile. This stratum continued to

120 cm b.d. in an auger test by the profile face. Stratum VI probably correlates with a layer of *Rangia* from 97 to 150 cm b.d. at N0 W10, and to layers of silt and clayey silt with *Rangia* from 105 to 140 cm b.d. at N0 W8.5. The higher portions of the auger columns at these locations are ambiguous. Even if Strata II-V at the profile face have been misinterpreted and are in fact spoil deposit, the Stratum VI *Rangia* layer is surely an *in situ* midden higher than any recorded in EU5-7. Auguring below the exposed profile face to a depth of 249 cm b.d. revealed beds of clay, *Rangia*, and organics-rich silt, and *Rangia*.

All three auger tests discussed in the beginning of this section terminated in *Rangia* at the effective limit of the two-meter auger's capability: N0 W5 at 221 cm, N0 W8.5 at 255 cm, and N0 W10 at 222 cm b.d. This elevation appears to corresponds with that of Stratum I within EU5-EU7.

Auger tests were also excavated on the south side of the actual Pump Canal. An auger test at S40.5 E0 hit the heavy blue clay at about -315 cm, and another auger test at S39 W20 encountered a heavy blue clay at a depth of 275 cm b.d. similar to that termed Level H during the 1979-1983 excavations. At S40.5 E0, black midden containing sherds, shell, and faunal remains was present from about 285 to 315 cm b.d., whereas no cultural strata were encountered west of this test. A deeply subsided portion of the site therefore extends southeast across the canal from the site datum. Mike Comardelle reports that earlier auger testing in that direction showed the buried site strata ended a short distance south of the canal.

The overall downward slope from north to south of the cultural strata within EU5-7 suggests that the land surface was slightly higher northeast or north-northeast of the trench, beyond the spoil bank island. The general thinning of the cultural strata from north to south within the trench and the complete absence of cultural material a short distance south-southwest of the site datum probably indicate that the original center of the site was north of the 1991 excavation units. The distributary channel associated with Pump Canal site tentatively has been located northeast of the island (Britsch and Dunbar 1990), flowing southeast toward Lake Salvador. All portions of the site except for the postulated shell mound within the spoil bank island, have subsided below prevailing lake levels in Lake Cataouatche. It is, therefore, not possible to determine the original extent or configuration of the site, nor is it possible to determine the stratigraphic relationship of the buried shell mound to other areas of the site.

CHAPTER 11
CERAMIC ANALYSIS FOR 16SC27
By Marco Giardino

Introduction

This chapter presents the results of analysis that include typological and modal identification of sherds recovered in the course of field work recounted in Chapter 10. Results from this analysis generally support, albeit with modifications, the conclusions from a similar study of ceramic artifacts excavated from Pump Canal between 1979 and 1983 by the Louisiana Archaeological Society (LAS). A summary of the previous analysis is included in Chapter 10 of this report.

In overview, aboriginal ceramics from Pump Canal (16SC27) are representative of cultures/periods spanning the late Baytown (A.D. 450-600) (Belmont and Williams 1981; Belmont 1984) to the late Mississippi (A.D. 1780) (Davis 1984; Giardino 1984). Based on the relative density of ceramic artifacts recovered from the various components, it appeared that the site was occupied most intensively during the Coles Creek period (A.D. 700-1000) (Belmont 1980).

The components represented and the proveniences with which they are associated are summarized in Table 43. Tables 44 through 52 represent a catalogue of ceramic types recovered from individual proveniences for each of the chronological components. Figures 50 through 77 present illustrations of selected ceramics.

Methods of Analysis

Each sherd from the 1991 excavations was examined in order to identify paste and decorative attributes. In addition, rim sherds were examined and described in terms of characteristics such as vessel shape and lip modifications. When these attributes demonstrated temporal and/or functional reliability and acquired discriminatory relevance, they were denoted as modes.

Typological analysis followed the framework for the Lower Mississippi Valley ceramics established by Phillips (1970) and Williams and Brain (1983). Other relevant sources which utilized the Lower Valley analytic framework, were also consulted. Brown (1982) served as the taxonomic guide for check-stamped pottery. The work of Fuller and Fuller (1987) was utilized for recent additions to the ceramic typology of Coastal Louisiana. Springer (1973), Weinstein et al. (1978), and Weisman et al. (1979) were

Table 43. Chronological Components/Ceramic Industries Recognized at 16SC27 and the Proveniences Associated with Each.

Component/Industry	Proveniences Included
Spoil	EU5 A & AB EU5 B
Mississippi period	EU5 C EU6 S-1/2 C EU6 NE-1/4 C EU6 NW-1/4 C EU7 0-5 cm C EU 7 Below Compact Surface in C EU7 FL 8-2 & FL 40
Transitional Coles Creek/Plaquemine	EU5 C/D EU5 D EU6 S-1/2 D EU6 NE-1/4 D EU6 NW-1/4 D EU7 D
Late Coles Creek (Stratum E - Upper)	EU6 S-1/2 upper 10 cm E EU6 NW-1/4 upper 5 cm E EU6 NE-1/4 Above F19 EU6 NW-1/4 Below F19 and Above Compact Surface EU6 NE-1/4 Below F19 and Above Compact Surface
Middle Coles Creek (Stratum E - Middle)	EU6 S-1/2 Bottom 10 cm EU6 NW-1/4 Below Compact Surface & Above Dense *Rangia* EU6 NW-1/4 Dense *Rangia* EU6 NE-1/4 Below Compact Surface EU7 Below Compact Surface & Above Dense *Rangia*
Early Coles Creek (Stratum E - Lower)	EU6 NW-1/4 Below Dense *Rangia* EU7 Below Dense *Rangia*
Des Allemands Phase (Strata F, G, I, and J)	All proveniences designated with "F," "G," "I," or "J"

Table 44. Ceramics from the Spoil in EU5, 16SC27.

	EU5 Str A1	EU5 Str A2	EU5 Str A3	EU5 Str A4	EU5 Str A/B	TOTAL
Evansville Punctated,						
var. Rhinehart				1		1
Pontchartrain Check						
Stamped,						
var. *Pontchartrain*	1				1	2
Unclassified Incised				2	1	3
Baytown Plain,						
var. Reed		15		3	7	25
Baytown Plain,						
var. #1		1	2	7	11	21
Baytown Plain,						
var. #2	13	6	3	42	47	111
Baytown Plain,						
var. #4				4	6	10
Mississippi Plain						
var. *unspecified*				1		1
Plain, Very Gritty						
Sand	3	1				4
Other Rims	1	1		2	8	12
Unclassified (Plain)						
Ceramic Fragments	3	12		24	35	74
TOTAL	21	36	5	86	116	264

Table 45. Ceramics from the Mississippi Period Component, 16SC27.

	EU5	EU6	EU6	EU6	EU7	EU7	TOTAL
	Str C	NW1/4	NE1/4	S1/2	Str C	Str C	
		Str C	Str C	Str C	0-5cm	BCS[1]	
Anna Incised,							
var. *Australia*	1		1				2
Avoyelles Punctated,							
var. *Tatum*						2	2
Buras Incised,							
var. *Buras*	1						1
Coles Creek Incised,							
var. *Blakely*		1					1
Coles Creek Incised,							
var. *Hardy*		2				3	5
Coles Creek Incised,							
var. *Hunt*		1					1
Evansville Punctated,							
var. *Rhinehart*				3	1	2	6
French Fork Incised,							
var. *unspecified*						1	1
Mazique Incised,							
var. *Manchac*						1	1
Mazique Incised,							
var. *Mazique*						1	1
Mazique Incised,							
var. *unspecified*	1						1
Pontchartrain Check							
Stamped,							
var. *Lambert Ridge*	2			2			4

Table 45. Ceramics from the Mississippi Period Component, 16SC27.

	EU5	EU6	EU6	EU6	EU7	EU7	TOTAL
	Str C	NW1/4	NE1/4	S1/2	Str C	Str C	
		Str C	Str C	Str C	0-5cm	BCS[1]	
Pontchartrain Check							
Stamped,							
var. Pontchartrain	1			2			3
Unclassified Brushed				1			1
Unclassified Incised	3	2	4	1	1	3	14
Unclassified Interior							
Incised	1					1	2
Unclassified Punctated			1		1	1	3
Baytown Plain,							
var. Reed	56	16	17	32	15	18	154
Baytown Plain,							
var. #1	28	15	12	42	23	32	152
Baytown Plain,							
var. #2	126	54	47	62	61	62	412
Baytown Plain,							
var. #4	9	4		16	9	14	52
Mississippi Plain							
var. unspecified	3						3
Other Rims	10	4		7	8	2	31
Unclassified (Plain)							
Ceramic Fragments	394	104	27	196	158	335	1214
TOTAL	636	203	109	364	277	478	2067

[1]BCS : Below Compact Surface

Table 46. Ceramics from the Transitional Coles Creek/Plaquemine Component, 16SC27.

	EU5 Str C/D	EU 5 Str D	EU6 NW1/4 Str D	EU6 NE1/4 Str D	EU6 S1/2 Str D	EU7 Str D	TOTAL
Anna Incised, *var. Australia*						2	2
Anna Incised, *var. unspecified*		2			2		4
Avoyelles Punctated, *var. Tatum*	1						1
Buras Incised, *var. Buras*				1			1
Churupa Punctated, *var. unspecified*		2					2
Coles Creek Incised, *var. Coles Creek*					1		1
Coles Creek Incised, *var. Hardy*					1	2	3
Coles Creek Incised, *var. Hunt*		2	4		2		8
Coles Creek Incised, *var. Mott*				4			4
Coles Creek Incised, *var. unspecified*		1					1
Evansville Punctated, *var. Duck Lake*	8					1	9
Evansville Punctated, *var. Sharkey*	5	2				5	12
French Fork Incised, *var. LaBorde*						1	1

Table 46. Ceramics from the Transitional Coles Creek/Plaquemine Component, 16SC27.

	EU5 Str C/D	EU 5 Str D	EU6 NW1/4 Str D	EU6 NE1/4 Str D	EU6 S1/2 Str D	EU7 Str D	TOTAL
French Fork Incised,							
var. McNutt		1					1
French Fork Incised,							
var. unspecified		3	2			1	6
L'Eau Noire Incised,							
var. unspecified					1		1
Mazique Incised,							
var. Barataria	4	2					6
Mazique Incised,							
var. Manchac		2				1	3
Mazique Incised,							
var. unspecified					1	1	2
Pontchartrain Check							
Stamped,							
var. Lambert Ridge	3	2			1		6
Pontchartrain Check							
Stamped,							
var. Pontchartrain	16				1	1	18
Pontchartrain Check							
Stamped,							
var. unspecified						2	2
"Drag & Jab" Execution						1	1
Unclassified Brushed			1			1	2
Unclassified Incised	3	4		2	2	5	16
Unclassified Incised/							
Punctated					1		1

Table 46. Ceramics from the Transitional Coles Creek/Plaquemine Component, 16SC27.

	EU5 Str C/D	EU 5 Str D	EU6 NW1/4 Str D	EU6 NE1/4 Str D	EU6 S1/2 Str D	EU7 Str D	TOTAL
Unclassified Interior Incised						1	1
Unclassified Punctated	1	3					4
Baytown Plain, *var. Reed*	39	66	9	23	67	50	254
Baytown Plain, *var. #1*	102	78	2	24	24	49	279
Baytown Plain, *var. #2*	420	310	44	74	189	133	1170
Baytown Plain, *var. #4*	51	69	4	1	25	51	201
Mississippi Plain *var. unspecified*	30	1			2	2	35
Other Rims	39	21	5	6	14	17	102
Unclassified (Plain) Ceramic Fragments	951	301	112	184	478	475	2501
TOTAL	1673	872	183	319	812	802	4661

Table 47. Ceramics from the Late Coles Creek Component, 16SC27.

	EU7	EU6	EU6	EU6	EU6	EU6	EU6	EU6	EU7	TOTAL
	Str D/E	S1/2	NW1/4	NE1/4	NW1/4	NW1/4	NW1/4	NE1/4	Str E	
		Str E	Str E	Str E	Str E	Str E	Str E	Str E	ACS[5]	
		Top 10 cm	0-5cm	Af19[1]	AbAshLen[2]	Bf19ACS[3]	ScmtoCS[4]	Bf19ACS[3]		
					Top 5 cm					
Anna Incised,										
var. *unspecified*	6	2								8
Beldeau Incised,										
var. *unspecified*			1							1
Coles Creek Incised,										
var. *Athanasio*		1							1	2
Coles Creek Incised,										
var. *Blakely*		3						3		6
Coles Creek Incised,										
var. *Coles Creek*		1		2		1		1	1	6
Coles Creek Incised,										
var. *Hardy*	2	4				1				7
Coles Creek Incised,										
var. *Hunt*	2		2	1		1		5		11
Evansville Punctated,										
var. *Braxton*	2									2
Evansville Punctated,										
var. *Duck Lake*		1				2		1		4
Evansville Punctated,										
var. *Evansville*				1						1
Evansville Punctated,										
var. *Rhinehart*	3	4	2					1		10
Evansville Punctated,										
var. *Sharkey*	5									5

Table 47. Ceramics from the Late Coles Creek Component, 16SC27.

	EU7 Str D/E	EU6 S1/2 Str E Top 10 cm	EU6 NW1/4 Str E 0-5cm	EU6 NE1/4 Str E Af19[1]	EU6 NW1/4 Str E AbAshLen[2] Top 5 cm	EU6 NW1/4 Str E Bf19ACS[3]	EU6 NW1/4 Str E ScmtoCS[4]	EU6 NE1/4 Str E Bf19ACS[3]	EU7 Str E ACS[5]	TOTAL
French Fork Incised, var. *Iberville*	1									1
French Fork Incised, var. *Larkin*		1						1		2
French Fork Incised, var. *McNutt*		2								2
L'Eau Noire Incised, var. *unspecified*			1							1
Mazique Incised, var. *Manchac*									1	1
Mazique Incised, var. *Mazique*								1		1
Mazique Incised, var. *unspecified*	1									1
Pontchartrain Check Stamped, var. *Lambert Ridge*		1				1		3		5
Pontchartrain Check Stamped, var. *Pontchartrain*	9	12	1			3		8		33
Pontchartrain Check Stamped, var. Tiger Island	1	2						4		7

Table 47. Ceramics from the Late Coles Creek Component, 16SC27.

	EU7	EU6	EU6	EU6	EU6	EU6	EU6	EU6	EU7	TOTAL
	Str D/E	S1/2	NW1/4	NE1/4	NW1/4	NW1/4	NW1/4	NE1/4	Str E	
		Str E	Str E	Str E	Str E	Str E	Str E	Str E	ACS[5]	
		Top 10 cm	0-5cm	Af19[1]	AbAshLen[2]	Bf19ACS[3]	5cmtoCS[4]	Bf19ACS[3]		
					Top 5 cm					
Pontchartrain Check										
Stamped,										
var. *unspecified*		1						4	1	6
"Drag & Jab" Execution								1		1
Unclassified Incised	8	3		1				2	2	16
Unclassified Incised/										
Punctated								1		1
Unclassified Interior	2									2
Incised			1			1				2
Unclassified Punctated								2		2
Baytown Plain,										
var. *Reed*	34	8	2	14				10	1	69
Baytown Plain,										
var. #1	92	112	27	5		28	1	36	5	306
Baytown Plain,										
var. #2	414	216	77	34		88		156	11	996
Baytown Plain,										
var. #4	85	39	12	8		24		17		185
Mississippi Plain										
var. *unspecified*		2		2				1		5
Sandy Paste Plain	1		1							2
Other Rims	31	29	7	2	2	4		4		79
Unidentified (Plain)										0
Ceramic Fragments	956	772	143	56		197		139	13	2276
TOTAL	1655	1216	277	126	2	351	1	401	36	4065

[1]Af19 : Above Feature 19
[2]AbAshLen : Above Ash Lens
[3]Bf19ACS : Below Feature 19 Above Compact Surface
[4]5cmtoCS : 5 cm to Compact Surface
[5]ACS : Above Compact Surface

Table 48. Ceramics from the Middle Coles Creek Component, 16SC27.						
	EU6	EU6	EU6	EU7	EU6	TOTAL
	S1/2	NW1/4	NE1/4	Str E	NW1/4	
	Str E	Str E	Str E	BCS[3]	WDR[4]	
	B10cm[1]	BCSADR[2]	BCS[3]			
Anna Incised,						
var. *unspecified*				1		1
Avoyelles Punctated,						
var. *Tatum*				1		1
Beldeau Incised,						
var. *Beldeau*			1			1
Coles Creek Incised,						
var. *Blakely*				2		2
Coles Creek Incised,						
var. *Chase*	1					1
Coles Creek Incised,						
var. *Hunt*				1		1
Coles Creek Incised,						
var. *Mott*				1		1
Coles Creek Incised,						
var. *unspecified*	1					1
Evansville Punctated,						
var. *Braxton*				1	2	3
Evansville Punctated,						
var. *Duck Lake*	2					2
Evansville Punctated,						
var. *Rhinehart*				4	1	5
Evansville Punctated,						
var. *Sharkey*				1		1
Evansville Punctated,						
var. *unspecified*		1		3		4
French Fork Incised,						
var. *Larkin*				2		2
French Fork Incised,						
var. *McNutt*				1		1
French Fork Incised,						
var. *unspecified*	1	1		1	1	4
Mazique Incised,						
var. *Barataria*			1	1		2
Mazique Incised,						
var. *Brusly*				1		1

Table 48. Ceramics from the Middle Coles Creek Component, 16SC27.

	EU6 S1/2 Str E B10cm[1]	EU6 NW1/4 Str E BCSADR[2]	EU6 NE1/4 Str E BCS[3]	EU7 Str E BCS[3]	EU6 NW1/4 WDR[4]	TOTAL
Mazique Incised, var. *Manchac*				1		1
Mazique Incised, var. *unspecified*	2					2
Pontchartrain Check Stamped, var. *Lambert Ridge*	1	3		3		7
Pontchartrain Check Stamped, var. *Pontchartrain*	10	7	3	40	11	71
Pontchartrain Check Stamped, var. *Tiger Island*	1	2		3	1	7
"Drag & Jab" Execution		2	1	1	1	5
Unclassified Decorated	1			1		2
Unclassified Incised	1	3	3	2		9
Unclassified Incised/ Punctated	3			1		4
Unclassified Interior Incised				3		3
Unclassified Red Slip						
Unclassified Punctated		2	1			3
Baytown Plain, var. *Reed*	7	6	14	11	6	44
Baytown Plain, var. *#1*	50	13	10	125	30	228
Baytown Plain, var. *#2*	97	37	108	226	52	520
Baytown Plain, var. *#4*	43	5	13	77	14	152
Sandy Paste Plain						
Other Rims	13	5	7	47	6	78
Unclassified (Plain) Ceramic Fragments	231	64	113	529	150	1087
TOTAL	465	151	275	1091	275	2257

[1]B10cm : Below 10 cm
[2]BCSADR : Below Compact Surface Above Dense Rangia
[3]BCS : Below Compact Surface
[4]WDR : Within Dense Rangia

Table 49. Ceramics from the Early Coles Creek Component, 16SC27.			
	EU7 Str E BDR[1]	EU6 NW1/4 Str E BDR[1]	TOTAL
Coles Creek Incised, *var. Coles Creek*	1		1
Coles Creek Incised, *var. Hardy-like*	1	1	2
Coles Creek Incised, *var. unspecified*	1		1
Evansville Punctated, *var. Rhinehart*	2		2
French Fork Incised, *var. unspecified*		1	1
Mazique Incised, *var. Sweet Bay*	1		1
Pontchartrain Check Stamped, *var. Lambert Ridge*		2	2
Pontchartrain Check Stamped, *var. Pontchartrain*	1	6	7
"Six Mile" Treatment	1	1	2
Unclassified Incised	1	2	3
Unclassified Incised/ Punctated	1		1
Baytown Plain, *var. Reed*	26	13	39
Baytown Plain, *var. #1*	59	12	71
Baytown Plain, *var. #2*	108	89	197
Baytown Plain, *var. #4*		11	11
Sandy Paste Plain			
Other Rims	10	7	17
Unclassified (Plain) Ceramic Fragments	246	191	437
TOTAL	459	336	795

[1]BDR : Below Dense Rangia

Table 50. Ceramics from the Des Allemands Phase Component (Stratum F), 16SC27.						
	EU5 Str F	EU6 NE1/4 Str F	EU6 NW1/4 Str F	EU6 S1/2 Str F	EU7 Str F	TOTAL
Coles Creek Incised,						
var. *Hunt*	1					1
Evansville Punctated,						
var. *Rhinehart*	3		2	1	1	7
Evansville Punctated,						
var. *unspecified*	4					4
French Fork Incised,						
var. *Larkin*	2					2
French Fork Incised,						
var. unspecified	1					1
Mazique Incised,						
var. *Bruly*	15					15
Pontchartrain Check						
Stamped,						
var. *Pontchartrain*	3					3
"Six Mile" Treatment	2	1	1			4
Unclassified Incised	6	1			2	9
Baytown Plain,						
var. *Reed*	147	14	4	15	25	205
Baytown Plain,						
var. *#1*	88	6	8	38	41	181
Baytown Plain,						
var. *#2*	376	42	20	46	119	603
Baytown Plain,						
var. *#4*	45	2	3	1	9	60
Mississippi Plain,						
var. *unspecified*	9					9
Sandy Paste Plain						
Other Rims	34	2	1	1	13	51
Unclassified (Plain)						
Ceramic Fragments	920	51	43	211	284	1509
TOTAL	1656	119	82	313	494	2664

Table 51. Ceramics from the Des Allemands Phase Component (Stratum G), 16SC27.

	EU6	EU6	EU6	EU7	EU5	EU6	EU7	TOTAL
	NE1/4	NE1/4	S1/2	Str G	Str G	NW1/4	Str G	
	Str G	Str G	Str G	Feat.2		Str G		
	Feat.18	Feat.2						
Complicated Stamped							1	1
Pontchartrain Check								
Stamped,								
var. Pecaniere					1			1
"Six Mile" Treatment					2			2
Unclassified Incised			2		1		2	5
Unclassified Incised/								
Punctated			1					1
Unclassified Red Slip			1					1
Baytown Plain,								
var. Reed		4		2	9		12	27
Baytown Plain,								
var. #1			4	2	21	2	7	36
Baytown Plain,								
var. #2	1	1	11	2	86	3	30	134
Baytown Plain,								
var. #4			2	2	2			6
Sandy Paste Plain					2	1		3
Other Rims					9	2	4	15
Unclassified (Plain)								
Ceramic Fragments			12	1	85	10	42	150
TOTAL	1	5	33	9	218	18	98	382

Table 52. Ceramics from the Des Allemands Phase Component (Strata I and J), 16SC27.

	EU5 Str I 0N-1N	EU5 Str I 1N-2N	EU6 NW1/4 Str I AR[1]	EU6 NW1/4 Str I	EU5 Str I BSGClay[2]	EU6 NE1/4 Str I	EU6 S1/2 Str I	EU6 NE1/4 Str I AR[1]	EU7 Str I Rangia	EU7 Str I AR[1]	EU5 Str J	TOTAL
Larto Red, var. unspecified					1							1
Unclassified Incised	1	1				1						3
Unclassified Interior Incised	1											1
Baytown Plain, var. *Reed*		5		1		4	4		3	3		20
Baytown Plain, var. *Troyville*		2										2
Baytown Plain, var. *#1*	4						4		102	2		112
Baytown Plain, var. *#2*	29	25	1	9		6	21	1		15	2	109
Baytown Plain, var. *#4*	2	3					2		1			8
Sandy Paste Plain	1	5		4		1	1		8	2		22
Other Rims	2	1	1	1	1	2	1		5	4		18
Unidentified (Plain) Ceramic Fragments	29	22	4	10		11	16	4	68	20		184
TOTAL	69	64	6	25	2	25	49	5	187	46	2	480

[1]AR : Above Rangia
[2]BSGClay : Below Stratum G Clay

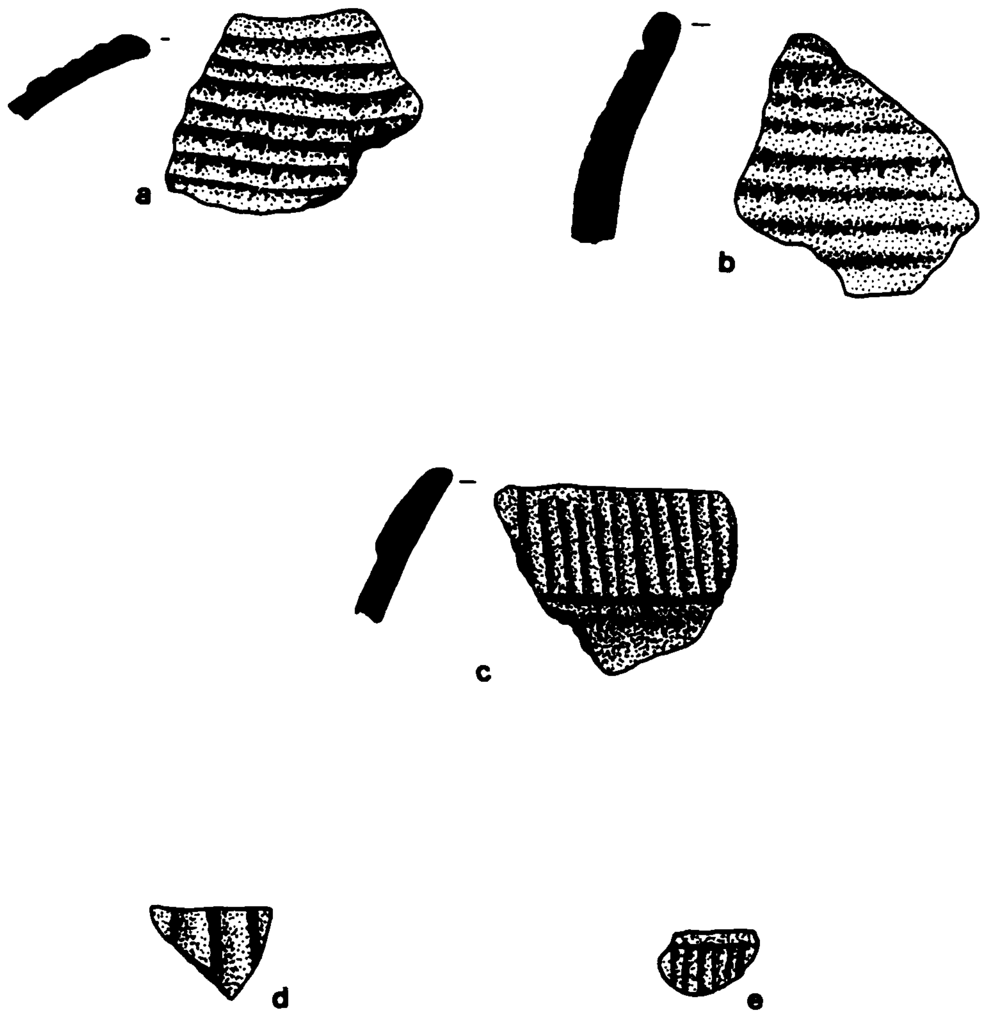


Figure 50. Examples of Evansville Punctated, *var. Duck Lake*, and Mazique Incised, *var. Barataria* (Scale 1:1). A) Evansville Punctated, *var. Duck Lake* (EU6 NE1/4 Stratum E, Below Feature 19, Above Compact Surface); b) Evansville Punctated, *var. Duck Lake* (EU5 Stratum E); c) Mazique Incised, *var. Barataria* (EU5 Stratum C/D); d) Mazique Incised, *var. Barataria* (EU7 Stratum E, Below Compact Surface); e) Mazique Incised, *var. Barataria* (EU6 NE1/4 Stratum E, Below Compact Surface).

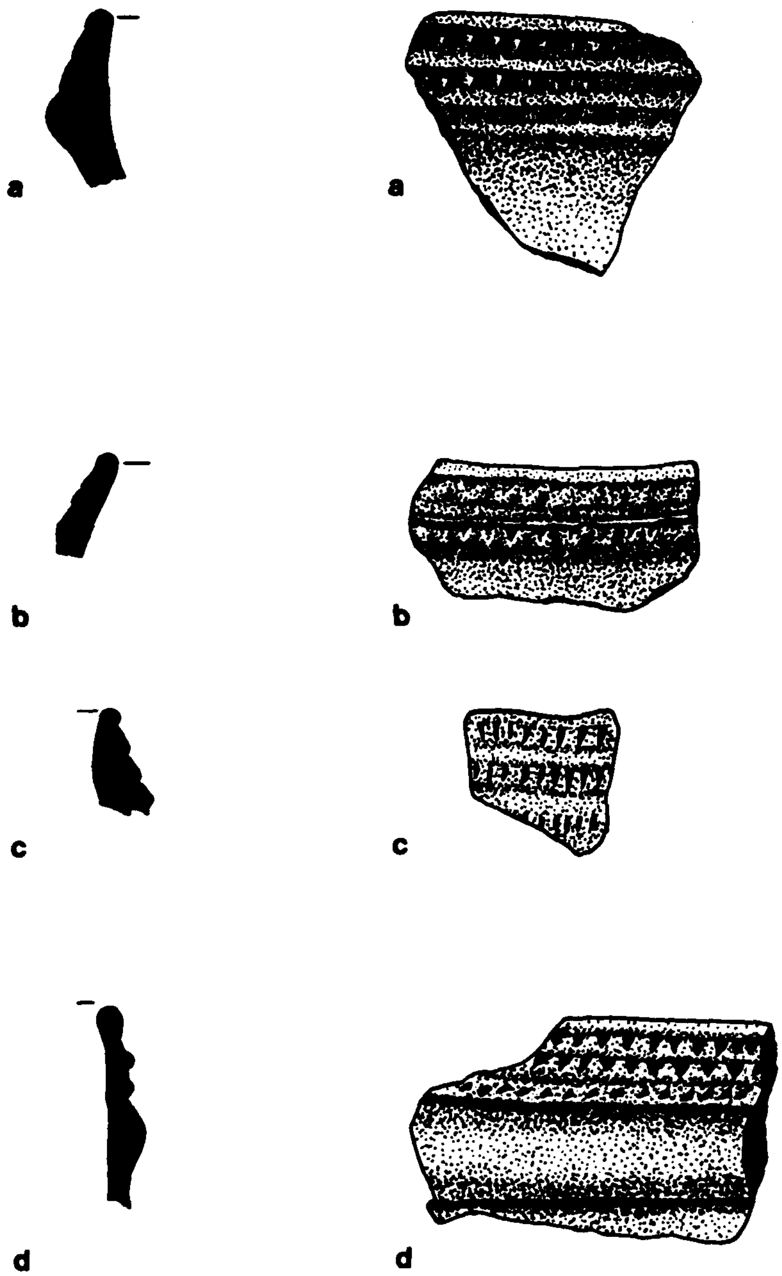


Figure 51. Selected examples of Lone Oak rims (Scale 1:1). Proveniences: a-b) EU6 NW1/4 Stratum E, Below Compact Surface, Above Dense *Rangia*; c) EU6 NW1/4 Stratum E, Below Dense *Rangia*; d) EU7 Stratum E, Below Compact Surface.

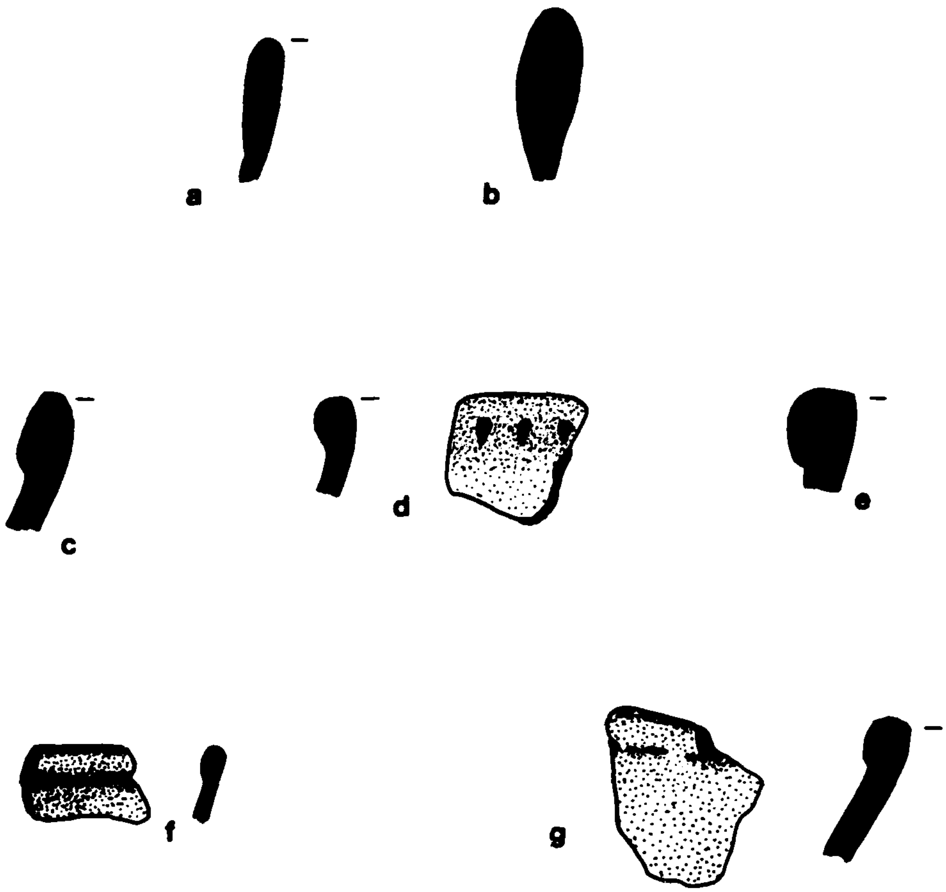


Figure 52. Selected examples of Pump Canal rims (a,b) and Onion Lake rims (c-g) (Scale 1:1). Proveniences: a-b) EU5 Stratum C/D; c-d) EU5 Stratum E; e) EU5 Stratum C/D; f-g) EU5 Stratum F.

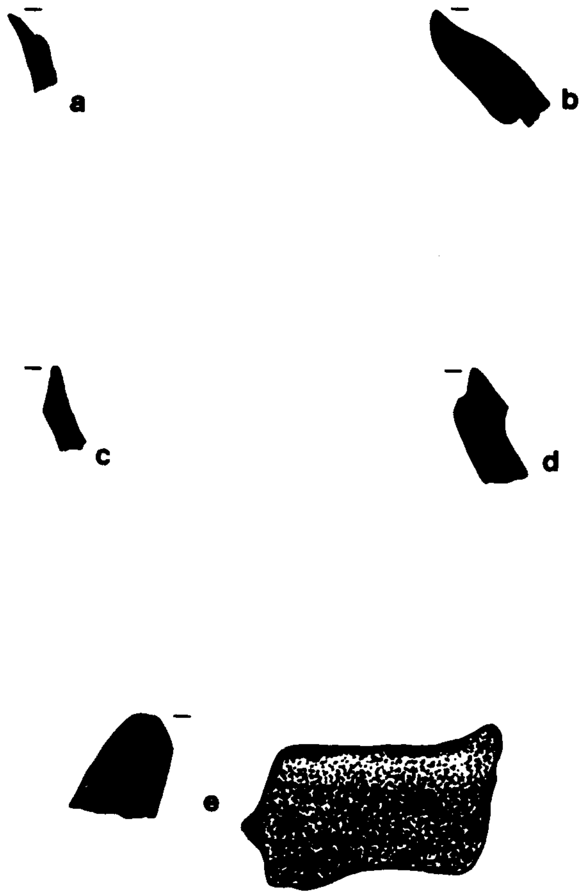


Figure 53. Selected examples of Peaked Rims. Proveniences:
a) EU5 Stratum E; b) EU5 Stratum E; c) EU5 Stratum C and D;
d) EU5 Stratum C and D; e) EU5 Stratum E.

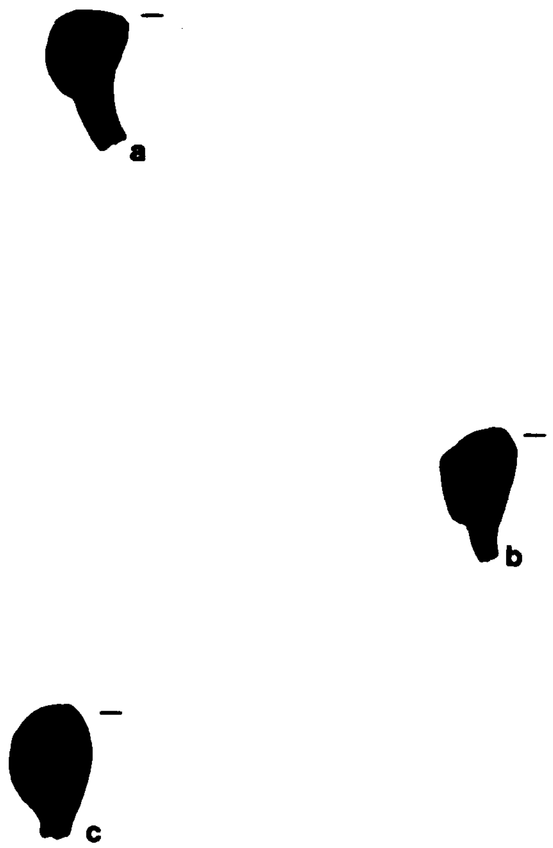


Figure 54. Selected examples of Troyville thick rims from EU5 Stratum G.

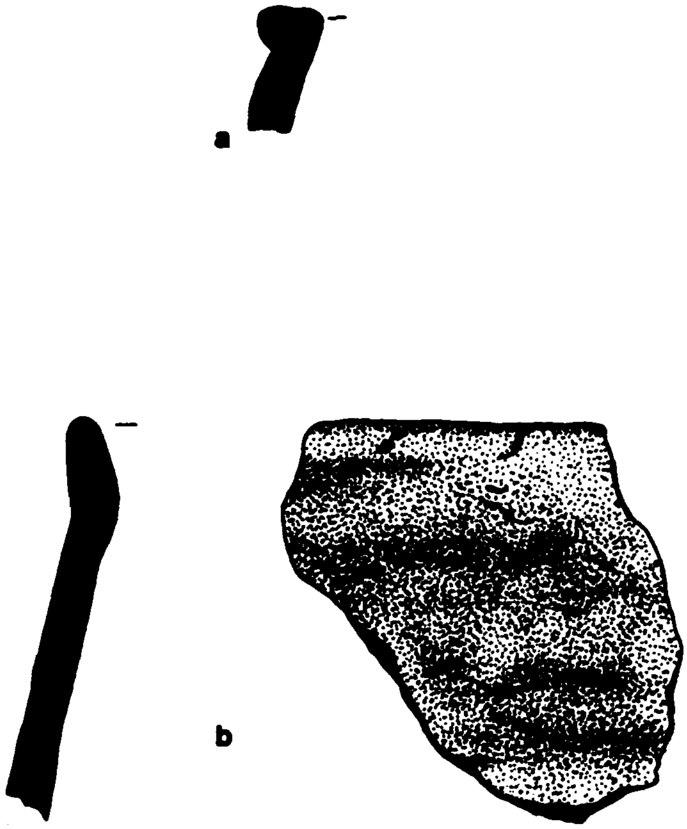


Figure 55. Selected sherds derived from jars in Strata E and I (Scale 1:1). Proveniences: a) EU6 NW1/4 Stratum E, Below Feature 19, Above Compact surface; b) EU6 NW1/4 Stratum I, Above Dense *Rangia*.

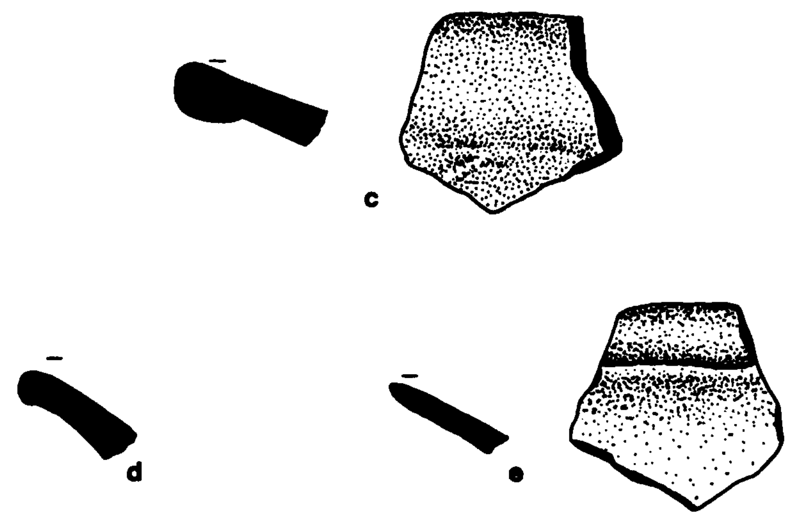


Figure 56. Selected examples of sherds derived from plates (Scale 1:1). Proveniences: a) EU6 NE1/4 Stratum I; b) EU6 NE1/4 Stratum C; c) EU6 NE1/4 Stratum F; d) EU6 NW1/4 Stratum E; e) EU6 NW1/4 Stratum E, Ash Lens Top 5 cm.

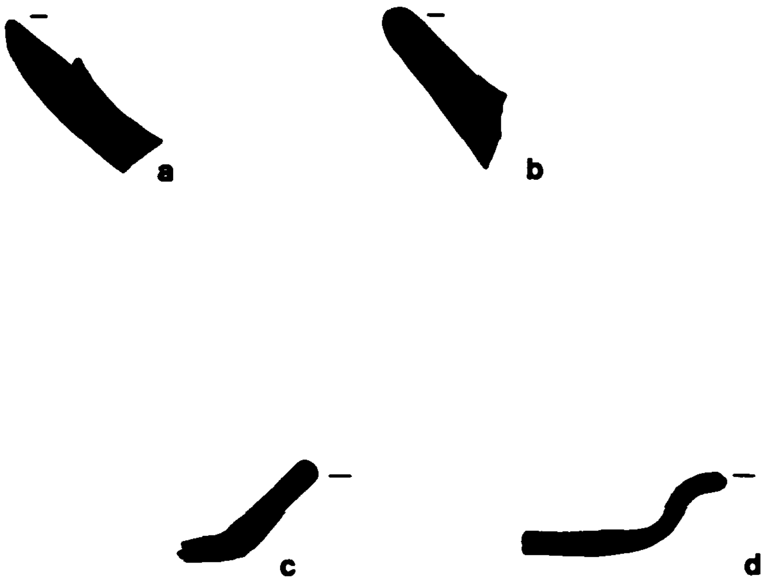


Figure 57. Selected examples of sherds derived from shallow bowls (Scale 1:1). Proveniences: a) EU6 NE1/4 Stratum D; b) EU6 NW1/4 Stratum G; c) EU6 NW1/4 Stratum E, 5 cm to Top of Compact Surface; d) EU7 Stratum C (0-5 cm).

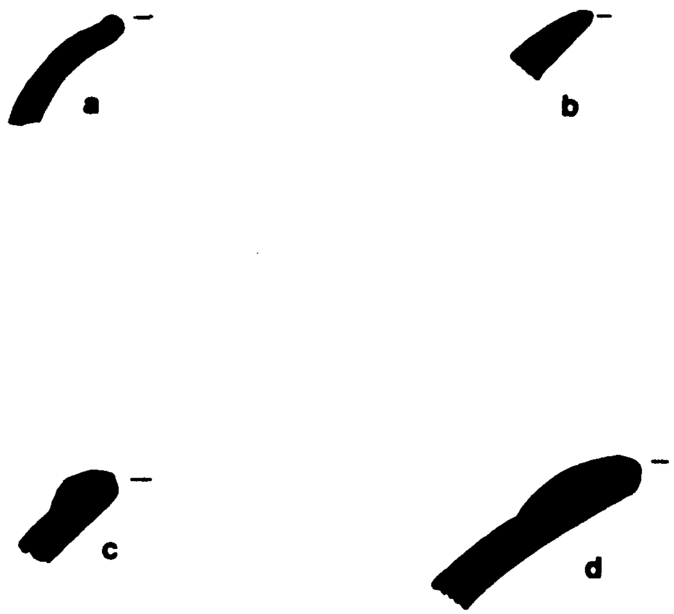


Figure 58. Selected examples of sherds derived from ollas or gourd-shaped vessels (Scale 1:1). "C" represents a Pump Canal rim and "d" an Onion Lake rim. Proveniences: a) EU6 NE1/4 Stratum E, Below Compact Surface; b) EU6 NW1/4 Stratum E, Below Dense *Rangia*; c) EU5 Stratum C; d) EU6 NE1/4 Stratum D.

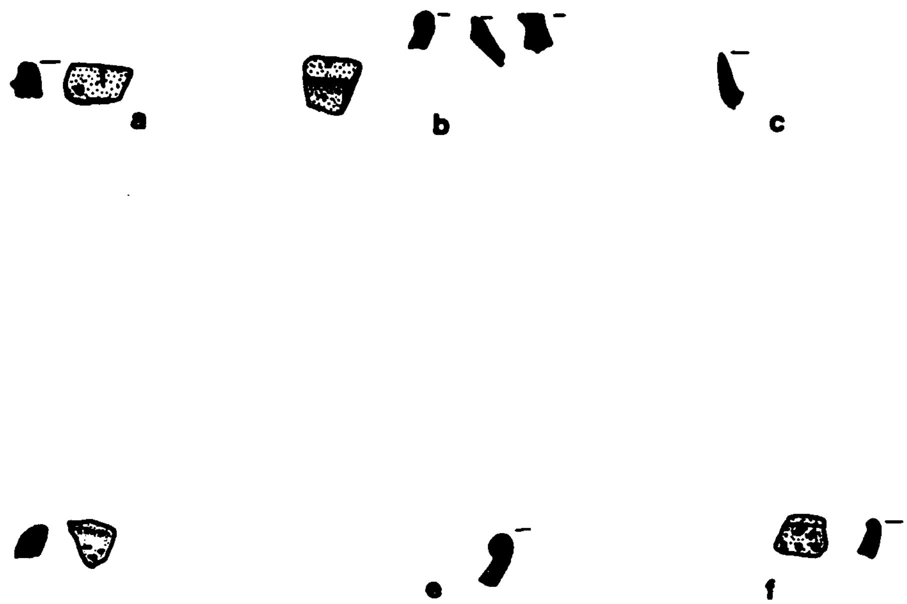


Figure 59. Illustrations of selected sherds derived from "miniature vessels" (Scale 1:1). Proveniences: a) EU5 Stratum C; b) EU5 Stratum C/D; c) EU5 Stratum E; d) EU6 NW1/4 Stratum D; e-f) EU6 NE1/4 Stratum E, Below Compact Surface.

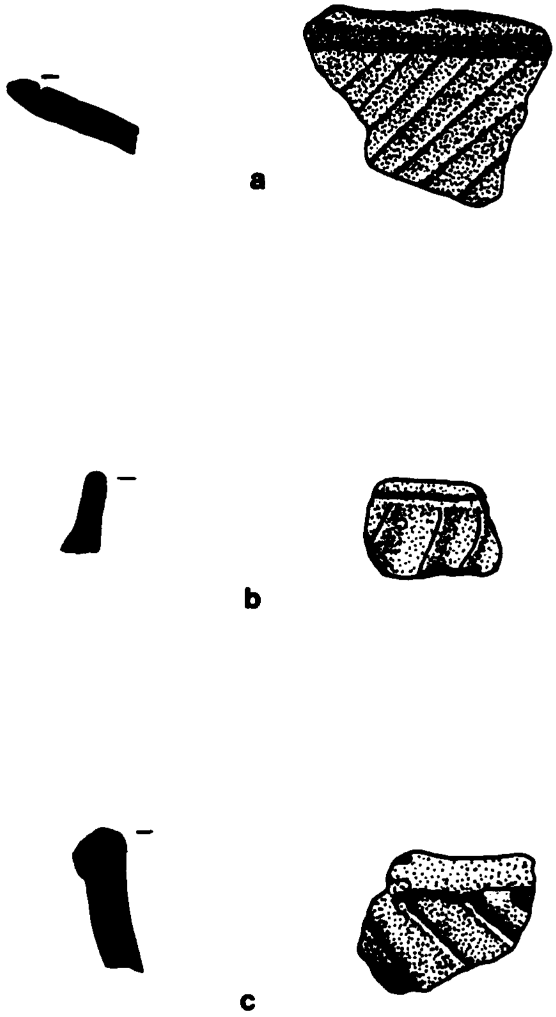


Figure 60. Selected examples of Mazique Incised sherds. (Scale 1:1). A) Mazique Incised, *var. Mazique* (EU7 Stratum E, Below Compact Surface); b) Mazique Incised, *var. Manchac* (EU7 Stratum E, Below Compact Surface); c) Mazique Incised, *var. Brusly* (EU5 Stratum E).

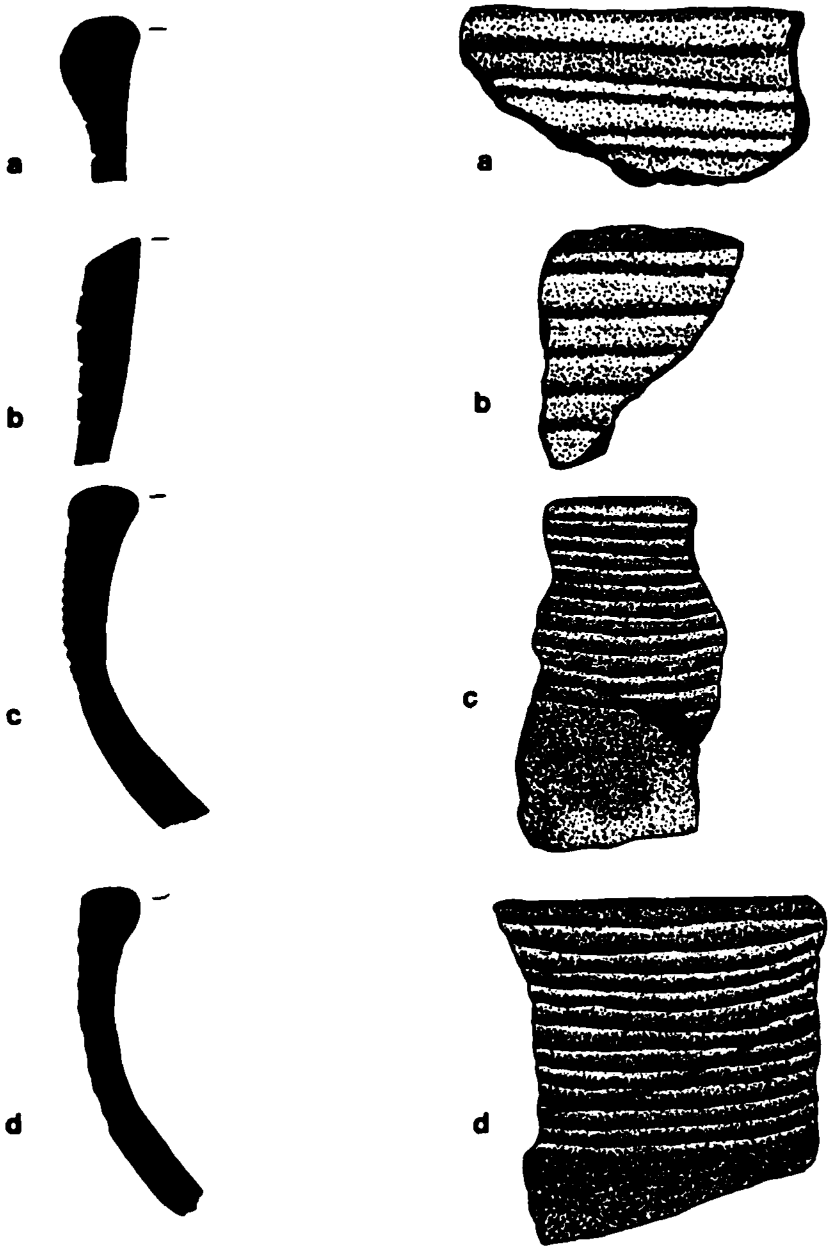
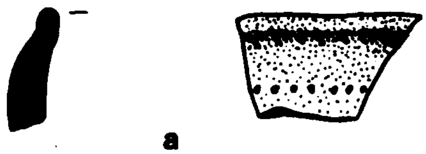


Figure 61. Selected examples of Coles Creek Incised sherds (Scale 1:1). A) Coles Creek Incised, *var. Greenhouse* (EU5 Stratum E); b) Coles Creek Incised, *var. Coles Creek* (EU6 NE1/4 Stratum E, Above Feature 19); c) Coles Creek Incised, *var. Mott* (EU6 NE1/4 Stratum D); d) Coles Creek Incised, *var. Coles Creek*, but difficult to sort from Mott (EU6 NE1/4 Stratum E).



a

b

Figure 62. Selected examples of "Six Mile" Treatment and "Drag and Jab Execution" from Stratum E (Scale 1:1). A) Six Mile Treatment (EU6 NW1/4 Stratum E, Below Feature 19, Above Compact Surface; b) Drag and Jab Execution (EU6 NE1/4 Stratum E, Below Feature 19, Above Compact Surface).

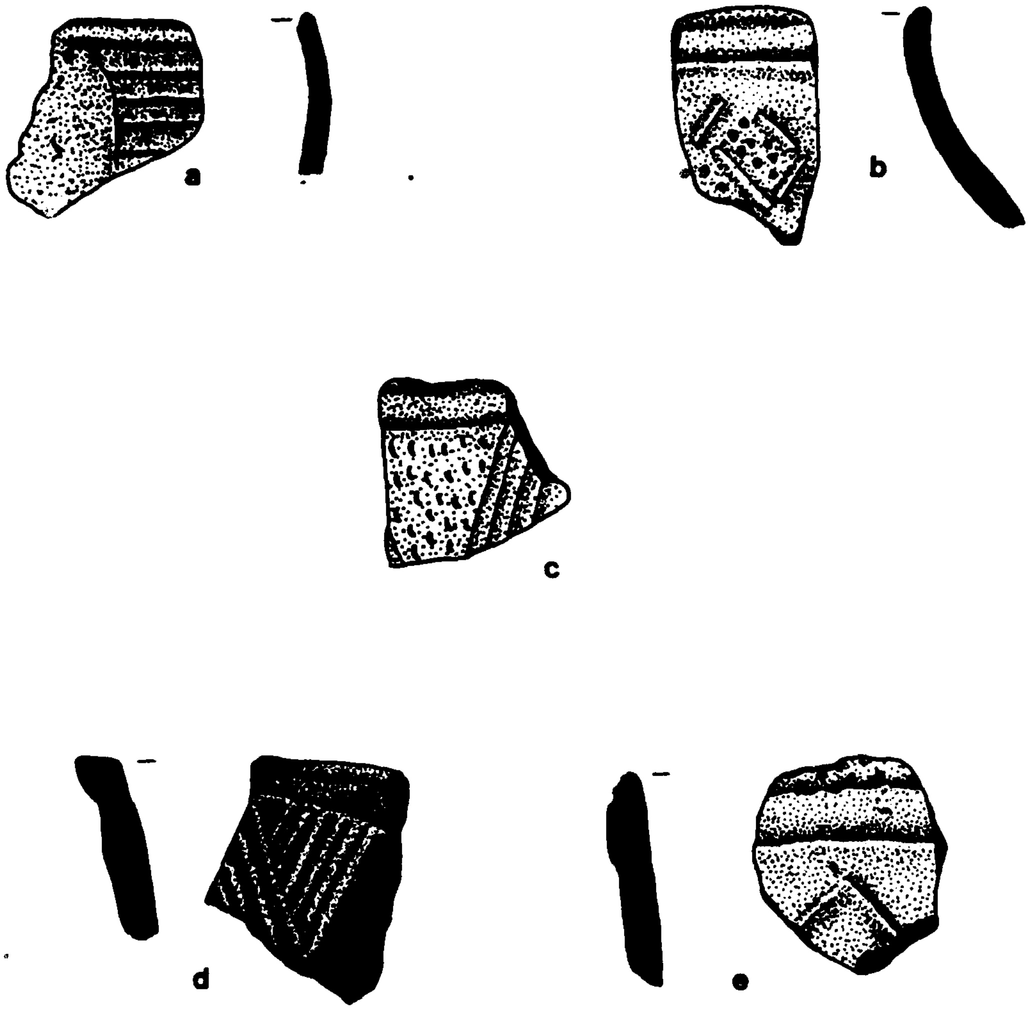


Figure 63. Selected examples of French Fork Incised and Unclassified decorated sherds (Scale 1:1). A) French Fork Incised, *var. Larkin*, (EU6 NE1/4 Stratum E, Below Feature 19, Above Compact Surface); b) French Fork Incised, *var. Larkin*, (EU7 Stratum E, Below Compact Surface); c) French Fork Incised, *var. unspecified*, (EU5 Stratum F); d) exhibiting both French Fork Incised and Evansville Punctated decorations, (EU7 Stratum D/E, Feature 31); e) Unclassified with chevron similar to Beldeau Incised and to sherd (b), (EU7 Stratum F, Feature 38).

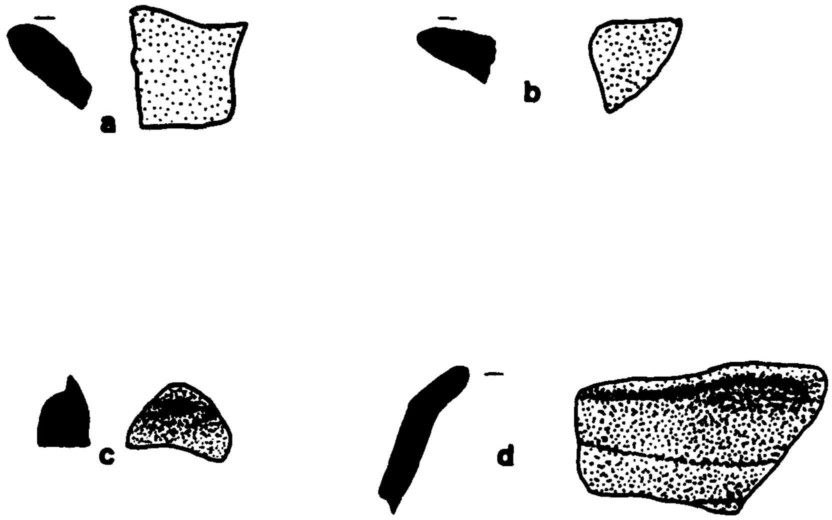


Figure 64. Selected examples of ears, lugs, and French Fork "bossing" from Stratum E (Scale 1:1). Proveniences: a) EU6 S1/2 Stratum E, Below 10 cm; b) EU7 Stratum E, Below Compact Surface; c) EU6 NW1/4 Stratum E, Below Dense *Rangia*; d) EU7 Stratum E, Below Compact Surface.

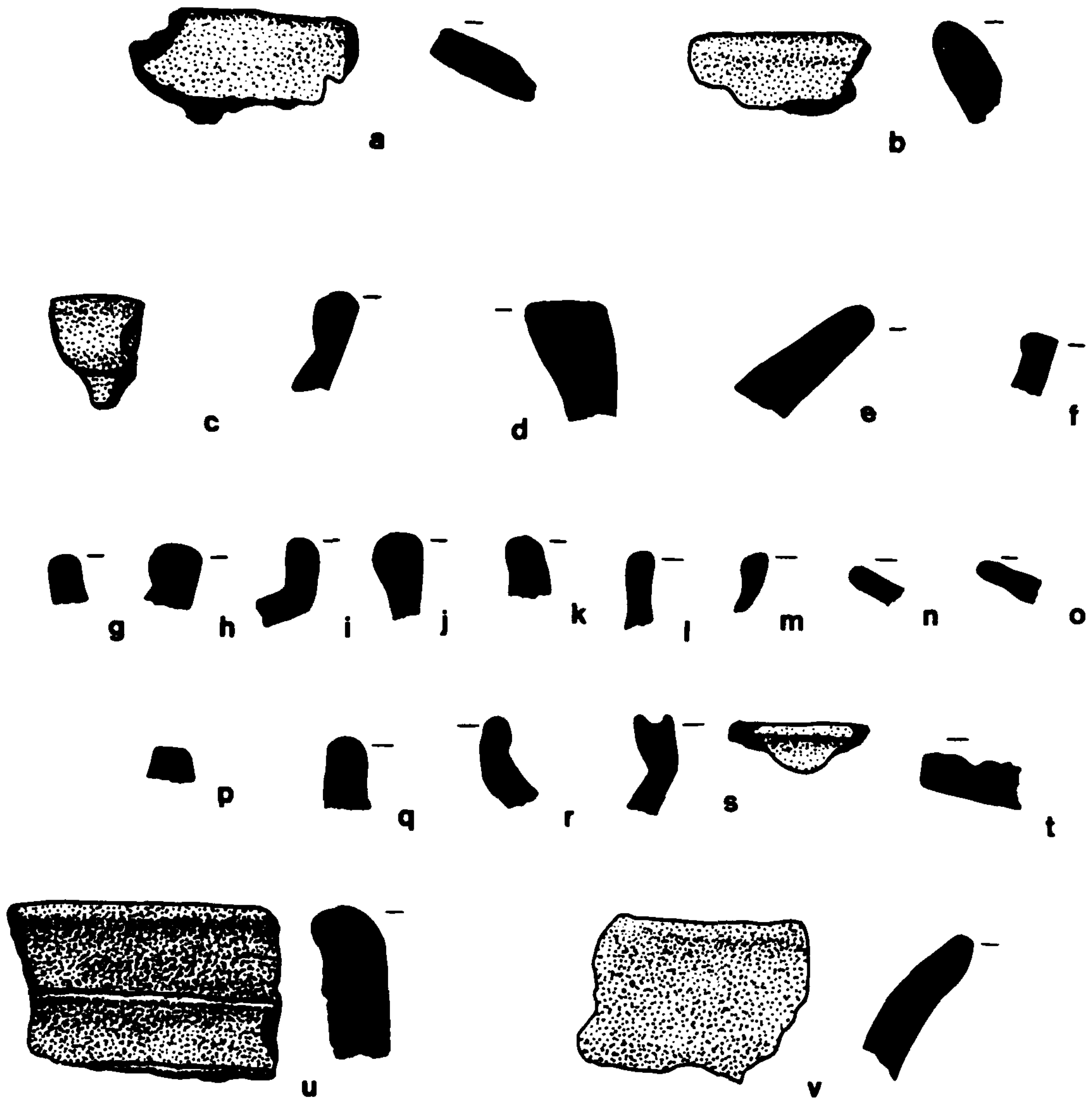


Figure 65. Rim profiles and decorated sherds representing the Mississippi Period component from Stratum C (Scale 1:1). Decorated types - Unclassified Punctated (s); Coles Creek Incised, *var. Hardy* (u). Paste - Baytown Plain, var. No.1: c,f,l-n,r,t; Baytown Plain, var. No. 2: a,b,d,e,g-i,k,p,q,s; Baytown Plain, var. No. 1: j,o. No information available on paste types of u,v. Proveniences: a-k) EU6 NW1/4 Str C (0-5 cm); l-t) EU7 Str C (0-5 cm); u-v) EU7 Str C, Below Compact Surface.

Figure 66. Rim profiles and decorated sherds representing the Transitional Coles Creek/Plaquemine component from Stratum D (Scale 1:1). Decorated types - Evansville Punctated, *var. Sharkey* (o); Coles Creek Incised, *var. Hardy* (z); Unclassified Punctated (Aa). Paste - Baytown Plain, var. No. 1: g,h,k,q,y; Baytown Plain, var. No. 2: f,i,j,l,m,p,r,t-v,x; Baytown Plain, var. No. 3: c,e; Baytown Plain, var. No. 4: a,b,n,s,w. No information available on paste types of d,o,z,Aa. Proveniences: a-q) EU5 Str C-D; r-u) EU6 NE1/4 Str D; v-y) EU6 Str D; z-Aa) EU7 Str D.

Figure 66.

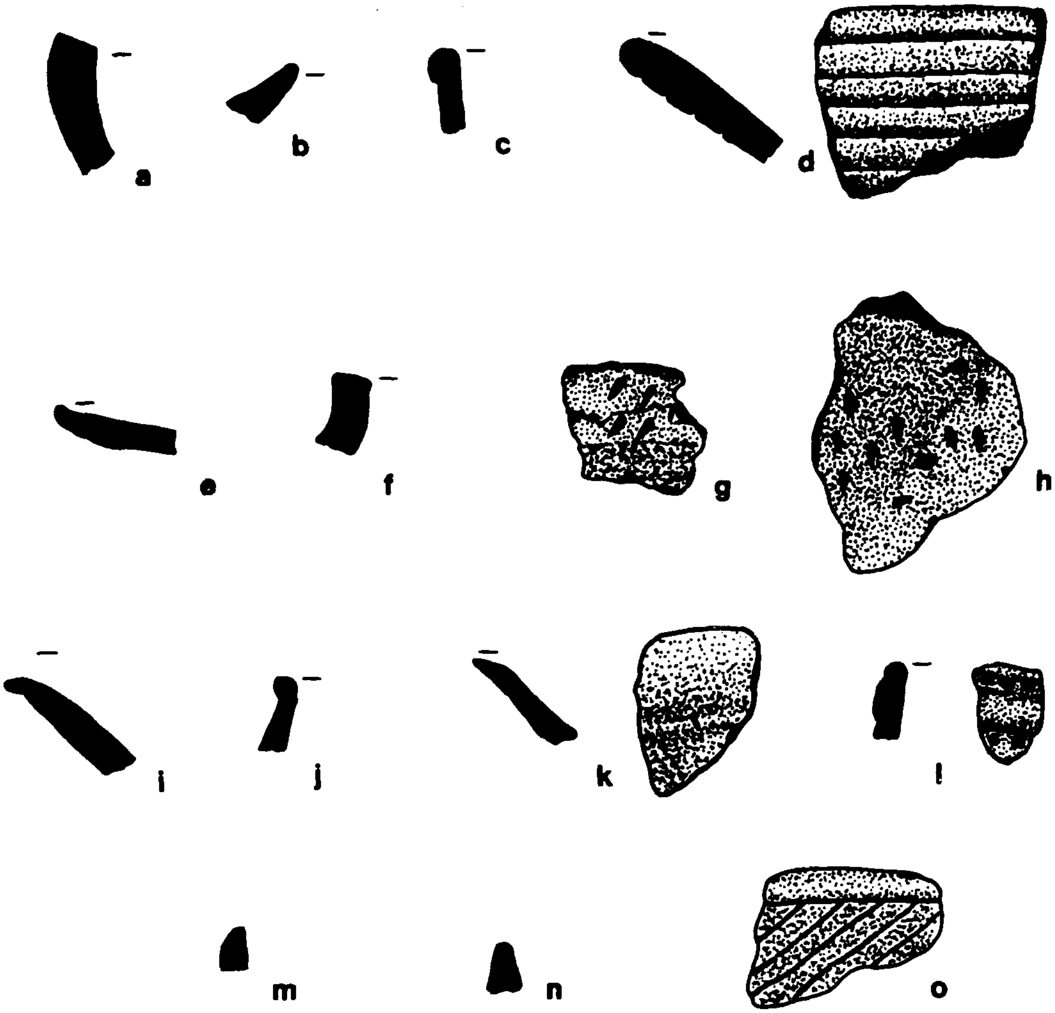


Figure 67. Rim profiles and decorated sherds representing the Late Coles Creek component from Stratum E (Late). (Scale 1:1). Decorated types- Coles Creek Incised, *var. Coles Creek* (d); Unclassified Punctated, similar to Evansville Punctated, *var. Braxton* (g,h); Machias rim (l); Mazique Incised, *var. Mazique* (o). Paste - Baytown Plain, var. No.1: c,g,i,j; Baytown Plain, var. No. 2: a,b,e,f,h,m-o. No information available on paste types of d,k,l. Proveniences: a-c) EU6 NW1/4 Str E, Below Feature 19, Above Compact Surface; d-f) EU6 NE1/4 Str E, Above Feature 19; g-o) EU6 NE1/4 Str E, Below Feature 19, Above Compact Surface.

Figure 68. Rim profiles and decorated sherds representing the Middle Coles Creek component from Stratum E (Middle) (Scale 1:1). Decorated types - Pontchartrain Check Stamped, *var. Tiger Island* (j); Unclassified Incised, similar to Coles Creek Incised, *var. Chase* (o). Paste - Baytown Plain, var. No. 2: a,d,e-g,i; Baytown Plain, var. No. 4: b,c,n-p. No information available on paste types of h,j-m. Proveniences: a-c) EU6 NW1/4 Str E, Below Compact Surface, Above Dense *Rangia*; d-i) EU6 NE1/4 Str E, Below Compact Surface; j-p) EU6 S1/2 Str E, (Bottom 10 cm).

Figure 68.

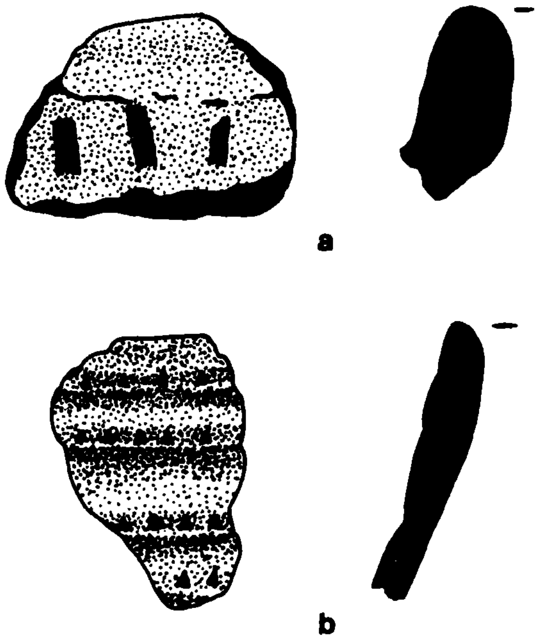


Figure 69. Additional rim profiles and decorated sherds representing the Middle Coles Creek component from Stratum E (Middle) (Scale 1:1). Decorated types - Unclassified Punctated (a); Coles Creek Incised, *var. Wade*, but foreshadows Machias rim mode (b). Paste - Baytown Plain, var. No. 2: a-b.

Figure 70. Rim profiles and decorated sherds from EU7 Stratum, Below Compact Surface. Decorated types - Evansville Punctated, *var. Rhinehart* (a,e); Evansville Punctated, *var. Braxton* (b); Peaked rim (c); Unclassified Incised/Punctated (f); possible Avoyelles Punctated, *var. Tatum* (g). Sherd (d) is a possible pipe bowl fragment (shown here in basal cross-section). Paste - Baytown Plain, var. No. 1: e,f; Baytown Plain var. No. 2: c,d; Baytown Plain, var. No. 4: a,j. No information availabale on paste types of b,g-i,k-o. Provenience for a-o: EU7 Str E, Below Compact Surface.

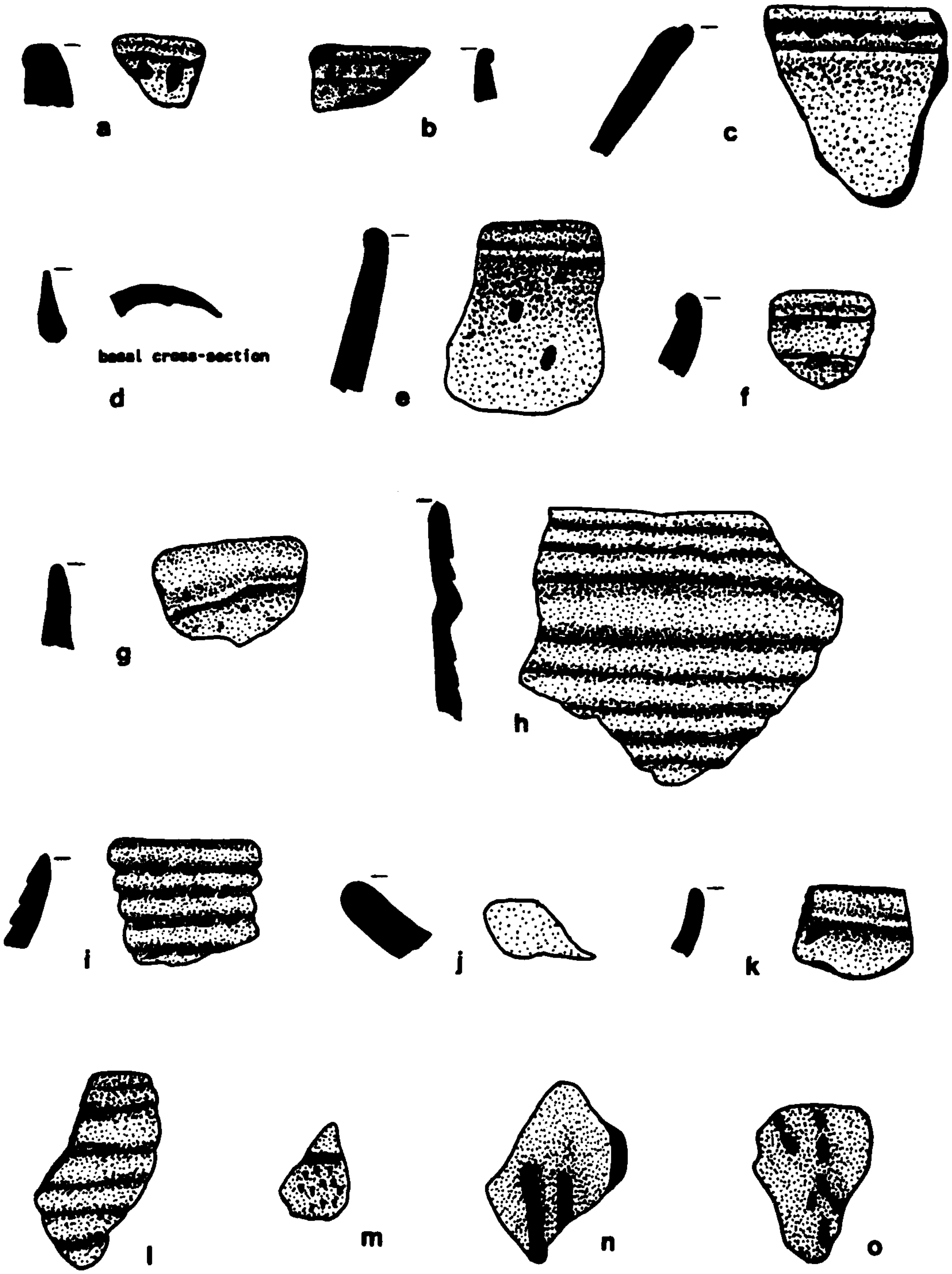


Figure 70.

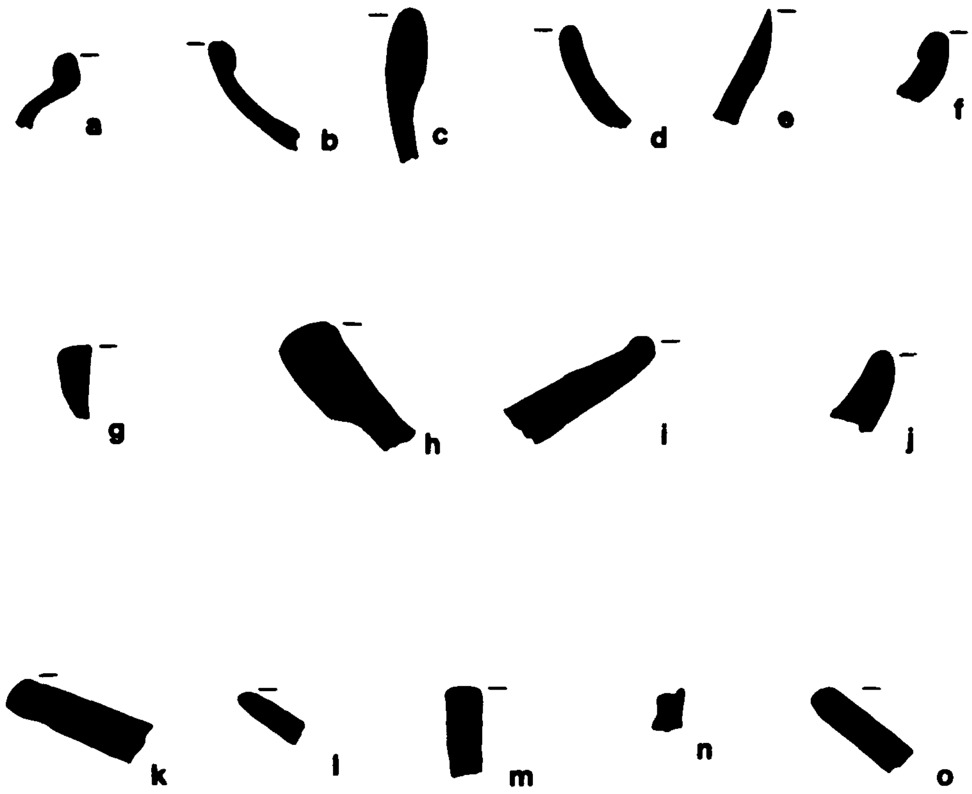


Figure 71. Rim profiles from EU7 Stratum E, Below Compact Surface (Scale 1:1). Paste - Baytown Plain, var. No. 1: g,l,o; Baytown Plain, var. No. 2: a,c,e,h-k,m,n; Baytown Plain, var. No. 3: d; Baytown Plain, var. No. 4: b. No information available on paste type of f. Provenience for a-o: EU7 Str E, Below Compact Surface.

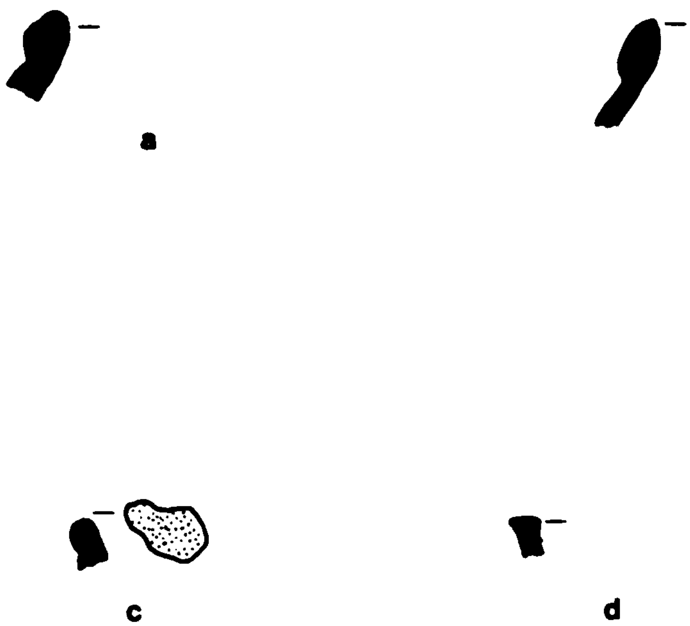


Figure 72. Rim profiles representing the Early Coles Creek component Stratum E (Lower) (Scale 1:1). Paste - Baytown Plain, var. No. 2: a-d. Provenience: a-d: EU6 NW1/4 Str E, Below Dense *Rangia*.

Figure 73. Rim profiles and decorated sherds from EU5 Stratum E, which was undivided (Scale 1:1). Decorated types - Evansville Punctated, *var. Rhinehart* (a); Mazique Incised, *var. unspecified* (b); Mazique Incised, *var. unspecified* (m); Unclassified Incised/Punctated (r); Unclassified Punctated (w). Paste - Baytown Plain, var. No. 1: q,w,x,z; Baytown Plain, var. No. 2: c-l,n-p,s,t; Baytown Plain, var. No. 4: v,y. No information available on paste types of a,b,m,r,u. Provenience for a-z: EU5 Str E.

Figure 73.

Figure 74. Rim profiles and decorated sherds representing the Des Allemands Phase component from Stratum F (Scale 1:1). Decorated types - Onion Lake Rim (e,f,g,h,i,j,k, l,m,n); Evansville Punctated, *var. Rhinehart* (d). Paste - Baytown Plain, var. No. 1: a; Baytown Plain, var. No. 2: b-d. No information available on paste types of e-o. Proveniences: a) EU6 NW1/4 Str F; b-c) EU6 NE1/4 Str F; d) EU6 S1/2 StrF; e-o) EU5 Str F.

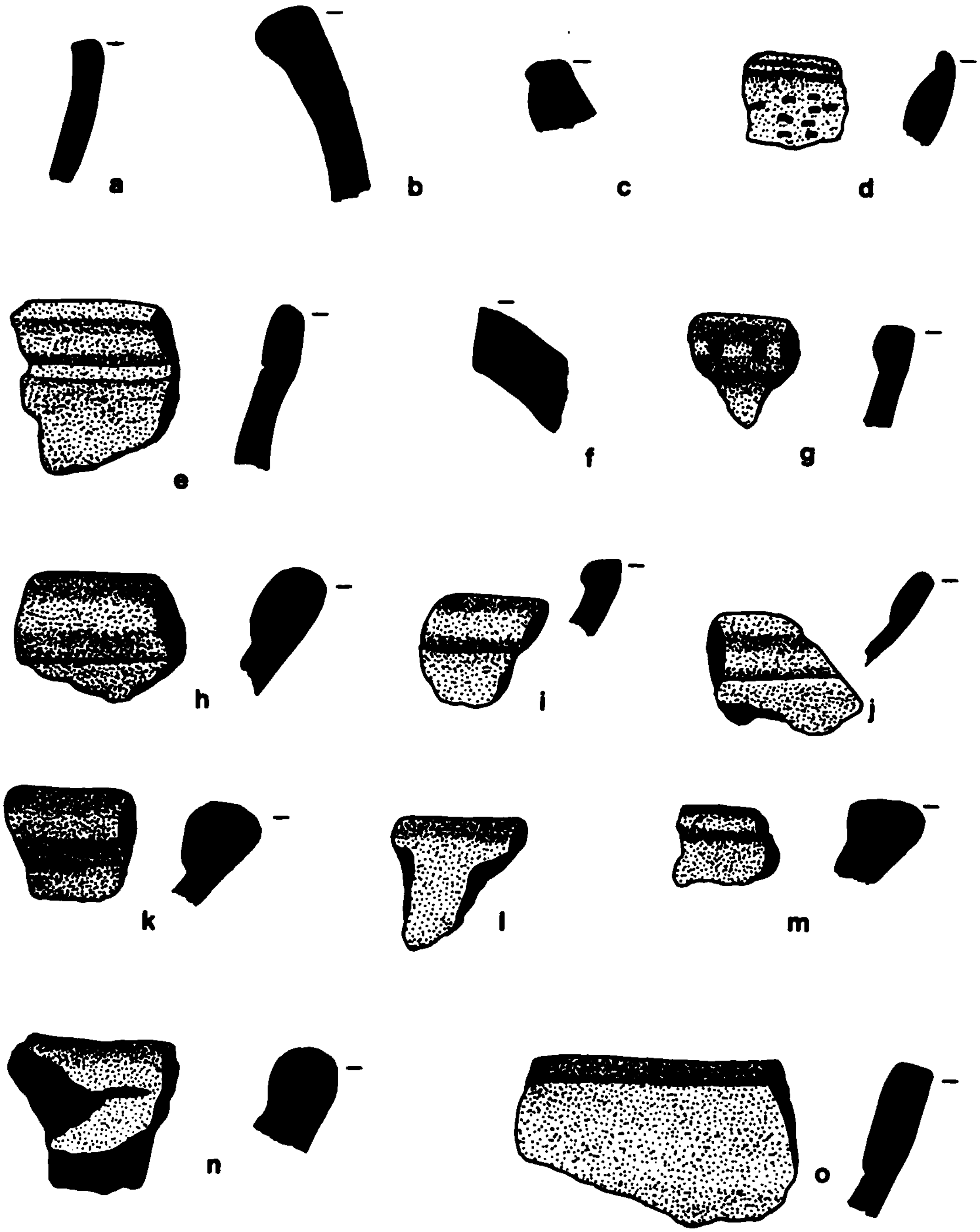


Figure 74.

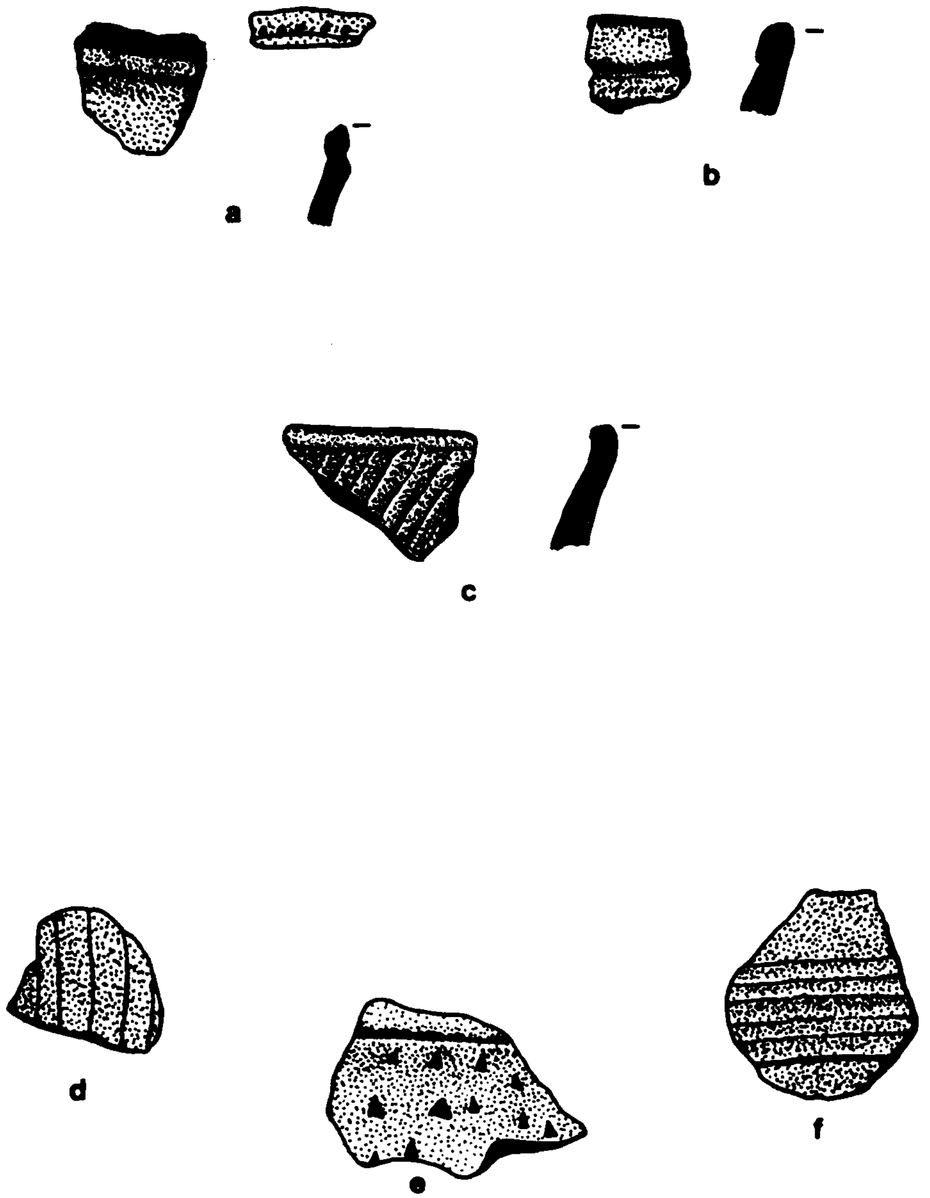


Figure 75. Additional rim profiles and decorated sherds representing the Des Allemands Phase component from Stratum F (Scale 1:1). Decorated types Mazique Incised, *var. unspecified* (c); Unclassified Incised (d,f); Unclassified Punctated (e). No information available on paste types of a-f. Proveniences: a-f) EU5 Str F.

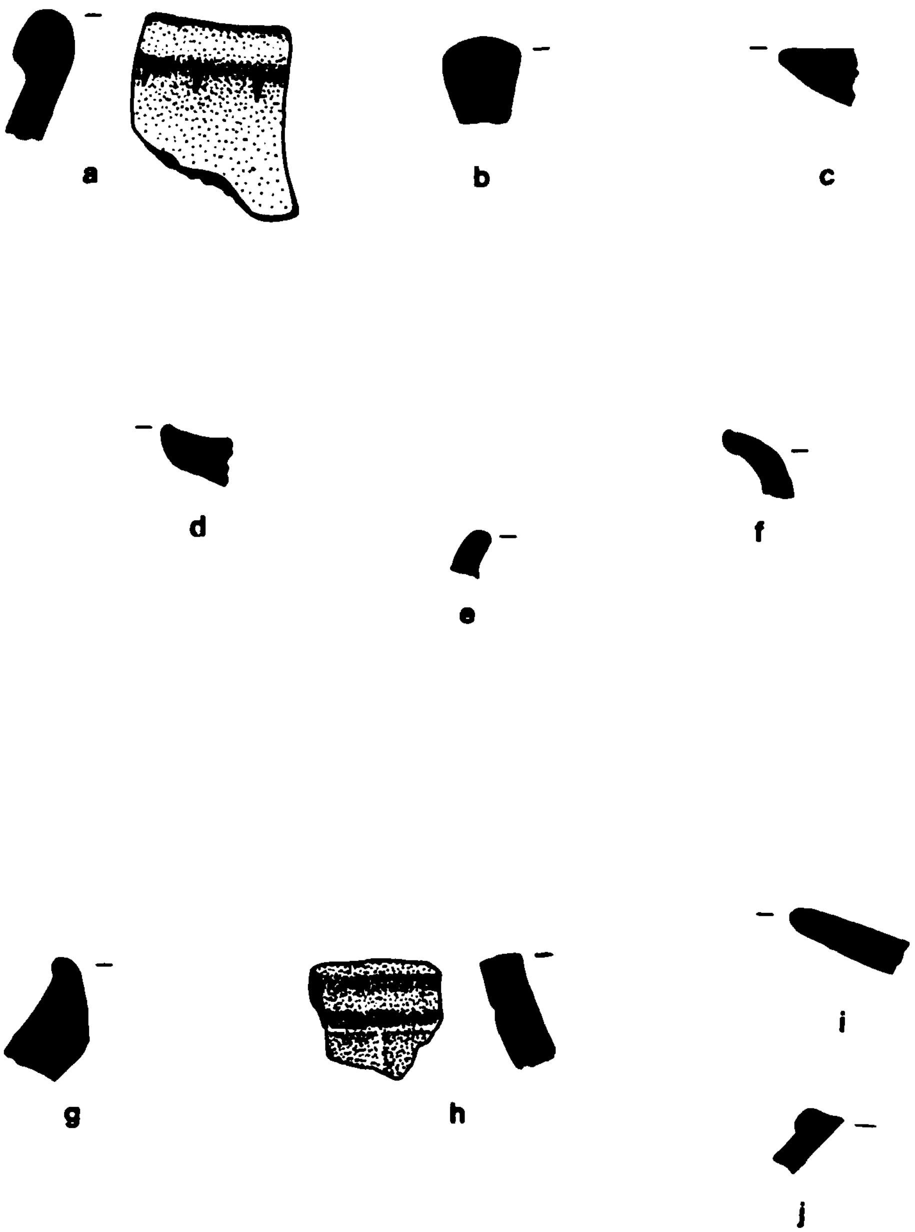


Figure 76. Rims from Stratum G (Scale 1:1). Paste - Baytown Plain var. No. 1: e,f; Baytown Plain var. No. 2: a-d,h-j. No information available on paste type of g. Proveniences: a-f) EU5 Str G; g) EU6 NW1/4 Str G; h) EU6 S1/2 Str G; i-j) EU7 Str G, Feature 43, Flotation Sample 47.

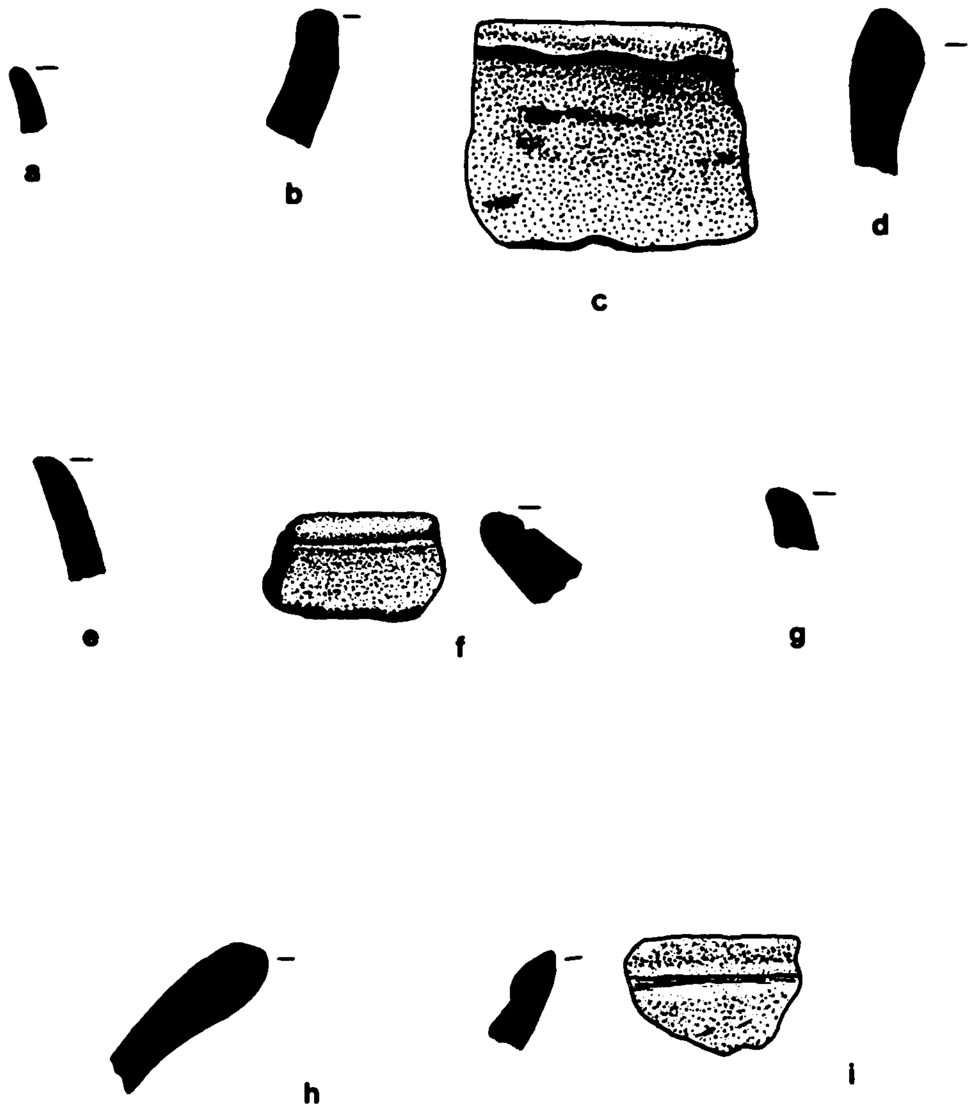


Figure 77. Rims representing the Des Allemands Phase component from Stratum I (Scale 1:1). Paste - Baytown Plain var. No. 1: a,h; Baytown Plain var. No. 2: b,c,g,i; Baytown Plain var. No. 4: f. No information available on paste types of d,e. Proveniences: a)EU6 NW1/4 Str I; b-c) EU6 NE1/4 Str I; d) EU 5 Str I, Below Sterile Gray Clay; e-g) EU5 Str I; h-i) EU5 Str I, 1N-2N.

employed for taxonomic descriptions applicable to southeastern Louisiana. Ceramic analyses from the Upper Tensas Basin (Bitgood 1989) were consulted to augment our understanding of the cultural framework derived from the Pump Canal ceramic analysis, particularly the apparent co-occurrence of phases with distinct cultural backgrounds and styles. Two new decorated ceramic varieties and one new rim mode were proposed as a result of the analysis presented in this chapter.

Sherds from each excavation provenience were sorted initially into plain, decorated, rim, and decorated rim categories (Table 53). Poorly preserved sherds and/or ceramic fragments too small to properly analyze were counted and included in an "unidentified ceramic fragment" category. Since doing so would diminish relative frequencies, the large number of these small fragments were not utilized for calculations of percentages of ceramic types and varieties (for a similar approach to handling small fragments or "sherdlets," see Jones et al. 1993:109).

Sorting of undecorated ceramics began with the separation of sherds by temper (shell, clay, grog), followed by a sorting according to paste "fineness." Sherds in each level were sorted from fine (not contorted) to coarse (very contorted). Although each ceramic assemblage graded from one category to the next, four varieties of Baytown Plain (clay/grog temper) ceramics were identified. Some of these ceramics were sortable into existing varieties such as Baytown Plain *vars. Addis, Reed,* and *Troyville.*

Although sharing several traits with established Baytown Plain varieties, the remaining plainwares were not clearly recognizable as such. Therefore, these sortable varieties of Baytown were classified as varieties 1, 2, and 4. A "variety 3" had been tentatively identified during the initial phases of the analysis, but after a re-examination of those sherds the designation was dropped. These new (numbered) varieties of Baytown Plain were offered as provisional categories that fit the need of the present analysis. Variety names have not been proposed Because they are provisional. Future studies should provide clearer indications of how these provisional varieties relate to the Baytown Plain varieties defined in other areas, and which if any warrant new nomenclature.

Plainwares

Six varieties of clay and clay/grog tempered wares were sortable in the Pump Canal ceramic collection. In addition,

Table 53. Frequencies and Relative Frequencies of Identifiable Sherds from 16SC27.

	tot. n*	decorated	rims	decorated rim	% decorated	% rims
Stratum A	105	4	7	1	3.8	6.7
Stratum A/B	86	2	9	1	2.3	10.5
Stratum C EU5	236	9	10	1	3.8	4.2
Stratum C/D	683	41	43	3	6.0	6.3
Stratum C Top	109	1	10	2	0.9	9.2
Stratum C EU7, Below						
Compact Stratum	144	14	3	1	9.7	2.1
Stratum C	338	21	12	1	6.2	3.6
Stratum D EU5	550	26	27	6	4.7	4.9
Stratum D EU6	528	27	30	5	5.1	5.7
Stratum D EU7	313	25	25	8	8.0	8.0
Stratum D/E EU7	710	43	39	11	6.1	5.5
Stratum E EU5	591	27	43	10	4.6	7.3
Stratum E, Above						
Ash Lens	656	50	46	17	7.6	7.0
Stratum E, Above						
Compact Surface	450	54	18	10	12.0	4.0
Stratum E, Below						
Compact Surface	886	105	80	19	11.9	9.0
Stratum E, Dense Rangia	128	17	7	1	13.3	5.5
Stratum E	365	23	24	9	6.3	6.6
Stratum F	1174	43	53	10	3.7	4.5
Stratum G	246	11	21	2	4.5	8.5
Stratum I	300	5	20	3	1.7	6.7
Stratum J	5	0	0	0	-	-

one sandy paste type, and three shell-tempered types were also present in the ceramic assemblage.

Varieties of Baytown Plain. The vast majority of sherds from Pump Canal were clay and/or grog tempered and belonged in the "supertype" Baytown Plain (Williams and Brain 1983:91). The var. *Addis* (Williams and Brain 1983:92) had a limited occurrence in possibly disturbed contexts. The *var. Troyville* (Phillips 1970:55) occurred only in the lowest stratum (Table 54). The remainder of the Baytown Plain ceramics, with the exception of *var. Reed* (Williams and Brain 1983:92), which was sortable in the Pump Canal collection, were slightly but noticeably different from published variety descriptions. Consequently, three provisional varieties of Baytown Plain were described herein. Two of these were defined by texture, i.e., "fine" (variety 1) or "coarse" (variety 2). When the paste was "very coarse," sherds were classified as *var. Reed.* Variety 4 was defined by firing technique. These sherds were poorly fired, and exhibited the traits of ceramics manufactured in a reducing environment. The result was a friable paste, usually black throughout. Future studies of coeval ceramic industries should provide justification for either maintaining these new distinctions (in which case they could be assigned variety "names"), or dropping the provisional varieties from the taxonomic scheme.

Baytown Plain, variety No. 1. Sherds classified as Baytown Plain variety No. 1 were mostly clay tempered, but with some grog and more rarely "other" tempering agents. This variety was very finely made, not contorted, and had smooth, matte surfaces. When surfaces were lustrous (which was very rare), variety No. 1 paste resembled Baytown Plain, *var. Vicksburg* (Williams and Brain, 1983: 103-105). Variety No. 1 sherds were usually thin, and dark gray to beige in color.

In the upper strata at 16SC27, variety No. 1 was almost sortable into those sherds with soft, reduced pastes, and those with harder, more lustrous surfaces. The latter, at times, contained tempering agents that were often referred to as "volcanic tufa" (e.g., the description of Baytown Plain, *var. Valley Park*, in Williams and Brain 1983:103). Variety No. 1 reached its highest relative frequency in Stratum E (20-24%) and Stratum C (19%). Low frequencies of variety No. 1 occurred in Stratum I (11.5%) (Table 54).

Baytown Plain, variety No. 2. This variety was the most common in the ceramic samples from the Pump Canal site. Sherds in this variety were slightly to medium textured wares, and were orange, red, and beige in color. They often

Table 54. Relative Frequency Distribution of Plainwares at 16SC27.

STRATUM	Var. #1	Var. #2	Reed	Var. #4	Mississippi Plain	Sand	Troyville	Addis
A	10%	63%	18%	4%	1%	4%	0%	0%
A/B	16%	66%	10%	8%				
C	19%	54%	20%	7%	0%	0%	0%	0%
C/D	18%	59%	14%	7%	2%	0%	0%	0%
E LATE	20%	63%	4%	12%	1%	0.1%	0%	0%
E MIDDLE	24%	55%	5%	16%	0.1%	0%	0%	0%
E EARLY	22%	63%	12%	4%	0%	0%	0%	0%
F	17%	57%	19%	6%	1%	0%	0%	0%
G	17%	65%	13%	3%	0.5%	1%	0%	0%
I	11.5%	64%	10%	0.6%	0%	13%	1%	0%

were fully oxidized, and are mostly tempered with grog and clay. Variety No. 2 was the dominant plainware in every excavation level at 16SC27. Its relative frequency ranged from 54% to 66% (Table 54). Due to its "middle-of-the-road" descriptive traits, such as being medium textured, variety No. 2 became a catchall for all plain, clay/grog-tempered sherds that were not readily sortable into the other, more unique, varieties. Thus the "pedestrian" nature of variety No. 2 may have tended to inflate its frequency, and it probably could be further subdivided in future studies.

Baytown Plain, variety No. 4. This clay tempered ware was readily distinguishable by its contorted, often friable paste which was the result of poor firing. Sherds in this variety were black throughout and they varied in thickness. This variety was a minority ware in all levels. It was most common in Stratum E, especially in the proveniences designated as "Below Compact Surface and Above *Rangia*" (Table 43).

Baytown Plain, *var. Reed*. This variety appeared in the Pump Canal collection and was sortable along attributes described in the published literature (Williams and Brain 1983:92). The relative frequency of *var. Reed* ranged from a low of 4% in the provenience designated "Below F19 and Above Compact Surface" within Stratum E to about 19% in Strata C and F (Table 54).

Baytown Plain, *var. Troyville*. Plain pottery sorted as *var. Troyville* was recovered only in the lowest culture bearing strata in the 1990-1991 excavations. These sherds generally conformed to the published description (Phillips 1970:55), although they tended to be thicker and qualitatively less well made.

Shell-Tempered Wares. Mississippi Plain, *var. unspecified*, was present as minority ware in the Pump Canal ceramic assemblage. Mississippi Plain pottery at Pump Canal was made using crushed live shell and most closely resembled the published *var. Pomme D'Or* (Wiseman et al. 1979:5.6). Recovery of nine sherds of Mississippi Plain, *var. unspecified* in Stratum F raised interesting questions concerning shell tempering in the lowermost Mississippi River Valley. These issues have often been discussed (Phillips 1970; Giardino n.d.) but not fully explained. The exception being the unsatisfactory conclusion that when occurring in non-Mississippian contexts, they were intrusive. One research issue for future analyses should be an assessment of the importance of shell as a tempering agent in shell midden contexts along the Louisiana coast where its availability may have encouraged pre-Mississippian experimentation with this ceramic technology.

Sand-Tempered Wares. This minority ware occurred in the disturbed Stratum A, which consisted of canal spoil. It accounted for 4% of a small ceramic sample from that provenience. Sandy paste wares were also present in the lowermost level (Stratum I), where they comprised 13% of a sizable ceramic sample (n = 284). When found in a protohistoric context, sand-tempered sherds were probably closely affiliated with Baytown Plain, *var. Jean Lafitte* (Franks et al. 1990:82), which occurred in a late-eighteenth-century context in nearby Jean Lafitte National Historical Park and Preserve. The sand tempered sherds from the Des Allemands phase levels possibly indicated connections to early Weeden Island-related groups living on the Mississippi Gulf Coast (Blitz and Mann 1993:64-65).

Proposed New Varieties of Decorated Wares

Two new varieties of decorated wares were proposed based on the analysis of sherds recovered in 1990-1991 at 16SC27. This section provides their descriptions.

Evansville Punctated, *var. Duck Lake*. This proposed new variety exhibited rows of well-executed, shallow, evenly spaced punctations in bands parallel to the rim, applied on dry paste (Figure 50). The design was similar to the "Six Mile" treatment (Phillips 1970:Figure 62g-m) but the punctations in *Duck Lake* were more closely spaced and covered a larger portion of the vessel's surface. The design was commonly found on inflaring vessels. This variety first appeared in the Middle E stratum, and its frequency peaked in stratum C/D.

Mazique Incised, *var. Barataria*. This new variety was similar to Mazique Incised, *var. Kings Point* (Fuller and Fuller 1987:Figure 37c-d), except that the design was limited almost exclusively to broadly outfolded rims (i.e., the "Pump Canal" rim mode). The vertical incised lines were thin and applied after the paste was dry (Figure 50). This type occurred most frequently in Stratum D, which encompasses the Transitional Coles Creek/Plaquemine and Barataria phase components at Pump Canal.

Discussion of Rim Modes at 16SC27

Four principal rim modes were present in the Pump Canal ceramic collection (Table 55). One of these, the Pump Canal rim mode, was newly defined as the result of the present

Table 55. Relative Frequency Distribution of Rim Modes at 16SC27.

	A, A/B	C	D	E Late	E Middle	E Early	F	G	I
Lone Oak	0%	0%	0%	8%	15%	17%	0%	0%	0%
Machias	0%	6%	0%	0.9%	2%	0%	0%	0%	0%
Onion Lake	0%	6%	5%	7%	10%	4%	28%	0%	0%
Pump Canal	0%	6%	7%	2%	14%	12%	4%	0%	5%
Rolled	0%	0%	2%	6%	2%	8%	9%	0%	5%
Peaked	0%	0%	3%	0%	1%	8%	2%	5%	0%
Troyville									
Thick	0%	0%	0%	0%	0%	0%	2%	23%	0%

analysis. Several other rim modes occurred in lesser frequencies.

"Machias" and "Lone Oak" Rim Modes. "Machias" rims (Fuller and Fuller 1987:142, 149, Figure 56e-h; Wiseman et al. 1979:7.10-7.12, Figure 7.5a-d) had thickened rim profiles and were often decorated by punctations in neatly arranged rows. "Lone Oak" rims (Fuller and Fuller 1987:140; Wiseman et al. 1979:7.7-7.10, Figure 7-3) were very similar to "Machias" rims, but were generally thicker than the latter, and exhibited pronounced exterior swelling of the bottom of the rim (Fuller and Fuller 1987:140-142, Figure 56a-d).

The sorting of sherds representing either the "Machias" or the "Lone Oak" rim mode was attempted during analysis of the Pump Canal ceramics. However, transitional examples sometimes made definitive distinctions difficult. Fuller and Fuller (1987:142) noted the apparent similarities between these two rim modes, and distinguished between them through differences in ware. At Pump Canal, ware did not appear to be a diagnostic element in evaluating between these rims modes.

At 16SC27, "Lone Oak" rims (Figure 51) occurred only in Stratum E. They decreased in relative frequency from the lower to upper levels of the Coles Creek deposits (Table 55). "Machias" rims were most numerous in Stratum C (6%) and were present in small quantities in Stratum D as well as in Stratum E.

"Onion Lake" Mode. Sherds which represented the "Onion Lake" rim mode (Brown 1982:37, Figure 10b-d) were common in Stratum F (28%). They continued in significantly smaller quantities through Strata E, D and C (Table 55; Figure 52).

"Pump Canal" Mode. This mode was defined on the basis of ceramics recovered at 16SC27 in 1990-1991. It was similar to the "Onion Lake" mode, but was readily sortable. Sherds assigned to the "Pump Canal" mode of rim manufacture exhibited a broad, outfolded, round rim (Figure 52). Its distribution in the strata was similar to that of "Onion Lake" rims, except that the "Pump Canal" mode occurred in greatest frequencies in the Coles Creek component.

"Rolled" Rims. Several rims from Pump Canal exhibited a "rolled" rim mode, in some ways similar to the "Cane Ridge" rim mode described by Fuller and Fuller (1987:138). These rims at 16SC27 were just barely outfolded, and often were accompanied by a single incised line below the lip.

"Rolled" rims were present in Stratum I and continued as a minority mode into Stratum D (Table 55).

"Peaked" Rims. Rims referred to as "peaked" were usually unfolded and severely tapered, and were commonly associated with plates and shallow bowls in the Pump Canal collection (Figure 53). This rim mode was mostly found in Strata G and F, and in the lower portions of Stratum E (Table 55).

"Troyville Thick." During the analysis of the Pump Canal ceramics, this highly diagnostic rim mode was originally defined as being outfolded with bulbous interior thickening (Figures 54, 77h). Bitgood (1989) briefly described an apparently similar rim mode, identified as "Troyville Thick," found in the Upper Tensas Basin during the Insley phase of the Baytown period. Although it was unclear from published descriptions if "Troyville Thick" rims were infolded. They appeared similar enough to those found at Pump Canal to adopt the same name for both rim samples.

"Troyville Thick" was the most diagnostic rim mode found, to date, in the Pump Canal ceramic assemblages. This rim mode was associated almost exclusively with well made shallow bowls with thin vessel walls made primarily on Baytown Plain variety No. 1 and *var. Troyville* wares. The mode occurs only in Strata F and G where it accounted for over 23% of all identifiable rim types (Table 55).

Vessel Shapes

Four primary vessel shapes were found in the Pump Canal ceramics (Table 56). A set of miniature vessels, discussed below, was also recognized during the analysis. The principal shapes identified in the ceramic industries were jars (Figure 55), plates (Figure 56), shallow bowls (Figure 57) and ollas or "gourd-shaped" vessels (Figure 58). Beakers and vessels with outflaring rim profiles were rare.

The distribution of vessel shapes throughout the excavation levels seemed to have no chronological relevance. However, it was possible that the distributions of vessel shapes may have reflected different activities during the various occupations at the site. Analysis of vessel shape distributions in conjunction with faunal remains had occasionally been productive for understanding other sites (e.g., Shenkel 1984). This is one avenue that should be explored in future research at this and other sites in southeastern Louisiana.

Table 56. Relative Frequency Distribution of Vessel Shapes at 16SC27.

	A, A/B	C	D	E Late	E Middle	E Early	F	G	I
Shape									
Plates	0%	23%	7%	15%	5%	8%	9%	5%	5%
Shallow Bowls	6%	14%	5%	6%	8%	4%	15%	24%	5%
Olla	25%	9%	2%	15%	6%	4%	4%	10%	15%
Jar	6%	20%	15%	11%	28%	21%	11%	5%	25%
Miniature	33%	11%	17%	11%	6%	25%	6%	10%	10%

Sherds from Stratum A

Soil in Stratum A represented spoil associated with the ca. 1910 excavation of the Pump Canal. For this reason, only part of the material was screened (Chapter 10). Nevertheless, sherds from Stratum A were examined and a few of these were diagnostic. Perhaps the most noteworthy observation about sherds from this level was the presence of a relatively high percentage of sand-tempered wares (4%). These sherds did not appear to be as well-made as the sand-tempered sherds excavated from Stratum I, which were more fully cxidized.

In general, the ceramics from Stratum A could be described as thick, heavily tempered with grog and clay, poorly kneaded but well fired. Two vessel fragments came from highly restricted ollas. One sherd of Pontchartrain Check Stamped, *var. Pontchartrain*, and one sherd of Evansville Punctated, *var. Rhinehart*, were recovered from this Stratum.

Sherds from Stratum A/B

Sherds from this provenience also derived from a context disturbed during the early twentieth century excavation of the Pump Canal. The sherds sufficiently preserved for study included two decorated pieces: one a sherd of Pontchartrain Check Stamped, *var. Pontchartrain*, and the other an unidentified incised sherd, possibly executed with drag and jab technique.

Nine rims, five of which were from highly restricted, olla shapes, were recovered in Stratum A/B. Three ollas represented very small or miniature vessels (Figure 59), a vessel shape not previously recognized in Pump Canal ceramic collections, but present at sites like Morgan (Fuller and Fuller 1987:126, Figure 54). These diminutive shapes were frequent in the underlying levels (Table 56).

Sherds from Stratum C

Excavation proveniences included in Stratum C for the purposes of ceramic analysis were: EU5, C; EU 7, 0-5 cm, Above Compact Surface; EU6, C south half, northeast quarter, and northwest quarter; and EU7 Below Compact Surface (Table 45). These proveniences yielded a total of 853 identifiable sherds, including 49 decorated pieces, 31 rim fragments, and five decorated rims.

Within EU7, Stratum C was subdivided. The "compact surface" was used to separate upper and lower portions of the stratum. Ceramics from above and below the compact surface were very similar with the exception of the following two observations. First, the relative frequency of rims was greater above the compact surface (9.2% of identifiable sherds) than was the case below that surface (2%). Second, there were relatively fewer decorated sherds from above the Compact Surface (one specimen representing less than 1%) than was the case below the Compact Surface (9.7%). Otherwise, the ceramic assemblage from all of the proveniences listed in the first paragraph of this section and in Table 45 were generally similar.

Among the decorated types recovered from Stratum C were Buras Incised, *var. Buras* (EU5); Anna Incised, *var. Australia* (EU5); Mazique Incised, *vars. Manchac, Mazique* (both Below Compact surface), and *unspecified* (Figure 60). Two unidentified curvilinear incised sherds were recovered from Stratum C in EU5. Evansville Punctated, *var. Rhinehart*, occurred both Below and Above the Compact Surface, which ranged from 9% to 13% throughout Stratum C. Two sherds of Avoyelles Punctated, *var. Tatum* (Williams and Brain 1983:124), occurred Below the Compact Surface within EU7, which accounted for 14% of all decorated sherds in this provenience. This variety was similar in decorative motif to Evansville Punctated, *var. Rhinehart*, found in lower, earlier levels of EU7. A distinctive "style," evident in the Stratum C ceramics, was the use of fingernails in the application or embellishment of standard decorations like Evansville Punctated, Avoyelles Punctated, French Fork Incised, and unclassified interior incised.

Evansville Punctated, *vars. Duck Lake* and *Sharkey*, did not appear in Stratum C although they were relatively frequent in the proveniences designated "C/D" within EU5 and "Stratum D" within various subdivisions of EU6 (below). However, several ceramic types which were generally associated with earlier contexts were present in Stratum C. Among these were Pontchartrain Check Stamped, *vars. Pontchartrain* and *Lambert Ridge* (7% and 9% respectively), and Coles Creek Incised, *vars. Hardy* (11%), *Hunt* (5%), and *Blakely* (5%). An unidentified brushed sherd and one of French Fork Incised, *var. unspecified*, were also recovered from Stratum C.

Among the plainwares, Baytown Plain, *var. Reed*, was relatively common. Examples from this provenience were often well-oxidized, which appeared to be a trait typical of *Reed* sherds from the upper levels of Pump Canal. *Var. Reed* approached more closely its published description (being more contorted) within that portion of EU7 Stratum C "Below the Compact Surface." Also recovered from Stratum C were two sherds, classified as variety No. 1, which were very finely made, with lustrous surfaces. Only three Mississippi Plain, var. *unspecified* sherds were recovered from the proveniences under discussion here.

One "Machias" rim (6% of all rims) and four miniature vessels (11%) occurred in Stratum C. "Onion Lake" and "Pump Canal" rim modes each accounted for 6% of the rim sherds from this level (Table 55). Among the vessel shapes identified in Stratum C were plates (23%), shallow bowls (14%), ollas (9%), and jars 20%. One loop handle was also present.

Sherds from Stratum D

Sherds discussed in this section were from the following proveniences: EU5, Stratum D; EU5, Stratum C/D; EU6, Stratum D within the south half, northeast quarter, and northwest quarter; and EU7, Stratum D (Table 46). Stratum D consisted of *Rangia* shells in a silt matrix and was the equivalent of the provenience designated "Level B" during the 1979-1983 LAS excavations (Chapter 10). Analysis of ceramics from both excavations indicated a Transitional Coles Creek/Plaquemine occupation, possibly associated with the St. Gabriel phase (A.D. 1000-1200) (Weinstein 1987). Many sherds, with the exception of those derived from the south half of EU6, appeared water-worn. The significance of this observation was unknown.

As was the case for Stratum C (above), several examples of ceramic types normally considered "out of context" appeared in the ceramic industry from Stratum D. Among these were Buras Incised, *var. Buras* (3%); and a small number of sherds classified as Mississippi Plain, *var. unspecified*. These latter sherds were remarkably similar, although they were not all from the same vessel. Mississippi Plain sherds, accounted for 2% of all sherds in Stratum D and C/D. These sherds were fine to slightly contorted, beige, and tempered with live shell and an occasional fragment of grog.

Other ceramic types and modes diagnostic for Stratum D included the presence of thin incisions done on very dry paste, often described as "engraving" in the Lower Mississippi Valley. Several examples of French Fork Incised were present. One that was classified as *var. unspecified* was made of a very "foreign" paste. An example of *var. Laborde* was very finely made and depicts the "cameo" effect. One French Fork vessel was a "miniature." A French Fork lug was also recovered. Like Stratum C, Stratum D exhibited a wide variety of styles among the punctated sherds, which included crescents, circles, and diamond punctations.

Stratum D yielded numerous miniature vessels. Also recovered from this stratum were non-shell-tempered sherds with curvilinear incision. One scalloped or crenelated rim and "ledge" like rim from a bowl made of "foreign" paste rounded out the distinctive ceramics from Stratum D.

Generally, the ceramic assemblage from Stratum D supported the assertion of Brown (1985:232) and Weinstein (1987) that Transitional Coles Creek/Plaquemine components could be recognized in Coastal Louisiana. The ceramic types associated with this component at Pump Canal were Pontchartrain Check Stamped, *vars. Pontchartrain* (16%) and *Lambert Ridge* (4%); Mazique Incised, *vars. Manchac* (3%), *Barataria* (4%), and *unspecified* (2%); Coles Creek Incised, *vars. Mott* (3%), *Coles Creek* (1%), and *unspecified* (*Hunt*-like [7%], *Hardy*-like [3%], and *Chase*-like [1%]) (Figure 61); and Anna Incised, *var. unspecified* (3%). Also present in Stratum D were sherds classified as French Fork Incised, *vars. Laborde* and *unspecified*.

In general, plainwares in this stratum were oxidized more often than was the case in Stratum C. The sherds classified as Baytown Plain variety No. 2 were very similar to Baytown Plain, *var. Addis*. Also, there was an increase in the frequency of Baytown Plain variety No. 4 relative to that observed in Stratum C. Sherds of Mississippi Plain, *var. unspecified*, were present in the sample under discussion here. One loop handle with bossing, one boss fragment with an accentuation (classified as French Fork Incised, *var. unspecified*) and one French Fork Incised lug were also observed in this stratum.

For purposes of analysis, the provenience designated "C/D" was included with Stratum D for two reasons. First, the manner in which it was extracted in the field indicated that only a few sherds from Stratum C were included within the sample relative to those from Stratum D (Chapter 10). The second reason, which tended to confirm the above observation, was that the C/D provenience included Evansville Punctated, *vars. Duck Lake* and *Sharkey*, neither of which occurred in Stratum C. Also common to provenience "C/D" and Stratum D, but not to Stratum C, was the absence of Evansville Punctated, *var. Rhinehart*, and the presence of Mazique Incised, *var. Barataria*.

Sherds from Stratum E

The period of most intensive occupation of Pump Canal site was associated with the Bayou Cutler phase of the Coles Creek period. Analysis of the ceramics recovered by the LAS excavations indicated that this occupation was found in "Level C," and two of the units were subdivided into an upper (Ca) and a lower (Cb) provenience (Chapter 10). In the 1991-1992 excavations this occupation was associated solely with Stratum E. During the excavations, Stratum E was subdivided into three substrata, designated Stratum E - Late, E - Middle, and E - Early. These substrata were divided relative to their stratigraphic relationship with the "Compact Surface" found in Stratum E during the 1990-1991 excavations.

The discussion below was organized into the three groupings outlined above. These were designated "Stratum E - Late," "Stratum E - Middle," and "Stratum E - Early." The sample from Stratum E of EU5 was not included in the discussion because it was excavated as a single natural level, and consequently represented a mixture of these three groupings.

Stratum E - Late. Sherds included within this grouping were from the following proveniences: EU7 D/E; EU6 south half upper 10 cm; EU6 northwest quarter upper 5 cm; EU6 northeast quarter Above F19 (Ash Lens); EU6 northeast quarter and northwest quarter Below F19 and Above Compact Surface. As a general characterization, "Stratum E - Late" contained a very high ratio of decorated sherds (12% of all identifiable sherds in the sample), which included numerous decorated rims. Punctations placed on incised lines, drag and jab execution (Figure 62), and a normally careless application of the decoration characterized this level. The pastes observed in "Stratum E - Late" were often well-manufactured and well-oxidized. Most sherds were large and preservation was good, although sherds from provenience "D/E" gave the appearance of having been slightly water-worn.

The ceramic assemblage from Stratum E - Late was distinguished from the E - Middle by the lower proportion of Pontchartrain Check Stamped, *var. Pontchartrain* (Table 57), and the small, but steady decrease of *var. Lambert Ridge* relative to the underlying levels. The Coles Creek Incised varieties in "Stratum E - Late" appeared to be less well made than those found in the underlying portion of Stratum E. The incised sherds from this upper portion of Stratum E were poorly executed, often completed on dry paste, which resulted in a quasi-engraved appearance. The paste of Coles

Table 57. Distribution of Varieties of the Type Pontchartrain Check Stamped at 16SC27.

	D	E Late	E Middle	E Early	F
Pontchartrain Check Stamped, var. *Pontchartrain*	16%	22%	58%	35%	7%
Pontchartrain Check Stamped, var. *Lambert Ridge*	8%	3%	6%	9%	0%
Pontchartrain Check Stamped, var. *Tiger Island*	0%	5%	6%	0%	0%

Creek Incised sherds in "Stratum E - Late" was thinner than that in the lower levels, tending to foreshadow the paste of shell-tempered wares. In fact, Baytown Plain variety No. 1 pastes were better made than those found in the rest of Stratum E. Also, the variety No. 2 paste was less contorted than in other levels. In EU 6 northwest quarter, variety No. 4 was noticeably better fired than the norm. This upper portion of Stratum E was the only one which yielded shell-tempered plainwares. These were classified as Mississippi Plain, *var. unspecified*, and may have been intrusive from levels D or C above.

The "Stratum E - Late" component differed from the underlying levels of Stratum E in the reduced frequency of jars. Jars were only about half as numerous as they were in the middle and early portions of Stratum E. In contrast, plates and ollas (gourd-shaped vessels) were significantly more numerous in the late component than in the other two (Table 56).

Differences in rim mode frequencies also distinguished the divisions of Stratum E. "Lone Oak" rim modes were less prevalent in "Stratum E - Late" than in the two lower components. Rolled rims increased from the middle level while "Onion Lake" modes and "Pump Canal" rim modes decreased (Table 55).

Coles Creek Incised, *vars. Blakely* and *Hunt*, were well represented. Unlike the norm for most other incised sherds in "Stratum E - Late," sherds from these two varieties were neatly executed on dry paste (Williams and Brain 1983:151). The type Evansville Punctated was well represented in "Stratum E - Late," and included examples of *vars. Duck Lake* and *Evansville, Rhinehart*, and *unspecified*.

Also numerous in this upper level were several sherds which represented well-made varieties of French Fork Incised, although this type was better represented in "Stratum E - Middle." One sherd recovered from Feature 31 in "Stratum E - Late" was an especially well made example of French Fork Incised, *var. unspecified* (Figure 63d). This fragment from a shallow bowl, manufactured on a fine paste similar to Baytown Plain, *var. Satartia*, was decorated with incisions and punctations, cleanly executed on wet paste. The bowl had a typical French Fork Incised peaked rim with punctations applied on the lip panels.

One sherd from "Stratum E - Late" exhibited a mixture of attributes that baffled typological classification. The decoration was executed in a style reminiscent of Avoyelles Punctated, *var. Kearney*, while the vessel was very similar to the French Fork style, particularly that found in well-made varieties like *Larkin* (Figure 63) and *McNutt*. Vessel panels exhibited a combination of Evansville Punctated and Mazique Incised decoration. Similar examples of "combination decoration" were well represented at the Morgan site (Fuller and Fuller 1987:122, Figure 52) and elsewhere in the Lower Mississippi Valley.

Feature 19 (Compact Surface) and Feature 34 (Ash Lens). These two stratigraphic features were associated with the break between "Stratum E - Late" and "Stratum E - Middle." Feature 19 (a compact surface) and Feature 34 (an ash lens) appeared to correlate with the same stratigraphic context as the hearth found in 1979-1983 (Chapter 10). These features, and the large numbers of sherds from the strata immediately above and below these features, suggested that the most substantial occupation of the Pump Canal site occurred in this stratigraphic level.

One sherd of Coles Creek Incised, *var. Athanasio*, was recovered from Feature 34. One sherd of Avoyelles Punctated, *var. Avoyelles*, was found in the EU7 East Wall, and it was also associated with these features. Ceramics from EU7 Flotation Sample 43, associated with the compact surface were too few to provide significant results, but did not differ in any noticeable way, from those sherds found above and below this feature.

Stratum E - Middle. Sherds assigned to this designation were from the following proveniences: EU6 south half Bottom 10 cm; EU6 northwest quarter Below Compact Surface and Above Dense *Rangia*; EU6 Dense *Rangia*; EU6 northeast quarter Below Compact Surface; and EU7 Below Compact Surface and Above Dense *Rangia* (Tables 43 and 48). This grouping of proveniences was characterized by the greatest frequency of Pontchartrain Check Stamped, *var. Pontchartrain* (Table 57). Also, the ceramic assemblage in this level was clearly the best-represented and most well-executed Coles Creek industry found at the Pump Canal site.

Another ceramic characteristic that distinguished "Stratum E - Middle" was a high relative frequency of decorated sherds (13%). This proportion was almost identical to that observed in "Stratum E - Late," but more than twice the percentage of decorated sherds found in "Stratum E - Early" (below). The relative frequency of Mazique Incised, *var. Bruly* (Figure 60c), was low, but its presence in this component was significant. French Fork Incised varieties were well represented as were the classic varieties of Coles Creek Incised, such as *Coles Creek*, *Mott*, *Chase*, and

Blakely. Another variety present was Beldeau Incised, *var. Beldeau*.

Jars were the most frequently recognizable vessel shape (Table 56). They were nearly three times more numerous than shallow bowls which exhibited the second highest frequency. The "Lone Oak," "Onion Lake," and "Pump Canal" rim modes were more prevalent here than in "Stratum E - Late" (above).

One notable characteristic of "Stratum E - Middle" was the total absence of shell-tempered pottery which occurs in most other proveniences from Pump Canal, albeit in very small quantities. In this assemblage, examples of Baytown Plain variety No. 2 tended to be less well-oxidized, on average, than is the case in "Stratum E - Late." In general, wares from Stratum E were not as well-fired as those from strata which represented later components, which included in particular those from Stratum D. However, some of the variety No. 2 plainwares appeared to be relatively more lustrous when compared to those in "Stratum E - Late."

Within the proveniences discussed herein, sherds classified as Baytown Plain variety No. 1 were mostly gray. They also tend to be thick, and a minority of sherds were fully oxidized. This variety could almost be sorted into "finer" and "coarser" subvarieties. The former appeared to be extremely well-made, very fine, with beige exterior/interior and mostly gray cores.

One round loop handle was recovered from these proveniences. Three French Fork "lugs" (Figure 64), two with large punctations, were present in this assemblage. Similarly, two unidentified punctated sherds from this level exhibited large punctations. Finally, an enigmatic ceramic "strap" had been decorated on what would be the "interior" surface, on a true rim strap. The hatched checkerboard style is similar to decorated sherds illustrated by Fuller and Fuller (1987:Figure 45h).

Stratum E - Early. Ceramics assigned to this designation derived from proveniences designated EU6 northwest quarter Below Dense *Rangia*; and EU7 Below *Rangia* (Table 43). In these proveniences the relative frequency of Pontchartrain Check Stamped, var. *Pontchartrain*, decreased significantly (Table 57). Also, *var. Tiger Island* was absent in the analyzed sample, while *var. Lambert Ridge* reached its greatest percentage. Unlike the other portions of Stratum E, the percentage of decorated sherds in the "Early E" was low (6.3% compared to 13% in Middle E and 12% in Late E). This outcome was directly related to the decrease in Pontchartrain Check Stamped sherds.

"Stratum E - Early" also exhibited the highest proportion of miniature vessels (25%). The only exceptions were Stratum A and A/B which were disturbed, and for which only small, non-representative samples were obtained. Jars were the predominant vessel shape, and the distribution of other identifiable shapes (i.e., plates, ollas, and shallow bowls) was very similar to that in "Stratum E - Middle" but different from that in "Stratum E - Late" (Table 56).

"Lone Oak" rim modes were most numerous in "Stratum E - Early" and "Stratum E - Middle." Interestingly, no "Lone Oak" or "Machias" rim modes appeared anywhere below Stratum E. Thus, when the "Lone Oak" mode first appeared at Pump Canal, it occurred at its greatest frequency. This mode then slowly decreases through Stratum E and did not reappear in Strata C and D.

The ceramic assemblage in "Stratum E - Early" included examples of the "Six Mile" treatment mode (9%). This mode also appeared in Strata G and F in the same percentage. Its frequency decreased steadily in the upper levels. Although a derived ceramic style, defined as Evansville Punctated, *var. Duck Lake*, was common in the Coles Creek (Stratum E - Middle and Late) deposits.

Other decorated varieties present in "Stratum E - Early" included Mazique Incised, *var. Sweet Bay* (Fuller and Fuller 1987:86, Figure 34a-d). This variety reached its modest frequency peak of 4% in this stratum. Coles Creek Incised, *vars. Coles Creek* (4%) and *unspecified* (*Hardy*-like [9%]), also were represented in this assemblage. One French Fork Incised, *var. unspecified*, sherd with a "sand dollar" motif was found in this stratum. Similar sherds from the Morgan site were illustrated by Fuller and Fuller (1987:104, Figure 43d, f).

In general, the ceramic assemblage associated with "Stratum E - Early" was characterized by relatively thick sherds. One square, flat base was recovered from this level. As was the case in "Stratum E - Middle," Baytown Plain variety No. 1 could almost be sorted into "superfine" and fine ware.

Sherds from Stratum F

Stratum F was the equivalent of "Level D" in the LAS excavations (Chapter 10). Consistent with previous findings, Stratum F was clearly different in several important aspects from the Coles Creek industries in overlaying strata.

Among the most striking difference from the overlying Coles Creek strata was the relatively high proportion of sherds classified as Mazique Incised, *var. Bruly.* These sherds were decorated with multiple, rectilinear lines, executed on dry paste and exhibited an accentuated line ending characteristic of the type Alligator Incised (Phillips 1970: 38-39). They did not, however, carry the decoration across the entire vessel surface as was the case with Alligator Incised. They resembled very strongly similar examples illustrated by Springer (1973:Plate 2a-b, d, g, j; see also Weinstein et al. 1978:23). These sherds accounted for 28% of all decorated sherds in Stratum F. Evansville Punctated sherds in this stratum were similar to those identified as the "Six Mile" treatment (e.g., Evansville Punctated, *var. Amite*, which was seen by Weinstein et al. [1978:22-23, 30], as a good marker for the Baytown period Whitehall phase). In terms of the regularity of design and the stylistic layout, the Evansville Punctated in Stratum F was a precursor to the Evansville Punctated, *var. Duck Lake*, found in the Later Coles Creek stratum (Stratum E - Late).

The frequency of Pontchartrain Check Stamped, *var. Pontchartrain*, decreased dramatically in Stratum F. It accounted for only 7% of decorated sherds, down from 35% in "Stratum E - Early." Other significant decorated types present in this ceramic assemblage were Evansville Punctated, *var. Rhinehart* (16%) and small amounts of French Fork Incised.

The most common vessel shapes in Stratum F were shallow bowls (15%) and jars (11%). "Onion Lake" rims are the dominant rim mode in Stratum F (28%). Rolled rims (similar to the Cane Ridge mode of Fuller and Fuller [1987]) were a significant minority mode (9%) (Table 55), but "Lone Oak" or "Machias" rims were not common. A unique rim mode, very similar to "Troyville Thick" (Bitgood 1989:160) occurred in small quantities in Stratum F but increased dramatically in the underlying Stratum G. Sherds were relatively thick and well-oxidized. Stratum F appeared more closely similar to Stratum G than to the overlying Strata E. This was consistent with the field interpretation of Stratum G, which was that it was largely sterile with the exception of sherds that were intrusive from Stratum F. This intrusion was due to a large number of features such as postmolds and fill associated with the Feature 2 log.

Nine sherds of shell-tempered pottery identified as Mississippi Plain, *var. unspecified*, were recovered from this stratum. They were finely made, with a beige/gray paste, and probably represented fragments from a single vessel. They did not appear to be intrusive but this possibility could not be ruled out. Their presence in this context was interesting, and may have indicated early experimentation with the use of shell as a tempering agent. The distribution of similar ceramics from pre-Mississippi Period sites in the delta region would be a profitable avenue for future research.

Sherds from Stratum G

This stratum yielded only 11 decorated sherds. Like Stratum F and unlike Stratum I, this ceramic assemblage had a relatively high frequency (9%, but representing only two sherds) of the "Six Mile" rim treatment. Most of the decorated sherds from Stratum G were unclassified incised, which included one with curvilinear designs. Most incised pieces were decorated by thin, dry paste incisions. One possible complicated stamped sherd was discovered in this level, but was too poorly preserved for positive identification.

The most diagnostic element in the ceramic industry from Stratum G was the presence of "Troyville thick" rims (23%). These rims were infolded, which formed a "bulbous" profile. Belmont (in Bitgood 1989:160) described similar rims as approaching the shape of a light bulb in cross-section. At the Pump Canal site, this mode occurred only in Strata G and F, although in the latter it was only represented by one sherd. The "Troyville Thick" rim appeared as an important horizon marker for the ceramic assemblage represented in Strata F and G. This unique rim mode occurred mostly on shallow bowls, which were the most frequently occurring vessel shape in both strata (Table 55 and 56).

Stratum G also shared a unique rim trait with Stratum I in the relatively high frequency of bevelling on rims. Nearly 20% of the rims in Stratum G exhibited either interior or exterior bevelling, a trait that was very rare in the upper levels of the Pump Canal site. In the underlying Stratum I, bevelling on rims occurred on 35% of all rims studied (n = 20). Sandy-paste wares were also a noticeable characteristic of this ceramic assemblage.

Sherds from Stratum I

This stratum represented an occupation associated with the Late Baytown period Des Allemands phase (ca. A.D. 550-700) (Belmont 1982; Belmont and Williams 1981). It was equivalent to "Level F" in the LAS excavations (Chapter 10).

Five red filmed sherds were recovered in this level, two of Larto Red, *var. Larto*, and three classified as Larto Red, *var. Silver Creek*. Only five decorated sherds were recovered from Stratum I in 1990-1991. One was classified as Larto Red, *var. unspecified*.

"Pump Canal" and "rolled" rims were the only two rim modes represented in this level. The most common vessel shape was the jar (25%), followed by the olla vessel (15%). Plates and shallow bowls were relatively rare, each accounting for 5% of the ceramic sample (Table 56).

Plainwares from Stratum I exhibited a relatively high proportion of sand tempered sherds (8%). The bulk of the plainware, however, was similar in paste characteristics to Baytown Plain, *var. Troyville*, although it was generally thicker and cruder than the published description allows. In this vein the plain pottery appeared to relate to pottery described from contemporary contexts at sites such as Bruly St. Martin (Springer 1973) and 16SC42, 16SC43, and 16SC45 (Davis et al. 1982).

CHAPTER 12
CERAMIC AND CULTURAL CHRONOLOGY
By Tristram R. Kidder

Introduction

In a recent synthesis of the archeology of the Mississippi Valley and the Trans-Mississippi South, Jeter and Williams noted that the "nature of prehistoric developments in the coastal zone during the time span between late Marksville (Issaquena) and Plaquemine cultures is not well defined" (1989:152). This statement applies especially well to the Barataria Basin portion of the coastal zone, where despite over 80 years of archeological research, basic culture historical and chronological subdivisions remain vaguely defined and poorly understood. Excavations at the Pump Canal site provide the basis for an examination of the regional culture historical sequence from at least the late Baytown period (ca. A.D. 400-700) to the Mississippi period (ca. A.D. 1200-1700). Although the archeological deposits at the Pump Canal site do not themselves span the entire sequence from Baytown to the Mississippi period, it is still possible to attempt a synthesis of the available data from the region in an attempt to place the site within the broader context of the prehistory of the coastal zone.

The archeology of the Barataria Basin is generally well understood in the broadest perspective of Lower Mississippi Valley prehistory. Archeologists recognize a pattern of cultural development over time, and are able to classify archeological cultures into large temporal and culture historical units. It is on the local level, however, that our ability to create appropriately fine-grained culture historical entities fails us. Naturally, the creation of cultures, phases, and chronological frameworks is only a beginning point for further, presumably more meaningful analyses of Native American behavior in the coastal zone. We must recognize, though, that until we have a comprehensive means of examining changes through space and time, and relating these patterns to coeval events in adjacent areas, archeological research cannot proceed in a systematic fashion.

Pump Canal represents an important resource for furthering the culture history of the Barataria region precisely because it is here that we can define and delimit many of the major culture historical units which have so far escaped our full comprehension. This is especially true of the earliest deposits at the site which can be attributed to the late Baytown and early Coles Creek periods. The transition between these periods and the formulation of culture historical units to encompass these events is perhaps the most poorly understood of all aspects of regional prehistory. Regrettably, however, the data base from Pump Canal is small, and our conclusions will remain tentative until further research can confirm or disprove our analysis.

The following synthesis is organized chronologically according to the Pump Canal stratigraphy, beginning at the bottom of the excavation and moving up through the levels and through time. Our major goal is to fit this stratigraphy into the regional culture historical framework. From the outset, it should be made clear that this research is organized around the study of ceramics and their change through time. Other aspects of material culture are either too rare to use for our purposes (i.e., lithics), or do not appear to be temporally or stylistically sensitive enough (i.e., bone tools). Changes in subsistence practices and other adaptive patterns can only be substantiated once we have arrived at a well supported culture historical framework.

Baytown Period (ca. A.D. 400-700)

Historically, the interval between roughly A.D. 400 to 700 has been one of the most difficult to understand from a culture historical perspective. When it was first recognized in the coastal zone by McIntire (1954, 1958), this period was designated Troyville, a name taken from the culture sequence developed by Ford (1951) at the Greenhouse site (Gibson 1984; Jeter and Williams 1989:152). As noted by Gibson (1984:32-35), Troyville at this time was a pottery complex as well as a temporal and cultural unit. Researchers in the coastal zone adopted the designation as a temporal unit (McIntire 1958:5, Figure 1), following Ford (1951). As more sites were encountered and as further research was undertaken, Troyville began to expand as a designation of both temporal and cultural significance (Gibson 1984:40-42). Still, to most researchers working in the coastal zone (and, who had access only to surface collections), Troyville was mostly just a pottery complex. Most importantly, as a pottery complex which was ultimately derived from farther north, Troyville ceramics could not be differentiated from later Coles Creek pottery in a consistent manner. The Troyville "period" was thus inseparable from later Coles Creek, and the two were hybridized by the addition of a hyphen, thus resulting in a "Troyville-Coles Creek" period (Gibson 1984; Jeter and Williams 1989:152; Neuman 1984).

When Philip Phillips undertook his monumental synthesis of the prehistory of the Lower Mississippi Valley, he reorganized the cultural nomenclature to reflect the difference between temporal units ("periods") and cultural entities ("cultures") (Phillips 1970). In Phillips' scheme, the entire interval between ca. A.D. 400-700 became the Baytown period. During this time a number of geographically distinct cultures were identified, each defined by the presence of distinctive ceramic complexes and traits (Phillips 1970:922-923). These distinctive ceramic complexes were designated as phases, and are the basic units used by Phillips to discuss the distribution of cultures in the Lower Mississippi Valley. Phillips was, however, by his own admission (1970:923), "evasive" in his use of the terms culture and period. Troyville, as a result, was still a rather nebulous category, especially on the coast (Gibson 1984). A lasting contribution of Phillips' synthesis was the use of the type-variety system of ceramic classification, which is now the center piece of most culture historical classifications.

Phillips designated Whitehall as the Baytown period archeological phase in the Louisiana coastal zone. He did not, however, attempt to clear up the use of the term Troyville on the coast, although he preferred to restrict its use to the archeological phase covering the Baytown period in the southern Tensas and Black River areas. Subsequent to Phillips's work, Troyville has continued to be used in a variety of ways, both to designate a temporal unit, and to identify a cultural entity (Gibson 1984). In the early 1980s archeologists continued to refine the culture history of the Lower Mississippi Valley, and especially the cultural units encompassed within Phillips' Baytown period. In the central and northeast parts of Louisiana, the Troyville culture concept was revived and defined to cover the cultural entities in that area (Belmont 1984; Gibson 1984). Troyville culture designated a complex of material remains and associated behaviors (such as mound burials, communal ceremonialism, and the use of bathtub-shaped pits). This cultural complex was spatially restricted to the areas from roughly Baton Rouge north to the Arkansas-Louisiana state line (Belmont 1984; Kidder and Wells 1992).

With Phillips' revival of the Baytown period concept, and Belmont's restriction of the Troyville culture, the situation in the coastal zone became thoroughly ambiguous. On the one hand are those who continued to use the notion of Troyville-Coles Creek for the temporal unit (Jeter and Williams 1989:152; Neuman 1984), while on the other hand some scholars prefer a different approach, suggesting that "another cultural designation is warranted" for the Baytown period peoples of the coastal zone (Gibson 1984:59). A point little appreciated by scholars working in the area was brought out by Gibson in his discussion of the difficulties involved in resolving the so-called Troyville-Baytown issue:

> this typological problem has at least provided a clue that the happenings along the coast...were sufficiently distinctive from inland historical sequences to set the coast off as a separate culture area deserving of a special chronology of its own. **The coast simply cannot be adequately conceptualized by extrapolations from inland culture histories** [1984:41-42, emphasis added].

When Phillips (1970:911-912) established the Whitehall phase to encompass the Baytown period in the Louisiana coastal zone, he specifically noted that the phase "would be more accurately described... as a collection of widely dispersed sites" (1970:911) rather than a coherent archeological manifestation. Indeed, his distribution maps have Whitehall phase sites from north of Baton Rouge to the Barataria Basin, and from the western Chenier Plain to eastern St. Bernard Parish (Phillips 1970:Figure 445). Subsequently, Whitehall has become the broad temporal and culture historical unit into which all Baytown or Troyville material has been subsumed (see Wiseman et al. 1979:4.9-4.10). Gagliano et al. (1979:4.20) have observed that the "Baytown period probably needs more work than any other period in coastal Louisiana." There has been no attempt to examine Whitehall from either a spatial or temporal perspective, although Phillips (1970:911-912) did note several possible Whitehall phase clusters (see also McIntire 1958).

Phillips' classification of Whitehall phase components was accomplished by recognition of several important ceramic diagnostics. Most notable among these were Larto Red and Woodville Zoned Red (Phillips 1970:911). Where these ceramic diagnostics were absent, Phillips fell "back on rather devious expedients: (1) presence of sherds classified as Troyville Stamped, Yokena Incised, or Churupa Punctated, without Marksville Stamped or Marksville Incised; (2) presence of Mazique Incised, French Fork Incised, Chevalier Stamped, or Chase Incised, without Coles Creek Incised or Pontchartrain Check Stamped" (1970:911).

The problem, of course, is that there are few excavated contexts with which to define the Whitehall phase. Phillips' entire discussion of the phase was based on surface collections obtained by McIntire (1958), and Saucier

(1963). It is evident, though, that the Whitehall phase is a misnomer, as acknowledged by Phillips, and that its limits are stretched beyond the ability of the data to support such a construct.

Based on the excavations at Pump Canal and by making comparisons to contemporary components at other sites, it is now possible to more fully define the culture history of the Baytown period in the deltaic portion of the coastal zone (Giardino 1993). The excavated data from Pump Canal come from Level F, Test units 2 and 3 of the 1979-1983 LAS excavations, and Strata F, G, and I from the 1990-1991 excavations.

Here, as expected, Larto Red, *vars. Silver Lake* and *unspecified* (equivalent to var. *Larto*) are important diagnostic decorated variants. Evansville Punctated, *var. Rhinehart*, appear for the first time in Stratum F. The "Six Mile" rim treatment occurs in Strata F and G (Figures 74g, 74i, 75a, 76a). This rim treatment or mode is also known as Evansville Punctated, *var. Amite* (Weinstein et al. 1978:30), and appears to be a good Baytown period marker in the coastal zone (see also Springer 1973:70-71, Plate 1f-g). Unclassified single line incised pottery, similar to Coles Creek Incised, *var. Phillips*, is also present (Figures 74h-k, 74m, 77f, 77i), but in relatively small amounts. Mazique Incised, var. *unspecified* is also encountered for the first time in Stratum F, as are rare examples of French Fork Incised, var. *unspecified* (similar to *Larkin* and *Laborde*). One sherd of Marksville Incised, *var. Goose Lake*, was recovered in Level F in the LAS excavations. Seven sherds of Pontchartrain Check Stamped were also recovered, but may be intrusive from the overlying strata (Giardino 1993).

An important rim mode in this assemblage is the so-called "Troyville Thick" form, which is most frequently encountered in these strata (Figures 54, 56c, 76a-b, 77h-i). Beveled rims are also common in the lower strata, comprising nearly 20% of the rims in Stratum G and 35% of those in Stratum I. The "Onion Lake" rim mode in its highest frequency in Stratum F, but is absent in the strata underlying F. Plain pottery tends to be thick and coarsely tempered. Sand added to the paste is also found at this time, especially in Stratum I.

Although the data from Pump Canal are not especially dense, they do appear in a good stratigraphic context and allow us to expand our discussion beyond the site to encompass other contemporary occupations in the coastal zone. Springer's (1973) excavations at the Bruly St Martin site represents the largest excavated Baytown period occupation in the Barataria Basin. The data from this site are difficult to interpret due to stratigraphic mixing and the presentation of the typology (the type-variety system was not employed, making precise comparisons difficult). Still, a glance at Springer's data and its stratigraphic placement indicate that the lower levels at Bruly St. Martin are partially contemporary with the basal strata at Pump Canal (Springer 1973:Table 7, Figure 19). At Bruly St. Martin, Larto Red is the dominant type in the lowest levels of the trench excavations (Springer 1973:50-58, Table 7, Figure 19). Troyville Stamped, Yokena Incised, and Woodville Zoned Red are also important in the lower levels but are waning in their popularity (Springer 1973:Figure 19). Pontchartrain Check Stamped is virtually absent from the lower levels, but Coles Creek Incised, French Fork Incised, Mazique Incised, and Rhinehart Punctated are all present in relatively small amounts, and their frequency increases through time.

Since Springer did not differentiate the varieties of each type, it is difficult to specify the exact culture historical position of this component. The presence of small amounts of Troyville Stamped and Yokena Incised indicated a relatively early Baytown period date, although the stratigraphy and seriation suggested a strong continuity into the later Baytown period (Springer 1973:Figure 19). This later Baytown occupation may have been best identified by the presence of Woodville Zoned Red and Rhinehart Punctated ("variety 2"), which Springer (1973:71) noted was similar to the "Six Mile" rim treatment. Both of these types, but especially the variety 2 Rhinehart Punctated, were found in the lower levels of the excavations. These data taken together indicated that the Baytown period occupation at Bruly St. Martin spanned much of, or even all of, the temporal span between roughly A.D. 400-700. Compared to Pump Canal, this occupation probably began earlier, but their Baytown components certainly overlapped in time. The radiocarbon dates from Bruly St. Martin gave general support to the dating of the Baytown component as a whole, although their stratigraphic relationship may have been jumbled (Springer 1973:92, 95-96; Figure 49).

Another excavated component of relevance to this discussion comes from the Shell Beach site (16SB39) in St. Bernard Parish (Jones et al. 1993:81-136). In Excavation Unit [illegible] an early Baytown component was found, with sherds of Larto Red, *var. unspecified*, Marksville Incised, *var. unspecified* (similar to *vars. Anglim* or *Vick*), and Marksville Stamped, *var. Bayou Rouge* (Jones et al. 1993:134-136). Surface collections provided other evidence of early Baytown period ceramics, including an unspecified variety of

Churupa Punctated closely resembling *var. Watson* in the Tensas Basin. Several rim modes in the surface collections are also thought to be diagnostic of this time period (Jones et al. 1993:135-136). A shell sample from Feature 2 yielded a radiocarbon date of 1760 ± 60 B.P. (Beta-55112), which provides a cal AD range at two standard deviations of A.D. 128-412. This date is a bit early for what we would expect for an early Baytown occupation, but it is within the general age span and represents the earliest Baytown period date in the coastal zone at present.

Brief excavations and testing at several sites on Grand Bayou in St. Charles Parish revealed important evidence concerning the Baytown period occupation in the coastal zone (Davis et al. 1982). Although the initial report concerning the site suggested that the earliest occupation of these sites may have been as early as the Late Marksville period (Davis et al. 1982), subsequent reanalysis indicates that this is not likely, and that the first components date to the early Baytown period. At sites 16SC42, 16SC43, and 16SC45, small samples of diagnostic pottery suggesting early Baytown occupations were noted. This was especially true of 16SC42, where Marksville Incised, *var. unspecified* sherds were found. At 16SC45, several unspecified Marksville Incised sherds were recovered in the surface collections, including one which could be defined as *var. Anglim* (Bitgood 1989). Later Baytown period components were noted at all three sites, and these can be defined by the presence of Larto Red (which is rare), French Fork Incised, *vars. Brashear*, *Laborde*, and *Lafayette*, Mazique Incised, *var. Bruly*, and several examples of the "Six Mile" rim treatment. Pontchartrain Check Stamped is absent at these sites, and Coles Creek Incised is present only in the form of single lines incised below the rims of large jars. The predominant plain ware at these three sites is a very thick, crude form of Baytown Plain. Rims are frequently thickened, and several French Fork lugs are found.

One of the best examples of the components dating to this time in the coastal zone is found at the Gibson Mounds (16TR6), where Weinstein et al. (1978) found a number of late Baytown period diagnostics. Much of this material came from surface collections, but an important group of sherds were found in Zone III of Mound C (Weinstein et al. 1978:168-198, Tables 30-35). The Baytown period materials from Zone III included Coles Creek Incised, *vars. Hunt* and *Stoner*, and Evansville Punctate, *var. Amite* (the "Six Mile" treatment). Materials attributed to the early Coles Creek occupation were Coles Creek Incised, *var. Campbellesville*, French Fork Incised, *var. French Fork*, Mazique Incised, *var. Mazique*, and Pontchartrain Check Stamped, *var. Pontchartrain*

(Weinstein et al. 1978:Table 34). Weinstein et al. interpret the data from Zone III in Mound C to suggest that this is a mixed assemblage with both late Baytown and early Coles Creek diagnostics present (1978:189). An alternate interpretation is that Zone III is a late Baytown deposit in which later Coles Creek markers are first appearing. A radiocarbon date of 1075 ± 60 BP [UGa-1616 (cal A.D. 977] was obtained from a clump of charcoal found at the base of the profile in Zone III (Weinstein et al. 1978:184). This date seems to support the interpretation that the Baytown period ceramics were mixed with later deposits. Other Baytown period ceramics found on the surface include Larto Red, *vars. Larto* and *Silver City*, Mazique Incised, *var. Bruly*, and Woodville Zoned Red, *var. Woodville* (Weinstein et al. 1978; Weinstein and Kelley 1992:36).

A Late Baytown period occupation has been detected in surface collections at the Richeu Field site (16TR82), located 2.4 km southwest of Gibson Mounds. Here, Weinstein et al. (1978:Tables 38-39) recovered sherds of Larto Red, *var. Larto*, and Evansville Punctated, *var. Amite*. Similar components have been detected in surface collections from the Lake Penchant (16TR4) (Weinstein and Kelley 1992:218-230, Figure 6-44, Table 6-15) and Bayou Penchant (16TR76) (Weinstein and Kelley 1992:329-330, Table 7-19) sites. In both these instances, diagnostics included Larto Red, *var. Larto*, and Woodville Zoned Red, *var. Woodville*. The Lake Penchant site also yielded sherds of Larto Red, *var. Silver City*, Coles Creek Incised, *var. Stoner*, and Mazique Incised, *var. Bruly*. Weinstein and Kelley (1992:226) further note the presence of several "early" looking varieties of French Fork Incised at the site, but do not assign them to the Baytown period because they lack sound stratigraphic associations.

Elsewhere in the coastal zone, evidence for Baytown period occupations is scarce. Surface collections from the Gheens Crevasse on the east side of Bayou Lafourche yielded tenuous evidence of late Baytown or early Coles Creek components (Hunter et al. 1988; Pearson et al. 1989). Sites of this age were identified by the presence of French Fork Incised varieties (especially *var. Brashear*), Coles Creek Incised, *vars. Coles Creek*, *Hunt*, and *Stoner*, and Pontchartrain Check Stamped (Pearson et al. 1989:174). These sites lack Larto Red, Woodville Zoned Red, and the distinctive "Six Mile" rim treatment, and it would appear that they are later than the Baytown component at Pump Canal.

Although Phillips defined the Whitehall phase to encompass the entire Baytown period sequence in coastal

Louisiana, the data are now sufficient to warrant a revision of the existing cultural chronology. Initially I considered referring to this interval as the Whitehall I and II phases (Jones et al. 1993:239-244). Excavations at Pump Canal and subsequent investigation of the existing data lead me to suggest that *Whitehall be discontinued as a phase applicable to the coastal zone*. Whitehall, in my scheme, would be relegated to the geographic area north of the Barataria Basin. Furthermore, I would advance the idea that the Baytown period in the Barataria Basin and probably all of coastal Louisiana be subdivided temporally into early and late phases. Although, as Gibson (1984) noted, coastal Louisiana is distinctive in many ways, the basic culture history does not seem to depart radically from that found in the rest of the Lower Mississippi Valley. A two-part chronology for the Baytown period on the coast would be in keeping with existing chronologies farther up the river, and would seem to fit the data better than having one overreaching and therefore amorphous temporal unit.

Since Whitehall (and thus all of the Baytown period in the coastal zone) has been conventionally dated to ca. A.D. 400-700 (Weinstein 1987:Figure 1), it is reasonable at this time to draw the line between early and late Baytown at ca. A.D. 550. In the coastal zone, these chronological divisions are not especially well supported by consistent or well defined radiocarbon sequences. Thus, these dates are at best reasonable approximations, often reinforced by extrapolation to phases elsewhere in the Lower Mississippi Valley.

Although phase chronologies are easy to propose, and even easier to name, I believe that if nothing else they provide a framework for further analysis. I am suggesting that the early Baytown period occupation in the Barataria Basin be called the Grand Bayou phase, while the later Baytown phase should be termed Des Allemands (Giardino 1993). I am creating these phases specifically for the Barataria region, although they are, by extension, applicable to the eastern coastal zone, from the Atchafalaya River to the St. Bernard Delta area.

The Grand Bayou phase can be expected to be marked by the presence of the so-called "terminal" Marksville ceramic tradition, characterized elsewhere by local analogs to Marksville Incised, *vars. Anglim* and *Vick*, and Marksville Stamped, *var Bayou Rouge*. Larto Red pottery is evident, as are late variants of Churupa Punctated, especially something similar to *var. Watson*. Rim modes include characteristic early Baytown thickened rim modes and rim and lip notching. Plain pottery consists of relatively thick, coarse grit-grog tempered plain pottery. This latter phenomenon, the use of very thick, coarse plain ware, may be diagnostic of the Grand Bayou phase, at least along Grand Bayou. Grand Bayou phase components have been identified at Bruly St. Martin, Shell Beach, Gibson Mounds, 16SC42, 16SC43, and 16SC45.

Des Allemands phase components can be identified in stratigraphically unmixed contexts, but will be difficult to separate from the early Coles Creek Bayou Cutler phase, largely because definitive criteria are harder to isolate (Giardino 1993). The Marksville Incised and Stamped tradition are no longer evident, but red filming continues. The addition of Woodville Zoned Red may be associated with early Weeden Island influences extending westward along the Gulf Coast (Belmont and Williams 1981:32-34). Early variants of French Fork Incised increase in frequency, although the specific relationship among varieties is still unknown. The so-called French Fork lug appears for the first time, and together with the decorated varieties indicates strong Weeden Island-like influences or even contacts. New types such as Evansville Punctated, and Hollyknowe Pinched, which is rare, also make their appearance at this time. Especially notable in this regard is the use of punctations in lines, and as a mode below the rim. The use of the "Six Mile" treatment may be one of the best and most consistent diagnostic hallmarks of the Des Allemands phase, although it certainly is continued into the Coles Creek period. It is possible that an early form of Pontchartrain Check Stamped might be found, although this type seems to be very rare and is only found in surface collections or mixed stratigraphic components. A characteristic of the Des Allemands phase is single- and possibly double-line examples of Coles Creek Incised, often with incision on thickened rims. Although these variants begin at this time, they carry on into the Coles Creek period and are not of and by themselves especially diagnostic. Early Mazique Incised variants are found for the first time, and are especially notable for the initial appearance of Mazique Incised, *var. Bruly*. Thick, coarse grit-grog tempered plainwares dominate collections, but sand added to the paste achieves a brief period of popularity.

Separating the Grand Bayou and Des Allemands phases in the Barataria Basin and elsewhere is only a first step in understanding the culture history and chronology of the coastal zone. Chronologically it appears that the separation suggested here is similar to that witnessed farther north. Grand Bayou is roughly contemporary with the Black River, Indian Bayou, and Little Sunflower phases of the Lower Red, Tensas, and Yazoo sequences, respectively. To the east the Graveline phase has been defined to account for the presence of polychrome painted pottery and other early Baytown period markers on the Mississippi Gulf Coast (Blitz and Mann 1993:24-25, 63-64, Table 7). The Des Allemands phase is temporally equivalent to the Fort Adams, Marsden, and Deasonville phases (Belmont 1984:Figure 3; Belmont and Williams 1981:Table 1). The Des Allemands phase may be partially coeval with the Graveline phase on the Gulf Coast to the east, although specific diagnostics are absent.

Both Grand Bayou and Des Allemands should be considered phases of the so-called "Coastal Troyville" culture. Although I do not especially like this term, it is regrettably ingrained in the literature and probably cannot be rooted out at this late date (Gibson 1984; Jeter and Williams 1989). Grand Bayou demonstrates ceramic affinities to phases up the Mississippi River, especially the Troyville culture phases at Greenhouse and in the Tensas Basin. Grand Bayou is not the same culturally as the Troyville peoples living in the Mississippi River Valley proper, however. Absent on the coast are the distinctive site plans, site hierarchies, burial mounds and mortuary patterns, and total ceramic repertoire. This "Coastal Troyville" culture seems to represent an egalitarian hunting and gathering society widely distributed across the habitable parts of the coastal zone (Giardino 1993). Although farther north and to the east contemporary groups constructed mounds and earthen platforms (Blitz and Mann 1993; Kidder and Wells n.d.), there is not certain data to substantiate this practice in the Delta. No burial sites dating to the Grand Bayou phase have been isolated, but there is no reason to suspect the presence of burial mounds similar to those found at the Troyville, Indian Bayou, Gold Mine, or Reno Brake sites (Belmont 1984; Kidder and Wells n.d.).

In contrast with the Grand Bayou phase, the Des Allemands phase peoples seem to have a more eastern orientation (Giardino 1993). It is at this time that we see the beginnings of what appears to be relatively intensive interaction with Weeden Island or Weeden Island-related groups along the eastern Gulf Coast. Although these external connections are notable, it is important that we encourage a view that the peoples of the Louisiana coastal zone were developing their own unique adaptation to the delta environment of the Mississippi River. Des Allemands phase ceramics mirror a broad trend in Lower Valley prehistory marking the origins of later Coles Creek patterns. This is especially true of the onset of incising lines both parallel and oblique to the rim. Check Stamping may have its beginning at this time in the Louisiana coastal zone, although the concept has earlier roots to the east and does not become prevalent until later (Brown 1982).

Although pottery styles change in the Delta, little else seems to differ when compared to earlier occupations.

Because the data become more dense at this time, we can note with some certainty that the coastal pattern of intensive exploitation of fish, deer, and muskrat is in place by the end of the Baytown period. Shellfish harvesting or exploitation continues, but little evidence for settlement differentiation exists at present. Although others have hypothesized a pattern of seasonal movement between villages and collecting stations or camps (Weinstein and Kelley 1992), we have no firm evidence for this behavior. The data from Pump Canal hint at a series of relatively brief occupations, and the *Rangia* seasonality data indicates a late Spring to early Summer occupation. Perhaps at this time populations living in the Barataria were making seasonal trips to the distal ends of distributary courses to hunt, fish, and exploit the *Rangia* beds in the nearby brackish water environments. If this was a part of a seasonal round that involved living in larger, more established villages, such sites have not yet been found. Possibly Bruly St. Martin, located well into the interior of the Barataria Basin, might qualify for such a village location.

Given our limited data, it is difficult to establish any socio-political pattern with confidence. It appears that the Des Allemands phase peoples were egalitarian hunter gatherers. Research at the Gibson Mounds indicates that part of Mound C may have been built at this time, but the data are too equivocal to make a firm determination at present (Weinstein et al. 1978). Otherwise, no mounds appear to have been built at this time, and no strong site hierarchy can be identified. Site differentiation may exist, but what evidence there is indicates that site function plays the determining role in the size and nature of the site occupation.

Coles Creek Period (ca. A.D. 700-1200)

The advent of the Coles Creek period in the Louisiana coastal zone is marked by changes in ceramic frequencies and, to a lesser extent, by the appearance of new types or varieties and the disappearance of others. More fundamental patterns of economic and social behavior change too, but at a seemingly slower rate. Unlike previous periods, Coles Creek is well known, at least from a ceramic point of view. In the Lower Mississippi Valley, Coles Creek has been divided into early, middle, and late phases (Phillips 1970; Williams and Brain 1983). More recently, however, a fourth, usually "transitional" Coles Creek (or in some cases early

Plaquemine) phase has been added (Brown 1985; Kidder 1994; Weinstein 1987).

The archeological record of south Louisiana is sufficiently detailed so that the Coles Creek period is divided both into temporal phases and spatially discrete geographic areas. In the coastal zone, there are at least three geographic areas with two Coles Creek phases each. Only recently has a third, transitional phases been proposed for these geographic areas (Brown 1984; Weinstein 1987). In the western Chenier Plain the three phases are (from earliest to latest), Welsh, Jeff Davis, and Holly Beach (Weinstein 1987:Figure 1). The Coles Creek sequence in the central coastal area has been defined largely by Ian Brown based on research conducted on and around Avery Island. The central area, or Petit Anse, sequence consists of three phases, White Lake, Morgan, and Three Bayou (Brown 1981, 1982, 1984, 1988; Brown et al. 1979; Fuller and Fuller 1987; Weinstein 1987). In the eastern portion of the coastal zone, from roughly the Atchafalaya eastward to the St. Bernard marshes, the Coles Creek sequence is defined to include the Bayou Cutler, Bayou Ramos, and St. Gabriel phases (Weinstein 1987). It is this last group of phases that are of concern to this discussion.

The Bayou Cutler phase was initially described by Kniffen (1936) as the Bayou Cutler complex, named for the site type in the Barataria Basin (Gagliano et al. 1979). Ford and Quimby (1945:18), and later McIntire (1958:77) recognized Bayou Cutler "type" ceramics from the eastern coastal area and correlated them with Troyville-Coles Creek period ceramics from the Mississippi Valley. Phillips (1970:920-922) preferred to place Bayou Cutler as a phase "mostly if not entirely **within** the Coles Creek period" (1970:921, emphasis in original). Based on Kniffen's initial formulation and using McIntire's data, Phillips defined Bayou Cutler as containing the types Pontchartrain Check Stamped, Coles Creek Incised, French Fork Incised, Mazique Incised, Chevalier Stamped, Beldeau Incised, Chase Incised, Rhinehart Punctated, and "Coles Creek rims" (1970:921). Phillips further "made a reasonably serious effort to subdivide the phase" (1970:922), but he found "the concept of Bayou Cutler is frail enough without overloading it with such refinements (1970:922). Like Whitehall, then, Bayou Cutler stood as the only phase of the Coles Creek culture in coastal Louisiana, encompassing both great temporal depth and significant spatial dimension.

In the late 1970s, a new phase, encompassing the later half of the existing Bayou Cutler phase, was created to reduce its temporal extent (Weinstein et al. 1978:22-23).

The new phase, named Bayou Ramos, was the equivalent of Bayou Cutler "in the latter half of the Coles Creek period." Bayou Cutler was retained for the early half of the Coles Creek period, and was still "too broad geographically" (Weinstein et al. 1978:23). Bayou Ramos suffered this same problem. According to the new definition, Bayou Cutler could be identified by the presence of Coles Creek Incised, *vars. Coles Creek*, *Campbellesville*, *Chase*, and *Wade*, Mazique Incised, *var. Mazique*, Chevalier Stamped, *var. Chevalier*, Evansville Punctated, *var. Rhinehart*, and Pontchartrain Check Stamped, var. *Pontchartrain*. French Fork Incised was also included in this definition, although varieties were not specified; most though were thought to date to the early Coles Creek period (Weinstein et al. 1978:23).

The Bayou Ramos phase ceramics included Avoyelles Punctated, *var. Avoyelles*, Beldeau Incised, *var. Beldeau*, Coles Creek Incised, var. *Mott*, Mazique Incised, *var. Kings Point*, and Pontchartrain Check Stamped, *var. Pontchartrain*. This last variety was thought to decline in frequency during the late Coles Creek period (Weinstein et al. 1978:23, 99-100), a fact not substantiated by later research on the Louisiana coast (Brown 1982:31-37, Figure 25). "Certain varieties" of French Fork Incised were found at this time, but evidently in declining frequencies and with lesser elaboration (Weinstein et al. 1978:23).

The Bayou Ramos phase was defined partially on the basis of excavations at the Bayou Ramos I site (16SMY133), which yielded radiocarbon dates of 970 ± 50 and 1215 ± 70 B.P. (Weinstein et al. 1978:91). The two dates were stratigraphically reversed, with the earlier date coming from a higher level. The Bayou Ramos I site excavations also yielded very small decorated pottery samples, which further complicates the picture of later Coles Creek prehistory in the coastal zone. Subsequent to the definition of the Bayou Ramos phase, excavations at the Morgan site in the Petit Anse region yielded a large number of dates for the later Coles Creek period in the central coastal area, and allowed for the formulation of a separate culture historical sequence in that region (Brown 1984, 1988; Fuller and Fuller 1987). The Morgan site data helped to pin down the ambiguous Bayou Ramos chronology, and more critically strengthened the definition of Bayou Ramos by restricting its spatial extent.

At Pump Canal, the culture historical position of the Coles Creek deposits is reasonably well defined (Giardino 1993). The stratigraphic position of the Coles Creek deposits is Stratum E in the 1990-1991 excavations, and levels C and D in the LAS excavations of 1979-1983. In both instances these deposits can be assigned to the Bayou Cutler phase, although ceramics in the upper portions of these levels appear to anticipate a Bayou Ramos-like assemblage (Giardino 1993).

The Coles Creek ceramics from the lower levels of Stratum E (lower) and levels D and Cb (below hearth) contain a number of sherds generally taken as Bayou Cutler phase diagnostics. These include Avoyelles Punctated, *var. Avoyelles*, Coles Creek Incised, *vars. Coles Creek*, *Hunt*, and *Athanasio*, Evansville Punctated, *vars. Evansville* and *Rhinehart*, French Fork Incised, *vars. Laborde* and *Larkin*, and Pontchartrain Check Stamped, *vars. Lambert Ridge* and *Pontchartrain*. Earlier varieties extend into these deposits, and include Mazique Incised, *var. Bruly*, and rare examples of the "Six Mile" rim treatment.

The "Onion Lake" and "Lone Oak" modes are also found, with the "Lone Oak" form predominating (this appears to be Kniffen's [1936:Plate XIV, Nos. 1-3] "Coles Creek" rim). The plain pottery from these lower Coles Creek levels is relatively thick and coarsely tempered, but it is not nearly as thick or crude in appearance as the wares in the Des Allemands phase strata. Sand as an obvious addition to the temper of pottery disappears at this time. These early Coles Creek levels are also notable for the presence of a relatively large number of miniature vessel fragments.

The ceramics from the middle portion of Stratum E appear to represent a continuum from the lower Coles Creek deposits, with the addition of a few new varieties which are generally seen as "later" forms (Giardino 1993). Rare examples of Beldeau Incised, *var. Beldeau*, Coles Creek Incised, *vars. Blakely* and *Mott*, French Fork Incised, *var. McNutt*, and Mazique Incised, *vars. Barataria* and *Kings Point* are found in both Stratum E (Middle) and E (Upper). Although these sherds appear in Stratum E for the first time in the Middle level, they neither constitute a large percentage of the decorated pottery, nor do they become significantly more common in Stratum E (Upper).

A notable pattern in the Stratum E deposits is an increase in the frequency of Pontchartrain Check Stamped, *var. Pontchartrain*. This variety reaches its greatest frequency in Stratum E (Middle) and declines thereafter. On the other hand, Pontchartrain Check Stamped, *var. Lambert Ridge* begins to decline in frequency in Stratum E (Middle), while *var. Tiger Island* appears for the first time. Other new additions to the ceramic repertoire include "jab and drag" punctations, frequently found on rims or in bands parallel to the rim. Evansville Punctated, *var. Duck Lake*

The "Lone Oak" rim mode appears to decline slightly in popularity, and the "Machias" rim appears for the first time, albeit very rarely. The "Onion Lake" mode is relatively common, and the "Pump Canal" rim achieves its greatest frequency at this time. Plain pottery tends to be moderately thick and crude, although some sherds are well made and on occasion polished surfaces appear. Plain pottery from the middle and lower levels of Stratum E is essentially indistinguishable when compared between levels.

The pottery in Stratum E (Upper) continues the trends seen in early levels of this provenience. As in previous levels, Pontchartrain Check Stamped, *var. Pontchartrain* is the most dominant variety, although its frequency is diminished from Stratum E (Middle). Pontchartrain Check Stamped, *var. Lambert Ridge* continues in small numbers, and *var. Tiger Island* is slightly more common. Coles Creek Incised pottery is also prevalent in this level, with *vars. Coles Creek*, *Athanasio*, and *Blakely* recovered in modest amounts. Ten sherds of an unspecified Coles Creek Incised variety similar to *Hunt* were found, as were seven sherds with *Hardy*-like designs executed on a Baytown Plain paste. Other well represented styles include Evansville Punctated, *vars. Duck Lake*, *Evansville*, *Rhinehart*, and *unspecified*, French Fork Incised, *vars. Laborde*, *Lakin*, and *McNutt*, and Mazique Incised, *var. Mazique*.

Unlike earlier levels, interior incising was relatively common in Stratum E (Upper) and has been assigned to the type Anna Incised, *var. unspecified*, even though these sherds are found on a Baytown Plain paste. Linear punctation (Evansville Punctated, *var. Duck Lake*) is present, but not especially common, and "jab and drag" incisions are less common than in earlier levels of Stratum E. "Lone Oak" rims continue to decline in frequency, as does the "Machias" rim. "Onion Lake" and "Rolled" rim forms are popular, but the "Pump Canal" rim shows a sudden and seemingly drastic decline in frequency. Plain pottery is still largely crudely made, relatively thick, and coarsely tempered. The plain wares in this level, however, are qualitatively better made than in the earlier levels of this stratum, with less tendency to be contorted, and they seem a bit harder and better fired. These differences are not quantifiable, though, and we cannot place too much reliance on these differences.

The Coles Creek ceramics from Pump Canal are assigned to the Bayou Cutler phase of the Coles Creek period, although it appears that the assemblage in Stratum E (Upper) may approach that defined for Bayou Ramos (Giardino 1993).

Our difficulty in positively attributing the entire Stratum E deposits to the Bayou Cutler phase emphasizes the continuity of coastal zone Coles Creek culture through time. The Pump Canal Coles Creek assemblage shows a general pattern of gradual change through time. The most notable aspect of shifts in the ceramic assemblage is seen in the rise and decline in the frequency of Pontchartrain Check Stamped, *var. Pontchartrain*, through time. Furthermore, certain rim modes, notably the "Lone Oak," "Machias," and "Pump Canal" forms rise and fall in these deposits. Changes in the composition of the assemblage are noted, but the degree of change is not especially pronounced and seems to suggest strong continuity (Giardino 1993).

Contemporary Bayou Cutler phase components are abundant in coastal Louisiana, although few excavated assemblages have been isolated. The Mulatto Bayou site (16SB12) in St. Bernard Parish appears to have a Bayou Cutler occupation, although the site was badly disturbed (Wiseman et al. 1979). The ceramics from Mulatto Bayou are generally similar to those found in Stratum E at Pump Canal. The "Lone Oak" and "Machias" rims were especially prevalent, as were sherds of Coles Creek Incised, *vars. Athanasio*, and *Coles Creek*. Coles Creek Incised, *vars. Campbellesville*, *Hardy*, and *Mott* were also found at the site, but were less common (Wiseman et al. 1979:Table 7-1). French Fork Incised, *vars. Brashear*, *French Fork*, *Laborde*, *Lafayette*, *Larkin*, and *unspecified* comprised almost seven percent of the decorated ceramics in the surface collections. Mazique Incised, *var. Mazique* was the dominant variety of this type, but examples of *vars. Bruly*, *Manchac*, and *Kings Point* were also found. Pontchartrain Check Stamped, *var. Pontchartrain* made up 33% of the decorated pottery, while *var. Tiger Island* comprised only 0.4%. Additional ceramics attributed to the Bayou Cutler phase occupation at Mulatto Bayou include Beldeau Incised, *vars. Beldeau* and *Treadway*, Chevalier Stamped, *var. unspecified*, and Evansville Punctated, *vars. Rhinehart* and *unspecified* (Wiseman et al. 1979:Table 7-1).

The strong showing of Coles Creek Incised varieties (many associated with the "Lone Oak" rim mode), coupled with the presence of large amounts of French Fork Incised and low frequencies of *Pontchartrain*, suggests that Mulatto Bayou represents an early aspect of the Bayou Cutler phase, probably coeval with the Pump Canal ceramics in Stratum E (Lower) and E (Middle). Sherds of *Hardy*, *Manchac*, and *Harrison Bayou* may not be associated with the Bayou Cutler occupation but in fact with a later Barataria or Bayou Petre phase component found in the surface collections (Wiseman et al. 1979:7.26-7.27, Table 7-1). A radiocarbon date obtained from charcoal fragments from an earth midden deposit yielded a determination of 1055 ± 120 B.P. (UGa-2632), or cal AD 988. This date is somewhat later than expected for the Bayou Cutler phase, although the estimated age range of this sample clearly overlaps with the projected dating of this phase (Table 42).

It appears that there is also a Bayou Cutler or Bayou Cutler-like occupation at Bruly St. Martin (Springer 1973). Here too the occupation appears to be early in the Coles Creek sequence, at least based on the relative frequencies of various types (Springer 1973:Figure 19). No stratigraphically distinct Coles Creek levels could be distinguished, however (Springer 1973, 1976). Bayou Cutler phase (or Bayou Cutler *complex* [Kniffen 1936, Mcintire 1958]) assemblages are common in the eastern deltaic portion of the coastal zone (Gagliano et al. 1979:Plate 4.3; McIntire 1958:Plates 6a-b, 7a-b; Wiseman et al. 1979:Figure 6-9).

South and east of the Pump Canal site, a dense concentration of early Coles Creek period Bayou Cutler phase communities arose along Bayou Barataria around and near its junction with Bayou Villars. This complex of sites includes the Flemming (16JE36), Isle Bonne (16JE60), Bayou Des Oies (16JE35), Tom Smith (16JE93), and the Bayou Dupont-Dupree Cut (16JE91) sites. Farther south on Bayou Barataria are the Bayou Cutler I (16JE3) and Chenier St. Dennis (16JE2) sites (Gagliano et al. 1979:Plate 4-3). Most of these sites support later, Barataria phase occupations, and some appear to have Bayou Ramos phase components as well.

Elsewhere in the coastal zone, Bayou Cutler phase components are well represented in the Terrebonne marsh area. The Gibson site evidently supported a significant Bayou Cutler phase occupation, and it is possible that Mound C (or at least part of Mound C) was constructed at this time (Weinstein et al. 1978). Ceramics attributed to this phase at Gibson include Coles Creek Incised, *vars. Athanasio, Campbellesville*, and *Coles Creek*, Evansville Punctated, *var. Rhinehart*, French Fork Incised, *vars. Brashear, French Fork, Larkin*, and *Lafayette*, Mazique Incised, *var. Mazique*, and Pontchartrain Check Stamped, *vars. Pontchartrain* and *Tiger Island*. Rare sherds of Avoyelles Punctated, *var. Avoyelles*, and Beldeau Incised, *var. Beldeau* were also recovered and can probably be attributed to this phase (Weinstein et al. 1978:178-191, Tables 31-34, Figures 65-66). The radiocarbon date from Mound C is on the later end of the Bayou Cutler range, but is not unreasonable for the estimated age span (Table 42).

Excavations in test pit 1 at the Thibodaux site (16AS35) yielded an early Coles Creek period date (1070 ± 55 BP [UGa-1743]) associated with plain pottery identified as Addis Plain, *var. unspecified*, and four unclassified decorated sherds (Weinstein et al. 1978:40). The Goat Island site (16SMY1) is thought to be a Bayou Cutler phase village, although radiocarbon dates associated with unclassified plain pottery appear to date to late Coles Creek or even Plaquemine occupations (Weinstein and Kelley 1992; Weinstein 1987). Bayou Cutler phase components are scattered throughout much of the Terrebonne marsh, including coastal or near coastal contexts (Weinstein and Kelley 1992:Plate 7).

Farther west, Ian Brown has defined the White Lake phase to encompass the early Coles Creek components in the Petit Anse region (Brown 1984). White Lake is separated from the later Coles Creek Morgan phase by slight shifts in ceramic frequencies, largely involving minor changes among varieties of Pontchartrain Check Stamped (Brown 1984, 1988; Fuller and Fuller 1987). These Coles Creek phases are largely defined from excavated contexts at the Morgan site (16VM9). Morgan is a large Coles Creek period mound complex, and much of the material used for defining the Coles Creek phases comes from mound and mound slope contexts (Brown 1981, 1984; Fuller and Fuller 1987). The ceramics from these contexts may be different in important ways from pottery collected from less complex settlements. In fact, investigations in the submound midden at Morgan revealed a very different ceramic assemblage (in terms of the frequency of decorated types and varieties) than was found in the mound (Brown 1988, Fuller and Fuller 1987). The radiocarbon dates from the submound and mound contexts overlap in such a manner as to suggest that the ceramic differences cannot wholly be attributed to temporal factors (Brown 1988; Fuller and Fuller 1987:54-56, Table 2).

Diagnostic ceramics of the White Lake phase include Coles Creek Incised, *var. Athanasio*, French Fork Incised, *var. Lafayette*, Mazique Incised, *var. Sweet Bay*, and Pontchartrain Check Stamped, *vars. Pontchartrain*, *Crawford Point*, *Fire Island*, and *Tiger Island* (Brown 1984, 1988). Other types and varieties which have a "minor representation" include Coles Creek Incised, *vars. Dozier* and *Pecan*, Evansville Punctated, *var. Rhinehart*, Gainesville Complicated Stamped, *vars. Lost Island* and *Wauchope*, Larto Red, *var. Vaughan*, Mazique Incised, *vars. Mazique*, *Back Ridge*, and *Kings Point*, Morgan White, *var. Morgan*, and Pontchartrain Check Stamped, *vars. Lambert Ridge* and *Tabasciana* (Brown 1984, 1988). Most of these types and varieties carry into the succeeding late Coles Creek Morgan phase (Brown 1988).

In the Morgan phase, however, there are some differences in the frequency in which some varieties appear, and a few new varieties appear for the first time. Excavations at the Morgan site demonstrate that Evansville Punctated, *var. Rhinehart* increases in popularity, as does Mazique Incised, *var. Kings Point*, and Morgan White, *var. Morgan*. Pontchartrain Check Stamped, *var. Fire Island*, though, is reduced to a minor element of the ceramic assemblage. Several new varieties appear for the first time in the Morgan phase, including Coles Creek Incised, *vars. Blakely* and *Mott*, and Mazique Incised, *var. Manchac*. Only two varieties disappear completely, Gainesville Complicated Stamped, *var. Lost Ridge*, and Mazique Incised, *var. Back Ridge* (Brown 1988; Fuller and Fuller 1987).

The White lake phase is essentially contemporary with Bayou Cutler, and the distribution of ceramic types and varieties at Morgan essentially mirrors that found in Stratum E at Pump Canal. There are some expectable differences between the ceramics from Morgan and those at the Pump Canal site. At Pump Canal there is a tendency for some of the "later" Coles Creek markers to appear in the middle and upper portions of Stratum E, but their quantity is minimal, and they occur in contexts with Bayou Cutler diagnostics (Giardino 1993). A possibility exists that part of Stratum E is disturbed or that later sherds were intruded into the stratum as a result of post holes or other features. This does not seem to be indicated, however, by the stratigraphy, which suggests that these Coles Creek levels were largely uncontaminated. The evidence from Pump Canal does show, however, that there is a temporal pattern to the ceramic changes, and the deposits in Stratum E seem to demonstrate a gradual shift towards what we might expect from a Bayou Ramos phase late Coles Creek assemblage (Giardino 1993). This may be especially well marked by the slight reduction in Pontchartrain Check Stamped, *var. Pontchartrain* in the upper part of Stratum E, as well as the appearance of Beldeau Incised, *var. Beldeau*, Coles Creek Incised, *var. Blakely*, and French Fork Incised, *var. McNutt*.

Although the ceramics can be taken to suggest the trend towards a later Coles Creek period occupation in the upper part of Stratum E, the radiocarbon dates support the notion that this stratum dates to the Bayou Cutler phase. Of the three dates obtained from this stratum, only one (Beta-52648) has a midpoint dating later than the traditional starting point for the Bayou Cutler phase (A.D. 750 [Weinstein 1987:Figure 1]). At two standard deviations, only two of the dates place stratum E in the Bayou Cutler phase age-range, and one (Beta-52649) does not even reach up to A.D. 700. The later of the two wood dates from Feature 2 in Stratum G encompasses part of the predicted dating of Bayou Cutler at two standard deviations, as does the shell date from Stratum I (Beta-52651) (Figure 49, Table 42). These later two dates can be better accounted for by including them in the earlier Des Allemands phase, as is suggested by the ceramics associated with these strata.

The radiocarbon dates and the ceramics from the Pump Canal site indicate that there is a significant hiatus in occupation spanning what is traditionally recognized as the late Coles Creek Bayou Ramos phase (cf. Giardino 1993). Although this phase is perhaps poorly understood in the eastern coastal zone, it is difficult to believe that an occupation dating to this interval is present but unrecognized. I believe that in fact there is no Bayou Ramos phase component at Pump Canal. A possible explanation for this hiatus in occupation is evident when examining the archeological data from nearby sites in the Barataria Basin. At the Bowie site (16LF17) the occupation is largely confined to the Bayou Ramos, Barataria, and Delta Natchezan phases. In the lower levels of this site, Pontchartrain Check Stamped is found at roughly the same frequency as in the upper part of Stratum E at Pump Canal, but it declines in popularity through time. Similarly, the lower levels at Bowie include greater quantities of later diagnostics than are found at Pump Canal, including Beldeau Incised, *var. Beldeau*, Coles Creek Incised, *vars. Blakely*, *Greenhouse*, *Hardy*, and *Mott*, Evansville Punctated, *var. Rhinehart*, Larto Red, *var. Vaughan*, and Mazique Incised, *vars. Kings Point* and *Manchac*. Avoyelles Punctated, *var. unspecified*, and French Fork Incised, *var. unspecified* are also present in small amounts (Jackson 1977:Figures 7-8). A similar component may be present at the nearby Sims site (16SC2), although the exact chronology is not fully established for the Coles Creek period deposits (Davis 1981; Davis and Giardino 1980).

Elsewhere in the Barataria Basin, late Coles Creek occupations are confined either to the more interior portions of the basin, especially along more recent distributary channels (such as Bowie), or on the edges of crevasse distributary fans (for example, Sims and Vachierie [16SJ2]). Surveys in the Gheens crevasse area indicate that later Coles Creek components are common along the distributary channels west of Lake Salvador (Hunter et al. 1988; Pearson et al. 1989). These sites, however, are generally small and are most frequently associated with shell middens. Similarly, investigations along the lower courses of Bayou Barataria indicates that most later Coles Creek sites were concentrated on the levees of Bayou Barataria, and that very few initial occupation sites dating to this interval exist outside of the stable and established water courses (Gagliano et al. 1979: Plate 4-3). Major occupations appear at the Flemming and Isle Bonne sites at the confluence of bayous Barataria and Villars, and these sites appear to be the major Bayou Ramos phase occupations in the lower Barataria region. To the east in the St. Bernard marshes, Coles Creek occupations are common, but have not been broken down by phase of occupation (Wiseman et al. 1979:Figure 6-9). The so-called "continuing occupation" sites of this period (which presumably date, at least in part, to the Bayou Ramos phase) are scattered throughout the area, with a major concentration on the levees of the La Loutre course (Wiseman et al. 1979:Figure 6-9).

Although further research will be necessary, I believe that a tentative pattern can be established which indicates that significant late Coles Creek period village type settlements in the Barataria were being established in geologically stable situations, either on the banks of major distributaries or along crevasse distributary flanks. Pump Canal, located at or near the distal end of a relatively old distributary, would no longer be a prime location in the later Coles Creek period, presumably due to continued subsidence and associated environmental degradation. Occupation of less stable land surfaces, or distal ends of tributaries may have been untenable, or, more likely, was only possible on a temporary or seasonal basis. The occupation hiatus at Pump Canal should be no particular surprise in fact. By the end of the Bayou Cutler phase, the distributaries of the Bayou Cypriere Longue distributary system were reaching the end of their natural cycle as predicted by human geographers and anthropologists (Gagliano 1984). Subsequent components at the site dating to the transitional Coles Creek and later Mississippi periods appear to represent less intensive occupations, perhaps reflecting the hypothetically more transient nature of human land use. There is no adequate explanation for the nearly total (or perhaps fully complete) hiatus in occupation at Pump Canal during the Bayou Ramos phase. Perhaps the movement of the Mississippi River out of the Lafourche course and into its essentially modern channel was causally related to the low intensity of late Coles Creek period occupation in the southern and central parts of the Barataria Basin.

The archeological record from the Pump Canal site indicates that the site was most intensively occupied during the Bayou Cutler phase of the Coles Creek period (Giardino

1993). The deposits forming Stratum E were the deepest vertically, and yielded the greatest quantity and diversity of artifactual material. Analysis of *Rangia* shell seasonality indicators suggest a late Spring or Summer occupation, although these data need to be examined with some care (see Chapter 15). The faunal assemblage from Stratum E demonstrates a decline in the biomass contribution of fish and a concomitant rise in the importance of mammals from Stratum E (Lower) to Stratum E (Upper). Fish generally increase in size in the upper part of Stratum E, and muskrat assume their greatest importance in the diet.

Although these data are subject to differing interpretations, it is possible that they reflect further on the notion that the Pump Canal site environment was gradually changing as the distal ends of the Bayou Cypriere Longue system subsided. The changes in the composition and size of the fish fauna may indicate changes in habitat within the local waterways, perhaps as they became increasingly sluggish and more turbid. The heavy emphasis on muskrat and an actual decline in deer may indicate an increasing emphasis on marsh habitats. The subsidence of the levees of the Bayou Cypriere Longue system may have decreased the availability of deer, or it may have made them more difficult to pursue and capture.

The settlement patterns of the Coles Creek period are not well understood at this time. There is a general sense that populations were organized into a relatively loosely arranged hierarchy of site types. The best defined model comes from the Terrebonne marsh area west of the Barataria Basin. Here, Weinstein and Kelley (1992) hypothesize a pattern of major mound sites, satellite villages, and seasonal camps or shellfishing stations. The mound sites consisted of one or more earthen mounds, presumably supporting the structures of elite chiefs and/or priests. They suggest that the Gibson Mounds may have served as the major Coles Creek period mound center in this area, although the precise chronology of all of the mounds is as yet undetermined. Most, if not all of Mound C at Gibson Mounds appears to have been constructed during the Bayou Cutler phase. Smaller village sites are found along stable levee segments, usually at the junction of one or more tributaries. These settlements may be year-round occupations, although Weinstein and Kelley (1992:Chapter 8) subscribe to the notion that part of the subsistence cycle involved seasonal movement into the marshes and towards the coast. These seasonal movements may have been oriented towards exploiting shellfish and other coastal or marsh resources. There are no data to support their hypothesized seasonal pattern of movement, however.

In the Petit Anse region of central coastal Louisiana, excavations at the Morgan site demonstrate unequivocally that mound building was taking place during the later part of the Coles Creek period. Radiocarbon dates from Mound 1 show that the construction occurred over a relatively brief period of time (Brown 1988; Fuller and Fuller 1987). Mound 1 supported a circular structure with a central hearth. Numerous post molds and overlapping hearth remains indicate that this building was rebuilt and reused over a lengthy period of time (Fuller and Fuller 1987). Data from the Petit Anse region as a whole indicates that Coles Creek period sites were widely distributed across all landforms, and were common in the marshes (Brown 1984, 1988). Excavations at the Onion Lake site (16VM17) revealed a possible circular house feature in a *Rangia* shell midden feature (Brown 1984, 1988; Brown et al. 1979:116-119). Ian Brown has noted a number of these features in the Petit Anse region and elsewhere on the coast and suggests that they may be a common form of habitation for these marsh sites. We still do not know, however, if these sites situated in the marshes were seasonal or year-round occupations.

In the Barataria Basin, the archeological data are not adequate to fully address the nature of settlement and social organization. Excavations at the Flemming and Isle Bonne sites indicates that Coles Creek period occupations comprise a considerable portion of the vertical extent of these occupations (Holley and DeMarcay 1977). At Flemming, Coles Creek deposits underlay later Mississippi period components, but it is not clear if the mound was constructed at this time (Holley and DeMarcay 1977; Manuel 1984). A radiocarbon date (UGa-1084; 1095 ± 60 B.P.) from level 10 of Unit 7 at the Flemming site yielded a date of cal. A.D. 964, with a calibrated age range of A.D. 792-1024 (at two standard deviations). A maize cob was recovered from a similar level in Unit 12, which was only a couple of meters away from Unit 7 (Holley and DeMarcay 1977). Along with the Bayou Villars site and Isle Bonne sites, Flemming makes up one of the major "Barataria Complex" occupations (Gagliano et al. 1979; Holley and DeMarcay 1977). This locality is presumed to be the major center for Coles Creek and Mississippi period settlement in the lower part of the Barataria Basin. All three of these sites supported earthen or shell mounds, although none can be confidently assigned to the Coles Creek period (Gagliano et al. 1979).

North of Pump Canal there were significant Coles Creek occupations at both Sims and Bowie, and numerous Coles Creek period occupations are scattered across most landforms (Hunter et al. 1988; Pearson et al. 1989). Sims and Bowie are presumed to be major villages, but little evidence exists to confirm this hypothesis. To the east of Pump Canal there appears to have been a Coles Creek period occupation at the Coquilles site (16JE37), although the data for this attribution are unclear (Giardino n.d.). Based on the settlement data from surrounding areas, combined with the artifact assemblage, richness, and diversity, Pump Canal can be hypothesized to be an important village occupation during the Coles Creek period (Giardino 1993). The site may not have been occupied year-round, but it clearly supported a relatively large population and may have been an important locality serving as a "base camp" for exploiting the resources of the surrounding marshes and lakes. As the Bayou Cypriere Longue system deteriorated over time the nature of the site function appears to have changed, such that during the later Coles Creek period, the site was abandoned or only sporadically occupied. During subsequent occupations the site seems to have served as a temporary or perhaps seasonal camp site.

Transitional Coles Creek/Plaquemine

The transition from the Coles Creek to Plaquemine culture has never been well defined in the Lower Mississippi Valley. In most culture historical reconstructions, this event (or these events) took place abruptly at ca. A.D. 1000, and are assumed to be causally related to the diffusion of Mississippian culture traits from farther north or east (Phillips 1970; Williams and Brain 1983). Recent work suggests a far more complex picture, with a longer period of transition occurring over the period ca. A.D. 1000-1200 (Kidder 1994; Weinstein 1987). The emergence of Plaquemine came not from an intrusion of Mississippian elements, but rather from a slow *in situ* series of changes in local cultures across the Mississippi Valley and the coastal zone. In recognition of the gradual evolutionary pattern witnessed in the region, archeologists have adopted the term Transitional Coles Creek/Plaquemine to identify this interval. In the coastal zone, the best discussion of this period is by Weinstein in his 1987 synthesis of the late prehistory of the delta and coastal zone.

Weinstein recognized a series of very late Coles Creek or early Plaquemine occupations which tended to manifest characteristics of both Coles Creek and Plaquemine ceramics (1987:87-93). In the western coastal zone, this period was associated with the Holly Beach phase (Weinstein 1987:Figure 1). The identification of this phase represents the "first tentative step in defining a transitional Coles Creek phase for extreme southwestern Louisiana" (Weinstein 1987:91-93). This phase is marked by the use of late Coles Creek and early Plaquemine ceramics, including Coles Creek Incised, *var. Hardy*, Mazique Incised, *var. Manchac*, Evansville Punctated, *var. Wilkinson*, and "significant" amounts of Harrison Bayou Incised, *var. Harrison Bayou* and Pontchartrain Check Stamped (Weinstein 1987:93). Sites dating to this period stretch from the western end of Vermillion Bay in Louisiana across the Sabine River into coastal Texas, and into the interior up to roughly 50 km north of the coast.

In the Petit Anse, Brown (1982) designated this interval as the Three Bayou phase. Ceramics diagnostic of this phase included Plaquemine Brushed, *var. Plaquemine*, Pontchartrain Check Stamped, *var. Pontchartrain*, Mazique Incised, *var. Manchac*, Evansville Punctated, *var. Wilkinson*, Harrison Bayou Incised, *var. Harrison Bayou*, and Hollyknowe Pinched, *var. Patmos* (Brown et al. 1979:14-15). Avoyelles Punctated, *var. Dupree*, and Coles Creek Incised, *var. Hardy* may also be part of this ceramic assemblage but *Hardy* may date earlier (Brown et al. 1979:15, 155-156). Three Bayou phase sites are found throughout the Petit Anse, but are especially common on the salt domes and also on the chenier ridges in the western portion of Vermillion Bay (Brown et al. 1979:Figure 49). Brown et al. (1979:174, Figures 48-49) observe that there was an important shift away from the marshes between the later Coles Creek and Transitional Coles Creek/Plaquemine phases in this region. During the later Mississippi period, this emphasis on salt domes and chenier ridges became even more pronounced.

In the eastern section of the coastal zone, from the Atchafalaya eastward, Weinstein observed that the Transitional Coles Creek/Plaquemine occupations were best defined as an extension of the St. Gabriel phase, first defined by Brown (1985) based on excavations at the types site (Woodiel 1980). Excavations in the premound surface at St. Gabriel revealed a circular wall trench structure with ceramics and other material remains in good association. The pottery from this occupation surface included Addis Plain, Coles Creek Incised, *vars. Mott* and *Hardy*, Evansville Punctated, *var. Rhinehart*, Mazique Incised, *var. Manchac*, Plaquemine Brushed, *var. Plaquemine*, and Pontchartrain Check Stamped. Radiocarbon dates from this structure place the occupation between ca. cal. A.D. 950-1250 (Kidder 1992:22-23; Woodiel 1980:Table 19). Additional St. Gabriel phase occupations were noted at the nearby Bayou Goula and Medora sites (Weinstein 1987:90, Figure 2), and also at the Kleinpeter site near Baton Rouge (D. Jones et al. 1993). In the coastal zone, St. Gabriel or contemporary occupations are found at Mulatto Bayou, Thibodaux (16AS35), and Bergeron School (16LF33) (Weinstein 1987:93, Figure 2). At

Thibodaux, a stratified excavation unit yielded a ceramic assemblage associated with a *Rangia* shell lens comprised of Addis Plain pottery with Mazique Incised, *var. Manchac* and Plaquemine Brushed, *var. Plaquemine*. A radiocarbon date from this shell layer came out at cal. A.D. 1026 (Weinstein 1987:93, Figure 7; Weinstein et al. 1978:43).

At Pump Canal, there appears to be a contemporary occupation dating to the St. Gabriel phase (cf. Giardino 1993). The ceramics indicative of this component are found in strata C and especially D of the 1990-1991 excavations, and levels A, B, C, and Ca in the LAS excavations. In both excavations, however, the deposits appear to be mixed with earlier and later materials, and it does not appear that there is any intact or undisturbed Transitional Coles Creek/Plaquemine occupation at the site (Giardino 1993).

The ceramics presumably indicative of this occupation are Baytown Plain, *var. Addis*, Coles Creek Incised, *var. Hardy*, Evansville Punctated, *var. Sharkey*, and Harrison Bayou Incised, *var. Harrison Bayou*. Other types and varieties which may belong in this assemblage would include Avoyelles Punctated, *var. Tatum*, Coles Creek Incised, *var. Mott*, Mazique Incised, *var. Manchac*, Plaquemine Brushed, *var. Plaquemine*, and Pontchartrain Check Stamped. Sherds of Anna Incised and L'Eau Noire Incised may also belong in this assemblage, or may date later (Giardino 1993).

In both excavations, the upper levels of the site were essentially hopelessly disturbed, at least if the ceramics are any guide. Pottery that is clearly situated in the Bayou Cutler phase is found in association with shell tempered Mississippian types, and virtually every type and variety is represented in these strata (Giardino 1993). The radiocarbon dates obtained from these deposits is therefore not likely to be an especially sensitive determinant of the cultural context of the ceramics. The radiocarbon date on shell from Stratum D in the 1990-1991 excavations was ca. A.D. 1285, with a two sigma age range of cal. A.D. 1264-1396. This is later than the conventional age span of the Transitional Coles Creek/Plaquemine interval in the Lower Mississippi Valley (Weinstein 1987:Figure 1). Similarly, one shell date from Stratum C in the 1990-1991 excavations yielded a midpoint of cal. A.D. 1230, with a two sigma age range of cal. A.D. 1154-1279, while two wood charcoal dates from the same level were cal. A.D. 1657 and 1679 to 1955 (Figure 49, Table 42). The shell dates from strata C and D are inverted, and in fact they barely overlap even at two standard deviations. Level C in the LAS excavations was dated to cal. A.D. 1405, with an age span at two standard deviations of cal. A.D. 1287-1447. Obviously this date too is later than can be reasonably expected for the Transitional Coles Creek/Plaquemine occupation, despite the relative abundance of markers indicating an occupation at this time.

In summary, the ceramic data from Pump Canal allow us to note the presence of a Transitional Coles Creek/Plaquemine occupation, but the stratigraphic context in which these sherds are found is badly mixed or disturbed (Giardino 1993). The quantity of pottery which can be certainly attributed to this occupation is relatively minimal, although the ceramic assemblage may be larger than we realize at this time (Giardino 1993). The quantity of ceramics appears to indicate that the site supported a relatively minor (perhaps seasonal cr transitory) occupation. We cannot tell how intensive this occupation may have been since the stratigraphic contexts are so badly disturbed. The fact that these contexts are clearly mixed makes it difficult to articulate any clear statement concerning settlement patterns or subsistence activities.

The available data from surrounding areas suggests that the Transitional Coles Creek/Plaquemine occupation of the Barataria Basin was largely unchanged from earlier Coles Creek times. The data from this region indicate that the major settlements continue to be located along Bayou Barataria or farther inland on the distributary channels of Bayou Lafourche or at the edges of large crevasse splays. The largest site of this time which is certainly known appears to be the Bowie site to the west of Pump Canal. Most of the pottery from the middle and upper stratigraphic contexts here dates to this interval (Jackson 1977). A contemporary component is also found at the nearby Sims site. The concentration of sites at the junction of bayous Barataria and Villars is the best candidate for a regional center in the Barataria Basin, but the precise chronology of these sites is still unknown. Data presented by Holley and DeMarcay (1977) leads me to suspect that a considerable part of the Flemming site deposits accumulated at this time.

Although Brown et al. (1979) note that important changes in settlement (and presumably subsistence) are initiated during transitional Coles Creek/Plaquemine times in the Petit Anse region, no such evidence is found in regions to the east. In the Terrebonne marshes the settlement pattern evidently continues unbroken from earlier times (Weinstein and Kelley 1992:353-355). The quantity and number of mounds constructed appears to increase through time, but how many date to this interval cannot be determined at present. A clear mound center and subsidiary village hierarchy developed during the Coles Creek period and probably continues into these transitional times. The Transitional Coles Creek/Plaquemine population of the coastal zone clearly needs considerable study before we can fully understand the processes leading up to and through the advent of the subsequent Plaquemine culture. It is evident, however, that the trend in the coastal zone is one of gradual and steady evolution within the region. External influences may be present, but they do not appear to be significant in terms of the process of cultural change. The origins of the Mississippi period cultures of the coastal zone seem to be wholly local. Later events, though, seem to suggest that this region, especially the Barataria Basin and the St. Bernard marshes to the east, witness a significant influence from Mississippian groups farther eastward along the coast.

Mississippi Period

The late prehistoric culture history and chronology of the eastern portion of the Louisiana coastal zone is not well understood at present (Jeter and Williams 1989:191). The data indicate that local Plaquemine populations in the region developed out of the Transitional Late Coles Creek/Plaquemine beginning at roughly A.D. 1200 (Jeter and Williams 1989:191-195, Figures 17-21; Weinstein 1987). At roughly the same time, however, Mississippian ceramics (and possibly peoples), identified with the Pensacola variant of Mississippian, enter into the area from the east, presumably via the Gulf Coast. Although these Mississippian ceramics tend to be found primarily in the easternmost part of the region, Mississippian Bayou Petre phase pottery is not wholly confined to this region (McIntire 1958:Plates 9a-9b). To further complicate the picture, there is increasing evidence that the late prehistoric populations in the Barataria Basin integrated some of the Mississippian designs and styles into the local ceramic repertoire (Davis and Giardino 1980).

Kniffen was first to recognize the complexity of the late prehistoric period. He established his Bayou Petre complex to account for the presence of shell tempering, and vessels with handles and/or nodes or lugs on the rim (1936:412). Kniffen also noted the absence of check stamping and the lack of decoration on vessel rims. McIntire (1958) also acknowledged the existence of Bayou Petre "complex" sites, although he took the chronology further by identifying Plaquemine sites, as well as those which yielded "Fort Walton" and Moundville pottery (1958:Plates 8-9). McIntire did not distinguish any temporal variation in the presence of shell tempered pottery from the eastern Gulf Coast region, and lumped all of these sites into the Plaquemine "period" (1958:81-88).

It was Phillips who first established the phase chronology for the Louisiana coastal zone. Using McIntire's data for the most part he set up two sequential phases, Bayou Petre and Delta Natchezan to encompass the Mississippi period on the coast. A third phase, Medora, was established for the Plaquemine occupation of the southern Lower Valley (Phillips 1970:949-953, Figure 447). Although some Medora phase sites were identified in the coastal zone as far south as the Gibson site and as far west as Avery Island, Phillips largely restricted the distribution of this phase to the non-coastal part of the southern Mississippi River Valley. He further excluded all Plaquemine from the eastern coastal zone by establishing the Bayou Petre phase (reconstituted from Kniffen's original Bayou Petre complex), which he argued was "not a phase of Plaquemine culture" (Phillips 1970:950, Figure 447). Bayou Petre was essentially defined to encompass all sites with shell tempered wares assumed to be of an eastern (Fort Walton, Pensacola, or Moundville) origin (McIntire 1958:Plate 13; Phillips 1970:952). Delta Natchezan was similarly defined to include those sites which manifest Natchez-like pottery (1970:949). Phillips was not especially comfortable with the validity of either phase, noting that the Delta Natchezan phase was "very tentative, if not entirely hypothetical" (1970:949). Phillips had considerable difficulty distinguishing between Bayou Petre and Delta Natchezan sites, and concluded that there was a "zone of contact in which Delta Natchezan and Bayou Petre sites occur together" (1970:953). Bayou Petre sites were largely confined to the eastern portion of the delta, especially in the St. Bernard marshes east of the modern channel of the Mississippi River. The zone of contact noted by Phillips was roughly marked by the line of Bayou Barataria (1970:953, Figure 447).

More recent analyses of the prehistory of the eastern coastal zone suggest that there is an important Plaquemine occupation in the Barataria Basin and westward. The situation east of the modern course of the Mississippi is less well known, but Plaquemine as it is traditionally known may not have spread into the region. Weinstein (1987:Figure 1) places the Delta Natchezan phase at the end of the prehistoric sequence in the region, with Bayou Petre beginning earlier and continuing through to the historic period. The early part of the Mississippi period in the region is marked by the Medora phase in the interior and the Barataria phase along the eastern coastal zone.

The Plaquemine occupation of the Barataria Basin and adjacent parts of the coastal zone is designated the Barataria phase. This phase was defined by Holley and DeMarcay based on amateur excavations conducted at the Flemming site (Holley and DeMarcay 1977; Manuel 1984). Due to poor recording during the excavations the stratigraphic relationships among the cultural components is uncertain, but the site clearly manifest an important Plaquemine occupation. Flemming consists of at least one earth and shell mound, and a shell midden (Holley and DeMarcay 1977:4; Weinstein 1987:96). The Flemming site is one of three apparently contemporary occupations at the junction of Bayou Barataria and Bayou Villars. The Isle Bonne and Bayou Villars sites also consisted of earth and shell middens and mounds (Gagliano et al. 1975:24, 58, 1979; Holley and DeMarcay 1977; Weinstein 1987:96). As noted by Weinstein (1987:96), "This large mound complex forms the hub of the Barataria phase."

The Barataria phase is differentiated from the contemporary Medora phase of the Mississippi Valley by the virtual absence of Plaquemine Brushed pottery and the extensive use of so-called "Southern Cult" motifs associated with typically Lower Valley pottery such as Anna Incised and L'Eau Noire Incised (Holley and DeMarcay 1977; Weinstein 1987:96). The Barataria phase ceramics, however, are otherwise Plaquemine in composition. Significant types and varieties associated with this phase include Anna Incised, *vars. Anna* and *Evangaline*, L'Eau Noire Incised, *vars. L'Eau Noire* and *Bayou Bourbe*, Carter Engraved, Maddox Engraved, and Mazique Incised, *var. Manchac* (Holley and DeMarcay 1977:14-18).

The Flemming site excavations also uncovered a relatively large amount of shell tempered pottery which appears to be stratigraphically later than the initial appearance of Plaquemine ceramics (Holley and DeMarcay 1977:Table 1). These shell tempered sherds, however, were evidently partially coeval with some of the Plaquemine materials at the site, and it seems that some degree of overlap occurred during the span of occupation. The excavations at Flemming and other late prehistoric sites in the region demonstrate the difficulty in identifying Plaquemine and Mississippian occupations in the Barataria Basin. At the Sims site, for example, shell tempering occurs initially in association with Plaquemine types and varieties, but soon dominates the latest assemblages (Davis 1981; Davis and Giardino 1980; Giardino 1985).

The traditional culture historical model assumes that the Plaquemine Barataria phase is distinct from the

Mississippian Bayou Petre phase (Weinstein 1987:Figure 1). An alternative view, however, derived from an examination of the ceramics from the Barataria Basin, suggests that Bayou Petre is not a distinct phase but rather represents the intrusion of shell tempered ceramics from the east (Phillips 1970). In this model, the appearance of shell tempering only indicates the movement of ceramic ideas, not peoples, into the region. A possible indication of this notion is seen in the manufacture of a pottery type identified as Buras Incised. This type consists of "Moundville Incised decoration on typical Addis paste" (Weinstein 1987:98). The integration of shell tempering and non-local styles into the local ceramic repertoire marks the evolution of local Mississippi period populations who were responding to both internal and external events. The expansion of the Pensacola "variant" of Mississippian westward into the deltaic portion of the Mississippi Valley is not especially surprising in light of the expansion of Mississippian ideas and traits across the Gulf Coast (Blitz and Mann 1993; Knight 1984). Furthermore, given the proximity of the St. Bernard marshes to the Mississippi Gulf Coast, it is no surprise that the bulk of the "Mississippian" ceramics are found here.

With the decline of Moundville and its influences across the Gulf Coast in the later part of the fifteenth century, the deltaic part of the coastal zone saw once again a renewed emphasis on indigenous styles in ceramics. The so-called Delta Natchezan phase represents the final late prehistoric occupation of the region. Ceramics of this phase show a strong continuity from the Barataria/Bayou Petre phase occupations in the region, with the addition of pan-Lower Valley varieties such as Fatherland Incised, *vars. Fatherland* and *Bayou Goula*. Shell tempering continues as an important characteristic in the ceramics from the region (Giardino 1985). The Thibodaux site in the Terrebonne marsh area contains a representative Delta Natchezan occupation, with ceramics including Addis Plain, Fatherland Incised, *vars. Fatherland* and *Bayou Goula*, Maddox Engraved, *var. Emerald*, and Plaquemine Brushed, *var. Plaquemine*. Two radiocarbon dates from the Delta Natchezan levels at Thibodaux indicate an occupation in the fifteenth century, with an age range at two standard deviations of cal. A.D. 1294-1525 (Weinstein 1987:101; Weinstein et al. 1978:44) (Table 42).

Pump Canal appears to support a Barataria/Bayou Petre phase occupation and possibly one dating to the Delta Natchezan phase (Giardino 1993). The stratigraphic contexts for these late prehistoric components comes from Strata A, B, and C in the 1990-1991 excavations, and the surface collections and levels A and B in the LAS excavations. The only certain diagnostics in these collections is the presence of Anna Incised, Buras Incised, L'Eau Noire Incised, Moundville Incised, and Mississippi Plain (Giardino 1993). The contexts for these sherds is all disturbed, and there is little that we can infer from these strata. The quantity and diversity of ceramics dating to these late prehistoric phases is minimal and suggests once again that the nature of occupation at Pump Canal had changed significantly from the Bayou Cutler phase into the Mississippi period. Although there was a large mound center located farther south on Bayou Barataria, Pump Canal was evidently only a minor occupation in the region.

Contemporary sites in the area include those found on Bayou Barataria and Bayou Villars (Gagliano et al. 1975, 1979; Holley and DeMarcay 1977), and also several important sites in the Lake Salvador area and farther west. The Temple site (16LF4) on the western edge of Lake Salvador appears to have supported a Barataria phase component, and the occupation included a "large Mississippian component" as well (Gagliano et al. 1982:48; McIntire 1958). A 4.2 m-tall mound at Temple appears to have been built during the Barataria phase or later (Gagliano et al. 1982:Figure 2-56). This earth and shell mound was built in at least six stages, and included living floors, hearths, and burials (Gagliano et al. 1982:48, Figures 2-56, 3-9A). The Temple site is situated near the confluence of Bayou Des Allemands and Bayou Vacherie. Mississippi period components have been found farther up these bayous and also along the banks of Lake Salvador (Hunter et al. 1988:Figure 27). A large Delta Natchezan phase occupation was found at the Bayou Matherne site (16LF3), located at the confluence of Bayou Matherne and Bayou Vacherie (Hunter et al. 1988:Figures 27-29).

The largest excavated late prehistoric site in the deltaic portion of the coastal zone is the Sims site (Davis 1981; Davis and Giardino 1980; Giardino 1985). Excavations in areas 1 and 3 at Sims revealed significant Mississippi period deposits attributable to the Bayou Petre and Delta Natchezan phases. Charcoal from a hearth at the base of Mound B and associated with shell tempered sherds (including D'Olive Incised, Leland Incised, and Mound Place Incised) yielded a date of 490 ± 180 B.P. (cal. A.D. 1427) (Table 42). Excavations in area 3 at Sims revealed a late Mississippi period component thought to be related to the terminal occupation at the Bayou Goula site and possibly dating into the protohistoric or early historic period (Giardino 1985).

The Bowie site also contained a minor Bayou Petre or Delta Natchezan phase occupation (Jackson 1977). Analysis of the remains from this site was undertaken prior to the recognition of the Barataria phase, but Jackson noted that the site also seemed to support an important Plaquemine component as well. One of the most notable finds at this site was the recovery of part of a rectangular structure constructed with wall trenches but no supporting posts (Jackson 1977).

Farther west in the coastal zone the culture history is equally complex. In the far western chenier plain, Weinstein (1987:93, Figure 1) has defined the Bayou Chene phase to encompass the entire Mississippi period occupation of the region. Bayou Chene is described as a "somewhat nebulous blend of Plaquemine and localized traditions" (Weinstein 1987:93). Ceramics dating to this time "show an increase in sandy-paste and sand-tempered types and varieties, reminiscent of east Texas wares... along with a spattering of typical Plaquemine and Caddoan sherds (Weinstein 1987:93). Weinstein does not consider Bayou Chene to belong in the Plaquemine cultural tradition. During the very late prehistoric and protohistoric periods the "Attakapas culture began to consolidate its identity, something clearly not Plaquemine" (Weinstein 1987:98).

In the Petit Anse region of south-central Louisiana, the culture history is more typical of the Lower Mississippi Valley sequences farther up the river. A significant Plaquemine occupation is found in the region, especially on the salt domes and in high, well drained areas (Brown 1982; Brown et al. 1979:174-181, Figures 49-50, 52, Table 57). The Burk Hill phase in the Petit Anse is marked by the ceramic diagnostics Anna Incised, Carter Engraved, Leland Incised, Maddox Engraved, Mazique Incised, and Plaquemine Brushed. Brown et al. (1979:174)) emphasize the "drastic changes" in settlement organization during the Plaquemine occupation of the region. The major difference noted at this time is a marked decrease in the emphasis on settlements in the marsh area and the concentration of sites on and around the salt domes in the region. The cause of this settlement shift is related to a hypothesized emphasis on agricultural production beginning around A.D. 1000 (Brown et al. 1979:180).

The latest prehistoric occupation in the Petit Anse appears to represent a direct influx of Mississippian peoples from farther north in the Mississippi Valley and was oriented almost wholly around the exploitation of salt resources on Avery Island (Brown 1980). With the exception of the Salt Mine Valley site (16IB23) on Avery Island, "Mississippian culture is hardly represented at all in the region" (Brown et al. 1979:180, Figure 51). Ceramics from the Petit Anse phase are shell tempered and manifest decorative patterns and styles found farther north in the central part of the Lower Mississippi Valley.

Summary

Excavations at the Pump Canal site have provided an important glimpse into the later prehistory of the Louisiana coastal zone (Giardino 1993). Stratified deposits at the site indicate that Pump Canal was first occupied during the Baytown period, probably ca. A.D. 400-700. The Des Allemands phase peoples evidently moved into the Barataria Basin to exploit the rich resources of the distributary channel on which the site was located. Although the exact affiliation of this group is still unknown, they can be recognized as participants in a widespread tradition known as coastal Troyville (Giardino 1993). This initial occupation may have been temporary or perhaps seasonal, and it does not seem likely that the site supported any significant population at this time.

Subsequently, the Pump Canal site witnessed its major period of occupation during the Coles Creek period Bayou Cutler phase. At this time, deep deposits were laid down, and a midden rich in fish and animal bone accumulated. The site may have been a fairly substantial habitation at this time, and the wooden planks and post molds associated with Stratum E may attest to a long-term occupation of the site. The Coles Creek people either lived at, or returned to Pump Canal regularly enough to allow for the formation of a deep midden which shows clear evidence of ceramic changes leading towards the later Coles Creek period (Giardino 1993). It is surprising, however, that the site occupation does not appear to extend into the later Coles Creek Bayou Ramos phase. Changes in the local environment and perhaps even with the immediate site environment may account for the absence of components dating to this time period. Subsidence of the natural levees of the Bayou Cyprier Longue system may have led to the abandonment of Pump Canal as a long-term center of occupation.

After the Bayou Cutler phase, Pump Canal seems to have been occupied only sporadically or by small groups. The middens above Stratum E appear to be disturbed, probably by recent farming and dredging activities. A Transitional Late Coles Creek/Plaquemine component has been identified, but the quantity and diversity of ceramics and other artifacts suggests a short-term use of the site. Similarly, a later Mississippi period occupation by peoples associated with the

Barataria or Bayou Petre phase is noted, but it too seems to indicate that this site was inhabited for only a short while.

Although Pump Canal may have been occupied intermittently for over a thousand years, only the Des Allemands and Bayou Cutler phase components at the site are sufficiently intact enough for us to utilize them to expand our understanding of the culture history of the Louisiana coastal zone (Giardino 1993). Still, stratified sites in this region are so rare that we must pay careful attention to any such site. The periodicity of occupation at Pump Canal is hypothesized to relate to the changing nature of the natural levee on which the site was built. Further research needs to be directed towards exploring the nature and timing of the occupations of these distributary channel features. Native Americans living in these environments must have been remarkably well attuned to the habitability of these tributaries. The data from Pump Canal seem to suggest a narrow window of opportunity for exploiting the levee systems, at least towards their distal ends. Evidently these Indians waited a considerable period of time after the channels had formed before they ventured down the levees to establish their sites. Even then the occupations may have been temporary or seasonal. Only once these distributary systems had matured, both geologically and ecologically, did large-scale occupation take place. The only problem seems to be that the life span of these distributaries was already largely expended, and the intense habitation of these systems was limited to a relatively brief time span. Subsequently, as the environment changed so too did the nature of occupation, and it appears that the site was exploited opportunistically as a place for foraging or collecting local resources rather than as a place to live for any extended period of time. It is interesting to note, though, that once the site was built it continued as a beacon for later Indians. It is worth speculating that perhaps the artificial environment of the shell midden created by earlier Indians served as one of the reasons that the site was reoccupied time and again for centuries after it had been abandoned as a village site.

CHAPTER 13
LITHIC ARTIFACTS FROM 16SC27
By Tristram R. Kidder

Three lithic artifacts were recovered from the Pump Canal site during the 1991-1992 excavations. One consists of a broken biface fragment recovered from Stratum A which is spoil. The other two are finished hafted bifaces ("projectile points"). One of these was collected from the surface of a beach at the eastern end of the site. The other was recovered from Stratum I.

These artifacts are shown in the photograph in Figure 78. They are referred to by their catalogue numbers. The broken biface from Stratum A is 16SC27-13. The projectile point from the surface is 16SC27-113 and that from Stratum I is 16SC27-114.

All three artifacts are made from what appears to be a tan to tan-orange chert. The nearest source for such material is the extensive Pleistocene gravel formations on the north shore of Lake Pontchartrain. Two of the artifacts (16SC27-13 and -114) have some cortex remaining on one face which provides reasonable evidence for their reduction from pebbles or cobbles. The following is a brief discussion of these three artifacts.

16SC27-13

This is a fragment of a narrow biface which was broken with a clean lateral snap. The sides are roughly parallel and the remaining tip is rounded and thin. The margins of this fragment have been blunted by a number of very small step fractures. It is not clear if this was a deliberate action or if these step fractures were initiated as part of the final retouch of the artifact. The function, type, and chronological place of this piece is impossible to discern.

16SC27-13 and 16SC27-114

These two artifacts can be discussed together since they are morphologically and metrically similar. Measurements in Table 58 demonstrate that these artifacts are essentially indistinguishable based on metric characteristics. Both artifacts can be described as notched-stemmed bifaces. Specimen 16SC27-114 has a well defined shallow corner-notched stem with a slightly expanding base, while 16SC27-113 is similar but lacks any pronounced corner-notching. However, 16SC27-113 shows evidence of extensive lateral retouch on the blade and basal portions, and it is likely from the overall morphological

Figure 78. Photograph of lithic artifacts from 16SC27. A is 16SC27-13 from EU5 Stratum A (spoil). B is 16SC27-113 from the surface of the site. C is 16SC27-114 from EU5 Stratum I.

Table 58. Metric Attributes of the Two Projectile Points Recovered at 16SC27.

Specimen No.	16SC27-113	16SC27-114
Length	5.4 cm	5.485 cm
Max. Blade Width	1.665 cm	2.02 cm
Haft Width	1.25 cm	1.249 cm
Max. Stem Width	1.7 cm	1.739 cm
Max. Thickness	0.7 cm	0.59 cm

similarities that these two points were fashioned with a similar shape in mind.

Both artifacts appear to have been reduced directly from pebbles, and have similar manufacturing characteristics. Blades are generally symmetrical, and exhibit fine pressure flake scars on both dorsal and ventral surfaces. Artifact 16SC27-113 shows considerable retouch and/or edge damage in the form of multiple step fractures and platform initiation scars. Both artifacts have thinned bases which were created by pressure flaking and are not ground. The quality of craftsmanship on both of these artifacts is quite good, and they are clearly not the product of an inexperienced or casual knapper.

From their initial morphological appearance they might reasonably be classified as Epps Stemmed points (Webb 1981). This classification is probably not correct, however. According to Webb, Epps Stemmed points have a length range from 3.7-11 cm, with an average of 5.6 cm; widths average 2.7 cm, and thickness 0.9 cm. While the Pump Canal bifaces are within the average range of Epps Stemmed, they are not generally within the width and thickness ranges (although the sample size is too small for adequate determination of actual statistical ranges). Furthermore, the classification of these points to the Epps Stemmed category would imply a Poverty Point date or affiliation, which does not seem to be reasonable for the cultural context. Of course it is possible that these bifaces could have been collected as finished pieces from Poverty Point sites in the Pontchartrain Basin, but this seems unlikely.

A more reasonable typological parallel would be to classify these points as some variety of the Collins Side Notched type (Williams and Brain 1983:222-225). Even so, this is admittedly stretching the definition of Collins Side Notched. The Collins Side Notched type, however, provides a closer chronological fit, dating as it does to the Baytown and Coles Creek periods.

Conservatively, however, it should be noted that no true morphological parallel exists for these points. This is really not surprising given the fact that stone tools are so rare in the Mississippi Delta and that no stratigraphic excavations have been conducted and reported for contemporary assemblages in the Delta or elsewhere in the Pontchartrain Basin. Stemmed and Notched points have been recovered from earlier contexts at the Tchefuncte site in St. Tammany Parish and at the Big and Little Oak sites in eastern Orleans Parish. While these do not match the Pump

Canal specimens morphologically, they provide evidence for an established lithic industry in the region.

The morphological and metric similarity of these two bifaces suggests that they were reduced by either the same knappers or craftsmen who were following a very similar template. The absence of lithic reduction debris from Pump Canal indicates that these artifacts were likely introduced to the site as finished products, possibly as the result of trade or contacts with peoples located farther north, possibly on the North Shore of Lake Pontchartrain.

CHAPTER 14
VERTEBRATE FAUNA FROM 16SC27
By Elizabeth J. Misner and Elizabeth J. Reitz

Introduction

Vertebrate fauna from the Pump Canal Site (16SC27) were examined at the University of Georgia's Zooarcheology Laboratory. A total of 53,171 bones weighing 5,214.55 gm and containing the remains of an estimated 673 individuals were studied. These were recovered from the northwest quarter of Excavation Unit 6 (EU6). This unit provides a stratigraphic record of vertebrate use from the Baytown through late Mississippi periods. The Pump Canal data indicate that wetland resources were an important part of the economy throughout the occupation of the site. Wetland resources provided at least two-thirds of the individuals as well as two-thirds of the meat estimated for all occupations represented in Excavation Unit 6. Primary use was made of freshwater fishes and turtles with little change through time. The estimated Standard Length of fish suggests that different fishing techniques were stressed by earlier as compared to later Coles Creek peoples.

There is little evidence for change in subsistence orientation when vertebrate remains associated with the various occupations are compared. However, a change does occur during the Coles Creek Period. Prior to that change, fish account for a greater percentage of the total biomass in all strata. After that change, fish remain important, but the percentage of biomass they represent is reduced in all strata. Simultaneous with the relative decline in fish biomass is the increase of the percentage of biomass represented by muskrat.

Review of Other Data for the Region

Remarkably little is known about animal use by people living adjacent to streams and ponds or in swamps throughout the southeastern United States. This is true despite of the fact that archeological sites are common at riparian and lacustrine locations. Quantified zooarcheological data are lacking in large part because it is assumed that deer provided most if not all of the animal protein to residents of these sites, even though the locations of their settlements suggest that aquatic resources should also be considered essential components of the diet.

Few vertebrate data are available from aquatic sites in the Lower Mississippi River valley. In a 1980 survey of faunal data for the Central and Lower Mississippi River valley, James Springer (1980) found only three fully quantified faunal reports south of the Fatherland site (Cleland 1965). The three quantified reports which are available provide strong evidence for frequent use of aquatic resources at sites occupied during Tchefuncte and Troyville-Coles Creek occupations. However, data for the entire time frame of human occupation in the valley are not currently available.

One of the three quantified studies cited by Springer is of material from the Morton Shell Mound (16IB3), located on Weeks Island upstream from Vermillion Bay in Iberia Parish. The site is a multicomponent shell midden from which both aquatic and estuarine resources are currently accessible. Kathleen Byrd (1974, 1976b) studied materials from the Tchefuncte occupation. These materials were recovered using a 1/4-inch mesh and flotation. In her study of the assemblage, Byrd (1974) found that a wide range of aquatic vertebrates were used. Wetland animals, muskrat, mink, birds other than turkeys, amphibians, reptiles, and fish (four of which were estuarine), constituted 92% of the individuals (Table 59). Byrd (1974) estimated that mammals contributed 57% of the meat, with deer alone constituting about 36% of the total amount of edible meat estimated for the sample. Birds and reptiles, including alligators, constituted about a third of the meat represented in the sample and fish contributed an additional 10% of the edible meat. One of the striking features of the Tchefuncte collection was the high percentage of seasonally abundant migratory water fowl identified, especially geese, swans, and cranes. Byrd and Robert Neuman (1978) observed that small animals such as ducks and muskrats were present in the archeological assemblage but only at levels below what their natural availability would warrant. Instead they interpreted these data as evidence that people made a special effort to capture larger animals such as geese and deer while underexploiting ducks and muskrats. They further conclude that these data indicate a flexible strategy in resource selection.

Robin Futch (1979) studied materials from Troyville-Coles Creek occupations (A.D. 500-1100) at the Morton Shell Mound. Her data are summarized in Table 59. She found that a wide range of aquatic vertebrates were present in the assemblage from this time period. Wetland vertebrates, including muskrat, mink, ducks, amphibians, reptiles, and fish (seven of which were estuarine), constituted 81% of the individuals (Futch 1979:Table 7). Futch used the same approach to estimate biomass as is used in the present study, although with different constants of allometry. From her calculation, Futch estimated that mammals contributed

Table 59. Vertebrate Faunal Results from Other Sites in Louisiana.

	Morton Shell Mound					
	Tchefuncte (1)		Troyville-Coles Creek (2)		Bruly St. Martin (3)	
	MNI	%	MNI	%	MNI	%
Deer	7	3.1	20	10.5	4	0.5
Muskrat	23	10.1	25	13.2	34	4.2
Other Mammals	11	4.9	18	9.5	15	1.9
Aquatic Birds	26	11.5	7	3.7	60	7.4
Turkeys	1	0.4	2	1.1	0	0
Reptiles/Amphibians	64	28.2	44	23.2	14	1.7
Freshwater Fish	91	40.1	67	35.3	682	84.2
Marine Fish	4	1.8	7	3.7	1	0.1
Total	227		190		810	

(1) Byrd 1974; (2) Futch 1979; (3) Springer 1980

about 10% of the edible meat. The absence of an allometric formula for alligators resulted in the exclusion of these animals from the biomass estimate.

Compared to the Tchefuncte deposit, the Troyville-Coles Creek deposit at the Morton Shell Mound differs in only a few respects. As with the earlier occupations at the site, aquatic and estuarine resources contributed a high percentage of the individuals estimated for the Troyville-Coles Creek sample and about half of the estimated meat. The primary differences between the two temporal components appear to be attributed to a very high number of geese in the Tchefuncte component and a higher level of deer in the Troyville-Coles Creek component. On the other hand, other aquatic resources appear in very similar proportions in both components. Muskrats constitute 10% of the individuals in the Tchefuncte assemblage and 13% in the Troyville-Coles Creek assemblage, while amphibians, reptiles, and fish are also present in similar levels (Tchefuncte=70% and Troyville-Coles Creek=62%). While these data demonstrate that aquatic resources were frequently used at the Morton Shell Mound, the site's current estuarine setting means that the data from this site may not reliably inform us about resource use at a site in a clearly freshwater location.

The third site with quantified faunal data included in Springer's survey was one studied by Springer himself. The data reported by him are from the Bruly St. Martin site (16IV6) in Iberville Parish (Springer 1973, 1980). This site is located on a natural levee in a wetland location associated with what was once a freshwater bayou section of the Mississippi River delta. More specifically, the site is located adjacent to a distributary that originates on the west side of Bayou Lafourche. The data are associated with a Troyville-Coles Creek occupation. Springer reported on a sample of 62,472 vertebrate fragments containing the remains of an estimated 810 individuals. During excavation of this very large sample, a 1/4-inch mesh screen was used to recover vertebrate remains, and a portion of the collection was obtained by flotation. Aquatic animals, including muskrats, mink, duck, heron, reptile, and fish (one of which was estuarine), contributed 98% of the individuals in the sample studied by Springer (Table 59). He found that fish were the predominant class (84% of the individuals), with birds (7%), mammals (7%), and reptiles (2%) uncommon in the Bruly St. Martin collection. Gar, suckers, and bullhead catfish were the most common fish, constituting 61% of the individuals estimated for the sample. Springer concluded that fish contributed 67% of the meat, and that bullhead catfish alone contributed more meat than deer. Springer estimated that deer contributed 800 lbs. of meat, and muskrats may have contributed only 136 lbs; however, muskrat represented 4.2% of the individuals compared to the less than one percent contributed by deer (Springer 1980:211). Springer found little change through time, arguing that people at the site were relatively sedentary and well adapted to an environment offering a wide range of aquatic but limited terrestrial animal resources.

Similar results have been found in other studies of sites in southern Louisiana, including the Sims site (16SC2), and Coquilles (16JE37). Susan Scott (1979) presents only bone weight and biomass in her report for Sims, a multicomponent site in St. Charles Parish. Using biomass, Scott documented the use of a wide range of freshwater resources in Coles Creek, Plaquemine, and Mississippian components at Sims. While this was true for all three components, evidence was found that mammal use was more common in the Mississippian occupation than in earlier ones. Deer contributed 3% of the biomass in the Coles Creek levels, 10% in the Plaquemine level, and 36% of the biomass in the Mississippian levels. The most significant fish resources were bullhead catfish, which contributed 24% of the biomass in the Coles Creek sample, 38% in the Plaquemine sample, and 50% in the Mississippian component.

In discussing vertebrate remains from the Coquilles site, Gary DeMarcay (1985) relied upon bone count, or what zooarcheologists refer to as Number of Identified Specimens (henceforth abbreviated NISP). Some of the 269 bones studied were recovered using 1/2-inch rather than 1/4-inch screen. DeMarcay found that in terms of NISP, deer declined from 24% of materials in the earliest occupation (A.D. 280-320) to 12% of the fragments in levels deposited around A.D. 570. This appears to be a consequence of an increase in fish and turtle fragments. The small sample size and the large screen used to recover the vertebrate remains probably bias whatever evidence this sample could provide for use of aquatic resources during the occupation of the site. However, it is interesting that in spite of a recovery strategy which is known to bias against recovery of fish, 55% of the fragments reported were from fish.

Evidence for use of aquatic vertebrates is a prominent feature of all of the faunal assemblages reviewed for this study, as well as elsewhere (Carder 1989). While variations in the types of animals used and their frequency in an assemblage are apparent, it is clearly reasonable at this point to argue that people living in aquatic settings made extensive use of aquatic resources, particularly of fish. It also seems likely that subsistence technology would remain fairly consistent through time unless profound environmental alterations or socio-political changes were experienced. However, this conclusion is largely based on Springer's 1980 study of the Bruly St. Martin fauna. Additional large samples recovered using fine-screen techniques are needed in order to demonstrate that the pattern of resource use found by Springer was not unique and may be generalized to other settings. Excavations at the Pump Canal Site, therefore, offer an important opportunity to expand our knowledge of animal use in the Lower Mississippi River valley.

Methods

Faunal materials were recovered using 1/4-inch, 1/8-inch, 1/16-inch nested screens during the 1990-1991 excavations at Pump Canal (16SC27). Results of quantitative analysis of the 1/4- and 1/8-inch materials are reported here. The 1/16-inch material was briefly examined in order to determine whether quantitative analysis of this fraction would be likely to change the results of analysis of material from the two larger mesh sizes. This examination indicated that the 1/16-inch material appeared to represent primarily smaller-sized remains of the same species as were present in the larger meshes, as well as large numbers of unidentifiable bone and small shell fragments.

All of the vertebrate materials analyzed came from the northwest quarter of Excavation Unit 6. Examination of a single quadrant permitted a more thorough study of the vertebrate materials by including the 1/8-inch fraction in this study. It is important to note that the material was obtained from a limited area of the site. The site itself was at one time considerably larger, and one must assume that the behavior represented in Excavation Unit 6 was typical of behavior elsewhere at the site. It would be highly desirable to examine samples from other activity areas to confirm or reject this assumption.

Chapters 10 and 12 of this report discuss the stratigraphic and cultural components distinguished at 16SC27. Stratum I, representing a Baytown period occupation, is the earliest cultural component and predated all others at the Pump Canal site. It is primarily a *Rangia* midden. Stratum G is largely sterile fill, although features were intrusive into G from Stratum F above. Stratum F represents an early Coles Creek occupation. Stratum E was deposited later in the Coles Creek period. Stratum D is a Transitional Coles Creek/Plaquemine level, and Stratum C dates from the Mississippi period, some mixing has occured within Strata D and C. A list of the samples examined is organized by lot number, strata, and screen size (Table 60).

The vertebrate materials were studied using standard zooarcheological methods. Materials were sorted by Shyly Amarasinghe, Mary Elfner, and Elizabeth Misner. All identifications were made by Elizabeth Misner using the comparative skeletal collection of the Zooarcheological Laboratory, Museum of Natural History, University of Georgia. Bones of all taxa except those that were unidentified (henceforth abbreviated UID Bone) were counted to determine NISP. Bone weight was recorded for all taxonomic levels. Since the Pump Canal collection contained more gar scales than could be efficiently removed from the samples examined, a sampling plan was devised. All gar scales were picked out of the 1/4-inch fractions. The 1/8-inch fractions were sampled as follows. After the 1/8-inch fraction had been examined for all other identifiable bones, five minutes were allowed for picking gar scales from the fraction. Hence, UID Bone contains some gar scales and the bone count and weight for gar (*Lepisosteus* spp.) is somewhat incomplete. Invertebrates included in the samples examined for vertebrate remains are recorded as unidentified shell (abbreviated UID Shell) in the materials reported here.

In most cases, the terminology used in the accompanying species lists are clear, although two terms may require further explanation. Sometimes it was not possible to distinguish between small fragments of amphibians and reptiles. These bones are classified as "UID Herptile" in the following discussion. More often, it was not possible to distinguish between frogs and toads, resulting in a hybrid known as a frog/toad. Mammalian nomenclature was organized following Lowery (1974); birds following Peterson (1980); amphibians and reptiles following Conant and Collins (1991); and fish following Robins et al. (1991). It should be noted that many sunfish (Centrarchidae) hybridize readily (Douglas 1974:286), which hampers identification of members of this family.

Minimum Numbers of Individuals (MNI) were estimated based on paired elements and age. The number of individuals estimated is influenced by the manner in which data from archeological proveniences are aggregated during analysis. The aggregation of separate samples into one analytical whole allows for a conservative estimate of MNI while the "maximum distinction" method applied when analysis discerns discrete sample units results in a much larger MNI (Grayson 1973). Based on stratigraphic distinctions and ceramic variability, the Pump Canal collection was organized into six analytical units (Table 61). In general these

Table 60. Pump Canal Lot Numbers and Strata Analyzed.

Lot No.	Stratum	Fraction
1	EU6, Str C	1/4"
2	EU6, Str D	1/4"
3	EU6, Str E (0-5cm)	1/4"
4	EU6, Str E (0-5cm)	1/8"
5	EU6, Str E Below Feature 19, Above Compact Surface	1/4"
6	EU6, Str E Below Feature 19, Above Compact Surface	1/8"
7	EU6, Str E Below Compact Surface, Above Dense Rangia.	1/4"
8	EU6, Str E Within Dense Rangia	1/4"
9	EU6, Str E Below Dense Rangia	1/4"
10	EU6, Str E Below Dense Rangia	1/8"
11	EU6, Str F	1/4"
12	EU6, Str G	1/4"
13	EU6, Str I Above Dense Rangia	1/4"
14	EU6, Str I	1/4"
15	EU6, Str C	1/8"
16	EU6, Str D	1/8"
17	EU6, Str E Within Dense Rangia	1/8"
18	EU6, Str E Below Compact Surface, Above Dense Rangia	1/8"
19	EU6, Str F	1/8"
20	EU6, Str G	1/8"
21	EU6, Str I	1/8"
22	EU6, Str I Above Dense Rangia	1/8"

Table 61. Pump Canal Distribution of Bone by Analytical Unit.			
	NISP	MNI	Temporal Affiliation
Strata			
G-I	491	21	Des Allemands Phase
F	1,951	38	Des Allemands Phase
Lower E	29,015	357	Early Coles Creek
Upper E	14,444	153	Later Coles Creek
D	2,151	36	Transitional Coles Creek/Plaquemine
C	5,119	68	Mississippi Period
Total	53,171	673	

analytical units correspond to the stratigraphic sequences; however, there are two differences between stratigraphy and analytical units. Because Strata G and I had low numbers of faunal materials, they were combined into a single analytical unit for this study. Both represent Baytown occupations. Stratum E was subdivided into Upper and Lower units based on changes in the ceramic sequence and variations in the stratum itself.

Due to the fact that only a few elements could be identified to genus or species, it was often the case that the remains of more individuals were found in materials identified to a higher taxonomic level, such as family. For example, more individuals might be estimated if all materials identified as either Centrarchidae or one of the genera of Centrarchidae such as *Lepomis* were examined. In these cases, MNI was estimated for both the family and for the genera within that family. Whichever calculation resulted in the largest MNI estimate was used. The lower MNI estimate is included in the species lists in parentheses for information only and is not included in the total for each list or in subsequent calculations.

While MNI is a standard zooarcheological quantification medium, the measure has several problems, two of which have been alluded to above. MNI also emphasizes small species over large ones. This is easily demonstrated by a hypothetical sample which consists of four muskrats and only one deer. While four muskrats represent a larger number of individuals, one deer will supply substantially more meat, but perhaps only if the entire carcass was consumed. The use of MNI assumes that the entire carcass was utilized and discarded near the excavated area. Ethnographic evidence indicates that this is not necessarily the case, particularly in regards to larger animals such as deer and for animals providing special products such as fur or ritual items (Thomas 1971; White 1953).

Biomass and Standard Length estimates compensate for some of the problems encountered with MNI counts. Biomass refers to the quantity of meat which might have been supplied by an animal and "standard length" is the length of a fish from the premaxilla to the base of the tail. Predictions of biomass and Standard Length are based on the allometric principle that the proportions of body mass, skeletal mass, and skeletal dimensions change with increasing body size. This scale effect results from a need to compensate for weakness in the basic structural material, in this case bone. The relationship between body weight and skeletal weight is described by the allometric equation:

$$Y=aX^b$$

(Simpson et al. 1960:397). In this equation, **X** is bone weight or the anterior centrum width of a fish atlas, **Y** is the biomass or the Standard Length, **b** is the constant of allometry (the slope of the line), and **a** is the Y-intercept for a log-log plot using the method of least squares regression and the best fit line (Casteel 1978: Reitz and Cordier 1983; Reitz et al. 1987; Wing and Brown 1979). Many biological phenomena show allometry described by this formula (Gould 1966, 1971) so that a given quantity of bone or a specific skeletal dimension represents a predictable amount of tissue or body length due to the effects of allometric growth. Values for **a** and **b** were obtained from calculations based on data at the Florida Museum of Natural History, University of Florida, and the University of Georgia Museum of Natural History. Allometric formulae for biomass estimates are not currently available for amphibians or for alligators (*Alligator mississippiensis*) so biomass was not estimated for these groups. Standard Length was estimated for gar (*Lepisosteus* spp.), bowfin (*Amia calva*), and members of the sunfish family (Centrarchidae). The allometric formulae used here are presented in Table 62.

Both biomass and MNI are subject to sample size bias. Casteel (1978), Grayson (1979, 1981), and Wing and Brown (1979) suggest a sample size of at least 200 individuals or 1400 bones for a reliable interpretation. Small samples frequently will generate a short species list with undue emphasis on one species in relation to others. It is not possible to determine the nature or the extent of the bias, or correct for it, until the sample is made larger through additional work.

Bone count, MNI, and biomass also reflect identifiability. Elements of some animals are more readily identified than others and may appear more significant than they actually were in the diet. If these animals or taxa are identified largely by unpaired elements, such as scales or cranial fragments, the estimated MNI for these taxa will be low. At the same time, animals with many highly diagnostic but unpaired bones will yield a high bone weight and biomass estimate. Hence high bone count, low MNI, and high biomass for some animals are artifacts of analysis. This source of bias is particularly critical to interpretations of the role of the turtles, gar (*Lepisosteus* spp.), and bowfin (*Amia calva*) in the subsistence strategies reflected in the Pump Canal collection.

Table 62. Allometric Formulae Used.

Faunal Categories	n	Slope (b)	Y-intercept (log a)	r^2
	Bone Weight (kg) to Body Weight (kg)			
Mammal	97	0.90	1.12	0.94
Bird	307	0.91	1.04	0.97
Turtle	26	0.67	0.51	0.55
Snake	26	1.01	1.17	0.97
Chondrichtyes	17	0.86	1.68	0.85
Osteichtyes	393	0.81	0.90	0.80
Non-Perciformes	119	0.79	0.85	0.88
Siluriformes	36	0.95	1.15	0.87
Perciformes	274	0.83	0.93	0.76
Centrarchidae	38	0.84	0.76	0.80
Sciaenidae	99	0.74	0.81	0.73
	Atlas Width (mm) to Standard Length (mm)			
Lepisosteus spp.	18	0.96	1.96	0.83
Amia calva	4	0.62	2.02	0.87
Centrarchidae	105	0.68	1.86	0.77

*Key to abbreviations: Formula is $Y=aX^b$, where **Y** is biomass or meat weight; **X** is bone weight; **a** is the Y-intercept; and **b** is the slope; **n** is the number of observations (Reitze and Cordier 1983; Reitze et al. 1987; Wing and Brown 1979).

The variety and degree of faunal specialization at Pump Canal can be compared by measuring the diversity and equitability of the species identified from this site (Hardesty 1975; Wing 1973, 1976; see Davis 1987 for an application of this measure to the Sims site fauna). Diversity measures the number of species used at the site. Equitability measures the degree of dependence on the utilized resources and the effective variety of species used at the site based on the even, or uneven, use of individual species. These indices allow discussions of food habits in terms of the variety of animals used at the site (richness or diversity) and the equitability (evenness) with which species were utilized.

To measure diversity at Pump Canal, the Shannon-Weaver Index is used. The formula for the index is:

$$H' = -p_1 \log_e p_1$$

where p_1 is the number of **ith** species divided by the sample size (Pielou 1966; Shannon and Weaver 1949:14). P_1 is actually the evenness component since the Shannon-Weaver Index measures both how many species were used and how much each was utilized.

Equitability is calculated using the formula:

$$E = H'/H\ max$$

where **H'** is the Diversity Index and **H max** is the natural log of the number of observed species (Pielou 1966; Sheldon 1969).

Interpreting the indices can be difficult. Diversity increases as both the number of species and the equitability of species abundance increases. A diversity index of 4.99 is the highest possible value. A sample with many species identified and in which the number of individuals slowly declines from most abundant to least abundant will be high in diversity. Diversity can be increased by adding a new taxon to the list, but if another individual of an already present taxon is added, diversity is decreased. A low diversity can be obtained either by having a few species or by having a low equitability, where one species is considerably more heavily used than other species in the sample. A high equitability index, approaching 1.0, indicates an even distribution of species in the sample following a normal pattern where there are a few abundant species, a moderate number of common ones, and many rare ones.

Diversity and equitability were calculated for both MNI and biomass. In the cases of MNI, estimates of individuals were taken from the species lists, excluding MNI estimates in parentheses. Biomass represents a different problem because biomass was estimated for more taxonomic levels than MNI. When doing statistical comparisons of this sort it is necessary to compare the same sample universe. Therefore, it was considered important to calculate biomass diversity and equitability using the same taxonomic units used to calculate these values for MNI. For this reason, only those biomass estimates for taxa for which MNI was estimated were included in the biomass diversity and equitability calculations. For example, in calculating biomass diversity and equitability for Stratum F, biomass for Centrarchidae was used rather than biomass for *Lepomis* spp. This ensures that when comparing biomass and MNI diversity results, exactly the same observations were used in both cases.

Bone modification can indicate butchering methods as well as site formation processes. Modifications of faunal materials recovered from the site were classified as burned, cut, and gnawed. Burning occurs when bones are exposed to fire intentionally or unintentionally. Small incisions across the surface of bones can be attributed to the use of a sharp cutting tool as meat was removed from bone before or after it was cooked. Cuts may also be left behind if attempts are made to disarticulate the carcass at joints during butchering. Some small incisions may be abrasions inflicted after the bones were discarded. To distinguish the sources of small incisions requires examination at magnification of 30x or above and was not undertaken as part of this study (Shipman and Rose 1983). Gnawing may indicate that bones were not immediately buried after disposal. While burial would not insure an absence of gnawing, exposure of bones for any length of time might result in gnawing. Gnawing by carnivores and rodents would result in loss of an unknown quantity of discarded bone. Gnaw marks may be caused by a variety of animals, such as coyotes, dogs, foxes, raccoons, and bobcats. It is presumed that dogs were the primary carnivores involved in gnawing modifications exhibited in the faunal collection from Pump Canal.

The distribution of elements in an archeological sample provides data on butchering practices and site formation processes. Element distributions were recorded for all mammals; however, sufficient numbers of bones were recovered only for muskrat. For this reason, only the distribution of muskrat elements are presented for the Pump Canal site. Muskrat elements were divided into several categories. The Head category includes skull fragments and teeth. The atlas, axis, vertebrae, and ribs form a separate category. The scapula, humerus, ulna, and radius are included in the Forequarters category. The Forefoot category includes carpals and metacarpals. The Hindfoot category includes tarsals and metatarsals; the Foot category contains bones identified only as metapodials and phalanges which could not be assigned to one of the other categories. The Hindquarters category includes the innominate, sacrum, femur, and tibia.

Efforts were made to record information about the relative ages of deer, and sex for deer, turkey, and turtle for elements recovered from excavations at the Pump Canal site. Relative age was to be estimated based on observations of the degree of epiphyseal fusion for diagnostic elements. When animals are young their bones are not fully formed. Along the area of growth, the shaft and the end of the bone, the epiphyses, are not fused. When growth is complete, the shaft and epiphyses fuse. While environmental factors influence the actual age at which fusion is complete (Watson 1978), elements fuse in a regular temporal sequence (Gilbert 1980; Schmid 1972; Silver 1963). The sex of animals is also an important indication of animal use. Males can be identified based on the presence of antlers in deer, spurs on the tarsometatarsus of turkey, and a depression in the plastron of turtles. Females can be determined based on the absence of such features or on the presence of medullary bone indicating a laying bird (Rick 1975). Unfortunately, these signs are not always present in an archeological sample.

Linear measurements from elements of deer, turkey, and fish species provide biological information about the animals utilized, suggest capture techniques which might target specific size or age classes, and indicate locations frequently used during food procurement. Unfortunately, no measurements could be taken for deer and turkeys. Measurements were taken of the anterior centrum width of the first vertebra, or atlas, for fish (see Quitmyer 1985). Measurements were made using hand-held dial calipers and are presented in Table 63.

Results

The total number of bones analyzed in this study is 53,171, excluding UID Bone and UID Shell. The total sample weight was 5,214.55 gm, and it contained the remains of an

Table 63. Pump Canal Atlas Width (mm) to Standard Length (mm).

Lot (Str)	*Lepisosteus spp.*		*Amia calva*		Centrarchidae		*Lepomis spp.*		*Micropterus spp.*		*Pomoxis spp.*	
	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length
1(C)			9.50	637.4								
1(C)			10.30	669.9								
1(C)			7.30	541.9								
1(C)			9.30	629.1								
1(C)			8.50	595.2								
15(C)	6.80	573.6	4.80	418.6	2.80	145.5	3.80	179.1				
15(C)	5.70	484.0	5.70	465.3	3.40	166.0	2.90	149.0				
15(C)	4.40	377.3	6.10	485.2	2.60	138.3	2.70	141.9				
15(C)	5.30	451.3	6.70	514.0	3.10	155.9	2.60	138.3				
15(C)	6.20	524.8	4.70	413.2			3.10	155.9				
15(C)			5.10	434.5			2.20	123.5				
15(C)							1.80	107.7				
TOTAL	5.00		11.00		4.00		7.00					
2(D)			8.30	586.5	4.80	210.0						
2(D)			8.60	599.5								
16(D)	5.40	459.5					2.50	134.7				
16(D)	5.00	426.7					1.70	103.6				
TOTAL	2.00		2.00		1.00		2.00					
3(Up E)			12.45	752.8	6.20	250.0			5.50	230.4		
3(Up E)			10.70	685.8								
3(Up E)			7.10	532.7								
3(Up E)			8.25	584.3								
3(Up E)			7.50	551.0								
3(Up E)			8.95	614.4								
3(Up E)			6.80	518.8								
3(Up E)			6.50	504.5								
3(Up E)			9.30	629.1								
3(Up E)			8.90	612.3								
3(Up E)			8.90	612.3								
3(Up E)			11.60	720.8								

Table 63. Pump Canal Atlas Width (mm) to Standard Length (mm).

Lot (Str)	*Lepisosteus spp.*		*Amia calva*		Centrarchidae		*Lepomis spp.*		*Micropterus spp.*		*Pomoxis spp.*	
	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length
3(Up E)			11.80	728.4								
3(Up E)			8.60	599.5								
3(Up E)			8.65	601.6								
3(Up E)			7.40	546.5								
3(Up E)			6.40	499.7								
3(Up E)			10.80	689.7								
3(Up E)			9.50	637.4								
4(Up E)	6.60	557.3					3.30	162.7				
4(Up E)	6.90	581.7					3.00	152.5				
4(Up E)	7.20	606.0										
4(Up E)	6.60	557.3										
4(Up E)	6.60	557.3										
4(Up E)	7.50	630.2										
4(Up E)	7.20	606.0										
4(Up E)	6.20	524.8										
4(Up E)	5.30	451.3										
4(Up E)	5.40	459.5										
4(Up E)	5.50	467.7										
4(Up E)	5.20	443.1										
4(Up E)	6.80	573.6										
5(Up E)			9.30	629.1					9.60	336.6		
5(Up E)			9.60	641.5					8.30	304.9		
5(Up E)			9.10	620.7					6.70	263.5		
5(Up E)			8.80	608.0								
5(Up E)			9.10	620.7								
6(Up E)	7.90	662.5	6.70	514.0	2.40	131.0	3.10	155.9			2.10	119.6
6(Up E)	4.50	385.6	7.50	551.0			3.70	175.9			2.50	134.7
6(Up E)	8.40	702.8	5.30	444.9			2.50	134.7				
6(Up E)	5.90	500.3	7.40	546.5			3.70	175.9				
6(Up E)	7.70	646.4	5.90	475.3			2.50	134.7				
6(Up E)	6.30	532.9	6.75	516.4			3.20	159.3				
6(Up E)	7.60	638.3					2.70	141.9				

Table 63. Pump Canal Atlas Width (mm) to Standard Length (mm).

Lot (Str)	*Lepisosteus spp.*		*Amia calva*		Centrarchidae		*Lepomis spp.*		*Micropterus spp.*		*Pomoxis spp.*	
	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length
6 (Up E)	4.80	410.3					3.20	159.3				
6 (Up E)	5.90	500.3					2.50	134.7				
6 (Up E)	5.00	426.7					2.20	123.5				
6 (Up E)	6.20	524.8					2.40	131.0				
6 (Up E)	5.10	434.9										
6 (Up E)	5.10	434.9										
6 (Up E)	5.60	475.8										
6 (Up E)	7.40	622.2										
6 (Up E)	5.20	443.1										
6 (Up E)	5.80	492.2										
TOTAL	30.00		30.00		2.00		13.00		4.00		2.00	
7 (LowE)			9.05	618.6					5.50	230.4		
7 (LowE)			10.00	657.8								
8 (LowE)	14.90	1219.8	8.70	603.7			2.35	129.1	4.10	188.6		
8 (LowE)	8.50	710.9	8.00	573.4								
8 (LowE)			9.10	620.7								
8 (LowE)			11.60	720.8								
8 (LowE)			7.00	528.1								
8 (LowE)			7.45	548.7								
8 (LowE)			6.05	482.7								
8 (LowE)			6.10	485.2								
9 (LowE)			10.45	675.9					7.05	272.8		
9 (LowE)			6.90	523.4					6.50	258.1		
9 (LowE)			7.10	532.7								
9 (LowE)			5.80	470.3								
9 (LowE)			6.35	497.3								
9 (LowE)			8.25	584.3								
9 (LowE)			11.00	697.6								
9 (LowE)			8.55	597.3								
9 (LowE)			8.00	573.4								
9 (LowE)			6.55	506.9								

Table 63. Pump Canal Atlas Width (mm) to Standard Length (mm).

Lot (Str)	*Lepisosteus spp.*		*Amia calva*		Centrarchidae		*Lepomis spp.*		*Micropterus spp.*		*Pomoxis spp.*	
	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length
9 (LowE)			7.80	564.5								
9 (LowE)			7.75	562.3								
9 (LowE)			7.20	537.3								
9 (LowE)			6.40	499.7								
9 (LowE)			7.15	535.0								
9 (LowE)			8.50	595.2								
9 (LowE)			6.80	518.8								
9 (LowE)			7.40	546.5								
9 (LowE)			6.70	514.0								
10 (LE)	7.30	614.1	4.95	426.6	3.00	152.5	2.65	140.1	3.90	182.3	3.20	159.3
10 (LE)	7.70	646.4	5.95	477.8	3.50	169.4	2.80	145.5	3.90	182.3	2.40	131.0
10 (LE)	5.70	484.0	5.25	442.4	2.20	123.5	3.80	179.1			2.15	121.5
10 (LE)	5.80	492.2	4.50	402.3	2.25	125.4	2.40	131.0			2.90	149.0
10 (LE)	7.00	589.8	4.80	418.6	2.60	138.3	1.90	111.7			3.10	155.9
10 (LE)	4.60	393.8	5.80	470.3	2.50	134.7	3.30	162.7				
10 (LE)	7.90	662.5	5.50	455.2	3.60	172.6	1.80	107.7				
10 (LE)	6.00	508.5	5.90	475.3	1.50	95.1	3.05	154.2				
10 (LE)	6.40	541.1	3.00	313.4	2.30	127.3	2.20	123.5				
10 (LE)	6.70	565.4	5.05	431.9	2.30	127.3	2.40	131.0				
10 (LE)	6.20	524.8	5.10	434.5	2.60	138.3	2.20	123.5				
10 (LE)	7.10	597.9	5.70	465.3	1.50	95.1	1.75	105.6				
10 (LE)	5.90	500.3	4.80	418.6			2.30	127.3				
10 (LE)	6.20	524.8	5.95	477.8			1.75	105.6				
10 (LE)	6.70	565.4	5.50	455.2			3.80	179.1				
10 (LE)	3.50	302.8	4.00	374.2			2.50	134.7				
10 (LE)			6.70	514.0			3.10	155.9				
10 (LE)			5.20	439.8			2.20	123.5				
10 (LE)			5.00	429.3			1.80	107.7				
10 (LE)			6.25	492.5			2.00	115.7				
10 (LE)			4.00	374.2			2.55	136.5				
10 (LE)			4.00	374.2			2.05	117.7				
10 (LE)			5.45	452.7			2.00	115.7				

Table 63. Pump Canal Atlas Width (mm) to Standard Length (mm).

Lot (Str)	*Lepisosteus spp.*		*Amia calva*		Centrarchidae		*Lepomis spp.*		*Micropterus spp.*		*Pomoxis spp.*	
	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length
10(LE)			7.15	535.0			2.70	141.9				
10(LE)			4.70	413.2			2.95	150.7				
10(LE)			3.80	362.5			2.75	143.7				
10(LE)			4.30	391.2			2.25	125.4				
10(LE)			5.25	442.4			2.95	150.7				
10(LE)			6.00	480.3			2.65	140.1				
10(LE)			4.30	391.2			2.40	131.0				
10(LE)			5.30	444.9			2.10	119.6				
10(LE)			4.60	407.8			2.80	145.5				
10(LE)			5.30	444.9			1.80	107.7				
10(LE)			5.70	465.3			2.10	119.6				
10(LE)			5.20	439.8			2.10	119.6				
10(LE)			5.30	444.9			3.70	175.9				
10(LE)			4.00	374.2			3.25	161.0				
10(LE)			5.30	444.9			2.75	143.7				
10(LE)			4.20	385.6			2.60	138.3				
10(LE)			4.80	418.6			2.80	145.5				
10(LE)			4.30	391.2			1.80	107.7				
10(LE)			4.50	402.3			2.00	115.7				
10(LE)							1.75	105.6				
10(LE)							2.00	115.7				
10(LE)							1.75	105.6				
10(LE)							2.10	119.6				
10(LE)							1.70	103.6				
10(LE)							2.25	125.4				
10(LE)							2.10	119.6				
10(LE)							2.15	121.5				
10(LE)							2.75	143.7				
10(LE)							1.95	113.7				
10(LE)							2.40	131.0				
10(LE)							1.80	107.7				
10(LE)							2.70	141.9				

Table 63. Pump Canal Atlas Width (mm) to Standard Length (mm).

Lot (Str)	*Lepisosteus spp.*		*Amia calva*		Centrarchidae		*Lepomis spp.*		*Micropterus spp.*		*Pomoxis spp.*	
	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length
10(LE)							2.00	115.7				
10(LE)							1.65	101.5				
10(LE)							2.10	119.6				
10(LE)							2.10	119.6				
10(LE)							2.00	115.7				
17(LE)	6.70	565.4	5.20	439.8	2.70	141.9	2.65	140.1	5.25	223.2		
17(LE)	4.90	418.5	5.90	475.3	3.00	152.5	3.05	154.2	2.35	129.1		
17(LE)	6.50	549.2	4.80	418.6	2.90	149.0	2.50	134.7	2.60	138.3		
17(LE)	5.20	443.1	5.50	455.2			3.10	155.9				
17(LE)	4.50	385.6	4.85	421.3			3.35	164.4				
17(LE)	6.20	524.8	5.20	439.8			3.10	155.9				
17(LE)	8.00	670.6	4.55	405.0			2.80	145.5				
17(LE)	5.75	488.1	5.20	439.8			3.90	182.3				
17(LE)			6.10	485.2			2.90	149.0				
17(LE)			5.40	450.1			2.75	143.7				
17(LE)			4.85	421.3			2.50	134.7				
17(LE)			4.75	415.9			2.55	136.5				
17(LE)			4.95	426.6			3.80	179.1				
17(LE)			5.15	437.2			4.00	185.5				
17(LE)			5.35	447.5			2.10	119.6				
17(LE)			3.90	368.4			2.25	125.4				
17(LE)			4.40	396.8			2.65	140.1				
17(LE)			4.50	402.3			2.10	119.6				
17(LE)							3.00	152.5				
17(LE)							2.40	131.0				
17(LE)							2.10	119.6				
17(LE)							2.20	123.5				
17(LE)							2.70	141.9				
17(LE)							2.70	141.9				
17(LE)							2.25	125.4				
17(LE)							2.20	123.5				
17(LE)							1.65	101.5				

Table 63. Pump Canal Atlas Width (mm) to Standard Length (mm).

Lot (Str)	*Lepisosteus spp.*		*Amia calva*		Centrarchidae		*Lepomis spp.*		*Micropterus spp.*		*Pomoxis spp.*	
	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length	Atlas Width	Standard Length
17(LE)							1.75	105.6				
17(LE)							2.30	127.3				
17(LE)							2.00	115.7				
17(LE)							2.10	119.6				
17(LE)							2.35	129.1				
18(LE)	6.30	532.9	7.20	537.3			2.65	140.1	3.70	175.9		
18(LE)	6.95	585.7	5.20	439.8			3.05	154.2				
18(LE)	6.10	516.6	5.45	452.7			2.50	134.7				
18(LE)	4.70	402.0	5.80	470.3			3.10	155.9				
TOTAL	30.00		93.00		15.00		97.00		10.00		5.00	
11(F)			6.40	499.7								
19(F)	4.20	360.8	6.30	494.9	2.70	141.9	2.40	131.0				
19(F)	4.00	344.3	6.25	492.5			3.00	152.5				
19(F)			5.25	442.4			1.80	107.7				
19(F)			5.20	439.8								
19(F)			7.90	568.9								
19(F)			7.30	541.9								
TOTAL F	2.00		7.00		1.00		3.00		0.00		0.00	
12(G)			8.30	586.5								
20(G)			5.20	439.8			3.20	159.3				
20(G)							2.60	138.3				
22(I)			5.60	460.3			2.85	147.3				
22(I)			4.50	402.3								
21(I)			4.00	374.2								
TOTAL G-I	0.00		5.00		0.00		3.00		0.00		0.00	

estimated 673 individuals (Table 61). The size of the sample for each analytical unit was highly variable. Only two have large samples in terms of MNI, although most analytical units did provide large samples in terms of bone count. The largest samples are those from Upper and Lower Stratum E, and interpretation of these analytical units is considered more reliable than that of the other units. The primary result of this analysis is to demonstrate that wetland resources provided at least two-thirds of the animals used as well as two-thirds of the biomass estimated for Excavation Unit 6.

Des Allemands phase, Strata I and G. For purposes of this analysis, the faunal remains from Strata G and I were considered together. Remains from both are associated with a Des Allemands phase occupation. To some extent, the remains from Stratum G may be intrusive from Stratum F. Several features such as postmolds extended into Stratum G from F. Also, it is possible that some mixing has occurred with material from Stratum I due to bioturbation and, to a lesser extent, the occasional difficulty in recognizing the "break" between the upper part of I and the lower part of G in the course of excavations.

The combined species list for Strata G and I contained 491 bones and the remains of an estimated 21 individuals (Table 64). Mammals contributed 10% of the individuals and 14% of the biomass. The two mammals identified in these strata were raccoon (*Procyon lotor*) and deer (*Odocoileus virginianus*). Deer contributed 5% of the biomass. Only four bird bones were observed in the sample. The biomass estimate for amphibians and reptiles is low because there are no allometric formulae for many of these animals. Nonetheless, siren (*Siren intermedia*), pond turtles (Emydidae), and water snake (*Nerodia* spp.) contributed 14% of the individuals and 18% of the biomass in this analytical unit. Fresh water fish identified were gar (*Lepisosteus* spp.), bowfin (*Amia calva*), bullhead catfish (Ictaluridae, *Ameiurus melas*), and sunfish (Centrarchidae, *Lepomis* spp.). Bowfin was the most abundant animal in the sample, contributing 33% of the individuals and 26% of the biomass.

Altogether, wetland vertebrates (amphibians, reptiles, and fish) contributed 86% of the individuals and at least 84% of the biomass represented in Strata G and I. The diversity and equitability results (Table 65) suggest a subsistence strategy in which a number of different taxa were used more or less equitably, but that few animals contributed substantial quantities of meat to the diet. The animals which figured prominently in the diet were bowfin, which were supplemented by other resources.

Table 64. Species List: Des Allemands Phase (Strata G and I).

Species	NISP	MNI	MNI %	Weight gm	Biomass kg	Biomass %
UID Small mammal	8			0.5	0.014	2.61
Procyon lotor (Raccoon)	7	1	4.76	1.1	0.029	5.4
Odocoileus virginianus (Deer)	1	1	4.76	1.2	0.031	5.77
Mammal Total	**16**	**2**	**9.52**	**2.8**	**0.074**	**13.78**
UID Bird	4	1	4.76	0.4	0.009	1.68
Bird Total	**4**	**1**	**4.76**	**0.4**	**0.009**	**1.68**
UID Herptile	7			0.3		
Siren intermedia (Lesser siren)	5	1	4.76	1.4		
UID Turtle	20			4.2	0.083	15.46
Emydidae (Pond turtles)	1	1	4.76	0.1	0.007	1.3
UID Snake	9			0.4	0.005	0.93
Nerodia spp. (Water snake)	2	1	4.76	0.1	0.001	0.19
Herptile Total	**44**	**3**	**14.29**	**6.5**	**0.096**	**17.88**
UID Fish	152			4.6	0.101	18.81
Lepisosteus spp. (Gar)	107	1	4.76	3.9	0.088	16.39
Amia calva (Bowfin)	149	7	33.33	6.9	0.139	25.88
Anguilla rostrata (American eel)	1	1	4.76	0.1	0.005	0.93
Ictaluridae (Bullhead catfishes)	1			0.1	0.002	0.37
Ameiurus melas (Black bullhead)	1	1	4.76	0.1	0.002	0.37
Centrarchidae (Sunfishes)	10			0.4	0.008	1.49
Lepomis spp. (Sunfish)	5	4	19.05	0.3	0.006	1.12
Aplodinotus grunniens (Freshwater drum)	1	1	4.76	0.1	0.007	1.3
Fish Total	**427**	**15**	**71.43**	**16.5**	**0.358**	**66.67**
UID Bone				**19.35**		
TOTAL OF ALL	**491**	**21**	**100**	**45.55**	**0.537**	**100**

Table 65. Diversity and Equitability by Strata for MNI and Biomass.				
MNI				
	MNI	N	Diversity	Equitability
G-I	21	12	2.1315	0.8578
F	38	18	2.4159	0.8359
Lower E	357	23	1.6939	0.5402
Upper E	153	23	2.1308	0.6796
D	36	17	2.5152	0.8877
C	68	24	2.6393	0.8305
Biomass				
	kg	N	Diversity	Equitability
G-I	0.324	11	1.6104	.6716
F	0.742	15	1.4810	.5469
Lower E	6.072	19	1.6566	.5626
Upper E	5.479	20	1.6410	.5478
D	1.353	14	1.8449	.6991
C	2.293	20	1.8662	.6230

Des Allemands phase, Stratum F. Ceramic analysis (Chapter 11) indicates that Stratum F also represents a Des Allemands phase component. The stratum contained 1,951 bones and the remains of an estimated 38 individuals (Table 66). Mammals contributed 11% of the individuals and 25% of the biomass in this analytical unit. Mammals included muskrat (*Ondatra zibethicus*), dog (*Canis familiaris*), raccoon (*Procyon lotor*), and deer (*Odocoileus virginianus*). The dog is included in the biomass calculation although there is no evidence that it was used for food other than skeletal incompleteness. The single deer contributed 3% of the biomass, which is equaled by the muskrat. Bird is poorly represented in the sample from this stratum. Amphibians and reptiles constituted 13% of the individuals and 9% of the biomass. These included lesser siren (*Siren intermedia*), frog/toad, alligator (*Alligator mississipiensis*), softshell turtle (*Apalone* spp.), and water snake (*Nerodia* spp.). Fish contributed most of the individuals (74%) and biomass (65%) in the sample. The most abundant species both in terms of MNI and biomass was bowfin (*Amia calva*), which comprised 29% of the individuals and 29% of the biomass. Gar (*Lepisosteus* spp.), bullhead catfish (Ictaluridae, *Ameiurus melas, Ictalurus furcatus, I. punctatus*), and sunfish, (Centrarchidae, *Lepomis* spp.) were also common in the analytical unit.

Wetland vertebrates (muskrat, amphibians, reptiles, and fish) contributed 89% of the individuals and at least 76% of the biomass in Stratum F of Excavation Unit 6. The diversity and equitability results (Table 65) suggest a subsistence strategy in which a number of different taxa were used more or less equitably, but in which very few animals contributed substantial quantities of meat to the diet. The dominant vertebrate resource was bowfin.

Early Coles Creek, Lower Stratum E. For purposes of faunal analysis, the material from Stratum E was grouped into a "Lower" and an "Upper" portion. The compact surface discussed in Chapter 10 represents the break between these two portions of the stratum.

The sample from Lower Stratum E, which represents a Bayou Cutler phase occupation, had 29,015 bones containing the remains of an estimated 357 individuals (Table 67). Mammals supplied 2% of the individuals and 15% of the biomass in this analytical unit. The four identified mammals were opossum (*Didelphis virginiana*), muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), and deer (*Odocoileus virginianus*). Muskrats contributed 5% of the

Table 66. Species List: Des Allemands Phase (Stratum F).

Species	NISP	MNI	MNI %	Weight gm	Biomass kg	Biomass %
UID Small mammal	89			7.1	0.154	12.19
Ondatra zibethicus (Muskrat)	5	1	2.6	0.6	0.017	1.35
Canis familiaris (Dog)	3	1	2.6	6.2	0.136	10.77
Procyon lotor (Raccoon)	1	1	2.6	0.1	0.003	0.24
Odocoileus virginianus (Deer)	1	1	2.6	0.2	0.006	0.48
Mammals Total	**99**	**4**	**10.5**	**14.2**	**0.316**	**25.02**
UID Bird	9	1	2.6	0.2	0.005	0.40
Birds Total	**9**	**1**	**2.6**	**0.2**	**0.005**	**0.40**
UID Herptile	13			0.9		
Siren intermedia (Lesser siren)	1	1	2.6	0.1		
Frog/Toad	5	1	2.6	0.3		
Alligator mississippiensis (Alligator)	10	1	2.6	5.7		
UID Turtle	59			4.5	0.087	6.89
Apalone spp. (Softshell turtle)	2	1	2.6	0.3	0.014	1.11
UID Snake	14			0.6	0.008	0.63
Colubridae (Non-poisonous snakes)	3			0.4	0.005	0.40
Nerodia spp. (Water snake)	1	1	2.6	0.4	0.005	0.40
Herptile Total	**108**	**5**	**13.2**	**13.2**	**0.119**	**9.42**
UID Fish	517			11.9	0.214	16.94
Lepisosteus spp. (Gar)	221	3	7.9	8.3	0.161	12.75
Amia calva (Bowfin)	923	11	29.0	23.4	0.364	28.82
Catostomidae (Suckers)	1	1	2.6	0.1	0.005	0.40
Ictaluridae (Bullhead catfishes)	37			2.5	0.048	3.80
Ameiurus spp. (Bullhead)	1			0.1	0.002	0.16

Table 66. Species List: Des Allemands Phase (Stratum F).

Species	**NISP**	**MNI**	**MNI %**	**Weight gm**	**Biomass kg**	**Biomass %**
Ameiurus melas (Black bullhead)	3	1	2.6	0.1	0.002	0.16
Ictalurus furcatus (Blue catfish)	2	2	5.3	0.1	0.002	0.16
Ictalurus punctatus (Channel catfish)	3	2	5.3	0.2	0.004	0.32
Centrarchidae (Sunfishes)	17	7	18.4	0.3	0.006	0.48
Lepomis spp. (Sunfish)	6	(4)		0.1	0.003	0.24
Aplodinotus grunniens (Freshwater drum)	4	1	2.6	0.2	0.012	0.95
Fish Total	**1735**	**28**	**73.7**	**47.3**	**0.823**	**65.16**
UID Bone				84.4		
UID Shell				0.2		
All Total	**1951**	**38**	**100**	**159.3**	**1.263**	**100**

Table 67. Species List: Early Coles Creek (Lower Stratum E).

Species	NISP	MNI	MNI %	Weight (gm)	Biomass (kg)	Biomass %
UID Mammal	133			6.40	0.140	1.40
UID Small mammal	314			29.70	0.557	5.56
UID Large mammal	2			2.10	0.051	0.51
Didelphis virginiana (Opossum)	4	1	0.28	0.30	0.009	0.09
Ondatra zibethicus (Muskrat)	163	5	1.40	28.40	0.535	5.34
Procyon lotor (Raccoon)	10	1	0.28	3.50	0.081	0.81
Odocoileus virginianus (Deer)	3	1	0.28	5.60	0.124	1.24
Mammals Total	**629**	**8**	**2.24**	**76.00**	**1.497**	**14.94**
UID Bird	48			3.40	0.062	0.62
Anatidae (Ducks/Geese)	1			0.10	0.003	0.03
Aythya spp. (Diving duck)	2	1	0.28	0.40	0.009	0.09
Birds Total	**51**	**1**	**0.28**	**3.90**	**0.074**	**0.74**
UID Herptile	184			33.40		
Siren intermedia (Lesser siren)	2	1	0.28	0.90		
Necturus spp. (Salamaner)	1	1	0.28	0.10		
Frog/Toad	79	6	1.68	6.10		
Rana catesbeiana (Bullfrog)	4	(2)*		1.60		
Alligator mississippiensis (Alligator)	422	2	0.56	361.60		
UID Turtle	1359			96.20	0.674	6.73
Chelydra serpentina (Snapping turtle)	3	1	0.28	5.70	0.101	1.01
Kinosternidae (Mud turtle)	19	2	0.56	2.40	0.057	0.57
Sternotherus spp. (Musk turtle)	3	(1)		0.50	0.020	0.20
Emydidae (Pond turtles)	21	2	0.56	7.90	0.126	1.26
Trachemys scripta (Yellow bellied turtle)	1	(1)		0.50	0.020	0.20
Apalone spp. (Softshell turtle)	3	1	0.28	0.60	0.022	0.22
UID Snake	175			9.50	0.143	1.43
Colubridae (Non-poisonous snakes)	20			1.30	0.038	0.38
Nerodia spp. (Water snake)	31	1	0.28	4.10	0.081	0.81
Viperidae (Pit vipers)	22	1	0.28	5.20	0.095	0.10

Table 67. Species List: Early Coles Creek (Lower Stratum E).

Species	NISP	MNI	MNI %	Weight (gm)	Biomass (kg)	Biomass %
Herptile Total	**2349**	**18**	**5.04**	**537.60**	**1.377**	**13.74**
Dasyatis cf. sabina (Atlantic stingray)	2	1	0.28	0.10	0.017	0.17
UID Fish	10210			194.40	1.941	19.37
Lepisosteus spp. (Gar)	3079	35	9.80	104.10	1.185	11.83
Lepisosteus oculatus (Spotted gar)	1	(1)		0.10	0.005	0.05
Lepisosteus spatula (Alligator gar)	1	(1)		0.10	0.005	0.05
Amia calva (Bowfin)	11780	65	18.21	350.90	3.095	30.89
Carpiodes carpio (River carpsucker)	1	1	0.28	0.10	0.005	0.05
Minytrema melanops (Spotted sucker)	1	1	0.28	0.10	0.005	0.05
Ictaluridae (Bullhead catfishes)	382	72	20.17	25.70	0.436	4.35
Ameiurus spp. (Bullhead)	6			0.60	0.012	0.12
Ameiurus melas (Black bullhead)	19	(5)		1.40	0.027	0.27
Ameiurus natalis (Yellow bullhead)	55	(13)		3.10	0.058	0.58
Ictalurus spp. (Bullhead)	7			0.30	0.006	0.06
Ictalurus furcatus (Blue catfish)	12	(4)		0.90	0.018	0.18
Ictalurus punctatus (Channel catfish)	34	(9)		3.30	0.062	0.62
Pylodictus olivaris (Flathead catfish)	7	(2)		0.50	0.010	0.10
Centrarchidae (Sunfishes)	155	152	42.58	3.50	0.050	0.50
Lepomis spp. (Sunfish)	154	(106)		2.80	0.041	0.41
Micropterus spp. (Bass)	35	(10)		3.00	0.044	0.44
Pomoxis spp. (Crappie)	12	(10)		0.30	0.006	0.06
Pomoxis annularis (White crappie)	3	(2)		0.20	0.004	0.04
Aplodinotus grunniens (Freshwater drum)	30	3	0.84	1.00	0.039	0.39
Fish Total	**25986**	**330**	**92.44**	**696.50**	**7.071**	**70.58**
UID Bone				1459.60		
UID Shell				1.30		
All Total	**29015**	**357**	**100**	**2774.90**	**10.019**	**100**

biomass and deer 1%. Birds included a diving duck (*Aythya* spp.) which contributed less than 1% of the biomass in this analytical unit.

Amphibians and reptiles comprised 5% of the individuals and 14% of the biomass in Lower Stratum E. Lesser siren (*Siren intermedia*), salamander (*Necturus* spp.), and frog/toads, including at least two bullfrogs (*Rana catesbeiana*), were identified. Many of the frog/toad individuals were large. For example, one was quite a bit larger than the Carolina Supply reference specimen which measures over 14.5 cm from the premaxilla to the end of the ischium. Two alligators were identified, but unfortunately their biomass could not be estimated. Snapping turtle (*Chelydra serpentina*); mud turtles (Kinosternidae), including at least one musk turtle (*Sternotherus* spp.); pond turtles (Emydidae), including at least one yellow bellied turtle (*Trachemys scripta*); softshell turtle (*Apalone* spp.); water snake (*Nerodia* spp.); and pit vipers (Viperidae) were identified.

One of the most interesting animals identified in the sample is a cartilaginous fish, possibly an Atlantic stingray (*Dasyatis* cf. *sabina*) that was identified from two vertebrae. It was not possible to determine species from these specimens. Stingrays are members of a marine family, only a few members of which survive in fresh water. The Atlantic stingray is one species which does, and has been recorded at locations hundreds of kilometers inland in the Mississippi River (Douglas 1974:400; Lee et al. 1980:37). If the assumption is correct that this specimen is an Atlantic stingray, the single individual represented here probably does not indicate an appreciable shift in salinity in waters surrounding the Pump Canal site.

Bony fish supplied most of the individuals (92%) and biomass (71%) in the Lower Stratum E sample. A total of 329 Bony fish individuals were estimated for this sample. Gar (*Lepisosteus* spp., *L. oculatus, L. spatula*) comprised 10% of the individuals and 12% of the biomass. Two species of gar were identified. These were spotted gar (*Lepisosteus oculatus*) and alligator gar (*Lepisosteus spatula*). Bowfin (*Amia calva*) supplied 18% of the individuals and 31% of the biomass in this analytical unit, while bullhead catfish contributed 20% of the individuals and 6% of the biomass. At least five of these individuals were black bullheads (*Ameiurus melas*); 13 were yellow bullheads (*Ameiurus natalis*); four were blue catfish (*Ictalurus furcatus*); nine were channel catfish (*Ictalurus punctatus*); and two were flathead catfish (*Pylodictus olivarus*). Sunfish (Centrarchidae, *Lepomis* spp., *Micropterus* spp., *Pomoxis* spp., *P. annularis*) contributed 43% of the individuals in Lower Stratum E, but only 2% of the biomass.

Wetland vertebrates (muskrat, ducks, amphibians, reptiles, and fish) contributed 99% of the individuals and at least 90% of the biomass in Lower Stratum E of Excavation Unit 6. This high percentage of wetland vertebrates occurs largely because of the high numbers of sunfish individuals in the sample. The diversity and equitability results (Table 65) suggest a subsistence strategy in which a very few different taxa were used and in which only a few animals contributed substantial quantities of meat to the diet. In terms of fishing effort, catfish and sunfish were the primary targets, while in terms of diet, the dominant vertebrate resource was bowfin.

Later Coles Creek, Upper Stratum E. The Upper Stratum E analytical unit has the second highest number of bones identified in this study, containing 14,444 bone and the remains of at least 153 individuals (Table 68). Ceramic analysis (Chapter 12) indicates that, like Lower Stratum E, it corresponds to a Bayou Cutler phase occupation, although the assemblage approaches that defined for the Bayou Ramos phase. Mammals contributed 9% of the individuals and 41% of the biomass. Most of the mammals are small, including a squirrel that may have been a fox squirrel (*Sciurus* cf. *niger*), muskrat (*Ondatra zibethicus*), marsh rice rat (*Oryzomys palustris*), and raccoon (*Procyon lotor*). Six percent of the individuals and 21% of the biomass was contributed by muskrat. No deer (*Odocoileus virginianus*) were identified in the sample. Three birds were identified. These included diving duck (*Aythya* spp.), rail (Rallidae), and turkey (*Meleagris gallopavo*). Birds constituted only 2% of the individuals and less than 1% of the biomass. Amphibians and reptiles make up 7% of the individuals and 7% of the biomass in Upper Stratum E. They include salamander (*Necturus* spp.) and three frog/toads, one of which was a bullfrog (*Rana catesbeiana*). One alligator (*Alligator mississippiensis*) was identified, as were three turtle individuals. The turtles were stinkpot (*Sternotherus odoratus*), pond turtles (Emydidae), and softshell turtle (*Apalone* spp.). Three snakes were identified: one water snake (*Nerodia* spp.) and two pit vipers (Viperidae). In addition to morphological features, the pit viper individuals were differentiated by the size of their vertebrae.

One non-freshwater fish was identified. This was a cartilaginous fish, a shark in the order Lamniformes. The shark was identified from a single unmodified vertebra. Some sharks, such as the bull shark (*Carcharinus leucas*),

Table 68. Species List: Later Coles Creek (Upper Stratum E).

Species	NISP	MNI	MNI %	Weight (gm)	Biomass (kg)	Biomass %
UID Mammal	410			32.40	0.602	6.53
UID Small mammal	439			43.30	0.781	8.47
UID Large mammal	5			8.70	0.184	2.00
Sciurus cf. niger (Fox squirrel)	2	1	0.65	0.20	0.006	0.07
Ondatra zibethicus (Muskrat)	417	9	5.88	120.20	1.958	21.23
Oryzomys palustris (Marsh rice rat)	1	1	0.65	0.10	0.003	0.04
Procyon lotor (Raccoon)	32	2	1.31	10.50	0.218	2.36
Homo sapiens	1			0.20		
Mammals Total	**1307**	**13**	**8.50**	**215.60**	**3.752**	**40.70**
UID Bird	10			1.70	0.033	0.36
Aythya spp. (Diving duck)	2	1	0.65	0.10	0.003	0.03
Rallidae (Rails)	1	1	0.65	0.10	0.003	0.03
Meleagris gallopavo (Turkey)	1	1	0.65	0.20	0.005	0.05
Birds Total	**14**	**3**	**1.96**	**2.10**	**0.044**	**0.48**
UID Herptile	37			3.30		
Necturus spp. (Salamaner)	1	1	0.65	0.10		
Frog/Toad	20	3	1.96	1.75		
Rana catesbeiana (Bullfrog)	2	(1)*		0.90		
Alligator mississippiensis (Alligator)	7	1	0.65	1.40		
UID Turtle	453			44.50	0.402	4.36
Sternotherus odoratus (Stinkpot)	4	1	0.65	1.00	0.032	0.35
Emydidae (Pond turtles)	6	1	0.65	2.00	0.050	0.54
Apalone spp. (Softshell turtle)	7	1	0.65	2.10	0.052	0.56
UID Snake	39			2.30	0.032	0.35
Colubridae (Non-poisonous snakes)	15			0.80	0.011	0.12
Nerodia spp. (Water snake)	6	1	0.65	0.70	0.010	0.11

Table 68. Species List: Later Coles Creek (Upper Stratum E).

Species	NISP	MNI	MNI %	Weight (gm)	Biomass (kg)	Biomass %
Viperidae (Pit vipers)	4	2	1.31	2.90	0.040	0.43
Herptile Total	**601**	**11**	**7.19**	**63.75**	**0.629**	**6.82**
Lamniformes (Shark)	1	1	0.65	0.10	0.017	0.18
UID Fish	4222			142.90	1.522	
Lepisosteus spp. (Gar)	4830	32	20.92	78.90	0.952	10.32
Amia calva (Bowfin)	3107	51	33.33	165.30	1.708	18.52
Ictaluridae (Bullhead catfishes)	218	22	14.38	16.40	0.285	3.09
Ameiurus spp. (Bullhead)	9			0.70	0.014	0.15
Ameiurus melas (Black bullhead)	6	(2)		1.50	0.029	0.31
Ameiurus natalis (Yellow bullhead)	6	(2)		2.00	0.039	0.42
Ictalurus furcatus (Blue catfish)	1	(1)		0.10	0.002	0.02
Ictalurus punctatus (Channel catfish)	20	(5)		3.60	0.067	0.73
Centrarchidae (Sunfishes)	23			1.60	0.026	0.28
Lepomis spp. (Sunfish)	17	12	7.84	0.60	0.011	0.12
Micropterus spp. (Bass)	18	4	2.61	2.90	0.043	0.47
Pomoxis spp. (Crappie)	4	2	1.31	0.20	0.004	0.04
Aplodinotus grunniens (Freshwater drum)	40	2	1.31	2.60	0.079	86.00
Fish Total	**12522**	**126**	**82.35**	**419.40**	**4.798**	**52.02**
UID Bone				1040.00		
UID Shell				5.00		
All Total	**14444**	**153**	**100**	**1746.00**	**9.223**	**100**

are known to travel into areas with low salinity (Lee et al. 1980:36). A single specimen probably does not indicate a significant change in the water conditions around the Pump Canal site.

Bony fish comprised 82% of the individuals and 52% of the biomass in this analytical unit. Gar (*Lepisosteus* spp.) contributed 21% of the individuals and 10% of the biomass, and bowfin (*Amia calva*) a third of the individuals and 19% of the biomass. Bullhead catfish (Ictaluridae, *Ameiurus melas, A. natalis, Ictalurus furcatus, I. punctatus*) contributed 14% of the individuals and 5% of the biomass. Several species of catfish were identified, including at least two black bullhead (*Ameiurus melas*), two yellow bullhead (*A. natalis*), one blue catfish (*Ictalurus furcatus*), and five channel catfish (*I. punctatus*). Sunfish (Centrarchidae, *Lepomis* spp., *Micropterus* spp., *Pomoxis* spp.) supplied twelve of the individuals but less than 1% of the biomass. Sunfish included twelve sunfish (*Lepomis* spp.), four bass (*Micropterus* spp.), and two crappie (*Pomoxis* spp.).

Wetland vertebrates (muskrat, birds other than turkey, amphibians, reptiles, and fish) contributed 97% of the individuals and at least 80% of the biomass in the Later Coles Creek component of Excavation Unit 6. The diversity and equitability results (Table 65) suggest a subsistence strategy in which a number of different taxa were used more or less equitably, but very few animals contributed substantial quantities of meat to the diet. In terms of effort, gar and bowfin were the primary targets, while in terms of meat, the dominant vertebrate resource were muskrat and bowfin.

The Transitional Coles Creek/Plaquemine Component, Stratum D. Ceramic analysis indicates that Stratum D represents a Transitional Coles Creek/Plaquemine occupation. The total number of bones analyzed from this level was 2,151, with an estimated 36 individuals (Table 69). Mammals contributed 17% of the individuals and 34% of the biomass for this level. Only two mammals were identified in this analytical unit. These were muskrat (*Ondatra zibethicus*) and raccoon (*Procyon lotor*). Muskrats contributed 14% of the individuals and 17% of the biomass. Amphibians and reptiles comprised 25% of the individuals and 17% of the biomass. These included salamander (*Necturus* spp.), two frog/toads, alligator (*Alligator mississippiensis*), mud turtles (Kinosternidae), pond turtles (Emydidae), softshell turtle (*Apalone* spp.), water snake (*Nerodia* spp.), and pit vipers (Viperidae). Fish in Stratum D made up 58% of the individuals and 49% of the biomass. Eight percent of the

Table 69. Species List: Transitional Coles Creek/Plaquemine (Stratum D).

Species	NISP	MNI	MNI %	Weight (gm)	Biomass (kg)	Biomass %
UID Small mammal	140			14.20	0.286	12.01
UID Large mammal	2			3.00	0.071	2.98
Ondatra zibethicus (Muskrat)	102	5	13.89	20.10	0.392	16.46
Procyon lotor *(Raccoon)*	7	1	2.78	2.90	0.069	2.90
Mammals Total	251	6	16.67	40.20	0.818	34.36
UID Herptile	15			0.60		
Necturus spp. (Salamaner)	1	1	2.78	0.10		
Frog/Toad	11	2	5.56	1.00		
Alligator *mississippiensis (Alligator)*	11	1	2.78	16.20		
UID Turtle	257			19.40	0.231	9.70
Kinosternidae (Mud turtles)	2	1	2.78	0.40	0.017	0.71
Emydidae (Pond turtles)	7	1	2.78	4.70	0.089	3.74
Apalone spp. (Softshell turtle)	8	1	2.78	2.10	0.052	2.18
UID Snake	5			0.10	0.001	0.04
Colubridae (Non-poisonous snakes)	3			0.20	0.003	0.13
Nerodia spp. (Water snake)	5	1	2.78	0.50	0.007	0.29
Viperidae (Pit vipers)	2	1	2.78	0.10	0.001	0.04
Herptile Total	327	9	25.00	45.40	0.401	16.84
UID Fish	618			24.00	0.372	15.62
Lepisosteus spp. (Gar)	356	3	8.33	14.90	0.255	10.71
Amia calva (Bowfin)	502	7	19.44	23.30	0.363	15.25
Ictaluridae (Bullhead catfishes)	57	6	16.67	4.10	0.076	3.19
Ameiurus spp. (Bullhead)	5			1.60	0.031	1.30
Ameiurus natalis (Yellow bullhead)	3	(1)		0.40	0.008	0.34
Ictalurus punctatus (Channel catfish)	1	(1)		0.60	0.012	0.50

Table 69. Species List: Transitional Coles Creek/Plaquemine (Stratum D).

Species	NISP	MNI	MNI %	Weight (gm)	Biomass (kg)	Biomass %
Centrarchidae (Sunfishes)	13			0.70	0.013	0.55
Lepomis spp. (Sunfish)	6	2	5.56	0.10	0.003	0.13
Micropterus spp. (Bass)	1	1	2.78	0.30	0.006	0.25
Pomoxis spp. (Crappie)	1	1	2.78	0.10	0.003	0.13
Aplodinotus grunniens (Freshwater drum)	10	1	2.78	0.40	0.020	0.84
Fish Total	1573	21	58.33	70.50	1.162	48.88
UID Bone				199.50		
UID Shell				0.10		
All Total	2151	36	100	355.60	2.381	100

individuals were gar (*Lepisosteus* spp.), which contributed an estimated 11% of the biomass. Bowfin (*Amia calva*) was the most common fish (MNI=19% and biomass=15%). Bullhead catfish (Ictaluridae, *Ameiurus natalis, Ictalurus punctatus*) contributed 17% of the individuals and 5% of the biomass. Sunfish (Centrarchidae, *Lepomis* spp., *Micropterus* spp., *Pomoxis* spp.) contributed 11% of the individuals but less than 1% of the biomass.

Wetland vertebrates (muskrat, amphibians, reptiles, and fish) constituted most of the individuals (97%) and biomass (at least 82%) in the Transitional Coles Creek/Plaquemine component of Excavation Unit 6. The diversity and equitability results (Table 65) suggest a subsistence strategy in which a number of different taxa were used more or less equitably, and in which several animals contributed substantial quantities of meat to the diet. In terms of capture effort, the dominant vertebrate resources were muskrat, bowfin, and catfish. Muskrat, gar, and bowfin were the primary sources of meat in the diet.

The Mississippi Period Component, Stratum C. Two bone buttons and a small number of brick fragments, as well as two C-14 dates, indicate that part of the material in Stratum C dates to the historic period (perhaps as late as ca. A.D. 1800). However, ceramic analysis (Chapter 12) indicates that Stratum C represents, for the most part, aboriginal activity during the Mississippi period.

The total number of bones from this level is 5,119 containing the remains of an estimated 68 individuals (Table 70). Mammals contributed 12% of the individuals and 39% of the biomass. Mammals included muskrat (*Ondatra zibethicus*), marsh rice rat (*Oryzomys palustris*), raccoon (*Procyon lotor*), and deer (*Odocoileus virginianus*). Muskrat were more common (MNI=6% and biomass=17%) than deer (MNI=2% and biomass=3%). Birds contributed 6% of the individuals and 3% of the biomass in this analytical unit. They included rail (*Rallus* spp.), barred owl (*Strix varia*), and perching bird (Passeriformes). Rails and barred owls prefer freshwater wetlands. Amphibians and reptiles comprised 16% of the individuals and 12% of the biomass in the Stratum C sample. Amphibians included lesser siren (*Siren intermedia*), salamander (*Necturus* spp.), and frog/toad, at least one of which was a bullfrog (*Rana catesbeiana*). An alligator (*Alligator mississippiensis*) was identified, as were mud turtles (Kinosternidae), pond turtles (Emydidae), softshell turtle (*Apalone* spp.), water snake (*Nerodia* spp.), and pit vipers (Viperidae).

Table 70. Species List: Mississippi Period (Stratum C).

Species	NISP	MNI	MNI %	Weight (gm)	Biomass (kg)	Biomass %
UID Mammal	93			22.20	0.428	10.98
UID Small mammal	231			10.90	0.226	5.80
Cricetidae (Mice and rats)	5			0.10	0.003	0.08
Ondatra zibethicus (Muskrat)	173	4	5.88	35.40	0.652	16.72
Oryzomys palustris (Marsh rice rat)	1	1	1.47	0.10	0.003	0.08
Procyon lotor (Raccoon)	15	2	2.94	4.70	0.106	2.72
Odocoileus virginianus (Deer)	2	1	1.47	4.30	0.098	2.51
Homo sapiens (Human)	1			1.10		
Mammals Total	**503**	**8**	**11.80**		**1.516**	**38.88**
UID Bird	43			4.20	0.075	1.92
Rallus spp. (Rail)	4	2	2.94	0.10	0.003	0.08
Strigidae (Owls)	6			0.90	0.019	0.49
Strix varia (Barred owl)	3	1	1.47	0.80	0.017	0.44
Passeriformes (Perching birds)	3	1	1.47	0.10	0.003	0.08
Birds Total	**59**	**4**	**5.88**	**6.10**	**0.117**	**3.00**
UID Herptile	42			4.00		
UID Amphibian	97			1.10		
Siren intermedia (Lesser siren)	2	1	1.47	0.10		
Necturus spp. (Salamander)	1	1	1.47	0.20		
Frog/Toad	15	2	2.94	0.70		
Rana catesbeiana (Bullfrog)	1	(1)		0.20		
Alligator mississippiensis (Alligator)	11	1	1.47	2.00		
UID Turtle	277			22.20	0.252	6.46
Kinosternidae (Mud turtle)	3	1	1.47	0.50	0.020	0.51
Emydidae (Pond turtles)	10	1	1.47	5.40	0.098	2.51

Table 70. Species List: Mississippi Period (Stratum C).

Species	NISP	MNI	MNI %	Weight (gm)	Biomass (kg)	Biomass %
Apalone spp. (Softshell turtle)	1	1	1.47	0.10	0.007	0.18
UID Snake	4			1.50	0.021	0.54
Colubridae (Non-poisonous snakes)	18	1	1.47	1.60	0.022	0.56
Nerodia spp. (Water snake)	7	1	1.47	0.70	0.010	0.26
Viperidae (Pit vipers)	35	1	1.47	1.40	0.019	0.49
Herptile Total	**524**	**11**	**16.18**		**0.449**	**11.52**
UID Fish	1132			38.00	0.535	13.72
Lepisosteus spp. (Gar)	669	7	10.29	18.00	0.296	7.59
Lepisosteus spatula (Alligator gar)	4	(1)		0.70	0.023	0.59
Amia calva (Bowfin)	2046	11	16.18	60.70	0.774	19.85
Ictaluridae (Bullhead catfishes)	133	15	22.06	7.60	0.137	3.51
Ameiurus spp. (Bullhead)	3			0.10	0.002	0.05
Ameiurus melas (Black bullhead)	2	(1)		0.10	0.002	0.05
Ameiurus natalis (Yellow bullhead)	3	(1)		0.20	0.004	0.10
Ictalurus furcatus (Blue catfish)	1	(1)		0.10	0.002	0.05
Ictalurus punctatus (Channel catfish)	2	(2)		0.20	0.004	0.10
Centrarchidae (Sunfishes)	16			0.50	0.010	0.26
Lepomis spp. (Sunfish)	8	7	10.29	0.10	0.003	0.08
Micropterus spp. (Bass)	5	3	4.41	0.50	0.010	0.26
Pomoxis nigromaculatus (Black crappie)	1	1	1.47	0.10	0.003	0.08
Aplodinotus grunniens (Freshwater drum)	8	1	1.47	0.20	0.012	0.31
Fish Total	**4033**	**45**	**66.18**	**127.10**	**1.817**	**46.60**
UID Bone				327.40		
UID Shell						
All Total	**5119**	**68**	**100**	**133.2**	**3.899**	**100**

Fish contributed 66% of the individuals and 47% of the estimated biomass in the Stratum C analytical unit. Gar (*Lepisosteus spp., L. spatula*) comprised 10% of the individuals and 8% of the biomass, and bowfin (*Amia calva*) 16% of the individuals and 20% of the biomass. Bullhead catfish (Ictaluridae, *Ameiurus melas, A. natalis, Ictalurus furcatus, I. punctatus*) constituted 22% of the individuals and 4% of the biomass. Four species of catfish were identified. These included at least one black bullhead (*Ameiurus melas*), one yellow bullhead (*A. natalis*), one blue catfish (*Ictalurus furcatus*), and two channel catfish (*I. punctatus*). Sunfish (Centrarchidae, *Lepomis spp., Micropterus spp., Pomoxis nigromaculatus*) contributed 16% of the individuals but less than 1% of the biomass. Sunfish included sunfish (*Lepomis* spp.), bass (*Micropterus* spp.), and black crappie (*Pomoxis nigromaculatus*).

Wetland vertebrates contributed 93% of the individuals and at least 76% of the biomass in the Mississippi period component of Excavation Unit 6. The diversity and equitability results (Table 65) suggest a subsistence strategy in which a number of different taxa were used more or less equitably, and in which several animals contributed substantial quantities of meat to the diet. In terms of individuals, the dominant vertebrate resources were gar, bowfin, catfish, and sunfish (*Lepomis* spp.). Muskrat and bowfin were the primary sources of meat in the diet.

Bone Modifications and Elements Identified

Modifications and elements identified provide additional information about animal use at the Pump Canal site. Some indications of butchering activities are represented by cut marks and burned bones, which suggest butchering, food preparation, or disposal practices. It is difficult to burn bones that are still surrounded by soft tissue. Hence burning indicates exposure to fire only in limited situations. These situations would include bone ends exposed in a cut of meat being roasted in a bed of coals or broiled over a fire, an accident in which a cut of meat was unintentionally charred, disposal of bone in a fire, burning of a refuse area, or accidental conflagrations, such as when the house or village caught fire. Few of these represent food preparation practices. For the sake of argument, in the following discussion it will be assumed that burned bones resulted from intentional exposure to fire as food was roasted in coals or over fires, since they were apparently not recovered from hearths or from burned structures. Due to the low incidence of deer in the Pump Canal material, little is learned from deer element distribution, although element distributions for muskrat suggest that entire carcasses were generally brought back to the site.

Strata G and I, Des Allemands phase. Table 71 itemizes the sources and number of modified bones in the Strata G-I analytical unit. Modifications were observed on 7% of the bones. Only one bone was cut and the remainder were burned. The cut bone was a UID Turtle femur fragment, supporting the interpretation that these animals were used as a food source. The majority (83%) of the modified bones were burned fish bones. Although most of the burned bones were fish, only 7% of the fish bones in this unit were burned, whereas 24% of the turtle bones had been burned. This may indicate that broiling or roasting in coals was one way to prepare turtles and fish.

The elements in the Strata G-I analytical unit provide little evidence for the use of mammals. The raccoon was identified from teeth, and the deer was identified from a single carpal. None of these elements provided information about age at death or sex, although neither the raccoon nor deer individuals were juveniles when they died.

Des Allemands phase, Stratum F. In Stratum F, 4% of the bones were modified (Table 72). Only two UID bones had cut marks. The remaining 98% of the modified bones were burned. While only 1% of the mammal bones had been burned, 15% of the turtle bones had been burned, and 4% of the fish bones. Over half of the burned bones were identified as bowfin.

The elements identified in Stratum F provide little evidence for the use of mammals, their age, or their sex. Muskrat was identified only from head and foot bones (Table 73), none of which were cut or burned. The dog was identified from ilium, ischium, and acetabulum fragments from the right innominate, which was also unmodified. The acetabulum was fused, indicating an animal which was at least a subadult if not an adult at death. The raccoon and deer were identified from single teeth fragments in each case. More precise estimates of age at death could not be made.

Early Coles Creek, Lower Stratum E. The large number of total bones in the Lower Stratum E analytical unit is matched by a large number of modified bones. Modified bones comprised 8% of the Lower Stratum E sample (Table 74). One UID Mammal bone was gnawed by a carnivore, and seven bones were cut. The cut bones include a raccoon tibia, a UID turtle limb bone fragment, a snapping turtle precoracoid, a gar basioccipital, and three UID bone fragments. Burned

Table 71. Pump Canal Bone Modifications: Strata G and I.					
Taxon	**Burned**	**Cut**	**Carnivore gnawed**	**Rodent gnawed**	**Total**
UID Turtle	5	1			6
UID Fish	22				22
Lepisosteus spp.	2				2
Amia calva	4				4
Ameiurus melas	1				1
Total	34	1	0	0	35

Table 72. Pump Canal Bone Modifications: Stratum F.					
Taxon	Burned	Cut	Carnivore gnawed	Rodent gnawed	Total
UID Mammal	1				1
UID Turtle	9				9
UID Fish	26				26
Lepisosteus spp.	1				1
Amia calva	42				42
Ictaluridae	2				2
UID Bone		2			2
Total	81	2	0	0	83

Table 73. Element Distribution of Muskrats (Ondatra zibethicus) from Pump Canal Strata.

	G-I	F	Lower E	Upper E	D	C
Head		3	66	159	50	98
Vertebrae/Ribs			1	58		1
Forequarters			22	34	15	20
Forefeet					2	1
Feet		1	25	63	9	9
Hindfeet		1	25	19	10	18
Hindquarters			23	74	16	26
Total		5	163	417	102	173

Table 74. Pump Canal Bone Modifications: Lower Stratum E.					
Taxon	Burned	Cut	Carnivore gnawed	Rodent gnawed	Total
UID Mammal	24		1		25
Ondatra zibethicus	7				7
Procyon lotor		1			1
UID Herptile	10				10
Anura	1				1
Alligator mississippiensis	15				15
UID Turtle	222	1			223
Chelydra serpentina		1			1
Kinosternidae	3				3
Emydidae	3				3
UID Snake	13				13
Nerodia spp.	1				1
Viperidae	1				1
UID Fish	443				443
Lepisosteus spp.	76	1			77
Amia calva	827				827
Ictaluridae	42				42
Ameiurus melas	6				6
Ameiurus natalis	5				5
Ictalurus furcatus	1				1
Ictalurus punctatus	3				3
Pylodictus olivaris	1				1
Centrarchidae	10				10
Lepomis spp.	10				10
Pomoxis spp.	1				1
UID Bone	687	3			690
Total	2412	7	1	0	2420

bones comprised 99% of the modifications. These included a burned frog/toad bone as well as 15 burned alligator bones. UID snake, water snake, and pit viper vertebrae were also burned. Most of the burned bones were from mammals (1% of the modified bones), turtles (9% of the modified bone), and fish (59% of the modified bone). Five percent of mammal bones in this analytical unit had been burned; 16% of the turtle bones; 6% of the snake bones; and 5% of the fish bones. Among the fish, 7% of the bowfin bones had been burned, 11% of the catfish bones, and 6% of the sunfish bones.

The elements identified in the Lower Stratum E sample provided little evidence for the use of mammals, their age, or their sex. Muskrat was identified from a large number of bones from throughout the skeleton (Table 73) and raccoon from seven teeth and three post-cranial bones. The deer was identified from three tooth fragments. The age and sex of the deer could not be estimated.

Later Coles Creek, Upper Stratum E. Modified bones totaled 908 or 6% of the Upper Stratum E sample (Table 75). Less than 1% of the modified bones were cut or gnawed. The cut bones from this analytical unit included one UID Mammal bone and two cut muskrat bones, a femur and a tibia fragment. Although it is unusual to find cut marks on small fish, a sunfish dentary had been cut. Two UID bones had marks on them, and a muskrat femur had evidence of carnivore gnawing. The burned bone consists of mammal (7% of the modified bones), turtle (8% of the modified bones), and fish (84% of the modified bones). Five percent of mammal bones had been burned; 15% of turtle bones; 3% of snake bones; and 6% of fish bones. Most of the burned fish bones were restricted to three families. Eleven percent of bowfin bones identified in Upper Stratum E had been burned; 16% of catfish bones; and 10% of sunfish bones.

The elements identified in Upper Stratum E provide little evidence for the use of mammals. Muskrat was identified from elements throughout the entire skeleton (Table 73) and raccoon only from teeth. One human tooth was identified, a child's incisor.

The Transitional Coles Creek/Plaquemine Component, Stratum D. Modifications were found on 7% of the bones in the Stratum D analytical unit (Table 76). Only one cut bone was noted, a UID Mammal fragment. The majority of the burned bones are mammal (12% of the modified bones), turtle (39% of the modified bones), and fish (48% of the modified bones). Seven percent of mammal bones had been burned; 20% of turtle bones; and 4% of fish bones. Most of the burned

Table 75. Pump Canal Bone Modifications: Upper Stratum E.					
Taxon	Burned	Cut	Carnivore gnawed	Rodent gnawed	Total
UID Mammal	49	1			50
Ondatra zibethicus	13	2	1		16
UID Herptile	4				4
UID Turtle	71				71
UID Snake	2				2
UID Fish	338				338
Lepisosteus spp.	37				37
Amia calva	338				338
Ictaluridae	38				38
Ictalurus punctatus	3				3
Centrarchidae	2	1			3
Lepomis spp.	1				1
Micropterus spp.	2				2
Pomoxis spp.	1				1
UID Bone	2	2			4
Total	901	6	1	0	908

Table 76. Pump Canal Bone Modifications: Stratum D.					
Taxon	Burned	Cut	Carnivore gnawed	Rodent gnawed	Total
UID Mammal	11	1			12
Ondatra zibethicus	6				6
Anura	1				1
UID Turtle	55				55
UID Fish	2				2
Lepisosteus spp.	20				20
Amia calva	24				24
Ictaluridae	17				17
Centrarchidae	1				1
Lepomis spp.	3				3
Aplodinotus grunniens	1				1
Total	141	1	0	0	142

fish bones were restricted to two families. Twenty-six percent of catfish bones and 19% of sunfish bones had been burned. Muskrat was identified from elements throughout the entire skeleton (Table 73) and raccoon from teeth.

The Mississippi Period Component, Stratum C. There were 244 bones with modifications, representing 5% of the Stratum C sample (Table 77). Eight percent of the modified bones were cut or gnawed. These included eight cut UID Mammal bone fragments and three cut muskrat bone (zygomatic arch, femur, tibia). An UID bird fragment, a rail tibiotarsus, and two bones (femur, tarsometatarsus) from a barred owl had been cut [the Strigidae is probably part of the barred owl (*Strix varia*)]. One UID mammal bone fragment, a muskrat tibia, and a raccoon ulna were carnivore gnawed and an UID mammal bone had been rodent gnawed, indicating that these bones might have been exposed on the surface for a longer period than the bones from earlier strata. The burned bones consist of mammal (9% of the modified bones), turtle (16% of the modified bones), and fish (60% of the modified bones). Four percent of mammal bones had been burned; 13% of turtle bones; 11% of snake bones; and 4% of fish bones. Most of the burned fish bones were restricted to three families. Thirteen percent of gar bones identified in Upper Stratum E had been burned; 19% of catfish bones; and 10% of sunfish bones.

The elements identified in Stratum C provide little evidence for the use of mammals, their age, or their sex. Muskrat was identified from elements throughout the entire skeleton (Table 73) and the raccoon from eleven teeth and three forequarter fragments. The deer was identified from an antler fragment which had also been burned, and a tooth fragment. The antler was not attached to the frontal. While it indicates use of antler, a small piece such as this cannot be used to interpret seasonal hunting since it might be from a larger antler segment that had been collected at some other time, either from a recently killed animal or from a shed antler. The age of the deer could not be determined, although it probably was not a juvenile. The human was identified from a worn adult incisor.

Other Modified Bone. A sample of additional worked bones was studied. These bones are from contexts outside the 50 x 50 cm portion of the Excavation Unit 6 which was examined and discussed above. They were pulled by the Earth Search, Inc., laboratory staff during washing and re-bagging of artifacts, and were sent to the Zooarcheology Laboratory for examination.

Table 77. Pump Canal Bone Modifications: Stratum C.					
Taxon	Burned	Cut	Carnivore gnawed	Rodent gnawed	Total
UID Mammal	7	8	1	1	17
Ondatra zibethicus	13	3	1		17
Procyon lotor	1		1		2
Odocoileus virginianus	1				1
UID Bird	3	1			4
Rallus spp.		1			1
Strigidae/Strix varia		2			2
UID Herptile	4				4
Anura	1				1
Alligator mississippiensis	1				1
UID Turtle	37				37
Emydidae	2				2
UID Snake	4				4
Colubridae	3				3
Lepisosteus spp.	86				86
Amia calva	31				31
Ictaluridae	26				26
Ameiurus natalis	1				1
Lepomis spp.	1				1
Micropterus spp.	2				2
UID Bone		1			1
Total	224	16	3	1	244

The bones were first analyzed to determine whether they were worked. Thirteen were determined to have been modified in some intentional manner. Ten were pointed artifacts (Figures 79 and 80, a-j) and three were carved or otherwise worked (Figure 80, k-m). Except for those artifacts made of deer antler, none could be identified as to family. Eleven of the pointed bones were made out of mammal bone shafts, one was made of deer antler tine, and one was made of an unidentified bone. The shafts were cut or broken longitudinally and then one end was ground to a point. Some of these pointed artifacts had a good deal of polish on the outside of the bones. There were also three bones that were worked or carved. One was finely polished with three lines cut into either side (Figure 80k). Another had two lines cut into it but was not polished (Figure 80l). The third (Figure 80m) was a mammal shaft that was smoothed on one side and may have been a fragment of a pointed artifact.

The function of the pointed bone artifacts can only be hypothesized at this time. Stewart (1977) illustrates the manufacture of bone barbs for fish hooks, and the Pump Canal artifacts would meet those criteria. However, Stewart's description is of artifacts from the Northwest coast. The pointed artifacts might also have been net making or basketry tools. Similar bone tools have been recorded from the Bowie, Sims, and Morgan sites in coastal Louisiana (Davis, Kidder, and Barondess 1982; Fuller and Fuller 1987:62-78; Kidder and Barondess 1982).

Atlas Measurements and Estimates of Standard Length for Fish

Using allometric relationships for atlas widths, Standard Lengths (SL) were estimated for three groups of fish: gar (*Lepisosteus spp.*), bowfin (*Amia calva*), and sunfish (members of the Centrarchidae family). Establishing a size range based on Standard Length from atlas measurements allows discussion of changes in fish size and fishing gear throughout the occupation of the Pump Canal site. Standard Length could be estimated for only a few individuals in Strata G-I and F (Tables 78 and 63). The combined G-I analytical unit had only eight atlases that could be measured. None of these were gar. Five bowfin had a mean Standard Length of 15 cm. The atlases of two gar, seven bowfin, and four sunfish could be measured in the Stratum F analytical unit. The gar had a mean Standard Length of 35 cm, the bowfin 50 cm, and the Centrarchids 13 cm.

The largest atlas samples were found in the Upper and Lower E components (Tables 78 and 63). The atlases of 250 individuals could be measured in the Lower Stratum E sample

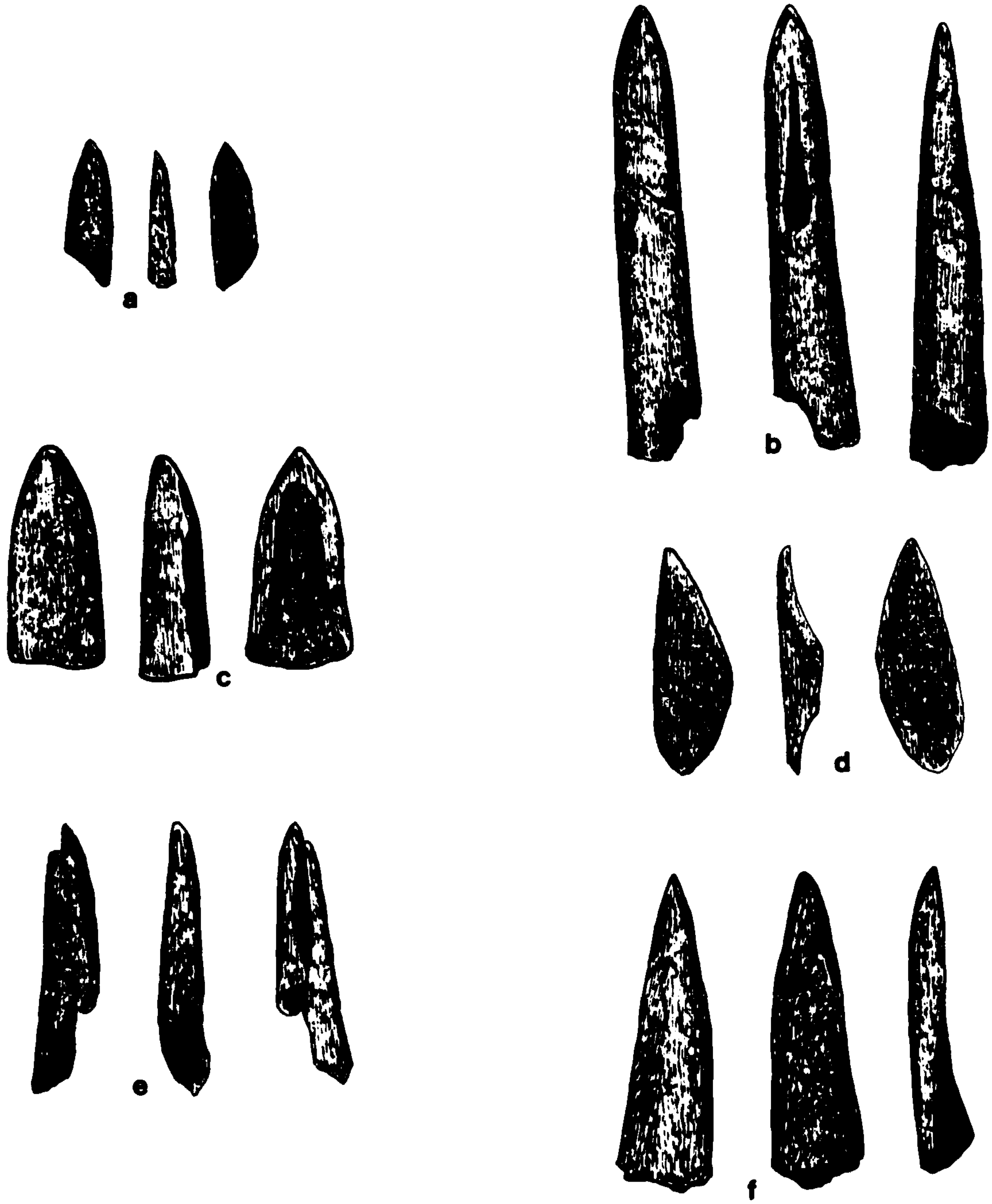


Figure 79. Worked bone from 16SC27. All are pointed artifacts. Proveniences: a) EU7 Stratum C (0-5 cm); b) EU7 Stratum D, Feature 34; c) EU7 Stratum I; d) EU7 Stratum I; e) EU7 Stratum I; f) EU5 Stratum E.

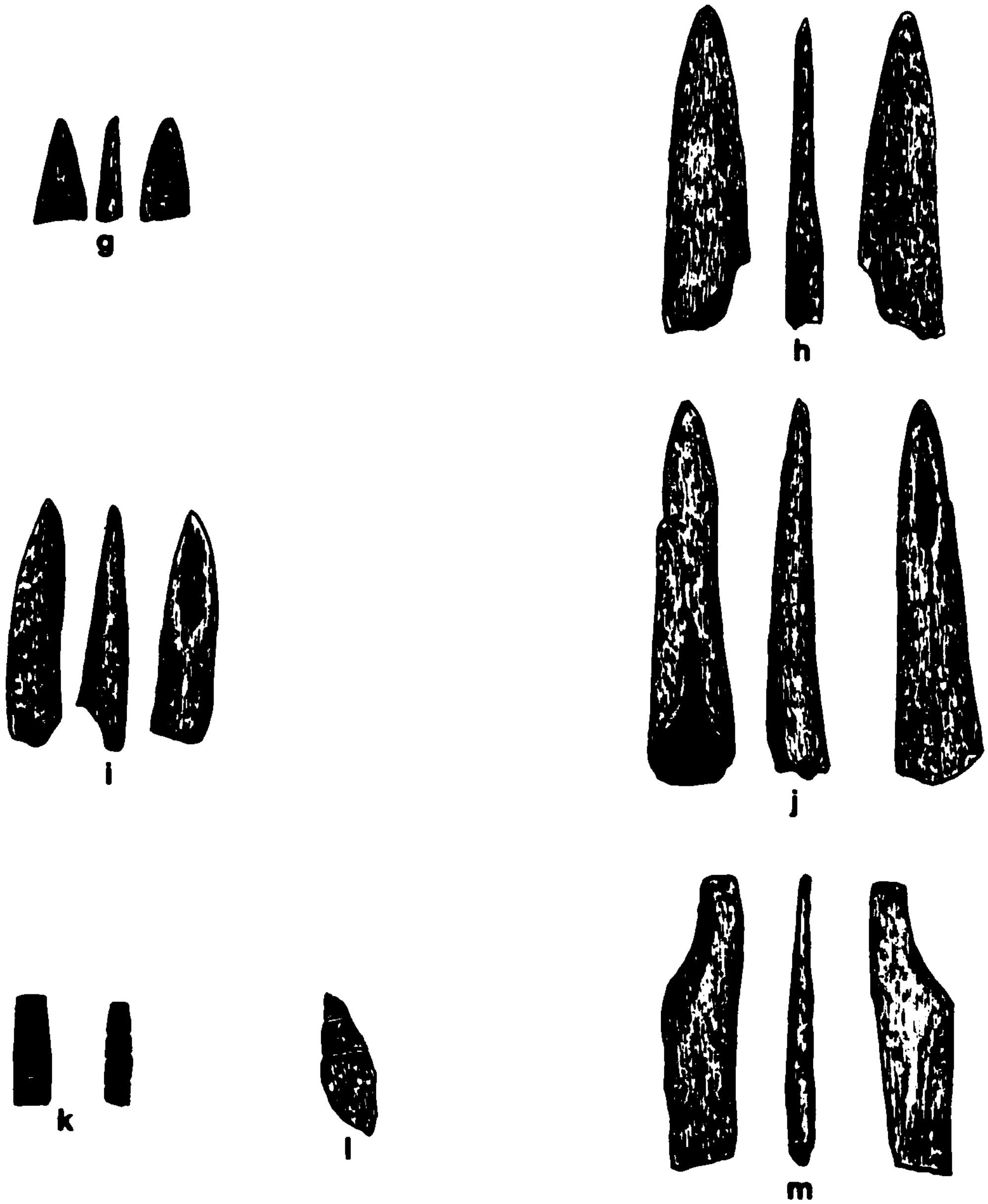


Figure 80. Additional worked bone from 16SC27. G-j are pointed artifacts; k is polished with 3 lines, l is not polished but has 2 lines, m is a shaft smoothed on one side. Proveniences: g) EU6 S1/2 Stratum E (Top 10 cm); h) EU6 NE1/4 Stratum E, Below Ground Surface; i) EU6 NE1/4 Stratum E, Below Ground Surface; j) EU6 NW1/4 Stratum E, Below Dense *Rangia*; k) EU7 Stratum D; l) EU6 S1/2 Stratum G; m) EU6 NW1/4 Stratum E, Below Dense *Rangia*.

Table 78. Pump Canal Standard Length, Mean, and Range of Selected Fish.

	Gar			Bowfin			Centrarchidae		
	mean	**range**	**n**	**mean**	**range**	**n**	**mean**	**range**	**n**
G-I	0	0	0	45.5	37.4-58.7	5	14.8	13.8-15.9	3
F	35.3	34.4-36.1	2	49.7	44-56.9	7	13.3	10.8-14.2	4
Lower E	55.1	30.3-122	30	47.4	31.3-72.1	93	13.9	95.1-27.3	127
Upper E	52.8	38.6-70.3	30	59.3	44.5-75.3	30	17.7	12-33.7	21
D	44.3	42.7-46.0	2	59.3	57-60	2	14.9	10.4-21	3
C	48.2	37.7-57.4	5	52.8	41.3-67	11	14.6	10.8-17.9	11
Total			69			148			169

and Upper Stratum E had measured atlases from 81 individuals. From these measurements it was estimated that gar had a mean Standard Length of 55 cm in the Lower Stratum E sample and 53 cm in the Upper Stratum E sample. However, the Lower Stratum E mean is decreased to 53 cm when a very large gar individual (SL=122 cm) is removed from the sample. [This individual was probably an alligator gar due to its large size (McClane 1978:179)]. Thus, the gar averages for both Lower and Upper Strata E are about the same. The bowfin mean, however, is considerably different between the two analytical units, with the Lower Stratum E Mean Standard Length of 47 cm considerably smaller than the Mean Standard Length of 59 cm in the Upper Stratum E sample. A similar pattern is seen in the sunfish with Mean Standard Length in Lower Stratum E (14 cm) smaller than that in Upper Stratum E (SL=18 cm).

Figure 81 illustrates the difference in combined fish size by percentage between Lower and Upper Strata E. Measured atlases in each stratum were grouped by size and divided by the total number of atlases measured from that stratum. This provides a comparison of the percentage of atlases in each size range found in each stratum relative to atlases in other size ranges in that stratum. Overall, there is no appreciable difference in the size range of fish between the two analytical units of Stratum E.

There is, however, a shift in the percentage of large fish between the two analytical units of Stratum E. Lower Stratum E had a much higher percentage of fish in the smallest size ranges than did Upper Stratum E, and large fish comprised a high percentage of the measurable individuals in Upper Stratum E. The majority of the small fish in both strata were members of the Centrarchid family, that is, sunfish (*Microperus* spp.), and crappie (*Pomoxis* spp.). Gar and bowfin are present primarily in the medium and large size ranges. In terms of Standard Length, small sunfish individuals (MNI) are far more common than the larger gar and bowfins in the Lower Stratum E sample. In contrast, fish in the Upper Stratum E sample are more commonly medium and larger bowfin and gar than small sunfish. Thus, variation in the size of fish exploited corresponds to the percentage of MNI contributed by gar, bowfin, and sunfish.

Very few atlases could be measured in the samples from Strata D and C (Tables 78 and 63). Gar from these strata had mean Standard Lengths of 44 cm and 48 cm. Mean Standard Length of bowfin in these strata were 59 cm and 53 cm. Sunfish had a mean Standard Length of 15 cm in both strata.

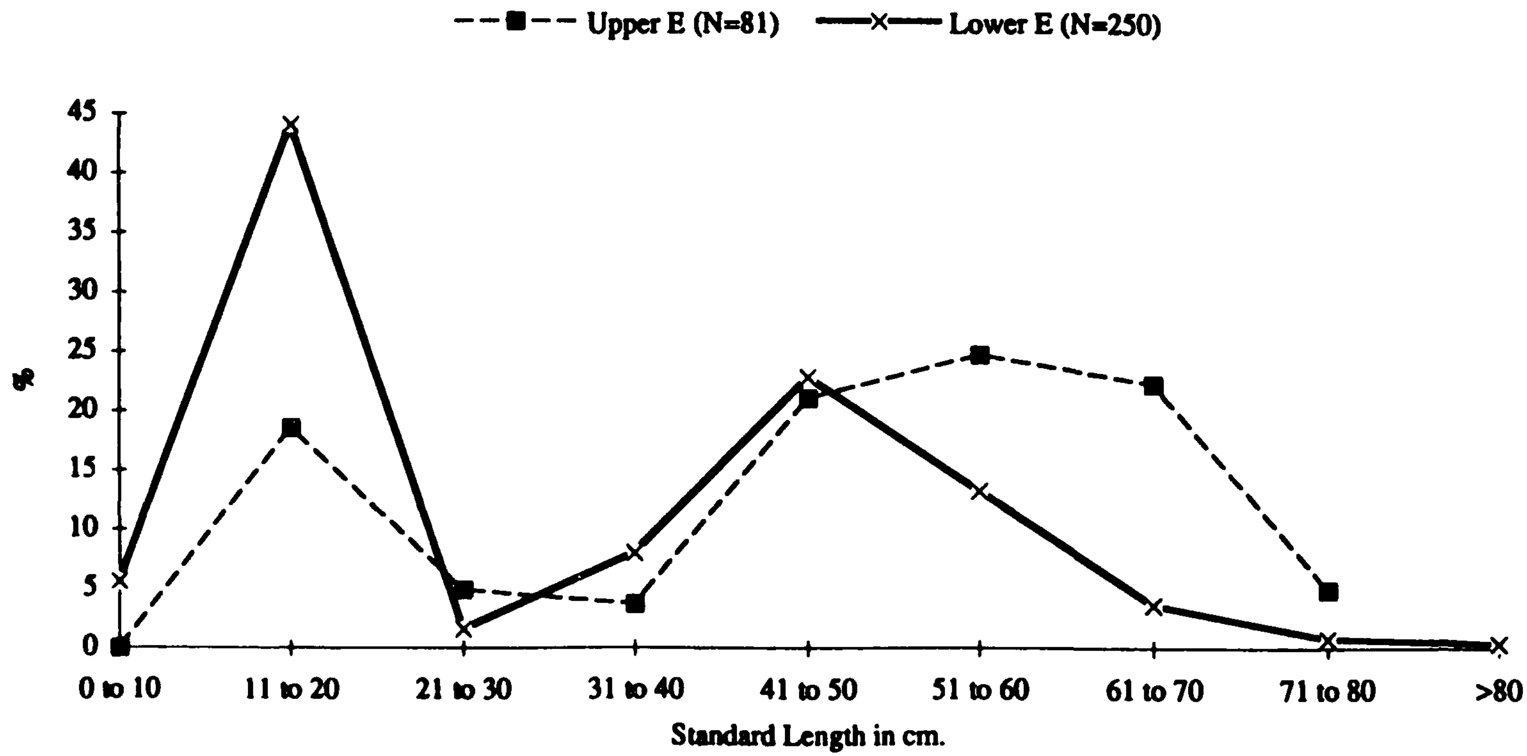


Figure 81. Variation in Percentage of Fish Size in Upper and Lower E.

These ranges fit into those described above where sample sizes were larger.

Habits and Habitats of Significant Taxa

A survey of literature available for wetland Louisiana clearly suggested that the Pump Canal materials should provide evidence that aquatic wetland resources were used extensively at this site. The habits and habitats of most of the taxa found in the Pump Canal assemblage demonstrate that this was the case. In terms of mammals, the dominant animals in all time periods were muskrats, which are common in marsh settings (Lowery 1974:271-273). Today, muskrats build substantial houses in the marsh, where they are widely trapped for their fur. Muskrats are primarily nocturnal, although they are sometimes active in the late afternoon (Lowery 1974:275). The birds and turtles identified are also primarily species common in freshwater locations. Deer and turkeys at first appear to represent a possible exception because both are often considered to be upland animals. However, they may be found in low-lying areas as well. Deer are animals with crepuscular habits and are often found in hardwood bottomlands (Lowery 1974:498). Analysis of macrobotanical remains indicates that the Pump Canal site was located in or very close to such a hardwood bottomland during the period of occupation (Chapter 16). Turkeys prefer to roost near water and are often found in backwater swamps and near cypress ponds (Bent 1963:336). Again, floral species associated with these habitats are well-represented in the macrobotanical remains from the site (Chapter 15).

The fish are of considerable interest. The species of fish common in the Pump Canal collection utilize similar habitats. All are found primarily in slow moving to still waters, such as bayous and oxbows (Douglas 1974:46-55, 222-230; McClane 1978:102-111, 178-180). Bowfin and gar are both voracious predators and eat other fish, as well as crabs and shrimp (McLane 1965:33-38). Catfish are primarily omnivorous scavengers, eating invertebrates and occasionally small fish (McClane 1978:103). Both gar and bowfin may be found feeding in weedy vegetation, and bowfin prefer densely vegetated marginal areas (McLane 1965:32). Bowfin and gar both come to the surface to breathe air. They also school at night when feeding, sometimes in very shallow waters, as do catfish (McLane 1965:33-34, 35, 105-106; Thompson 1985:104). Gar, bowfin, and catfish may be taken with hooks, seines, and traps (Thompson 1985:27, 31, 105). Fresh water is a prerequisite for bowfin (Myers 1938) so the abundance of this species in all Pump Canal strata is evidence that there was no substantial influx of saline waters at any time during the occupation of Pump Canal.

Those species of sunfish which could be identified are found in many habitats, but generally also prefer slow to still water within or near vegetation (Douglas 1974:286). Along with sunfish, the few bass identified may be found in slightly deeper water. Larger individuals of all species tend to be found in deeper waters. Many of these fish occur in schools. Sunfish are primarily carnivorous, feeding on crustaceans, molluscs, insects, and other fish. In turn, sunfish are preferred prey for gar (McLane 1965:38). Bowfin (McClane 1978:179) and, less commonly, small catfish (McClane 1978:103; Thompson 1985:107), also eat small fish, including sunfish. Thus, gar, bowfin, catfish, and sunfish could have all been taken from similar slow moving water conditions at the same time. For example, shortnose gar have been taken with bottom trawl accompanied by centrarchids (McLane 1965:38).

Discussion

The Pump Canal assemblage indicates that aquatic, wetland resources were the source of vertebrates used for subsistence in all periods considered. This is illustrated by the amount of estimated biomass contributed by fish. The percentage of estimated biomass contributed by mammals, birds, reptiles, and fish are illustrated in Figure 82. Fish contributed the highest amount of estimated biomass throughout the occupation of the Pump Canal site. However, there is a decrease in the percentage of estimated biomass contributed by fish over time. During the Baytown and Early Coles Creek occupations (Strata G-I, F, and Lower E), 70% of the estimated biomass was from fish. However, in the later Coles Creek, Transitional Coles Creek/Plaquemine, and Mississippi period occupations (Upper E, D, and C), barely 50% of the estimated biomass was contributed by fish. At the same time, the later Coles Creek and Transitional Coles Creek/Plaquemine samples also have higher biomass contributions from mammals. For the earlier occupations, mammals contributed 16% of the biomass while for the later occupations they contributed 39% of the biomass.

While it is tempting to argue that this increased use of mammals might be related either to development of ridges and hence to easier access to terrestrial mammals such as deer, or to increased horticultural activities, it is important to note that the increase in mammal use reflects an increase in biomass from muskrat rather than an increase in the use of deer. Deer actually contributed fewer individuals and less biomass during the later Coles Creek

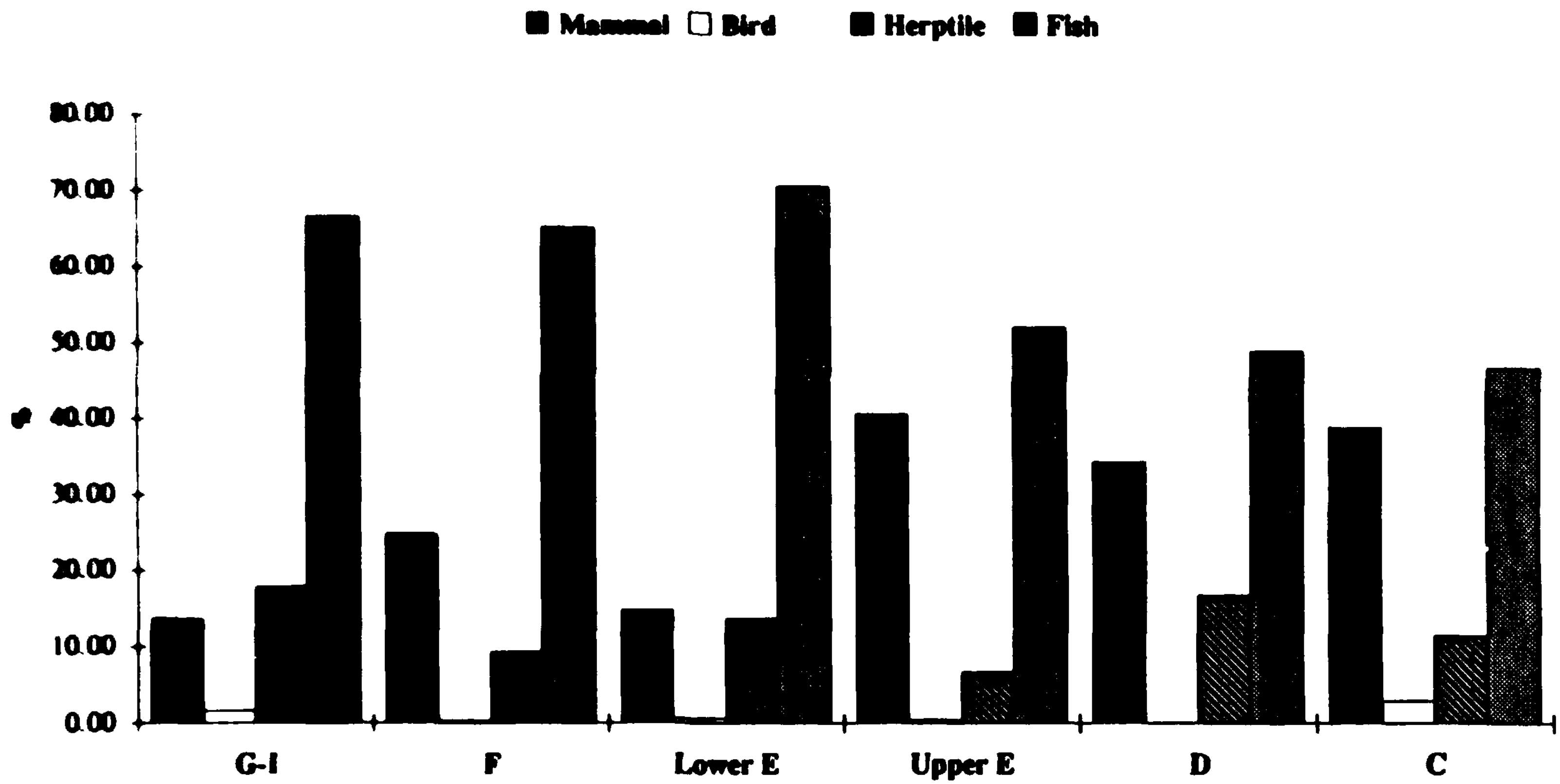


Figure 82. Summary of Biomass Percentages from Pump Canal.

and Transitional Coles Creek/Plaquemine occupations than during the Baytown and early Coles Creek occupations. The increased use of muskrats does not correlate with a substantial change in subsistence behavior as indicated by diversity and equitability indices (Table 65). These indices indicate that there was very little change in subsistence orientation between the Baytown and early Coles Creek occupations (Strata G-I, F, and Lower E) as compared with and the later Coles Creek, Transitional Coles Creek/Plaquemine, and Mississippi period occupations (Strata Upper E, D, and C).

The decline in fish biomass in the later Coles Creek strata as well as variation in the size of the fish could be due to three factors: a change in the natural environment; a change in capture techniques; a change in socio-political conditions. Excluding the third option, which is beyond the scope of this report, these other two factors are closely related phenomena. Changes in dissolved oxygen, turbidity, current strength, or salinity could have stimulated a change in capture techniques either because of alterations in water characteristics and/or in fish fauna available at a particular location. Changes in capture techniques might also accompany a change in fishing location unrelated to changes in water conditions *per se*. For example, an area that was once relatively shallow may have deepened, attracting larger fish which people exploited by changing fishing gear to take advantage of the new resource. Development of a new fishing technology might also facilitate use of a resource previously available but less commonly used. Since many of the fish identified in the Pump Canal assemblage are catholic in their habits and habitat preferences, it seems unwise to infer environmental change from these data. Rather, independent geological information should be used to establish change in water conditions and the faunal data examined from that perspective.

In the following, we assume that changes in fish recovered from Pump Canal reflect technological alterations, including both different fishing gear and different fishing locations. Combining knowledge about the habits and habitats of the fish with the estimated Standard Length of fish used during the different cultural occupations at the site allows us to explore the influence of capture techniques on fish use at Pump Canal. There may be several different technologies employed such as nets, traps, lines with hooks or gorges, poisons, and spears. Examining the variation and type of fish recorded from Pump Canal may point to a preference of one type of fishing technique over another.

Whenever small fish are common in an archeological assemblage, mass capture devices such as nets, traps, and weirs may have been used. Nets might include hauled seines, set gill nets, hand nets, dip nets, or basketry scoops (Rostlund 1952; Stewart 1977). The gauge of the net would influence the size of the fish captured. Small gauges would capture large fish as well as small fish, while larger gauges would permit small fish to escape. Le Page du Pratz (in Rostlund 1952:164) noted the use of small hand nets carried by swimmers among the Choctaw, Chickasaw, Creek, and Cherokee. The Pacaha also had nets set in place according to Elvas (in Rostlund 1952:164). The use of nets is supported by the presence of net sinkers in prehistoric sites in the southeast. Traps and weirs function in a similar manner (Rostlund 1952; Stewart 1977). The mouth of the trap or weir would also determine the size of the fish captured. A small mouth would exclude large fish while a large mouth would capture large fish but allow small fish to escape. These devices require either slow moving waters (nets) or narrow channels (weirs). Traps would be particularly effective in the capture of turtles. Since no small minnow-sized fish such as madtoms, silversides, or small perches were found in the Pump Canal assemblage, very small meshed seines may not have been used to any great extent. Larger meshed nets, traps, and weirs, however, may have been used, particularly in the earlier periods of occupation.

Methods employing hook or gorges attached to line to capture fish may also have been used (Stewart 1977:45). This would include set or trot lines as well as hand-held devices. Set lines could be left untended for periods of time and collected whenever convenient and would, therefore, require less effort than hand-held lines. Bowfin, gar, catfish, and sunfish, as well as turtles, may have been caught by some type of hook. However, some species of gar, especially longnose gar, have mouths that are too bony to take a hook well (Thompson 1985:27). There is archeological evidence for fish hooks at Morton Shell Mounds (Byrd 1974:8) and other areas in Louisiana (Penicaut in Rostlund 1952:184). Many hooks can be shaped out of wood (Stewart 1977:35) and so might not survive archeological deposition. Stewart (1977:49) illustrates several types of bone points and barbs that might be used to form fishhooks. The pointed bone artifacts found in the Pump Canal collection could be bone points used for similar barbs or hooks.

Poison is another mass capture fishing technique. Swanton (1946:344) notes the use of pounded buckeye and devil's shoestring as fish poison by the Choctaw. Poison would be most effective in areas with slow water movement. Poisoning would result in a wide variety of fish species and sizes floating to the surface, although it is theoretically possible for fishermen to select just those species or sizes preferred from the bounty. There is some question whether poison would affect gar, an air-breathing, armored fish, as much as it would affect other fish. Since poisoning works best in shallow, quiet waters, it would be more likely that many small fish would be captured, and that these would be recovered in archeological deposits. The Pump Canal assemblage, however, contains a fairly limited range of species unlike the diversity of fish poison would provide.

Spearing is another possibility. It is also the most labor intensive and time consuming technique, since it requires someone to be present at all times. Most of the fish in the Pump Canal collection were large enough to spear. However, many of the fish identified prefer muddy bottoms and weedy areas, which would tend to make spearing less effective as a regular food gathering technique. On the other hand, bowfin and gar, both of which are common in the Pump Canal collection, tend to congregate part of the time near the surface, and this would make spearing more efficacious. Given the time required for spearing an armored fish, preference should have been given to less time-consuming techniques.

The observed variation in the Standard Length of fish used can be explained by a change in capture techniques employed during early and later Coles Creek occupations. Small sunfish constituted a greater percentage of the measurable fish in the early Coles Creek collection than in the later Coles Creek. Although sunfish were not a major contributor of biomass, they constituted 43% of the individuals in the early Coles Creek collection, compared to 12% in the later Coles Creek. The early Coles Creek peoples may have employed techniques that captured sunfish preferentially and bowfin, gar, and catfish secondarily. The large numbers of small sunfish suggest that they were caught using a fine meshed net or trap. The mesh size was probably around 8-10 cm. Some type of hook/gorge and line was probably also used, particularly to capture the very large gar whose standard length was determined to be 122 cm. Devices designed to capture large bowfin, gar, and catfish may have been preferred during the later Coles Creek occupation. Since these fish are either voracious carnivores or bottom feeding scavengers, this argues for preferential use of lines with hooks or gorges or traps/weirs with large mouths rather than small gauged nets Gar in particular seem unlikely to be caught with nets

While the same suite of animals were used throughout the entire occupation of Pump Canal, there are differences in the collection which might reflect slight shifts in subsistence technology. In the early Coles Creek, small gauge nets were used to capture sunfish, although traps and hooks/gorges on set lines were probably also used to capture larger fish and turtles. In the later Coles Creek occupation, small sunfish constituted a much lower percentage of the fish used, indicating that smaller gauge nets were probably not used as often as larger gauge nets, traps, or hook/gorge on set lines. At the same time, muskrat use increased in the later Coles Creek occupation. Since these small aquatic mammals are easily trapped, this suggests more frequent use of traps in the wetlands around the site. These differences in food gathering techniques between the early and later Coles Creek occupation may indicate a change in environmental features, a shift in available labor, or alterations in socio-political networks which are beyond the purview of this chapter. Since there is so little evidence for change in the natural setting, alterations in the cultural environment seem more probable.

Conclusions

These data from the Pump Canal site demonstrate that the use of fish documented for Morton Shell Mound and Bruly St. Martin is also found in another southern Louisiana wet site. Fine-screening during recovery of the materials has resulted in a unique collection which is both large and well recovered. By estimating the dietary contribution of vertebrate resources used during the occupation of the site as well as the Standard Length of fish recovered, it was possible to examine resource use from the Baytown through Mississippi period occupations at the site. While the same suite of freshwater animals was used throughout the occupation, there are differences in the collection which might reflect shifts in subsistence technology. The change in early Coles Creek as compared to later Coles Creek subsistence remains indicates a trend towards use of larger fish and more muskrat. While changes in resource use may reflect environmental fluctuations, it seems more likely that they reflect alterations in the cultural environment. Correlation of some of these trends with changes in societal complexity may indicate to the cultural historian some of the factors that influenced prehistoric peoples in southern Louisiana.

CHAPTER 15
RANGIA ANALYSIS FOR 16SC27
By James Patrick Whelan, Jr.

Eleven samples of *Rangia cuneata* shells from the Pump Canal site (16SC27) were analyzed. All of the samples were recovered from Excavation Unit 6 (EU6). Initial samples were limited to the northwest quarter of the unit because that quadrant was used for vertebrate faunal analysis (Chapter 14). Comparability between proveniences was desired. However, the small number of usable shells from two levels required additional shells from the northeast quarter of the unit to provide an adequate sample size. These samples were from Stratum E Below Feature 19, Above Compact Surface and Stratum I Above *Rangia*." Analyses of the samples focused on three main topics: (1) estimating the season during which the *Rangia* were collected, (2) characterizing the population structure represented by the shells, and (3) estimating potential meat weight represented by the shells.

Rangia Seasonality

Eleven samples of *Rangia* shells were submitted for morphological seasonality analysis. The analysis was based on the technique developed and described by Aten (1972, 1981) and Dillehay (1975) and refined by Carlson (1988) and Aten (personal communication 1987). The basic methodology has been explained and used many times. For that reason, the methodology is not recapitulated in this chapter.

For purposes of clarity, however, it is appropriate to define the categories used in the analysis of the shells. *Rangia*, and other molluscs, undergo two types of growth during an annual cycle. First, a period of fast growth when most of the annual growth ring or increment is laid down, and second, a period of near dormancy or slow growth. Aten (1981) divides the fast growth period into thirds labeled "Early," "Middle," and "Late." "Early" refers to the first third of the fast growth period, "Middle" to the second third, and "Late" to the last. After a full growth ring has been identified for a particular shell, the last growth increment is measured with a set of sliding calipers. If the width of that ring is less than one-third the width of the full growth ring, the last increment is classed as "Early." If its width is between one-third and two-thirds that of the full ring, it is classed as "Middle." If the width of the last growth increment is more than two-thirds that of the full growth ring, it is classed as "Late." The period of slow growth, labeled "Interrupted," occurs between the "Late" and "Early" portions of the fast growth cycle.

It is abbreviated as INTERR in Figures 83 through 93. A fifth category used to classify the shells is "Indeterminant," abbreviated as INDET in the figures. This category is used only to record shells on which the annual growth ring morphology is indistinct or equivocal. While it is not a growth stage, it does serve as a check to monitor a function of *Rangia* population growth. On the average, the size of the indeterminant class should be about 13 percent (Aten 1981, personal communication 1987).

Carlson's contribution has been to create a mathematical model of the annual growth cycle in modern clam populations. The model provides the basis for a computer program capable of comparing the similarity of growth stages in a given sample against the 24 semi-monthly increments of the annual population model. The program determines which of the 24 increments is most similar to the sample. This "best fit" increment is taken to be the most accurate estimate of seasonality for the sample (Aten, personal communication 1987).

Each sample from 16SC27 was analyzed using Aten's technique. The results were processed with Carlson's computer program using a Kaypro I CPM computer. The results are presented in Figures 83 to 93. It should be noted that the quality of the shell submitted for analysis was poor. In every sample, nearly all of the shells were badly eroded and their outside surfaces were worn. In addition, the ventral edges of most shells, portions vital for seasonality analysis, were worn or battered. The submitted samples were well below the quality normally desired for a seasonality estimation. Nevertheless, a decision was made to proceed with the analysis. Although the quality of the shells made the results somewhat questionable, analysis was pursued because few studies of this kind had been conducted on samples of *Rangia* shells from archeological sites in Louisiana. Therefore, the results provided at least a basis for future comparisons should data from other sites become available.

The computer-generated seasonality estimates indicate a mid-spring to mid-summer season of occupation at 16SC27. The earliest estimates are End-April from Stratum E, Below Dense *Rangia* (Figure 89), and Stratum I Above *Rangia* (Figure 92). The latest estimate is End-July from Stratum D (Figure 84). These dates are not surprising, as a substantial majority of all *Rangia* seasonality estimates at other sites fall within this mid-spring to mid-summer time period (Weinstein and Whelan 1987).

MORTALITY DATE	ESS	ESS HISTOGRAM [* = 0.01 unit]
Mid Jan	0.7072	***
End Jan	0.7549	***
Mid Feb	0.7070	***
End Feb	0.5628	**
Mid Mar	0.4157	**
End Mar	0.2995	******************************
Mid Apr	0.1911	*******************
End Apr	0.1000	**********
Mid May	0.0367	****
End May	0.0082	*
Mid Jun	0.0173	**
End Jun	0.0340	***
Mid Jul	0.0572	******
End Jul	0.1158	************
Mid Aug	0.1801	******************
End Aug	0.2200	**********************
Mid Sep	0.2452	*************************
End Sep	0.2872	*****************************
Mid Oct	0.3500	***********************************
End Oct	0.3797	**************************************
Mid Nov	0.3849	**************************************
End Nov	0.4074	***
Mid Dec	0.4839	**
End Dec	0.6082	***

The best fit is End May and the error sum of squares (ESS) is 0.0082
The mean squared error is 0.3147 with variance 0.0519

DATA

Growth Classes:	INTERR	EARLY	MIDDLE	LATE	INDET	Total
Rangia Counts:	0	13	19	9	5	46
Actual Prop:	0.0000	0.2826	0.4130	0.1957	0.1087	
Expected Prop:	0.0451	0.3012	0.4378	0.1236	0.0923	

Figure 83. *Rangia cuneata* seasonality estimate for Stratum C: End May.

MORTALITY DATE	ESS	ESS HISTOGRAM [* = 0.01 unit]
Mid Jan	0.4627	**
End Jan	0.5242	**
Mid Feb	0.5056	***
End Feb	0.4055	***
Mid Mar	0.2994	******************************
End Mar	0.2286	***********************
Mid Apr	0.1719	*****************
End Apr	0.1304	*************
Mid May	0.0997	**********
End May	0.0858	*********
Mid Jun	0.0918	*********
End Jun	0.0805	********
Mid Jul	0.0362	****
End Jul	0.0241	**
Mid Aug	0.0406	****
End Aug	0.0582	******
Mid Sep	0.0723	*******
End Sep	0.0968	**********
Mid Oct	0.1365	**************
End Oct	0.1584	****************
Mid Nov	0.1661	*****************
End Nov	0.1887	*******************
Mid Dec	0.2548	*************************
End Dec	0.3629	************************************

The best fit is End Jul and the error sum of squares (ESS) is 0.0241
The mean squared error is 0.1951 with variance 0.0226

DATA

Growth Classes:	INTERR	EARLY	MIDDLE	LATE	INDET	Total
Rangia Counts:	6	12	15	19	8	60
Actual Prop:	0.1000	0.2000	0.2500	0.3167	0.1333	
Expected Prop:	0.0962	0.0591	0.2633	0.3804	0.2010	

Figure 84. *Rangia cuneata* seasonality estimate for Stratum D: End July.

MORTALITY DATE	ESS	ESS HISTOGRAM [* = 0.01 unit]
Mid Jan	0.6287	***
End Jan	0.6644	**
Mid Feb	0.6071	***
End Feb	0.4576	**
Mid Mar	0.3081	*******************************
End Mar	0.1939	*******************
Mid Apr	0.0993	**********
End Apr	0.0362	****
Mid May	0.0112	*
End May	0.0253	***
Mid Jun	0.0719	*******
End Jun	0.1036	**********
Mid Jul	0.1112	***********
End Jul	0.1456	***************
Mid Aug	0.1931	*******************
End Aug	0.2290	***********************
Mid Sep	0.2547	*************************
End Sep	0.2892	*****************************
Mid Oct	0.3367	**********************************
End Oct	0.3576	************************************
Mid Nov	0.3590	************************************
End Nov	0.3760	**************************************
Mid Dec	0.4394	**
End Dec	0.5436	**

The best fit is Mid May and the error sum of squares (ESS) is 0.0112
The mean squared error is 0.2851 with variance 0.0373

DATA

Growth Classes:	INTERR	EARLY	MIDDLE	LATE	INDET	Total
Rangia Counts:	1	11	9	5	4	30
Actual Prop:	0.0333	0.3667	0.3000	0.1667	0.1333	
Expected Prop:	0.0782	0.3911	0.3368	0.0818	0.1121	

Figure 85. *Rangia cuneata* seasonality estimate for Stratum E 0-5 cm. Mid May.

MORTALITY DATE	ESS	ESS HISTOGRAM [* = 0.01 unit]
Mid Jan	0.5716	***
End Jan	0.6339	***
Mid Feb	0.6085	***
End Feb	0.4937	***
Mid Mar	0.3722	*************************************
End Mar	0.2835	****************************
Mid Apr	0.2031	********************
End Apr	0.1348	*************
Mid May	0.0806	********
End May	0.0485	*****
Mid Jun	0.0437	****
End Jun	0.0357	****
Mid Jul	0.0178	**
End Jul	0.0358	****
Mid Aug	0.0733	*******
End Aug	0.1001	**********
Mid Sep	0.1185	************
End Sep	0.1526	***************
Mid Oct	0.2062	*********************
End Oct	0.2342	***********************
Mid Nov	0.2426	************************
End Nov	0.2678	***************************
Mid Dec	0.3432	**********************************
End Dec	0.4652	***

The best fit is Mid Jul and the error sum of squares (ESS) is 0.0178
The mean squared error is 0.2403 with variance 0.0360

DATA

Growth Classes	INTERR	EARLY	MIDDLE	LATE	INDET	Total
Rangia Counts:	2	9	15	13	6	45
Actual Prop	0.0444	0.2000	0.3333	0.2889	0.1333	
Expected Prop	0.0482	0.0827	0.3905	0.3156	0.1630	

Figure 86 *Rangia cuneata* seasonality estimate for Stratum E Below F19 and Above Compact Surface Mid July

MORTALITY DATE	ESS	ESS HISTOGRAM [* = 0.01 unit]
Mid Jan	0.5858	***
End Jan	0.6295	***
Mid Feb	0.5843	**
End Feb	0.4505	***
Mid Mar	0.3164	********************************
End Mar	0.2157	**********************
Mid Apr	0.1288	*************
End Apr	0.0633	******
Mid May	0.0239	**
End May	0.0156	**
Mid Jun	0.0390	****
End Jun	0.0570	******
Mid Jul	0.0601	******
End Jul	0.0947	*********
Mid Aug	0.1424	**************
End Aug	0.1756	******************
Mid Sep	0.1975	********************
End Sep	0.2302	***********************
Mid Oct	0.2790	****************************
End Oct	0.3016	******************************
Mid Nov	0.3040	******************************
End Nov	0.3220	********************************
Mid Dec	0.3873	***************************************
End Dec	0.4959	**

The best fit is End May and the error sum of squares (ESS) is 0.0156
The mean squared error is 0.2542 with variance 0.0343

DATA

Growth Classes:	INTERR	EARLY	MIDDLE	LATE	INDET	Total
Rangia Counts:	1	6	7	4	3	21
Actual Prop:	0.0476	0.2857	0.3333	0.1905	0.1429	
Expected Prop:	0.0451	0.3012	0.4378	0.1236	0.0923	

Figure 87. *Rangia cuneata* seasonality estimate for Stratum E Below Compact Surface and Above Dense *Rangia*: End May.

MORTALITY DATE	ESS	ESS HISTOGRAM [* = 0.01 unit]
Mid Jan	0.5368	**
End Jan	0.6012	**
Mid Feb	0.5820	**
End Feb	0.4772	**
Mid Mar	0.3664	*************************************
End Mar	0.2878	*****************************
Mid Apr	0.2164	**********************
End Apr	0.1532	***************
Mid May	0.0981	**********
End May	0.0606	******
Mid Jun	0.0486	*****
End Jun	0.0352	****
Mid Jul	0.0109	*
End Jul	0.0238	**
Mid Aug	0.0575	******
End Aug	0.0812	********
Mid Sep	0.0969	**********
End Sep	0.1276	*************
Mid Oct	0.1782	******************
End Oct	0.2052	*********************
Mid Nov	0.2136	*********************
End Nov	0.2380	************************
Mid Dec	0.3113	*******************************
End Dec	0.4312	***

The best fit is Mid Jul and the error sum of squares (ESS) is 0.0109
The mean squared error is 0.2266 with variance 0.0326

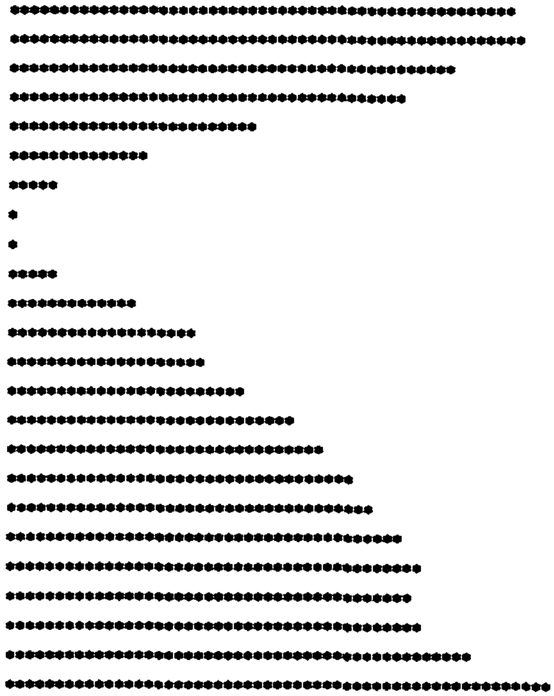
DATA

Growth Classes:	INTERR	EARLY	MIDDLE	LATE	INDET	Total
Rangia Counts:	2	5	10	9	4	30
Actual Prop:	0.0667	0.1667	0.3333	0.3000	0.1333	
Expected Prop:	0.0482	0.0827	0.3905	0.3156	0.1630	

Figure 88. *Rangia cuneata* seasonality estimate for Stratum E Within Dense *Rangia*: Mid July.

MORTALITY DATE	ESS
Mid Jan	0.6098
End Jan	0.6246
Mid Feb	0.5523
End Feb	0.3964
Mid Mar	0.2475
End Mar	0.1352
Mid Apr	0.0503
End Apr	0.0065
Mid May	0.0084
End May	0.0539
Mid Jun	0.1324
End Jun	0.1890
Mid Jul	0.2044
End Jul	0.2403
Mid Aug	0.2863
End Aug	0.3222
Mid Sep	0.3475
End Sep	0.3728
Mid Oct	0.4061
End Oct	0.4181
Mid Nov	0.4132
End Nov	0.4211
Mid Dec	0.4673
End Dec	0.5481

ESS HISTOGRAM
[* = 0.01 unit]



The best fit is End Apr and the error sum of squares (ESS) is 0.0065
The mean squared error is 0.3106 with variance 0.0333

DATA

Growth Classes:	INTERR	EARLY	MIDDLE	LATE	INDET	Total
Rangia Counts:	1	5	3	1	1	11
Actual Prop:	0.0909	0.4545	0.2727	0.0909	0.0909	
Expected Prop:	0.1473	0.4406	0.2320	0.0522	0.1279	

Figure 89. *Rangia cuneata* seasonality estimate for Stratum E Below Dense *Rangia*: End April.

MORTALITY DATE	ESS	ESS HISTOGRAM [* = 0.01 unit]
Mid Jan	0.6623	**
End Jan	0.6905	***
Mid Feb	0.6256	***
End Feb	0.4694	***
Mid Mar	0.3166	********************************
End Mar	0.1980	********************
Mid Apr	0.0984	**********
End Apr	0.0307	***
Mid May	0.0033	
End May	0.0178	**
Mid Jun	0.0685	*******
End Jun	0.1101	***********
Mid Jul	0.1334	*************
End Jul	0.1835	******************
Mid Aug	0.2411	************************
End Aug	0.2812	****************************
Mid Sep	0.3080	*******************************
End Sep	0.3426	**********************************
Mid Oct	0.3904	***************************************
End Oct	0.4102	***
Mid Nov	0.4088	***
End Nov	0.4226	**
Mid Dec	0.4827	**
End Dec	0.5837	**

The best fit is Mid May and the error sum of squares (ESS) is 0.0033
The mean squared error is 0.3116 with variance 0.0419

DATA

Growth Classes:	INTERR	EARLY	MIDDLE	LATE	INDET	Total
Rangia Counts:	2	23	20	7	8	60
Actual Prop:	0.0333	0.3833	0.3333	0.1167	0.1333	
Expected Prop:	0.0782	0.3911	0.3368	0.0818	0.1121	

Figure 90. *Rangia cuneata* seasonality estimate for Stratum F: Mid May.

MORTALITY DATE	ESS	ESS HISTOGRAM [* = 0.01 unit]
Mid Jan	0.5513	***
End Jan	0.5870	***
Mid Feb	0.5346	***
End Feb	0.3949	***************************************
Mid Mar	0.2549	*************************
End Mar	0.1524	***************
Mid Apr	0.0741	*******
End Apr	0.0309	***
Mid May	0.0244	**
End May	0.0537	*****
Mid Jun	0.1098	***********
End Jun	0.1388	**************
Mid Jul	0.1253	*************
End Jul	0.1352	**************
Mid Aug	0.1659	*****************
End Aug	0.1947	*******************
Mid Sep	0.2176	**********************
End Sep	0.2456	*************************
Mid Oct	0.2832	****************************
End Oct	0.3001	******************************
Mid Nov	0.3016	******************************
End Nov	0.3176	********************************
Mid Dec	0.3751	**************************************
End Dec	0.4699	***

The best fit is Mid May and the error sum of squares (ESS) is 0.0244
The mean squared error is 0.2516 with variance 0.0263

DATA

Growth Classes:	INTERR	EARLY	MIDDLE	LATE	INDET	Total
Rangia Counts:	4	21	13	11	7	56
Actual Prop:	0.0714	0.3750	0.2321	0.1964	0.1250	
Expected Prop:	0.0782	0.3911	0.3368	0.0818	0.1121	

Figure 91. *Rangia cuneata* seasonality estimate for Stratum G: Mid May.

```
MORTALITY          ESS HISTOGRAM
DATE       ESS     [* = 0.01 unit]

Mid Jan    0.5480  *******************************************************
End Jan    0.5776  **********************************************************
Mid Feb    0.5204  ****************************************************
End Feb    0.3781  **************************************
Mid Mar    0.2377  ************************
End Mar    0.1350  **************
Mid Apr    0.0585  ******
End Apr    0.0197  **
Mid May    0.0199  **
End May    0.0575  ******
Mid Jun    0.1223  ****** *****
End Jun    0.1588  ****************
Mid Jul    0.1491  ***************
End Jul    0.1612  ****************
Mid Aug    0.1926  *******************
End Aug    0.2219  **********************
Mid Sep    0.2449  ************************
End Sep    0.2706  ***************************
Mid Oct    0.3046  ******************************
End Oct    0.3192  ********************************
Mid Nov    0.3187  ********************************
End Nov    0.3321  *********************************
Mid Dec    0.3849  **************************************
End Dec    0.4734  ***********************************************
```

The best fit is End Apr and the error sum of squares (ESS) is 0.0197
The mean squared error is 0.2586 with variance 0.0255

DATA

Growth Classes:	INTERR	EARLY	MIDDLE	LATE	INDET	Total
Rangia Counts:	3	14	8	6	4	35
Actual Prop:	0.0857	0.4000	0.2286	0.1714	0.1143	
Expected Prop:	0.1473	0.4406	0.2320	0.0522	0.1279	

Figure 92. *Rangia cuneata* seasonality estimate for Stratum I Above *Rangia*: End April.

MORTALITY DATE	ESS	ESS HISTOGRAM [* = 0.01 unit]
Mid Jan	0.4844	**
End Jan	0.5201	**
Mid Feb	0.4732	***
End Feb	0.3451	***********************************
Mid Mar	0.2188	**********************
End Mar	0.1298	*************
Mid Apr	0.0650	*******
End Apr	0.0319	***
Mid May	0.0289	***
End May	0.0565	******
Mid Jun	0.1084	***********
End Jun	0.1337	*************
Mid Jul	0.1126	***********
End Jul	0.1156	************
Mid Aug	0.1411	**************
End Aug	0.1664	*****************
Mid Sep	0.1860	*******************
End Sep	0.2084	*********************
Mid Oct	0.2398	************************
End Oct	0.2537	*************************
Mid Nov	0.2536	*************************
End Nov	0.2668	***************************
Mid Dec	0.3187	********************************
End Dec	0.4071	***

The best fit is Mid May and the error sum of squares (ESS) is 0.0289
The mean squared error is 0.2194 with variance 0.0197

DATA

Growth Classes:	INTERR	EARLY	MIDDLE	LATE	INDET	Total
Rangia Counts:	7	23	15	13	10	68
Actual Prop:	0.1029	0.3382	0.2206	0.1912	0.1471	
Expected Prop:	0.0782	0.3911	0.3368	0.0818	0.1121	

Figure 93. *Rangia cuneata* seasonality estimate for Stratum I Dense *Rangia*: Mid May.

As previously noted, the quality of most shells in the samples was poor and the sample size varied. Although smaller samples can be used, Aten (1981) has noted that a sample size of ± 50 valves is preferable. The sample sizes from the 11 levels of 16SC27 ranged in size from 11 for Stratum E Below Dense *Rangia* to 68 for Stratum I.

The reliability of various-sized samples can be judged by use of the error sum of squares (ESS). The mean squared error (MSE) provides a method of determining the precision of the seasonality estimation. Both of these statistics, which are provided by Carlson's estimating procedure, have 95 percent confidence limits.

Based on figures provided by Aten (personal communication 1987), the following sample sizes have the designated percentage probabilities of correct seasonality estimates if the ESS falls within the confidence limit: <20 = 60 percent, 20-29 = 70 percent, 30-39 = 80 percent, 40-59 = 90 percent 60> = 100 percent. For samples from Stratum C, Stratum E 0-5 cm, Stratum E Below Compact Surface and Above Dense *Rangia*, Stratum E Within Dense *Rangia*, Stratum E Below Dense *Rangia*, and Stratum F the results were within the 95 percent confidence limits. This indicates that the seasonality estimations were likely correct.

With regard to the MSE ranges, also provided by Aten (personal communication), only two of the samples have MSE statistics that fall outside the upper and lower confidence limit, and the MSE for Stratum I Dense *Rangia* is only 0.0002 below the lower confidence limit.

Based on the ESS and MSE results, one concludes that the seasonality estimations for Stratum C, Stratum E 0-5 cm, Stratum E Below Compact Surface and Above Dense *Rangia*, Stratum E Within Dense *Rangia*, and Stratum F are correct. The estimates for the other samples are less likely to be accurate. These results may reflect the quality and/or quantity of the shells in these samples. These reservations having been expressed, the results of this analysis support a Mid-May to Mid-July harvesting season.

***Rangia* Population Structure Analysis**

As part of the analysis program for *Rangia* valves from 16SC27, a population structure analysis was conducted on each submitted sample. Unlike seasonality estimation, population structure analysis is not hampered by poor preservation. The only requirement is that the total length of the shell be measured. This type of analysis allows one to draw conclusions on the age and/or conditions of the

Rangia beds being harvested. For this analysis the maximum length of each complete valve from each level was measured. The raw frequencies of samples are presented in Table 79 and the percentage frequencies are plotted in Figures 94 through 104.

It should be noted that the growth class designations are the median shell length in millimeters for each measurement category. Thus growth class "29" includes all shells between 28.00 mm and 29.99 mm.

The population curves for Strata C, D, F, G, I Above *Rangia*, and I Dense *Rangia* are unimodal or have strong primary modes. This suggests single harvesting events from single *Rangia* beds. The curves for the five subdivisions of Stratum E have two or more secondary modes which suggests either multiple harvestings of single beds at different points in time, or the harvesting of multiple beds. Primary modal lengths indicate that the site's inhabitants favored *Rangia* between 3 and 5 years old. Strata D and I Above *Rangia* represent 3 year old beds and Stratum E Within Dense *Rangia* represents a 5 year old bed. The greatest variation is evidenced in Stratum E Below Feature 19 and Above Compact Surface, with shells indicating an age range of from 3 to 8 years. The numerous secondary modes suggest more than one incidence of harvesting for the pertinent samples.

The comparison of the population curves with the raw frequencies presented in Table 79 shows that the most uniform curves occur with the largest populations. The irregularity of the smaller samples' population curves may be more a factor of sample size than anything else. However, the results of the analysis do suggest that shell from some proveniences indicate at least the possibility of multiple harvestings or the harvesting of multiple beds, perhaps at different times of the year. This result raises questions about the accuracy of the seasonality estimates for those samples.

Rangia Biomass Estimates

The final analysis conducted on *Rangia* shells from 16SC27, Excavation Unit 6, was a determination of biomass within the northwest quarter. The system utilized for estimating *Rangia* biomass yield was based on previous research by Weinstein and Whelan (1987:64:72) at site 41CH56 in the Trinity River Delta, Chambers County, Texas. The method used is not recapitulated in this chapter. The system results in the calculations of *Rangia* meat weight, as derived from *Rangia* shell weight, based on the principle of

Key to Strata Abbreviations Used in Table 79
(on the following page)

Stratum E 1a - Stratum E 0-5 cm
Stratum E 1b - Stratum E Below Feature 19 and Above Compact Surface
Stratum E 2a - Stratum E Below Compact Surface and Above Dense *Rangia*
Stratum E 2b - Stratum E Within Dense *Rangia*
Stratum E 2c - Stratum E Below Dense *Rangia*

Table 79. Raw Frequencies for Complete Valves from Levels of EU6, 16SC27.

Measurement Category Increments (mm)*	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	TOTAL
Provenience																											
Strata C		1	3	4	6	6	5	11	2	3	3	4															48
Strata D			2	10	28	61	55	49	50	48	38	29	20	12	11	3	0	2									418
Strata E 1a				3	6	5	5	5	6	6	14	6	7	1	1	0	1	0	0	0	0	0	2				68
Strata E 1b					1	4	3	3	5	3	4	7	9	6	2	3	3	1	1	2	4	1	2	1	2		67
Strata E 2a					1	4	1	2	3	2	0	0	1	0	0	1	1	1									17
Strata E 2b			1	1	1	3	4	1	4	6	5	9	5	0	3	3	0	1									47
Strata E 2c					1	0	5	3	2	4	3	2	2	0	0	1											23
Strata F		1	13	25	25	28	25	38	46	55	37	21	11	9	5	5	1	2	1	1							349
Strata G		5	24	32	26	32	38	38	46	33	26	6	7	2	1	1	1	1	0	1							320
Strata I a		1		3	3	10	8	8	3	3	3	2	2														46
Strata I b			3	3	6	5	7	32	38	60	38	26	13	9	5	1	0	0	4	1	0	1					252

Each measurement category represents a 2 mm increment bracketing the number listed, e.g., the category "31" extends from 30.00 mm to 31.99 mm.

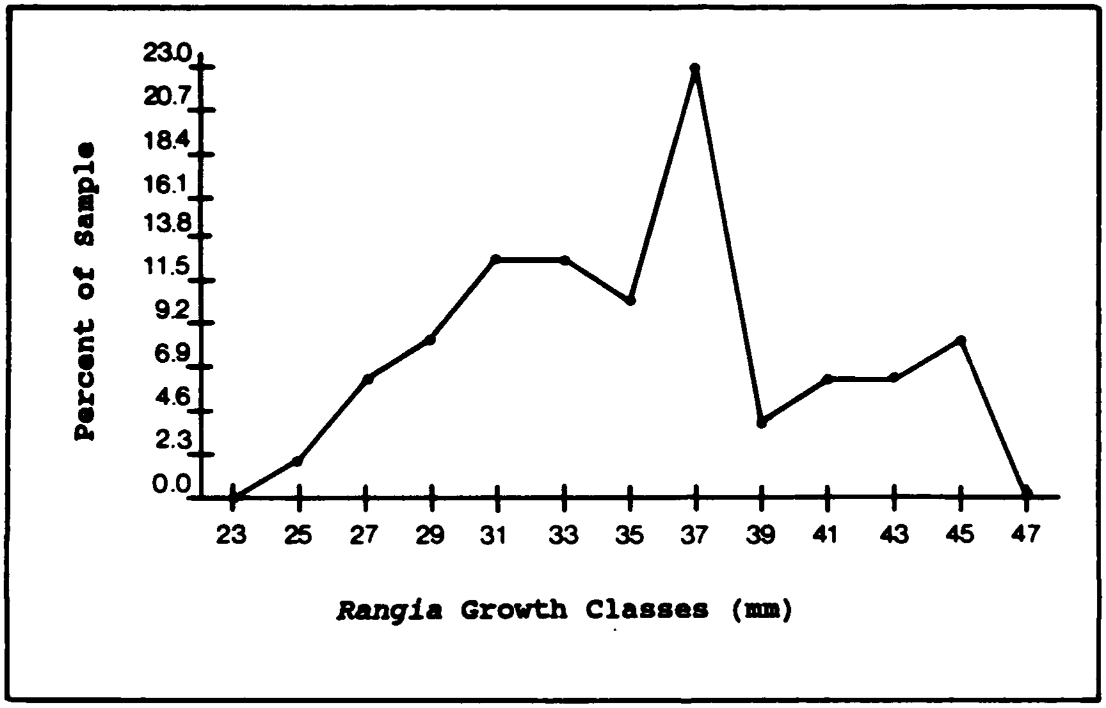


Figure 94. *Rangia* population curve for Stratum C.

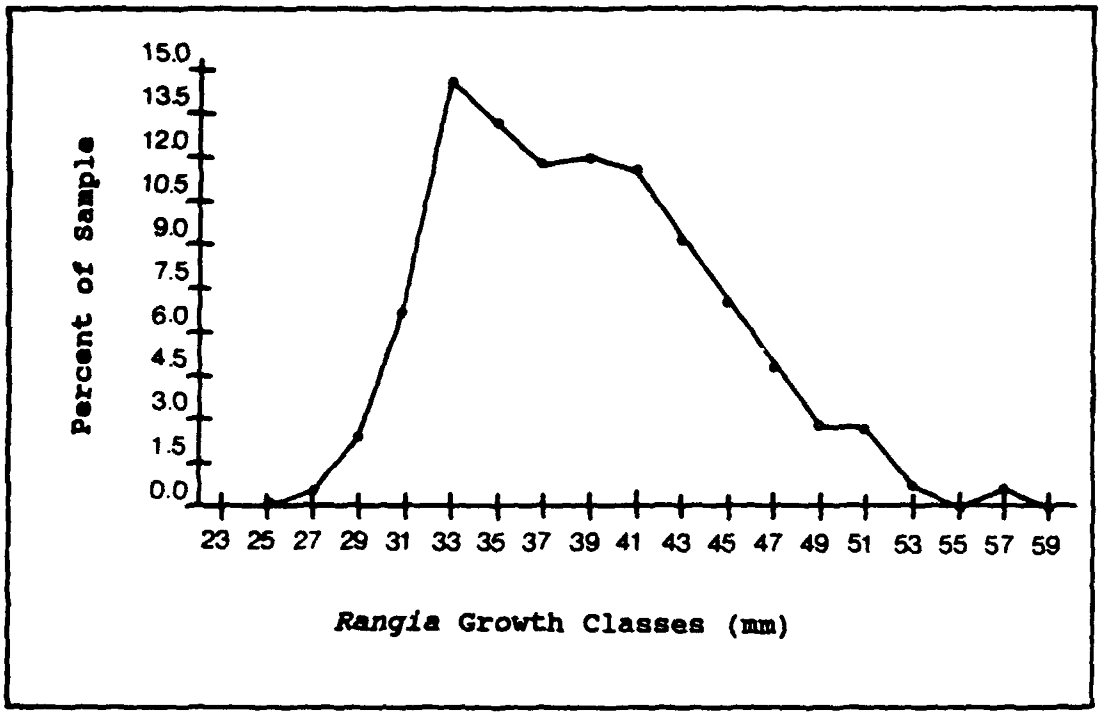


Figure 95. *Rangia* population curve for Stratum D.

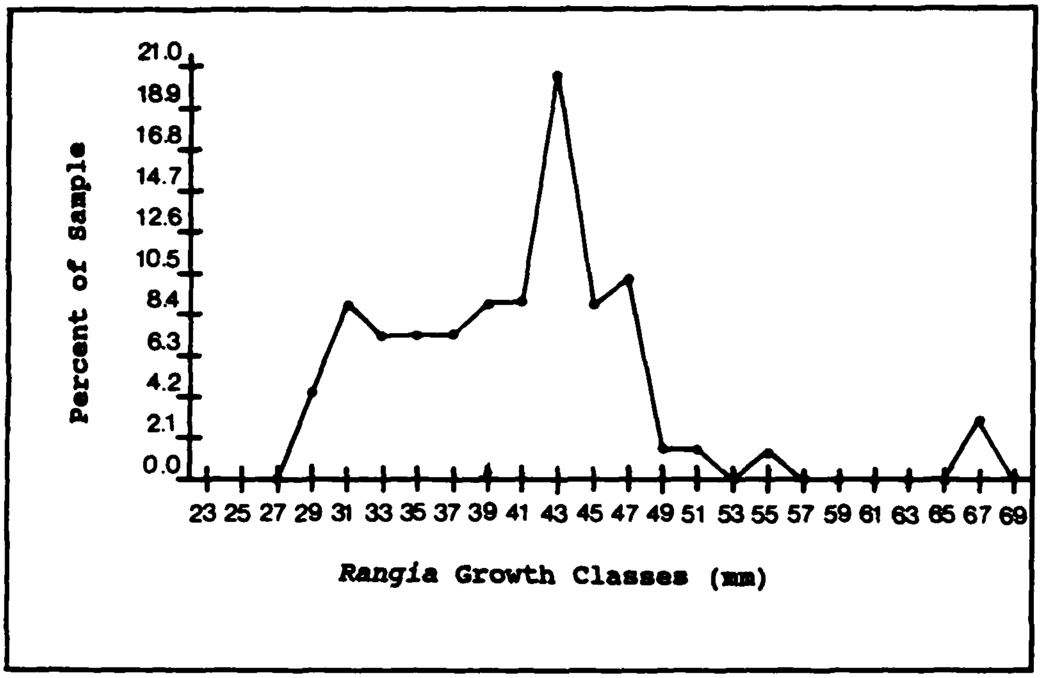


Figure 96. *Rangia* population curve for Stratum E 0-5 cm.

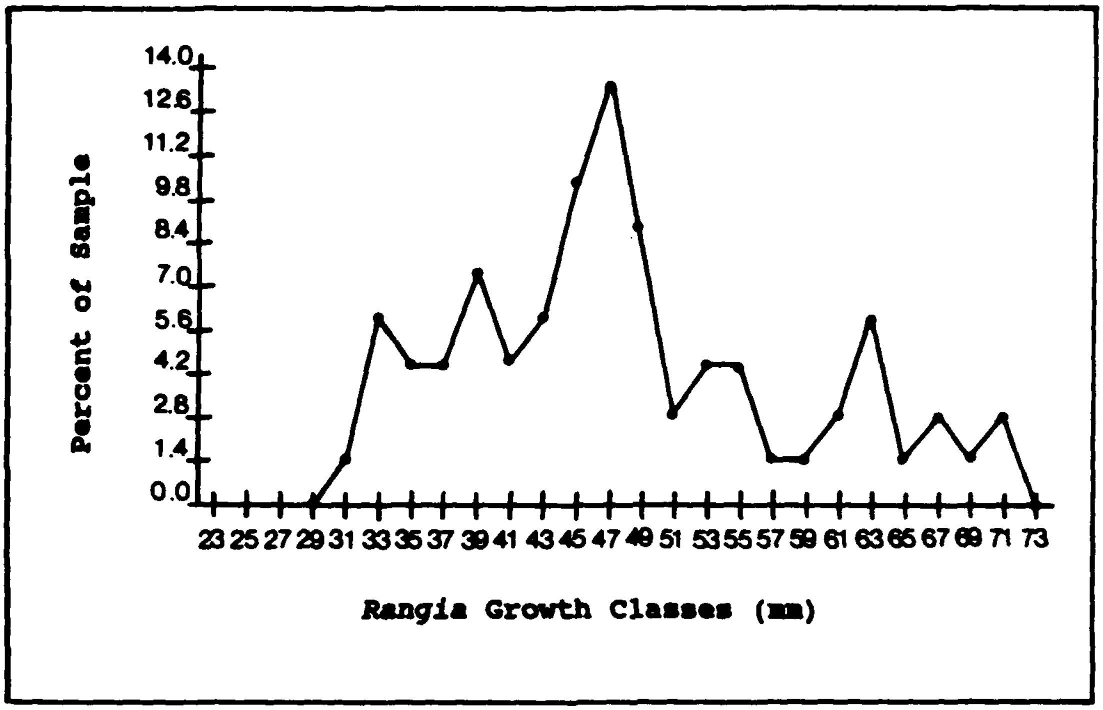


Figure 97. *Rangia* population curve for Stratum E, Below F19 and Above Compact Surface.

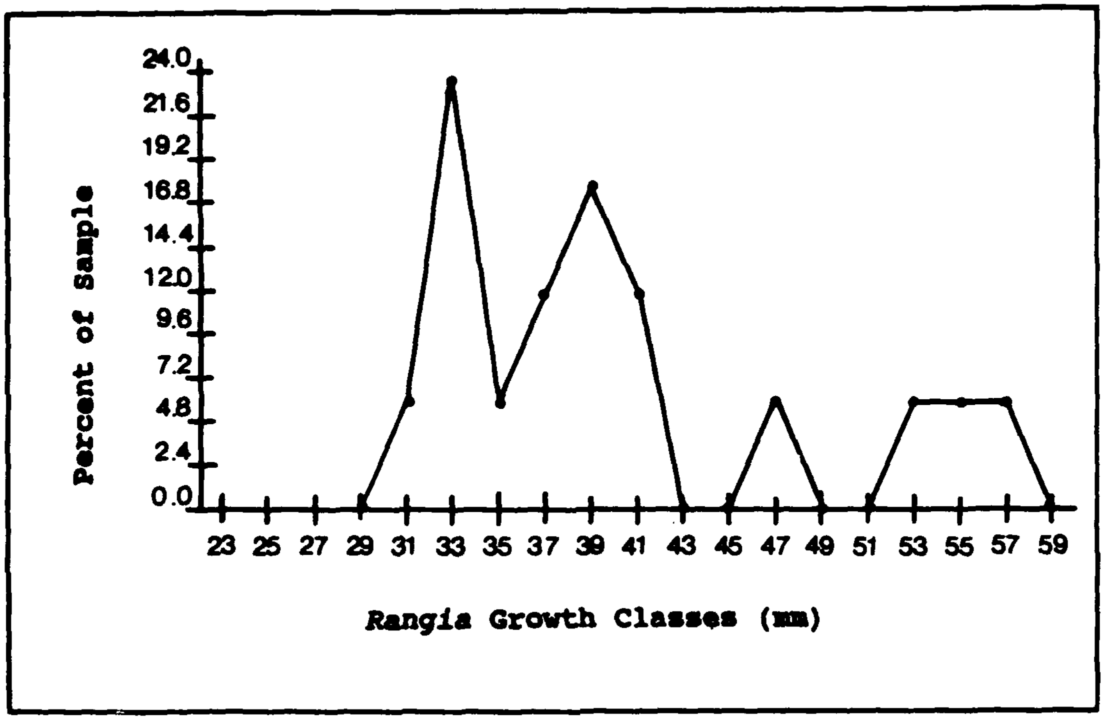


Figure 98. *Rangia* population curve for Stratum E Below Compact Surface and Above Dense *Rangia*.

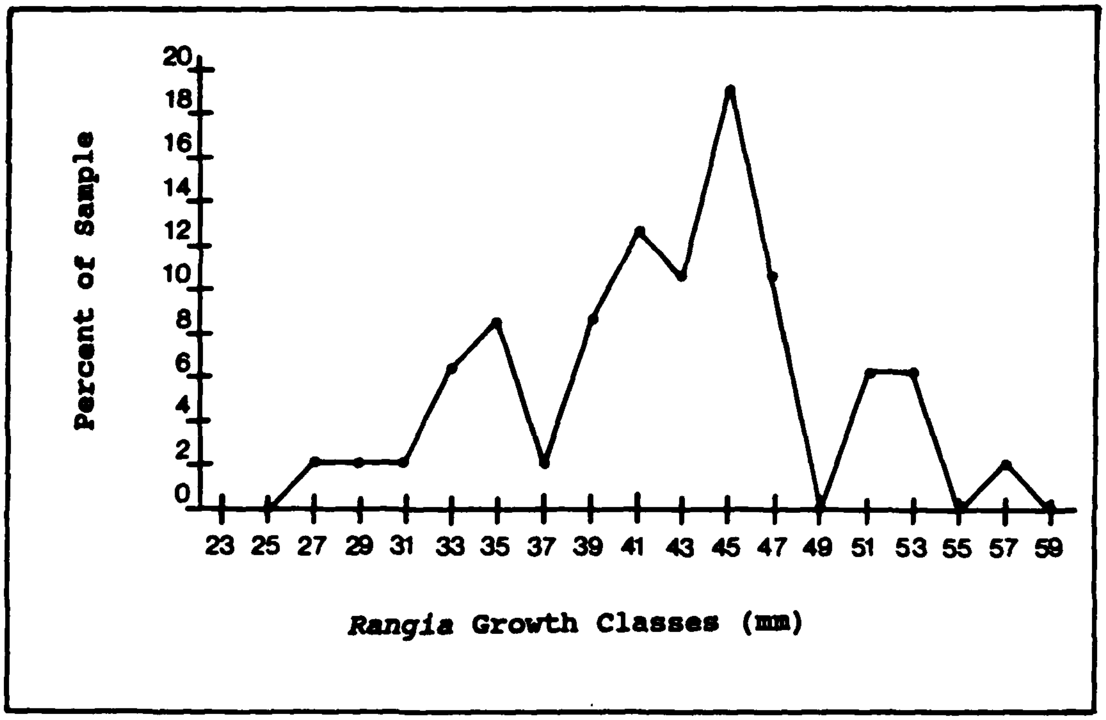


Figure 99. *Rangia* population curve for Stratum E, Within Dense *Rangia*.

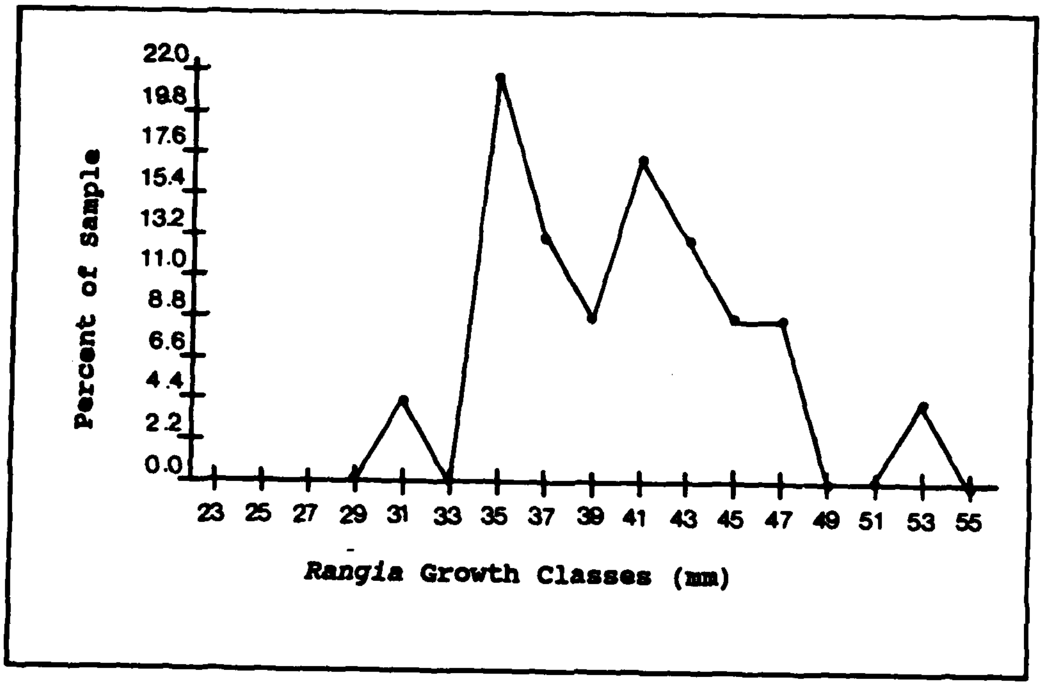


Figure 100. *Rangia* population curve for Stratum E, Below Dense *Rangia*.

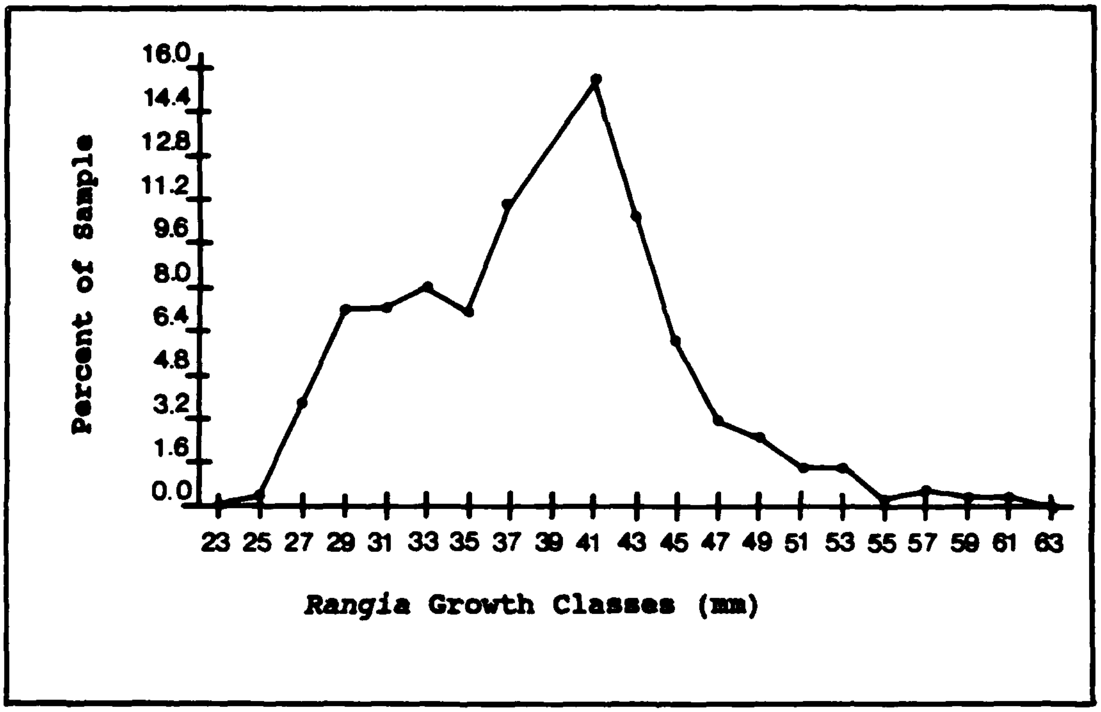


Figure 101. *Rangia* population curve for Stratum F.

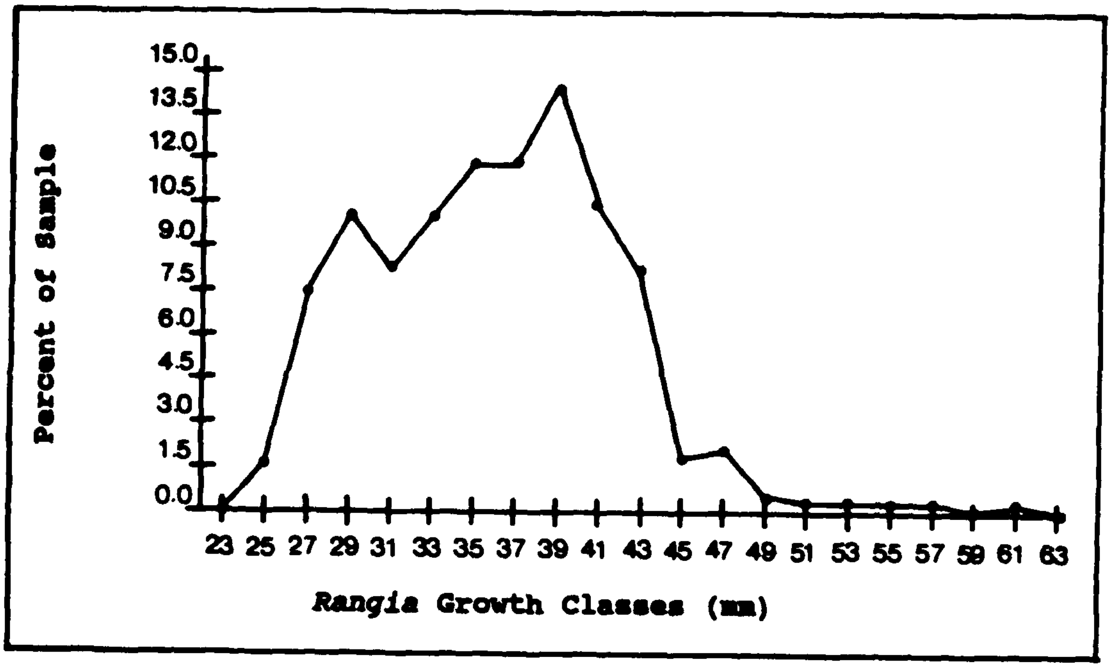


Figure 102. *Rangia* population curve for Stratum G.

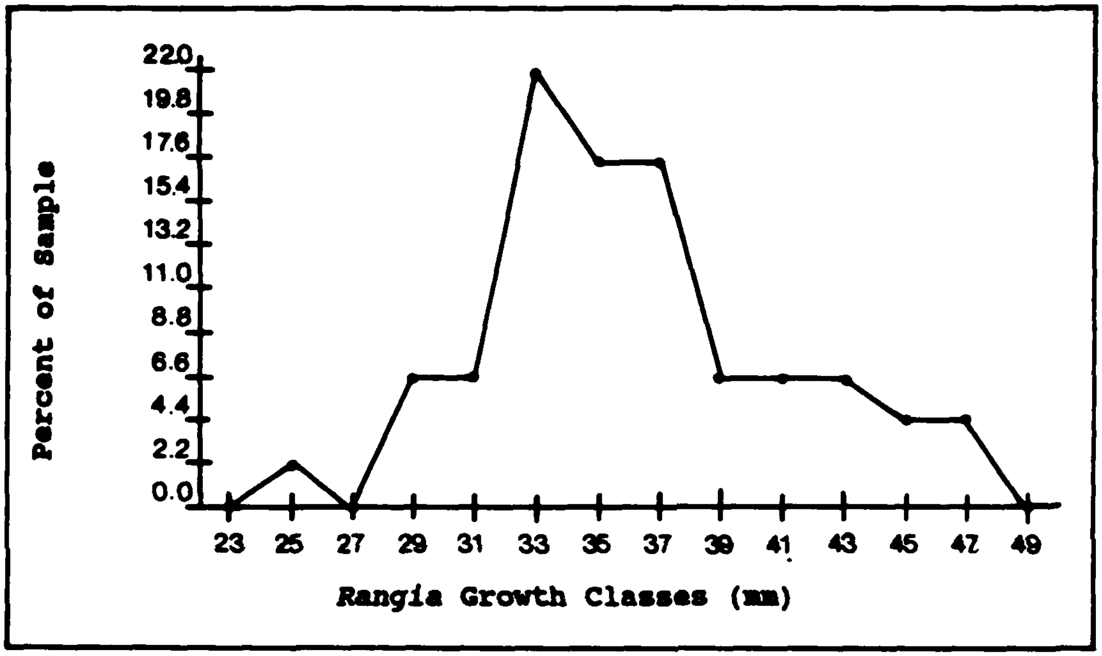


Figure 103. *Rangia* population curve for Stratum I, Above *Rangia*.

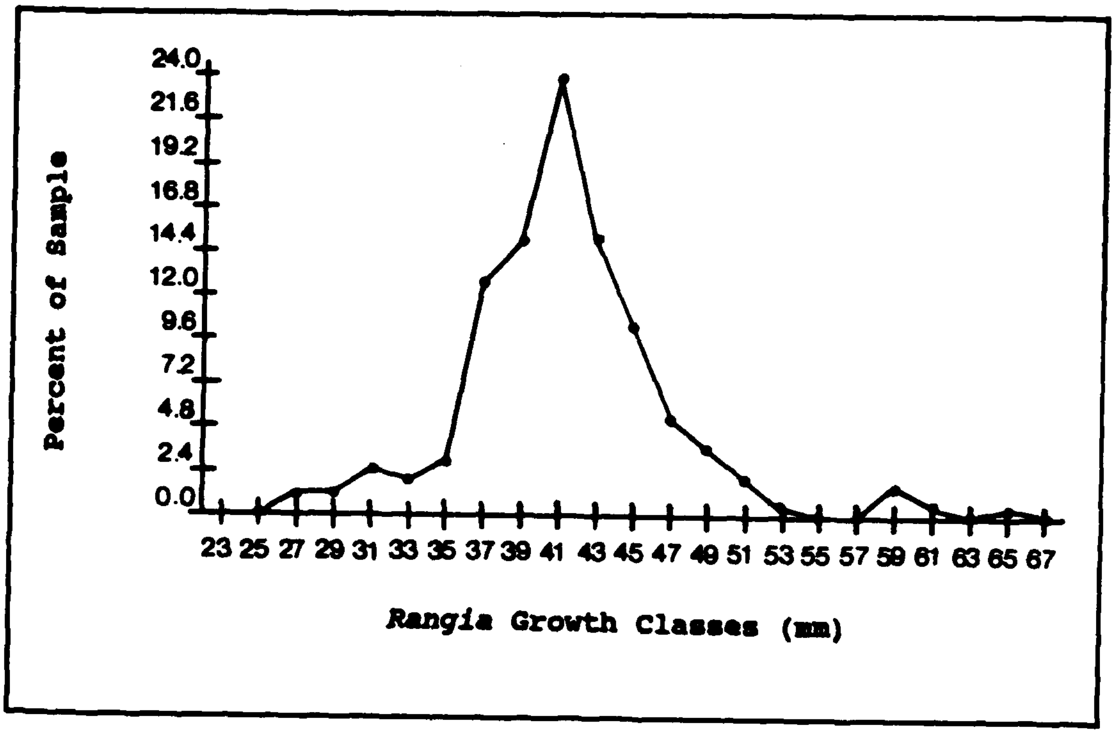


Figure 104. *Rangia* population curve for Stratum I, Dense *Rangia*.

allometric scaling. The pertinent formula is $y = 0.0935x^{1.077}$ where **y** is the expected meat weight and **x** is the shell weight in kilograms.

Table 80 presents the estimated meat weight in kilograms for each level of Excavation Unit 6, northwest quarter. The shell weights were provided by Earth Search, Inc. They were obtained by weighing all of the shell, both broken and whole, from the 1/4-inch mesh fraction.

It is not possible to reach any conclusions concerning the potential meat weight yield for the total *Rangia* population of the site. However, the estimated weights can be compared to the biomass estimates for vertebrate fauna. If Table 80 is reorganized so that proveniences are combined in the same manner as was done for vertebrate faunal analysis, then estimated *Rangia* meat weights are:

Stratum C	0.210 kg
Stratum D	0.542 kg
Stratum E Above Compact Surface	0.417 kg
Stratum E Below Compact Surface	0.641 kg
Stratum F	1.771 kg
Stratum G and I	1.040 kg

For the calculation, the total shell weights are combined and the estimated meat weight recalculated. This recalculation occurs because allometric scaling works in such a manner that the larger the **x** figure in the formula the larger the **y** result will be.

If the estimated biomass (above) is combined with that for vertebrate fauna in Table 70, then *Rangia* within Stratum C represents only about 5% of the total estimated meat weight. Using this method of calculation, the estimated contribution of *Rangia* meat for the same provenience combinations, as were discussed in Chapter 14, are:

Stratum C	5.1%
Stratum D	19.5%
Stratum E Above Compact Surface	4.3%
Stratum E Below Compact Surface	6.0%
Stratum F	58.4%
Stratum G and I	66.9%

These percentages suggest that there were changes in site function through time.

Table 80. Estimated *Rangia* Meat Weights, Based on *Rangia* Shell Weights for Strata of EU6, NW quarter, 16SC27.

Provenience	**Total Shell Wt. (kg)**	**Est. Meat Wt. (kg)**
Stratum C	2.120	0.210
Stratum D	5.111	0.542
Stratum E 0-5 cm	2.396	0.240
Stratum E Below F19, Above Compact Surface	1.613	0.156
Stratum E Below Compact Surface, Above *Rangia*	0.979	0.091
Stratum E Within Dense *Rangia*	3.111	0.317
Stratum E Below Dense *Rangia*	1.886	0.185
Stratum F	15.352	1.771
Stratum G	4.057	0.423
Stratum I Above *Rangia*	0.433	0.039
Stratum I Dense *Rangia*	4.873	0.515

Conclusions and Summary

The *Rangia* seasonality estimate analysis indicates a mid-spring to mid-summer collection time for the samples from EU6 of site 16SC27. The population structure analysis suggests primarily single harvesting events, although some levels within Stratum E tend to indicate the possibility of multiple harvestings of a single bed or the harvesting of multiple beds. The estimated meat yields for the northwest quarter of each level of the excavation unit were determined, and these were compared to estimated meat yields from vertebrate faunal. The comparison indicates that, if this provenience is accepted as reflecting activity at the site as a whole, *Rangia* accounted for a low of 4% and a high of 67% of the meat consumed during various prehistoric periods. The wide range suggests changes in site function and related activity patterning through time.

CHAPTER 16
PLANT REMAINS FROM 16SC27
By J. Philip Dering

Introduction

Excavations at the Pump Canal site provide an exciting opportunity to investigate prehistoric plant utilization in the Mississippi River delta region. Studies of plant food use and their contribution to prehistoric diet are rare in the Mississippi Valley as a whole (Fritz and Kidder 1992), and virtually nonexistent in the delta proper. This chapter reports on the results of analysis of flotation samples excavated from various levels at the site. These data provide a means for advancing our understanding of prehistoric subsistence and plant utilization, but because comparative results are so rare, our ability to generalize from these findings is limited.

Efforts to reclaim the land for farming during the early-twentieth century resulted in changes to the local topography and vegetation of the area around the Pump Canal site. Widespread subsidence has also lowered elevations of all land forms. Most of the site and the landform on which it was situated is now under shallow lake water year-round. Modern vegetation is therefore at best a pale reflection of the conditions which prevailed throughout the prehistoric sequence (Dunn 1983).

Geomorphological studies indicate that the Pump Canal site occupied the natural levee adjacent to an abandoned distributary that branches from Bayou Saules (Britsch and Dunbar 1990). Due to recent landform and vegetation changes, a description of modern vegetation at the site can produce little direct information concerning conditions during the prehistoric occupation. The goal of the following macrobotanical analysis is to contribute to an environmental reconstruction of the study area during the period of prehistoric and early historic period occupation.

Research Questions

The goal of this analysis was to describe and interpret the macrobotanical assemblage recovered from the Pump Canal Site. The analysis focused on three main topics: 1) formation processes affecting the macrobotanical assemblage, 2) a description of the plant remains and a consideration of their importance in the prehistoric economy, and 3) a reconstruction of local vegetation at the site based on the plant remains.

The following specific archeological research questions were addressed as part of the analysis:

1) Which plant remains are intrusive, and which are part of the archeological record?

2) What is the nature, context, and importance of the cultigens recovered from the samples?

3) What is the economic significance of the seed remains?

4) What is the environmental significance of the wood assemblage?

Flotation Methods (by Gail Lazaras)

During excavation, bags of midden and of feature fill were collected, labelled, and set aside for botanical analyses. The flotation device utilized to extract carbonized plant remains from these soil samples is an adaptation of the flotation machine described by Watson (1976:82-83), and modified by Kidder and Fritz (1993). A 55-gallon drum is filled with water that is agitated by means of an incoming pipe and nozzle. A basin, the bottom of which is equipped with a one-sixteenth inch screen, is fitted into this drum. Water drains off from the top of the basin into a piece of muslin cloth.

In order to allow flotation, the clayey soil was defloculated by soaking the samples in a mixture of baking soda and water for a period ranging from one hour to overnight. The soil was then placed directly into the flotation tank. The carbonized plant remains that floated were sluiced off by the water action and scooped out with a small strainer. After as much of the light fraction as possible was taken out, a simple siphon was used to separate the carbon fraction that was suspended among the heavier materials in the basin (Gumerman and Umemoto 1987), and the siphoned material was run through muslin cloth. All of the light fraction, collected in the muslin cloth, was then hung in the shade to dry. The heavy fraction remaining in the basin was removed, placed on newspaper, and dried. The entire flotation machine was cleaned between samples to prevent contamination.

The Pump Canal soil samples were heavily saturated because the midden levels are all below lake levels, and the samples placed in bags were wet. Also, the soil samples were soaked for a substantial amount of time in order to defloculate the clay. For these reasons, a large amount of the carbon was too heavy either to float or to be drawn up in the siphon. Sugar flotation was used to extract some of this additional carbon. All of the heavy fractions that resulted from the initial flotation were sugar floated. A ratio of approximately 2.5 pounds of sugar per gallon of water was used in the solution. The dried heavy fractions were placed into the sugar solution. The material that floated in the solution was strained off with a small, hand-held strainer into a muslin cloth, and the final heavy fraction screened through a one-sixteenth inch screen. Both samples were rinsed thoroughly, and the light fraction was placed in the shade to dry.

Carbonized remains from the light and heavy fractions were bagged and labelled separately. Each fraction was assigned its own flotation number so that each soil sample from midden or a feature had two flotation numbers. The dried carbon fractions were forwarded to the Palynology Laboratory of Texas A&M University for analysis.

Data Base for Botanical Analysis

The total number of light and heavy fractions examined was 144, representing 72 soil samples. These samples represented both midden and features within Excavation Units 5 and 7. Flotation samples were assigned to six natural levels that were designated Strata C, D, E, F, G, and I. Based on ceramic analyses, these strata appear to correspond to the Mississippi period (Stratum C), Transitional Coles Creek/Plaquemine (Stratum D), Coles Creek (Stratum E), and Des Allemands phase (Strata F, G, and I). Table 81 summarizes the genera and families which were represented within the samples.

Laboratory Sorting and Identification

Each sample was sorted through a series of nested geological screens with mesh sizes ranging from 4 mm to 0.5 mm. Material on the 2 mm, 3 mm, and 4 mm screens was scanned and identified under a binocular dissecting microscope at 8 magnifications. Material smaller than 2 mm was scanned for seeds. No attempt was made to identify or quantify carbonized wood smaller than 2 mm.

All seeds and herbaceous plant remains were sorted and counted. In cases where the amount of the carbonized wood was large, a grab sample of 25 pieces was examined, similar to Miksicek's (1987) procedure. Identifications were made using reference collections at Texas A&M University.

Table 81. Plant Taxa Represented in the 16SC27 Samples.

Species or Taxon	Common Name	Family
Acer negundo	Boxelder	Aceraceae
Amaranthus sp.	Pigweed	Amaranthaceae
Asteraceae	--	Sunflower family
Carya sp.	Hickory/pecan	Juglandaceae
Celtis sp.	Hackberry	Ulmaceae
Chenopodium sp.	Goosefoot	Chenopodiaceae
Cucurbita sp.	Squash	Cucurbitaceae
Diospyros virginiana	Persimmon	Ebenaceae
Juniperus sp.	Juniper/cedar	Cupressaceae
Liquidambar styraciflua	Sweetgum	Hammelidaceae
Passiflora incarnata	Passion flower	Passifloraceae
Pinus sp.	Pine	Pinaceae
Poaceae	--	Grass family
Polygonum sp.	Knotweed	Polygonaceae
Quercus sp.	Oak	Fagaceae
Rubus sp.	Dew/blackberry	Rosaceae
Sabal sp.	Palmetto	Palmae
Salicaceae	--	Willow family
Salix nigra	Willow	Salicaceae
Sambucus canadensis	Elderberry	Caprifoliaceae
Taxodium disitichum	Baldcypress	Taxodiaceae
Ulmus sp.	Elm	Ulmaceae
Vitis sp.	Grape	Vitaceae
Zea mays	Maize/Corn	

Quantification

In this study, the quantity of plant remains recovered from the flotation samples is described in terms of seed density. The seed density value is simply the number of carbonized seeds and edible plant parts other than wood, divided by the volume of the flotation sample from which they were sorted. For the calculation of seed density in midden samples, the total number of seeds from all samples was divided by the total volume of midden. The same method was used for each of the features sampled. The resulting figures are presented in terms of seeds per liter of soil. This method of calculation corrects for samples of unequal volumes.

At least one 2-liter sample of midden or soil was floated for each stratum. For most strata, additional samples were floated which resulted in unequal volumes of midden. For most features, the volume of soil collected reflected the size of the feature. As a result, volumes from the various features are not comparable. For this reason, the ubiquity value, defined as the percentage of all analyzed samples in which a particular taxon is present, is not presented here.

Carbonized Seeds

The assemblage of carbonized seeds is comprised of eleven genera from ten families. Cultigens include maize and squash. It should be noted that no maize was recovered from a flotation sample. However, a single carbonized cob fragment was recovered from the floor of EU6 within Stratum F. Possible cultigens or encouraged wild plants include pigweed (*Amaranthus*) and goosefoot (*Chenopodium*). Gathered plants include hackberry (*Celtis*), blackberry/dewberry (*Rubus*), grape (*Vitis*), elderberry (*Sambucus*), persimmon (*Diospyros*), and knotweed (*Polygonum*).

Table 82 summarizes the identity and number of seeds recovered from midden samples and from feature samples. The basis for assigning associations of the various features was discussed in Chapter 10. Table 83 presents the same data in a format that allows easy comparison of presence/absence of seeds in the various strata. Table 84 summarizes overall seed density for the various strata.

Carbonized Wood

Table 85 summarizes the plant taxa represented in the carbonized wood assemblage from the various midden and

Table 82. Summary Table of Seeds Recovered in Floated Samples of Midden and Features.

ASSOCIATED WITH STRATUM C

Feature No. and Type or Midden	Amt. (liters)	No. Seeds	Seed Density (per l.)	Seeds Recovered
Midden	10.625	13	1.2	3 *Amaranthus* 3 *Cucurbita* 2 *Polygonum* 5 *Vitis* 4 uncar. Asteraceae (exc. from calc.)

ASSOCIATED WITH STRATUM D

Feature No. and Type or Midden	Amt. (liters)	No. Seeds	Seed Density (per l.)	Seeds Recovered
Midden	7.5	5	0.7	5 *Vitis*
F31-Ash lens	3.875	0	0	
Clay-filled hole (No F #)	0.5	0	0	

ASSOCIATED WITH STRATUM E

Feature No. and Type or Midden	Amt. (liters)	No. Seeds	Seed Density (per l.)	Seeds Recovered
Midden	15.0	16	1.1	3 *Amaranthus* 1 *Celtis* 2 *Diospyros* 8 *Rubus* 2 *Vitis*
F8-Ash lens	0.375	0	0	
F9-Postmold	0.4375	4	20.0	2 *Chenopodium* 2 *Sambucus*
F10-Postmold	0.25	0	0	

Table 82. Summary Table of Seeds Recovered in Floated Samples of Midden and Features (continued).

ASSOCIATED WITH STRATUM E (cont.)

Feature No. and Type or Midden	**Amt. (liters)**	**No. Seeds**	**Seed Density (per l.)**	**Seeds Recovered**
F11-Postmold	0.375	0	0	
F12-Postmold	0.250	0	0	
F13-Postmold	0.125	0	0	
F14-Pocket of dark soil	0.750	0	0	
F20-Postmold	0.25	0	0	
F21-Postmold	0.25	0	0	
F22-Postmold	0.25	2	12.0	2 *Celtis*
F23-Postmold	0.375	0	0	
F24-Postmold	0.375	3	8.0	3 *Vitis*
F26-Postmold	0.5	2	1.0	2 *Rubus*
F32-Postmold	0.625	0	0	
F34-Ash lens	4.4375	18	4.1	1 *Amaranthus* 1 *Celtis* 10 *Chenopodium* 5 *Vitis* 1 Unknown
F38-Postmold	0.5	3	6.0	2 *Celtis* 1 *Rubus* 2 uncar. Passiflora (excl. from calc.)

Table 82. Summary Table of Seeds Recovered in Floated Samples of Midden and Features (continued).

ASSOCIATED WITH STRATUM F

Feature No. and Type or Midden	**Amt. (liters)**	**No. Seeds**	**Seed Density (per l.)**	**Seeds Recovered**
Midden	6.0	5	0.83	1 *Diospyros* 1 *Sambucus* 3 *Vitis*
Clay lump (No F #)	0.25	0	0	
F2-Horizontal wood "post" and assoc. fill	2.0	0	0	
F15-Postmold	0.875	2	2.3	2 *Sambucus*
F17-Pocket of dark soil	0.5	0	0	
F18-Horizontal wood "plank" and assoc. fill	2.0	0	0	
F27-Postmold	0.25	0	0	
F28-Postmold	0.375	1	2.7	1 *Sabal* (cf.)
F29-Postmold	0.250	3	12.0	3 *Sambucus*
F39-Postmold	0.625	5	8.0	3 *Rubus* 2 *Sambucus*
F40-Postmold	0.75	0	0	
F41-Postmold	0.25	0	0	
F42-Postmold	0.375	1	2.7	1 *Amaranthus*

Table 82. Summary Table of Seeds Recovered in Floated Samples of Midden and Features (continued).

ASSOCIATED WITH STRATUM G

Feature No. and Type or Midden	Amt. (liters)	No. Seeds	Seed Density (per l.)	Seeds Recovered
Midden	2.0	4	2.0	2 *Amaranthus* 2 *Vitis*

ASSOCIATED WITH STRATUM I

Feature No. and Type or Midden	Amt. (liters)	No. Seeds	Seed Density (per l.)	Seeds Recovered
Midden	2.0	0	0	
30-Postmold	1.25	1	0.8	1 *Vitis*

Table 83. Summary of Number of Seeds in Strata and Features Associated with those Strata at 16SC27.

	Ama.	Chen.	Cucu.	Cel.	Dios.	Poly.	Rub.	Sab.	Sam.	Vit.	Unk.
Str. C	3	-	3	-	-	2	-	-	-	5	-
Str. D	-	-	-	-	-	-	-	-	-	5	-
Str. E	4	12	-	6	2	-	11	-	2	10	1
Str. F	1	-	-	-	1	-	3	1	8	3	-
Str. G	2	-	-	-	-	-	-	-	-	2	-
Str. I	-	-	-	-	-	-	-	-	-	1	-

Key to Abbreviations and Common Names:

Ama = *Amaranthus* = pigweed, amaranth
Chen = *Chenopodium* = goosefoot, chenopodium
Cucu = *Cucurbita* = squash
Cel = *Celtis* = hackberry
Dios = *Diospyros* = persimmon
Poly = *Polygonum* = knotweed
Rub = *Rubus* = dewberry, blackberry
Sab = *Sabal* = palmetto (tentatively identified)
Sam = *Sambucus* = elderberry
Vit = *Vitis* = grape

Table 84. Comparison of Seed Density (per liter) in Features and Midden in the Strata at 16SC27.

	Midden Density	Feature Density*	Combined Midden and Feature Density**
Stratum C	1.2	---	1.2
Stratum D	0.7	0.0	0.4
Stratum E	1.1	3.2	1.9
Stratum F	0.8	1.4	1.2
Stratum G	2.0	---	2.0
Stratum I	0.0	0.8	0.3

*Calculated by dividing number of seeds in all features by the total volume of feature material that was floated.

**Calculated by dividing number of seeds in all features and midden samples by the total volume of material floated.

--- indicates no feature samples were floated

Table 85. Taxa of Carbonized Wood Recovered in Midden and Feature Flotation Samples from 16SC27.

ASSOCIATED WITH STRATUM C

Feature No. and Type or Midden	Carbonized Wood Recovered
Midden	*Carya*, *Nyssa*, *Taxodium*, indet.

ASSOCIATED WITH STRATUM D

Feature No. and Type or Midden	Carbonized Wood Recovered
Midden	Juniper (uncarb. leaves), Nyssa, Taxodium, indet.
F31-Ash lens	*Carya*, *Pinus*, *Quercus*, *Taxodium*, *Ulmus*, indet.

ASSOCIATED WITH STRATUM E

Feature No. and Type or Midden	Carbonized Wood Recovered
Midden	*Acer*, *Carya*, *Celtis*, *Juniper* (uncarb. leaves), *Liquidambar*, *Nyssa*, *Pinus*, *Taxodium*, *Ulmus* indet. and indet. Gymnosperm
F8-Ash lens	*Taxodium*, indet. Gymnosperm
F9-Postmold	*Carya*, *Liquidambar*, *Taxodium*
F10-Postmold	*Taxodium*, indet.
F11-Postmold	*Nyssa*, *Taxodium*, *Ulmus*
F12-Postmold	*Nyssa*, *Taxodium*, indet.
F13-Postmold	*Liquidambar*, *Taxodium*, indet.
F14-Pocket of dark soil	*Liquidambar*, *Nyssa*, *Taxodium*, indet.

Table 85. Taxa of Carbonized Wood Recovered in Midden and Feature Flotation Samples from 16SC27 (continued).

ASSOCIATED WITH STRATUM E (cont.)

Feature No. and Type or Midden	**Carbonized Wood Recovered**
F19-Ash lens	*Liquidambar, Nyssa, Taxodium*
F20-Postmold	*Taxodium*, indet.
F21-Postmold	None
F22-Postmold	*Taxodium*
F23-Postmold	None
F24-Postmold	Taxodium
F25-Postmold	*Taxodium*, indet.
F26-Postmold	*Taxodium*, indet.
F32-Postmold	Indet.
F34-Ash lens	*Carya, Nyssa, Juniper* (needles, not carbonized), *Liquidambar, Pinus, Taxodium, Ulmus*, indet.
F38-Postmold	*Taxodium*

ASSOCIATED WITH STRATUM F

Feature No. and Type or Midden	**Carbonized Wood Recovered**
Midden	*Liquidambar, Nyssa, Taxodium*, indet.
F2-Horizontal wood "post" and assoc. fill	*Taxodium, Ulmus*, indet.
F15-Postmold	*Taxodium*, indet.

Table 85. Taxa of Carbonized Wood Recovered in Midden and Feature Flotation Samples from 16SC27 (continued).

ASSOCIATED WITH STRATUM F (cont.)

Feature No. and Type or Midden	Carbonized Wood Recovered
F17-Pocket of dark soil	None
F18-Horizontal wood "plank" and assoc. fill	*Carya*, *Pinus* (not carb.), *Quercus*, *Taxodium*, indet.
F27-Postmold	*Celtis*, *Nyssa*
F28-Postmold	None
F29-Postmold	None
F39-Postmold	*Liquidambar*, *Taxodium*, indet. Gymnosperm
F40-Postmold	*Nyssa*, *Taxodium*, indet. Gymnosperm
F41-Postmold	*Liquidambar*, *Nyssa*, *Taxodium*
F42-Postmold	*Taxodium*
F43-Pocket of dark soil with *Rangia*	Indet.
"Clay lump" - no Feature No.	*Carya*, *Liquidambar*, indet.

ASSOCIATED WITH STRATUM G

Feature No. and Type or Midden	Carbonized Wood Recovered
Soil sample	*Nyssa*, *Pinus*, *Taxodium*, indet.

Table 85. Taxa of Carbonized Wood Recovered in Midden and Feature Flotation Samples from 16SC27 (continued).

ASSOCIATED WITH STRATUM I

Feature No. and Type or Midden	Carbonized Wood Recovered
Midden	Salicaceae
F30-Postmold	*Liquidambar*, indet.
F44-Postmold	None

feature samples. Table 86 presents those data in terms of presence/absence.

Problems in Interpretation of the Macrobotanical Assemblage

Critical to the interpretation of the data is an assessment of the formation processes affecting the macrobotanical assemblage at the site. These processes modify the appearance and affect the context of the plant remains, which in turn dictate their interpretation. For example, at most open sites, archeobotanists consider only carbonized plant remains to be a part of the macrobotanical assemblage (Bryant 1989; Keepax 1977; Minnis 1981: Miksicek 1987). At the Pump Canal site, however, an uncarbonized cypress log excavated from Stratum G provided radiocarbon dates ranging from ca. A.D. 200 to 600. Therefore, the first question that must be addressed is: Which plant remains are part of the archeological assemblage, and which are intrusive?

Macrobotanical remains undergo many processes which modify their appearance before they are identified in an archeological assemblage. These include changes resulting from gathering, processing, storage, and consumption, and changes that occur after the archeological site is abandoned. How these processes have affected the botanical assemblage at the Pump Canal Site must be understood before any attempts are made to interpret their significance.

After deposition, the botanical remains of a human occupation are subject to a number of environmental factors. Biological factors that both transform and reduce the amount of plant remains recovered from a site include decomposition by microorganisms such as bacteria and fungi. Available moisture has a great effect on the susceptibility of plant material to bacterial and fungal attack. Continuous wetting and drying cycles create the worst situation for preservation, because the alternating conditions both weaken the plant parts and promote microbial growth (Bryant 1989; Gasser and Adams 1981).

Dead plant material also serves as a major food source for millipedes, ants, springtails, and mites. Rodents and many insects select plant parts that are rich in protein and carbohydrates, consuming seeds and fruits (Bryant 1989).

The plant material that survives such predation is subject to disturbance resulting from soil formation, floralturbation, faunalturbation, argilliturbation, and aeolian and alluvial processes (Wood and Johnson 1978). Any one of these processes has the potential to drastically

Table 86. Summary of Presence/Absence of Taxa of Wood in Strata and Features Associated with those Strata at 16SC27.

	Acer	Car	Cel	Jun	Liq	Nys	Pin	Quer	Sal	Tax	Ulm	Unid.
Str. C		X				X				X		
Str. D		X		X		X	X	X		X	X	X
Str. E	X	X	X	X	X	X	X			X	X	X
Str. F		X	X		X	X	X	X		X	X	X
Str. G						X	X			X		
Str. I					X				X			X

Key to Abbreviations and Common Names

Acer	=	Acer	=	Boxelder
Car	=	Carya	=	Hickory or Pecan
Cel	=	Celtis	=	Hackberry
Jun	=	Juniperus	=	Juniper
Liq	=	Liquidambar	=	Sweetgum
Nys	=	Nyssa	=	Water tupelo
Pin	=	Pinus	=	Pine
Quer	=	Quercus	=	Oak
Sal	=	Salicaceae	=	Willow
Tax	=	Taxodium	=	Bald cypress
Ulm	=	Ulmus	=	Elm
Unid	=	Unidentified		

alter the nature and context of each component of the archeobotanical assemblage.

At present, the Pump Canal Site midden is permanently saturated, and anaerobic conditions prevail in the archeological deposits. The lack of oxygen inhibits microbial growth and incursion by most animals that forage on plant parts, encouraging excellent preservation of all plant remains. If these conditions were present throughout the history of the site, then all of the uncharred plant remains might be considered to be part of the archeological assemblage. This however, probably was not the case. The subsidence rate due to human land modification has accelerated drastically within the last 100 years. Moreover, geomorphological studies indicate that the site probably was located on a distributary natural levee. These studies are supported by the carbonized wood data from the macrobotanical analysis in this chapter. This indicates that the site was slightly elevated above the surrounding terrain. This slight elevation might have been sufficient during the period of occupation to allow wet/dry cycles which promote microbial and insect growth rather than inhibit it (Bryant 1989).

Miksicek (1987:234) has listed criteria for determining the origin of seeds recovered from archeological sites. Two of the criteria are particularly appropriate to this study:

1. What is the state of preservation of the seed? If it is from an open site and it is not carbonized, then it may well be a recent introduction. If the seed is not charred and it does not look old, then it is probably not.

2. Is this species part of the modern local vegetational seed rain? Control samples collected away from a site will be useful for determining the diversity and density of background seeds as well as indicating the possible existence of a naturally charred seed rain.

Table 87 presents a comparison of identified carbonized and uncarbonized plant remains recovered from the flotation samples. There are distinct differences in the species composition and plant parts represented by the two categories. The uncharred assemblage is composed mostly of leaves, delicate seeds and fruits, and masses of rootlets. Most of the uncharred seeds and leaves in pristine condition are part of what would be expected from a natural seed "rain" and leaf fall. The exceptions are uncharred cypress wood, hackberry seeds, and juniper needles. The calcium carbonate in hackberry seed coats make them highly resistant

Table 87. Comparison of Carbonized and Uncarbonized Plant Remains from the Pump Canal Site.

Taxon	Plant Part	Carbonized	Uncarbonized
Amaranth	seed	X	
Rubus	seed	X	
Chenopodium	seed	X	
Sambucus	seed	X	
Vitis	seed	X	
Polygonum	seed	X	
Diospyros	seed	X	
Cucurbita	seed	X	
Passiflora	seed	X	
Zea	seed	X	
Taxodium	wood	X	X
Nyssa	wood	X	
Liquidambar	wood	X	
Ulmus	wood	X	
Celtis	wood	X	
Pinus	wood	X	X
Quercus	wood	X	
Carya	wood	X	
Salicaceae	wood	X	
Acer	wood	X	
Celtis	seed		X
Quercus	leaf		X
Ulmus	flower, fruit		X
Salix	flower		X
Juniper	needles		X
Asteraceae	disc flower/fruit		X
Poaceae	seed		X

to decomposition (Miksicek 1987). Cypress wood is well-known for its durability, even under unfavorable conditions for preservation (Panshin and DeZeeuw 1970). One would expect the presence of both of these taxa even under marginal preservation conditions. The uncharred cypress wood in the samples was noticeably weathered. It exhibited characteristics typical of wood that has been under water for a long period of time, including weakened parenchymal walls that made the overall texture of the wood comparatively soft.

Juniper needles present an interesting interpretive problem. At present, juniper is not a part of the natural vegetation in the area, nor is juniper wood present in the archeological assemblage. One explanation for their presence would be that the juniper needles, which are fairly resistant to decomposition, were present in the area in the recent past. Another explanation would be that they were transported as flotsam down the Mississippi River and its distributary to the study area during a flood episode. Ideally, one would look at some off-site samples to analyze with the site samples, in order to compare the content of non-cultural sediments to the archeological sediments. Finally, it is possible that the juniper leaves were actually brought to 16SC27 from some other area by the site's occupants.

If the uncarbonized material such as juniper is intrusive, how did it become incorporated into the lower strata of the site? The best explanation is bioturbation. Burrowing activity of rodents and invertebrates such as crayfish and insects is an excellent vehicle for the downward transport of surface materials (Wood and Johnson 1978). Floralturbation, especially tree falls which are common in the hardwood bottoms, are very effective in turning over sediments.

Given these considerations, most of the uncharred plant remains are probably intrusive. For the purposes of interpretation, only the carbonized plant material, and in special cases, a few of the uncarbonized taxa, are treated as part of the archeological assemblage. Calculations of seed density in Tables 82 and 84 exclude all noncarbonized remains with the exception of hackberry, which as is noted above, is highly resistant to decomposition.

Cultigens and Possible Cultigens

Maize kernels and cupule fragments were recovered in Stratum F. They were extracted during the actual excavation. No maize was recovered in any of the flotation samples, and no maize phytoliths were noted (Chapter 17).

Maize is a tropical food crop introduced from Mesoamerica. This sample is only the second report of maize from a prehistoric site within the Barataria Basin. Maize began to appear in eastern North America around A.D. 200, but did not begin to attain prominence as a food crop until after A.D. 800. Between A.D. 800 and 1100, maize became an important crop across eastern North America from Florida to the northern limits of maize agriculture (Smith 1989). In the Caddoan area to the north and west, maize has been recovered from contexts dating to A.D. 800, spreading geographically across northeast Texas and Louisiana over the next 300 years. The intensity of its utilization in the Caddoan diet was geographically varied, and in many areas it probably was obtained by trade (Story 1990). In the Lower Mississippi Valley north of Baton Rouge, maize is first found in late Coles Creek contexts, but does not appear to be a common part of the diet until the period ca. A.D. 1200-1400 (Fritz and Kidder 1992; Kidder and Fritz 1993).

The presence of a very small amount of maize at the Pump Canal Site does not demonstrate that it was cultivated locally, or that it was an important part of the diet. Despite the fact that the environment was favorable for the preservation of phytoliths, no maize phytoliths were recovered. More likely, maize was traded into the area or cultivated elsewhere by the same group and brought into the study area as part of a seasonal food procurement round.

Parts of four squash seeds were recovered from Strata C and D. The seeds are assignable either to *Cucurbita pepo* or *Cucurbita texana*. *C. pepo* is a pumpkin-type squash that appears in eastern North America around 500 B.C. Decker (1986) has demonstrated that *C. pepo* was probably domesticated independently in eastern North America from a wild type, the indigenous *C. texana*, which has recently been found growing in the Barataria Basin (White et al. 1983). Given the size and archeological context of these seed fragments, they are most likely from the domesticate *C. pepo*, but this is difficult to determine due to the small sample. No rind fragments were encountered in the samples.

The occurrence at this site of very small amounts of goosefoot (*Chenopodium*), an important cultigen of eastern North America, and pigweed (*Amaranthus*), a common weed of disturbed soils, especially middens, is very interesting. Neither were reported from botanical surveys in the Barataria Basin (Dunn 1983; White et al. 1983). The seeds do not occur in numbers that would suggest local cultivation. They may be a part of the naturally occurring seed rain from the local prehistoric vegetation that grew around the site, but their absence in recent botanical inventories is evidence against this explanation. It is possible that these seeds represent food brought to the site from another area.

It is particularly interesting to note that the *Chenopodium* was recovered from only two features, both within Stratum E. One of these is Feature 34, an ash lens. The other is Feature 9, a postmold, but it extends through Feature 8 which is also an ash lens. Thus, the *Chenopodium* occurrences are in contexts that are consistent with the roasting of seeds.

Gathered Plants

Given the limited evidence of cultigens recovered from the sediments and the nature of the study area's surrounding topography, wild plants were probably much more important than cultivated plants in the prehistoric diet of the Pump Canal site inhabitants. The assemblage of wild plants is dominated by carbonized seeds of grape, dewberry/blackberry, elderberry, and uncarbonized hackberry seeds. Also present in the samples were persimmon and passion flower seeds. These are all very durable and commonly occurring seeds in archeological sediments of eastern North America (King 1984). While it would appear from the data that the plant component of the diet is dominated by wild fruits, they are probably over-represented in the assemblage due to the fact that they were most likely to be accidentally carbonized during processing for storage.

Knotweed was present in minute quantities in the samples, occurring only in the Stratum C midden. Although *Polygonum erectum* has been cited as a possible cultigen in the lower Illinois Valley, the American Bottoms, and in Tennessee (King 1984), only a trace was present at the Pump Canal Site. A common constituent of disturbed soil habitats, the plant was probably growing on the site naturally during the period that it was occupied.

Nut fragments, perhaps the most common plant remains recovered from archeological sites in eastern North America, were not recovered in the flotation samples at the Pump Canal Site. This is somewhat surprising since *Carya* charcoal is present in the assemblage. Although pecan and water hickory have been reported from the hardwood bottoms of the Barataria Basin (White et al. 1983), they probably did not occur in sufficient numbers to provide a reliable food resource. Apparently, the unique nature of the cypress/tupelo and hardwood bottom vegetation types provided a microenvironment that dictated a subsistence technology that differed from the typical riverine floodplain habitation sites (Fritz and Kidder 1992).

Prehistoric Vegetation: The Evidence From Carbonized Wood

Carbonized wood can be particularly useful in the reconstruction of the prehistoric environments at archeological sites (Minnis 1981). Usually, the modern vegetation reflects at least a rough impression of the flora present in the past, especially for late Holocene sites (Dunn 1983). At the Pump Canal Site, the modern vegetation bears little resemblance to even early historic vegetation due to changes brought on by land modification projects initiated in the early-twentieth century. Fortunately, there is sufficient evidence in the form of carbonized wood to be able to present a rough sketch of the vegetation present in the area surrounding the site.

Baldcypress is by far the most commonly occurring charcoal type in the assemblage, followed by sweetgum and tupelo. Also occurring in the assemblage are hackberry, boxelder, elm, pecan/hickory, willow family, oak, and pine. White et al. (1983) describe four major natural habitats, marked by distinct vegetation types, in the eastern section of the Barataria Basin. There are floristic elements of three of the major vegetation types in this prehistoric botanical assemblage. Baldcypress and tupelo, both very common in the samples, make up the cypress-tupelo swamp habitat. Oak, hackberry, and sweetgum, all present in the botanical assemblage of the Pump Canal Site, are common elements of the hardwood bottoms habitat. The third vegetation/habitat type was termed transition forest, and contained major floristic elements of both cypress-tupelo swamp and the hardwood bottoms. At present, pine is either extremely rare or not present at all in the Barataria Basin. As was the case with juniper, its presence in the archeobotanical assemblage may suggest that it was present at the site or that it was transported to the site from elsewhere.

Elevation is the single most important parameter governing the distribution of plant communities in the Barataria Basin (White et al. 1983). The botanical remains suggest the possibility that significant relief was present in the landform of the study area during the prehistoric occupation. Based on botanical evidence, the Pump Canal Site was probably situated on a natural levee that supported a hardwood bottoms vegetation type. The abundance of both cypress and tupelo provide evidence of extensive lowlands, probably swamp, in the immediate vicinity of the site. Transitional swamp, containing elements of both of these plant communities, may have existed nearby.

Botanical and Faunal Analysis of Coprolites

Five coprolites suspected to be of human origin were recovered from cultural deposits at the Pump Canal Site in Louisiana and were submitted to Texas A&M University for analysis. Coprolite analyses can provide a unique opportunity to gain more direct information regarding the economy, diet, health, and ecology of prehistoric populations (Bryant 1974; Reinhard and Bryant 1992). The goal of this analysis was to (1) identify whether these coprolites were of human origin, and (2) to determine the pollen, and plant and animal macrofossil content of the coprolites.

The coprolite samples and their proveniences are listed in Table 88. The coprolites were found in Excavation Units 6 and 7 of the site in the levels identified with the Coles Creek and Baytown occupations. Due to the nature of the cultural deposits, it was difficult to determine whether the coprolites were recovered from discrete cultural features. A latrine area as has been demonstrated at other sites was not detected because of the scattered nature of the remains (Williams-Dean 1978).

Table 88. Proveniences of Coprolites from 16SC27.

Earth Search Sample Number	**Provenience**	**Coprolite Number**	**Wt. (g)**
32	EU6 S1/2 Stratum G	Coprolite 1	5.5
63	EU7 Stratum E	Coprolite 2	4.9
47	EU7 Stratum G, F. 43	Coprolite 3	17.25
68	EU7 Stratum I	Coprolite 4	3.5
"Earth Search Coprolite"	(No provenience, no number, in film canister)		2.0

Methods. The preparation of coprolites followed standard analytical procedures outlined by Reinhard (1988).

1. The coprolites were cleaned of all extraneous sediment, weighed, measured and sketched.

2. Each coprolite was then split into two roughly equal parts. Each sample was weighed, and one half was processed while the other half was saved for curation.

3. The samples were rehydrated in a 0.5 % weight to volume solution of sodium triphosphate for four days.

4. Samples were sieved through 350 micrometer mesh. Materials smaller than 350 micrometers were retained for the pollen analysis. Macrofossils retained on the mesh were transferred to filter paper and air dried.

The dried macrofossil material was passed through a nested set of geological screens measuring 2 mm, 1 mm, and 0.45 mm. Each size fraction, including the material that passed through the 0.45 mm mesh into the catch pan, was scanned and sorted under a binocular dissecting microscope at 8-15X magnification.

The liquid fraction was processed for the extraction of pollen. The procedure for extraction pollen from coprolites is very similar to that for extracting pollen from sediments. Added to each sample was a spike of 11,300 ± 400 spores of the cryptogam *Lycopodium* (fern spore). These spores were added so we could determine the pollen concentration values of each fossil sample. Although the genus does occur in the Eastern United States, this specific *Lycopodium* spore tablet was selected as our "exotic" because this spore type is not found in the natural environment of the region.

During the first step of processing, carbonates were removed by using concentrated hydrochloric acid. The second step focused on removing small rocks and coarse-grained silicates by decanting. Each sample was placed in a large beaker, filled with distilled water and then stirred in all directions to enable pollen to remain suspended. The liquid fraction was then quickly poured into another beaker and saved. This process was repeated several times for each sample before the remaining rocks and large-grained silicates were checked and discarded. Fine-grained silicates, not removed by decanting, were dissolved in 70% hydrofluoric acid.

After the carbonates and silicates were removed, each sample was deflocculated in a Darvan dispersing solution, then sonicated for one minute in a Delta D-5 sonicator. This was followed by heavy density separation with zinc bromide; a process that removed much of the remaining detritus from the pollen. Organics in the sediments were removed by processing each sample using the acetolysis method (Erdtman 1960).

When the laboratory procedures were completed, samples were stained with saffranin-0 and mounted in glycerin for examination. Identification and counting were performed using a JENA binocular microscope. Identifications of pollen and spore types in each sample were checked against reference materials on file in the Texas A&M Palynology Laboratory. These include the Texas A&M Modern Pollen Reference Collection and the Mobil Oil Modern Pollen Reference Collection. Whenever possible, we attempt to count at least 200 fossil grains from each sample (excluding fungal spores and *Lycopodium* tracers). If the pollen concentration is so low that a 200 grain count is not possible, we scan the entire slide for pollen grains of economic plants, and stop the count when 50 *Lycopodium* tracer spores have been noted.

Results. An important step in the analysis of coprolites is to determine if they are human fecal material. While no single character distinguishes human fecal material from other animals, the rehydration process provides a critical clue to the nature of coprolites. If, during exposure to sodium triphosphate, the coprolite turns black, the sample may be of human origin (Reinhard and Bryant 1992:260). Although none of the coprolites from 16SC27 turned black, exceptions to the norm do occur (Reinhard 1988), and the analysis was continued.

The botanical analysis revealed that pollen was present only in sample 47 (coprolite 3). The results of the count are presented in Table 89. No pollen grains were observed in the other four coprolites. Identifiable macrobotanical remains were not recovered from the samples. In sample 68, three tiny fragments of charred wood (< 1 mm) were encountered, but the wood was too small to identify.

Table 89. Pollen Counts from Sample 47 (Coprolite 3).

Taxon	**Count**
Morus	3
Alnus	2
Quercus	2
Lycopodium	50

The faunal remains were examined and found to contain small pieces of bone. The bone measured from 1 to 2 millimeters. The size of the bone prevented specific identification, but several vertebrae of small fish were recovered from Samples 63 and 47. The small size of the bone, and the compacted nature of the bone within the coprolite, suggested that this was not human fecal matter.

Conclusion. The coprolites submitted to Texas A&M University for analysis from 16SC27 were not of human origin. This conclusion is based on the negative reaction of the coprolites to the sodium triphosphate solution, and on the botanical and faunal content of the samples.

CHAPTER 17
ANALYSIS OF OPAL PHYTOLITHS FROM 16SC27
By Glen G. Fredlund

Study Objectives

Five archeological sediment samples from 16SC27 were analyzed for opal phytoliths and other biogenic silicate microfossils. Opal phytoliths, the silica bodies deposited within and between the cells of living plants, can be used in both paleo-ethnobotanical and paleoenvironmental reconstructions (Piperno 1988). The primary purpose of this study is paleo-ethnobotanical reconstruction. Opal-phytolith assemblages were analyzed for evidence of use or potential use of botanical resources. The samples were selected for their potential to contain evidence of cultural activities, including the presence of cultigens. Evidence for the presence of *Zea maize* (corn), domesticated Cucurbidia (pumpkins), and *Phaseolus vulgaris* (beans) was sought. Diagnostic opal phytolith forms for these important New World domesticates have been documented: *Zea maize* (Pearsal 1978; Piperno 1984; 1985), *Cucurbita* (Bozarth 1987), and *Phaseolus vulgaris* (Bozarth 1990). The ethnobotanical application of phytolith analysis, however, is certainly not limited to identification of cultigens (Piperno 1988). Variability among archeological phytolith assemblages may provide clues to any number of other human activities.

Study Limitations

One limitation in this study is the lack of systematic investigations of the phytolith forms produced by many of the plants of the region. Lanning and Eleuterius (1985) have demonstrated that most plants of the Gulf Coast region do contain biogenic opal to some degree. Their study does not, however, provide researchers with any guide to the phytolith forms which could result from this plant silica or of the potential for opal phytoliths to be preserved or represented in soil or sedimentary environments. Applications of phytolith analytical techniques in the tropics have demonstrated that with proper exploration of the flora, important diagnostic forms can be recognized for many plants even in a diverse vegetation (Piperno 1988). These tropical studies also demonstrate the potential use of phytolith analysis in documenting the use of non-domesticated plant species from archeological contexts.

Characteristic phytolith forms along the Gulf Coast of North America have only just begun to be explored. Until a detailed, systematic analysis of opal phytolith occurrence in plants of the Mississippi River delta is conducted, evidence of important ethnobotanical resources is likely to go undocumented.

Laboratory Methods

Ten grams of sediment, without *Rangia* shells or other large clasts, were processed from each sample. Modified selective oxidation and heavy-liquid flotation procedures were employed in the concentration of phytoliths from these samples (Johnson and Fredlund 1985; Fredlund 1986). The selective oxidation pre-treatments were required because of the high percentages of both organic matter and carbonate. The latter was primarily from the *Rangia* shell litter. The modified procedure consists of six steps. These are:

(1) The oxidation of organic matter. Each sample was treated with 30 ml of 35% hydrogen peroxide and allowed to stand for 24 hours at 38 degrees centigrade.

(2) Oxidation of carbonates with hydrochloric acid. Each sample was treated with 30 ml of 10% hydrochloric acid and allowed to stand for 24 hours. The samples were washed with distilled water following this treatment.

(3) Dispersal of clays and other colloidal materials with sodium pyrophosphate (0.1 molar solution). The dispersed clays were then decanted and the silt- and sand-sized clasts retained. All solution was decanted through a 5-micron mesh Nitex filter and any materials collected on the filter were backwashed into the sample.

(4) These clay- and colloid-free samples were fractionated with a heavy liquid. A 2.35 specific gravity solution of zinc bromide was used to separate the lighter biogenic opal microfossils from the heavier mineral clasts. Three separate flotations were used on each sample to ensure that all of the biogenic opal materials had been recovered.

(5) The recovered lighter fraction was then washed with distilled water and transferred into two-dram vials. These phytolith concentrates were then dehydrated thermally (at 78 degrees centigrade).

(6) Microscope slides were then prepared from the residues. The phytolith extracts were mounted in a refractive index oil on standard microscope slides and sealed with paraffin.

These permanently mounted slides were then systematically searched using a Leitz Laboralux-S microscope at 400X magnification. At least one complete slide was searched for each sample. Grass phytoliths were classified using the general system proposed by Twiss et al. (1969) and modified by Brown (1984), Twiss (1986), and Mulholland (1989). Other phytolith forms were identified by using a number of published references.

Results

Of the five samples analyzed, two were stratigraphic and three were from feature fills. The stratigraphic samples included Stratum C (below the compact surface) and Stratum E (above the compact surface). The archeological features analyzed consisted of sediment samples from three ash lens within Stratum E: Features 819, and 34. All samples analyzed contained phytoliths and other biogenic opal microfossils. Counts of phytolith forms observed are provided in Table 90.

Preservation within all of the samples was somewhat mixed, with both well preserved and not so well preserved microfossils occurring within the same assemblage. The less well preserved forms had pitted surfaces indicative of dissolution. Often, the siliceous sponge spicules exhibited signs of dissolution. The mixed preservation may relate to the origin of the micro-fossils. Some of these microfossils may have been deposited with sediment. The damage (dissolution) observed may be a function of processes which occurred during transportation of the phytoliths within the geomorphic system. An alternative explanation is differential resistance of different microfossil forms to dissolution. The movement of alkaline waters through a *Rangia* shell midden could result in dissolution of biogenic silicates.

The most readily identifiable group or class of opal phytoliths comes from Poaceae (grass family) short-cells. These heavily silicified epidermal cells may be classified into several diagnostic morphotypes (Table 91), which have been used to distinguish among climatically indicative grass subfamilies (Fredlund et al. 1985; Twiss 1986). Given the topographic and geomorphic setting of this site, it is hypothesized that any change in the relative frequencies of Poaceae short-cell types is related to either changes in local edaphic conditions or cultural activity, or both, rather than climate. Although a Chi-Square test has not been performed, there does not appear to be any significant difference among the Poaceae short-cell assemblages. Given the low short-cell totals used to calculate these percentages, any observed differences, such as the absence

Table 90. Phytolith counts from 16SC27.

Phytolith Forms	Stratum C	Stratum E	Feature 8	Feature 19	Feature 34
Poaceae Short Cells	18	54	25	32	28
Trichome Cell Forms	3	6	3	2	3
Fan- and Keystone-Forms	3	2	2	4	4
Elongate Smooth	(10)	(8)	(11)	(14)	(16)
Elongate Sinuous	(3)	(5)	(1)	(5)	(3)
Elongate Dendritic	(3)	(1)	(0)	(1)	(0)
Total Elongate Forms	16	14	12	20	19
Cyperaceae Cone Forms	2	0	1	3	2
Palmae Sinulose Forms	2	0	0	1	6
Dicotyledon Seed Forms	1	0	0	0	0
Mesophyll Forms	0	0	0	0	3
Other Regular Forms	2	1	3	1	1
Large Hollow Oval Forms	12	3	1	1	3
Large Blocky Silicified Cells	32	42	36	39	53
Small (<5 micron) Unidentifiable Fragments	145	92	179	128	105
Sponge Spicules	48	9	84	53	67
TOTAL:	286	220	346	284	294

Table 91. Counts of Poaceae Short Cell Types Identified at 16SC27. Within-sample percentages are shown in parentheses.

Samples: Short Cell Types	Stratum C	Stratum E	Feature 8	Feature 19	Feature 34
Rondel Forms	14 (74)	30 (56)	14 (56)	17 (61)	19 (60)
Rectangular Trapezoidal Forms	0 (0)	6 (11)	2 (8)	1 (4)	2 (6)
Sinuate Trapezoidal Forms	0 (0)	2 (4)	0 (0)	0 (0)	1 (3)
Saddle-Shaped Forms	1 (5)	5 (9)	2 (8)	1 (4)	1 (3)
Bilobate Forms	4 (21)	11 (20)	7 (28)	9 (32)	9 (28)
TOTAL:	19	54	25	28	32

of sinuate short-cell types from some samples, is probably an artifact of sampling.

Silicified trichome cells - cells which extend out from the epidermis, such as hair and hair-base cells - are produced by a wide number of plants including grasses and many plant genera classified with the Asteraceae (sunflower) family (Brown 1984; Piperno 1988). Unsegmented, silicified hair-base cells were the most common trichome forms observed in the 16SC27 samples. These microfossil forms do not conform with those described from the Asteraceae (Piperno 1988) or most grasses (Brown 1984). They are not the hook-shaped forms reported from *Phaseolus vulgaris* (Bozarth 1990). The source for these forms at 16SC27 remains unknown.

Other regular, but non-diagnostic forms include the "Fan-shaped" and "keystone-shaped" forms and elongate forms. "Fan-shaped" and "keystone-shaped" forms are commonly produced in grass leaves by bulliform cells, but similar forms are also created within a wide range of plants. Elongate forms are also commonly produced by grasses but are also found in other plants. Both of the general form groups, fan-shaped and elongate forms, occur more or less evenly within all of the samples analyzed.

Cyperaceae (sedge family) cone-shape forms were also identified in the 16SC27 samples. Although morphologically similar forms may be produced by other plants, these conical forms on flat, polygonal bases are most commonly produced by sedges. These forms occur in all but one sample, Stratum E.

Palmaceae (palm family) spinulose forms identical to those observed at 16SC27 have been isolated from *Sabal minor* (palmetto) (Piperno 1988). Palmetto has a wide variety of potential ethnobotanical uses (e.g., thatching or woven mats). While the occurrence of this phytolith form suggest the use of palmetto, there currently are no off-site samples which would serve as a measure of non-anthropogenic frequencies of this form. The relatively greater occurrence of this form within Feature 34 especially suggests human use of the plant on the site.

A variety of less common phytolith forms also suggests some cultural behavior. One is the single example of a dicotyledon seed form phytolith, similar to examples illustrated in Piperno (1988), observed from Stratum C. The type of seed represented remains unknown. Silicified mesophyll cells, also similar to those illustrated by Piperno (1988), were also identified from Feature 34. The plant or plants which produced these fossils remain unknown.

It is most likely that these fossils are from some angiosperm leaf.

A distinctive, but unknown phytolith form (included with "other regular forms" on Table 90) occurred in two separate samples, Feature 8 and Stratum C. This heavily silicified form has a flat base approximately 25 microns square, but a triangular cross section. A deep U-shaped trough cuts the triangular cross section almost in half. That this form occurred in more than one sample, within an archeological context, suggests that it may be of ethnobotanical significance.

Occurring in all of the samples analyzed, but far more commonly in Stratum C, were large (50 or 60 micron diameter) oval-shaped cells which had heavily silicified walls. Many of these large forms were shattered during the mounting procedure but remained distinctly identifiable. Again, the plant which produced these phytoliths has not been identified.

Occurring far more frequently and ubiquitously are several phytolith classes which do not appear to have any potential ethnobotanical significance. These include the large, blocky silicified cells commonly produced by many angiosperm leaves (Rovner 1983) and the small (less than 5 micron) opal fragments. Both of these phytolith classes occur abundantly throughout all of the samples analyzed (Table 90).

Finally, fresh (and brackish) water sponge spicules were abundant in all but one of the samples. The curved, needle-shaped form of sponges were by far the most common; however, spool-shaped sponge forms also occurred. Although these microfossil forms are ubiquitous, it is unusual to find them in such abundance within an archeological site. It is hypothesized that these organisms were transported into the site within or on the *Rangia*. The significantly lower occurrence of these forms in Stratum E suggests a distinctive and different origin for the sediments composing this zone.

Conclusions

The primary objective of this phytolith analysis was the identification of ethnobotanical resources used at 16SC27. The results of this analysis offer little in the way of evidence for either domesticated or non-domesticated food resources. No evidence was found in the five samples from Strata C and E which would suggest the use of corn, beans, or squash at the site despite the presence of squash seeds in Stratum C and corn cupules and kernels in Stratum F (Chapter 16). The Poaceae short-cell assemblages lacked the characteristic signatures indicative of *Zea maize* (cf. Piperno 1984). Nor were the characteristic phytolith forms of *Cucurbita* or *Phaseolus vulgaris* observed in any of the samples analyzed (Bozarth 1987, 1990). A single dicotyledon seed phytolith was the only evidence for non-domesticated food resources.

Almost all of the plant opal types identified represent potential ethnobotanical resources. For example, both grass (Poaceae) and sedge (Cyperaceae) phytolith types represent potential botanical resources. However, the levels of occurrence of these phytolith types probably fall within the range expected for natural, non-archeological assemblages. There is, therefore, no strong evidence for specific uses of these plants at 16SC27.

A stronger, though not conclusive, case can be made for the use of palmetto at 16SC27. The relatively common occurrence of a phytolith form characteristic of palmetto in Feature 34 is especially suggestive of cultural use. However, in all of the samples, only 9 phytoliths of this type were observed. Empirical evidence is not available to show whether or not this level was greater than would occur in non-archeological contexts.

There also appear to be significant overall differences among the five 16SC27 phytolith samples (Table 90). All three of the samples extracted from feature fills are similar in overall composition. The two stratigraphic samples are distinctly different from the feature fills and from each other. The Stratum C phytolith sample contains lower relative frequencies of Poaceae forms than any of the other samples. Stratum C also includes a relatively larger percentage of the large hollow oval phytolith forms. The Stratum E sample includes lower relative frequencies of sponge spicules but higher relative frequencies of Poaceae phytoliths than any of the other samples. Although the significance of these difference remains unclear, it appears likely that they are somehow culturally induced.

CHAPTER 18
HISTORIC ARTIFACTS FROM THE PUMP CANAL SITE
By Jill-Karen Yakubik

The 1979 Surface Collection

The largest collection of historic material from the Pump Canal site was recovered from the surface in 1979. These artifacts were classified by Jill-Karen Yakubik in 1980 (Table 92). In addition to artifacts that were collected, an *in situ* layer of crushed and fragmented brick was discovered on the surface of the site.

Two sherds of faience were recovered, but the majority of the material consisted of pearlwares and whitewares. Although creamware was not recovered in the 1979 surface collection, it was collected when the site was investigated in 1991 (below). The presence of primarily pearlwares and whitewares as well as albany-slipped stoneware, the paucity of creamware, and the absence of ironstone suggest that this material was probably deposited at the site sometime during the period between ca. 1810 and ca. 1850. The mean ceramic date obtained for the collection was 1834.1 (n = 37), which fits well with this range. This calculation also includes three creamware sherds collected in 1992.

The presence of two sherds of faience in this context is somewhat surprising, although faience does occur in small quantities in assemblages dating to the first two decades of the nineteenth century (Yakubik 1990). It is possible that these were relict pieces. Alternatively, and perhaps more likely, the faience may reflect European influence at the site during the colonial period.

Fifty-one sherds of glass representing a minimum of four bottles were collected from the site. The sherds consisted primarily of fragments of liquor bottles. None of the glass exhibited diagnostic traits that conflicted with the ceramic date. The presence of glass, ceramics, and two spoons indicate the regular consumption of food at the site. The existence of brick indicates that someone made the effort to bring building materials to the site, so that it is likely that more than just a temporary shelter was located here. Thus, it is presumed that someone at least intermittently resided at the site during the period 1810 to 1850.

There is also some evidence of leisure activity at the site. This includes both smoking pipe fragments and one ceramic marble. While marbles today are considered

Table 92. Historic Artifacts Collected in 1979 from the Surface of 16SC27.

Ceramics

2	faience
1	finger-painted pearlware
2	polychrome hand-painted pearlware
2	blue hand-painted pearlware
1	annular pearlware
10	whiteware
5	red transfer-printed whiteware
3	blue transfer-printed whiteware
3	polychrome hand-painted whiteware
3	unglazed earthenware
5	salt-glazed stoneware, albany slip interior

Glass

4	"black" glass
7	"black" bottle kickup fragments
1	"black" bottle neck, applied lip
20	olive glass
7	olive bottle kickup fragments
2	olive bottle neck, applied lip
9	light green glass
1	light green bottle neck, applied lip

Other

1	kaolin pipebowl, marked "TD"
1	blue glass bead
1	ceramic marble
2	spoons
3	bone buttons
1	lead sprue
1	lead shot
98	gunflints
211	brick fragments

children's toys, adults formerly played with marbles (Richard Gartley, personal communication 1991). A large collection of marbles was collected from the ca. 1800-1840 occupation of the prison formerly at the site of the Cabildo in New Orleans. It was suggested that marbles may have been used for gambling (Yakubik and Franks 1992).

Most surprising was the large number (n = 98) of gunflints recovered from the Pump Canal site. Of these, 83 were honey-colored flints while 15 were black flint. Virtually all were in pristine condition, suggesting that they had been cached at the site. Other evidence of armaments included lead sprue and lead shot.

The 1991 Investigations

Far less historic material was collected at 16SC27 during the 1991 investigations (Table 93). Three sherds of creamware were the only materials collected from the surface of the site. All three of the sherds derived from different vessels. One was from a royal pattern soup plate, another was from a plain rim pattern soup plate, and the third was from a bowl.

Stratum A, the spoil material, in EU5 yielded evidence of recent activity at the site: two Heineken beer caps, a 1984 nickel, and a 1984 penny. One sherd of decaled ironstone was also collected from this level. This post-1900 sherd undoubtedly derives from the Winter Garden Farms occupation of the area (Chapter 10).

Most of the other historic material collected in 1991 consisted of small brick fragments. Interestingly, three brick fragments, including one with mortar adhering to it, were recovered from Stratum C below the compact surface. Also, three single-holed bone buttons were recovered from Stratum C (Figure 105). Bone disks with single holes were molds for cloth- or thread-covered buttons. The hole of the button was functional only in that it resulted from the production of the disk itself. Cloth-covered buttons were utilized throughout the 1700s, but they became especially widespread after 1727 (Hinks 1988:72-73).

Interpretations

As suggested above, the historic material from the surface indicates intermittent Euro-American use of the Pump Canal site during the period of 1810 to 1850. Since no diagnostic material was found in context, there is no evidence to determine whether the site was used regularly over a long period, or if there were hiatuses in the

Table 93. Historic Artifacts Collected During 1991 Investigations at the Pump Canal Site, 16SC27.

Surface
3 creamware

Auger Test at N6 E0, 45-60 cm
1 olive glass
1 brick fragment (<0.25 lb.)

Auger Test at N6 E0, 60-66 cm
1 brick fragment (<0.25 lb.)

EU5 Stratum A (Level 1)
2 Heineken beer caps
1 1984 nickle
1 1984 penny
1 decaled ironstone

EU6 NE 1/4 Stratum C
3 one-holed bone buttons

EU7 Stratum C (below compact surface)
2 brick fragments (<0.25 lb.)
1 brick fragment with mortar (<0.25 lb.)

EU7 Stratum C (0-5 cm)
3 brick fragments (<0.25 lb.)

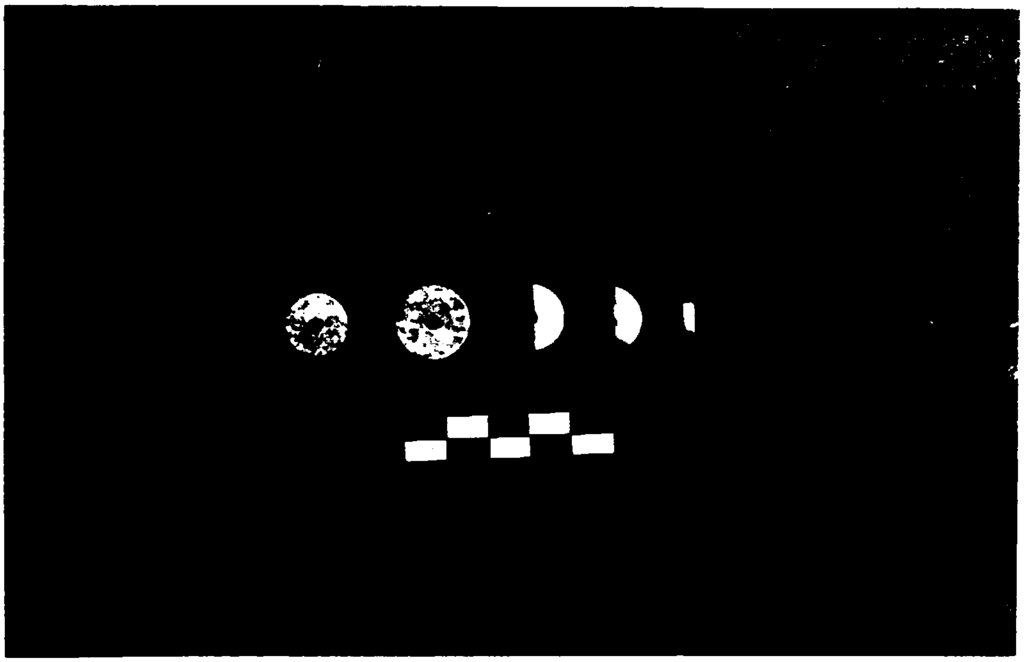


Figure 105. Bone Buttons and bone button fragments from Stratum C at 16SC27.

historic occupation at the site. However, the fact that bricks and/or brick fragments were brought to the site suggests that the site was utilized either repeatedly over a few years or for a relatively extended period (at least several months). The brick surface found in 1979 appeared to be either the remains of a floor or a footing for a pier, which indicates there was some effort to create at least a semi-permanent shelter. Finally, the presence of faience on the surface, as well as the bone buttons in association with aboriginal material in excavations, suggests that at least European goods, if not the Europeans themselves, reached the site during the colonial period.

No historic documentation indicates who may have been utilizing the Pump Canal site during the first half of the nineteenth century. One possibility is contraband traders. Jean Lafitte in particular has been associated with "Baratarian" contraband trading. Interestingly, Lafitte dealt in gunflints and ammunition. He is reported to have had a secret storehouse in the marshes where he hid ammunition and flints. He also was reported to have delivered 7,500 gunflints to Andrew Jackson (Thompson 1948:104). Although the presence of the gunflints at Pump Canal cannot be used as proof of association of the site with Jean Lafitte, contraband trade offers one possible explanation of why so many flints were found.

Another likely, although less romantic possibility is that the site served as a hunting camp. An "encampment of French hunters" was noted on the shores of Lake Salvador in an 1802 survey (Pintado Papers III C. No. 3 F, p. 71), so it is not unlikely that there were hunting camps on Lake Cataouatche at this date as well.

CHAPTER 19
CONCLUSIONS AND RECOMMENDATIONS

Evaluation of Sites

Introduction. In 1990-1991 Earth Search, Inc., surveyed approximately 670 acres within the Davis Pond Freshwater Diversion Project area. All portions of the project area where archeological sites may be directly impacted by construction and which are accessible to pedestrian survey have been investigated as part of the Davis Pond Freshwater Diversion Project. Only one site, 16SC73, was identified within the planned impact corridor. This site is not eligible or potentially eligible for inclusion on the National Register of Historic Places (NRHP).

During pedestrian survey, two sites were recorded near the project construction corridor. These were 16SC74 and 16SC76. Only a surface collection was made at 16SC74. That site is recommended as being potentially eligible for inclusion on the NRHP. 16SC76 is a small prehistoric site. Sufficient excavations were conducted to indicate that it is not eligible for inclusion on the NRHP.

Excavations were also conducted at 16SC27. Results of those excavations indicate that the site is highly significant and is eligible for listing on the National Register. The possibility of project impact to the site is discussed below.

16SC73. This was the only site recorded within the actual area of construction impact. The site represents a scatter of late-nineteenth and early-twentieth-century artifacts. Forty shovel tests and a 1 x 1 m unit were excavated here. Deposits are relatively shallow, and the site appears to have been disturbed by excavation of a ditch.

To qualify for nomination to the National Register, it would be necessary for 16SC73 to be likely to yield information important in prehistory or history (National Park Service 1982:28). Louisiana's Comprehensive Archaeological Plan (Smith et al. 1983:95-96) identifies cultural themes for the region that includes Davis Pond. The relevant theme for 16SC73 is "Plantation Archeology." That document proposes that one of the research issues related to the theme is whether there are differences in lifeways for post-bellum occupants of sugar plantations compared to cotton plantations (Smith et al. 1983:98). Other important research issues related to plantations have also been proposed, such as the difference between lifeways of slaves as compared to Freedmen on sugar plantations.

Unfortunately, the paucity of artifacts at 16SC73 indicates that further excavations at the site would not be likely to yield information important to furthering our understanding of research issues like those discussed in the preceding paragraph. Admittedly, artifacts are usually not abundant at sites dated to this period. However, in the case of 16SC73, the tightly spaced shovel tests provided no evidence for spatial patterning that might be an alternative source of data for understanding activity at the site. Also, there is no evidence for features such as trash pits or historic fence lines where artifacts might be concentrated or which might provide data concerning activity patterning.

The apparent absence of such features indicates that the site does not exhibit integrity which would also be necessary for it to be considered significant:

> For properties important for their information potential, integrity depends on the presence of those parts of the property which contain the important data and which survive in a condition capable of yielding important information [National Park Service 1982:37].

Site 16SC73 should not be considered eligible or potentially eligible for nomination to the National Register of Historic Places because of its apparent lack of integrity and further research potential. No further work is recommended.

16SC74. Based on the date range of artifacts at 16SC74 (eighteenth and early-nineteenth century), the relevant themes for the site probably are "Historic Exploration and Colonization of Louisiana" and "Plantation Archeology" (Smith et al. 1983:95). It is important to note that sites dating from the eighteenth and even the early-nineteenth century are relatively rare along the Mississippi River in the region that includes 16SC74.

In terms of research potential, it is *possible* that excavations at this site could provide important information related to the two themes identified above. Thus, the site should be considered potentially eligible for nomination to the National Register under Criterion D (National Park Service 1982:28). The presence of a possible brick floor indicates that at least parts of the site may exhibit the quality of integrity (National Park Service 1982:37).

However, because 16SC74 was outside the area of construction impact, no test excavations were conducted at the site. Therefore, the true NRHP status of 16SC74 remains undetermined. If plans for construction are changed in such a way that the site will be impacted, or if mobilization for construction will result upon impact, then it is recommended that formal test excavations be undertaken.

16SC76. This small, prehistoric site is located outside the area of construction impact as depicted in Figure 1. Nevertheless, excavations were conducted here. The reason for conducting the excavations was that this was the only new prehistoric site recorded as a result of survey and, therefore, data were desired concerning the period and nature of activity at the site.

Excavation of four shovel tests, three auger tests, and four 50 x 50 cm units produced small amounts of *Rangia* shell and a single prehistoric sherd. The sherd was not diagnostic of a particular prehistoric period. Deposits at the site are shallow, with material occurring within 30 cm of ground surface. The site has been previously disturbed by construction of an oil well access road and by a jeep trail located along the highest portion of the natural levee, which is the area the site actually occupies.

Given the density of cultural materials, additional excavations would not provide information that could further our understanding of prehistoric activity in the Barataria Region. Also, the site's integrity has been compromised by construction and use of the jeep trail. Therefore, the site is not significant in terms of National Register criteria (National Park Service 1982). Site 16SC76 should not be considered eligible or potentially eligible for nomination to the National Register. It is recommended that additional archeological testing is unnecessary because it would not be productive.

16SC27. Six auger tests, a bankline profile, and the equivalent of four 1 x 1 m units were excavated at this small site during the 1990-1991 field season. In 1979-1983, the Delta Chapter of the Louisiana Archeological Society had also excavated four units at the site. Results of these excavations and the analyses reported in this volume indicate that 16SC27 is highly significant. It now represents the only stratified, multi-component site within the Barataria Basin for which excavations are well-reported. Floral and faunal remains are well-preserved, and ceramic artifacts are abundant. Features documented to date include postmolds, ash lens, and hearths.

Criterion D for NRHP evaluations states that "Properties may be eligible for the National Register if they have yielded, or may be likely to yield, information important in prehistory or history" (National Park Service 1982:28). There is no question that 16SC27 has yielded such information. However, the issue for establishing its eligibility status is whether further excavations would be likely to yield additional information:

> Properties that have yielded important information in the past and that no longer retain additional research potential (such as completely excavated archeological sites) must be assessed essentially as historic sites like properties eligible under Criterion A, significant for associative values related to: (1) the importance of the data gained, or (2) the impact of the property's role in the history of the development of anthropology/archeology or other relevant disciplines... A property that has been excavated may be eligible if, for instance, the data recovered was of such importance that it influenced the direction of research in the discipline, as in a site which clearly established the antiquity of the human occupation of the New World... [National Park Service 1982:29-30].

In terms of its importance to the development or history of archeology as a discipline, 16SC27 is not significant. Although the site has yielded important information, that information represents a contribution to the general data base concerning prehistoric occupations in the Lower Mississippi Valley. The information will not profoundly influence the direction of research in the region, nor will it profoundly alter archeologists' views of prehistoric developments there.

Nevertheless, 16SC27 warrants further consideration:

> The current existence of appropriate physical remains must be ascertained in considering the property's ability to yield important information. Properties that have been partially excavated or otherwise disturbed, and that are being considered for their potential to yield additional important information must be shown to retain that potential in their remaining portions...

A site that has been partially excavated but still retains substantial intact deposits (or a site in which the remaining deposits are small but contain critical information on a topic which is not well known) may be eligible [National Park Service 1982:30, emphasis added].

Those portions of 16SC27 which are accessible to traditional methods of archeological excavation are indeed small, perhaps only about 125 square meters. The issue, then, is what further research potential that small area exhibits. First, it is important to note that the auger tests reported in this volume indicate that undisturbed deposits are everywhere present beneath the spoil mound at the site. The tests also suggest that even within the small remaining portion of the site, areas exist that are functionally different from those areas where EU1-4 and EU5-7 were placed. Specifically, the tests indicate that a shell mound may be found beneath the spoil at the more western portions of the site. It is not known whether such mounds in the region represent deliberate constructions or are simply disposal areas for *Rangia* shells. If functionally different areas are in fact preserved, then their relationship to the areas already excavated would be an important research issue.

In addition, within the areas where EU1-4 and EU5-7 were placed, features that appear to be associated with structures were encountered. Most of these were postmolds. However, a possible construction trench containing part of a cypress log was also excavated. A similar feature was excavated at the Bowie site (16LF17), but has not been reported in the archeological literature (T.R. Kidder, personal communication 1993). To date, the only other possible prehistoric structures excavated in the Barataria Basin were at the Coquilles site (16JE37). It appears that the remains of a structure or structures may be present at 16SC27 within, at minimum, Strata F and E, which together represent much of the Baytown through Coles Creek period occupations.

Excavations at 16SC27 could also contribute to our understanding of other research issues. One of these is prehistoric diets. The data reported in this volume indicate that in terms of vertebrate resources, occupants of the site depended heavily on fish, with lesser amounts of meat obtained from terrestrial vertebrates. If functionally different areas are present at the site, comparative data would be valuable for determining whether the observed pattern prevails elsewhere. In addition, muskrat appears to be more important than deer in the diet of the inhabitants of 16SC27. This is unlike the situation at many other Lower Valley sites. Again, confirmation from another portion of the site, even one only a few meters distant from EU6 would be a valuable contribution to our understanding of faunal exploitation. Based on analysis to date at 16SC27, it appears that the importance of *Rangia* to prehistoric diets at the site varied between occupations from a primary constituent to being only minimally exploited. Additional data concerning this issue would be desirable because the role and importance of *Rangia* in prehistoric diet has been long debated for southeastern Louisiana (Byrd 1976a). Seasonality data from the *Rangia* indicates the possibility that shellfish gathering was restricted to the Spring and Summer months. These seasonality data represent an important potential source for understanding site distributions and prehistoric settlement strategies throughout the Louisiana coastal zone. It is absolutely necessary, however, to confirm the pattern indicated by this seasonality study since we do not know if these data are fully representative of the occupation at any one point in time.

Site 16SC27 could also contribute additional data pertaining to the role of floral species in prehistoric diets. The results of flotation analyses indicate that seeds were well-preserved. One incidence of corn was recorded, and it occurred within an earlier-than-expected context. Four squash seeds were recovered from two of the later strata. The low density of domesticated plant remains indicates that they were relatively unimportant in prehistoric diets at the site. However, their mere presence raises interesting questions because of the abundance of natural food resources available within the Barataria Basin. Additional data from 16SC27 concerning the presence/absence of domesticates within the various strata would represent important information. In addition, relevant data regarding non-domesticated or semi-domesticated plant remains could be obtained at the site. For instance, it appears that *Chenopodium* is concentrated in particular contexts, while *Vitis* (grape) seeds are nearly ubiquitous at the site. Results of analyses reported in this volume indicate that much larger samples would be desirable from the various midden strata. A larger data set would allow for more reliable quantification of the representation of floral dietary items in the archeological record.

Site 16SC27 also has the potential to provide additional information concerning culture chronology in the Barataria region. To date, excavations indicate that ceramic sherds are abundant, and that these are associated with occupations beginning with the Baytown period. This period is poorly defined and not well understood in the Mississippi Valley (Gibson 1984). Excavations at 16SC27 provide the first stratigraphically defined Baytown period component in the Louisiana coastal zone and have allowed us to significantly advance our understanding of the cultural relationships of these early occupants in the region.

The Coles Creek occupations at 16SC27 are no less important for providing culture historical and chronological data. Early Baytown and Coles Creek components will also allow a better understanding of the nature and timing of the occupation of developing levee deposits in complex and dynamic environments. The Bayou Cutler phase occupation at 16SC27 is currently the best known, most defined expression of this phase of Coles Creek culture in the coastal zone. Excavations have not only supplied a wealth of ceramic data, they also have provided a link between the culture chronology, subsistence practices, and other, previously poorly known, aspects of prehistoric behavior.

The latest occupations at the site provide a tantalizing glimpse of the dynamics of later Coles Creek and early Plaquemine cultures. The existence of a Transitional Coles Creek/Plaquemine component in Strata C and D demonstrates that the evolution of Mississippi period cultures in the delta were similar to those witnessed elsewhere in the Lower Mississippi Valley (Weinstein 1987). These data encourage a view of slow, steady, and continuous culture change from Coles Creek into the Mississippi period. This view of Plaquemine culture development, however, is at odds with previous models of the "Mississippianization" of Coles Creek culture (e.g., Holley and DeMarcay 1977; Weinstein 1987), and need to be tested with further data from Pump Canal and elsewhere in the coastal zone.

The radiocarbon dates obtained in the course of the current study also present an interesting research issue. Pump Canal is now the best dated archeological site in the Barataria Basin. There are a number of problems with the radiocarbon chronology at the site which can only be resolved with further research and more dates. Additional dates from Pump Canal would be useful to establish a better radiocarbon database and chronology for the Barataria region. That database, in turn, would be important for relating developments there with those in other portions of the Lower Valley and along the Gulf Coast. The culture history and chronological data from 16SC27 are extremely significant, but we must recognize that they come from a very limited exposure at the site.

In summary, there are a number of research issues for which additional data from 16SC27 would be desirable. Therefore, the site should be considered eligible for inclusion on the National Register. However, it is important to note that it is not threatened directly by construction impact. Therefore, no further work related to construction of the Davis Pond Freshwater Diversion Project is recommended.

Recommendations Concerning Additional Terrestrial Survey

A one hundred percent survey has been conducted within the impact area associated with the Mississippi River natural levee. Only one site, 16SC73, was recorded, and it is recommended as ineligible for inclusion on the National Register.

As previously stated, an extensive natural levee system developed to the south of the Mississippi River natural levee as a result of several thousands of years of crevasse events. However, most of this natural levee system within the planned ponding area has subsided to such an extent that pedestrian survey is not feasible. It is estimated that at least 50% of the surveyable area in the ponding area has now been examined. Surface reconnaisance outside the project area resulted in the identification of only a single prehistoric site, 16SC76, which has been tested and found not to be significant. One hundred percent of the actual construction corridor which was accessible by foot was included within the area surveyed.

In terms of both prehistoric and historic site occurences, the sparse results of the investigations are initially surprising because site density is known to be high on other distributary/natural levee systems within the Barataria Basin. However, these other areas appear to have been located closer to large bodies of brackish water than is the case for the present study area. It has been hypothesized that proximity to these large bodies of brackish water provided access to *Rangia*. This suggests one possible explanation for the low density of prehistoric sites reported in this volume. The distributary system surveyed here was quite an active one. The result of this activity appears to have been that Lake Cataouatche was somewhat smaller than its present size. Also, the lake was very likely to have been fresh. Even today, fresh water predominates during periods of heavy rainfall. This scenario is consistent with results of faunal analysis at 16SC27, which indicates that an entirely freshwater environment prevailed throughout the 1000+ year period of occupation at the distal end of a distributary associated with the system in question. Based on a geomorphological analysis, it is also possible that the frequent periods of activity of the distributary system discouraged occupation along the natural levees (J. Dunbar, personal communication 1992).

Given the fact that at least 50% of the natural levee area accessible for pedestrian survey has now been examined and site density determined to be low, it is recommended that additional pedestrian survey not be undertaken within the ponding area. Even if some sites are inundated or buried within the area accessible on foot, the sites are likely to have been only briefly occupied and are very few in number.

As no elevated terrain or prehistoric cultural material was observed during boat reconnaissance of the navigable channels within the ponding area, there is a low probability of shallow sites present in this locale. Existing models for site location in the region emphasize site placement at locations near or at the interface of distinct ecozones (e.g., Hunter et al. 1988; Pearson et al. 1989; Weinstein and Kelley 1992). However, geomorphic research indicates that the lower courses of the distributary channels are at present located within open water or marsh in or north of Lake Cataouatche. Therefore, additional boat survey within the ponding area is likely to be unproductive.

A reconnaissance level examination was conducted along part of the natural levee associated with Bayou Cypriere Longue. This examination occurred during pedestrian access to the study area. Should construction impact the Cypriere Longue natural levee, or if construction access becomes necessary along this natural levee, an intensive survey would be required. This action would be necessary because a number of shell scatters were observed on the surface but not recorded. No further work is recommended within the Davis Pond Freshwater Diversion Project area.

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APPENDIX I

SCOPE OF SERVICES

CELMN-PD-RA November 28, 1990

SCOPE OF SERVICES

CULTURAL RESOURCE SURVEY AND TESTING FOR DAVIS POND FRESHWATER DIVERSION, SAINT CHARLES PARISH, LOUISIANA

1. Introduction

The Davis Pond Freshwater Diversion Project has been authorized for construction by the U.S. Army Corps of Engineers (COE) in St. Charles Parish, Louisiana. The Project will allow controlled diversion of Mississippi River water into the swamps which drain into Lakes Catahouache and Salvador and Barataria Bay. In addition to a diversion structure, the Project plan also includes a system of guide levees to assure that the fresh water is dispersed in the most beneficial manner. Immediate impacts to cultural resources will result from earth moving activities associated with building the diversion structure and guide levees. More subtle long term impacts will influence sites on the lands within the guide levees (the Project area) as the diverted fresh water engenders ecological change.

The Project area is geographically typical of the Lower Mississippi deltaic plain. Natural levee deposits adjacent to the river slope down to backswamp which in turn blends into marsh and open water. The open water is the Lac Des Allemands, Lake Catahouache, Lake Salvador system which in turn opens to Barataria Bay. Infilled over thousands of years by St. Bernard and Plaquemine lobe formation, the system of lakes falls along the Bayou Lafourche Mississippi interlevee basin. The infilling in the Project area appears today as a system of crevasse distributary channels dominated by Bayous Bois Piquant, des Sautes, Cyprierres Longues, and Verret. Land building episodes in the area continue into the period of historic record. Breaking through the protection levee immediately west of the proposed diversion site on 8 March 1884, the Mississippi River poured flood waters and sediment into the marsh. The physical remains of the Davis Crevasse include Davis Pond and the sediments deposited in a semi-circular pattern south of the Southern Pacific Railroad.

Literature and records search done for Project environmental studies document some historic sites in the Project vicinity. The Davis Plantation was located near the diversion structure, Lone Star Plantation just upstream (west), and Louisa Plantation just downstream (east).

No prehistoric archeological sites are currently recorded in the areas to be directly affected by earth moving activities.

The Pump Canal Site (16Sc27) is an important prehistoric shell midden. It is located outside of the area of direct impact on a remnant of the delta which Bayou des Sautes formed in Lake Catahouache. The site's deposits evince intensive prehistoric exploitation of the biological diversity of the transition from fresh to brackish marsh. Similar prehistoric settlement and subsistence strategies are well documented elsewhere in the lower Mississippi region (see in particular recent COE and National Park Service funded studies in Jefferson Parish). The Pump Canal Site is situated on an eroding remnant of land. It is likely to vanish into Lake Catahouache as a result of tidal and storm conditions which can be expected to occur in any year. There are no practical means of preserving the site in place. Earlier investigations were essentially volunteer salvage efforts. Provision was not made for analysis and publication of the extensive faunal and ceramic assemblages which were recovered. The test excavation done at the site also provided evidence of significant prehistoric architectural remains which it was not possible to fully explore.

No archeological sites are recorded in the Project area. This reflects the fact that no attempt has been made to find the sites which probably lie buried within the natural levees. The stratified cultural sequence at Pump Canal and a Project area COE geomorphological study indicate that land in the Project area suited for human habitation began to build about 1500 years ago. The basal artifact bearing strata at Pump Canal are Troyville and Baytown. Post Marksville cultures are the earliest anticipated for the Project area generally. The natural levees of the Project area distributaries have received no formal survey. With several significant sites known in their near vicinity, it is highly likely that they, like similar better explored terrain, also contain a number of scientifically worthwhile archeological sites.

2. Study Requirements

a.Objectives

The goals of the present study include:

1)Identify all cultural resources located in areas of initial direct Project impact.

2)Discover and document any significant historic period archeological sites and/or architecture located in the Project area.

3)Develop a factually based model of how the Project, over the long term, may affect pursuing significant archeological research in the area of Lakes Salvador and Catahouache.

4)Develop an operational research design to guide future project work to be done under delivery orders other than this one. The research design will include detailed recommendations regarding areas to survey and field techniques (intensity of survey and subsurface testing) to be used in defined areas.

b. Work Items.
The work will be accomplished in three phases.

1) Phase 1:

a) Background Research. The study will begin with research of literature and records to predict the nature of historic and prehistoric sites in the project area and refine survey methodology. This background research will include a literature review, geomorphological study (Dunbar and Britsch 1990), and research of historic records.

b) Pump Canal Site. Analysis of the ceramic, lithic, and faunal material previously recovered from the pump canal site will be initiated in Phase 1 and completed in the following Phase.

c) Reconnaissance. A brief informal field reconnaissance of the Project area will be done to assess current conditions affecting survey (access, vegetation cover, water level, etc.). The field reconnaissance will also include assessing project area locations where background research indicates that historic sites are present.

d) Phase 1 Report. A brief, interim report will be prepared at the conclusion of this Phase and submitted to the Contracting Officer's Representative (COR). The preliminary analysis of Phase 1 work (Pump Canal, background literature search, geomorphological analysis, field reconnaissance) will provide the basis for a formal plan for Phase 2 investigations. It is anticipated that this plan will be a budget of person hours to be allocated among various tasks (see Phase 2 below). If possible field work at the Pump Canal Site will not be done until after review and approval of the Phase 1 Report. However, if the weather conditions which allow work to be done at Pump Canal set in before the Phase 1 report is reviewed, the COTR will be notified and work may be begun at the site.

The interim report shall be submitted within 60 days after delivery order award for review and approval. All review comments will be resolved or incorporated within 14 days after submittal.

2) Phase 2: Survey and Testing.
Upon approval of the Phase 1 report by the Contracting Officer's Technical Representative (COTR), the Contractor shall initiate Phase 2 survey. The survey shall be a combination of bankline survey and intensive pedestrian survey with shovel testing.

a) Bankline survey will be done along the guide levee alignments which follow the courses of the Bayou Verret and the Bayou Bois Piquant/Cyprierre Longue system (see map). The bankline survey will consist of closely observing stratigraphic profiles of exposed banklines and shovel testing at 20 meter intervals along the banks. Access to the banklines will be by boat wherever this is most efficient. Approximately 11.5 miles of bankline survey will be done along Bayou Verret and the Bayou Bois Piquant/ Cyprierre Longue system.

b) An intensive pedestrian survey will be performed for the area of the future diversion structure. This area (see map) consists of 400 acres of land on top of

Mississippi River natural levee deposits. The intensive pedestrian survey will utilize lane spacing of 20 meters and a shovel testing interval of 50 meters in an offset pattern. Shovel tests will be approximately 30x30 cm in the horizontal plane and approximately 25-50 cm deep, i.e. to sterile subsoil. The excavated soil will be screened through 1/4 inch wire mesh. This systematic procedure will be supplemented with judgmental shovel testing based upon the background research.

c)Auger testing to a minimum depth of 2 meters will be substituted for at least 20 of the shovel tests at locations where deeply buried sites are deemed likely (either bankline and/or intensive survey area).

d)An area equivalent to 2 linear miles of bankline survey will be covered along the project area's interior drainages. The areas to be surveyed will be defined in the Phase 1 report/plan. Substituting intensive survey for bankline survey may be approved by the COR if adequately justified. A minimum of 10 auger tests will be substituted for shovel tests where warranted by field conditions.

e)Site testing will include the equivalent of excavation of 8 one meter squares at sites discovered during survey and two 2 X 2 meter squares at the Pump Canal Site. The sites to be tested will be selected in consultation with and approved by the COTR.

f)Historic sites identified during Phase 1 work will be defined and documented in accordance with appropriate professional standards. The mix of time and effort to be devoted to survey versus historic site documentation will be specified in the plan for Phase 2 investigations which emerges from the Phase 1 interim report.

g)State site forms will be completed and state-assigned site numbers will be utilized for all archeological sites located by the survey. All sites located in the survey corridors will be sketch-mapped, photographed, and briefly tested using shovel, auger, and limited controlled surface collection to determine depth of deposit, site boundaries, stratigraphy, and cultural association. Any pre-World War II standing structures located in the survey transects will be recorded on Louisiana state standing structure forms and will include a minimum of three clear black and white photographs. For structures located in the survey transects, the contractor shall also address the archeological component of the site.

3) Phase 3: <u>Data Analyses and Report Preparation.</u>
All data will be analyzed using currently acceptable scientific methodology. The Contractor shall catalog all artifacts, samples, specimens, photographs, drawings, etc., utilizing the format currently employed by the Louisiana State Archeologist. The catalog system will include site and provenience designations. All cultural resources located by the survey will be evaluated against the National Register criteria contained in Title 36 CFR Part 60.4 and within the framework of the historic setting to assess eligibility for inclusion in the National Register. The Contractor will classify each site as either eligible for inclusion in the National Register, potentially eligible, or not eligible. The Contractor shall fully support his recommendations regarding site significance.

The analyses will be fully documented. Methodologies and assumptions employed will be explained and justified. Inferential statements and conclusions will be supported by statistics where possible. Additional requirements for the draft report are contained in Section 4 of this Scope of Services.

Areas surveyed under this delivery order and survey type will be accurately shown on 1:24,000 scale maps. Previously recorded sites and those discovered in the course of this delivery order will also be accurately plotted on those maps. In addition to hard copy map versions, the mapped information (survey boundaries and sites) will also be provided as an Intergraph™ DGN file on a floppy disk. The furnished DGN file will conform to the specifications of Appendix A of this scope of work.

The Contractor will fill out and file state site forms with the Office of the Louisiana State Archeologist and cite the resulting state-assigned site numbers in all draft and final reports of this investigation. One unbound copy of each site or standing structure form will be submitted to the COR with the Management Summary. See also item C-6.3 in Contract.

3. References.

In addition to other relevant sources, the following will be consulted by the Contractor:

> the report on the 1989 geomorphological analysis of the Davis Pond area prepared by the COE Waterways Experiment Station (Britsch and Dunbar 1990),
>
> the National Park Service's draft standards entitled "How to Apply the National Register Criteria for Evaluation," dated June 1, 1982;
>
> the Secretary of the Interior's Standards and Guidelines for Archeology and Historical Preservation as published in the <u>Federal Register</u> on September 29, 1983;
>
> Louisiana's Comprehensive Archaeological Plan dated October 1, 1983;
>
> the Advisory Council on Historic Preservation's regulation 36 CFR Part 800 entitled, "Protection of Historic and Cultural Properties," and Section 106, Update 3, entitled, "Manual of Mitigation Measures (MOMM), dated October 12, 1982.

4. Reports:

a. Monthly Progress Reports. One copy of a brief and concise statement of progress shall be submitted with and for the same period as the monthly billing voucher throughout the duration of the delivery order. These reports, which may be in letter form, should summarize all work performed, information gained, or problems encountered during the preceding month. A concise statement and graphic presentation of the Contractor's assessment of the monthly and cumulative percentage of total work completed by task shall be included each month. The monthly report should also note difficulties, if any, in meeting the contract schedule.

b. Phase 1 Report. Two copies of the report on the results of the Phase 1 investigations will be submitted to the COR within 60 days after work item award for review and approval. This report will present the detailed plan for Phase 2 work.

c. Management Summary. Thirty days following the conclusion of fieldwork (160 days after the date of the order) two copies of a Management Summary will be submitted for review. The report will include concise narrative summary of the results of the literature and records search and fieldwork. The summary will rely heavily on tables showing numbers of sites and acreage of survey coverage organized by appropriate categories. Copies of site forms and field notes will be furnished to the COR concurrently with the Management Summary.

d. Draft and Final Reports. Four copies of the draft reports of this investigation will be submitted to the COR for review and comment. The Draft of Volume 1 will be submitted within 290 days after work item award and the Draft of Volume 2 will be submitted within 370 days after work item award. These written reports shall follow the format set forth in MIL-STD-847A with the following exceptions: 1) separate, soft, durable, wrap-around covers will be used instead of self covers; 2) page size shall be 8-1/2 x 11 inches with a 1-11/2-inch binding margin and 1-inch margins; 3) the text reference and Reference Cited formats of Society for American Archeology will be used. 4) Arabic page numbering will begin with the first page of Chapter 1; 5) Photographic figures may be screened matt finish. Spelling shall be in accordance with the U.S. Government Printing Office Style Manual, dated January 1973. If appropriate, along with the draft reports, the Contractor shall submit three copies of National Register of Historic Places Registration Forms. The Contractor will follow the guidance provided in National Register Bulletin 16: Guidelines for completing National Register Forms. The Contractor shall also provide recommendations for management and mitigation of the site if he recommends it as eligible.

The body of each report shall include the following : 1) introduction to the study, study objectives, and study area; 2) environmental setting; 3) review and evaluation of previous relevant investigations; 4) presentation of study methodology; 5) results; 6) data analyses (including distribution of prehistoric and historic settlement in the study area); 7) data interpretation (including proposed research design/predictive model(s) for future work); 8)conclusion; 9) recommendations; 10) references cited; and 11) copy of this Scope-of-Work, and other appendices as appropriate.

In order to preclude vandalism, the draft and final reports shall not contain specific locations of archeological sites. Predicted site locations will appear in separate appendices from the main report.

The COR will provide all review comments to the Contractor within 60 days after receipt of the draft reports (350 days for Volume 1 and 430 days for Volume 2 after delivery order award). Upon receipt of the review comments, the Contractor shall incorporate or resolve all comments with the approval of the COR and submit one reproducible master copy, one copy on floppy diskette as required in the Contract, and 40 bound paper copies of each report of investigation, and all separate appendices to the COR within 390 days for Volume 1 and 470 days for Volume 2 after work item award.

5. Disposal of Records and Artifacts

All records, photographs, artifacts, and other material data recovered under the terms of this delivery order shall be recorded and catalogued in a manner compatible with those systems utilized by the Louisiana SHPO and by State and Federal agencies which store archeological data. They shall be held and maintained by the Contractor until completion of the delivery order. Final disposition of the artifacts and records will be in accord with applicable Federal and State laws. Unless otherwise specified, artifacts will be returned to the landowner or permanently housed with the Louisiana Division of Archeology and Historic Preservation or in a repository selected by the State Archeologist. The Principal Investigator shall inform the COR in writing when the transfer of data has been completed and shall forward to the COR a catalog of items entered into curation. The location of any notes, photographs or artifacts which are separated from the main collections will also be documented. Presently existing private archeological collections from the Project area which are used in data analyses will remain in private ownership. The Contractor shall be responsible for delivery of the analyzed archeological materials to the individual landowners, the Louisiana SHPO's office, or any other repository designated by the Government following acceptance of the final report. All artifacts to be permanently curated will be cleaned, stabilized, labeled, catalogued on typed State curation forms, and placed in sturdy bags and boxes which are labeled with site, excavation unit or survey collection unit provenience.

6. Schedule

Delivery Order Award
Initiate work on Literature and Records Search-Within 10 days of Date of Order.
Phase I Report-Within 60 days of Date of Order.
Start Phase 2 Fieldwork- Within 30 days of COE receipt of Phase 1 Report.
Finish Fieldwork- Within 200 days of Date of Order.
Management Summary-Within 230 days of Date of Order.
Submit Draft of final report Volume 1-Within 290 days of Date of Order.
Receive COE Volume 1 comments-Within 350 days of Date of Order.
Submit final Volume 1report-Within 390 days of Date of Order.
Submit Draft of final report Volume 2-Within 370 days of Date of Order.
Receive COE Volume 2 comments-Within 430 days of Date of Order.
Submit final Volume 2 report-Within 470 days of Date of Order.