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SITE VARIABILITY IN THE OCONEE PROVINCE: A LATE MISSISSIPPIAN SOCIETY OF THE GEORGIA PIEDMONT

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SITE VARIABILITY IN THE OCONEE PROVINCE: A LATE MISSISSIPPIAN SOCIETY OF THE GEORGIAN PIEDMONT

by

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FORWARD

This report was originally written as a dissertation in anthropology and submitted to the Graduate School of the University of Florida in partial fulfillment of the requirements for the degree of Doctor of Philosophy. It is herein reproduced as Contribution Number 24 of the University of Georgia Wallace Reservoir Archaeological Project.

David J. Hally
Principal Investigator

ACKNOWLEDGEMENTS

This study is an outgrowth of archaeological salvage undertaken in a portion of the Oconee River valley that has since been flooded for a hydroelectric facility. The Georgia Power Company funded our work in the area now known as Lake Oconee, and thus deserves a good deal of credit for the resultant increase in our understanding of the prehistoric and historic peoples who once lived in this portion of the Southeast. I am grateful for the knowledge gained through the Wallace Project. Much of the information collected is, I think, of great significance and will continue to mystify archaeologists for years to come. Such advances, however, bear a heavy price. Among the eighty or ninety individuals who comprised the Wallace Reservoir Archaeological Project, there is hardly a soul who does not feel a great sense of tragedy for the loss of such a beautiful river valley. These sentiments have been aptly expressed in song and verse by Dan Elliott. The Oconee River was unique and dear to all who were fortunate enough to have sojourned there. My own sense of loss was greatest when, in 1981, I floated my canoe a hundred and fifty feet above the

most beautiful portions of the former river valley. All the archaeological reports, all the lakefront property, and all the kilowatts in the world cannot replace the Oconee River. Only time can do that. This study is therefore dedicated to the Oconee River valley, to its beautiful shoals and bottomlands, and to its eight thousand or more years of human occupation.

I wish to thank the members of my dissertation committee for their encouragement, for their many red marks on my various drafts, and for all that I've learned from them through the years. The committee was ably chaired by Dr. Jerald Milanich and consisted of Drs. Edward Deevey, Prudence Rice, Bruce Smith, Charles Wagley, and Elizabeth Wing. Each member contributed a unique and complementary perspective to my own thoughts. I have enjoyed working with all of them and I sincerely hope that we will have the chance to work together again in the future.

I would like to make special mention of my debt to Dr. Wing, with whom I first became acquainted as an undergraduate in her zooarchaeology class. The experience of working with archaeologically recovered faunal materials to derive information about past human behavior really set the hook for me. That attempt at problem solving, guided by Dr. Wing, helped me decide that archaeology was a worthwhile pursuit. Another very important influence

on that decision was the inspiration of Dr. Charles Fairbanks. In addition to his encouragement and support, Dr. Fairbanks has imparted a view of anthropology as a very rational, very human science of humanity, and I am grateful for that perspective in a time of clashing paradigms. Special thanks are also due to Dr. Bruce Smith for his participation and his continued interest in this research.

It was through the encouragement of Drs. Paul Fish and David Hally that I first became involved in the Wallace Reservoir Project. I owe them a great deal of gratitude. Dr. Hally's advice, cooperation, and hospitality have been especially crucial to the completion of this project--I am extremely grateful for his patience and assistance in so many matters.

Identification and comparison of ceramic vessels from sites in the Oconee Province are an important part of this study. That analysis could not have been conducted without the financial support provided by the American Museum of Natural History in the form of a Richard B. Lounsbery Predoctoral Fellowship. Special thanks are due to Dr. David Thomas for his administration of that award.

This dissertation has been in the oven for four years. In that time, so many individuals contributed essential ingredients. Many individuals contributed to the technical ingredients of the study. These include Barbara Ruff, who identified most of the faunal remains, and Jennifer Chester, who reconstructed most of the vessels from the Punk Rockshelter. Helen Doney also contributed substantially to the reconstruction and recording of vessels. Elizabeth Sheldon identified the floral remains. Kay Wood and Terry Rudolph mastered the gargantuan task of managing the archaeological laboratory during the Wallace Project. Gisela Weis drafted several of the figures that appear in this study. Lois Greene and Carol Laine deserve much thanks for their help in putting the manuscript into its final form.

It was a particular pleasure to work with the field crew at 9Ge175. The crew included Jimmy Alexander, Carolyn Rock, Jack Tyler, Karen Walker, and Holger Weis. Part-time crew members included Gilbert Head and Paul Webb. Tom Ford and Mark Williams each volunteered to help out in the field.

I recently heard James Griffin make the statement that, "you never know whose good idea someone is publishing." I find myself much in agreement with that statement, in that it describes an effect that is not a result of plagiarism, but is rather a symptom of the way things should work. When any field of inquiry is working properly there is a constant flow of information, ideas, and feedback among colleagues. I feel privileged to have shared in such a network of friends and colleagues. I would like to specifically express my gratitude to colleagues (in addition to those mentioned earlier) who read and commented on portions of the manuscript. In no particular order, they are Marvin Smith, Mark Williams, Steve Kowalewski, Chester DePratter, Jim Rudolph, Marion Smith, Dean Wood, and David Hally. Sometimes, just having someone to talk with can make one's own ideas clearer. Unfortunately, it is impossible for me to remember all the individuals with whom I shared conversations about my research. I hope that those friends will accept my thanks collectively.

Special heartfelt thanks are due to Helen Doney. More important than all her direct contributions to the dissertation, Helen's patience and understanding revived my spirits during even the roughest moments of the dissertation frenzy. I am very grateful.

I have saved the most important acknowledgement for last. It is a fact that any accomplishment, any merit I may achieve in life is merely a drop that spilled from the cup of immeasurable love and support that my parents have provided. While I am pleased with this study, and hope it is a contribution to the field, the greatest joy I will derive from the dissertation is that it pleases my Mother and Father.

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CHAPTER I
THE STUDY OF MISSISSIPPIAN SITE VARIABILITY

In this study, detailed comparisons are presented among four archaeological sites, each of which appears to have played a differing role within a single, Mississippian period society of the Georgia Piedmont. Three of the sites examined in this study are small in comparison with the large, impressive Mississippian sites which have been the subject of most archaeological attention in the past century. In spite of the fact that most Mississippian settlement systems contained many more small sites than large, nucleated settlements, the role of small sites in Mississippian societies and the activities they represent are poorly understood. Many hypotheses and models about the relationships among Mississippian societies, and about the degree to which dispersed populations exist or are regionally integrated with populations at large villages, cannot be adequately evaluated due to our current limited knowledge of the variety of sites, large and small, that comprise Mississippian settlement systems. It is hoped that the present study is at least a small contribution, in both method and substance, toward a clearer understanding of the variety of small sites that may exist within a Mississippian society.

Four dimensions of site use are examined for four sites in the Oconee Province, an archaeologically recognized Mississippian period society of the Georgia Piedmont. These dimensions of site use or site variability are (1) relative permanence of occupation; (2) season of occupation; (3) range and variety of activities represented (site specialization); and (4) relative size of groups that lived at or visited the sites.

The term, Mississippian, has been applied broadly to a number of archaeologically recognized societies which share several basic characteristics. These characteristics include truncated pyramidal mounds, palisaded villages located in river bottoms, and a heavy reliance on horticultural crops. Mississippian societies appear to have first developed along the middle course of the Mississippi River around A.D. 700-900. By A.D. 900-1000, societies which shared settlement characteristics and which probably shared elements of belief systems with Middle Mississippi societies began to appear throughout the interior southeastern United States.

A temporal designation, the Mississippian period, is used in this study to refer to the period from A.D. 900 to A.D. 1550, during which societies with Mississippian characteristics occupied much of the interior southeastern

United States. In the Georgia Piedmont, sites which date to the latter portion of this period are characterized by a ceramic assemblage which is a regional variant of the Lamar ceramic assemblage. Lamar pottery types were first described at the Lamar type-site in central Georgia (Jennings and Fairbanks 1939). Lamar pottery types are present at late Mississippian sites in Georgia, South Carolina, and parts of Tennessee and Alabama. In this study, the term, Lamar, refers to societies which occupied Georgia and portions of neighboring states during the late Mississippian period (A.D. 1300 to A.D. 1550).

As indicated above, a major deficiency in our knowledge of Mississippian period societies is a poor understanding of the smaller sites in late prehistoric, southeastern United States settlement systems. This deficiency is a result of uneven research emphases. The majority of research efforts have been directed toward excavation of large Mississippian sites, while the more numerous, smaller sites are known only from surface survey.

On the basis of excavations at Mississippian sites with mounds, most archaeologists would agree that the largest sites in Mississippian settlement systems can be characterized as permanently occupied villages which were also centers for public ceremony and political activities. Along with the recognition that, in most Mississippian settlement systems large sites with mounds are greatly outnumbered by small sites, has come a realization that perhaps only a small segment of a given Mississippian society resided at these large sites. This raises at least two fundamental questions. First, are these numerous small sites actually permanent residences for dispersed populations? Secondly, if there are small, dispersed settlements around large Mississippian villages, in what ways are inhabitants of these sites affiliated or integrated with populations at the large sites?

A few examples of sites which appear to have been small, permanently occupied residences have recently been excavated (B. Smith 1978c; Prentice and Mehrer 1981; Lynott 1982). One set of hypotheses about the relationship between these small settlements and large settlements in Mississippian societies has been proposed by Bruce Smith (1978a:488-491). Smith suggests that the most energy-efficient spatial distribution for Mississippian peoples would be a dispersed pattern of small settlements. He suggests that these small settlements were dispersed in order to be located adjacent to the linear bands of preferred horticultural soils which occur in meander-zones of southeastern rivers. Opposing the tendency for dispersed settlement is a tendency for settlement nucleation. Settlement nucleation is a reaction to the problems of defense, boundary maintenance, and social cohesiveness by Mississippian groups. Smith hypothesizes a compromise settlement pattern, in which Mississippian societies may have resolved the opposing tendencies of settlement dispersal and nucleation by maintaining both kinds of settlements. According to Smith's scenario:

> Individual family units living in dispersed homesteads would have visited the local center, where they may well have maintained a second, temporary, habitation structure, only in certain situations:
> 1. For scheduled seasonal ceremonies of renewal and cultural integration.
> 2. For burial, or other rites of passage ceremonies of kinsmen or high-status individuals.
> 3. For payment of labor-energy demands (corporate labor construction projects, primarily fortification construction and mound construction).
> 4. For mutual defense, during periods of short- or long-term hostility with neighboring populations. (B. Smith 1978a:491)

If this notion is at all correct, then our current knowledge of Mississippian societies, which is based mostly on excavations at large villages with mounds, represents but a small component of the total settlement system of most Mississippian groups. Whether or not a large segment of all Mississippian societies maintained permanent residences away from large villages, the abundance of small Mississippian sites in many regions of the Southeast indicates that at the very least, many activities took place away from the villages. Clearly, an investigation of the function of small sites is an essential step toward a more complete understanding of Mississippian societies.

Because only a few small Mississippian sites have actually been excavated, current knowledge about the role of small sites within Mississippian societies remains largely hypothetical. For the most part, interpretations of small-site function have been limited to the use of settlement size as an indicator of the range of activities performed at a site. This assumption, which is based on the work of cultural geographers (cf. Haggett etal. 1977), seems especially well-suited to interpretation of archaeological survey data, in which knowledge of a site is frequently limited to its location, area, and temporal placement. Because site size (area) is relatively easy to determine for archaeological sites, many archaeologists have used this variable as a basis for interpreting Mississippian settlement patterns.

Frequently, archaeologists recognize three or four orders of site size in Mississippian settlement systems. Sites at each successively larger order of size are generally thought to have been loci for a broader range of activities than were smaller sites. Several examples of this approach may be found in a recent volume of contributions which address the problem of understanding Mississippian settlement patterns (B. Smith 1978b).

As indicated above, large sites with mounds are usually considered to have been locations of a wide range of domestic activities as well as the centers for public ceremony and political activity. Smaller villages or hamlets are often characterized as permanent residences which were occupied by people who depended on larger villages for public ritual or mutual defense. Below these in size, are usually a large number of small sites that are less than 0.25 ha in area. Interpretation of the use and function of these small sites on the basis of site size and surface collections has been largely unsatisfactory. Most often these small sites are simply grouped together as "special purpose" or "limited activity" sites. While several possible functional site categories have been suggested on the basis of surface collections (these include homesteads, hunting and butchering camps, plant collection and processing camps, raw material procurement sites, and others) very few such sites have actually been excavated.

While it is likely that site size is related to the range of activities carried out at a site, it is probable that site size can reveal only limited information about the kinds of activities performed, or about the role of a site within the settlement system. Such information is best recovered through detailed comparisons among excavated sites which are thought to have played differing roles in the same settlement system. The research presented here provides detailed comparisons among four such sites for which there is evidence suggesting each represents a different functional component of a single Mississippian period society in the Georgia Piedmont. One of the four sites is a relatively large village with a single mound. The remaining three sites are small (less than 2,000 m^2 in area).

There is no reason to suggest that the four sites compared in this study represent the entire range of variability among Mississippian sites in the Georgia Piedmont. Rather, it is hoped that this research will contribute to the study of Mississippian site variability on two levels. On one level, it is hoped that this research will serve as a case study for the measurement of similarities and differences among Mississippian sites with regard to four important dimensions of site use. These are (1) the relative permanence of site occupation; (2) season of site occupation; (3) the relative degree of site specialization (range of activities at each site); and (4) the relative size of groups that lived at or visited the sites. At another level, it is hoped that the investigation of similarities and differences among these four sites will contribute to a better understanding of prehistoric lifeways within a particular late prehistoric society of the Georgia Piedmont.

The sites that form the data base for this study were located and excavated by the University of Georgia Laboratory of Archaeology as part of the Wallace Reservoir Archaeological Project, funded by the Georgia Power Company. All four sites lie wholly within the Oconee Province, an archaeologically recognized social or political unit in the Georgia Piedmont (M. Smith and Kowalewski 1981). Evidence supporting the hypothesis that a single political/ social system occupied the Oconee River drainage during the Lamar period (A.D. 1300-1550) will be considered in greater detail in Chapter II. Also presented in Chapter II is a summary of previous archaeological investigations in the Oconee Drainage.

To provide a framework for hypotheses about the kinds of small, specialized sites that may have existed in the Oconee Province, a model of the "Mississippian adaptive niche " based largely on the seasonal availability and distribution of wild and domestic foods in the Mississippi Valley (B. Smith 1978a) is presented in Chapter III. In Chapter IV, environmental characteristics of the Oconee Province are presented, with an emphasis on the distribution and availability of important food resources. Distribution of important food resources in the Georgia Piedmont differs from that in the Mississippi Valley. These differences are examined in Chapter V, and in conjunction with B. Smith's model of the Mississippian adaptive niche, suggest the existence of several kinds of small sites that may have existed in the Oconee Province.

The use of Smith's model involves an assumption that densely populated, hierarchically organized societies throughout the interior Southeast had broadly similar energy requirements. In this light, an identification of some similarities and differences in distribution of important food resources in the Middle Mississippi Valley and the Georgia Piedmont suggests ways in which environmental variables may be related to differences between regionally distinct Mississippian settlement systems. An application of Smith's model, then, should have implications beyond understanding the particular settlement system of the Oconee Province.

In Chapter VI, descriptive characteristics for each of the four sites are presented. These characteristics, which include site size, location, plan, and stratigraphy, provide a basis for more specific hypotheses about the use of each site. In Chapter VII, faunal remains recovered from each site are examined to determine site seasonality and the relative specialization of animal exploitation at each site. In Chapter VIII, a comparison of the variety, size, and frequency of ceramic vessels identified at each of the four sites is presented. These data are employed to test hypotheses regarding the degree of site permanence, the size of groups that lived at or visited the sites, and the range of activities which involved the use of ceramic vessels at each site. A summary of findings is presented in Chapter IX.

CHAPTER II
THE OCONEE PROVINCE

There is reason to suspect that the earliest Spanish explorers tended to apply European conceptions of political organization to the Indian groups they encountered in the Southeast. Nevertheless, sixteenth century accounts of Indian societies leave little doubt that in most regions of the Southeast, political power was tightly structured. For example, it was clear to Hernando De Soto, that chiefs had the power to procure horticultural produce on demand from their subjects.

It was also clear that the rulers of Southeastern Indian societies held sway over geographic territories, and that some of these territorial chiefdoms were considered more powerful than others. The Spaniards found that in many areas of the Southeast, such as the Georgia and South Carolina Piedmont, several towns comprised a sociopolitical territory. These towns were in some way bound together under the control of a "cacique" or chief who generally resided in the principal town. The Spaniards applied the term *provincia* to these sociopolitical territories which were often separated from each other by large, uninhabited areas. The archaeologically recognized "Oconee Province" is suggested to have been one such sociopolitical territory. Archaeological evidence for the existence of the Oconee Province and ethnohistoric evidence for the identity of the Oconee Province as one of De Soto's "provincias" are presented below.

Archaeological Evidence

In a study of the distribution of Lamar period mound centers on the Oconee River and neighboring drainages, Marvin Smith and Stephen Kowalewski (1981) present convincing evidence for the existence of one large sociopolitical territory during the fifteenth and sixteenth centuries. They noted that four village sites in the Oconee drainage are characterized by the presence of more than one mound at each. These are Scull Shoals (9Ge4), Little River (9Mg46), Shoulderbone (9Hk1), and Shinholser (9Bl1). Two additional village sites, the Dyar site (9Ge5) and site 9Ge35, are each characterized by the presence of a single mound. The straight line distances between multiple mound sites are 41, 45, 46, and 47 km (Figure 1).

This patterned, evenly spaced geographical distribution of multiple-mound Lamar centers suggests that site location for these villages was determined by political or social factors rather than simply by proximity to important food resources. For instance, according to several models of Mississippian settlement systems, proximity to

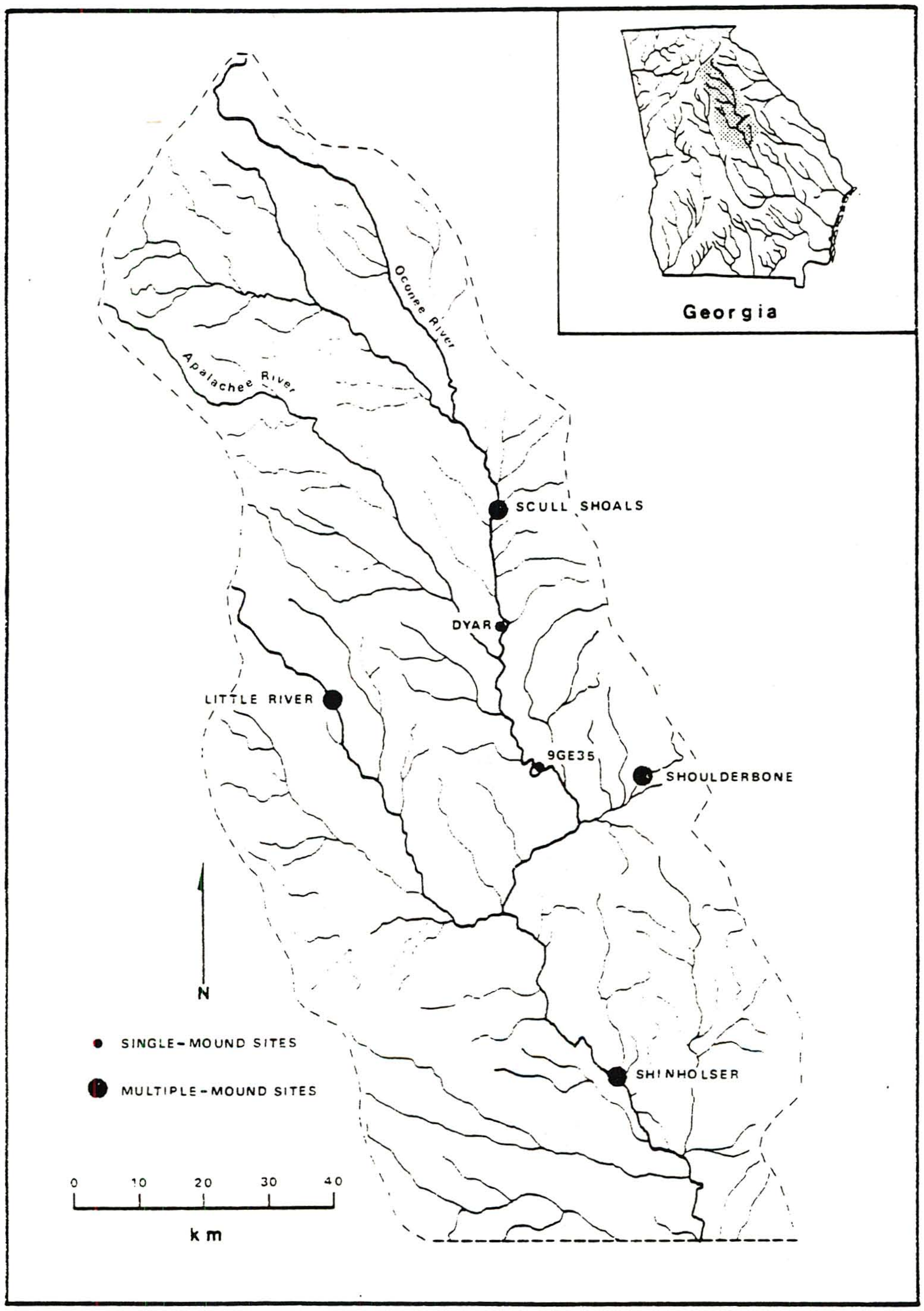


Figure 1. Lamar period sites with mounds in the Oconee Drainage.

horticulturally productive soils of the river floodplain is a major factor affecting the location of village settlements. Yet the Shoulderbone site, which, on the basis of its central location and number of mounds is hypothesized as the most important center in the Oconee Province, is located in an area of the Oconee drainage characterized by the lowest proportion of floodplain soils (see Chapter V).

Several observations mentioned by Smith and Kowalewski that lend support to the hypothesis that a single political/social system occupied the Oconee River drainage during the Lamar period are summarized below:

1. Four multiple-mound sites are evenly spaced relative to one another and are more distant from other neighboring multiple-mound sites. Noting the well developed system of trails described in the De Soto narratives (Bourne 1904 i: 73, ii: 97), M. Smith and Kowalewski suggest that straight line distances, rather than river routes, are behaviorally meaningful.
2. Distance between these sites is more than a day's travel. Thus, it is likely that these centers did not depend on each other for anything that required constant exchange or close coordination.
3. If the number of mounds is used as an indicator of site importance, the most important site (Shoulderbone) is centrally located relative to the

remaining three multiple-mound centers. The number of mounds is considered a better measure of site importance than mound-volume because Mississippian mounds are periodically renovated by the addition of mantles of earth to the mound summit. The size of mounds may therefore be largely a function of how long the mound has been in use and how many times it was renovated. Furthermore, there is evidence that the presence of more than one mound at a site reflects a greater range of mound-related activities. For instance, at the multiple-mound sites for which data are available (Scull Shoals, Shoulderbone, and Shinholser), it is clear that at each of these sites, at least one mound served a mortuary function. In contrast, the single mound at the Dyar site is known not to have had a mortuary function.

4. The locations of the Shoulderbone site and the Little River site do not appear to fit locational models based primarily on the distribution of important food resources.

5. During the Lamar period, the central Oconee drainage was a ceramic style zone in which the Lamar type-site on the Ocmulgee River (the nearest multiple-mound site relative to the Oconee Province) did not participate.

6. The differing number of mounds at village sites and the existence of at least two levels of settlement

size below the village level provide evidence of vertical differentiation and integration within the province.

Ethnohistoric Evidence

Existence of the Oconee Province was suggested solely on the basis of archaeological evidence. At the time M. Smith and Kowalewski published, there were no known ethnohistoric references to a province in the Oconee drainage. Since that time, research into the route of Hernando De Soto through the Southeast, as well as more recent archaeological research, has provided further evidence in support of Smith and Kowalewski's hypothesized province. On the basis of recent reconstruction of De Soto's route from Apalachee to Chiaha (Hudson, DePratter and Smith 1982), it appears that De Soto entered the Oconee drainage in the spring of 1540. The major town in the province was Ocute (possibly the Shoulderbone site).

After a brief stay in Ocute, De Soto and his men marched to the east, toward the neighboring province of Cofitachequi. They were accompanied by Patofa, who was the chieftain of a town subject to Ocute (possibly the Scull Shoals site), and his army. Seeking to achieve vengeance against Cofitachequi, Patofa had offered to accompany De Soto in a military assault. Between the province of Ocute and the province of Cofitachequi there was an unoccupied "wilderness" or no-man's land. Patofa's guides were confounded and lost in this territory, which appears to have been a "buffer zone" between hostile provinces. After numerous hardships in crossing this wilderness, Patofa and De Soto did eventually enter the impressive province of Cofitachequi.

In addition to their ethnohistoric research, Hudson, DePratter and Smith (1982) suggest that archaeologically known site distributions lend support to the identification of the Oconee Province as the province of Ocute, visited by De Soto in 1540:

1. The Oconee drainage was densely occupied from the fourteenth century to the sixteenth century (Rudolph and Blanton 1981). In the 78 km^2 area of the Oconee River Valley intensively surveyed as part of the Wallace Reservoir Archaeological Project, 824 separate Lamar period sites have been identified.
2. The distribution of multiple mound sites suggests some regional organization.
3. The Mulberry site, on the Wateree River in South Carolina, is likely to have been a principal town of Cofitachequi.
4. Intensive survey of the Savannah River drainage (Taylor and Smith 1978) shows virtually no aboriginal occupation dating to the late Lamar period (A.D. 1400-1600). It therefore appears likely that

the Savannah River drainage was the frontier or buffer zone between Ocute and Cofitacheqei.

The Oconee Province probably existed throughout the fourteenth, fifteenth, and sixteenth centuries, and was one of several such polities operating during this time in the southeastern United States.

Previous Archaeological Work in the Oconee Drainage

Archaeological investigations in the Oconee River drainage have been conducted intermittently since the late nineteenth century, when C. C. Jones first reported the Scull Shoals mound in Greene County, Georgia (Jones 1878). The most recent and most systematic surveys in the Oconee River drainage were conducted by the University of Georgia Laboratory of Archaeology as part of the Wallace Reservoir Archaeological Project. The project was occasioned by the impending inundation of a large segment of the Oconee River for a hydroelectric facility. Initial survey of the proposed Wallace Reservoir was accomplished during the summers of 1973, 1974, and 1975 (DePratter 1976; Wood and Lee 1973). During the final mitigation phase of the project (1977-79), intensive surface and subsurface survey techniques were applied to approximately 78 km^2 of the Oconee River Valley, which had recently been cleared of vegetation by the Georgia Power Company.

Data collected during the initial survey of the Wallace Reservoir formed the basis of the first systematic attempt to understand Lamar settlement patterns in the Georgia Piedmont. In his study, Chung Ho Lee (1977) utilized variables of site size and site artifact content from 149 Lamar period sites in a cluster analysis which suggested a three cluster solution of site classification. Because Lee's study encompasses a large part of what was later recognized as the Oconee Province, and because four of the sites used in his classification were subsequently excavated and are examined in greater detail in the present study, his summary characterization of site classes is presented below (Lee 1977:92):

> Class I sites are large sites and include such mound sites as Scull Shoals (9Ge4), Dyar (9Ge5), and Little River (9Mg46). Artifact collections from Class I sites show a higher average percentage of ceramics and flakes than occur in Class II and Class III sites while the average percentage of tools and total lithic artifacts from Class I sites are lower than those of Class II and Class III sites. Class II sites are relatively large sites and are assumed to have been villages or clusters of individual houses. Sites belonging to Class III may have been small individual homesteads or specialized camp sites. The average percentage of lithic tools and total lithic artifacts of Class III sites are higher than those of Class I and II. This may indicate that Class III sites were specialized activity camp sites.

The average size of Class I sites is 28,055 m^2. It is suggested that these large settlements "played a more important role in the settlement system than did Class II or

Class III sites," and that Class I sites "are likely to have been permanent, year-round settlements and centers of many social, economic, political, and religious activities" (1977:95).

Class II sites are also seen as permanently occupied settlements, with possible abandonment during the winter hunting season. These hypothesized "villages" or "clusters of individual houses" range in size between 11,889 m^2 and 18,000 m^2 (Lee 1977:95).

Class III sites range in size from 15 m^2 to 6,000 m^2 with an average size of 2,919 m^2. This is the smallest class of sites and includes the largest number of sites. Lee (1977:96) suggests that "Class III sites are less important than Class I and II sites in terms of diversity of functional activity and represent the location of rather specialized functional activities." Three of the four sites examined in this study were classified by Lee as Class III sites.

Thus, Lee suggests a three-fold hierarchical classification scheme for Lamar sites in the Georgia Piedmont. In further discussion however, Lee notes that Class I sites may be further divided into those with mounds and those without mounds. It should be noted that Lee's proposed site hierarchy differs from that proposed by Smith and Kowalewski. They suggest that large sites with mounds may themselves be hierarchically arranged within the Oconee

Province. They propose that the Shoulderbone site (discussed above) may have held sway over the three remaining multiple-mound sites, which in turn were centers for populations at single-mound sites such as Dyar and 9Ge35. These latter two sites may have been social and ceremonial centers for dispersed populations living at smaller, hamlet or homestead settlements.

After establishing the hierarchical nature of Lamar settlements in and around the Oconee drainage, Lee employed Universal Transverse Mercator map coordinates for each site in a cluster analysis. The cluster analysis was performed in conjunction with a nearest-neighbor analysis to test the hypothesis that there were agglomerations of sites within the study area. The resultant dendrogram suggests a four-cluster solution of site agglomeration. Although he suggests that these four site agglomerations may reflect "probable social and/or economic units that existed during the Late Mississippian period" (1977:153), Lee (1977:157) notes that due to sampling error, lack of distinct physiographic boundaries, and the probable truncation of cultural boundaries by arbitrary survey boundaries, the results of the cluster analysis should be viewed with extreme caution.

Another complicating factor is that diachronic change in settlement patterns was not addressed. Because an insufficient number of excavations had been conducted at

Lamar sites in the Oconee drainage, Lee was not able to subdivide the 300-year Lamar period into finer chronological units. In spite of these potential sources of error, it is interesting to compare Lee's site clusters with cultural boundaries suggested by Thiessen polygons drawn around the multiple-mound sites of the Oconee Province (Figure 2). If the dendrogram is interpreted as showing a three-cluster, rather than a four-cluster solution, agglomerations I and II are combined. The resultant map then shows agglomerations of sites around three of the four multiple-mound sites of the Oconee Province. These are the Little River site, the Scull Shoals site, and a portion of the settlement cluster associated with the Shoulderbone site.

As mentioned above, Lee's study was based on 149 Lamar sites known from the initial survey of the Wallace Reservoir and of a few detached areas in the Oconee drainage. Since the time of his analysis, the Wallace Reservoir Mitigation Survey recorded a total of 824 Lamar sites in the reservoir area alone. In addition to a systematic program of subsurface testing, this tremendous increase in reported sites was due in a large measure to the Georgia Power Company having cleared the entire reservoir of vegetation prior to inundation. Thus, the ground surface of nearly the entire 78 km^2 area was easily inspected for signs of prehistoric and historic occupation. Although the final report of the Wallace Mitigation Survey awaits completion

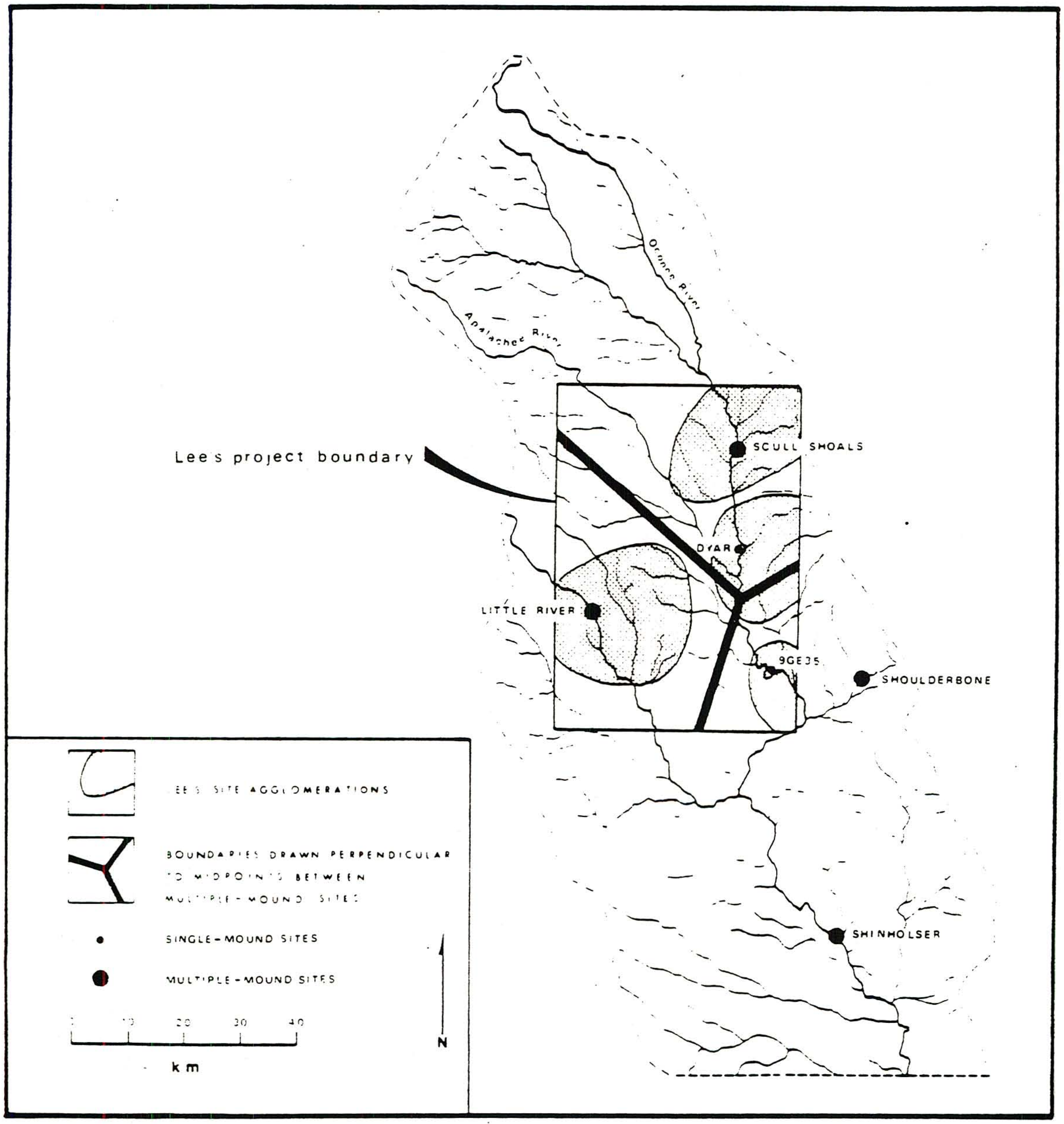


Figure 2. A comparison of Lee's (1977) site agglomerations with boundaries suggested by Thiessen polygons.

of analysis, some of the survey data is reported in a recent contribution by Rudolph and Blanton (1981) in which they investigate aspects of Mississippian settlement in the Wallace Reservoir.

In their analysis, Rudolph and Blanton recognized the need to subdivide the Mississippian period into finer chronological units. By 1979, excavations at the Dyar site and other sites in the Wallace Reservoir had made several phase designations possible. On the basis of stratigraphic analysis of ceramic assemblages, Marvin Smith (1981) was able to subdivide the Mississippian period in the Oconee drainage into an Etowah component (the Stillhouse phase, A.D. 1200-1300) and three successive Lamar components. These are the Duvall phase (A.D. 1300-1450), the Dyar phase (A.D. 1450-1600), and the Bell phase (A.D. 1600-1680).

Unfortunately, either because of lack of analysis time or because sherd collections from most of the unexcavated sites identified during the survey were too small, Rudolph and Blanton were not able to utilize Smith's phase designations. Instead, they employed a presence/absence criterion of diagnostic rim treatment to divide the Lamar period into early and late Lamar components (Rudolph and Blanton 1981:16). Stratigraphic excavation has shown that on Lamar sites in the Oconee drainage, punctated folded or applique rim sherds are found in earlier contexts than are pinched folded or applique rim sherds. Thus, all sites with at least two folded, punctated rims were considered to have an early Lamar component while all sites with at least two folded, pinched rims were considered to have a late Lamar component. According to these criteria, 22 sites could be assigned to the Etowah component, 54 sites to the early Lamar component, and more than 200 sites to the late Lamar component.

As Rudolph and Blanton (1981:18) have noted, there are a few problems with using the presence/absence of folded and punctated rims as a criterion for chronological placement. First, a recognizable style of pinching is present in the earliest Lamar phase in the Oconee drainage (the Duvall phase), and the disappearance of punctated rims through time is gradual rather than abrupt. Lastly, folded pinched rims are not only present in the early, Duvall phase, but in the latest Lamar phase as well--the protohistoric Bell phase. In spite of these chronological problems, Rudolph and Blanton's (1981:14) site distributions, plotted separately for Etowah, Early and Late Lamar, show clearly a tremendous increase in number of settlements between the Etowah and Lamar periods, an increase of twentyfold.

Rudolph and Blanton note that much of the observable increase in the number of sites occurred in the southern portion of the Wallace Reservoir, an area in which the Oconee River channel is characterized by shoals. They also note that a survey of two nearby upland tracts (551 and

413 acres) which had been cleared of vegetation showed an increase in site number similar to the rate observed in the shoals portion of the river valley. As a tentative explanation, they suggest that general population growth and changes in subsistence related to shoals and upland resources may have been important (Rudolph and Blanton 1981:35).

An alternative hypothesis is that a demographic shift related to the increasing importance of the Shoulderbone site in the Oconee Province may account for the increased number of sites in the southern portion of the Wallace Reservoir. Another potential explanation suggests that Spanish contact during the late Lamar period may have resulted in population dispersal, and therefore an inflated number of smaller sites. Testing of these hypotheses must await further analysis of the Wallace Reservoir survey data and extensive survey of other portions of the Oconee and neighboring drainages.

The pattern of increased occupation in the uplands from Etowah through Lamar times is supported by the survey of a third clear-cut upland tract in the Oconee drainage. From 1979 to 1981, Dan Elliott surveyed a 531 ha (1,312 acres) tract near Greensboro, Georgia. The nearest multiple-mound site to this study area is the Scull Shoals site. Elliott was able to use M. Smith's (1981) phase designations for temporal placement of 84 Mississippian sites. The results, summarized by Elliott, are striking:

> A breakdown by phase of Lamar sites in the Finch's survey indicates a peak during the Dyar phase. The amount of Mississippian sites goes from two sites during the Stillhouse phase to fourteen sites during the Duvall phase, to forty sites during the Dyar phase, to twenty-eight sites during the Bell phase. (Elliott 1982:7)

The results of this survey, as well as the contribution of Rudolph and Blanton, show quite clearly that there were significant demographic changes occurring in the Oconee Province during the late fifteenth and early sixteenth centuries.

CHAPTER III
THE MISSISSIPPIAN ADAPTIVE NICHE

In this chapter, Bruce Smith's (1975; 1978a) model of the "Mississippian adaptive niche," a characterization of Middle Mississippian subsistence and settlement patterns, is summarized. In Chapter IV, environmental characteristics of the Oconee Province are examined with an emphasis on the distribution and availability of important food resources. Environmental differences between the Georgia Piedmont and the Mississippi Valley, in conjunction with Smith's model, suggest the existence of several kinds of prehistoric settlements in the Oconee Province.

Bruce Smith (1975; 1978a) has presented a model of the "Mississippian adaptive niche" that is based largely on four kinds of evidence. These are first, the identification of food remains from archaeological sites in the Middle Mississippi Valley; second, the seasonal availability of these important food resources; third, the distribution of these resources in the Middle Mississippi Valley; and lastly, ethnographic accounts of Southeastern Indian hunting, gathering, fishing, and farming practices. Application of this model to the Oconee

Province is appropriate for a number of reasons. First, Smith's model is designed to help explain settlement and subsistence practices of hierarchically organized societies which inhabited the river systems of the interior Southeast. This description could easily fit the late prehistoric societies of the Georgia Piedmont. Furthermore, there are a number of specific traits shared by some Lamar and Middle Mississippi sites. Among these are truncated pyramidal mounds, palisaded villages located in river floodplains, and certain ceramic styles. In fact, Charles Fairbanks' (1952) observation that Lamar ceramics show a mixture of characteristics derived from Late Middle Mississippian elements combined with the indigenous stamping tradition of Swift Creek led to the term "South Appalachian Mississippian" which has been applied to Lamar societies (Ferguson 1971). It should also be mentioned that many of the ethnographic descriptions of Southeastern Indian subsistence practices that are cited by Bruce Smith are appropriate to the Georgia Piedmont. Lastly, it should be noted that several of the kinds of food species most frequently identified from Middle Mississippi sites are the same as those most frequently identified from sites in the Oconee Province.

In his characterization of the Mississippian adaptive niche, Bruce Smith has recognized the need of Mississippian populations to balance access to both aquatic resources and favored horticultural land. He suggests that the location of Mississippian sites within a river floodplain zone can be explained largely through two factors: (1) the availability of well-drained, easily tilled, energy subsidized natural levee soils suitable for horticultural garden plots; and (2) easy access to the rich protein sources of fish and waterfowl in channel-remnant oxbow lakes (B. Smith 1978a:488). A brief discussion of the seasonal nature of Southeastern Indian subsistence systems will indicate why it was so important for Mississippian populations to have access to these two kinds of resources.

Southeastern Indian Subsistence

Among the most fundamental aspects of Mississippian economy was a dependence on domestic cultigens. This notion is supported by even the earliest accounts of the Southeastern Indians (Varner and Varner 1962). There is abundant archaeological and ethnographic evidence that the location of land suitable for horticultural plots was a major factor in the selection of settlement location (Swanton 1946:256), and archaeological evidence for the "horticultural trinity" (corn, beans, and squash) is plentiful relative to earlier periods in the Southeast. Horticulture, however, was only part of the picture, since wild foods, both plant and animal, were exploited to a great degree. The degree to which exploitation of wild foods affected the diet, settlement patterns, and social organization of Southeastern Indians is well documented both ethnographically and archaeologically.

A major consensus among various ethnographic and archaeological contributions concerning Southeastern Indian economy is the seasonal nature of resource availability. This seasonal pattern includes wild, as well as domestic foodstuffs. Thorough accounts of the seasonal characteristics of the Southeastern Indian economic cycle are provided by Hudson (1976), Lee (1977), B. Smith (1975; 1978a), and Swanton (1946). Some of that information will be briefly summarized here.

Domestic crops are frequently considered an important staple of most southeastern groups. This is especially true of corn, since it is a crop that is easily stored. But even the storage capability of corn did not eliminate the seasonal nature of its availability. Three major types of corn were grown in the Southeast during the historic period. These types were differentiated according to the amount of time required for the ears to ripen. Early corn was usually planted in garden plots in and around towns in March or April (Hudson 1976:295). This early corn was probably popcorn (*Zea mays everta*) and was harvested about two months after planting (Swanton 1946:289). Hominy corn and dent corn were planted about a month after the early corn in large fields in the river bottoms. Both of these types required about three months to ripen.

The annual yield of corn was harvested by August or September. Summer was also the growing season for a number of other cultigens, including beans, squash, pumpkins, gourds, and sunflowers. Although all of these horticultural products were storable to some extent, Swanton (1946:256) suggests that the summer harvest probably did not last throughout the year:

> As the harvest was seldom sufficient to last, nor was it expected to last until another crop came in, the Indians were obliged to seek natural food supplies elsewhere, and, since such supplies were not usually concentrated, this meant that the people themselves scattered about in camps where they remained until planting time.

It is important to recognize that Swanton is speaking of historically known groups. It is possible that prehistorically, many southeastern societies were able to organize planting, harvest, and storage in such a way that the harvest would last until the following growing season. Nonetheless, there must have been years when the harvest was not sufficient to last, and it may be expected that these periods of scarcity, rather than periods of plenty, are the ones that most significantly affect subsistence strategies (Jochim 1981:53).

Seasonality was an important factor affecting availability of wild plant foods as well. During the summer months wild fruits such as plum, strawberry, blackberry, and passion-fruit were available. During the fall, large quantities of acorns and hickory nuts became available.

Bruce Smith (1975) has provided a detailed account of seasonal habits and habitats of animal species exploited by Middle Mississippian groups. His summary of the yearly exploitative cycle follows:

> The projected yearly cycle of exploitation of animal populations by Middle Mississippi groups can be divided into two basic seasons: a summer season during which various species of fish were the most extensively exploited, with aquatic species of turtles and perhaps rabbits being of secondary importance, and a winter season of exploitation during which a wide variety of terrestrial mammals, water-fowl, beaver, and turkey were taken. The white-tailed deer was the most important animal species taken during this winter period. (B. Smith 1975:123)

During the warm season, several factors contributed to the increased importance of aquatic resources. Perhaps most important among these were the seasonal characteristics of fish spawning behavior. Although the majority of fish species which were of economic importance could have been taken throughout the year, fish availability was greatest during the spring and summer.

Some fish species display the habit of moving upstream in great quantities during the spawning season, thereby increasing their availability to human groups. This is especially true of species in the family Catostomidae (including suckers, redhorse, and buffalo fish). These are species which breed on gravel but construct no nests. Hynes (1970:359) notes that

> . . . this is probably the most common pattern of breeding among running water species. Nearly all fishes which spawn in this way move on to clean gravel to do so, often upstream for some distance and into shallower and swifter water than is their normal adult habitat.

The spawning run for all species of suckers occurs in the early spring (Jordan and Evermann 1902:37).

Another type of breeding behavior involves the building of nests. Generally, nests are made in shallow water. Species that exhibit this kind of breeding behavior include members of the family Centrarchidae (including the basses, bluegill, and sunfishes), and the order Siluriformes (catfishes) (Jordan and Evermann 1902).

The spring migrations of fish corresponds with the season of flooding in southeastern rivers. This is related to the fishes' "cueing mechanism":

> Most fish are stimulated to move by rising waters, and when this movement is to be upstream this enables them to pass over riffles with greater safety, because the increased width at such points spreads out the discharge, and provides zones of slower water which are nevertheless deep enough to swim through. (Hynes 1970:353)

This meant that massive numbers of various fish species moved to the shallow waters over flooded land to spawn in the spring. As the waters receded throughout the summer months, stranded individuals and newly hatched fry became available for mass capture by netting or by poisoning the shrinking backwater sloughs and oxbow lakes.

Fishing the river channel at shoals with the use of weirs, and fishing the backwater sloughs with the use of drags and poison, are the two major types of mass-capture fishing techniques mentioned in ethnographic accounts. Both methods are indicated to be summer activities (Swanton 1946:257). Fish, of course, were not the only aquatic resources exploited during the warm season. The basking habits of some turtle species sometimes resulted in large congregations of individuals, and the periods of lower water may have enhanced the availability of freshwater molluscs.

Another factor that contributed to the seasonal importance of aquatic resources was that the timing of their increased availability coincided with periods during which other resources were scarce. As suggested earlier, stored horticultural products, harvested by September, may not have lasted until the following harvest season. In addition, the preparation of fields for planting required some labor force in residence at the fields. This may have precluded extensive hunts in search of scattered terrestrial game. Although shorter hunts were sometimes conducted during the summer between the planting and harvest of crops, the most intensive hunts were conducted in the fall and winter. This is due to seasonal aspects of the biology and behavior of white-tailed deer, which was the most important terrestrial animal hunted. Hudson (1976: 275) has summarized these seasonal characteristics:

> In any but the rutting season it is hard to get in close range of a deer. They have sharp senses, are frightened easily, and are extraordinarily swift and agile . . . . The rutting season for deer is from late September through November, and during this time the bucks relax their usual defenses and become aggressive; they will charge at anything, even bushes and low hanging tree limbs. At the same time, the acorns have fallen, and because this is their favorite winter feed, the deer become concentrated in oak forests. The Indians would not have failed to notice that it is during this time that deer reach their maximum weight.

It should be noted that another habit of deer rendered some individuals accessible during the summer months. Deer are frequently attracted to leafy vegetation that grows along the edges of cleared horticultural plots during the warm season. They are also attracted to the ripening crops in gardens. Olga Linares (1976) has applied the term "garden hunting" to the taking of animals which are attracted to planted fields. While it is likely that individual deer may have become available through garden hunting, congregations of deer were found only during the fall and early winter. During the colder months then, the location of groups of deer was quite predictable, but during the season of cultivation, deer were more scattered and therefore more difficult to locate and capture. In addition, preparation, planting, maintenance, and harvest of crops required substantial labor input. This may have reduced the capacity for conducting large-scale hunts that required groups of people to leave the settlement for long periods of time in search of scattered terrestrial game.

Unlike deer, aquatic resources were concentrated in known locations during the warm season. They could be found in the backwater sloughs or oxbow lakes of river floodplain meander-zones, and at the shoals areas.

The factors that contribute to the increased importance of aquatic resources during the summer months may be summarized as follows:

> 1. Seasonal habits of various fish and turtle species concentrated numbers of individuals in predictable locations.
>
> 2. These seasonal concentrations of aquatic resources coincided with low availability of other important food resources.
>
> 3. The period of increased availability of fish and turtles coincided with periods of low water, which increased the harvest potential of freshwater molluscs.

The seasonal importance of aquatic resources, during a time when Mississippian populations were somewhat tied to their horticultural fields, is an important feature of Smith's model for Mississippian settlement. Perhaps the most important feature is that permanently occupied Mississippian settlements are located to provide access to favored horticultural fields as well as to aquatic resources. As Smith has demonstrated, it was possible for populations in the Mississippi Valley to achieve this arrangement. In the meander-belt of the Mississippi River and other major streams, natural levees composed of fertile, easily tilled soils are juxtaposed with backwater swamps and channel-remnant oxbow lakes. The annually renewed soils of former river levees were those most highly favored by Mississippian horticulturalists, and the adjacent backwater habitats and oxbow lakes were rich in the aquatic resources that were so important during the summer months. In addition, these oxbow lakes were favorable habitat for migratory waterfowl, which could be exploited during the winter.

Thus, Smith has suggested that the following two factors can explain, to a large extent, the location of Mississippian populations within a river floodplain: (1) the availability of well-drained, easily tilled, energy subsidized natural levee soils suitable for horticultural garden plots; and, (2) easy access to the rich protein sources of fish and waterfowl in channel-remnant oxbow lakes (B. Smith 1978a:488). While this arrangement was optimal for populations in the Mississippi Valley, where these two kinds of resources are found in close proximity, the complementary distribution, in the Georgia Piedmont, of favored horticultural soils and aquatic resources may have required a somewhat different settlement strategy.

CHAPTER IV
ENVIRONMENTAL CHARACTERISTICS OF THE OCONEE PROVINCE

Physiography

The Oconee Province occupies the southern Piedmont portion of the Oconee River drainage. Its multiple-mound centers are distributed through the Washington Slope District of the Piedmont Physiographic Province and southward to the fall zone (Figure 3). The Piedmont is a strongly dissected highland area which gently slopes toward the Coastal Plain. The Washington Slope District is that portion of the Piedmont which "descends gradually from about the 700-foot elevation at its northern margin to about the 500-foot elevation at its southern edge" (Clark and Zisa 1976). At the southern edge of the Washington Slope District the Oconee River flows across the Fall Line Hills and continues southward until it joins the Ocmulgee River, approximately 125 km below the Fall Line. Together these two streams form the Altamaha River and continue southeast toward the Atlantic Ocean. The Altamaha River is the southernmost of the Piedmont-originating rivers which empty into the Atlantic.

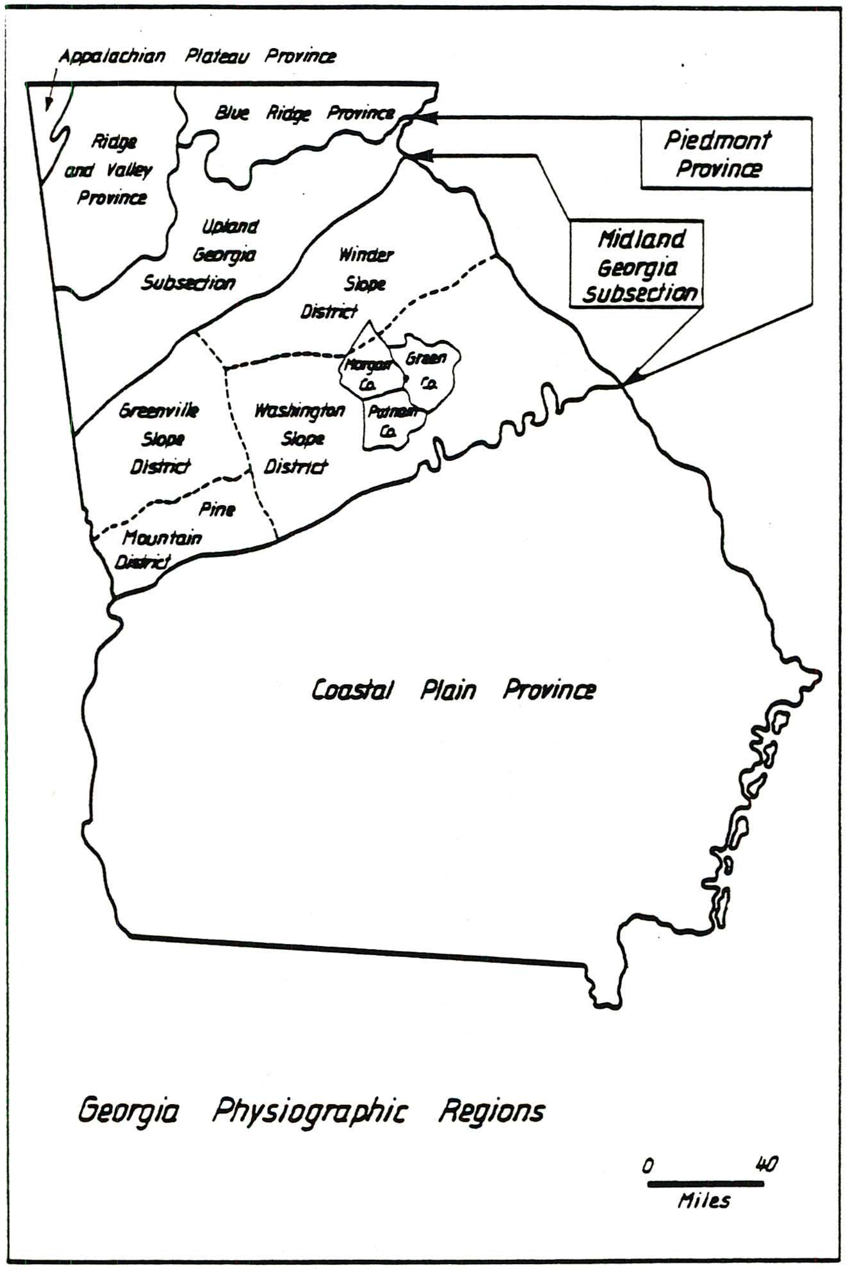


Figure 3. Physiographic Provinces of Georgia.

Climate

The central Oconee basin is included in the mid-latitude sub-tropical climate region of North America. Because temperatures are moderated by the Atlantic Ocean, the Gulf of Mexico, and the southern Appalachian Mountains, periods of extreme hot or cold are brief. July temperatures average between 75° F and 80° F, and January temperatures average approximately 40° F. There are approximately 222 frost-free days per year (Fussel n.d.:38). Average temperatures are presented in Table 1. Daily minimum and maximum temperatures fluctuate an average of 20-25° F (Payne 1976:70). Rainfall is well distributed throughout the year. Mean annual precipitation is 121.3 cm. Maximum rainfall occurs during the winter and early spring, with a secondary maximum during the mid-summer. Periods of lower rainfall occur in the late spring and early fall (Carter 1974).

Streamflow

Streamflow characteristics of the central Oconee River show a yearly cycle of mean monthly discharge that correlates well with precipitation. Peak flows occur in the late winter and early spring (with the highest in March) and low flows in the late summer and early fall (lowest in October) (Figure 4; Fussel n.d.:32). The two

Table 1. Average daily temperatures in the central Oconee drainage

Month	Average daily maximum (°F)	Average daily minimum (°F)
January	57.2	33.2
February	60.0	43.9
March	66.7	40.4
April	76.4	49.2
May	83.7	57.7
June	89.1	65.7
July	90.5	69.0
August	90.3	68.1
September	85.3	62.7
October	76.9	50.4
November	67.1	39.5
December	58.2	33.1
Annually	75.1	50.3

(Payne 1976:70)

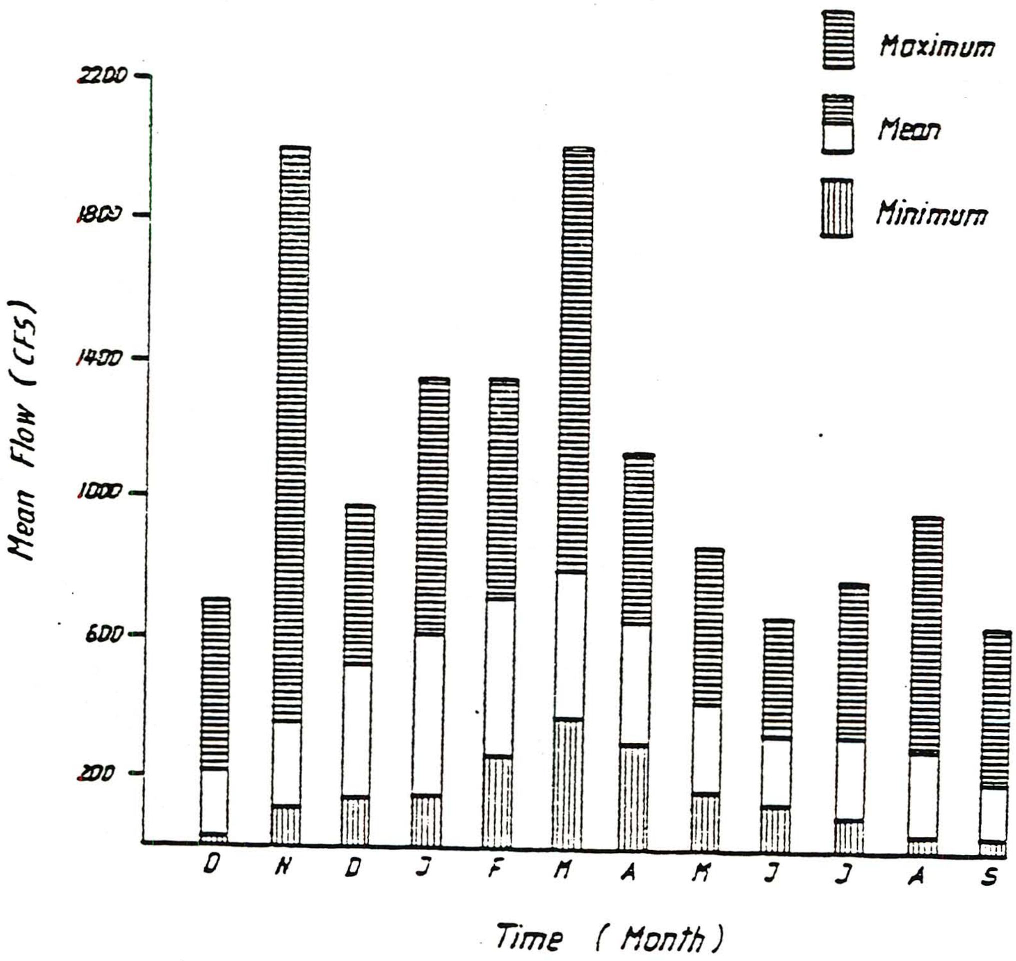


Figure 4. Streamflow characteristics of the Middle Oconee River (Fussel M.S.)

periods of peak flow are the seasons of likely flooding in the Oconee drainage. The winter flood is of greater severity due to lower evapotranspiration and decreased demand on soil moisture.

Topography

Topography of the Piedmont is largely the result of long-term erosion of a level plain, or peneplain, formed during the Lower Cretaceous period (King 1950). Stream downcutting in the Piedmont has been affected by uplift of this Lower Cretaceous Peneplain with respect to sea level, by stillstands in sea level, and by the underlying geologic structure (Brook 1981:2). As a result, Piedmont topography may be generally characterized as consisting of rolling hills or divides which are separated by the downcutting of major and minor streams. Typically, streams have cut their courses to about 35 m below the crest of intervening ridges (Payne 1976:71). Slopes may range from 0 to about 30% (Payne 1962:66).

Geology and Soils

The southern Piedmont is underlain by igneous and metamorphic rocks which include granites, gneisses, schists, metaquartzites, and metavolcanics (Brook 1981:1). These underlying rocks are the parent material for soil formation. Broad differences in soil type are directly related to mineralogical differences in the underlying rocks (Payne 1962:66). The following discussion of soil types is based largely on a soil survey of Baldwin, Jones, and Putnam Counties, Georgia (Payne 1976). Only one of the four sites compared in this study is located in Putnam County. The remaining three sites are located in adjacent Greene County, for which detailed soil studies are not yet available.

Broad patterns of soil types are grouped together into "soil associations." That is, large areas with similar proportions of individual soil types constitute a single soil association. These are composed of one or two major soils and at least one minor soil, and are named for the major soils. Soil associations may be grouped into three larger categories based on general landscape. The following brief characterization of soils is taken from Payne (1976:3-8).

I. Nearly Level Soils on Stream Floodplains:

In the one association of this group, the soils are nearly level and occur on floodplains. These soils are brownish to grayish and generally mottled, and they have layers in the profile that range from sandy to loamy. They formed in alluvial sediments washed from soils on uplands.

1. Chewacla-Congaree-Wehadkee association. These are well drained to poorly drained soils that have loamy layers below the surface layer. Chewacla soils are poorly drained with a surface layer of reddish-brown silt. Congaree soils are well drained with a surface layer of fine sandy loam. Wehadkee soils are poorly drained, and are in the wetter, lower parts of the association.

II. Very Gently and Gently Sloping Soils of the Uplands:

In the seven soil associations of this group, the soils occur chiefly on ridgetops and interstream divides. Slopes, typically, range from 2 to 10 percent. In associations 2, 3, 4, and 5, the soils formed in residual parent material that weathered from such rocks as granite, gneiss, diorite, quartz, mica, and feldspar. In associations 6, 7, and 8, the soils formed in sand and clay of marine origin.

2. Davidson association. These are well drained soils that have dark-red clayey layers below the surface layer. Davidson soils are the only major soils in the association. Approximately 60 percent of the association has slopes of 2 to 6 percent, and the rest has slopes of 6 to 10 percent. The surface layer is typically a dark reddish-brown loam.

3. Cecil-Vance association. These are well drained soils that have red to yellowish-red clayey layers below the surface layer. Typically, the surface layer is a reddish-brown sandy loam in the Cecil soils, and a light brownish-gray and brownish-yellow sandy loam in the Vance soils.

4. Helena-Enon-Wilkes association. These are moderately well drained and well drained soils that have yellowish-brown, strong-brown, grayish brown, or light olive-brown clayey layers below the surface layer. The Helena soils are moderately well drained, while the Enon and Wilkes soils are considered well drained.

5. Iredell-Enon association. These are well drained to somewhat poorly drained soils that have light olive-brown grayish-brown, and yellowish-brown, mottled clayey layers below the surface layer. These soils are found on very gentle slopes, ranging from 2 to 10 percent. Iredell soils are moderately well drained to poorly drained and have a surface layer of very dark grayish-brown loam. In nearly level areas water may pond on the surface. In contrast, the Enon soils are well drained and have a surface layer of dark grayish-brown sandy loam.

6. Ailey-Lakeland association. These are well drained to excessively drained soils that have

yellowish-brown and strong-brown loamy layers below the surface layer. The Ailey soils are well drained and occur mainly on the middle and upper parts of slopes. The Lakeland soils are excessively drained and are found chiefly on the crests and upper parts of interstream divides. Both major soils have a sandy surface layer.

7. Orangeburg-Norfolk-Red Bay association. These are well drained soils that have dark-red, red, and yellow-brown loamy layers below the surface layer. These soils are found primarily in the southernmost portion of the Oconee Province. About 70 percent of the association has slopes of 0 to 6 percent, and the rest has slopes of 6 to 15 percent. All three of the major soils have a surface layer of sandy loam.

8. Susquehanna-Vaucluse-Lakeland association. These are somewhat poorly drained to excessively drained soils that have grayish, mottled clayey layers or brownish loamy or sandy layers below the surface layer. Susquehanna soils are somewhat poorly drained and occur on the lower parts of hillsides near the small drainageways. Typically, the surface layer is a brown fine sandy loam. Vaucluse soils are well drained and occur throughout the association. Typically, the surface layer is

brown loamy sand. Lakeland soils are excessively drained and occur mainly on the crests of ridges. The surface layer is typically a very dark grayish-brown sand.

III. Strongly Sloping and Steep Soils of the Uplands: In the four soil associations of this group, the soils are strongly sloping and steep and occur mainly on hillsides and narrow ridgetops. Slopes typically range from 10 to 35 percent. The soils in associations 9, 10, and 11 formed in residual parent material weathered from such rocks as hornblende, gneiss, quartz, mica, schist, and diorite. The soils in association 12 formed in sandy, loamy, and clayey marine sediments.

9. Davidson-Gwinnett-Wilkes association. These are well drained soils that have dark-red to light olive-brown clayey layers below the surface layer. Most of the association is eroded. In the more severely eroded areas, erosion has removed all or nearly all of the original surface layer and has exposed the subsoil. Davidson and Gwinnett soils both have thin surface layers of dark reddish-brown loam. Wilkes soils have a very thin surface layer of dark grayish-brown sandy loam.

10. Cecil-Vance association. These are well drained soils that have red to yellowish-red, mottled clayey

layers below the surface layer. Cecil soils have a surface layer of reddish-brown sandy loam, while Vance soils have a surface layer of light brownish-gray and brownish-yellow sandy loam. Both major soils are eroded. Included in the association are severely eroded areas in which almost all of the original surface and some of the subsoil is gone.

11. Wilkes-Vance association. These are well-drained soils that have light olive-brown to yellowish-red, mottled clayey layers below the surface layer. Wilkes-Vance soils are found on narrow ridgetops and steep areas on side slopes.

12. Esto-Lakeland-Ailey association. These are well drained to excessively drained soils that have reddish-yellow, light yellowish-brown, and yellowish-brown, mottled clayey or loamy layers below the surface layer. Esto soils are well drained and are on the steeper, choppy, irregular parts adjacent to the drainageways. Typically, the surface layer is a dark grayish-brown loamy sand. Lakeland soils are excessively drained and occur throughout the association. Ailey soils are well drained and occur on both the ridgetops and the hillsides.

Stream Morphology

Stream characteristics in the Georgia Piedmont are quite variable. Woodruff and Parizek (1956) have noted that stream valley morphology is affected by lithologically controlled nick points. At these nick points the valleys are narrow and youthful, while upstream the rivers meander in less resistant rocks. The meandering portions of streams produce broad, flat valley profiles. Thus, it is possible to characterize Piedmont stream morphology as a series of broad floodplains separated and pinched off from each other by shoals at nick points (Brook 1981:2).

Figure 5 is a schematic representation of the Oconee drainage where the uplands may be characterized as gently to very gently sloping. The relationship between soil types and topographic features of the uplands and the bottomlands is illustrated for a steam well above a nick point (Payne 1965:4).

Forests

The Georgia Piedmont is included in the oak-hickory-pine forest vegetation zone (Kuchler 1964). Kuchler's classification employs the concept of "potential natural vegetation" zones. These are defined as the "vegetation that would exist today if man were removed from the scene and if the resulting plant succession were telescoped

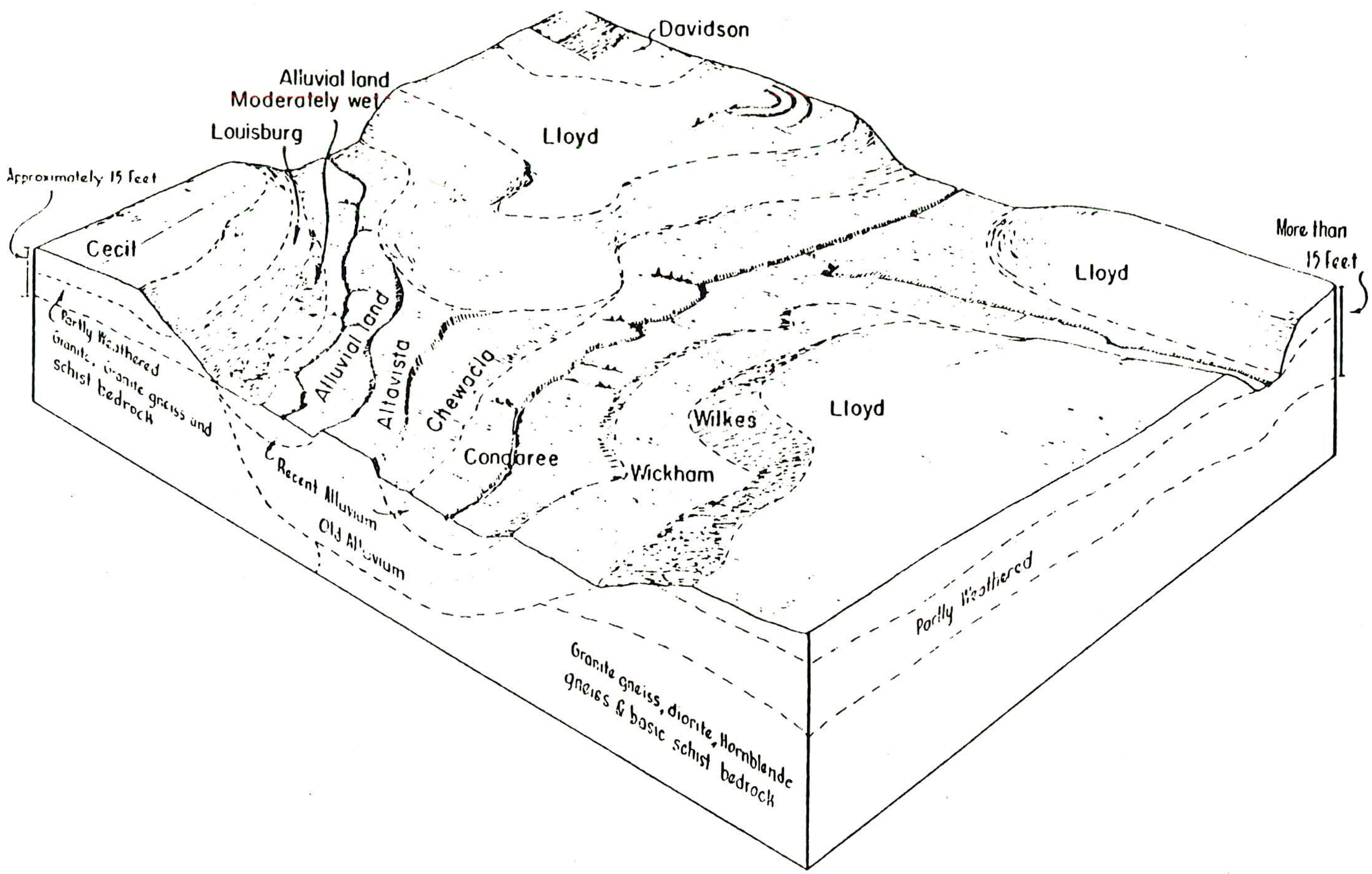


Figure 5. Relationship between topography and soil types (Payne 1965).

into a single moment" (1964:1-2). Kuchler lists the major species of this forest type as hickory (*Carya* sp.), shortleaf pine (*Pinus echinata*), loblolly pine (*Pinus taeda*), white oak (*Quercus alba*), and post oak (*Quercus stellata*). The mixed hardwood forests of the river bottoms include oak (*Quercus* sp.), sweet gum (*Liquidamber styraciflua*), red maple (*Acer rubrum*), and elm (*Ulmus americana*) (Lee 1977:30).

In an attempt to reconstruct the species composition of Georgia's forests as they existed prior to extensive alterations brought by European settlement, Plummer (1975) examined original county survey maps dated between 1805 and 1832. These original land survey maps recorded five trees to locate every intersection of lines separating property lots. For the Morgan district, which includes part of the Wallace Reservoir, Plummer reports that 7,319 trees, representing 36 species or species groups were recorded for the 3,218 acres surveyed. Plummer gives the ratio of oak-pine-hickory as 53:23:8 for the Piedmont (1975:16). These figures are essentially in agreement with Kuchler's characterization of the potential natural vegetation of Georgia's Piedmont forests.

Fauna

With the exception of a few species, whose presence is indicated only by early historic accounts, the modern mammalian faunal assemblage of the Piedmont includes most of the species that were economically important during the late prehistoric period (Golley 1966). The bison (*Bison bison*) and the elk (*Cervus canadensis*), which are no longer present in the Piedmont, are mentioned in early historic accounts and it is thus possible that these were available to people of the Oconee Province. Similarly, the wolf (*Canis niger*) has been displaced from this part of its range since European settlement (Golley 1966).

By all accounts, both archaeological and ethnographic, the white-tailed deer (*Odocoileus virginianus*) was the most important terrestrial mammal hunted by the Southeastern Indians (Smith 1975; Roth 1979; Swanton 1946). Black bear (*Ursus americanus*) and beaver (*Castor canadensis*), though hunted less frequently, were considered important for their fat. Other mammals whose remains have been identified from sites in the Oconee Province include cottontail rabbit (*Sylvilagus floridanus*), gray squirrel (*Sciurus carolinensis*), muskrat (*Ondatra zibethica*), bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), raccoon (*Procyon lotor*), and opossum (*Didelphis virginianus*).

Turkey (*Meleagris gallopavo*) is known to have been an important food resource hunted by the Southeastern Indians (Smith 1975; Swanton 1946). Turkey, although scarce today, may have reached high population densities in the Piedmont during prehistoric times. Large populations might have been made possible by the high availability of acorns from various species of oak in Piedmont forests (Shelford 1963:59).

As mentioned earlier, aquatic resources were of great importance to the Southeastern Indians. Numerous species of fish were available in the rivers of the Oconee Province. These include the basses and sunfishes (Centrarchidae), the catfishes (Ictaluridae), suckers (Catostomidae), the bowfin (*Amia calva*), and garfish (*Lepisosteus* sp.). In addition to fish, aquatic and terrestrial species of turtles and freshwater molluscs were important aquatic resources.

Recent Environmental Change

It is important to recognize that although environmental variables such as temperature and precipitation have probably remained quite stable, some aspects of the Georgia Piedmont environment today differ markedly from conditions prevalent during the late prehistoric period. Notably, erosive land-use practices since the eighteenth century have greatly altered the environment of the Piedmont (Trimble 1974). Between 1850 and 1920 the southern Piedmont of South Carolina and Georgia suffered a greater intensity of erosive land use than any other portion of the Piedmont from Virginia to Alabama.

The results of poor farming practices cannot be overemphasized. It has been estimated that the southern

Piedmont has lost about six cubic miles of soil material; the average soil loss from the Georgia Piedmont is estimated at 7.5 inches! Much of the Piedmont has lost its topsoil. Uplands have been severely dissected and gullied and the debris from this erosion has filled stream valleys in many places, covering the once fertile bottomlands with a heavy layer of fine silt (Trimble 1974:1). The heavy silt loads carried by Piedmont streams have raised the level of stream beds and thus increased the severity and incidence of flooding. Backwater swamps in the meandering portions of rivers are probably more extensive today than they were prehistorically. The raised level of river bottoms has also buried rapids and shoals along the rivers.

Of course, the effects of soil erosion are not limited to changes in topography and geomorphology. The loss of 70 to 80% of upland topsoils in the Georgia Piedmont has significantly altered the distribution of plant communities and consequently altered wildlife habitat (Fussel n.d.:21). Aquatic resources have been similarly affected. Piedmont streams, which were clear until the nineteenth century, today carry heavy loads of silt. Because suspended silt particles seriously limit light penetration and consequently inhibit the development of a phytoplankton community, the turbidity of streams has been cited as the single most limiting factor to the biotic potential of the Oconee River (Nelson and Scott 1962:396).

Considering the far-reaching ecological effects of past soil erosion, it is difficult to confidently assume that modern distributions and estimates of productivity for various food resources are representative of aboriginal conditions. Unraveling this problem will require sophisticated modeling that is beyond the scope of the present research. Nevertheless, there are certain resources, known to have been of importance prehistorically, whose prehistoric distributions can at least be plotted, if not accurately quantified. The distribution of two of these important resources, floodplain soils and productive fishing locations, can be examined for the Oconee Province. Both of these resources were of greatest importance during the warm season and are thought to have been major determinants of settlement location for Mississippian peoples.

CHAPTER V
BOTTOMLANDS AND RAPIDS

According to Bruce Smith's (1978a) model of the Mississippian adaptive niche, an important determinant of settlement location is the ability to maximize access to favored horticultural land and to aquatic resources. While other types of soils may have been farmed by Southeastern Indians, there is abundant archaeological and ethnohistoric evidence that the most highly favored horticultural soils in the Southeast were located in the floodplains of major streams. These floodplain soils were valued because of their high productivity and because they could be easily tilled using aboriginal cultivation techniques. The high productivity of these soils results from the seasonal deposition of waterborne nutrients over the bottomlands during floods. Smith, referring to the energy subsidy provided by waterborne nutrients, employs Odum's terminology to describe the meander-belt floodplain habitat as a "naturally subsidized solar-powered ecosystem" (1978a:481). He notes that these seasonally deposited nutrients account for the "unusually high biomass values for species of plants and animals within meander-belt habitat zones" (Smith 1978a:481).

A second feature that accounts for the preference for floodplain soils is the ease with which they can be tilled. A relatively small proportion of soils within the floodplain have this quality of good tilth. The variability in floodplain soils results from the way in which different grades of soil are suspended in, and deposited by floodwaters. As stream velocity drops during flooding, larger suspended particles are deposited closer to the main channel while the finer suspended particles, such as clays, are carried farther from the stream channel. The heavier particles constitute the levees that are adjacent to, and slope away from, the river channel. The finer particles, that are deposited away from the main channel, are poorly drained soils that support backwater habitat. For the most part the highly preferred, easily-tilled soils are those of well drained former levees that remain in the floodplain even after the river has abandoned the channel it occupied when the levees were formed.

In spite of the drastic effects of soil erosion in the Piedmont, the relative extent of floodplain in different portions of the Oconee Province should be similar to the prehistoric condition. This is due, in a large measure, to the geomorphology of Piedmont streams. The portion of the Oconee Province of immediate interest here lies entirely within the Piedmont Physiographic Province. As noted earlier, the form of Piedmont river valleys is affected by lithologically controlled nick points. Segments of a river may meander within relatively broad floodplains, but where the river flows over harder substrate the valley becomes narrow, and the stream itself may become rocky and filled with rapids. Piedmont streams have thus been characterized as consisting of a series of broad floodplains that are pinched-off by areas of rapids. Woodruff and Parizek (1956) call these "boudin valleys." Since the locations of broad floodplains are determined by relatively stable factors, namely the underlying geologic structure and topographic features, we may assume that relative proportions of floodplain, from one portion of the Piedmont to another, are representative of the late prehistoric distribution of floodplain soils.

The Wallace Reservoir itself is a good example of a boudin valley. At the southern end of the Reservoir, the river flows over the Siloam Granite formation (Figure 6). The river valley here is narrow, and the channel itself is filled with rocks and islands. This southernmost portion includes the three major shoals of the Wallace Reservoir. These are Laurens, Riley, and Long Shoals (Figure 6). Floodplain is very limited, because the river fills most of its valley floor at the shoals.

Upstream from Long Shoals, the river begins to meander within a gently curving, alluvium-filled valley floor. This characterization is especially appropriate for the Oconee

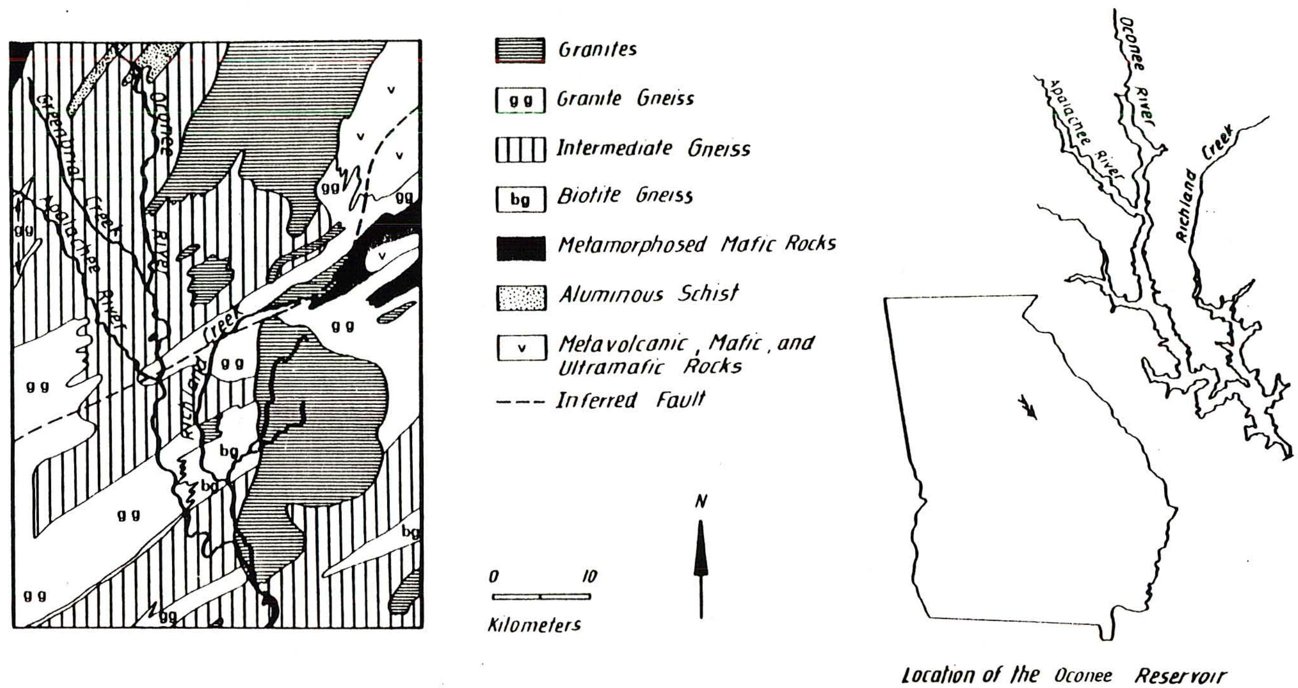


Figure 6. Geologic structure of the central Oconee drainage.

River at and above its junction with the Apalachee River (approximately 25 km north of Long Shoals). Here, levees up to 30 m in width may run unbroken for several hundred meters along the river. The Dyar mound and village site, in this northernmost portion of the Wallace Reservoir, is located on the largest contiguous tract of floodplain soils found in the Piedmont portion of the Oconee Province. Further upstream, the Oconee River continues to meander within a relatively broad floodplain until the next major nick point, at Barnett Shoals, approximately 30 km north of the Dyar site.

The significance of the boudin valley type of stream morphology is that there may be a great disparity in the amount of floodplain land found at different locations along a given stream. While the Dyar site is located, as B. Smith's model might predict, in a large tract of floodplain soils, the other single-mound site known in the Oconee Province, 9Ge35, is located at the southernmost portion of the boudin valley, an area characterized by more limited floodplain. Floodplain soils occupy 57% of the total area within a 1 km radius of the Dyar site. In contrast, floodplain soils occupy only 28% of the area within 1 km of site 9Ge35.

The second essential element of Smith's model for Mississippian settlement is access to aquatic resources. In the Mississippi Valley, broad meander-zones provide extensive linear bands of former levee soils that are contiguous with oxbow lakes and backwater swamps. The latter, of course, provide abundant aquatic resources that are essential during the warm season. For most of the Oconee Province, however, meander zones, with their highly productive levee soils and backwater habitat, are not nearly as extensive as those in the Mississippi Valley. In fact, segments of river valleys may be lacking these features entirely. Furthermore, for the Oconee Province, true meanders with oxbow lakes are presently found only in the Coastal Plain. Only the southernmost multiple-mound site of the Oconee Province (Shinholser), located at the Fall Line, had immediate access to the Coastal Plain.

It is nevertheless possible that in prehistoric times there were oxbow lakes in portions of the Piedmont in areas such as the broad floodplain occupied by the Dyar site. Using 1:24,000 scale color aerial photographs, George Brook (1981) was able to compile a map of stream terraces and old river channels in the northern section of the reservoir. Brook notes that several sites with Lamar components are located adjacent to old river channels. It is possible that these old channels were oxbow lakes during late prehistoric times, but have since filled with silt. On the other hand, recent silting is thought to have increased, rather than reduced the extent of backwater swamps in the Piedmont. If oxbow lakes were available in the broader floodplains of the Piedmont, it is possible that the inhabitants of the Dyar site enjoyed a situation directly analogous to that of the Mississippi Valley, that is, the ability to settle near fertile, easily tilled land adjacent to the aquatic resources provided by oxbow lakes.

Unfortunately, it is difficult to know the extent to which oxbow lakes existed prehistorically in the Piedmont. On the basis of geomorphology of Piedmont streams, however, it is likely that if oxbows were available, their distribution was segmented and restricted by the nature of boudin valleys whose floodplains are "pinched-off" at shoals. While quantified estimates of productivity are lacking, it is suggested here that although limited backwater habitats may have been available for exploitation, their contribution in terms of available aquatic food resources was small in comparison to that of another type of geomorphological feature, the shoals themselves.

Numerous ethnographic accounts indicate that fish spawning runs brought concentrations of people to the falls and rapids (shoals) of rivers in the Southeast, and it was here that the Indians built their fishing weirs (Hudson 1976; Swanton 1946). Shoals areas were attractive to fish (and therefore people) beyond the spawning season as well. In part, the high productivity at shoals is due to a juxtaposition of microenvironments that are suitable for species of both slow and fast water habitat preference.

Here rapid channels alternate with relatively still pools that lie immediately upstream; bottom characteristics include both rocky and sand bottoms, and the relatively still pools collect detritus, a major food source for bottom feeding fishes such as the suckers and some catfishes (Nelson and Scott 1962).

It has been demonstrated that turbulence at shoals enhances the stability of the water with respect to dissolved gases (Gameson 1957). Furthermore, at shoals the river spreads out to occupy most of its floodplain, allowing more light to penetrate to the shallow bottoms. These two factors contribute to the abundance of attached algae and mosses in swift water (Hynes 1970:42, 79). The attached algae and mosses found on rocks throughout the shoals provide favorable habitat for a variety of larval insect forms. These attract the more carnivorous species of fish, such as bass, bluegills, and sunfish (Peterson 1956). The presence of both detritus feeders and more carnivorous species of fish, in turn, attracts additional large, predatory species such as garfish and pike that prey on small fish.

A final factor contributing to the abundance of fish at shoals is that the large boulders which characterize the rapids create areas of dead water. These zones are resting stations for fish in rapid water (Hynes 1970:309). It has been shown in studies of fish territoriality as well, that where there are many large stones or artificial barriers more fish amicably occupy the same area (Kalleburg 1958; Stuart 1953).

In addition to concentrations of fish populations at shoals, behavioral characteristics of certain turtle species led to an increased availability of these reptiles at shoals. Among these are the river cooter (*Chrysemys floridana concinna*). LeConte (1836) noted that these turtles inhabit the Piedmont rivers of Georgia where the beds are rocky. This species is exclusively a river inhabitant, usually found in streams of considerable current (Carr 1963:288). The *concinna* subspecies is closely related to the subspecies *suwaniensis*, which is prone to large congregations for sunning and grazing. The author has witnessed congregations of more than thirty turtles in the shoals of the Oconee River during the summer months. It is the habit of basking in great number that is important from an exploitative point of view, and the large rocks in wide channels at the shoals provide abundant sunning stations. The river cooter is joined in the sunning habit by the map turtle (*Graptemys geographica*) and the soft-shell turtle (*Trionyx ferox*) along with others. It is possible that some variant of the mass capture technique described by Carr (1963:28-9), that of surprising the turtles at their sunning stations, was employed by the Indians at shoals.

The same food sources that make the shoals attractive to fish are also important to the turtles. Many turtle species are omnivorous, subsisting on algae, detritus, and invertebrates, all of which are found at the shoals. Other species, such as the map turtle, have a more specialized diet of mulluscs.

Some species of turtles can be gathered while wading through the shallow areas of the shoals. These are bottom-dwelling turtles such as the soft-shell and various species of the family Kinosternidae, the mud and musk turtles (Carr 1963). It is also interesting to note that the technique of poisoning water to capture fish also stupefies the soft-shell turtles. This is due to their capacity for cloacal breathing that allows the poison to enter the circulatory system (Carr 1963:30). The Kinosternidae and the soft-shell might have also been taken by an additional method. It has been noted that these species are easily, and quite frequently, caught by hook and line fishing (Carr 1963:29).

In addition to vertebrate food resources, molluscs were also abundant and accessible at shoals. Bivalves such as *Elliptio* sp. were common, and the small gastropods known locally as rock-snails (*Goniobasis* sp.) are found in great quantity adhering to the mosses that grow on the large rocks at shoals. These molluscs have been recovered from a number of sites in the Oconee Province.

Like the distribution of broad floodplains, the distribution of major shoals is determined by underlying geologic structure. In many areas of the Piedmont these two kinds of features have complementary distributions and may be separated by some distance. Thus, the significance of Piedmont stream morphology for understanding late prehistoric settlement is that two very important warm-season resources, the highly productive horticultural soils of bottomlands and the abundant aquatic resources of the shoals, are often geographically separate. Gaining access to both kinds of resources in the Georgia Piedmont requires some variation from the kind of settlement pattern found in the Mississippi Valley, where it is possible to settle adjacent to both.

Resource Distribution

To understand the variability that may exist on a regional scale, the amount of seasonally flooded bottomland was calculated for areas of 10 and 20 km radii around each of the multiple-mound centers of the Oconee Province. In addition, a map, showing major and minor shoals in the Oconee Province, was compiled (Figure 7). It should be made clear that this is not an attempt at catchment analysis. The intent here is not to estimate productivity, but to demonstrate the vast regional differences in representation of two important resources.

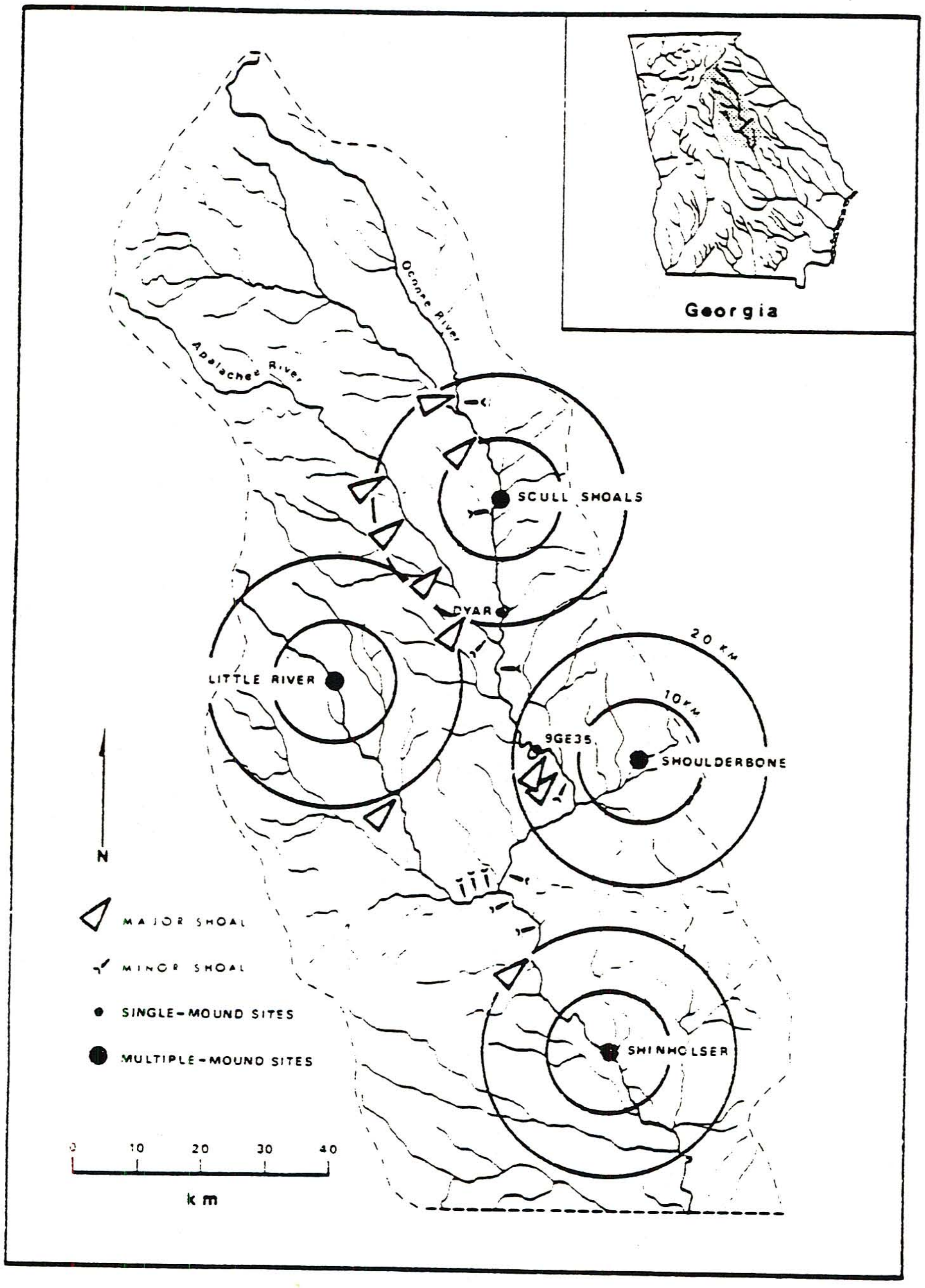


Figure 7. Locations of major and minor shoals.

Two sources were used to construct the map of major and minor shoals for the Oconee River and its tributaries. Both of these are early inventories of the utilized and potential water powers of Georgia, the shoals being desirable locations to harness water power (U.S. Census 1980; Hall 1896). In Figure 7, shoals are arbitrarily designated as major or minor on the basis of their stream distance. That is, shoals which continue downstream for a distance of greater than 300 m are here considered major shoals. Again, it is important to note that there is no attempt here to quantify the relative biological productivity of various major and minor shoals.

Floodplain measurements were taken from 7.5 minute, 1:24,000 USGS topographic maps using an Apple computer "graphics tablet" to calculate area. USDA General Soil Maps and USGS Floodprone Area Maps were consulted to help determine the extent of floodplain. Twenty kilometers was chosen as the maximum radius for the regional comparison because this is the largest radius at which the "territories" of multiple-mound centers would not overlap.

Table 2 shows the differences in absolute floodplain area for regions surrounding the four sites. Most striking is the very high representation of floodplain for the Shinholser site. This is to be expected because this site's territory encroaches upon the Coastal Plain, where the Oconee River floodplain becomes very broad and

Table 2. Area of floodplain surrounding multiple-mound sites in the Oconee Province.

	SHOULDERBONE	LITTLE RIVER	SCULL SHOALS	SHINHOLSER
0-10KM RADIUS	5.03 KM2	11.66 KM2	12.46 KM2	85.11 KM2
% OF AREA	1.6%	3.7%	4.0%	27.1%
10-20KM RADIUS	4.73 KM2	24.39 KM2	38.98 KM2	111.68 KM2
% OF AREA	0.5%	2.6%	4.1%	11.8%
0-20KM RADIUS	9.76 KM2	36.05 KM2	51.44 KM2	196.79 KM2
% OF AREA	0.8%	2.9%	4.1%	15.7%

contains true meanders and oxbow lakes. What is perhaps of greater interest for this study is the unexpectedly low representation of floodplain around the Shoulderbone site. This is especially anomalous because the location of Shoulderbone is central to the other three multiple-mound sites and it has the greatest number of mounds. Together these characteristics suggest that this site was the principal town of the Oconee Province. It is clear that the location of this site would not have been predicted solely on the basis of suitable floodplain soils. The Shoulderbone site is also of great interest because it is the multiple-mound site nearest to all of the small sites that are examined in this study. The 20 km radius around Shoulderbone includes these three small sites as well as the single-mound site, 9Ge35, with which the small sites may have been affiliated. A closer look at the distribution of floodplain and shoals around the Shoulderbone site is warranted.

The region around Shoulderbone is a good example of a portion of the Piedmont in which larger tracts of bottomland are geographically separate from the best places to gather aquatic resources. Within a 20 km radius around Shoulderbone, the majority of floodplain soils are found on Shoulderbone Creek and its tributaries. The largest tracts of floodplain are thus within a 5 km radius of the site itself. None of these small streams show evidence of meandering or of oxbow lakes. It is therefore likely that within the 20 km radius, aquatic resources were most abundant at the major shoals on the Oconee River, some 15 km away from the Shoulderbone site and away from the larger tracts of bottomland. It should be noted however, that while there are no large tracts of floodplain in the immediate vicinity of the shoals, small pockets of bottomland do exist between the headlands of the shoals and on the islands.

The model of the Mississippian adaptive niche, combined with an understanding of this complementary distribution of bottomland and aquatic resources, suggests the existence of a number of kinds of archaeological sites that may be found in the shoals region.

Site Characterizations

Bruce Smith (1978a:489) suggests that the most energy-efficient arrangement for settlement in the Mississippi Valley would consist of scattered homesteads, occupied by a single to several nuclear or extended family groups on a year-round basis. These homesteads would be dispersed so that each could be optimally located along the broad, linear bands of preferred soil types adjacent to oxbow lakes. On the other hand, Smith notes that Mississippian populations display a tendency toward settlement nucleation. This tendency toward nucleation is a reaction to the problems of defense, boundary maintenance, and social cohesiveness by Mississippian groups. Thus, Smith (1978a:490) suggests, a balance between the tendency for settlement dispersal and the opposing tendency for settlement nucleation often results in a compromise settlement system in which relatively large, often fortified settlements are located centrally to a dispersed settlement pattern of small homesteads. Settlement studies by Lee (1977), by Rudolph and Blanton (1981), and by M. Smith and Kowalewski (1981) suggest that a similar situation may have existed in the Oconee drainage. Certainly the Dyar site and site 9Ge35 are good candidates for local centers. While it is suggested that these local centers are part of a larger network of regional centers, it is clear that the vast majority of Mississippian period sites in the Oconee drainage are of the smallest size class. While some of these small sites may fit Bruce Smith's description of dispersed homesteads occupied on a year-round basis, the complementary distribution of shoals and bottomland in the Georgia Piedmont suggests the existence of a variety of additional kinds of sites at the shoals.

First, because a limited amount of floodplain is available at the shoals, a small resident population living in scattered homesteads near the shoals might be expected. Here small groups of individuals could maintain year-round residence farming the smaller tracts of bottomland adjacent to the abundant aquatic resources of the shoals.

On the other hand, the shoals were probably an important resource on a regional level as well. This is especially true for dispersed populations living around Shoulderbone and 9Ge35, since in this portion of the Oconee Province much of the bottomlands are geographically separate from the major shoals of the Oconee River. It might therefore be expected that individuals with permanent settlements throughout the region would visit the shoals periodically during the summer months to gather aquatic resources. The kinds of archaeological sites produced by these visits would vary along a number of important characteristics. This variability may reflect the ways in which the exploitation of aquatic resources is incorporated into the lifestyle of the inhabitants of the Oconee Province.

Several kinds of sites may thus by hypothesized. One way to conceptualize the differences between these hypothesized sites is by the permanence of site occupation (Figure 8). First, a general distinction may be made between sites that are occupied on a permanent basis and sites that are occupied seasonally. Within the category of permanently occupied sites, three hypothetical types have already been mentioned. These are (1) regional centers; (2) local centers; and (3) homesteads. Sites occupied seasonally may be further broken down by duration of occupation. For instance, there may be sites occupied throughout an entire season (such as the growing season).

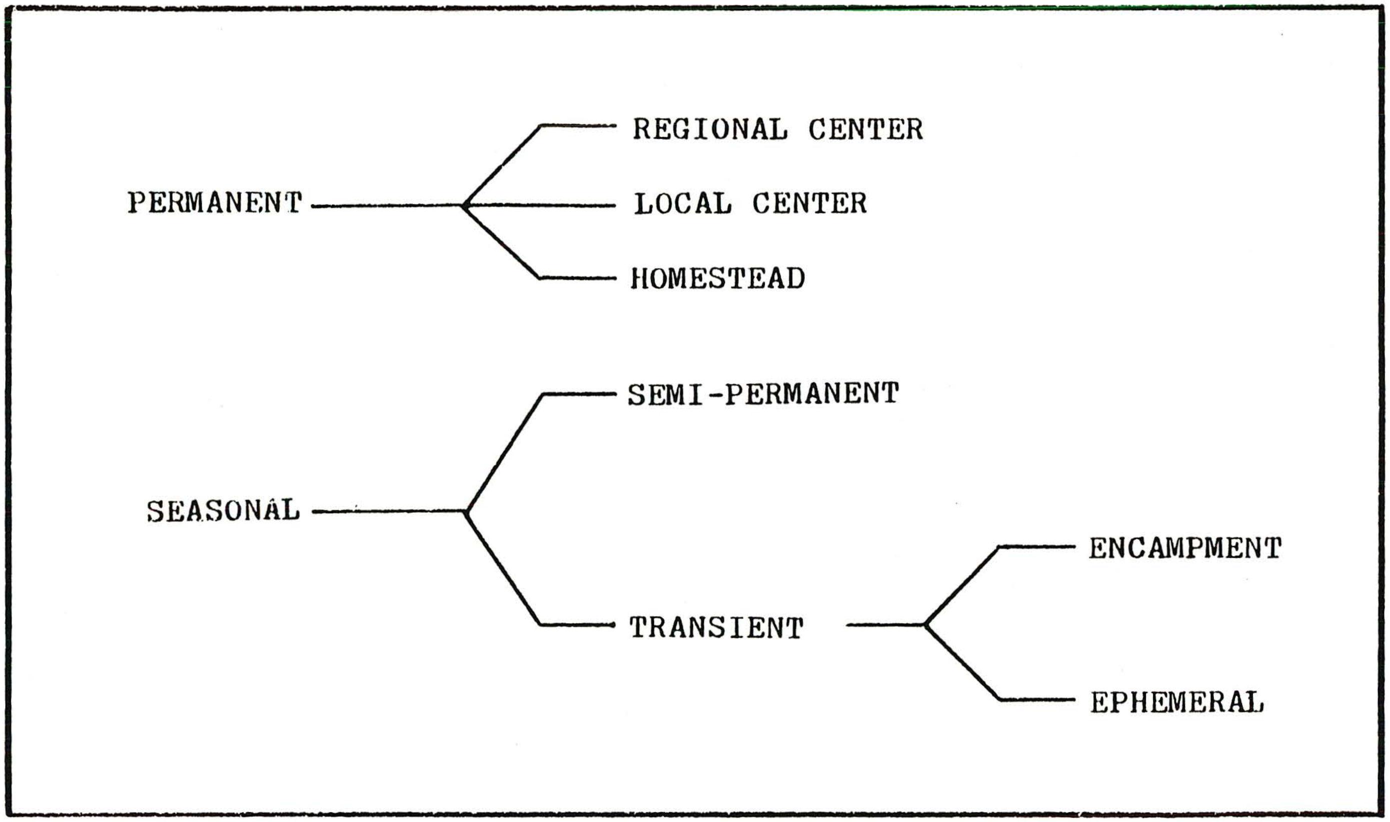


Figure 8. Site categories based on permanence of site occupation.

These may be called "semi-permanent" sites. Such sites would stand in contrast to sites that are occupied only briefly during a given season. In Figure 8 I have called such briefly occupied sites "transient" occupations. Transient sites may be broken down further into those sites that are used as encampments (either overnight or for several days) as opposed to those that are visited only on day trips for a very specific purpose. These latter sites are referred to as "ephemeral" occupations. The distinction between encampments and ephemeral occupations may simply reflect the distance a group has travelled from their permanent or semi-permanent residence to utilize the site.

These six potentially recognizable kinds of occupations are presented here only to indicate that a great deal of variability may be found even within traditional categories such as "homesteads" or "extractive sites." It is most important to note that the term "site type" is used here only as a conceptual device. Because the characteristics of so few small Mississippian period sites are known, it would certainly be premature to collapse site variability into a few rigid types. It will be more profitable for this investigation to describe variability among sites on the basis of a number of characteristics. Four general site characteristics are investigated. These are (1) permanence of site occupation; (2) season of occupation; (3) range and types of activities represented; and

(4) size of groups that lived at or visited the sites. In the following chapters, these four dimensions of site use are investigated for four sites in the Oconee Province.

CHAPTER VI
FOUR SITES

Each of the sites considered in this study was excavated by the University of Georgia as part of the Wallace Reservoir Archaeological Project. Several kinds of information, gathered during the initial survey of the Wallace Reservoir, led to intensive investigation of these four sites. These are the apparent contemporaneity of the sites and the variability among them in terms of site size, location, and content. An investigation of differences and similarities among sites in the Oconee Province must begin with a description of these basic attributes. In this chapter, site size, plan, location, and selected aspects of site content are summarized for each of four sites. The summary descriptions presented in this chapter form the basis for more specific hypotheses about each site. These hypotheses, in subsequent chapters, are tested through detailed analyses of faunal remains and of ceramic vessel forms recovered from each site.

More detailed descriptions of three of these sites are presented in a series of site reports on file at the University of Georgia. Much of the descriptive data presented in this chapter are taken from the following sources: Marvin Smith's (1981) report on excavations at the Dyar site; Marvin Smith, David Hally, and Gary Shapiro's (1981) report of excavations at the Ogeltree site; and Gary Shapiro's (1981) report on excavations at site 9Ge175. The following attributes are described here on a site-by-site basis:

1. The immediate environment: Topographic and physiographic features are described for a 1 km radius around each site.

2. Site size, plan, and content: Included here are descriptions of site excavations, stratigraphy, and prominent feature types. Because floral remains and stone artifacts were relatively infrequent at each site, these remains have not been the subject of detailed analyses. Floral and lithic materials recovered from each site are summarized in this section.

3. Chronology: Here are temporal placement of each site within the 300-year Lamar period is examined.

The Dyar site (9Ge5) is located in the northern portion of the reservoir, while the three remaining sites (Ogeltree, Punk Rockshelter, and 9Ge175) are located in the southern portion of the reservoir (Figure 9). In addition to these four sites, Figure 9 shows the location of site 9Ge35. Site 9Ge35 is a Lamar village site with a single-mound. Unfortunately, the University of Georgia was unable to conduct excavations at this site because it was outside the project boundaries. Nevertheless, it is important to be aware of the existence of this single-mound Lamar site which is located so near the small sites examined in this study. It is possible that in some way, small sites in the

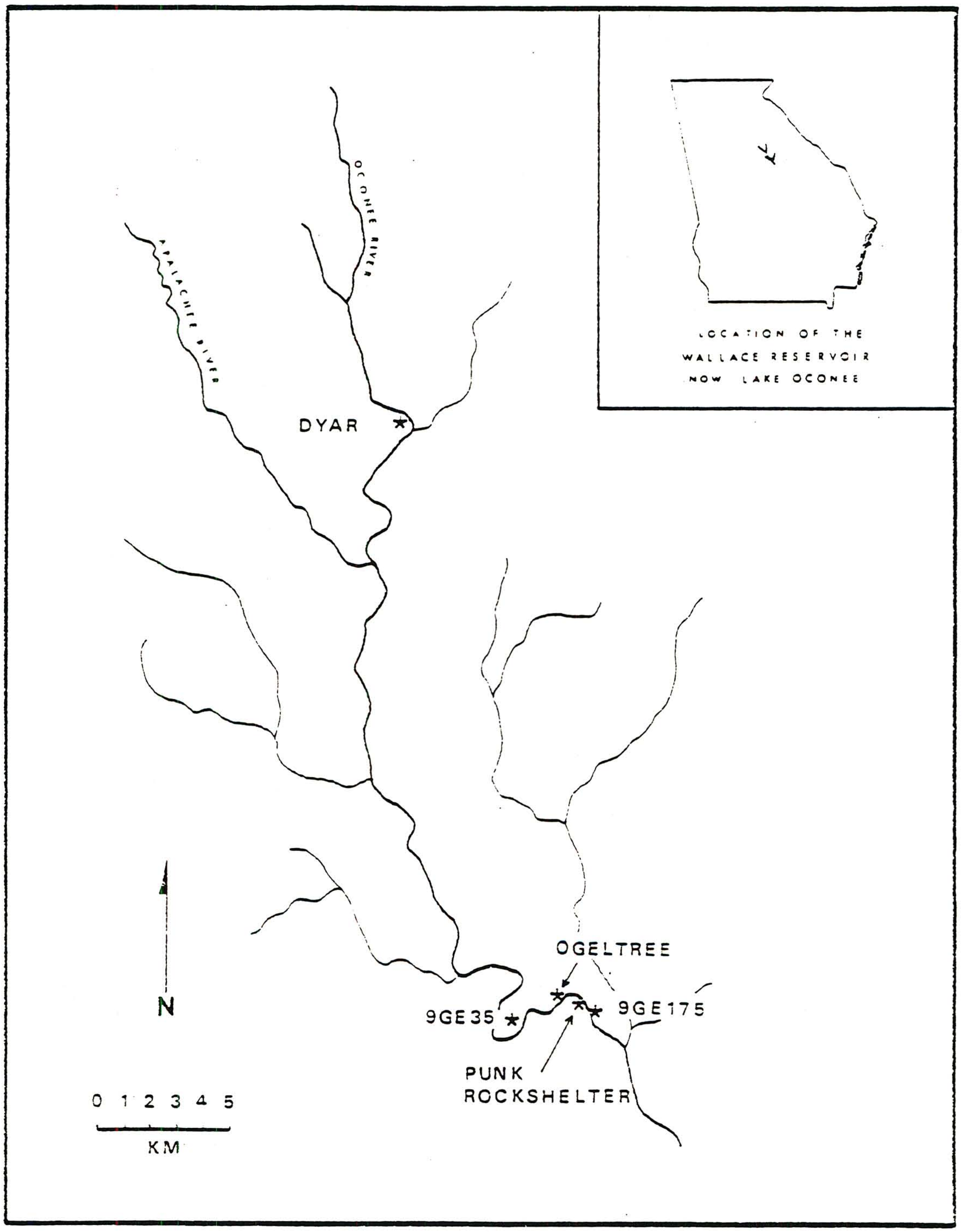


Figure 9. Site locations.

southern portion of the reservoir were affiliated with the village at 9Ge35. The nearest multiple-mound site to 9Ge35 and to other sites in the southern portion of the reservoir is Shoulderbone, at a distance of approximately 18 km to the east. Similarly, the nearest multiple-mound site to the Dyar site is Scull Shoals, at a distance of about 19 km to the north. The Dyar site is 24 linear-km or 39 river-km from site 9Ge35. If multiple-mound sites are villages which held sway over populations at single-mound sites, then the sites in the northern and southern portions of the Wallace Reservoir may have belonged to separate social or political territories within the Oconee Province.

Of the four sites compared in this study, only the Dyar site is large enough to qualify as a Class I site according to Lee's (1977:91) classification scheme. The remainder would be grouped together as Class III sites. These latter sites, according to Lee, are the smallest, yet most numerous Lamar period sites in the Oconee drainage. Although it is tempting to group these small sites within a single site-size class, it is important to recognize that a range of site size is represented. The smallest of these small sites is the Punk Rockshelter (30 m^2) and the largest is the Ogeltree site (1,568 m^2). Interestingly, all of these sites are smaller than the average size of Lee's Class III sites, 2,919 m^2 (Lee 1977:91).

The Dyar Site

The Dyar site consists of a large platform mound and an associated village of approximately 2.5 ha. The site is situated on the right bank of the Oconee River, 4.8 km above its confluence with the Apalachee River (Figures 9 and 10). The Dyar site is located in the largest expanse of river floodplain in the study area. The segment of floodplain contiguous with the Dyar site is more than 7 km long and in places, over 1.5 km wide. Floodplain soils occupy approximately 57% of the area within a 1 km radius of the Dyar site. The site is bordered on the north and and east by the Oconee River, and by an extensive swamp on the southwest. About 0.7 km southwest of the Dyar site, surface elevations rise abruptly to 30 m above the level of the floodplain.

Although the Dyar site has been known to archaeologists since the nineteenth century (Jones 1878), the first systematic research at the site was conducted as part of the University of Georgia's Wallace Reservoir Archaeological Project (DePratter 1976). Intensive excavations at the site, directed by Marvin Smith, were conducted from the fall of 1977 to the fall of 1978.

Excavations revealed that the Dyar village was occupied continuously from late Etowah to the protohistoric period (A.D. 1100-1600). Analysis of sherd frequencies from stratigraphically controlled contexts at the Dyar site

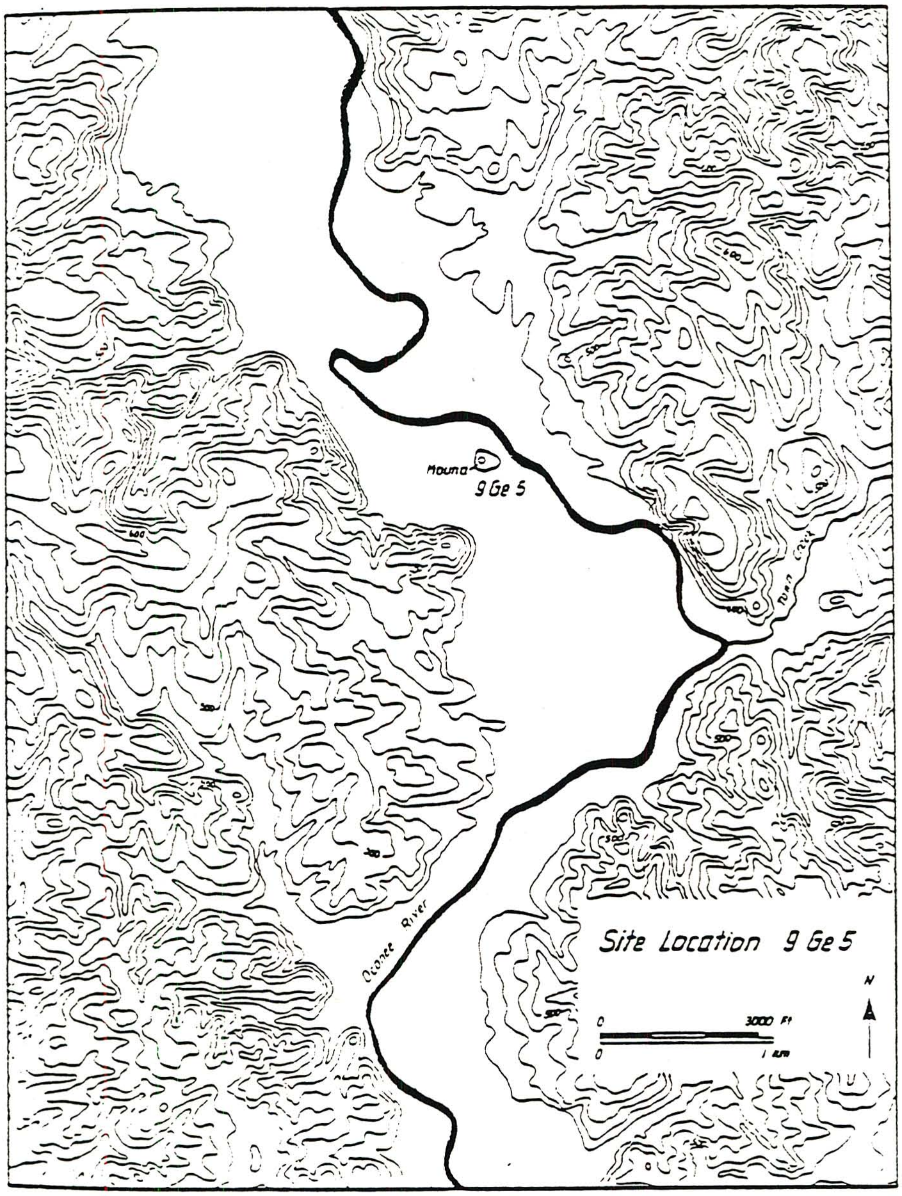


Figure 10. Location of the Dyar site.

enabled development of a relative chronology which can be applied to ceramic collections from other sites in the Oconee Province (M. Smith 1981:182). Four archaeological phases have been defined. Estimated absolute dates for these phases, although based on a few reliable radiocarbon determinations from the Dyar site itself, rely heavily on comparisons with other well-dated sites. Estimated dates for the four phases are

Stillhouse	- A.D. 1100-1300
Duvall	- A.D. 1300-1450
Dyar	- A.D. 1450-1600
Bell	- A.D. 1600-1680

The Stillhouse phase is the local expression of a late Etowah occupation and is similar to Etowah III as described for northwest Georgia (M. Smith 1981). The Duvall phase is a local manifestation of the early Lamar period. Ceramics dating to the Dyar phase constitute the local assemblage that most closely resembles Lamar ceramics as described from the Lamar type-site in central Georgia (Jennings and Fairbanks 1939). This phase is marked by the appearance of the pottery type, Lamar Incised, and by an increased frequency of Lamar Complicated Stamped in the ceramic assemblage. There are some criteria that enable a distinction between early and late Dyar phase ceramic assemblages, although there has yet been no attempt to assign either absolute dates or a new phase name to the transition.

The criteria for a distinction between early and late Dyar phase ceramics will be discussed in Chapter VIII. The Dyar phase differs from the clearly protohistoric Bell phase in that stamping virtually disappears during the latter. Differences between these phases are also apparent in incising motifs and in the elaboration of rim treatment techniques. It is important to note that there is clear evidence of stylistic continuity between phases. In several cases ceramic types which are diagnostic markers for the beginning of one phase continue to be present in the early portion of a subsequent phase. It should be stressed that these phases are somewhat arbitrary divisions within a continuum of longer-term ceramic trends.

The single mound at the Dyar site was conical in shape and rose to a height of 10.3 m above the surrounding ground surface. The base of the mound was approximately 52 m in diameter. The gently sloping southeastern side of the mound may have been a ramp leading to the mound summit. It is clear that the earliest mound stages date to the Stillhouse phase, and that new stages were periodically added to the mound during the subsequent Duvall and Dyar phases. No human burials were located in the Dyar mound. Throughout the occupation of the Dyar site, the mound served as a platform for structures of civic or ceremonial importance.

The configuration of structures on the mound was different at different times. For instance, during the early Dyar phase the mound summit had multiple levels. The higher, western level (away from the ramp) supported paired rectangular structures which were connected by a passageway. The lower, eastern portion of the mound supported an open shed, facing east, which contained paired hearths. This configuration of mound structures was rebuilt several times during the Dyar phase. Sometime during the late Dyar phase however, rebuilding of the northwestern structure ceased. The southwestern structure, on the other hand, continued to be rebuilt each time a layer of earth was added to the mound summit.

The entire village area of the Dyar site was blanketed by a thick layer of culturally sterile alluvium that ranged in thickness from 45 m to 160 cm. A nineteenth century button was recovered in a stratum directly beneath the alluvium. This indicates that the sterile alluvium was of recent origin. The stratum directly beneath the alluvium averaged 15 cm in thickness and is interpreted as a nineteenth century plowzone. A third stratum consisted of aboriginal midden. This layer was a fine sandy loam stained dark with organic material. The midden ranged between 25 and 60 cm in thickness. The aboriginal midden was underlain by a culturally sterile tan sandy loam.

Because the site was covered by a thick blanket of sterile alluvium, it was difficult to excavate extensive portions of the village area. A series of trenches, excavated with a backhoe, enabled identification of village limits (Figure 11). Near the center of the village, profiles of backhoe trenches revealed a rectangular area, approximately 40 x 65 m that was void of midden and had very few artifacts. This rectangular area extends southeast from the mound and is interpreted as a plaza.

Backhoe trenches enabled location of at least 17 structures in the village area. Two structures (Structure 1 and Structure 4) were excavated in their entirety, while about two-thirds of a third structure (Structure 2) was excavated. Test units, ranging from 2 x 2 m to 3 x 3 m in size, were excavated in another 7 of the 17 structures located by the backhoe. Village structures were generally rectangular or square, and ranged from 5.5 to 7.5 m on a side. Structure floors were slightly depressed or dished-out. Three village structures are briefly described below.

Structure 1 measured approximately 5.5 m on a side. A wall-trench entranceway was located near the southwestern corner of the structure. The entranceway was oriented toward the center of the site. The backhoe trench which enabled initial identification of Structure 1 passed directly through the center of the structure. It is likely

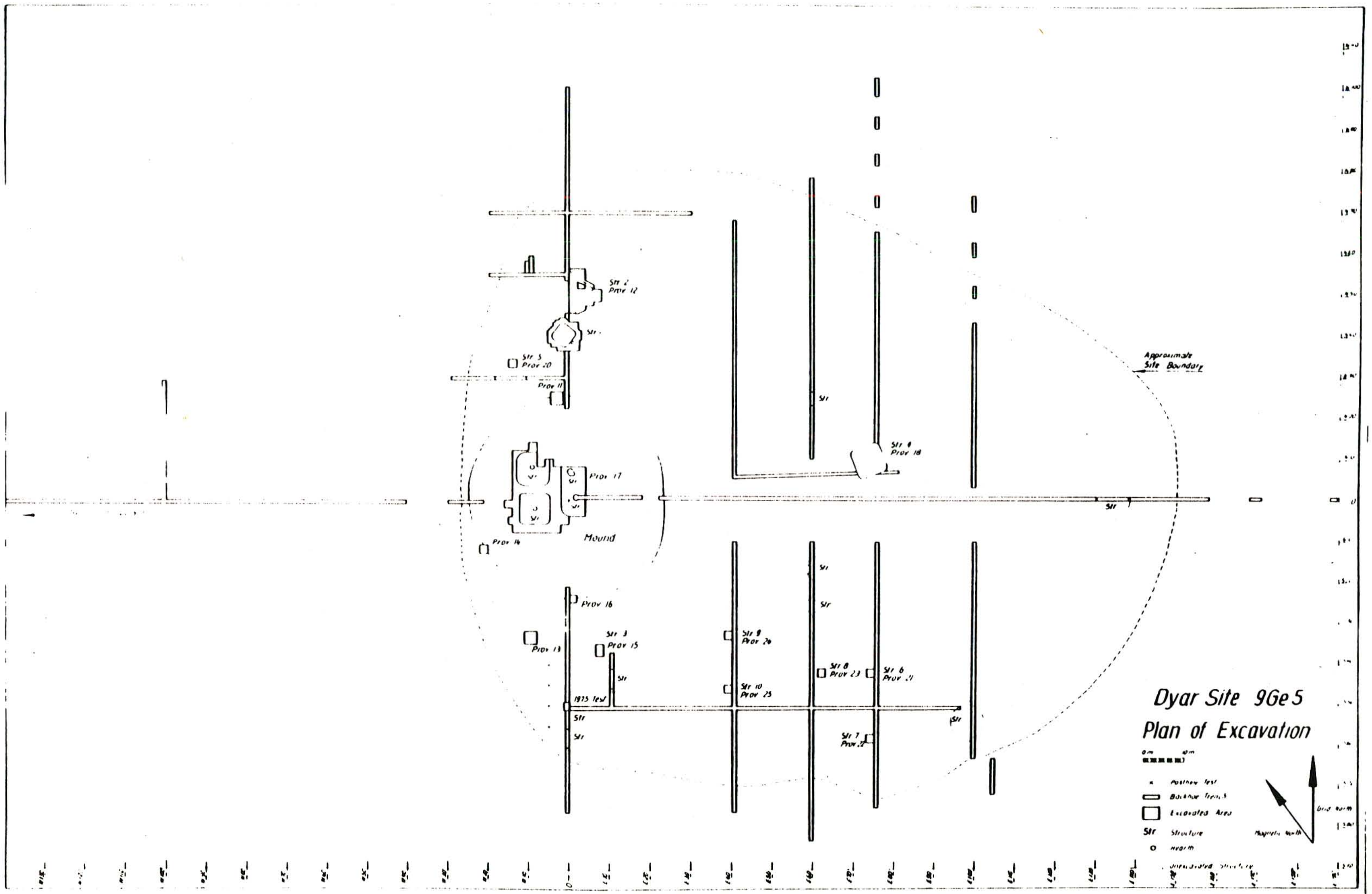


Figure 11. Plan of excavations at the Dyar site.

that the backhoe obliterated any evidence for a central hearth which may have been present. Structure 1 was built during the Duvall phase and had burned.

Many potsherds were found scattered over the floor of Structure 1. In contrast to the abundance of ceramics, stone tools and lithic debris were infrequent. Only a single flaked-stone tool (a small, triangular quartz projectile point) was found within the structure. Sixty-five pieces of debitage, mostly of locally available quartz, were recovered by screening through 1/4-in mesh. Sixteen liters of soil from the house floor were processed through 1/16-in mesh. This fine-screened sample yielded 15 additional flakes. Ground-stone tools were also rare at Structure 1. Only two grinding stones, or metates, were located.

Four plant genera contributed the majority of floral remains recovered from Structure 1. These are *Zea maize* (corn), *Carya* sp. (hickory), *Quercus* sp. (oak acorns), and *Phaseolus vulgaris* (bean). Seven additional plant genera were represented in small amounts in Structure 1. These are *Juglans* sp. (walnut), *Passiflora incarnata* (maypop), *Vitus* sp. (grape), *Diospyros virginiana* (persimmon), *Polygonum* sp. (smartweed), *Euphorbia* sp. (shrubs which grow in cleared areas), and *Prunus* sp. (wild plum).

Six burials were located during excavation of Structure 1. Of these, only two burials are clearly associated with the structure. The remaining four individuals were either outside the structure or intrusive through its collapsed remains. In addition to burials, six features located during the excavation of Structure 1 include a possible "urn burial" (these are infants interred in jars with an inverted bowl as a lid), three large refuse-filled pits, a small circular pit filled with charred acorns, and a small pit filled with charred corn cobs.

Structure 2 was a rectangular structure (approximately 7.2 x 6.6 m) that had burned and had been rebuilt three times during the Dyar phase. Approximately two-thirds of the structure was excavated. Unlike Structure 1, Structure 2 did not have an apparent wall-trench entranceway. A red clay hearth, consisting of an irregular area of burned clay, was located near the center of the structure.

As at Structure 1, ceramics were plentiful and stone artifacts were rare in Structure 2. No bifacially flaked stone tools were found within the rebuilt structure floors. Ground-stone tools consisted of two celts, a hammerstone, an anvil stone, and one miscellaneous ground-stone fragment. Several methods of recovery were employed in the excavation of Structure 2, and this greatly impairs any interpretation of floral remains. Small amounts of corn cupules and kernels, hickory shell, maypop seed, and locust seed were recovered from Structure 2.

Five burials were located during the excavation of Structure 2. Two of these were disturbed by a backhoe trench and their relationship to the three successive floors of the structure is not known. The remaining three burials appear to have originated with the upper or middle floors of Structure 2. Two of these are infants interred in ceramic vessels (urn burials). The third is an adult female (approximately 21 years of age) flexed on her right side and accompanied by two Lamar Bold Incised ceramic vessels.

Structure 4 was a burned structure measuring 7.5 m on a side. The structure was occupied and burned entirely during the Duvall phase. No prepared clay hearth was visible in the center of the structure. The center of the floor, however, did appear to have been fired to a hard surface. No clear evidence for an entranceway was found. Numerous complete and nearly complete ceramic vessels were located on the floor of Structure 4, and this has been interpreted as evidence that the structure was abandoned rapidly due to fire.

As in Structures 1 and 2, chipped-stone artifacts were rare in Structure 4. A single bifacially flaked stone tool (possibly a scraper or a core) was found in the structure. Recovery methods during the excavation of Structure 4 consisted solely of saving those artifacts noted while trowelling. This method of recovery limits interpretation of stone debitage recovered from the structure floor. A total of 9 utilized and 43 nonutilized flakes was recovered. Ground-stone artifacts were somewhat more abundant in Structure 4 than in other structures. Ground-stone tools consisted of a carefully prepared mano, a quartzite cobble abrader, two grooved abraders, a large quartzite cobble hammerstone, and a flat grinding stone which was associated with red pigment.

A few soil samples, of 1 l each, were processed through 1/16-in mesh in the laboratory. These yielded a small amount of floral remains, which included corn kernels and cupules, hickory shell, a single acorn cap, and four maypop seeds. Because the floor of Structure 4 was located at the same level as the water table, it was not possible to excavate below the floor to locate postholes, burials, or other features.

This brief description of the Dyar site may be summarized as follows. The Dyar site consisted of a substructure conical mound associated with numerous domestic structures which were arranged around a central plaza. The village appears to have been occupied continuously from approximately A.D. 1100 to A.D. 1550. The site is located in a large floodplain which included tracts of soils favorable for growing plant crops. Corn and beans, two cultigens that were of great importance to all Mississippian societies, are abundant in excavated contexts at the Dyar site. A wide variety of archaeological features was noted at the Dyar site. These include burials, structures, hearths, pits filled with refuse, and pits filled with charred plant materials. While the mound and plaza provide evidence for public ritual, it is clear from the numerous structures and rich midden deposits that the Dyar site was largely a place of residence for Lamar peoples.

The Ogeltree Site

The Ogeltree site, 9Ge153, is situated on the left bank of the Oconee River at Long Shoals (Figure 12). A University of Georgia survey team recognized the site in 1975 when pottery sherds were seen eroding from the bank of a small creek (DePratter 1976).

Long Shoals is in the southern portion of the Wallace Reservoir. It is the first in a series of major shoals created where the Oconee River flows over resistant rocks of the Siloam Granite formation. The river channel is shallow, broad, and filled with islands in many places. What little floodplain that exists is found on the islands, or in small pockets where creeks empty into the river channel. The Ogeltree site is located on one of these restricted pockets of floodplain where a small creek meets the river. Within a 1 km radius of the site, 15% of the area (including islands) consists of floodplain soils.

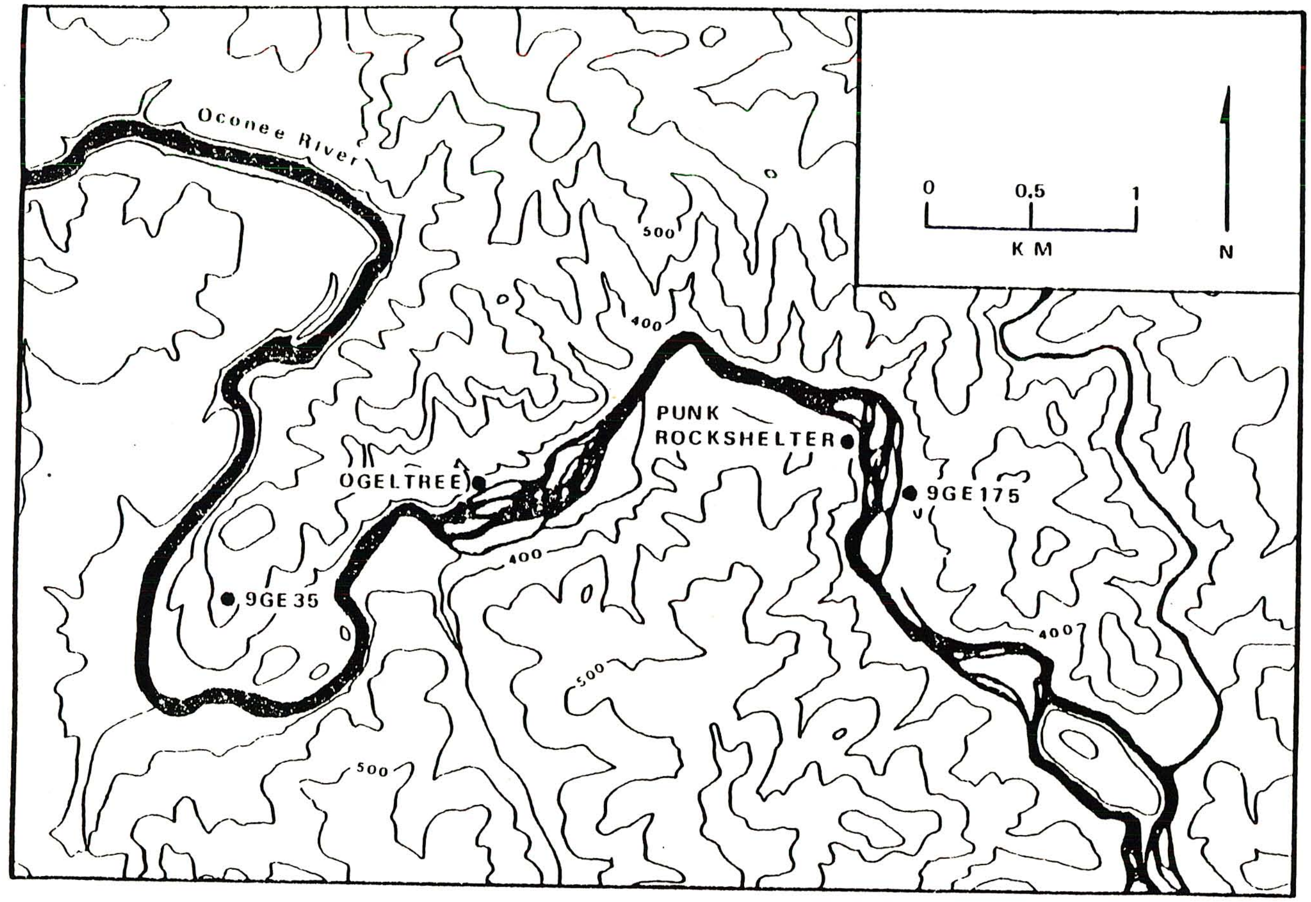


Figure 12. Sites located near Riley and Long Shoals.

Within 0.6 km of the site, elevations range from 126 m at the shoals to 180 m in the uplands. The site is bounded by uplands on the north, west, and east, and by the river channel on the south. The highest elevation within a 1 km radius of the site is approximately 53 m above the river floodplain.

Posthole tests, excavated during the summer of 1978, revealed a 639 m^2 area of dense shell midden. Surrounding the dense shell midden is another 960 m^2 of midden with a lower density of shell (Figure 13). Taken together, the posthole tests and the surface distribution of mollusc shell suggest 1,600 m^2 as a maximum estimate of site size.

Stratigraphy at the site consisted of an uppermost layer of humus mixed with a few Lamar artifacts and mollusc shell. Underlying this was the Lamar midden. The midden layer varied in thickness from about 10 to 30 cm. In portions of the site it was possible to distinguish two natural strata within the Lamar midden. The uppermost midden stratum consisted primarily of black midden soil with some shell. The underlying midden showed a higher proportion of shell to soil and, in general, better preservation of faunal remains than the uppermost midden level. Beneath the Lamar midden was a layer of brown sand that contained artifacts diagnostic of several Woodland and Archaic periods. The brown sand layer varied in thickness from 0 to 60 cm. Site stratigraphy was somewhat

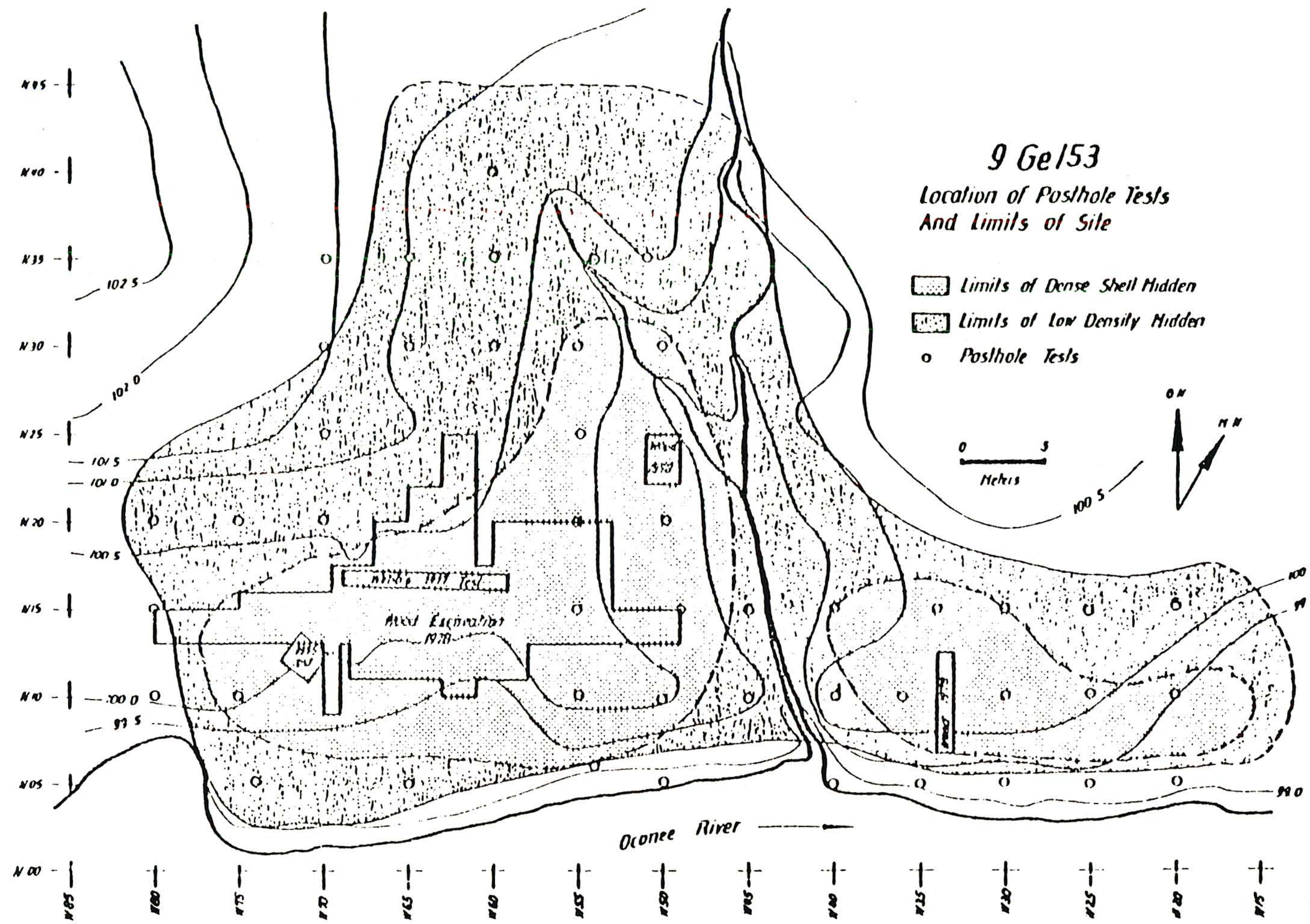


Figure 13. Distribution of shell midden at the Ogeltree site.

variable because archaeological deposits were underlain by an irregular granite bedrock surface. In places, the granite bedrock was just below ground surface while in others, it was overlain by as much as 80 cm of soil and midden.

In an unfortunate accident, a Georgia Power clearing contractor, using power equipment, stripped the site of vegetation before excavations could begin. To evaluate the damage done to the site by the clearing contractor, a crew under the direction of Paul Webb excavated a 1 m wide, 10 m long trench across the central portion of the site (Figure 13). Webb's test revealed that while the uppermost portion of Lamar midden was disturbed, intact shell midden was present throughout the length of the trench.

Excavations, under the direction of Dean Wood, began in June, 1978, and continued until August, 1978. Excavations began in a 5 x 5 m area immediately south of Webb's trench. After a layer of disturbed humus and shell midden was removed and discarded, Lamar midden in this portion of the site was excavated in two levels. The uppermost midden layer, composed of dark midden with sparse shell, was designated Level Ia. The underlying stratum of midden with a higher proportion of shell was designated Level Ib. Excavation was conducted in 1 x 1 m squares. All soil was passed through 1/4-in hardware cloth and soil samples of 1 liter volume were taken from each level in each square.

In portions of the site outside the initial 5 x 5 m area, excavation and recovery techniques varied somewhat. In some areas which were excavated in 1 x 1 m squares it was not possible to distinguish two natural strata within the shell midden. Thus, the Lamar shell midden was excavated as a single level and was designated Level I. In these areas, recovery was by screening through 1/4-in mesh. Taken together, Lamar midden from a 78 m^2 area was processed through 1/4-in screen. For an additional 104 m^2 area, Lamar midden was excavated without reference to 1 x 1 m units. The objective of these latter excavations was to expose a large area of the underlying brown sand and thereby reveal and record postmolds and other features attributable to the Lamar component. In these areas midden was shoveled into wheelbarrows and disposed of without screening. Figure 14 shows recovery methods and level designations used in different areas of the Lamar midden.

A comparison of ceramic frequencies from Levels Ia and Ib indicated that although the lower level (Ib) does have a greater (but still low) frequency of earlier types (such as check stamped, brushed, simple stamped, cord marked, fabric marked, and Etowah Complicated Stamped), there is very little difference in the relative frequencies of various Lamar pottery types between the two levels. This evidence, and the fact that none of the 16 features located at the site were observable in Level Ia, suggests that Level Ia

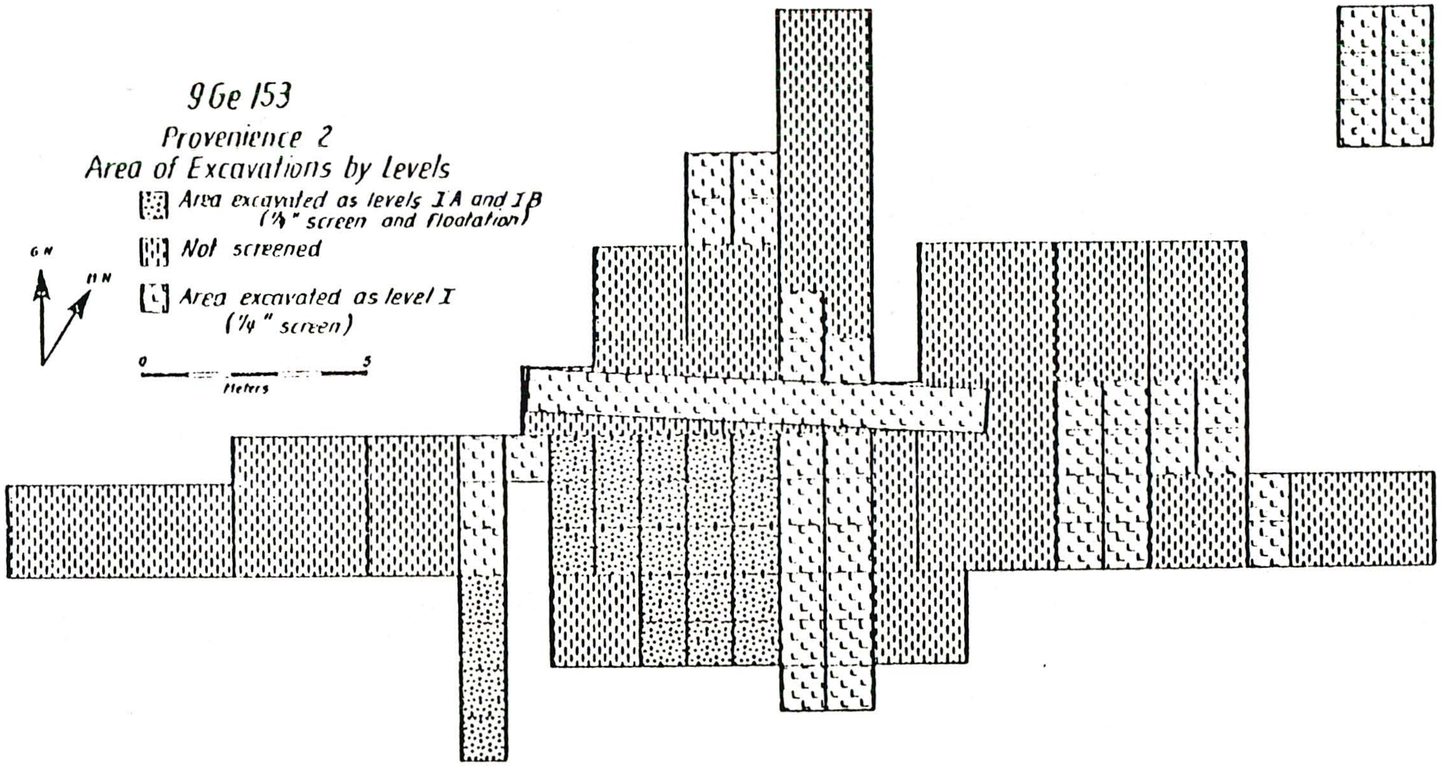


Figure 14. Plan of excavations at the Ogeltree site.

represents a relic plowzone which originated during the nineteenth century occupation of nearby Curtwright Factory. Thus, the two levels, Ia and Ib, probably represent a single Lamar occupation.

The relative frequencies of Lamar ceramic types indicate that the Ogeltree site was occupied during the early Dyar phase. The motifs on Lamar Incised pottery from the site show simple designs, usually consisting of two or three line elements. These motifs are indicative of the earliest Lamar Incised ceramics in the Oconee drainage and support the contention that the Lamar occupation at the Ogeltree site dates to the early Dyar phase, around A.D. 1400-1450. It appears that the Lamar component at the Ogeltree site represents a relatively short-term, but intensive occupation.

Twenty-one bifacially chipped stone tools were recovered from the Lamar midden and from the surface of the Ogeltree site. These include projectile point types which range from the Transitional Paleo-Indian period (two Dalton points) to the Lamar period (three small triangular points). Seven tools are varieties of the Early Archaic Kirk Corner Notched type (Cambron and Hulse 1975). Four points are Woodland types that may have been incorporated into the Lamar component through disturbance of underlying Woodland levels. Three tools are small triangular points characteristic of the Lamar period. The five remaining bifacially chipped stone tools are nondiagnostic forms. It is not presently clear whether the inclusion of earlier projectile point types in the Lamar midden reflects the collection and use of these tools by Lamar inhabitants of the site or is a result of incidental mixing of artifacts from earlier occupations.

Chipped-stone debitage from a 24 m^2 area of the Lamar component at the Ogeltree site was examined. In this sample only three thinning or retouch flakes were identified (recovery was by 1/4-in mesh). An additional 27 fragments of flakes were categorized as "debris." These are portions of flakes which could not be categorized as either thinning/retouch or percussion flakes. Ground-stone tools were rare at the Ogeltree site. Only 15 ground-stone artifacts were recovered from the entire Lamar midden. Five of these were simple hammerstones. Six ground-stone tools are stones which show evidence of abrasion along one or more edges. The use of these "edge-use implements" is unknown. Two ground-stone discs of unknown use were recovered, and a single polished stone fragment appears to have been the bit portion of a polished stone celt.

At least 321 postholes and 10 of the 17 features recognized during the excavation of the Ogeltree site can be confidently assigned to the Lamar occupation (Figure 15). Three of the Lamar features (Features 3, 10, and 11)

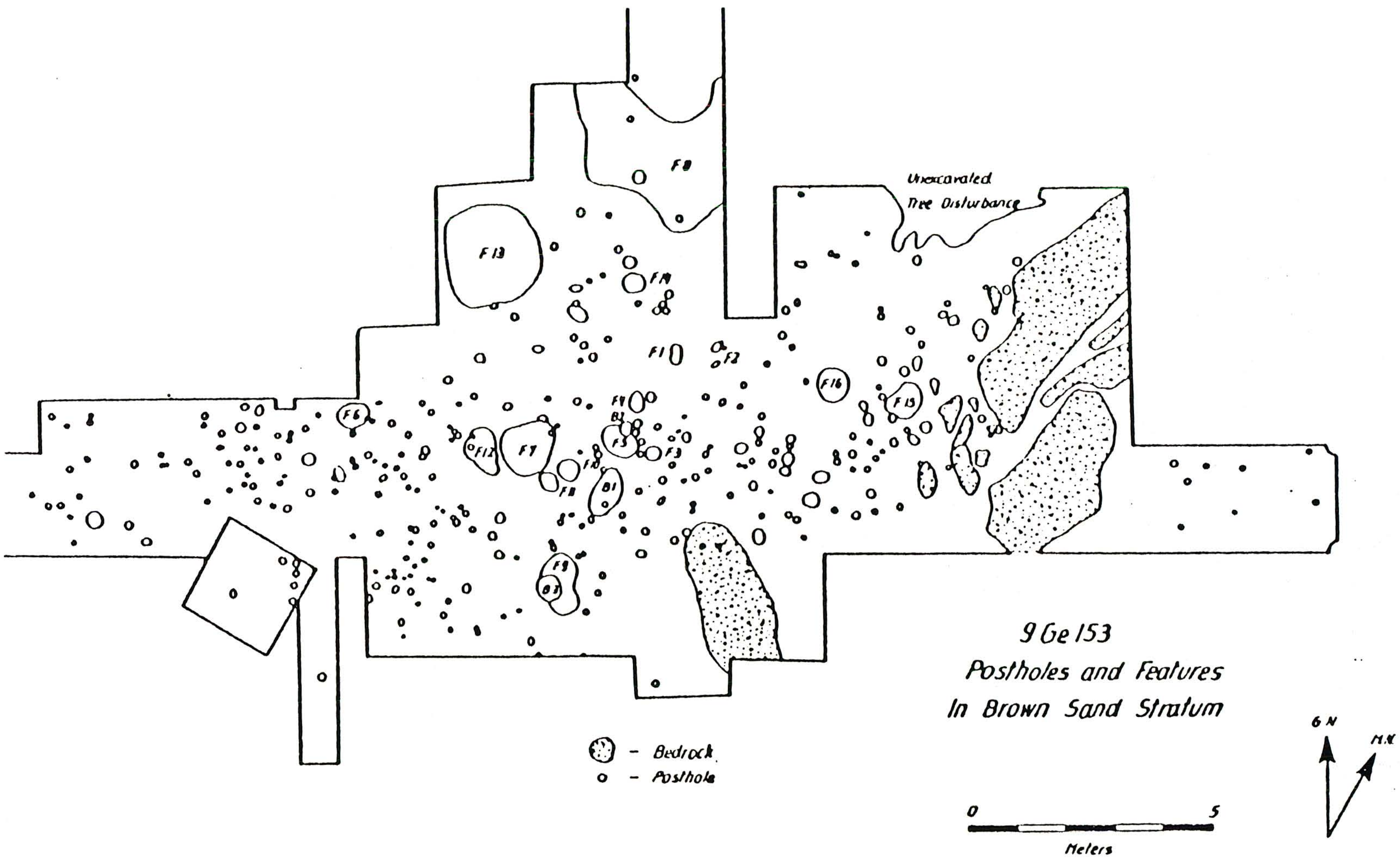


Figure 15. Features at the Ogeltree site.

are shallow, oval pits of unknown function that may simply have been unusually large postholes.

Two features, Feature 7 and Feature 15, are best interpreted as hearths. Feature 7 was an oval shaped area of fired clay with a horizontal, but irregular surface. This feature, which measured 144 x 94 cm, originated in Level Ib. A flotation sample taken from one of two slight depressions in the feature's surface yielded small amounts of charred maize and hickory shell. Feature 12, a 21 x 30 cm lens of ash, was located adjacent to Feature 7. Conceivably, Feature 12 may have been composed of ashes that were removed from the hearth, Feature 7.

Feature 15 is a second oval shaped area of fired clay. This feature measured 150 x 70 cm. Because Feature 15 was located in an area where midden was rapidly stripped away to expose features, it is impossible to know at what level the feature originated. In form, this feature was very much like Feature 7. As in Feature 7, a depression in the center of Feature 15 contained dark midden fill with shell, charcoal, and rock. Flotation of this fill yielded small amounts of maize and hickory shell. It should be noted that maize and hickory are known only from these two features at the Ogeltree site.

Three features at the Ogeltree site were burial pits. Burial 1 was a young adult, probably a female. Burials 2 and 3 were both infants of unknown gender. All three individuals were flexed and were lying on their left side. All three burial pits were first recognized in Level Ib. Although the burial pits were noticed only a few centimeters below the elevation of Feature 7, the burials appear to be clustered around the Feature 7 hearth. None of the individuals appear to have been accompanied by grave goods.

The numerous postholes at the Ogeltree site suggest the presence of structures of some kind. Unfortunately, there are few clear alignments of posts. A pattern does emerge, however, when postmolds with charcoal or ash fill are plotted separately from other postmolds. The distribution of postmolds with charcoal or ash fill suggests the presence of a structure measuring 5 x 6 m and oriented 70 degrees east of north (Figure 16). The hearth, Feature 7, is located near the center of this rectangle. In a pattern similar to structures excavated at the Dyar site, the three human burials are located near the hearth and are oriented parallel to the walls of the structure.

Although there are similarities between the structure recognized at the Ogeltree site and those known from Lamar village sites (such as the Little Egypt site, the King site, and the Dyar site), there are some notable differences. Unlike structures excavated at Lamar village sites, the wall posts at the Ogeltree site are generally smaller. Most posts at the Ogeltree site range between 10 and 15 cm in diameter, while those from structures at

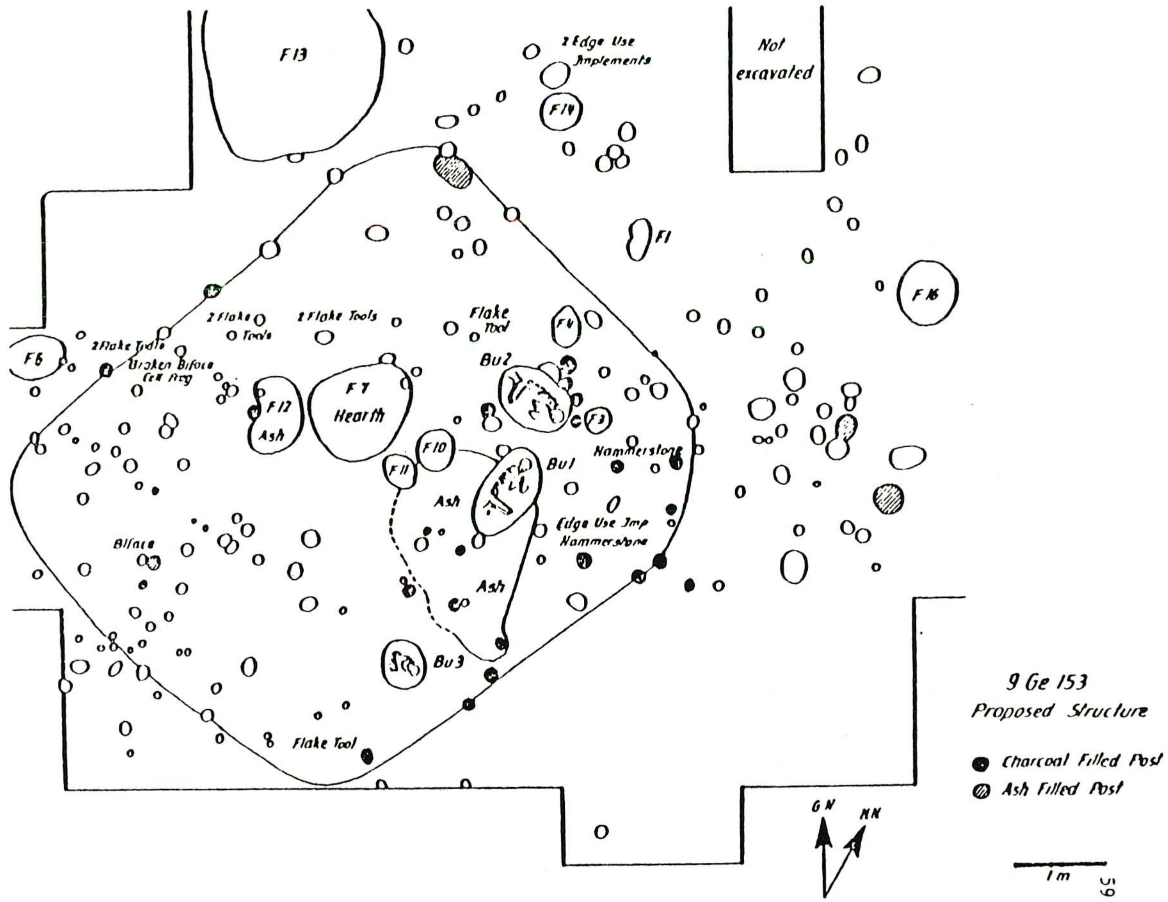


Figure 16. Structure at the Ogeltree site.

the Little Egypt site, the King site, and the Dyar site range between 15 and 25 cm in diameter. A second contrast is that while burials in village structures are usually placed 30 cm or more below the structure floor, burials at the Ogeltree site were found only a few centimeters below the elevation of Feature 7 and its associated ash lenses that may represent the structure floor.

Taken together, there is much evidence for the existence of a structure at the Ogeltree site, but for a structure that differs in some respects from those known from the Dyar site and other Lamar village sites. Architectural differences, such as the smaller size of wall posts and the informal hearth, suggest that the structure at the Ogeltree site was not as substantial or elaborately prepared as those in villages. The shallowness of graves at the Ogeltree site may indicate that the surviving occupants of the house did not intend to remain at the site long after the individuals were buried.

The Punk Rockshelter

The Punk Rockshelter, 9Pm211, is situated on the right bank of the Oconee River at the upper end of Riley Shoals (Figure 12). Riley Shoals is the second major rapids created where the river flows over the resistant bedrock of the Siloam Granite formation. Riley Shoals begins 1.8 km downstream from the eastern end of Long Shoals. Unlike the broad, shallow, and rocky river channel at Long and Riley Shoals, the segment of the Oconee River between these two major rapids is narrow and relatively deep.

The shelter itself is composed of large granitic boulders which are part of the same formation that creates the shoals. The site is at the northern terminus of a ridge that extends from the 174 m elevation 1 km south of the site, to the 128 m elevation at the site itself. In 1978, the nearest active channel of the Oconee River was approximately 40 m northeast of the site. Within a 1 km radius of the site approximately 10% of the area consists of floodplain soils. The highest elevation within a 1 km radius of the site is about 53 m above the river floodplain.

The shelter itself is quite small (Figures 17 and 18). Approximately 17 m^2 of the shelter floor would have been protected from rain by the large boulder that forms the roof. Although the shelter faces north, large boulders surround the opening to the north and east. This gives the effect of an enclosed floor area with an entranceway to the west. The amount of floor space in this enclosed area, approximately 30 m^2, defines the limits of the Lamar midden.

The Punk Rockshelter was discovered by the Wallace Reservoir survey team in 1974 (DePratter 1976). At this time, a posthole test and subsequently, a 1 x 3 m test excavation revealed Lamar midden buried beneath 40 to 80 cm

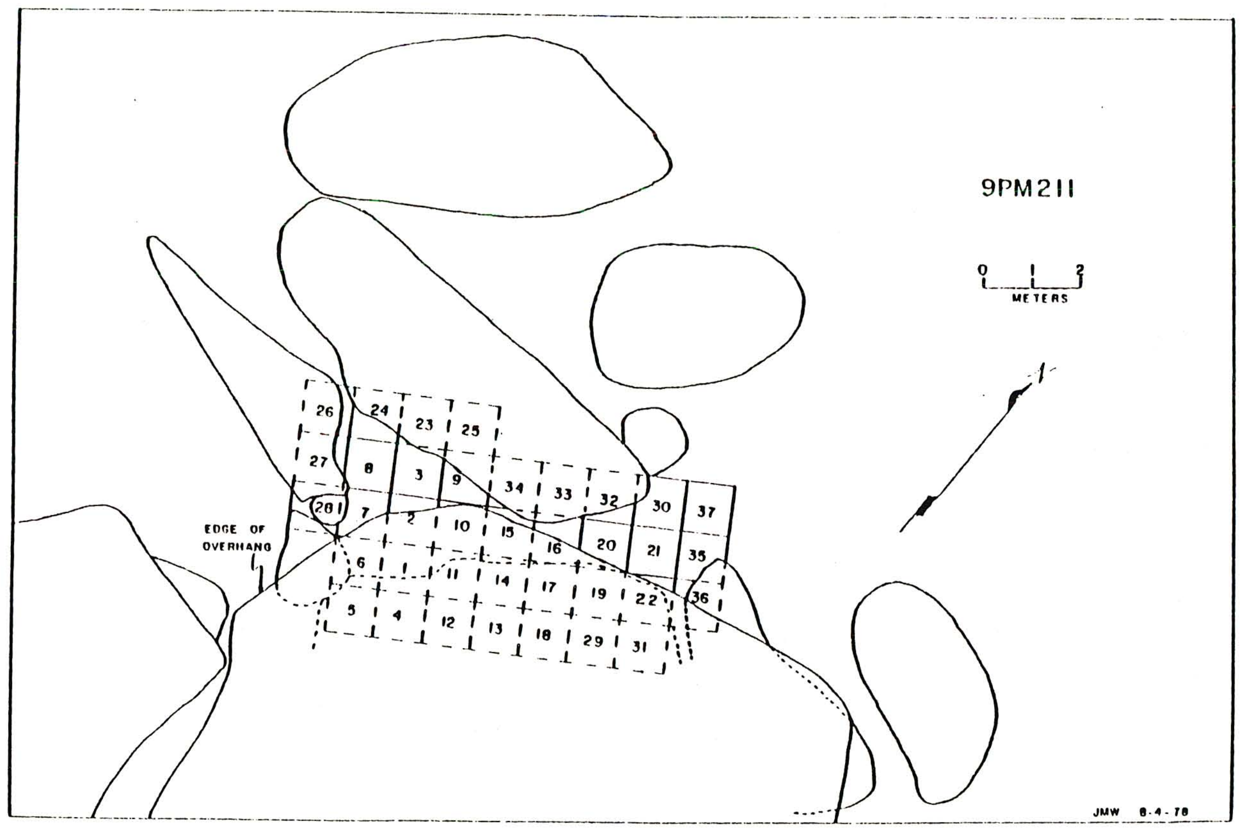


Figure 17. Plan of the Punk Rockshelter.

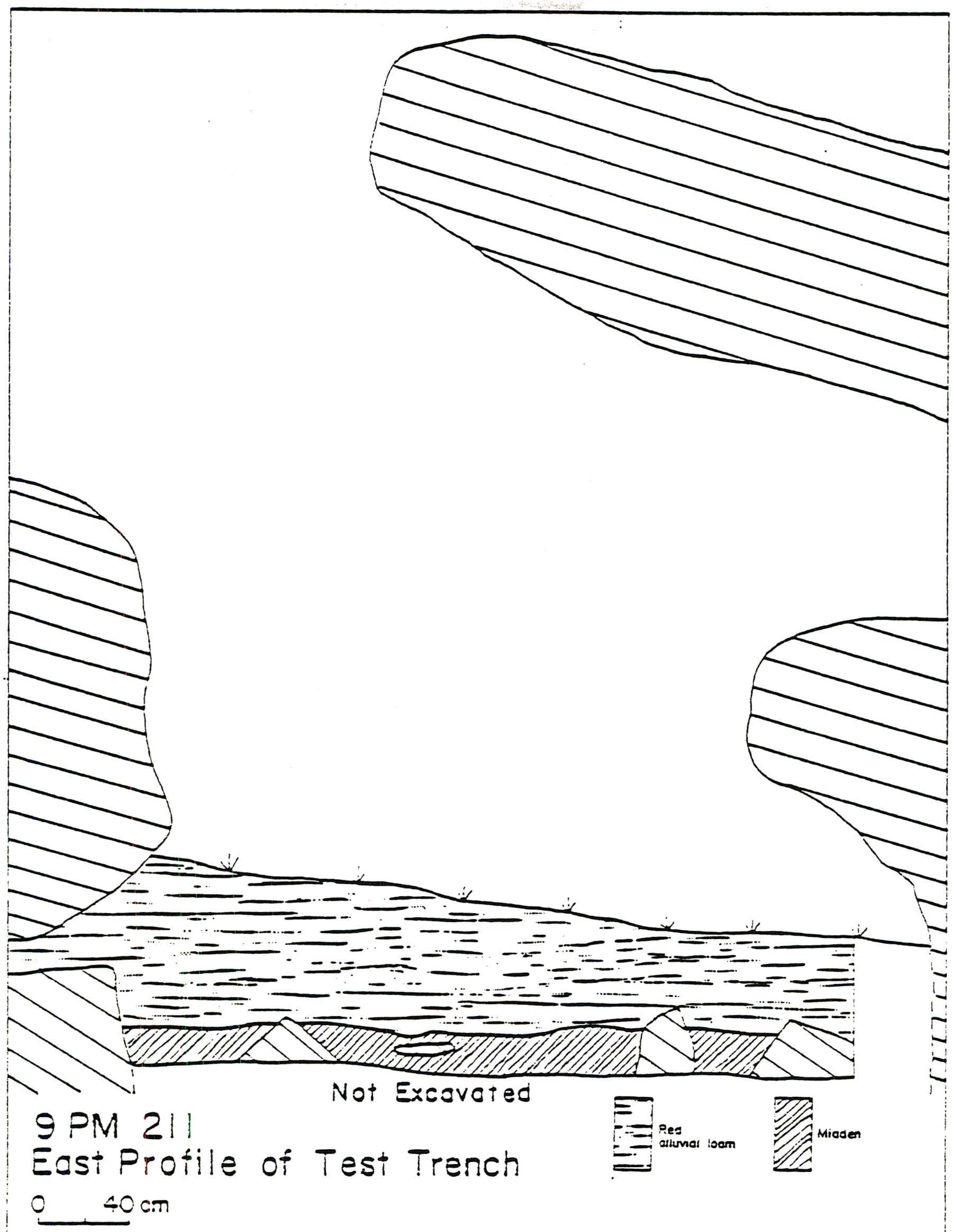


Figure 18. Profile of the Punk Rockshelter.

of recent alluvium. The midden was notable for its abundance of large fragments of ceramic vessels. Five hundred and eleven sherds, representing portions of at least 39 distinct Lamar ceramic vessels, were recovered in the 0.6 m^3 of midden that was excavated from the 1 x 3 m test pit.

Intensive excavations, under the direction of Mark Williams, were conducted in June and July, 1978. The uppermost stratum on the site consisted of a thick layer of clayey red alluvium. This layer varied in thickness from 150 cm at the eastern end of the shelter to about 30 cm at the western end. In the eastern portion of the shelter, at a depth greater than 1 m below the surface, a "pre pop-top" beer can and a fragment of clear bottle-glass was recovered in the red alluvium. This indicated that most of the alluvium had been deposited very recently. The alluvium was shoveled into wheelbarrows and disposed of without screening.

After the alluvium had been excavated to within 5 or 10 cm of the midden layer (as revealed by DePratter's test pit), a grid of 1 x 1 m squares was extended over the floor area of the site. A total of 25 squares was excavated. The midden, which ranged from about 10-15 cm in thickness, was excavated by trowelling in 10 cm levels. The midden was light brown and had a somewhat ashy appearance in places. A few small scatters of charcoal were noted, but these were not abundant. Although this stratum contained numerous large fragments of ceramic vessels, it contained little else. It was observed that screening the midden through 1/4-in and 1/16-in size mesh failed to yield faunal remains, floral remains, or lithic debitage. Thus, artifact recovery for most of the midden was by trowelling only. The only features recognized in the midden consisted of clusters of large sherds, some of which appeared to be fragments of vessels that had broken in place. Ceramics from the Punk Rockshelter indicate that the site was occupied or used almost entirely during the late Dyar phase. There are, however, a few sherds that indicate the site was visited during the early Dyar phase.

In the southernmost portion of the site, archaeological deposits were underlain by blue or gray clay. In fact, the blue clay was visible in the farthest recesses of the shelter prior to excavation. Here, the ground surface sloped radically downward to the water table. The blue color of the clay may indicate that it has not been exposed to air long enough to oxidize. This led to the hypothesis that the Punk Rockshelter may once have been the location of a spring.

In many places the midden was underlain by, or deposited between, large granite boulders. It is apparent that during the Lamar occupation of the site much of the floor area of the shelter was filled with these large tors.

Site 9Ge175

Site 9Ge175 is located on the left bank of the Oconee River at the southernmost end of Riley Shoals (Figure 12). This location is only a few hundred meters downstream from the Punk Rockshelter, which is on the opposite bank. The site, which extends approximately 15 m along the Oconee River, is naturally bounded on the west by the river channel and on the east by a series of large granitic boulders. A maximum estimate of site size is approximately 160 m^2. The area bounded by boulders displays a pronounced downward slope toward the river. In fact, this is a characteristic of much of the left bank of the river at Riley Shoals. Thus, the tracts of floodplain soils nearest to 9Ge175 are on the islands in the river channel. Some of these islands are of considerable size. The largest island presently in Riley Shoals is about 25,000 m^2 in area.

From the river channel to about 40 m east of the site, the ground rises to approximately 15 m above the elevation of the floodplain. Here, a relatively flat, ancient river terrace continues to the east for about a hundred meters before the slope to the uplands resumes. Within a 1 km radius of the site, approximately 9% of the area is occupied by floodplain soils. There is a 50 m difference between the lowest and highest elevations within a 1 km radius of the site.

Site 9Ge175 was discovered in 1975 by a University of Georgia survey team directed by Chester DePratter (DePratter 1976). The site was recognized due to the presence of numerous sherds and shell fragments which were eroding from the ground surface in the area of the large rocks. The survey team excavated five auger tests to determine the limits and thickness of the midden (Figure 19). Two auger tests, located to the east of the large boulders, encountered no archaeological materials or midden. Three auger tests, located in the sloping area to the west of the boulders, found midden that varied in thickness between 10 and 85 cm. The initial survey indicated that 9Ge175 was a small, single-component Lamar site which was intensively used and which showed excellent preservation of faunal remains.

Intensive excavations at 9Ge175 were conducted during July and August, 1978, under the direction of the author. A grid of 1 x 1 m squares was established across the site. In nearly all cases, archaeological deposits were excavated by trowelling. Excavated soils were water screened through either 1/4-in or 1/16-in mesh.

An attempt was made to excavate the site according to its natural strata. When a given stratum extended over 10 cm in depth, a second field specimen (lot) number was assigned. Due to the limited time allotted for the excavation of 9Ge175, it was decided to excavate several

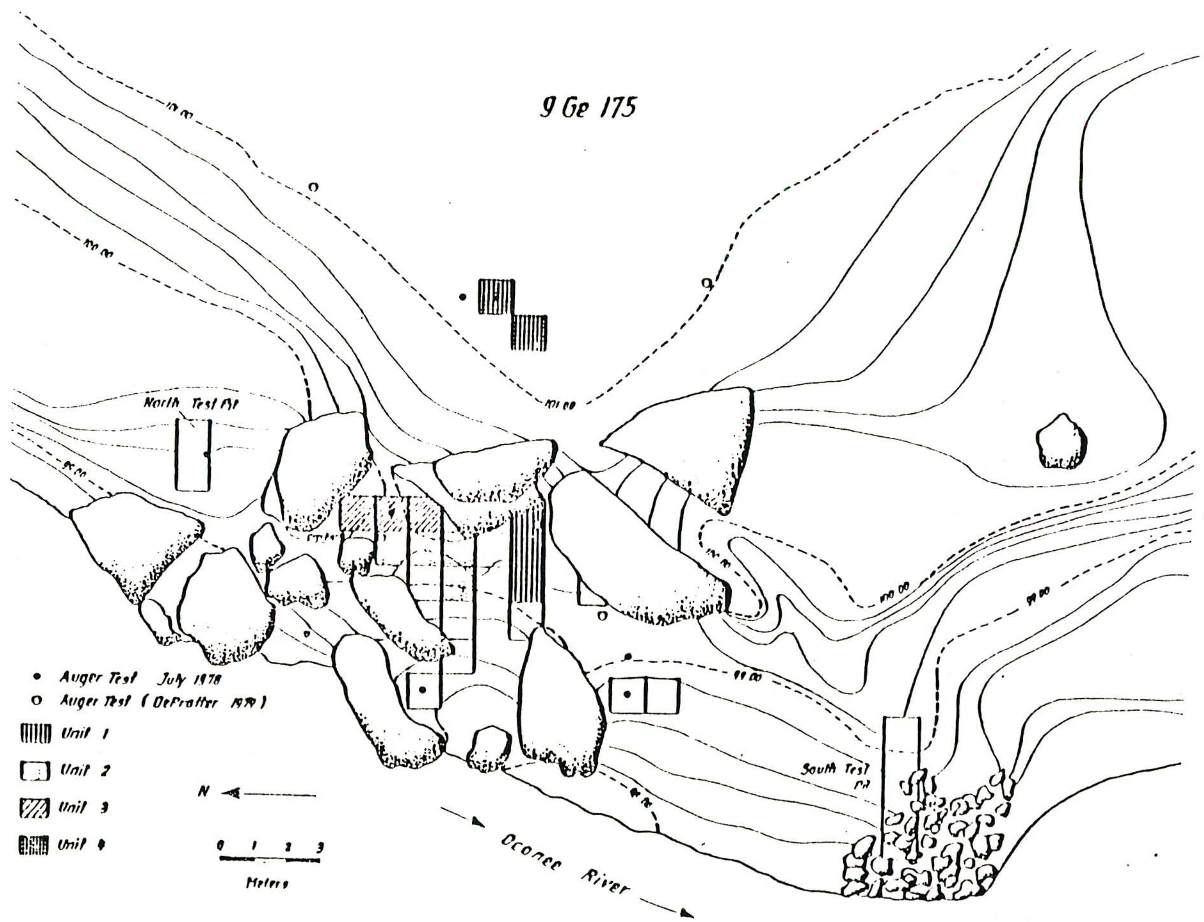


Figure 19. Plan of excavations at 9Ge175.

initial squares as rapidly as possible in order to assess the natural stratigraphy of the site. These were located in a "checkerboard" arrangement to maximize the number of profiles that could be examined. Materials from these initial squares (Squares 1, 6, 3, 8, 10, 24, 138, and 99) were generally passed through 1/4-in mesh screen. This procedure allowed the more meticulous excavation and fine-screening of those adjacent areas for which natural stratigraphy was most clearly understood. Approximately 50% of the excavated midden soils was passed through 1/16-in mesh.

Natural stratigraphy was highly variable in the portion of the site which was bounded by large, granitic boulders. In many cases large boulders, and to a lesser extent tree roots, obscured the relationship that existed between strata that were observed in different portions of the site. For this reason, it is necessary to divide the area bounded by boulders into four distinct interpretive stratigraphic units. These are located in Figure 19.

Unit 1

Squares 24, 143, and 8 comprise Unit 1. The southern profile of these three squares (Figure 20) shows five distinct soil layers. From top to bottom, these are

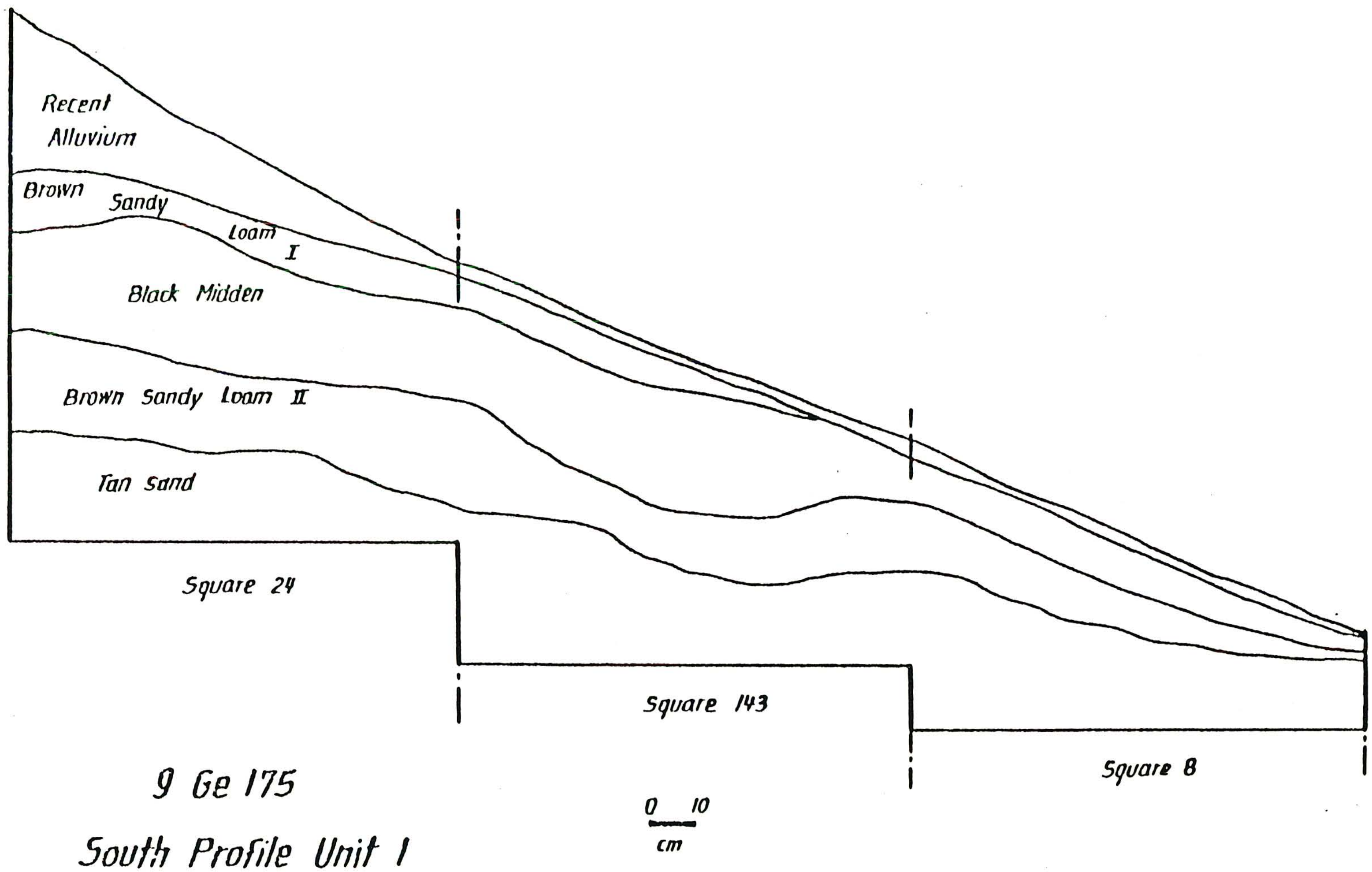


Figure 20. South profile of Unit 1 at 9Ge175.

Level I - recent alluvium
Level II - brown sandy loam I
Level III - black midden
Level IV - brown sandy loam II
Level V - tan sand

All levels in Unit 1 slope steeply from east to west, toward the river. Cultural materials in Levels II, III, and IV indicate a Lamar component, while materials in Level V are indicative of a Middle Woodland component.

Unit 2

Because of numerous tree roots, Square 3 was not excavated to sterile subsoil, thus precluding the observation of stratigraphic relationships between Unit 1 and Unit 2. Unit 2 includes Squares 52, 1, 2 and 6 (Figure 19). Although Unit 2 shows a more complex lensing of soil coloration, the layers may be simplified for interpretive purposes as follows:

Level I - recent alluvium
Level II - brown sandy loam I
Level III - midden I
Level IV - brown sandy loam II
Level V - mottled tan sand
Level VI - midden II
Level VII - tan sand

Cultural materials from Levels II, III, IV, V, and VI are associated with the Lamar component. Midden deposits extend to nearly 1 m below the surface in this portion of the site.

Unit 3

Unit 3 included Squares 41, 42, and 43. A large, buried granite boulder hampered attempts to trace relationships between strata in Unit 2 (where it occupies most of the eastern halves of Squares 52 and 1) and strata in Unit 3. Stratigraphy in Unit 3 may be characterized (from top to bottom) as follows:

Level I - recent alluvium
Level II - brown sandy loam
Level III - black midden
Level IV - tan sand

Cultural materials from Levels II and III are associated with the Lamar component. The few artifacts recovered from Level IV indicate a Late Archaic or Early Woodland component. Much of Unit 3 lies under an overhanging ledge of granite. Artifact density was lower in Unit 3 than in either Units 1 or 2. Since much of Unit 3 lies beneath a rock overhang, its lower artifact density suggests that midden in the area of the site bounded by boulders may be composed of refuse which was tossed or pushed from the granite rocks above the midden area.

Unit 4

Unit 4 designates a limited midden deposit on the granite boulders above the main area of midden accumulation. In Squares 99 and 138 a thin layer of disturbed brown sandy loam approximately 10 cm thick rested directly upon sterile red clay immediately to the east of the large boulders. The brown sandy loam was quite restricted in area and was disturbed, in part, by the clearing operation of a Georgia Power contractor. It is possible that this deposit was once more extensive and may have eroded around the large rocks toward the river. All artifacts from Unit 4 date to the Lamar period.

North Test Pit

A bucket auger test, north of the cluster of boulders at the site, located a stratum of cultural materials buried beneath 50 cm of sterile red-clay alluvium. A 1 x 2 m excavation revealed that the deposit itself was approximately 25 cm thick and showed no internal stratigraphy. The matrix was a gray sandy loam which contained Lamar pottery and little else; there being a conspicuous absence of bone and shell. The pottery fragments in the gray sandy loam appear to have been subject to some erosion. It is suggested that these artifacts were redeposited from a higher elevation, perhaps from Unit 4 above the granite boulders. This erosion and redeposition might also account for the 50 cm of sterile overburden in the North Test Pit.

South Test Pit

This excavation unit was designed to test a concentration of rocks (each about 30-40 cm in diameter) that were exposed on the surface near the southern limits of the site. It was this concentration of rocks which first led the 1974 survey team to investigate 9Ge175, since its location at a low fall on the river's edge suggested a possible fish weir. Excavations extended through approximately 30 cm of sterile clay alluvium. Although more rocks were exposed, no cultural materials were recovered. While the concentration of rocks appears to be a result of human activity, and conceivably was a fish weir, there is no strong evidence to support this hypothesis.

Ceramics were abundant at 9Ge175. The vast majority of sherds are Lamar types. While the major period of site use seems to have been during the early Dyar phase (approximately A.D. 1400-1450), it is important to note that ceramics indicating occupation during the late Dyar phase and the subsequent Bell phase are also present. In Units I, II, and III it was possible to compare frequencies of ceramic types among natural strata. While the relative frequencies of Lamar Incised, Lamar Complicated Stamped, and Lamar Plain ceramics suggest a site occupation during the early Dyar phase, there is evidence for gradual ceramic change from the earliest to the most recent levels in each unit. These changes in ceramic frequencies represent a transition from the late Duvall phase assemblage to that of the Dyar phase. From the lowest to the uppermost strata these changes are

1. a decrease in the proportion of sherds with plain surface treatment.

2. an increase in the proportion of Lamar Incised sherds.

3. an increase in the proportion of Lamar Complicated Stamped.

4. a decline in the representation of Morgan Incised sherds.

Complexity of stratigraphy at the site and the ability to view gradual ceramic changes among natural strata at the site suggest that 9Ge175 was repeatedly occupied during the Late Duvall, Early Dyar, Late Dyar, and Bell phases, with the greatest intensity of site use during the Early Dyar phase.

A number of characteristics of site stratigraphy at 9Ge175 suggest that midden accumulation in the area bounded by large boulders probably represents debris thrown off the large boulders that bound the site to the east. These characteristics are:

1. Density of artifacts is lowest in the portion of the site underneath the granite ledge, yet artifact density and midden depth are greatest just beyond (west of) the overhang.

2. No features dating to the Lamar period were noted in the area of midden accumulation.

3. Granite boulders underlie midden deposits in many places, restricting the amount of floor space in the area of greatest midden accumulation.

4. The small amount of disturbed midden present above the rocks (Unit 4) and the buried artifacts located in the North Test Pit suggest that a more substantial midden once existed over the boulders which bound the site on the east.

Thus the area of deepest midden accumulation is probably not the area of the site in which most activities took place. In any case it is clear that site 9Ge175 was used intensively, though possibly intermittently, throughout the Lamar period.

Chipped-stone artifacts were rare in all portions of the site. Only eight flake tools were recovered from the Lamar levels in Units 1, 2, and 3. Four fragments of bifacially chipped tools were recovered from Lamar levels in Unit 1. These appear to be portions of projectile points. One of these broken bifaces is thin and is made of a honey-colored chert. Only the basal portion of the tool is represented. The tool has roughly parallel sides and a flat, unstemmed base. A second projectile point fragment is the mid-portion of a tool, missing the tip and the base. It is made of a reddish chert, and is a thick, narrow biface with a strongly bi-convex cross-section and tapering edges. A single small triangular Mississippian point made of quartzite was recovered from Unit 2.

Chipped-stone debitage from 1/16-in screened samples in each unit consisted of a single chert core, six percussion flakes, 19 thinning/retouch flakes, and 83 fragments of unidentifiable chipping debris. Considering the large proportion of soils from the site that were screened through 1/16-in mesh, chipped-stone artifacts must be considered infrequent at 9Ge175. Ground-stone tools are similarly rare at the site. Four small pieces of granitic stone with smooth sides were recovered from Lamar levels. It is difficult at best to distinguish these from the naturally occurring, water-worn stones which are so abundant in the shoals adjacent to the site. A large granitic stone with very shallow, slightly depressed worn surfaces on both sides was recovered from the upper levels of Unit 2. This large stone, which measured approximately 20 x 20 x 12 cm, appears to be a broken portion of an oval-shaped grinding stone or mortar.

A substantial number of small (1-3 cm in diameter) smooth quartzite pebbles were recovered from Lamar levels in nearly all portions of the site. Because they were recovered in such large quantities from Lamar deposits (in Level III of Unit 1 alone 35,550 pebbles were recovered) and because they are virtually absent in culturally sterile soils and in the tan sand strata beneath the Lamar midden, the presence of these pebbles is thought to be a result of human activity rather than of natural deposition. In several areas of the site, concentrations of pebbles are associated with concentrations of whole *Elliptio* sp. (river mussel) shells. It is possible that these pebbles were somehow used in the preparation of mussels (perhaps in a steaming process). However, data for testing this hypothesis are not available from 9Ge175.

Charred botanical specimens from Lamar levels in Units 1, 2, and 3 were identified by Elizabeth Sheldon at Auburn University. In spite of the large proportion of midden deposits that were screened through 1/16-in mesh, the sample of identified flora is very small. Corn is represented by three kernel fragments and 10 fragments of cupule. Hickory fragments are the most abundantly represented plant remains (7.85 g from the entire site). Eight additional plants are represented by only one or two fragments each. These are *Nyssa sylvatica* (black gum), *Vitis* sp. (grape), *Passiflora incarnata* (maypop), Caryophyllaceae (chickweed), *Galium* sp. (bed straw), *Rhus* sp. (sumac), *Diospyros virginiana* (persimmon), and *Phytolacca americana* (pokeweed).

CHAPTER VII
FAUNAL REMAINS: SITE SEASONALITY AND SITE SPECIALIZATION

A comparison of faunal remains among the Dyar site, the Ogeltree site, and site 9Ge175 is presented in this chapter in order to derive information regarding site seasonality and site specialization. The Punk Rockshelter is excluded from this analysis because no faunal remains were recovered from that site. Absence of faunal remains at the Punk Rockshelter is probably a result of poor preservation. Specifically, soils at the Punk Rockshelter were quite acidic. At the Cahokia site, Kelly (1979:3) has found that all soils which yielded identifiable bone had high pH readings (6.5-8.0) while those soils which did not yield faunal remains had low pH readings (6.0-6.5). Soil pH was 5.8 at the Punk Rockshelter.

Three basic questions are addressed by the intersite comparison of faunal remains. First, do the faunal remains provide evidence for seasonality of site occupation? Second, what is the relative diversity or specialization of animal exploitation indicated by the faunal remains at each site? Third, does the relative abundance of skeletal elements of deer at each site suggest differences in the locality of animal capture/preparation versus the locality of consumption?

Methods

Faunal remains were identified through direct comparison with modern skeletal specimens at the University of Georgia Department of Anthropology Zooarchaeological Laboratory. Identifications were performed by Barbara Ruff and Gary Shapiro under the latter's supervision, thereby assuring consistency in the methods of identification employed throughout the analysis.

The following conventions were applied to the reporting of faunal data in Tables 3-10. Only those bone fragments identified to the family, genus, or species taxonomic levels are computed as "identified bone." Fragments identified only to class (mammal, bird, fish, etc.) are listed as unidentified representatives of each class. Bone fragments listed as unidentified turtle or unidentified snake are also omitted from the computation of "total identified bone." In Table 10, however, where total number of fragments from each class at each site is compared, all bones for which class could be determined are included. For example, the total number of identified mammal fragments is added to the total number of unidentified mammal fragments to yield the "total mammal" fragments from each site.

The box turtle (*Terrapene carolina*) is the only terrestrial representative in the taxonomic family, Emydidae. The remainder of the Emydidae are aquatic turtles such as the river cooter (*Chrysemys floridana*) and the map turtle (*Graptemys geographica*). In a slight departure from standard zoological taxonomy, the taxon Emydidae as employed in this report refers only to the aquatic members of the family and is meant to exclude the box turtle. This modification is made to accommodate a classification of turtles by habitat that is probably more useful in interpreting human behavior than the grouping together of aquatic and terrestrial turtles.

In addition to fragment counts (#), percentages of total identified fragments (%) are presented. Minimum Numbers of Individuals (MNI) and percentages of total MNI (%MNI) are also presented. When faunal data from a number of field specimen lots within a given site were combined, MNI were calculated using the "minimum distinction method" (Grayson 1972) so that in all cases the most conservative estimate of numbers of individuals is presented. This method treats the entire faunal collection as though it is derived from a single cultural or temporal deposit. Thus, the MNI is computed by counting the most frequently occurring single element for each taxon. An alternative method for calculating MNI, the "maximum distinction method" (Grayson 1972), would compute

MNI separately for each excavation unit or level. Using the latter method, a single deer bone found in each of five 10 cm levels would be reckoned as five MNI. The method employed here, the minimum distinction method, yields a more conservative estimate. It is hoped that intersite comparability is enhanced by consistent use of this method.

Before examining the intersite faunal comparisons, it is necessary to understand the nature of the faunal sample from each site with respect to faunal preservation, methods of recovery, and the representativeness of the sample with regard to both sample size and proportion of site area represented. These three variables--preservation, recovery, and representativeness--determine the confidence with which any differences or similarities between site faunal assemblages may be interpreted. In this chapter, these three variables are first discussed on a site-by-site basis. After a description of the faunal sample from each site, the intersite comparisons are presented to address the three questions outlined at the beginning of this chapter.

The Dyar Site

Faunal preservation was highly variable within the Dyar village area. In the majority of areas tested, faunal preservation may be characterized as poor to nonexistent. In addition to differential preservation, limitations of funding and time made it impossible to employ the most rigorous recovery techniques consistently and uniformly throughout the excavations. Methods of recovery thus varied from water-screening through fine mesh (window screen) to recovery of only those bones recognized while trowelling. It is unfortunate that for several of the areas in which fine-screening was applied, bone preservation was so poor as to preclude interpretation of the faunal data. This is the situation for Structure 1. For Structure 1 the excavator had hoped that meticulous excavation and recovery methods would yield valuable data on domestic subsistence patterns. A 7 x 8 m area was excavated in 50 x 50 cm units. Soil was passed sequentially through 1/4-in (6.3 mm) and 1/16-in (1.6 mm) mesh. In spite of meticulous recovery techniques, only a handful of identifiable bone fragments was recovered. The degraded condition of the bones indicated that the paucity of identifiable bone fragments is probably due to poor preservation rather than to cultural practices, such as disposal of bone away from domestic areas.

Unlike the vast majority of the Dyar village, an area to the southeast of the mound showed excellent faunal preservation. Although a large excavation unit was planned for this portion of the site, the area, tragically, was severely damaged by treasure seekers during a winter recess in fieldwork. Provenience 15, a 2 x 3 m unit, was the only excavation conducted in this portion of the site (Figure 11). Because Provenience 15 is the only village excavation unit in which excellent bone preservation and rigorous recovery techniques coincided, it yielded a faunal sample large enough to allow some interpretation of animal exploitation practiced by the inhabitants of the Dyar site.

Although the sample from Provenience 15 may be adequate in terms of numbers of identified bone, it is less than adequate in terms of area of village midden represented. On the other hand, it should be noted that patterns of midden deposition in Provenience 15 do not differ significantly from the situation found in other portions of the village. That is, like other areas of the village midden, Provenience 15 shows midden accumulation over a long period of occupation, with numerous pits, postholes, and superimposed portions of house floors. This similarity in depositional characteristics lends support to the supposition that faunal remains from Provenience 15 are representative of the remainder of village midden for which bone preservation was poor. Further support for this notion is observed in the similarity among faunal assemblages from different levels of Provenience 15.

The midden stratum in Provenience 15 was approximately 70 cm thick and represents nearly the entire span of human occupation at the Dyar site. The uppermost 20 cm aboriginal deposits contained superimposed lenses of ashy fill that may represent portions of structure floors. Based on M. Smith's (1981) ceramic chronology these can be clearly assigned to the Dyar phase, approximately A.D. 1450-1550. While the 20 cm layer containing the house floors was excavated according to its two natural strata, the remainder of the midden was excavated in arbitrary 10 cm levels. Table 3 shows the frequencies of faunal remains from strata which represent three phases of occupation at the Dyar site. Faunal recovery was by screening through 1/4-in mesh. The Dyar phase, the most recent, is preceded by the Duvall phase (A.D. 1300-1450). The Duvall phase, in turn, is preceded by the Stillhouse phase (A.D. 1100-1300).

Although, taken separately, the three samples in Table 3 are small, the representation of major vertebrate classes is similar between levels. The frequency of identifiable fish bone ranges from 5.2% to 13.5%. Turtle bone represents between 14.7% and 24.1% of the identified bone. Birds contributed 3.5% to 5.2% of the fauna, and mammals contributed between 59.4% and 64.2%. As will be seen below, the range of variability between levels of Provenience 15 is quite narrow in comparison to the variability between samples from Provenience 15 and fauna identified from other contemporaneous sites. The narrow range of faunal variability among the levels of Provenience 15 indicates at least a broad continuity in the patterns of animal exploitation practiced by inhabitants of the

Table 3. Faunal remains from three phases at the Dyar site

DYAR SITE - PROV. 15 - 1/4" SCREENED FAUNA

PHASES:	EARLY DYAR		DUVALL		STILLHOUSE	
	#	%	#	%	#	%
BOWFIN (AMIA CALVA)	3	0.75	1	0.44	3	1.37
GARFISH (LEPISOSTEUS SP.)	1	0.25		0.00	1	0.46
CATFISH (ICTALURUS SP.)	24	6.00	5	2.19	11	5.02
SUCKERS (CATOSTOMIDAE)	15	3.75	5	2.19	3	1.37
SUNFISHES (LEPOMIS SP.)	3	0.75	1	0.44		0.00
BLUEGILL (LEPOMIS MACROCHIRUS)		0.00		0.00	3	1.37
BASS (MICROPTERUS SP.)	8	2.00		0.00	1	0.46
TOTAL ID FISH	54	13.50	12	5.26	22	10.05
FROG (RANA SP.)	2	0.50	1	0.44		0.00
SNAPPING TURTLE (CHELYDRA SERPENTINA	1	0.25		0.00		0.00
MUD/MUSK TURTLES (KINOSTERNIDAE)	9	2.25		0.00	8	3.65
MUD TURTLE (KINOSTERNON SP.	8	2.00	27	11.84		0.00
MUSK TURTLE (STERNOTHERUS SP.)	24	6.00		0.00		0.00
AQUATIC TURTLES (EMYDIDAE		0.00		0.00	16	7.31
COOTER (CHRYSEMYS SP.)	1	0.25	6	2.63		0.00
BOX TURTLE (TERRAPENE CAROLINA)	14	3.50	22	9.65	21	9.59
SOFT-SHELL TURTLE (TRIONYX SP.)	2	0.50		0.00	3	1.37
TOTAL ID TURTLE	59	14.75	55	24.12	48	21.92
NON-POISONOUS SNAKES (COLUBRIDAE)	7	1.75	6	2.63	2	0.91
POISONOUS SNAKES (CROTALIDAE)		0.00	1	0.44		0.00
TOTAL ID SNAKE	7	1.75	7	3.07	2	0.91
LIZARD (IGUANIDAE)		0.00		0.00		0.00
FENCE LIZARD (SCELEPORUS SP.)		0.00		0.00		0.00
TURKEY (MELEAGRIS GALLOPAVO)	20	5.00	8	3.51	17	7.76
MOURNING DOVE (ZENAIDURA MACROURA)	1	0.25		0.00		0.00
TOTAL ID BIRD	21	5.25	8	3.51	17	7.76
RABBIT (SYLVILAGUS SP.)	25	6.25	2	0.88		0.00
EASTERN CHIPMUNK (TAMIAS STRIATUS)	3	0.75		0.00		0.00
GRAY SQUIRREL SCIURUS CAROLINENSIS)	12	3.00	3	1.32	2	0.91
RACCOON (PROCYON LOTOR)	6	1.50	1	0.44		0.00
DEER (ODOCOILEUS VIRGINIANUS)	211	52.75	139	60.96	128	58.45
TOTAL ID MAMMAL	257	64.25	145	63.60	130	59.36
TOTAL ID BONE	400	100	228	100.	219	100.

Dyar site throughout a few centuries of occupation. The internal consistency of the faunal sample from Provenience 15 also supports the notion that fauna from this small portion of the site may well be representative of the Dyar village in general. Furthermore, the sample's internal consistency lends justification to the combining of fauna recovered from various levels of Provenience 15 in order to obtain a larger sample for comparison with other sites.

Although for analytical purposes it might be supposed that the Provenience 15 fauna is representative of the village midden as a whole, it should be remembered that this may not be the case. Because the majority of faunal remains from Provenience 15 was recovered by 1/4-in screening, it is necessary to examine some of the limitations imposed by this recovery method.

Materials from a 1 x 2 m portion of Provenience 15 were water-screened sequentially through 1/4-in and 1/16-in mesh. By comparing the faunal sample recovered from the 1/4-in screen with combined data from both 1/4-in and 1/16-in screening of the same matrix, the differences in faunal data resulting from these two recovery methods can be observed. Faunal remains identified from the 1/4-in sample and the 1/16-in screened sample are summarized in Table 4. Examination of these data shows that the number of identified bones and MNI for the fine-screened sample is nearly double that for the 1/4-in sample. Six categories of

Table 4. Faunal remains recovered by two methods at the Dyar site

	FINESCREEN				1/4"			
	#	%	MNI	%MNI	#	%	MNI	%MNI
BOWFIN (AMIA CALVA)	8	1.75	1	2.22	3	1.24	1	3.85
GARFISH (LEPISOSTEUS SP.)	7	1.53	1	2.22	1	0.41	1	3.85
CHAIN PICKEREL (ESOX NIGER)	4	0.88	1	2.22	.	0.00		0.00
CATFISH (ICTALURUS SP.)	72	15.75	12	25.67	15	6.20	3	11.54
SUCKERS (CATOSTOMIDAE)	22	4.81	3	6.67	5	2.07	2	7.69
BASS/SUNFISH (CENTRARCHIDAE)	9	1.97	2	4.44		0.00		0.00
SUNFISHES (LEPOMIS SP.)	15	3.28		0.00	3	1.24	2	7.69
BASS (MICROPTERUS SP.)	11	2.41	2	4.44	6	2.48	2	7.69
CRAPPIE (POMOXIS NIGROMACULATUS)	5	1.09	2	4.44		0.00		0.00
TOTAL ID FISH	153	33.48	24	53.33	33	13.64	11	42.31
TOAD (BUFO SP.)	1	0.22	1	2.22		0.00		0.00
FROG (RANA SP.)	5	1.09	1	2.22	2	0.83	1	3.85
		0.00		0.00		0.00		0.00
SNAPPING TURTLE (C.SERPENTINA)	1	0.22	1	2.22	1	0.41	1	3.85
MUD/MUSK TURTLES (KINOSTERNIDAE)	1	0.22		0.00		0.00		0.00
MUD TURTLE (KINOSTERNON SP.)	8	1.75	1	2.22	8	3.31	1	3.85
MUSK TURTLE (STERNOTHERUS SP.)	23	5.03	2	4.44	23	9.50	2	7.69
BOX TURTLE (TERRAPENE CAROLINA)	12	2.63	1	2.22	11	4.55	1	3.85
TOTAL ID TURTLE	45	9.85	5	11.11	43	17.77	5	19.23
NON-POISONOUS SNAKE (COLUBRIDAE)	16	3.50	1	2.22	1	0.41	1	3.85
POISONOUS SNAKES (CROTALIDAE)	1	0.22	1	2.22		0.00		0.00
TOTAL ID SNAKE	17	3.72	2	4.44	1	0.41	1	3.85
LIZARD (IGUANIDAE)	6	1.31		0.00		0.00		0.00
FENCE LIZARD (SCELEPORUS SP.)	1	0.22	1	2.22		0.00		0.00
TURKEY (MELEAGRIS GALLOPAVO)	14	3.06	1	2.22	14	5.79	1	3.85
MOURNING DOVE (ZENAIDURA MACROURA)	1							
TOTAL ID BIRD	15	3.28	1	2.22	14	5.79	1	3.85
RABBIT (SYLVILAGUS SP.)	48	10.50	3	6.67	24	9.92	2	7.69
SMALL RODENT (RODENTIA)	1	0.22		0.00		0.00		0.00
EASTERN CHIPMUNK (TAMIAS STRIATUS)	8	1.75	1	2.22	3	1.24	1	3.85
GRAY SQUIRREL (S. CAROLINENSIS)	17	3.72	1	2.22	3	1.24	1	3.85
MOUSE (PEROMYSCUS SP.)	1	0.22	1	2.22		0.00		0.00
PINE MOUSE (PITYMYS PINETORIUM)	1	0.22	1	2.22		0.00		0.00
RACCOON (PROCYON LOTOR)	5	1.09	1	2.22	3	1.24	1	3.85
DEER (ODOCOILEUS VIRGINIANUS)	133	29.10	2	4.44	116	47.93	2	7.69
TOTAL ID MAMMAL	214	46.83	10	22.22	149	61.57	7	26.92
TOTAL ID BONE	457	100.00	45	100.00	242	100.00	26	100.00

animals which are not represented in the 1/4-in sample appear in the fine-screened sample. Five of these are represented by only one fragment each and probably were unimportant as subsistence resources if, indeed, they were food items at all. These are the toad (*Bufo* sp.), fence lizard (*Sceleporus* sp), poisonous snake (Crotalidae), pine mouse (*Pitymys pinetorium*), and the field mouse (*Peromyscus* sp.). With the exception of the fence lizard all of the above are known to inhabit burrows, and thus may be intrusive into the archaeological deposits. The chain pickerel (*Esox niger*) is identified only from the fine-screened sample (four fragments) and thus is the only species added to the list of subsistence resources by fine-screening.

The most dramatic difference between the two samples is the increased number of fish bones identified from the fine-screened sample (approximately fivefold) and the increased MNI for fish (more than twofold). On the other hand, the occurrence of turtle and bird bone is hardly affected by the difference in screen size. This is also true of deer bone. Although the occurrence of bone from small mammals increases dramatically, the MNI for small mammals is not altered greatly.

It appears then, that the major information gained by fine-screening is the increased representation of fish in the vertebrate fauna. While this comes as no surprise, it is important to recognize the importance of aquatic resources in the subsistence strategy of Late Mississippian peoples. As noted earlier, due to their seasonal importance, proximity to aquatic resources was an important factor affecting the location of Mississippian settlements.

Midden deposits from the remainder of Provenience 15 were water-screened through 1/4-in mesh. Faunal data from all 1/4-in screened portions of Provenience 15 are presented in Table 10, which includes the 1/4-in screened sample from Table 4. Taken together, the 1/4-in screened fauna from all levels of Provenience 15 yielded a total of 837 identified bones and a minimum of 41 individuals.

It is readily apparent from Table 10 that the sample is dominated by white-tailed deer (*Odocoileus virginianus*), which accounts for 57.1% of the total identified bone, and 12.2% of the MNI. Deer is also the largest animal represented in the species list and contributed more meat per individual than any other species identified.

Snakes are represented in this sample by vertebrae only and probably did not contribute significantly to the aboriginal diet. Turkey (*Meleagris gallopavo*) is represented by 45 bone fragments and an MNI of two, while the mourning dove (*Zenaidura macroura*) is represented by only one identified bone. Turtles contribute 18.1% of the identified bone (152 fragments) and 19.5% of the MNI (eight individuals).

The Dyar site is located adjacent to an abandoned channel scar of the Oconee River. It was hoped that the faunal analysis might provide some indication as to whether or not this feature might have been an oxbow lake available for exploitation by the inhabitants of the Dyar site. One line of evidence sought was the identification of fish species known to be associated with slow water, low oxygen environments. While a number of fish species could survive under such conditions, most occur in the river channel as well. One species, however, the bowfin or mudfish (*Amia calva*) prefers sluggish water conditions. Of the 19 archaeological sites in the Wallace Reservoir from which faunal remains were examined (most of which did not yield sample sizes sufficient for interpretation) bowfin was identified only from the Dyar site. Nonetheless, the representation of bowfin is very low (a total of 12 fragments identified) and should not be taken as proof of the existence of an oxbow or backwater slough.

In spite of the bias against representation of fish (due to screening through 1/4-in mesh), fish bone contributes 10.5% of the total identified bone (88 fragments) and 41.5% of the MNI (17 individuals). The comparison above, of 1/4-in screened and 1/16-in screened faunal samples, has shown that the former method greatly underestimates the number of identified fish bones and the MNI of fish. It is noteworthy then, that such a substantial number of individual fish is represented in the fauna from Provenience 15. Although it should be remembered that a single deer contributes the same amount of food as many fishes, the numbers of individuals of fish represented in the sample demonstrates that fishing was, at least, a common activity.

Given the numerous ethnographic indications that fishing was an important warm-season activity for Southeastern Indians of the historic period (Hudson 1976; B. Smith 1978a) we may hypothesize that the representation of numerous fish individuals in the sample reflects the seasonal importance of fish to Lamar peoples at the Dyar site. The primary importance of deer as the single most important source of animal protein throughout the remainder of the year may account for the predominance of deer bone in the sample. If fish is an important source of animal protein only seasonally, it will appear to be of secondary importance in a midden which is deposited throughout the year. The fauna identified from Provenience 15, then, appears to approximate very closely the pattern that ethnographic studies would predict for a settlement occupied on a year-round basis. The fauna from Provenience 15, which represents an assemblage from a large, permanently occupied site, will thus serve as a model against which fauna from the Ogeltree site and site 9Ge175 may be compared.

The Ogeltree Site

Determining the representativeness of the faunal sample from the Ogeltree site is less problematical than for the Dyar site. First, preservation of bone at the Ogeltree site was excellent for all areas excavated. Second, because the Lamar component represents a short-term, but intensive use of the site, there is no basis for stratigraphic differentiation of the faunal remains. That is, variability in site-use through time does not pose a problem for interpretation. Lastly, a large proportion of the site area was excavated during the 1978 season, and the faunal sample is derived from all areas of that excavation (Figure 21). Therefore, it is likely that the analyzed faunal sample is representative of faunal remains at the site in general.

Faunal material from 13 flotation samples and 61 1/4-in screened samples was identified in the laboratory. The location of these samples is shown in Figure 21. The flotation samples, each consisting of 2 l of midden, were water-screened in the laboratory through 1/16-in mesh. Unfortunately, these yielded an insufficient number of identifiable animal bones for reliable interpretation of subsistence activities (Table 5). The faunal sample obtained by 1/4-in screening, however, is probably adequate for this purpose. The following discussion of faunal

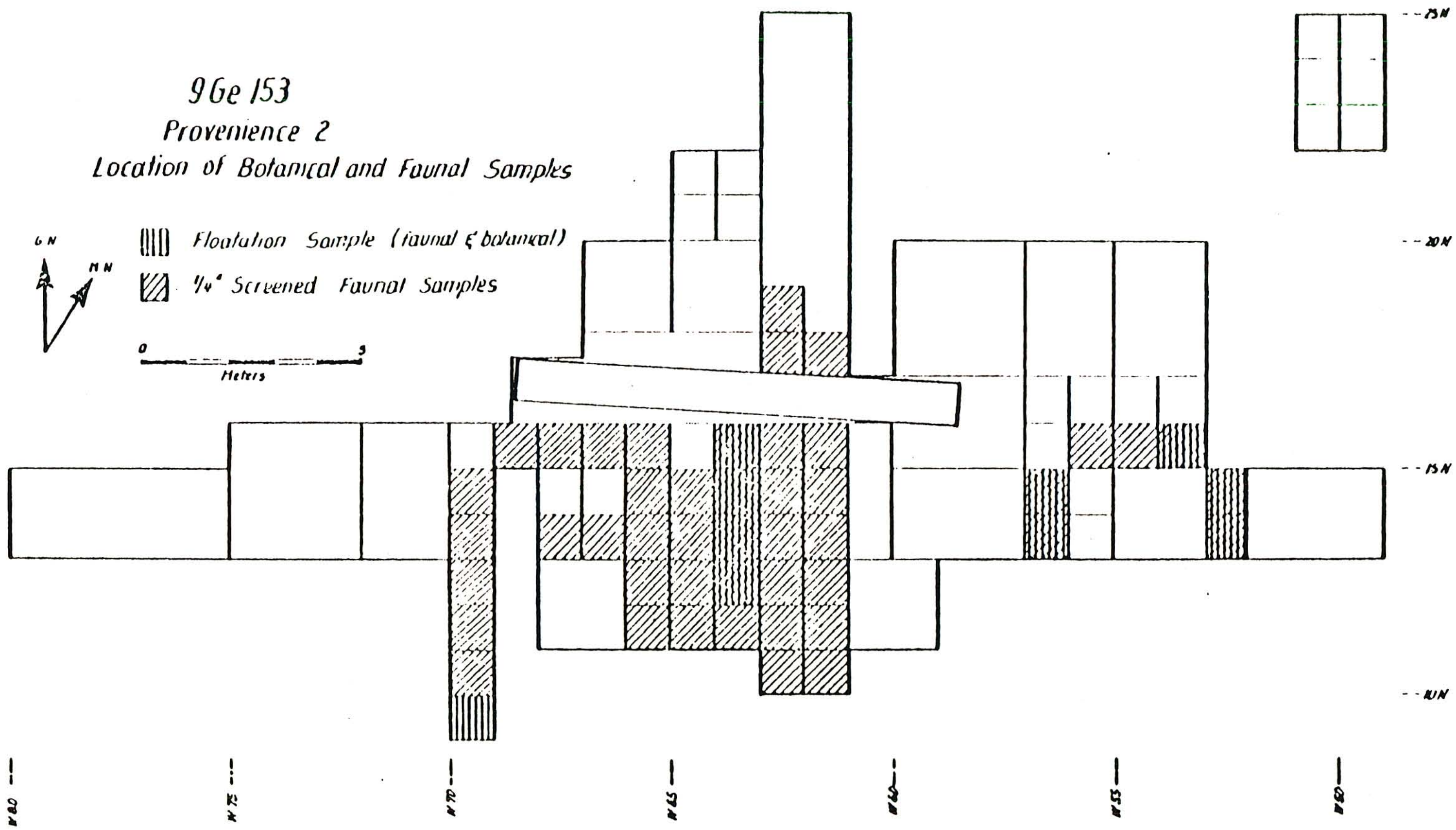


Figure 21. Location of faunal and botanical samples from the Ogeltree site.

Table 5. Fine-screened faunal remains from the Ogeltree site

	FINESCREEN			
	#	%	MNI	%MNI
CATFISH (ICTALURUS SP.)	12	6.59	2	16.67
SUCKERS (CATOSTOMIDAE)	5	2.75	1	8.33
BASS (MICROPTERUS SP.)	1	0.55	1	8.33
TOTAL ID FISH	18	9.89	4	33.33
		0.00		0.00
MUD/MUSK TURTLES (KINOSTERNIDAE)	4	2.20		0.00
MUSK TURTLE (STERNOTHERUS SP.)	2	1.10	1	8.33
BOX TURTLE (TERRAPENE CAROLINA)	15	8.24	2	16.67
SOFT-SHELL TURTLE (TRIONYX SP.)	3	1.65	1	8.33
TOTAL ID TURTLE	24	13.19	4	33.33
NON-POISONOUS SNAKE (COLUBRIDAE)	2	1.10	1	8.33
POISONOUS SNAKES (CROTALIDAE)	1	0.55	1	8.33
TOTAL ID SNAKE	3	1.65	2	16.67
LIZARD (IGUANIDAE)	4	2.20	1	8.33
DEER (ODOCOILEUS VIRGINIANUS)	133	73.08	1	8.33
TOTAL ID MAMMAL	133	73.08	1	8.33
TOTAL ID BONE	182	100.00	12	100.00

material from the Ogeltree site is based entirely on the 1/4-in screened sample (Table 10). It should be kept in mind that because the sample results from screening through 1/4-in mesh the frequency of fish bone in the sample is probably greatly underestimated.

Of the 1,961 identified bone fragments recovered by 1/4-in screening of all areas of the Lamar component, it is apparent that the sample is dominated by turtle bones (80.8%), of which the box turtle, *Terrapene carolina*, is by far the most abundant (representing 55.5% of the total number of identified bones and 46.0% of the total MNI).

Among the mammals, opossum, beaver, muskrat, squirrel, rabbit, raccoon, skunk, and bobcat are represented by a few fragments each and never by more than one individual. The white-tailed deer, represented by 238 fragments, comprises 12.3% of the total identified bone. Deer bone at the site represents at least six individuals (7.9% of the MNI).

The Ogeltree site was ideally located for exploitation of aquatic resources. It is not surprising therefore, that several species of aquatic turtles, molluscs, and fish are represented in the collection. Taken together, fish contribute only 3.8% of the total identified bone (74 fragments) and 15.8% of the MNI (12 individuals). Catfishes contribute the greatest number of individuals in the 1/4-in screened sample (seven MNI), followed by the bass (two MNI).

The garfish, suckers, and sunfishes are represented by one individual each.

Aquatic species of turtle are represented by the mud and musk turtles (Kinosternidae, including *Kinosternon* sp. and *Sternotherus* sp.), the family Emydidae (including only the aquatic members of the family), and the softshell turtle (*Trionyx* sp.). Taken together, these aquatic turtles contribute 25.3% of the total identified bone fragments (492 fragments) and 18.4% of the MNI (14 individuals).

Two species of mammals identified are generally associated with aquatic environments. The beaver, represented by seven fragments (one MNI) and the muskrat, represented by two fragments (one MNI) may also be considered aquatic resources.

While mollusc remains from the Ogeltree site are not quantified, the Lamar midden at the site was characterized by an abundance of shell, of which the vast majority were species of the family, Unionidae (including *Elliptio* sp.).

Site 9Ge175

As at the Ogeltree site, faunal preservation at site 9Ge175 was excellent in all excavated areas. Furthermore, the excavated area represents a relatively large proportion of the site area and should therefore be representative of the site's fauna as a whole. Unlike the Ogeltree site, however, occupation at 9Ge175 took place over a greater temporal span. Although the site was apparently used more intensively during the early Dyar phase, there is evidence of site use during the subsequent late Dyar and Bell phases as well. Because natural stratigraphy at the site was pronounced, and varied among the three site areas (analytical Units 1, 2, and 3), it is necessary to examine the faunal remains separately for each stratum of each unit. As with the Dyar site, it will be shown that faunal remains from all portions of the site are quite similar. This suggests that the exploitation of animals at site 9Ge175 varied little from one period of occupation to the next.

In contrast to both the Dyar and Ogeltree sites, at 9Ge175 a large sample of faunal remains was recovered by water-screening through 1/16-in mesh. Because this method of recovery presents a more accurate picture of faunal exploitation, the following discussion relies exclusively on data from these fine-screened samples. The fine-screened samples from each level of each unit will be presented separately to illustrate the extent of intrasite variability. These data will then be combined for a general characterization of the site's fauna. It should be noted that although the following discussion is based solely on 1/16-in screened fauna, in order to maintain comparability in recovery methods between fauna from all three sites, the intersite comparison will rely on a 1/4-in screened sample from 9Ge175. Tables 6, 7, and 8 show 1/16-in screened fauna identified from Units 1, 2, and 3. The locations of faunal samples used to construct these tables are shown in Figure 19.

Unit 1

In Unit 1, all soils from Square 143 were screened exclusively through fine-screen mesh. A total of 745 identified bones was recovered from the Lamar strata in this unit (Levels II, III, and IV).

Table 6 shows the distribution of faunal remains per level in Square 143 and the breakdown of identified categories. Figures are quite consistent among levels, with no apparently significant changes observable through time. The data show a high representation of fish, both in terms of identified fragments (44.2% to 53.9%) and numbers of individuals (52.2% to 61.9%). In all cases catfish are the predominant fish represented. These are followed in abundance by the Centrarchidae (which includes basses, sunfishes, bluegills, and crappie) and the Catostomidae (suckers).

Aquatic species of turtles, which include the Kinosternidae (mud and musk turtles) and the Emydidae, contribute between 25.0% and 27.1% of the total identified bone and between 11.9% and 15.4% of the total MNI. Although, as discussed above, Emydidae also includes the

Table 6. Fine-screened faunal remains from 9Gɛ175, Unit 1

	LEV.II				LEV.III				LEV.IV			
	#	%	MNI	%MNI	#	%	MNI	%MNI	#	%	MNI	%MNI
GARFISH (LEPISOSTEUS SP.)	3	5.00	1	7.69	12	2.51	1	2.38	5	2.43	1	4.35
CATFISH (ICTALURUS SP.)	17	28.33	2	15.38	119	24.84	9	21.43	49	23.79	4	17.39
SUCKERS (CATOSTOMIDAE)	6	10.00	1	7.69	38	7.93	5	11.90	13	6.31	3	13.04
SUNFISH (LEPOMIS SP.)	2	3.33	1	7.69	18	3.76	3	7.14	3	1.46		0.00
REDBREAST SUNFISH (L. AURITUS)		0.00		0.00		0.00		0.00	4	1.94	1	4.35
BLUEGILL (L. MACROCHIRUS)		0.00		0.00	12	2.51		0.00	8	3.88	1	4.35
BASS (MICROPTERUS SP.)	4	6.67	2	15.38	58	12.11	7	16.67	9	4.37	2	8.70
CRAPPIE (POMOXIS NIGROMACULATUS)		0.00		0.00	1	0.21	1	2.38		0.00		0.00
TOTAL ID FISH	32	53.33	7	53.85	258	53.86	26	61.90	91	44.17	12	52.17
TOAD (BUFO SP.)		0.00		0.00		0.00		0.00		0.00		0.00
FROG (RANA SP.)		0.00		0.00	1	0.21	1	2.38		0.00		0.00
MUD/MUSK TURTLES (KINOSTERNIDAE)	8	13.33		0.00	42	8.77		0.00	20	9.71		0.00
MUSK TURTLE (STERNOTHERUS SP.)	5	8.33	1	7.69	77	16.08	4	9.52	31	15.05	2	8.70
AQUATIC TURTLES (EMYDIDAE)	1	1.67		0.00	11	2.30	1	2.38	4	1.94	1	4.35
MAP TURTLE (GRAPTEMYS GEOGRAPHICA)	1	1.67	1	7.69		0.00		0.00		0.00		0.00
BOX TURTLE (TERRAPENE CAROLINA)	6	10.00	1	7.69	43	8.98	4	9.52	38	18.45	3	13.04
TOTAL ID TURTLE	21	35.00	3	23.08	173	36.12	9	21.43	93	45.15	6	26.09
NON-POISONOUS SNAKES (COLUBRIDAE)	1	1.67	1	7.69	40	8.35	1	2.38	16	7.77	1	4.35
POISONOOUS SNAKES (CROTALIDAE)	5	8.33	1	7.69	1	0.21	1	2.38	1	0.49	1	4.35
TOTAL ID SNAKE	6	10.00	2	15.38	41	8.56	2	4.76	17	8.25	2	8.70
SMALL RODENT (RODENTIA)		0.00		0.00		0.00		0.00	2	0.97		0.00
WOOD RAT (NEOTOMA FLORIDANA)		0.00		0.00	1	0.21	1	2.38		0.00		0.00
GRAY SQUIRREL (S. CAROLINENSIS)		0.00		0.00		0.00		0.00	1	0.49	1	4.35
MUSKRAT (ONDATRA ZIBETHICA)					1	0.21	1	2.38				
CANIDAE		0.00		0.00		0.00		0.00	1	0.49	1	4.35
DOG OR WOLF (CANIS SP.)		0.00		0.00	2	0.42	1	2.38		0.00		0.00
DEER (ODOCOILEUS VIRGIANUS)	1	1.67	1	7.69	2	0.42	1	2.38	1	0.49	1	4.35
TOTAL ID MAMMAL	1	1.67	1	7.69	6	1.25	4	9.52	5	2.43	3	13.04
TOTAL ID BONE	60	100.00	13	100.00	479	100.00	42	100.00	206	100.00	23	100.00

terrestrial box turtle, box turtles are here identified separately so that in this analysis, Emydidae designates exclusively aquatic turtles such as the river cooter and the map turtle.

Box turtles, which may be found in riverine or upland environments, contribute between 10.0% and 18.4% of the total identified fragments and from 7.7% to 13.0% of the total MNI. Snakes are represented by two individuals in each level.

Unlike the vast majority of sites reported from the inland Southeast, mammals are sparsely represented at 9Ge175. In all levels of Unit 1 combined, there is a total of 12 identified mammal bones out of 745 identified bones. Six of these are from small rodents (gray squirrel, muskrat, and eastern woodrat--one individual each). Three more fragments are of *Canis* sp., representing either wolf or domestic dog. The white-tailed deer, generally considered the most important food animal of the Southeastern Indians, is represented by only four fragments, one of which was being worked, possibly into a fish hook.

In the Lamar levels of Unit 1, aquatic vertebrates represent from 70.9% to 81.2% of the total number of identified bones and from 65.2% to 76.2% of the total MNI. It is also important to note that freshwater molluscs (largely *Elliptio* sp. and *Goniobasis* sp., a gastropod) were abundant in all levels, although these have not been quantified. By contrast, the white-tailed deer, the only species present which is usually associated with winter hunting, represents from 0.4% to 1.7% of the total number of identified fragments and from 2.4% to 7.7% of the total MNI. Deer is never represented by more than two fragments or one individual in any level.

Unit 2

Square 42 is the only portion of Unit 2 for which all matrices were fine-screened. Faunal data for Levels III and VI (midden I and II) are presented in Table 7. Although, taken alone, the sample size of identified fauna from Square 42 is probably too low for reliable interpretation, (357 identified bones) it reflects a reliance on aquatic resources similar to that shown for Unit 1.

Aquatic vertebrates account for 91.0% of the identified bone and 75.0% of the MNI from Level VI, and account for 59.3% of identified bone and 70.6% of the MNI from Level III. A large number of snake vertebrae (86, possibly from one individual) in Level III probably accounts for the lower figures reported for proportion of identified bone contributed by aquatic species in that level.

Two fragments of bird bone were identified from Level III, representing one bobwhite quail and one large wading bird (probably the great blue heron). Deer is represented in Level III by nine fragments which are part of one

Table 7. Fine-screened faunal remains from 9Ge175, Unit 2

	LEV.III				LEV.VI			
	#	%	MNI	%MNI	#	%	MNI	%MNI
GARFISH (LEPISOSTEUS SP.)	2	0.76	1	3.57	1	1.14	1	5.26
CATFISH (ICTALURUS SP.)	56	21.37	9	32.14	30	34.09	4	21.05
SUCKERS (CATOSTOMIDAE)	12	4.58	2	7.14	8	9.09	2	10.53
SUNFISH (LEPOMIS SP.)	3	1.15	2	7.14	2	2.27	2	10.53
BLUEGILL (L. MACROCHIRUS)	12	4.58		0.00	6	6.82		0.00
BASS (MICROPTERUS SP.)	20	7.63	4	14.29	4	4.55	1	5.26
TOTAL ID FISH	105	40.08	18	64.29	51	57.95	10	52.63
MUD/MUSK TURTLES (KINOSTERNIDAE)	35	13.36		0.00	22	25.00		0.00
MUSK TURTLE (STERNOTHERUS SP.)	13	4.96	3	10.71	5	5.68	2	10.53
AQUATIC TURTLES (EMYDIDAE)	4	1.53	1	3.57	1	1.14	1	5.26
BOX TURTLE (TERRAPENE CAROLINA)	5	1.91	1	3.57	4	4.55	2	10.53
TOTAL ID TURTLE	57	21.76	5	17.86	32	36.36	5	26.32
NON-POISONOUS SNAKES (COLUBRIDAE)	86	32.82		0.00	1	1.14	1	5.26
PROBABLE WATER-SNAKE (NATRIX SP.)	1	0.38	1	3.57				
POISONOUS SNAKES (CROTALIDAE)	1	0.38	1	3.57		0.00		0.00
TOTAL ID SNAKE	88	33.59	2	7.14	1	1.14	1	5.26
RABBIT (SYLVILAGUS SP.)	1	0.38	1	3.57				
SMALL RODENT (RODENTIA)	1	0.38		0.00	1	1.14	1	5.26
BEAVER (CASTOR CANADENSIS)					1	1.14	1	5.26
MUSKRAT (ONDATRA ZIBETHICA)	1	0.38	1	3.57		0.00		0.00
DEER (ODOCOILEUS VIRGIANUS)	9	3.44	1	3.57	2	2.27	1	5.26
TOTAL ID MAMMAL	12	4.58	3	10.71	4	4.55	3	15.79
TOTAL ID BONE	262	100.00	28	100.00	88	100.00	19	100.00
FISH SCALES	4							
UNID FISH	786				369			
UNID AMPHIBIAN	2							
UNID TURTLE	94				108			
UNID SNAKE	37				14			
UNID BIRD	4							
UNID MAMMAL	21				19			
UNID SMALL MAMMAL	3							
UNID LARGE MAMMAL	1							
TOTAL UNID MAMMAL	25				19			
UNID BONE FRAGMENTS	122				230			

individual. These appear to be the nearly articulated remains of a left hindquarter, the bones of which have been gnawed by rodents. The fact that these bones were left in an articulated position suggests that some of the deer bones recovered from Level III may have been from an individual that died there and are incidental to the human occupation of the site. Unfortunately, time constraints did not permit excavation of the square adjacent to the articulated deer hindquarter. It is therefore unknown whether or not the entire deer skeleton was present. In any case, the 11 fragments of deer bone from Square 52 account for only one individual.

Other mammals represented in Square 52 are the beaver (one fragment), muskrat (one fragment), rabbit (one tooth), and eastern chipmunk (two fragments). Molluscs, as in Unit I, were abundant in both midden layers.

Unit 3

Faunal remains from Levels II and III in Unit 3 are presented in Table 8. Level II is represented by fine-screened field specimens (lots) from Square 41, while Level III is represented by fine-screened portions of Squares 42 and 43. As can be seen in Figure 22, Level II exists predominantly in Square 41. The southern portion of the stratum extends into Square 42, where it overlies a portion of Level III. It should be noted that both levels

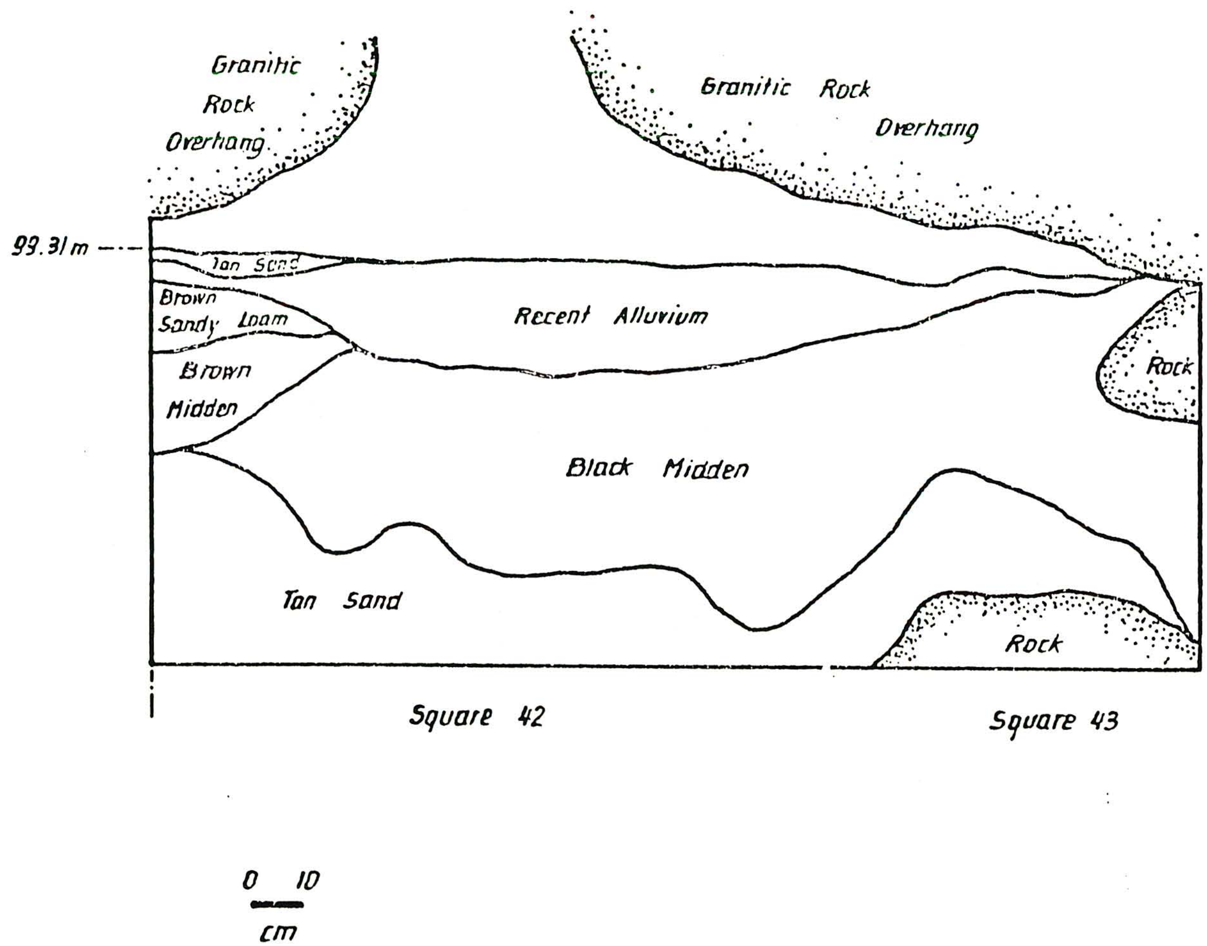


Figure 22. East profile of Unit 3, 9Ge175.

Table 8. Fine-screened faunal remains from 9Ge175, Unit 3

	LEV.II				LEV.III			
	#	%	MNI	%MNI	#	%	MNI	%MNI
GARFISH (LEPISOSTEUS SP.)	3	1.13	1	2.63	12	4.21	1	2.78
CHAIN PICKEREL (ESOX NIGER)		0.00		0.00	1	0.35	1	2.78
CATFISH (ICTALURUS SP.)	111	41.73	15	39.47	94	32.98	12	33.33
SUCKERS (CATOSTOMIDAE)	26	9.77	3	7.89	42	14.74	3	8.33
BASS/SUNFISH (CENTRARCHIDAE)		0.00		0.00	1	0.35		
SUNFISH (LEPOMIS SP.)	5	1.88		0.00	2	0.70		0.00
BLUEGILL (L. MACROCHIRUS)	14	5.26	3	7.89	18	6.32	2	5.56
BASS (MICROPTERUS SP.)	18	6.77	3	7.89	31	10.88	4	11.11
CRAPPIE (POMOXIS NIGROMACULATUS)		0.00		0.00	3	1.05	1	2.78
TOTAL ID FISH	177	66.54	25	65.79	204	71.58	24	66.67
MUD/MUSK TURTLES (KINOSTERNIDAE)	19	7.14		0.00	4	1.40		0.00
MUD TURTLE (KINOSTERNON SP.)		0.00		0.00	2	0.70	1	2.78
MUSK TURTLE (STERNOTHERUS SP.)	8	3.01	3	7.89	27	9.47	3	8.33
AQUATIC TURTLES (EMYDIDAE)	4	1.50		0.00	1	0.35		0.00
COOTER (CHRYSEMYS SP.)	3	1.13	1	2.63	4	1.40	1	2.78
BOX TURTLE (TERRAPENE CAROLINA)	18	6.77	1	2.63	27	9.47	2	5.56
SOFT-SHELL TURTLE (TRIONYX FEROX)	6	2.26	2	5.26	1	0.35	1	2.78
TOTAL ID TURTLE	58	21.80	7	18.42	66	23.16	8	22.22
NON-POISONOUS SNAKES (COLUBRIDAE)	25	9.40		0.00	10	3.51	1	2.78
PROBABLE MUD SNAKE (FARANCIA SP.)	1	0.38	1	2.63		0.00		0.00
POISONOUS SNAKES (CROTALIDAE)	1	0.38	1	2.63	2	0.70	1	2.78
TOTAL ID SNAKE	27	10.15	2	5.26	12	4.21	2	5.56
GRAY SQUIRREL (S. CAROLINENSIS)		0.00		0.00	1	0.35	1	2.78
MOUSE (PEROMYSCUS SP.)	1	0.38	1	2.63		0.00		0.00
BEAVER (CASTOR CANADENSIS)	1	0.38	1	2.63		0.00		0.00
MUSKRAT (ONDATRA ZIBETHICA)	1	0.38	1	2.63		0.00		0.00
PIG (SUS SCROFA)	1	0.38	1	2.63	2	0.70	1	2.78
TOTAL ID MAMMAL	4	1.50	4	10.53	3	1.05	2	5.56
TOTAL ID BONE	266	100.00	38	100.00	285	100.00	36	100.00
FISH SCALES	134				57			
UNID FISH	688				1058			
UNID AMPHIBIAN	2				1			
UNID TURTLE	117				106			
UNID SNAKE	46				24			
UNID BIRD								
UNID MAMMAL	7				12			
UNID SMALL MAMMAL					2			
UNID LARGE MAMMAL					2			
TOTAL UNID MAMMAL	7				16			
UNID BONE FRAGMENTS	163				28			

extend to the surface in some places beneath the rock overhang.

Just as the ceramic frequencies were nearly identical between these two levels, faunal data between them are virtually identical (266 and 287 identified bone fragments, 38 and 37 MNI). As in other portions of the site, aquatic resources predominate. Fish account for 66.5% to 71.1% of the total identified bone and 64.9% to 65.8% of the MNI. Aquatic turtles contribute 13.6% to 15.0% of the total identified bone and from 15.8% to 16.2% of the MNI. The following mammals are represented by one fragment each: "field mouse," gray squirrel, beaver, and muskrat. Pig is represented by three tooth fragments. The pig remains came from field specimen (lots) excavated near the surface of Squares 41 and 43. These lots also contained a blue glass bead and a small lead object. Thus it is likely that the three fragments of pig teeth represent some mixing of historic materials at the surface of the aboriginal deposit. Two fragments, representing what is probably a domestic dog, were identified from Level II.

Unit 3, like other portions of the site, contained a good deal of *Elliptio* sp. and *Goniobasis* sp. (mollusc remains. It should be noted however, that these were more plentiful in Level III than in Level II.

Combined Fine-Screened Fauna

Table 9 shows the combined, fine-screened faunal remains from all levels in all units at 9Ge175. The total number of identified bones is 1,654. MNI calculated by two techniques are also presented. The first is the maximum distinction method, in which MNI, calculated separately for each excavation unit, are simply added together. This technique produces a total MNI of 198. The second method is the minimum distinction method, in which the element counts for each taxon are first aggregated, and MNI are then calculated from the combined data. This method suggests a total of 97 MNI. It is of some methodological interest to note that the percentages of MNI contributed by each taxon are nearly identical for both methods of MNI computation.

In any case, the combined data reflect the same trends as those observed for each unit separately. These are a very high representation of fish and turtles, and a low representation of terrestrial mammals. Perhaps most notably, deer account for only 0.9% of the total identified bone and at most, 2.2% of the MNI. The comparison of 1/4-in screened faunal samples presented below illustrates that this low representation of mammals at site 9Ge175 is not simply an artifact of fine-screen recovery methods.

Table 9. Combined fine-screened fauna from 9Ge175

			MAXIMUM		MINIMUM	
	#	%	MNI	%MNI	MNI	%MNI
GARFISH (LEPISOSTEUS SP.)	38	2.30	7	3.13	2	2.02
CHAIN PICKEREL (ESOX NIGER)	2	0.12	1	0.45	1	1.01
CATFISH (ICTALURUS SP.)	476	28.81	55	24.55	26	26.26
SUCKERS (CATOSTOMIDAE)	145	8.78	19	8.48	8	8.08
BASS/SUNFISH (CENTRARCHIDAE)	1	0.06		0.00	1	1.01
SUNFISH (LEPOMIS SP.)	35	2.12	15	6.70	8	8.08
REDBREAST SUNFISH (L. AURITUS)	4	0.24		0.00		0.00
BLUEGILL (L. MACROCHIRUS)	70	4.24	18	8.04	3	3.03
BASS (MICROPTERUS SP.)	144	8.72	23	10.27	11	11.11
CRAPPIE (POMOXIS NIGROMACULATUS)	4	0.24	2	0.89	1	1.01
TOTAL ID FISH	919	55.63	140	62.50	61	61.62
FROG (RANA SP.)	1	0.06	1	0.45	1	1.01
MUD/MUSK TURTLES (KINOSTERNIDAE)	150	9.08	4	1.79		0.00
MUD TURTLE (KINOSTERNON SP.)	2	0.12	2	0.89	1	1.01
MUSK TURTLE (STERNOTHERUS SP.)	166	10.05	18	8.04	11	11.11
AQUATIC TURTLES (EMYDIDAE)	26	1.57	5	2.23	1	1.01
COOTER (CHRYSEMYS SP.)	7	0.42	2	0.89	1	1.01
MAP TURTLE (GRAPTEMYS GEOGRAPHICA)	1	0.06	1	0.45	1	1.01
BOX TURTLE (TERRAPENE CAROLINA)	141	8.54	14	6.25	6	6.06
SOFT-SHELL TURTLE (TRIONYX FEROX)	9	0.54	5	2.23	2	2.02
TOTAL ID TURTLE	502	30.39	51	22.77	23	23.23
NON-POISONOUS SNAKES (COLUBRIDAE)	179	10.84	5	2.23	1	1.01
PROBABLE WATER SNAKE (NATRIX SP.)	1	0.06	1	0.45	1	1.01
PROBABLE MUD SNAKE (FARANCIA SP.)	1	0.06	1	0.45		0.00
POISONOUS SNAKES (CROTALIDAE)	11	0.67	6	2.68	1	1.01
TOTAL ID SNAKE	192	11.62	13	5.80	3	3.03
FENCE LIZARD (SCELEPORUS SP.)	1	0.06	1	0.45	1	1.01
SMALL RODENT (RODENTIA)	4					
WOOD RAT (NEOTOMA FLORIDANA)	1	0.06	1	0.45	1	1.01
EASTERN CHIPMUNK (TAMIAS STRIATUS)	2	0.12	1	0.45	1	1.01
GRAY SQUIRREL (S. CAROLINENSIS)	1	0.06	1	0.45	1	1.01
MOUSE (PEROMYSCUS SP.)	1	0.06	1	0.45	1	1.01
BEAVER (CASTOR CANADENSIS)	2	0.12	2	0.89	1	1.01
MUSKRAT (ONDATRA ZIBETHICA)	3	0.18	3	1.34	1	1.01
CANIDAE	1					
WOLF OR DOG (CANIS SP.)	4		2		1	
PIG (SUS SCROFA)	3	0.18	2	0.89	1	1.01
DEER (ODOCOILEUS VIRGINIANUS)	15	0.91	5	2.23	2	2.02
TOTAL ID MAMMAL	37	2.24	18	8.04	10	10.10
TOTAL ID BONE	1652	100.00	224	100.00	99	100.00

Intersite Comparisons

Faunal remains from the Dyar site, the Ogeltree site, and site 9Gel75 are compared in order to investigate three related aspects of site-use. These are (1) seasonality of occupation; (2) relative specialization of animal exploitation; and (3) determination of local versus extra-local deer procurement and/or processing.

Site Seasonality

In the absence of direct osteological indicators of site seasonality (such as growth rings or stages of antler development) the relative frequency of various species with marked seasons of abundance will provide evidence for this aspect of site-use. As discussed in Chapter III, while most animals could be captured throughout the year, the Southeastern Indian economic cycle was basically divided into a warm season, during which fishing was of great importance, and a cold season, during which deer and turkey were most intensively exploited. Certain fish species, notably the suckers, are known to travel upstream in great numbers during the early spring, and these may provide evidence for fishing during a specific portion of the warm season. In addition to fish, both aquatic and terrestrial turtles were most active, and therefore most accessible, during the warm season.

Relative frequencies of vertebrate species from each site are presented in Table 10. In all cases these data are derived from midden that was screened through 1/4-in mesh. Fish and reptiles are considered most likely to have been exploited during the warm season. Figure 23 illustrates the relative frequencies of fish and reptile bone and the relative frequencies of turkey and deer bone from each site. There are striking differences among the three sites. The warm season animals contribute 30.5% of the Dyar site fauna, 82.9% of the Ogeltree site fauna, and 96.9% of the identified bone fragments from site 9Ge175. Conversely, deer and turkey, most intensively exploited during the fall and winter months, are best represented at the Dyar site (62.6%), are relatively rare at the Ogeltree site (12.3%), and are almost nonexistent at site 9Ge175 (0.6%). It should be noted in addition, that turkey is represented only at the Dyar site.

A series of two by two contingency tables was constructed to determine the statistical significance of these differences. The .01 level of significance was chosen. With 1 degree of freedom the region of rejection is defined at chi-square = 6.6. Comparison between the Dyar and Ogeltree sites, of the number of identified bones contributed by warm season and cold season fauna, yields a chi-square value of 814.7. Comparison between the Dyar

Table 10. One-quarter inch screened faunal remains from three sites

	DIAR SITE				OGELTREE SITE				SITE 9GE175			
	#	%	MNI	%MNI	#	%	MNI	%MNI	#	%	MNI	%MNI
BOWFIN (AMIA CALVA)	7	0.84	1	2.44								
GARFISH (LEPISOSTEUS SP.)	2	0.24	1	2.44	22	1.13	1	1.30	4	0.64	1	1.79
CATFISH (ICTALURUS SP.)	40	4.78	6	14.63	30	1.54	7	9.09	72	11.59	13	23.21
SUCKERS (CATOSTOMIDAE)	23	2.75	3	7.32	11	0.57	1	1.30	40	6.44	6	10.71
SUNFISHES (LEPOMIS SP.)	7	0.84	3	7.32	2	0.10	1	1.30	8	1.29	3	5.36
BASS (MICROPTERUS SP.)	9	1.08	3	7.32	9	0.46	2	2.60	19	3.06	4	7.14
TOTAL ID FISH	88	10.51	17	41.46	74	3.81	12	15.58	143	23.03	27	48.21
FROG (RANA SP.)	3	0.36	1	2.44		0.00		0.00	2	0.32	1	1.79
SNAPPING TURTLE (C. SERPENTINA)	1	0.12	1	2.44					7	1.13	1	1.79
MUD/MUSK TURTLES (KINOSTERNIDAE)	17	2.03			36	1.85			141	22.71		
MUD TURTLE (KINOSTERNON SP.)	35	4.18	1	2.44	32	1.65	6	7.79				
MUSK TURTLE (STERNOTHERUS SP.)	24	2.87	2	4.88					84	13.53	9	16.07
AQUATIC TURTLES (EMYDIDAE)	6	0.72			190	9.78	5	6.49	6	0.97		
COOTER (CHRYSEMYS SP.)	7	0.84	1	2.44	117	6.02			20	3.22	2	3.57
BOX TURTLE (TERRAPENE CAROLINA)	57	6.81	2	4.86	1078	55.51	35	45.45	145	23.35	7	12.50
SOFT-SHELL TURTLE (TRIONYX FEROX)	5	0.60	1	2.44.	117	6.02	3	3.90	4	0.64	1	1.79
TOTAL ID TURTLE	152	18.16	8	19.51	1570	80.84	49	63.64	407	65.54	20	35.71
NON-POISONOUS SNAKES (COLUBRIDAE)	15	1.79	1	2.44	14	0.72			46	7.41	1	1.79
PROBABLE MUD SNAKE (FARANCIA SP.)					1	0.05	1	1.30				
POISONOUS SNAKES (CROTALIDAE)	1	0.12	1	2.44	12	0.62	1	1.30	6	0.97	1	1.79
TOTAL ID SNAKE	16	1.91	2	4.88	27	1.39	2	2.60	52	8.37	2	3.57
TURKEY (MELEAGRIS GALLOPAVO)	45	5.38	2	4.88								
MOURNING DOVE (ZENAIDURA MACROROURA)	1	0.12	1	2.44								
TOTAL ID BIRD	46	5.50	3	7.32	0	0.00	0	0.00	0	0.00	0	0.00
OPOSSUM (DIDELPHIS VIRGINIANUS)					1	0.05	1	1.30	2	0.32	1	1.79
RABBIT (SILVILAGUS SP.)	27	3.23	2	4.88	2	0.10	1	1.30	1	0.16	1	1.79
EASTERN CHIPMUNK (TAMIAS STRIATUS)	3	0.36	1	2.44								
GRAY SQUIRREL (S. CAROLINENSIS)	17	2.03	1	2.44	7	0.36	1	1.30				
BEAVER (CASTOR CANADENSIS)					7	0.36	1	1.30	8	1.29	1	1.79
MUSKRAT (ONDATRA ZIBETHICA)					2	0.10	1	1.30	1	0.16	1	1.79
STRIPED SKUNK (MEPHITIS MEPHITIS)					1	0.05	1	1.30				
BOBCAT (LYNX RUFUS)					12	0.62	1	1.30				
RACCOON (PROCYON LOTOR)	7	0.84	1	2.44	1	0.05	1	1.30				
WOLF OR DOG (CANIS SP.)									1	0.16	1	1.79
DEER (ODOCOILEUS VIRGINIANUS)	478	57.11	5	12.20	238	12.26	6	7.79	4	0.64	1	1.79
TOTAL ID MAMMAL	532	63.56	10	24.39	271	13.95	14	18.18	17	2.74	6	10.71
TOTAL ID BONE	837	100	41	100	1942	100	77	100	621	100	56	100

Table 10—Continued

	DYAR SITE #	OGLETREE SITE #	SITE 9GE175 #
UNID FISH	245	67	157
UNID TURTLE	348	3101	294
UNID SNAKE	5	14	12
UNID BIRD	115	8	
UNID MAMMAL	1087	777	25
UNID SMALL MAMMAL	32	5	
UNID LARGE MAMMAL	156	86	2
TOTAL UNID MAMMAL	1275	868	2
UNID BONE FRAGMENTS	4755	430	85

	#	%	#	%	#	%
TOTAL (UNID + ID) FISH	333	11.79	141	2.35	300	27.62
TOTAL AMPHIBIAN	3	0.11		0.00	2	0.18
TOTAL TURTLE	500	17.70	4671	77.85	701	64.55
TOTAL SNAKE	21	0.74	41	0.68	64	5.89
TOTAL BIRD	161	5.70	8	0.13		0.00
TOTAL MAMMAL	1807	63.96	1139	18.98	19	1.75
TOTAL BONE IDENT. TO CLASS	2825	100.00	6000	100.00	1086	100.00

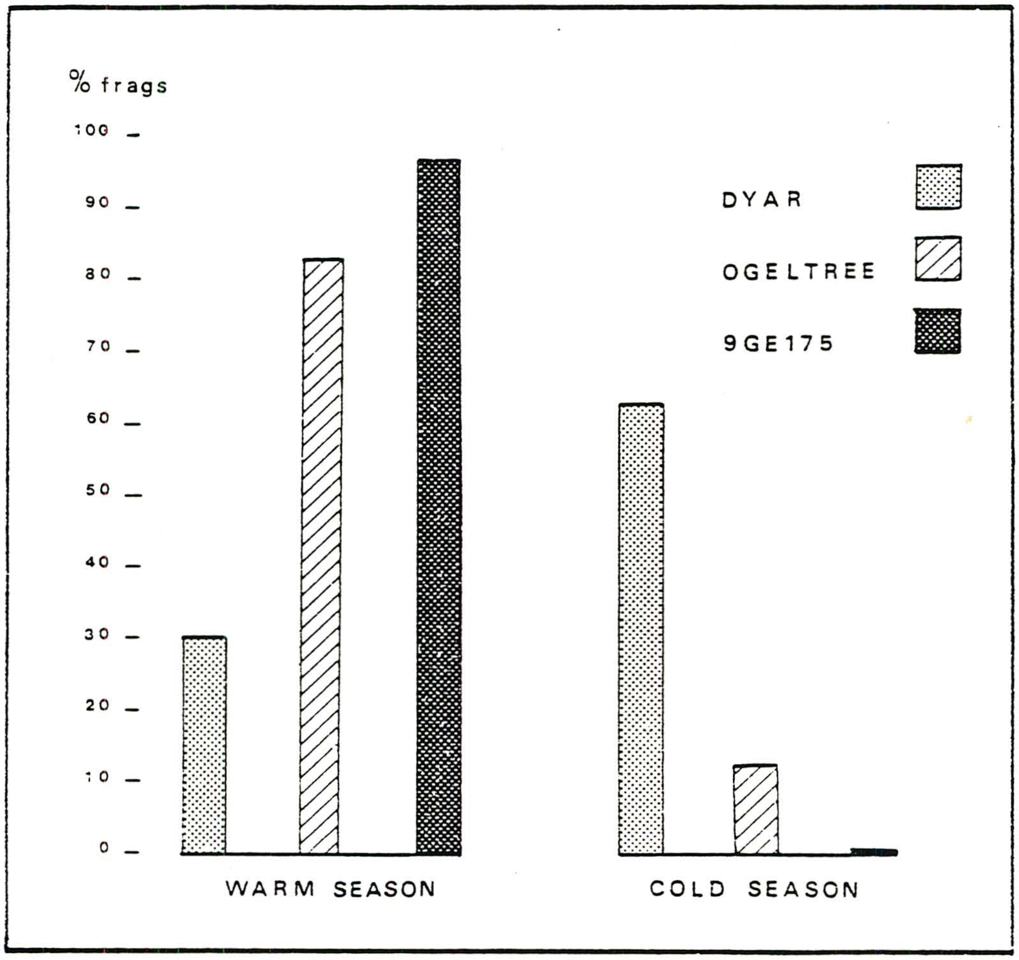


Figure 23. Frequency of cold season and warm season fauna from each site.

site and 9Ge175 yields a chi-square value of 639.0. Comparison between the Ogeltree site and 9Ge175 yield a chi-square value of 73.4. In all cases, the null hypothesis, that representation of warm season and cold season animals varies independently of the site of recovery, can be rejected at the .01 level of significance. It appears that there are significant differences in the representation of warm season and cold season fauna among all three sites.

The greatest difference in representation of warm versus cold season animals is between the Dyar site and the two remaining sites. Differences between the Ogeltree site and 9Ge175 are due to the greater representation of deer at the Ogeltree site. Although deer were hunted most intensively during the winter months, individual deer were often attracted to feed around the edges of horticultural plots and were therefore available on a somewhat limited basis during the warm season. As discussed above, the faunal data from the Dyar site most closely approximate the expectations, generated by B. Smith's model of the Mississippian adaptive niche, of a site which is occupied on a year-round basis. Faunal data from the Ogeltree site and site 9Ge175 suggest that these sites were occupied primarily during the warm season.

Site Specialization

A number of techniques have recently been employed by zooarchaeologists to determine the relative diversity and degree of specialization of archaeological faunal assemblages (Wing 1977:81; Styles 1981:41-45). Elizabeth Wing (1977) has shown that statistical techniques originally developed by researchers studying existing plant and animal populations (MacArthur and MacArthur 1961; Sheldon 1969) may be applicable to archaeologically recovered faunal assemblages. The units of analysis employed in the calculation of diversity and equitability are the MNI and the number of identified taxa in a given faunal sample. The Shannon-Weaver species diversity index (Shannon and Weaver 1949) is presented in Appendix 1.

The following provides an example of the possible variation of values for H'. If a population is composed of a single species, then H' equals 0.0. This is the lowest degree of species diversity. Higher H' values indicate greater species diversity. For example, if a site has 100 different species with one individual each, then H' equals 4.605. If a site has 1,000 different species with one individual each, H' equals 6.908. Both of these examples are, of course, unlikely for any archaeological situation, but they serve to illustrate the extremes of measurement offered by this technique.

Species equitability is a measure of the "evenness," or conversely, the "unevenness" with which each species is represented. The formula for the equitability index (Sheldon 1969) is given in Appendix 1.

Values generated by this formula range between 1.0 and 0.0. An equitability value of 1.0 indicates that all species are equally represented (in terms of MNI), and equitability values closer to 0.0 demonstrate unequal representation of species.

As Reitz (1979:125) has noted, the results of these indices are difficult to interpret. They are particularly problematical for a comparison among the three sites presented here. Specifically, a problem results from the even-handedness with which these formulae treat each taxon. To use an extreme example, if a site faunal assemblage contains 25 species of fish, 5 species of aquatic turtle, and 1 species of mammal, and if each taxon (species) is represented by a single individual, the sample will produce high values for both diversity and equitability. This would certainly be misleading, since it is clear that the hypothetical assemblage indicates a site which is highly specialized toward exploitation of aquatic resources. In other words, the diversity and equitability indices may not address the particular question being investigated by the archaeologist.

In spite of the difficulty of interpreting the cultural significance of diversity and equitability values, these indices were calculated for each site in the hopes that they may be of interest to other researchers. In light of the questionable utility of these values for understanding the relative degree of resource specialization among these three sites, there is no attempt to determine the statistical significance of apparent differences in these values among sites.

Diversity and equitability values for each site are presented in Figure 24. There are apparent differences among the three sites. The Dyar site shows the highest diversity and equitability (H' = 2.879, E = 0.9313). Site 9Ge175 shows the next highest values (H' = 2.459, E = 0.8351), and it, in turn, is followed by the Ogeltree site (H' = 2.121, E = 0.7079). According to these indices, the three sites form a continuum from the lowest degree of faunal specialization at the Dyar site to the greatest faunal specialization at the Ogeltree site. As indicated above, however, these differences should be viewed with extreme caution.

For this study, it is specialization with regard to the specific habitats exploited by the sites' human inhabitants that is of interest. A more appropriate measure of the degree to which sites show specialized habitat exploitation is the relative frequencies at each

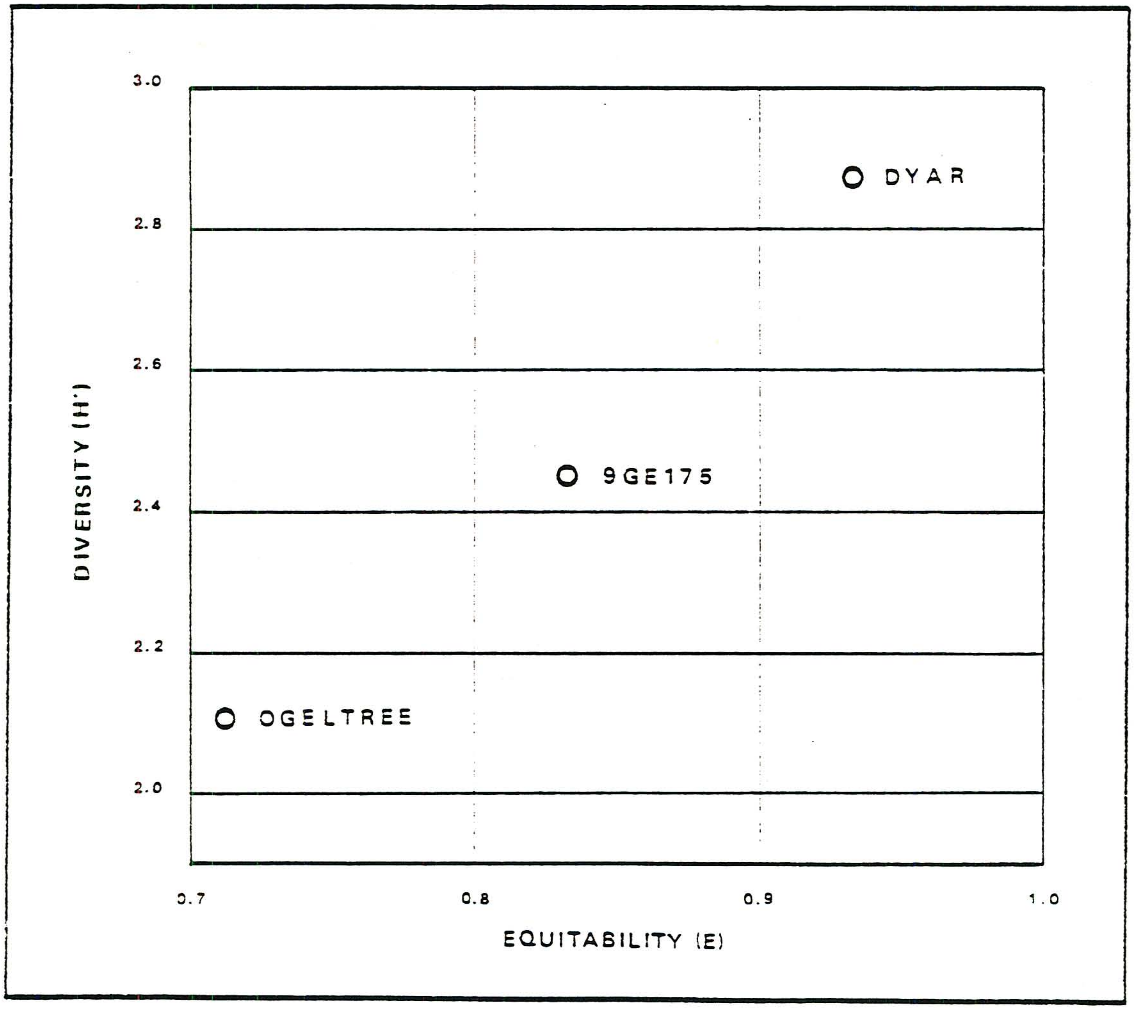


Figure 24. Diversity and equitability values.

site of species which are found in aquatic versus terrestrial habitats.

Although a comparison of aquatic and terrestrial fauna at each site may seem redundant because fish and turtles were employed above as indices of warm season versus cold season fauna, a grouping by habitat divides the sample somewhat differently and illustrates some important differences between site 9Ge175 and the Ogeltree site. First, the box turtle is a terrestrial species and therefore is distinguished from the remainder of the turtles. Second, two species of mammals are considered here as aquatic vertebrates. These are the beaver and muskrat. Lastly, turkey and mourning dove are exploited in forests and field and thus are considered terrestrial fauna.

Figure 25 illustrates the varying frequencies of identified bone from aquatic and terrestrial species at each site. According to this grouping of taxa, there appears to be a continuum from the greatest exploitation of terrestrial resources at the Dyar site, to the lowest representation of terrestrial fauna at site 9Ge175. A series of two by two contingency tables was constructed to determine the statistical significance of these differences. The .01 level of significance was chosen. With 1 degree of freedom the region of rejection is defined at chi-square = 6.6. Comparison between the Dyar and Ogeltree sites, of the number of identified bones

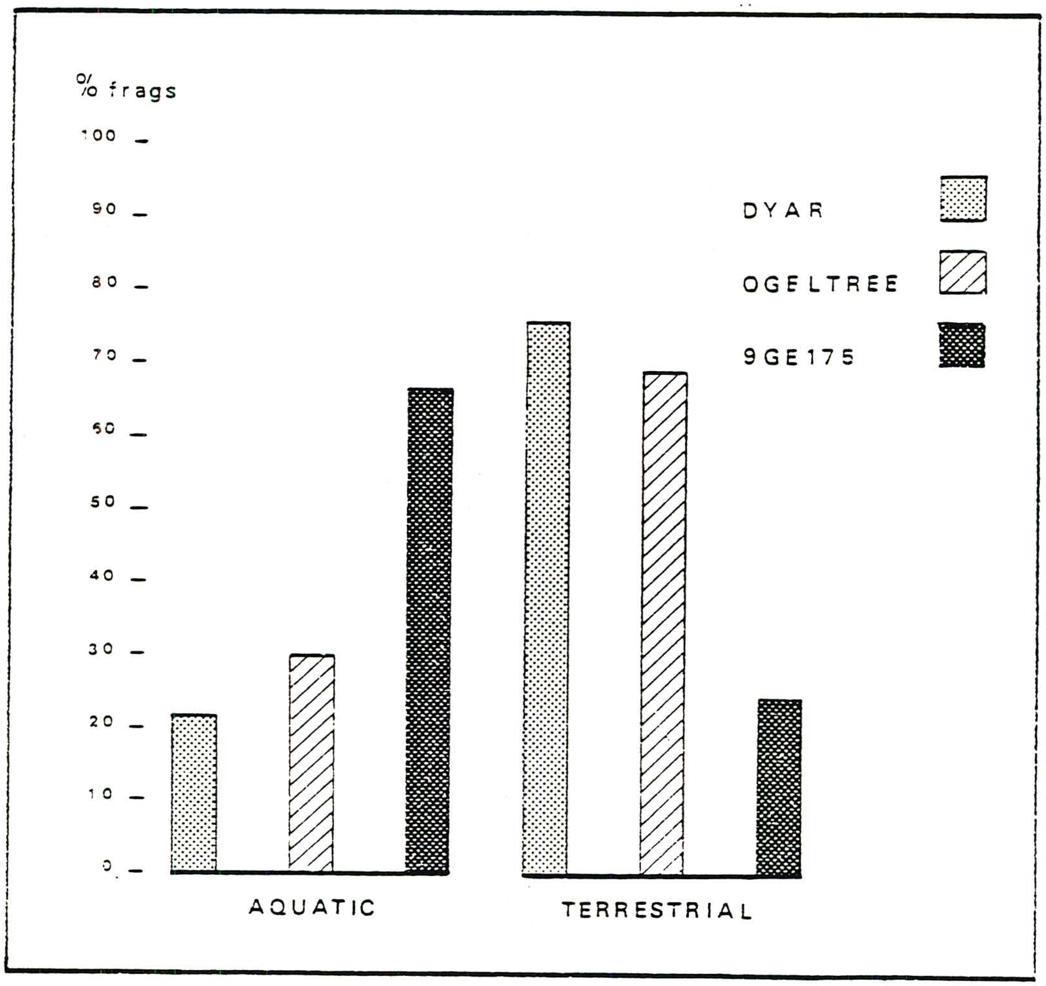


Figure 25. Frequency of aquatic and terrestrial fauna at each site.

contributed by aquatic and terrestrial fauna, yields a chi-square value of 323.9. Comparison between the Dyar site and 9Ge175 yields a chi-square value of 350.2. Comparison between the Ogeltree site and 9Ge175 yields a chi-square value of 8.0. In all cases, the null hypothesis, that representation of aquatic and terrestrial animals varies independently of the site of recovery, can be rejected at the .01 level of significance. It appears that there are significant differences in the representation of terrestrial and aquatic fauna among all three sites.

The abundance of terrestrial fauna at the Dyar site can be explained largely with reference to a single species, the white-tailed deer. Deer is generally considered to have been the staple source of animal protein for Southeastern Indians and has been consistently reported as contributing the greatest number of identified bone fragments from Mississippian sites (B. Smith 1975:137). While the disparity between Dyar and the remaining two sites in representation of deer bone may be partially explained by the warm season occupation of the latter, these figures point further to a significant and intriguing difference between the faunal assemblages from the Ogeltree site and site 9Ge175.

Faunal remains from site 9Ge175 indicate a highly specialized exploitation of aquatic resources. At that site aquatic resources contributed 66.7% of the total identified bone and 74.4% of the total MNI. By contrast, aquatic resources account for 29.6% of the total identified bone and 36.8% of the MNI from the Ogeltree site. These latter figures appear to be a significant departure from the pattern of aquatic resource exploitation observed for site 9Ge175. Much of the difference among these two sites can be attributed to differences in the representation of two species. These are the white-tailed deer and the box turtle.

At 9Ge175, identified deer bone contributed 0.6% of the total identified bone and 1.8% of the total MNI. This may be seen to contrast with the Ogeltree site where deer accounted for 12.3% of the total identified bone and 7.9% of the total MNI. The representation of box turtle at the Ogeltree site is strikingly high. Box turtles contribute 55.5% of the identified fragments and 46.0% of the MNI from the Ogeltree site. What do these two species have in common that might explain their greater abundance at the Ogeltree site than at 9Ge175? It is hypothesized that the representation of these two species may be related to the specific function of site 9Ge175 as opposed to the more general use of the Ogeltree site. At site 9Ge175 the vast majority of faunal remains are of species that can be exploited in the immediate vicinity of the site. These are the aquatic resources of the shoals. Deer and box turtle, on the other hand, are resources that were probably exploited away from the site itself. Although information is lacking concerning the relative population density of box turtles in hardwood forests of the Piedmont, it is known that these turtles have surprisingly restricted home ranges which often comprise an area less than 250 m in diameter (Carr 1963:145). Thus it would seem likely that box turtles were gathered during forays away from the site itself. A more specific explanation for the abundance of box turtle remains at Mississippian sites has been suggested by Lewis Larson (1980:137). Larson hypothesizes that box turtles were collected in large quantities during the early spring as a corellary of the preparation of fields for planting. If there were garden plots located near the Ogeltree site, "garden hunting" (Linares 1976) may provide an explanation for the greater abundance of deer remains at the Ogeltree site than at 9Ge175.

The distinction hypothesized here is that the Ogeltree site may represent a warm season "homestead" or semi-permanent site to which people would return with their box turtles and deer. Site 9Ge175, on the other hand, may have been visited with the express purpose of gathering the aquatic resources which were so abundant at the shoals. Of course, it must be noted that aquatic resources are not at all infrequent at the Ogeltree site and that although the mollusc fragments have not been quantified, they were abundant at both the Ogeltree site and 9Ge175.

It is important to recall that like 9Ge175, the Ogeltree site is located adjacent to the shoals. Yet in spite of sharing a similar local environment there are significant differences among the sites' faunal assemblages. The faunal data, therefore, suggest that the Ogeltree site was something more than a specialized locus for the extraction of aquatic resources.

Deer Element Distribution

A number of archaeologists have suggested that a complementary representation of deer skeletal elements at small versus large Mississippian settlements may provide evidence for the relationships among these sites (Scott 1981; Kelly 1979). In particular, Scott (1981) has found a greater representation of meat-yielding elements at a large Mississippian ceremonial center than at a small Mississippian farmstead site in eastern Mississippi. She hypothesizes that these differences may relate to the transportation of tribute, in the form of deer meat, from scattered farmsteads to regional Mississippian centers.

As Scott notes, there are alternative hypotheses for patterned deer element distributions. In general, studies of element distributions address the question of whether or not deer were being dressed and butchered at the site or away from the site. This local/extra-local distinction may indicate relationships between habitation sites, may aid in the identification of specialized hunting or butchering camps, or may be a result of differential treatment and disposal of bone at different sites. It was hoped that a comparison of deer skeletal elements from the Dyar and Ogeltree sites would address some of these questions. Unfortunately, although deer account for a substantial proportion of identified bone at each site, the sample sizes are probably insufficient for reliable interpretation (five MNI at the Dyar site, six MNI at Ogeltree). This is especially true for the Dyar site, where there is little control of intrasite variability. The element distribution data are presented in Table 11 in the hopes that they may be of interest to some future researcher.

Despite the interpretive problems mentioned above, there is a broad distinction that should be noted, although not necessarily accepted as significant because of the small sample size. This broad distinction is observable in the relative representation of elements from the axial skeleton (skull, teeth, vertebrae, ribs) and those from the quarters or limbs of the animal. Elements of the axial skeleton generally represent parts of the deer that bear less meat than the limbs of the animal. At the Dyar site, elements of the axial skeleton contribute 36.4% of the total

Table 11. Distribution of deer skeletal elements

	OGLETREE		DYAR	
	#	%	#	%
SCAPULA	8	3.36	4	0.84
HUMERUS	7	2.94	8	1.67
RADIUS	7	2.94	7	1.46
ULNA	6	2.52	4	0.84
CARPALS	11	4.62	8	1.67
METACARPALS	5	2.10	4	0.84
FOREQUARTER	44	18.49	35	7.32
PELVIS	6	2.52	9	1.88
FEMUR	5	2.10	2	0.42
PATELLA		0.00	1	0.21
TIBIA	10	4.20	15	3.14
METATARSALS	18	7.56	5	1.05
ASTRAGALUS	4	1.68	3	0.63
CALCANEUS	7	2.94	1	0.21
CUBO-NAVIC.	5	2.10	3	0.63
HINDQUARTER	55	23.11	39	8.16
UD LONGBONE	71	29.83	193	40.38
METAPODIALS	19	7.98	10	2.09
PHALANGES	24	10.08	16	3.35
SESAMOID	4	1.68	11	2.30
RIBS	4	1.68	33	6.90
SKULL	2	0.84	34	7.11
ANTLER	1	0.42	1	0.21
DENTARY	1	0.42	13	2.72
TEETH	5	2.10	74	15.48
CERV. VERT.	3	1.26	4	0.84
THOR. VERT.	2	0.84	8	1.67
LUMB. VERT	2	0.84	3	0.63
UD VERT.	1	0.42	4	0.84
TOTAL AXIAL	21	8.82	174	36.40
TOTAL DEER	238	100.00	478	100.00

identified deer bone. By contrast, only 8.8% of the identified deer bone from the Ogeltree site is contributed by elements of the axial skeleton. If these figures could be accepted as reliable, they would suggest that deer procurement or butchering at the Ogeltree site was more extralocal than at the Dyar site. This would seem to contradict the expectation that mound and village sites, such as the Dyar site, were receiving deer meat from outlying settlements. On the other hand, it is possible that the Dyar site itself, being a single-mound site, was contributing deer meat to the Scull Shoals site, which is the nearest multiple-mound site. Although the samples presented here are insufficient to address these questions, these kinds of data are relevant to the problem of understanding site variability and interrelationships and therefore should be a part of future research designs for investigations in the Oconee Province.

Summary

In this chapter, faunal remains have been used to examine three aspects of site-use for the Dyar, Ogeltree, and 9Gel75 sites. These are site seasonality, specialization of animal exploitation, and locality of deer procurement or butchering. The Dyar site appears to have been occupied on a year-round basis, while 9Gel75 and the Ogeltree site were probably occupied only during the warm season. Degree of specialization with regard to aquatic versus terrestrial animal exploitation indicates that the Dyar site was least specialized in this regard, as both terrestrial and aquatic fauna were well represented there. On the other hand, it is clear that the greatest proportion of edible meat at the Dyar site was contributed by a single species, the white-tailed deer. Selective exploitation of the white-tailed deer, as seen at the Dyar site, is a hallmark of Mississippian exploitation of animal populations. Faunal remains from 9Ge175, on the other hand, show the greatest degree of specialization toward exploitation of aquatic resources. The Ogeltree site falls somewhere between the Dyar site and 9Ge175 with regard to terrestrial versus aquatic specialization. Another difference noted between the Ogeltree site and 9Ge175 is that more species at the former are those which were likely exploited away from the site, while at the latter, the vast majority of species could be exploited in the immediate site vicinity. Although differences in deer element distributions among the Dyar and Ogeltree sites suggest that deer meat was procured or butchered away from the Ogeltree site, these data are not reliable due to insufficient sample size.

CHAPTER VIII
CERAMIC VESSELS: SITE PERMANENCE, GROUP SIZE, AND SITE SPECIALIZATION

In this chapter a comparison of the variety, size, and frequency of ceramic vessels identified at each of four sites is presented. These data are employed to test hypotheses regarding the degree of site permanence, the size of groups that lived at or visited the sites, and the range of activities which involved the use of ceramic vessels at each site.

A basic assumption underlying this analysis is that vessel size and shape are strongly determined by the intended-use of the vessel. An ability to identify the primary uses of vessels is therefore an important aspect of the present study. Several researchers have recently addressed this problem. Using information from ethnographic accounts of several southwestern United States Indian groups, David Braun (1980) has shown that archaeologically measurable attributes of vessel shape are systematically related to the intended use of ceramic vessels. Specifically, he has noted that orifice size and type of constriction appear ethnographically to vary with intended frequency of access and containment security

(Braun 1980:172). In an analysis of Lamar period ceramics from northwest Georgia, David Hally (1982) has identified at least 11 distinct vessel classes based on shape and size distributions. Hally has combined information from ethnographic accounts, archaeological context, and identification of vessel-use alteration in an effort to determine vessel function for these classes. A third approach to identifying vessel function is presented by Duane King (1977). Using several native Cherokee potters as informants, King developed a vessel shape and use classification scheme for ceramics that were recovered from eighteenth century Overhill Cherokee sites. King and his informants eventually settled on 10 categories of vessel shape (1977:155).

These three studies are of direct relevance to the present research and will be considered in greater detail later in this chapter. For now, however, it should be noted that several important aspects of the relationship between vessel size, shape, and use have been demonstrated by these authors. First, Braun's study illustrates the usefulness of rim sherds for the identification of vessel function. The present research relies largely on rim-sherds recovered from each of the Oconee Province sites. Secondly, Hally's (1980) survey of ethnographic studies demonstrates that most contemporary pottery-using communities have a limited number of vessel size-shape categories, each of which are reported to have a distinct use or range of uses. Lastly, the ceramic assemblages studied by Hally (1980) and by King (1977) bear geographic, temporal, and stylistic affinities with the ceramic assemblage of the Oconee Province. Both studies illustrate vessel forms that are directly analogous to forms present in the Oconee Province.

The notion that intended use strongly determines the form of ceramic vessels is not new (cf. Holmes 1903:61-62). While this assumption is essential to the present analysis, it is important to note Shepard's (1976:224) words of caution, that vessels are frequently put to uses for which they were not originally intended. In addition, others have noted that vessel fragments are frequently reused in a variety of ways. For example, Stanislawski (1969) has observed that modern-day Hopi reuse potsherds as chinking in mortar construction and as part of the pottery firing apparatus. Similarly, Hally (1980) hypothesized that several large vessel fragments, found on the floors of abandoned Lamar period structures in northwest Georgia, were being reused as scoops, pot lids, or palettes. In spite of these potential complications, the present research assumes that with adequate sample sizes, similarities, or differences among these four sites with regard to vessel shape and size will reflect the primary (intended) use of vessels. The relative frequencies of various vessel shapes and sizes at each site may thus be used to test hypotheses about site use and function.

Methods

A comparison of vessel shapes among sites involves two stages of observation, each with its own set of methods. The first stage is to develop a classification of vessel shapes for the Oconee Province. The second is an examination of the size and relative frequency of vessel classes at each site. The following methods were applied to meet the first goal of constructing a vessel form classification:

A minimum number of vessels, or MNV identification was performed for the three small sites (Ogeltree, Punk Rockshelter, and 9Ge175). MNV determinations were based on rim sherds that were large enough and distinctive enough to ensure that each vessel recognized was recorded only once. Because of the large volume of materials excavated, an MNV identification was not practical for collections from the Dyar site. Instead, only the most complete vessel fragments from the Dyar site were recorded in this stage of the analysis. In most cases, the whole or largely reconstructed vessel fragments from the Dyar site were from burial, house floor, or mound contexts. Because it is the largest and most complex site considered in this study, the contexts of the sample from the Dyar site will be discussed in greater detail later in this chapter.

Measured profiles were drawn of each vessel fragment identified. Variables of surface treatment, evidence of vessel use (such as the presence of sooting or interior surface wear), and estimated diameter at rim were recorded for each vessel fragment. Profiles were drawn in the following manner. In order to ensure the proper vertical orientation of the vessel or vessel fragment, the edge of the vessel's rim was set flush against a flat, horizontal surface. The rim was then rocked back and forth until little or no light passed between the rim edge and the table surface. A vertical measuring rod was placed against the properly oriented sherd or vessel and horizontal measurements (distance from the vertical rod to the sherd surface) were taken at several points along the vertical axis of the sherd. With these vertical and horizontal coordinates as guides, the profiles were drawn directly on graph paper. Although no special measuring devices were used, this method is essentially identical to that presented by Shepard (1976:254) in her analysis of Plumbate ware. In all cases only one side of the vessel or vessel fragment was measured and drawn. The drawings show idealized shapes that are produced by mirroring one contour on the plane passing through the midpoint of the rim diameter. Thus, in some cases, vessel drawings are probably more symmetrical than was the actual vessel. Figure 26 is an example of the original vessel drawings produced by this method.

Diameter at rim for each vessel was estimated by sliding the rim along a board on which a series of concentric circles had been drawn. Diameters of the concentric circles were calibrated in even numbers by 2 cm intervals. Occasionally a rim was regular enough to be assigned a diameter between the 2 cm diameter intervals, but in most cases when a rim fit the curve between 2 cm diameter intervals, it was assigned the higher of the two possible diameters. Thus, if a slightly irregular rim appeared to fit the curve somewhere between 18 and 20 cm, it would be assigned a diameter at rim of 20 cm. It should be noted that rim diameters were measured along the outer edge of the rim. This is important when the diameter of jars, which usually have outflaring rims, is being considered. In some cases it was useful to use a "Formagage" to copy the curvature of the rim. The Formagage could itself then be fitted to the concentric circle chart.

In all, measured drawings of 309 whole or partial vessels were recorded from the four sites. An additional 94 vessels from other sites in the Oconee drainage were also recorded. Of these latter, 83 vessels were part of a

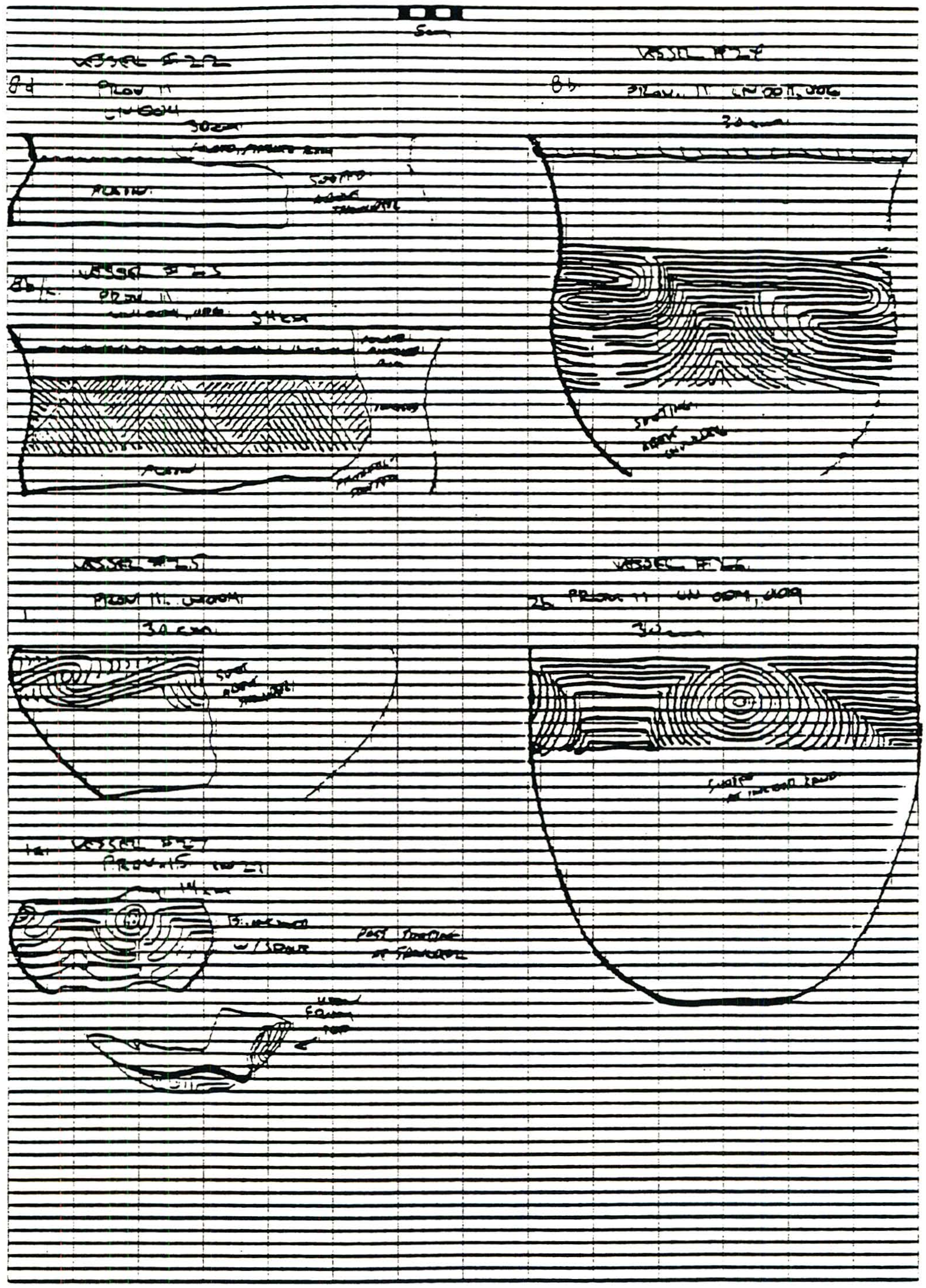


Figure 26. Original vessel drawings.

collection from the protohistoric Joe Bell site (9Mg28), which has been studied in detail by Mark Williams (Williams 1983). Measured drawings of each of the 309 vessels from the four sites are presented in Appendix 2.

These measured drawings form the basis of a classification of vessel shape based largely on visual similarity. Photocopies of the original drawings were used to make "vessel-form flash cards" which could be grouped or rearranged in several different ways. The vessel drawings were first separated according to whether they represented restricted or unrestricted forms. The former were then differentiated according to the presence or absence of a neck. Necked vessels could then be further separated according to the relative height of the neck. Unrestricted vessels were separated according to the angle at which the rim met the horizontal plane, and so on. Each re-sorting brought a further refinement of shape categories. After a preliminary classification scheme had been constructed, the "flash cards" were reshuffled and given to a second, and then to a third colleague for reclassification. Both individuals have some expertise in the analysis of Mississippian period southeastern ceramics and both were substantially and independently in agreement with the preliminary classification scheme. Although this method of sorting contains a subjective component, the general agreement among classification schemes proposed by three researchers suggests that this method of grouping vessel shapes provides a useful and certainly expeditious means of describing the range of vessel shapes in the Oconee Province. This method of classification is similar to that employed by O'Brien (1972) and Hally (1980).

As stated above, the immediate goal of the vessel shape classification was to provide a framework for the comparison of vessel shapes and sizes among sites. It must be emphasized that while the MNV unit of observation just described is suitable for identifying the range of vessel forms in the Oconee Province, MNV probably do not represent the best unit for comparing relative frequencies of vessel forms among sites. This is due to an inherent bias in the identification of MNV. For example, it is much easier to identify a vessel fragment as a unique vessel if there is some decoration or other surface modification present. In other words, plain sherds are less likely to be identified as minimum individual vessels. If particular vessel forms, such as hemispherical bowls, are usually undecorated, the frequency of these forms will be greatly underestimated. In fact, there will be a ceiling imposed by the size of the sample. Once a few hemispherical bowls have been identified in several different size classes, no more can be added to the sample because they are virtually indistinguishable from one another.

The goal of comparing relative frequencies of vessel forms among sites requires a different unit of observation, one which contains less inherent bias than the MNV. To eliminate this bias against undecorated vessels, the classification based on measured drawings was designed to accommodate all the rimsherds from a given site, as opposed to only those which clearly represented a distinct, individual vessel.

Figure 27 shows the 21 categories of profile shape that were used to classify rimsherds from the four sites. The rimsherd classification was designed to be as detailed as possible to allow for later collapsing of data into more inclusive categories during analysis. Each category is described below. Several of the terms used in the description of rim and vessel shape categories refer to specific characteristics of vessel profile and to structural classes of vessel shape. This terminology closely follows Shepard's discussion of vessel shape (Shepard 1976:226-236). Before a description of profile shape categories is presented, a few of these descriptive terms will be briefly defined here. Examples are illustrated in Figure 28:

> 1. point of vertical tangency: The point where the tangent of profile curvature is vertical. On a spheroidal form such a point would occur at the point of maximum diameter. On a hyperbolic form these points occur at points of minimum diameter.
>
> 2. inflection point: The point where the profile curvature changes from concave to convex or vice versa.

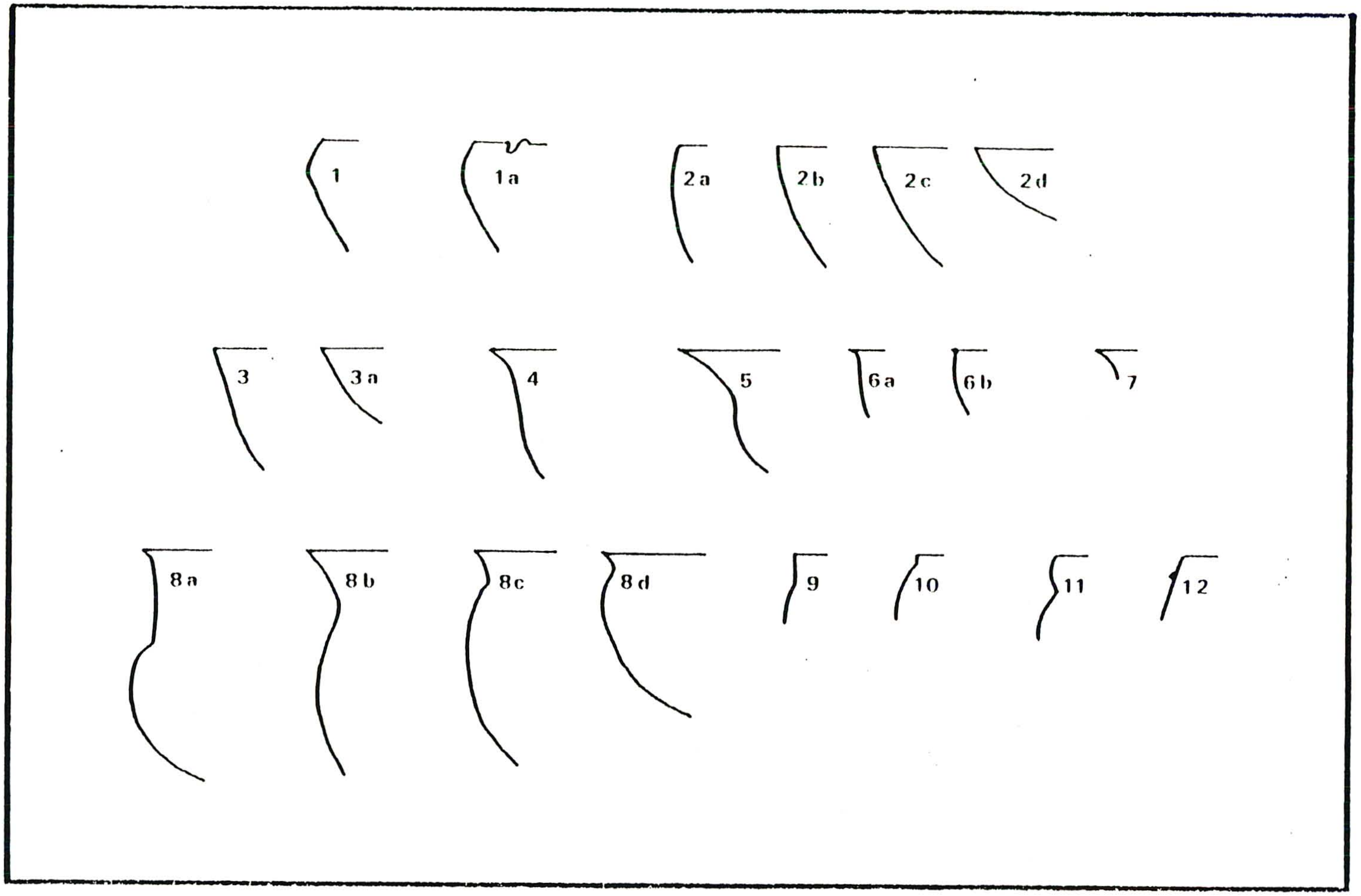


Figure 27. Vessel shape categories.

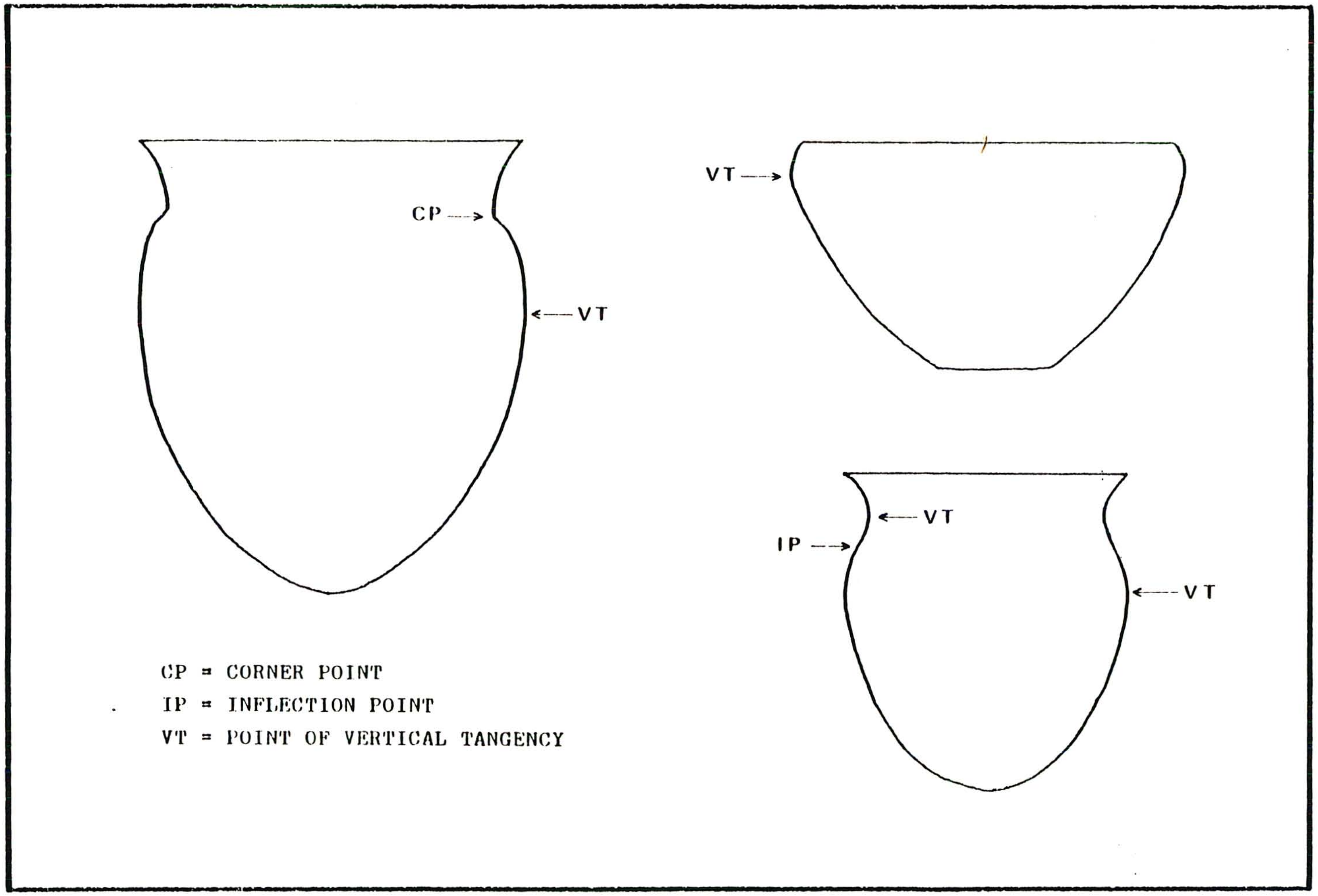


Figure 28. Characteristic points of a vessel profile.

3. corner point: The point where the vessel profile displays a sharp or angled change in contour.

4. unrestricted: A vessel whose orifice diameter is equal to or larger than the diameter at any other point of the vessel profile.

5. restricted: A restricted vessel has an orifice diameter that is smaller than the maximum vessel diameter.

6. composite contours: A vessel whose profile is marked by one or more corner points or inflection points.

7. simple contours: A vessel whose profile lacks corner points.

The following is a description of 21 vessel shape categories that are based on examination of 309 measured drawings of whole vessels and vessel fragments:

Category 1 is the cazuela or carinated bowl. Cazuela bowls are characterized by an insloping rim. The shoulder, or point of vertical tangency is usually located more than 2 cm below the rim. The shoulder may be slightly rounded or may display a sharp angle. During the early and late Dyar phases these vessels are frequently incised above the shoulder. When present, the base of these vessels is invariably flat.

Category 1a includes the few cazuelas or shouldered bowls with rims that are altered to form a spout for pouring.

Categories 2a-2d are unrestricted vessels with curved profiles. They are differentiated on the basis of the angle at which the rim meets the horizontal plane. In nearly all cases, the vessel bases, when present, are flat. Vessels in category 2a are hemispherical bowls that have a point of vertical tangency below the rim, but unlike vessels in category 1 there is no distinct shoulder present. Vessels in category 2b are characterized by a rim that is perpendicular to the horizontal plane. In other words, the point of vertical tangency is located at the rim. Vessels in categories 2c and 2d have rims that meet the horizontal plane at an acute angle. Category 2d is differentiated from 2c subjectively in that the former are very shallow bowls.

Categories 3 and 3a are unrestricted vessels with apparently straight profiles that meet the horizontal plane at an acute angle. The latter are subjectively differentiated from the former by the greater acuteness of the rim angle. Categories 3 and 3a are distinguished from categories 2c and 2d in that the latter have rims that curve upward to the horizontal plane while rim profiles of categories 3 and 3a are apparently straight. In practice, it was sometimes difficult to decide whether a rim belonged in category 3 or 2c. It was similarly difficult at times to decide whether to categorize a rim as either 3a or 2d.

Vessels in category 4 are unrestricted vessels with outflaring rims. No complete vessels in this category were recovered from the four sites in this study. However, several complete examples are known from the protohistoric Joe Bell site. These Bell phase examples invariably have a rounded base.

Vessels in category 5 are unrestricted vessels with composite contours. The lower portion of the profile is a curved bowl shape, while the upper portion is excurvate. These two contours are sharply delineated by a corner-point at the point of inflection.

Vessels in category 6 are bowls with rims that become excurvate at, or immediately below, the rim. Forms 6a and 6b are differentiated in that the latter has a very slight orifice constriction at the rim. It was sometimes difficult to distinguish 6b rims from those in category 8d (to be discussed below).

Category 7 is a catch-all for excurvate rims whose forms, due to the size of the rimsherd, could not be further distinguished. In other words, rims in category 7 could be fragments of vessels belonging in categories 4, 5, 6, or 8.

Categories 8a-8d are jars. These are vessels whose orifice is restricted below the rim. They are differentiated on the basis of neck length, or more precisely, by the distance from the rim to the inflection point. Vessels in category 8a have the longest necks, while those in category 8d have the shortest necks. Vessels in category 8a are distinctive in shape. They have a globular body and a long, straight neck. Category 8d vessels are similarly distinctive in that the maximum orifice constriction occurs immediately below the rim. It was not as easy to determine whether a rimsherd belonged in category 8b or 8c. As the classification of rimsherd collections progressed, jar fragments were often classified as 8b/c, or simply as 8, to indicate the difficulty in differentiating among these two categories. Vessels categorized as 8b, 8c, 8b/c, and 8 show the greatest form variability in that their inflection point may be marked by a corner point or by a gently curving contour. In all cases the bottoms of jars are rounded when present.

No complete vessels representing categories 9-12 were recovered. These categories are known only from rimsherds. All represent restricted vessel forms. Categories 9 and 10 are restricted below the rim. In both of these forms the rim rises vertically from the sharply marked inflection point. Categories 9 and 10 are differentiated in that the inflection point for the latter is located just below the rim. Category 11 rims represent vessels of composite contours. The shape may be loosely described as a "bowl on top of a bowl." Category 12 rims have straight profiles that slant slightly inward. These vessels are therefore restricted at the orifice.

With the use of this rimsherd classification, collections from the four sites were re-examined. All rimsherds of sufficient size were classified according to the 21 shape categories. Rims were considered acceptable for measurement only when the measured arc at the rim was equal to or greater than 20% of the estimated rim diameter. An additional 536 rims were added to the sample from all four sites. Taken together, the 536 measured rims and the 403 measured drawings of minimum vessels yield a total of 939 cases for this study. Frequencies of each shape category for each site are given in Table 12.

Data recorded for all vessel drawings and classified rims are presented in Appendix 3. Data were recorded for the following variables which appear in columns 1-10 of Appendix 3:

1. SITE #--Dyar site = 9Ge5; Ogeltree site = 9Ge153; Punk Rockshelter = 9Pm211.

2. V. #--(vessel number): Vessel numbers were assigned to all vessels or vessel fragments for which there are measured drawings. Numbers in this column that are prefixed by an "R" indicate rimsherds added to the analysis with the use of the rimsherd shape classification (which was based on the measured drawings).

3. PROV/LOT #--(provenience): Intrasite provenience was recorded by two numbers for sites in the Wallace Reservoir Project. The number on the left of the "/" indicates the "provenience" or location of the excavation area. The number on the right of the "/" indicates the "lot number" or field specimen number of the level or feature within the provenience unit.

4. SHAPE--Designation of shape is based on the 21 shape categories discussed above and illustrated in Figure 27.

5. DIAM--This indicates diameter (in centimeters) measured at the rim.

Table 12. Frequency of each vessel shape category

SHAPE CATEGORY	DYAR #	DYAR %	OGELTREE #	OGELTREE %	PUNK ROCKSHELTER #	PUNK ROCKSHELTER %	9GE175 #	9GE175 %
1	84	26.75	49	18.42	23	27.38	33	20.50
1A	1	0.32	0	0.00	3	3.57	0	0.00
2A	14	4.46	23	8.65	3	3.57	14	8.70
2B	15	4.78	32	12.03	2	2.38	12	7.45
2C	8	2.55	39	14.66	14	16.67	16	9.94
2D	13	4.14	14	5.26	3	3.57	2	1.24
3	2	0.64	19	7.14	15	17.86	27	16.77
3A	0	0.00	0	0.00	0	0.00	8	4.97
4	6	1.91	10	3.76	11	13.10	8	4.97
5	0	0.00	1	0.38	2	2.38	0	0.00
6A	1	0.32	5	1.88	0	0.00	0	0.00
6B	2	0.64	3	1.13	0	0.00	1	0.62
7	70	22.29	14	5.26	0	0.00	18	11.18
8A	32	10.19	14	5.26	1	1.19	3	1.86
8B	15	4.78	3	1.13	0	0.00	2	1.24
8B/C	15	4.78	6	2.26	3	3.57	5	3.11
8C	12	3.82	2	0.75	0	0.00	2	1.24
8D	6	1.91	5	1.88	3	3.57	2	1.24
8	9	2.87	10	3.76	0	0.00	5	3.11
9	1	0.32	2	0.75	0	0.00	1	0.62
10	3	0.96	3	1.13	0	0.00	2	1.24
11	4	1.27	6	2.26	1	1.19	0	0.00
12	1	0.32	6	2.26	0	0.00	0	0.00
TOTALS	314	100.00	266	100.00	84	100.00	161	100.00

6. RIM--(rim modification): Some secondary form characteristics of rim modification are of chronological significance. Furthermore, it is possible that one of these (thickening of the rim by folding or by addition of a filleted strip--most frequently found on jars) may have served some function, such as facilitating the fastening of a cover to the vessels. These and other rim modifications are recorded here. The following code was used to classify and record rim modifications:

0--These are rims which are not modified according to any subsequent categories (plain; Figure 29).

1--These are folded rims or applique rim strips which bear circular impressions produced by pressing the cut end of a hollow cane into the wet clay surface (cane punctate; Figure 29).

2--These are folded rims or applique rim strips bearing vertical or diagonal impressed lines (folded notched; Figure 29).

3--These are folded rims or applique rim strips which have a scalloped lower edge that appears to have been produced by pinching the wet clay (folded pinched; Figure 29).

4--These are folded rims or applique rim strips which appear to have been pinched in such a way that vertical lines stand in relief across the entire thickened rim (folded vertical pinched; Figure 29).

5--These are rims with slightly bulbous, rounded edges (rolled; Figure 29).

6--These are rims that bear incising on the top of a flattened rim or on the interior of an outflaring rim (incised; Figure 30).

7--These are rims that bear a ledge on the exterior surface immediately below the rim edge (ledge; Figure 30).

8--These are folded and thickened rims that bear no evidence of pinching or punctations (folded plain; Figure 30).

Figure 29. Rim modifications, row 1: plain; cane punctate; folded notched. Row 2: folded vertical pinched; folded pinched.

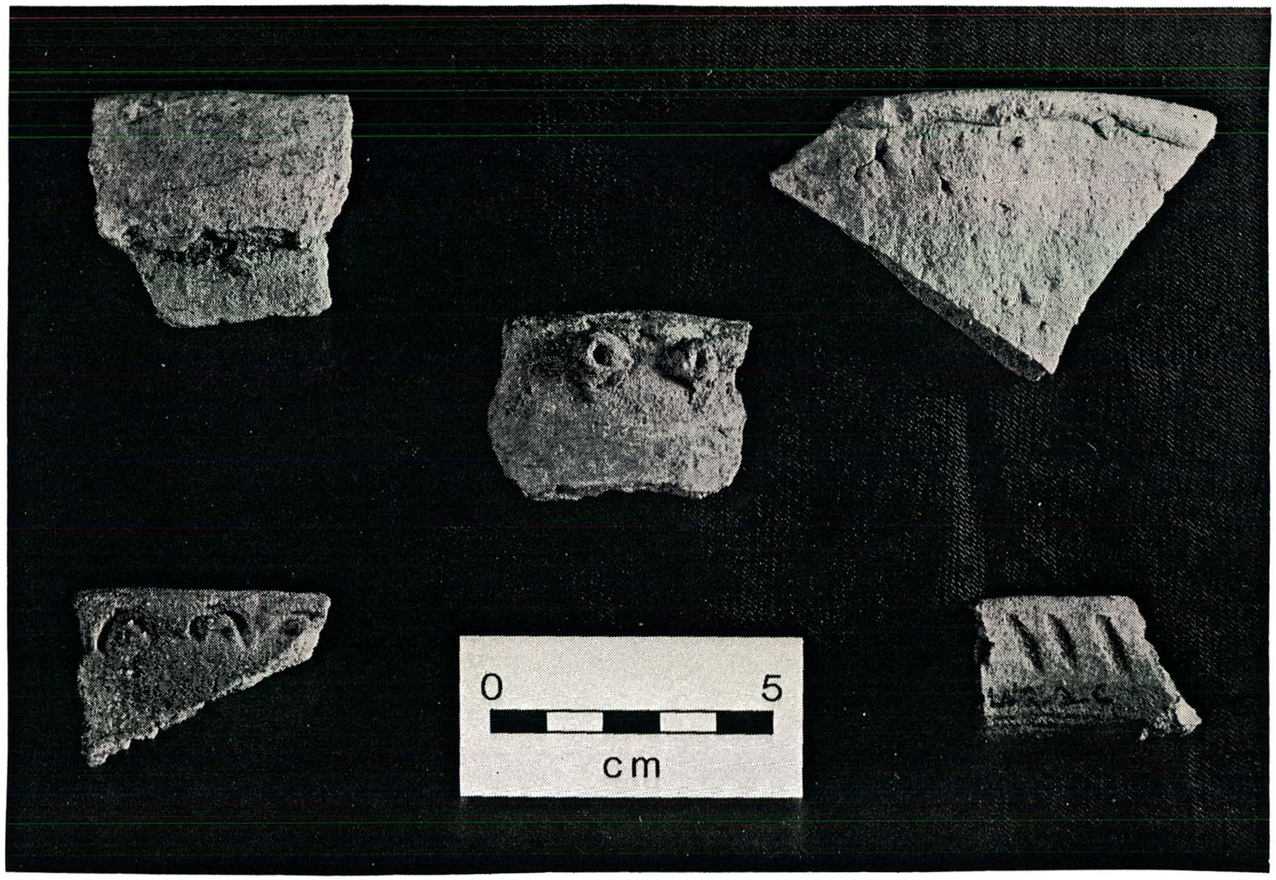


Figure 30. Rim modifications. Row 1: folded plain; rolled. Center: punctated nodes. Bottom: plain punctated; incised.

9--These are rims flattened to the extent that a cross-section would appear t-shaped (t-shaped; Figure 30).

10--These are rims that bear vertical or diagonal impressed lines but which are not thickened by folding or addition of a rim strip (plain notched; Figure 30).

11--These are rims to which nodes have been attached just below the rim edge. The nodes bear cane punctate impressions (punctated nodes; Figure 30).

12--These are rims that bear cane punctate impressions just below the rim edge. These rims are not thickened by folding, by the addition of a rim strip, or by the presence of nodes (plain punctated; Figure 30).

7. SURF--Thirteen categories of surface treatment are illustrated in Figures 31 and 32. For each vessel or rim recorded in this study, surface treatment is indicated by the following code numbers in Appendix 3.

0--plain surface
1--incised exterior
2--incised interior
3--Lamar Complicated Stamped
4--Etowah Complicated Stamped
5--burnished exterior
6--nodes
7--punctated shoulder
8--check stamped
9--corn cob stamped
10--punctated (other than on vessel shoulder)
11--simple stamped
12--brushed
13--lug or tab present at rim

8. INC--(incising): Four kinds of Lamar incising can be stylistically distinguished and have chronological significance in the Oconee Province. These categories are illustrated in Figure 33 and are described below:

1--The ceramic type, Morgan Incised (M. Smith 1981:189) is invariably associated with vessels that can be classified as shape 8a (above). These are globular jars with straight, vertical

Figure 31. Surface treatment. a. Lamar Complicated Stamped with nodes; b. burnished sherd with nodes; c. Lamar Bold Incised; d. Lamar Plain; e. plain sherd with nodes.

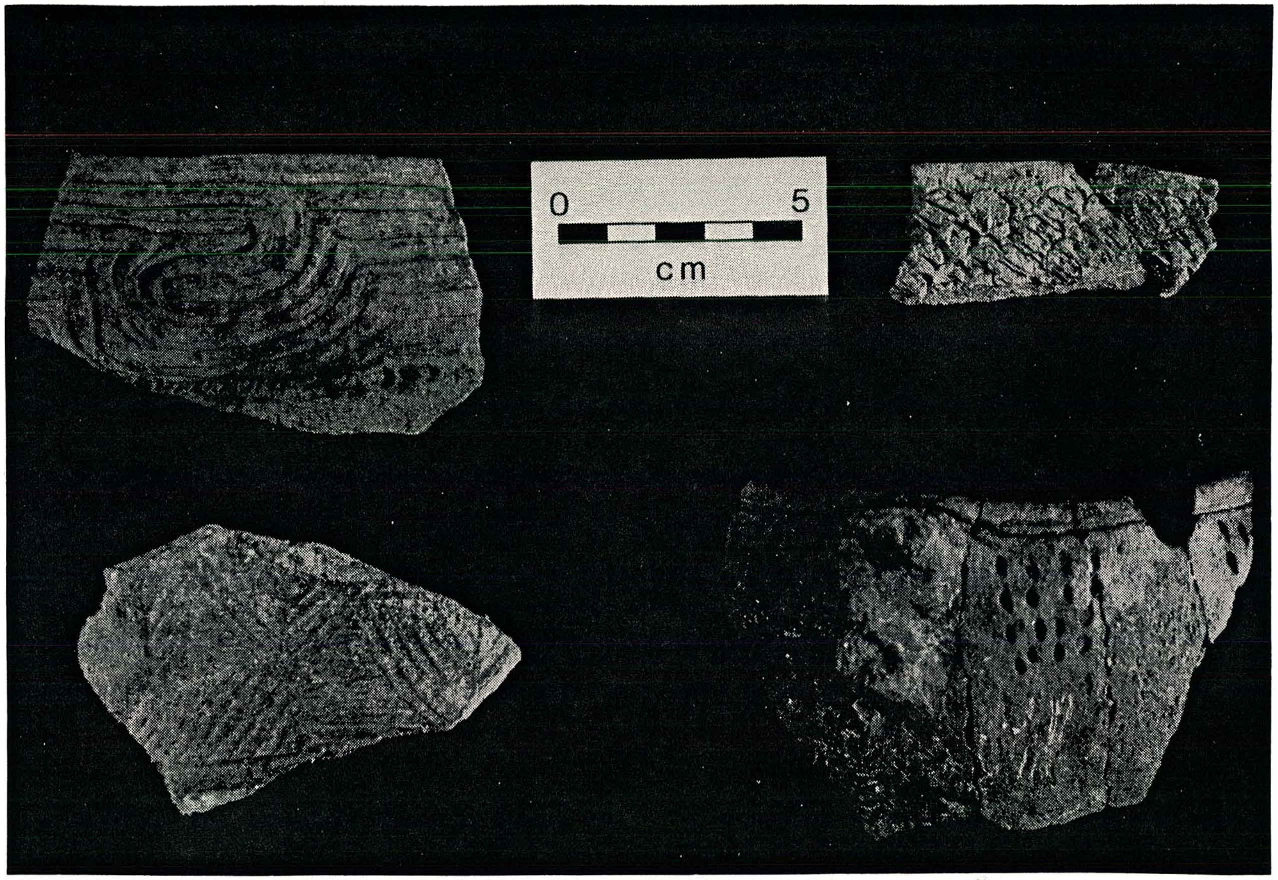


Figure 32. Surface treatment. a. Lamar Bold Incised sherd with punctations at shoulder; b. corn cob stamped; c. Etowah Complicated Stamped; d. unique sherd with single incised line and punctations (from 9Ge175).

Figure 33. Incising styles. Row 1: Morgan Incised.
Row 2: early Dyar phase Lamar Incised.
Row 3: late Dyar phase Lamar Incised.
Row 4: Bell phase Lamar Incised.

necks. The incising is found on the neck of the vessel and consists of zones of crosshatched lines that alternate with zones of parallel vertical lines. This style of incising is known almost exclusively from the Oconee drainage above the Fall Line. Morgan Incised is most popular during the early Lamar Duvall phase although it is also present during the early part of the subsequent Dyar phase. Marvin Smith has estimated the date range for this type as approximately A.D. 1275-1450 (M. Smith 1981:191).

2--Early Dyar incising refers to a variant of the type, Lamar Incised (Fairbanks and Jennings 1939) that is common during the early Dyar phase in the Oconee Province. Lamar Incised motifs during the early Dyar phase usually consist of only two or three incised lines arranged in very simple scroll patterns. Some of these are illustrated in Figure 33. These can usually be distinguished from incised motifs that are common during the later portion of the Dyar phase.

3--Late Dyar incising refers to variants of the type, Lamar Incised (Fairbanks and Jennings 1939) that are most prevalent during the late Dyar phase in the Oconee Province. The incised motifs of the late Dyar phase can be distinguished from those of the early Dyar phase in that the former usually consist of 4 to 11 incised lines arranged in more complicated patterns. Several of these are illustrated in Figure 33.

4--Bell phase incising is best known from the protohistoric Joe Bell site (9Mg28). Bell phase ceramics have been described in detail by Mark Williams (1983). Incised motifs during this phase show the greatest complexity of design, and can be distinguished from late Dyar incising by differences in the execution of incising. Unlike the three earlier styles of incising just described, Bell phase incising is executed with extremely fine lines, often less than 1.5 mm in thickness. Examples of Bell phase incising are illustrated in Figure 33.

5--This category includes incised rims which could not be confidently assigned to the incising categories presented above.

9. ALT--(use alteration): Several kinds of surface alteration related to vessel use have been recorded. These are coded as follows:

1--sooted exterior: Hally (1983) has shown that resinous soot deposits, resulting from repeated exposure to cooking fires, are relatively impervious to natural degradation, and can be readily distinguished from surface discolorations that result from the initial firing of a vessel. Because the majority of vessels in this study are represented only by small fragments, it is the presence of sooting that is of interest here. The absence of sooting may simply be due to the small proportion of the vessel that is represented.

2--interior surface pitting: Interior surface pitting appears to be a result of mechanical abrasion. As an alternative explanation, Hally (1982) has suggested that pitting may be a result of bacterial action related to fermentation of foods stored in the vessels. The distribution of pitting when present in large jars is invariably restricted to a band encircling the vessel interior from the point of maximum diameter to several centimeters above the base (Figure 34).

3--re-fired vessels: This category is perhaps a misnomer. It refers to vessels that appear to be completely oxidized such that the interior and exterior surfaces, as well as the vessel paste are light red in color. Such vessels usually exhibit a grainy, soft surface texture. Most examples of this condition are from the Punk Rockshelter. Firing experiments with local clays and with incompletely oxidized archaeological specimens may help determine whether or not this condition is in fact a result of exposure to intense heat.

4--re-used sherds: These are vessel fragments which show evidence of having been used after the original vessel was broken. Usually these are large fragments found on the floors of abandoned structures.

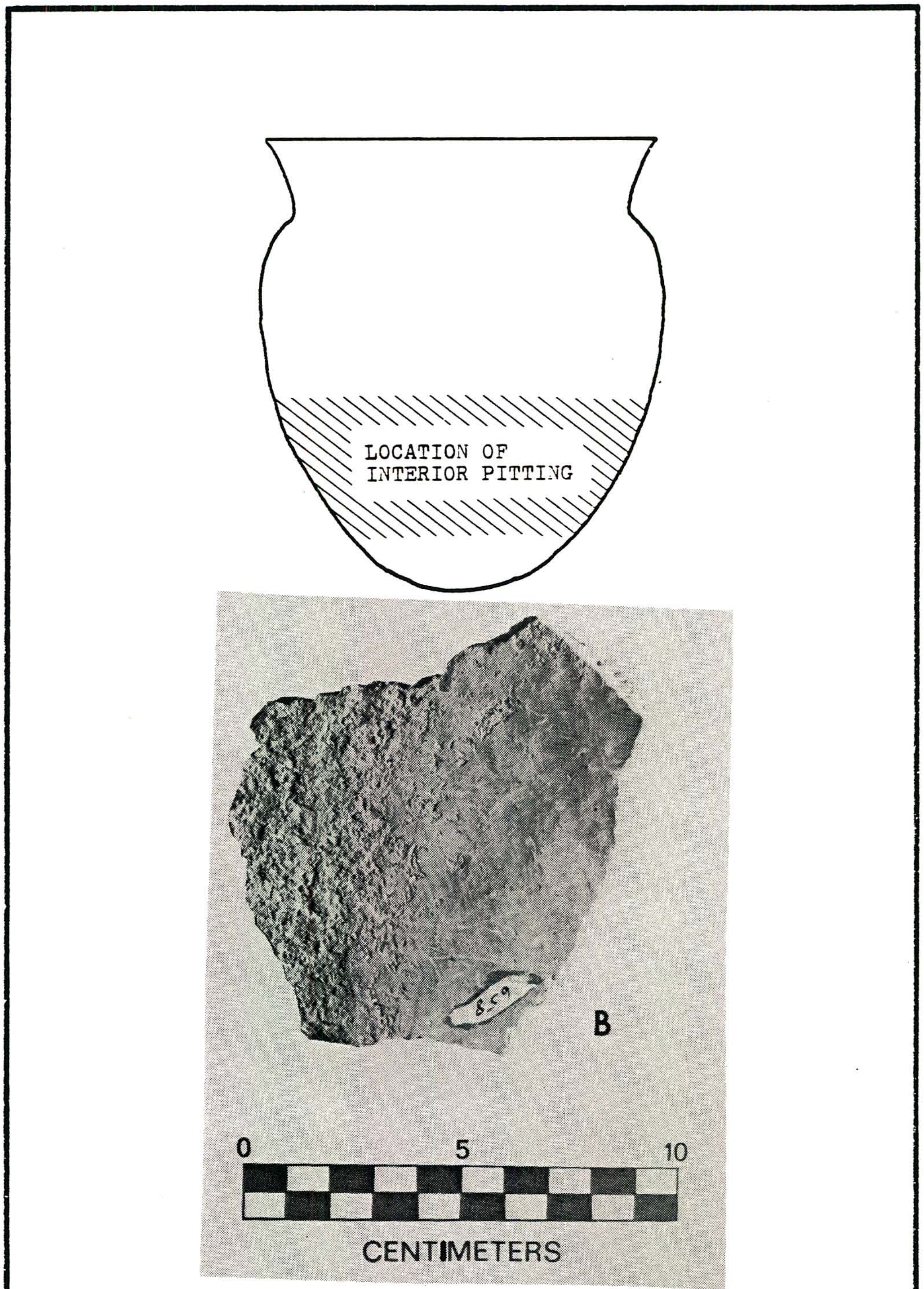


Figure 34. Location of interior surface pitting on large Lamar jars.

5--interior sooting: Occasionally, sooting was observed along the vessel interior in a distinct line just below the rim. Presumably these deposits are the result of food or broth that burned while being heated in the vessel.

10. RD--(relative date): Vessels with secondary form characteristics that are of chronological significance in the Oconee Province were assigned a relative date from 1 to 3. These relative dates do not always correspond directly to the named phases in the Oconee Province, but are a useful device for the examination of changes in size within a given vessel shape category through time. The following criteria were used to assign relative dates to the vessels:

1--A relative date of 1 was assigned to cazuelas (shape category 1) with early Dyar incised motifs (described above) or those without incising that exhibited nodes placed at the point of maximum diameter. These are vessels of the Duvall and early Dyar phases.

A relative date of 1 was also assigned to vessels with folded or applique cane punctate, and to vertical pinched rim forms. While it is difficult to assign rim forms to specific phases, it is clear that between the Duvall and Dyar phases there is a gradual replacement of the rim forms just mentioned by the folded pinched rim (Rudolph and Blanton 1981:16).

2--A relative date of 2 was assigned to vessels with late Dyar incised motifs (described above) and to vessels with folded pinched rims.

3--A relative date of 3 was assigned to vessels with protohistoric Bell phase incised motifs.

As with the MNV units, the use of rimsherds as a unit of observation carries its own sources of potential bias. At this point it is important to consider some assumptions inherent in the use of rimsherds as a unit of observation. One potential problem has already been discussed in that rimsherds, as vessel fragments, may have been used for purposes other than those for which the entire vessel was originally designed. It is assumed for purposes of this analysis that with adequate sample sizes the rimsherds from a site represent complete vessels that were used and broken (though possibly later re-used) at the site.

Another potential source of bias was noted by Braun (1980:177), who suggests that because vessels with larger rims will break to produce a greater number of rimsherds, these vessels will be overrepresented in a given collection. To some extent, this potential source of error is compensated for in this study by a size requirement. That is, not all rims were considered "measurable." When a rim fragment was too small to determine the vessel diameter, as were the majority of rim sherds, it was excluded from the study. As a general rule of thumb, rimsherds were acceptable if the measured arc was at least 20% of the estimated rim diameter. Vessels with larger rims must therefore be represented by larger rim fragments (20% of the estimated rim diameter), and this requirement provides some compensation for the potential overrepresentation of large vessels.

A third potential source of error involves the assumption that the relative frequency of rimsherds of a vessel shape category actually reflects the relative-use of that vessel form at a site. Because the majority of vessels examined in this study entered the archaeological record through discard behavior, representation of vessels is biased by factors that influence the relative breakage rates of different vessel forms. George Foster (1960) has observed several factors that influence the breakage and discard of various ceramic wares among villages in Michoacan, Mexico. These include the basic strength of the wares, the kinds of uses to which pottery is put (such as serving versus storage), the presence of domesticated animals or children, and the relative ease or expense of vessel replacement (Foster 1960:608). Compensation for factors related to vessel breakage and discard is beyond the scope of the present study. Therefore, the assumption that relative abundance is equal to relative use within a site must be considered untenable at present. It should be kept in mind that although rimsherds are spoken of as "vessels" throughout the following analyses, it is actually the frequency of rimsherds that is being discussed. These frequencies are distorted to an unknown extent by factors relating to vessel breakage and disposal rates. Although recognition of these potential sources of bias may limit the use of frequencies for the analysis of a single site, it by no means lessens the value of intersite comparison of frequencies, especially where each shape category is taken separately.

A fourth assumption which should be made explicit is that varying recovery methods do not bias the relative representation of vessels in any systematic way. Because only large rims are included in this study, recovery techniques as varied as hand recovery and screening through differing mesh sizes should not affect the reliability of comparisons within or among sites.

A final assumption that must be investigated prior to analysis is that the rimsherd samples from each site are representative of the site as a whole. This assumption is most easily justified for collections from the three small sites (Ogeltree, Punk Rockshelter, 9Ge175), since the area excavated at each of these was large in relation to total site area. Furthermore, rimsherd samples from these sites are derived almost entirely from undifferentiated midden, as opposed to specialized contexts such as burials. The burials at Ogeltree site were not accompanied by pots or by any other recognizable grave furniture. Unlike the three small sites, however, the Dyar site is large and has a variety of specialized contexts. The assumption of sample representativeness for the Dyar site bears the more detailed discussion presented below.

As indicated earlier, the term "provenience" was used in the Wallace Reservoir Project excavations to specify an area or portion of the site being excavated.

This term will retain its specialized meaning in the following discussion. Ceramic collections were examined from 12 of the 15 proveniences designated during excavation of the Dyar site village. The location of each village provenience is illustrated in Figure 11. The following provenience numbers refer to small units (2 x 2 m to 3 x 3 m in size) that were excavated to investigate possible village structures revealed in the profiles of backhoe trenches. These are Proveniences 13, 15, 20, 21, 22, 23, 24, and 25. In addition to these units, ceramics were examined from two larger scale excavations of domestic structures. One of these was Structure 2 (Provenience 12). The second was Structure 4 (Provenience 18). Structure 4 had been burned and several completely reconstructable vessels were found broken on the floor of the structure. Materials from surface collections and from all backhoe trenches excavated in the village area (Provenience 0 and 19) were examined. These latter contributed a large sample of rimsherds to the present study.

Several complete vessels from the Dyar site accompanied burials and some vessels were containers for infant burials. Infant "urn burials" consisted of a jar (shape category 8) with an inverted cazuela bowl as a cover (shape category 1). The presence of use alteration such as sooting and interior surface pitting on most burial vessels indicates that these pots, although found in a mortuary context, were utilitarian forms that were probably not designed solely for burial accompaniment.

Relatively few rims were identified from mound contexts. For the most part, the floors of structures that existed on top of the mound were kept clear of debris by the Indians. During the Dyar phase however, it appears that debris from mound structures was systematically dumped off the northeast side of the mound, resulting in a thick, sloping midden that contained several large vessel fragments (M. Smith 1981:139). Excavation of this "northeast dump" was designated as Provenience 11. Provenience 11 contributed the only vessels from mound contexts that are included in this study.

The proveniences of all vessels identified from the Dyar site are given in Appendix 3. In addition, Table 13 indicates the contexts of those vessels from the Dyar site that were found, nearly intact, in specialized contexts (on structure floors, as burial accompaniment, as infant urn burials, or on the mound slope). Because these "special context vessels" are often relatively intact, it was sometimes possible to take several measurements in addition to rim diameter (such as vessel height, neck height, maximum diameter, etc.). These

Table 13. Vessels from specialized contexts at the Dyar site

Vessel #	Shape Class	Context
1	8b/c	Bu15 (urn burial)
2	8a	Bu16 (urn burial)
3	8a	floor of Structure 4
4	8d	Bu14 (accompanied juvenile)
5	8b/c	small pit (possible urn burial)
6	8a	Bu11 (accompanied juvenile)
7	2c	Bu11
8	2c	Bu11
9	1	Bu17 (adult female - 21 yrs)
10	1	Bu16 (urn burial)
11	1	Bu15 (urn burial)
12	1	Bu17 (adult female - 21 yrs)
17	8b/c	mound talus (NE pottery dump)
18	8	mound talus (NE pottery dump)
19	1	mound talus (NE pottery dump)
20	1	mound talus (NE pottery dump)
21	1	mound talus (NE pottery dump)
22	8d	mound talus (NE pottery dump)
23	8b/c	mound talus (NE pottery dump)
24	8b	mound talus (NE pottery dump)
25	1	mound talus (NE pottery dump)
26	2b	mound talus (NE pottery dump)
27	1a	mound talus (NE pottery dump)
28	1	floor of Structure 2
29	8b/c	pit w/charred cane and corn)
30	8b/c	mound talus (NE pottery dump)
31	1	mound talus (NE pottery dump)
32	1	mound talus (NE pottery dump)
33	8a	floor of Structure 4
34	8a	floor of Structure 4
35	8a	floor of Structure 4
36	8b/c	floor of Structure 4
37	1	floor of Structure 4
38	8b/c	floor of Structure 4
39	8b/c	floor of Structure 4
40	8b/c	floor of Structure 4
41	8a	small pit w/charred nuts
42	1	floor of Structure 2

additional measurements were taken from measured drawings and are presented in Table 14).

As indicated in Figure 11, the 12 village proveniences examined in this study assure that all areas of the village are represented. In addition, several specialized contexts within the site, as well as undifferentiated village midden are represented. These characteristics of the sample support the assumption that the sample of rimsherds from the Dyar site (318 vessels) can be considered representative.

Analysis

It is hoped that the ceramic vessel data presented in this study will be useful to future researchers who wish to test a variety of hypotheses about human behavior. In this study, these data are employed as indicators of site variability with regard to the following three dimensions of site-use:

1. relative permanence of occupation;
2. relative size of groups that lived at or visited the sites;
3. relative diversity of behaviors that required ceramic vessels at each site.

Several aspects of site variability have been investigated in previous chapters. Data relating to site

Table 14. Measurements from Dyar site vessels

VESSEL #	SHAPE	RIM DIAMETER	VESSEL HEIGHT	MAX DIAM BELOW RIM	MIN DIAM BELOW RIM	NECK HEIGHT	RIM TO MAX DIAM
1	8B/C	30	34.5	31	26	6	11.5
2	8A	26	28	26	23	11	12.5
3	8A	16	17	18	15	7	8.5
4	8D	17	12.5	17	15	2	4
5	8B/C	19	16	20.5	17.5	3	5.5
6	8A	17	14.5	16.5	14.5	5.5	6.5
7	2C	14	9				
8	2C	15	7				
9	1	21	11	22			1.5
10	1	30	17	31			2.5
12	1	19	12	20			2
13	8B/C	30		*26	25	7	*9
14	8B/C	32		34	28	7.5	11.5
15	1	16		*24			*4
16	8B/C	30	34	30	25	6	12.5
17	8B/C	38	*38	40	34	7	13
18	8B/C	40		36	35.5	9.5	11
19	1	30		31			2.5
20	2C	16	7				
21	1	30	*20				4
22	8D	30		32.5	29	3.5	6
23	8B/C	34		32	30	8	11.5
24	8B	30	28.5	26.5	25	11	15
25	1	30		31			2
26	2B	30	28				
27	1A	14		16			2.5
28	1	36		38.5			2.5
29	8B/C	22		22	18	4.5	9.5
30	8B/C	40		*43	37	5.5	*13
31	1	30	19.5	33.5			3.5
32	1	28		32			3.5
33	8A	18	19	17	16	9.5	10.5
34	8A	20	23.5	21	17	10.5	12
35	8A	22	22.5	22.5	19	9.5	10.5
36	8B/C	34		35	32	6	9
37	1	12	7	13.5			2
38	8B/C	40	40	40	36	5.5	9
39	8B/C	36	36	37	33	7	12
40	8B/C	22	29	24	20	5.5	9
41	8A	30		27	26	13	15.5
42	1	30		34			4.5
44	8B/C	16		18	14	3	6.5

size, plan, and location for example, suggest hypotheses regarding relative permanence of site occupation. Similarly, faunal and floral remains suggest hypotheses about the seasonality of site use and the degree of specialized animal exploitation. These data, in conjunction with a general model of the Mississippian adaptive niche, allow the formulation of more specific hypotheses for each site along the three lines of variability mentioned above.

Each of these three lines of variability are examined separately below. First, an operational measurement of the variable is selected. Second, expectations about the relative position of each site along the lines of variability are presented. Lastly, these specific hypotheses are tested against the data.

Degree of Site Permanence

In what ways can vessel form indicate the relative degree of site permanence? It is assumed here that evidence for food storage can serve as indirect evidence of site permanence. Furthermore, it seems reasonable to assume that evidence for storage of larger quantities of foodstuffs would indicate the greatest degree of site permanence. There are several reasons to believe that jars (vessels in shape category 8) can be associated with food storage. First, jars are vessels with restricted orifices that facilitate containment while affording protection from spillage. Second, jars are necked vessels. In Braun's (1980:180) terminology, necked vessels reflect not only a strong concern for security of containment, but also reflect a limited frequency of access to vessel contents. Limited frequency of access may also be indicated by the fact that all jars have rounded bottoms and thus are not suited for uses that require them to be moved about frequently. The rounded bottom and outflaring rim of jars would also facilitate pouring of stored substances such as hominy, which was an important, storable staple food in the Southeast. Furthermore, the outflaring rim on jars would facilitate the fastening of some kind of covering over the vessel orifice.

Hally (1982) has presented similar, but more detailed hypotheses about the use of jars by Lamar inhabitants of the Little Egypt site. Beyond consideration of vessel form, Hally has added evidence from ethnographic accounts of Southeastern Indian food preparation techniques and observations of vessel use alteration on archaeological specimens. Reviewing the ethnographic literature, Hally notes that boiling was by far the most important cooking technique in the Southeast. He suggests that, for theoretical purposes, a distinction can be made between boiling that is done as an intermediate step in food preparation as opposed to boiling or mixing that is done as a final step immediately prior to consumption. Some of these steps in food preparation may be associated with a different vessel shape. Hally hypothesizes that "large pinched rim jars" (these occur in shape categories 8b or 8c) were used to store commodities such as water, corn soup, bear oil, and hickory oil. These are substances that were used or prepared in large quantities by Southeastern Indians. He supports this argument by noting that these large jars (with an orifice diameter greater than 40 cm) usually do not have soot deposits. Hally hypothesizes that "medium pinched rim jars" (with an orifice diameter between 21 and 37 cm) were used primarily for boiling large quantities of food that were transferred to other vessels for storage, further preparation, or consumption. "Small pinched rim jars" (orifice less than 18 cm in diameter) are suggested as cooking vessels for small quantities of food that were transferred to other vessels for further preparation or consumption.

If Hally is correct, larger jars were primarily used for storing foods that had either been cooked first in other vessels or had been cooked directly in the jar as an intermediate step in food preparation. Support for Hally's hypothesis that there is a functional distinction between large and small jars, is provided by the identification of interior surface wear on jars from the Dyar site. Of the 17 nearly complete jars from the Dyar site, only those with rim diameters larger than 29 cm showed evidence of interior surface pitting. Furthermore, all of these jars (those with rim diameters greater than 29 cm) exhibited the same pattern of interior wear. The interior pitting is always below the point of maximum vessel diameter, and extends to several centimeters from the vessel bottom. Although interior surface pitting appears to be a result of scraping or stirring, the specific activity that produced this pattern is not known. Nevertheless, the exclusive presence of interior pitting on large jars suggests that these vessels were used similarly and in a way that small jars were not used.

With the assumption that the size and relative frequency of jars is an indicator of site permanence, the following expectations are held for each site:

1. The Dyar site is expected to show the greatest degree of site permanence. Site size, depth of midden, presence of numerous substantial domestic structures, burials and public architecture (mound and plaza) all lend support to this hypothesis. Furthermore, the composition of faunal remains from the site suggests that the site was occupied on a year-round basis. While it may seem that the hypothesis that the Dyar site was permanently occupied is already well supported and need not be further tested, artifact and ecofact assemblages

from this site provide an essential contrast with sites whose permanence of settlement is less clear. It is thus expected that jars will be more frequent and larger at the Dyar site than at the three small sites.

2. The Punk Rockshelter and site 9Ge175 are expected to show the least permanence of settlement. The absence of any evidence for structures, burials, prepared hearths, or other features known to characterize Mississippian homestead and village life suggests that occupation or use of these locations was transient rather than permanent. More specifically, faunal remains from 9Ge175 suggest a seasonal site occupation with an emphasis on collecting aquatic resources. According to models presented in Chapter V, such sites may have been visited for brief periods by groups living at more permanent settlements which do not have immediate access to aquatic resources. The specific nature of occupations at the Punk Rockshelter is less clear. Nevertheless, the fact that this site is a small shelter which contained numerous large fragments of reconstructable vessels, and little else, suggests some specialized use of the site.

3. Degree of site permanence is perhaps more difficult to hypothesize for the Ogeltree site than for the sites discussed above. In terms of the classification of site permanence that was presented in Figure 8, the Ogeltree site is hypothesized to have been a semi-permanent settlement occupied throughout the warm season. If this hypothesis is correct, a measure of site permanence should place the Ogeltree site between Dyar on the one hand, and the Punk Rockshelter and 9Ge175 on the other. This hypothesis is based on the following known characteristics of the Ogeltree site. First, the site shows evidence of at least semi-permanent settlement in that a structure, three burials, and at least two hearths have been recognized at the site. On the other hand, the structure at the Ogeltree site is not nearly as substantial as those found at the permanently occupied Dyar site. The site shows evidence of seasonal occupation in that faunal remains are predominantly of warm season animals, yet unlike the warm season faunal assemblage recovered from 9Ge175, the Ogeltree fauna is not so specialized toward the exploitation of aquatic resources. These lines of evidence lead to the hypothesis that the Ogeltree site is a semi-permanent, warm season

occupation. There are alternatives to this hypothesis. For instance, the Ogeltree site may have been occupied on a year-round basis, or it may have been a transient encampment as hypothesized for 9Ge175. These alternatives emphasize the need for idependent testing through vessel form and other analyses.

Degree of site permanence is measured below by two tests. The first is a measurement of the relative frequency of jars at each site, and the second is a measurement of jar size at each site. Jars have been defined above as vessels with an orifice restriction below the rim. Such vessels are represented by all rims that have been classified as variants of shape 8 (these are 8a, 8b, 8b/c, 8c, 8d, and 8). Vessels in these shape categories contributed 28% of the total identified vessels at the Dyar site (89 vessels), 20% at the Ogeltree site (68 vessels), 8% at the Punk Rockshelter (7 vessels), and 12% at site 9Ge175 (19 vessels) (Table 12). It should be noted that these figures provide a conservative estimate of the frequency of rims contributed by jars at each site. This is due to the existence of a shape category for vessels represented by outflaring rims that are too small to indicate whether or not the vessel had a restricted orifice. If these vessels were included as jars, the relative frequencies would appear as follows: 51% for the

Dyar site, 26% for the Ogeltree site, 8% for the Punk Rockshelter, and 23% for 9Ge175. The former, more conservative estimates of jar frequency will be used here.

No matter which estimate of jar frequency is accepted, the data seem to support the expectations presented above. As expected, jars are most frequent at the Dyar site, less frequent at the Ogeltree site, and are least frequent at 9Ge175 and the Punk Rockshelter. A series of chi-square tests were performed to determine statistically whether the frequency of jars varies independently of site of recovery. As before, the more conservative estimate of jar frequency (excluding rims in category 7) was employed.

First, a four by two contingency table was constructed to include all four sites in a test of the null hypothesis that the frequency of jars is independent of site of recovery. The .05 level of significance was chosen, and with 3 degrees of freedom, the region of rejection is chi-square = 7.8. The calculated value of chi-square is 30.8, thus allowing rejection of the null hypothesis.

The comparison among all four sites suggests that the frequency of jars varies significantly among at least two of the four sites. It remains to be demonstrated that differences are significant between all four sites. Toward this end, two by two contingency tables were set up to test the same null hypothesis for the relationship between each site and the site with the next lowest frequency of jars. The .05 level of significance was chosen. With 1 degree of freedom the region of rejection is defined at chi-square = 3.84. Comparison of the Dyar and Ogeltree sites yields a chi-square value of 5.01. Comparison between Ogeltree and 9Ge175 yields a chi-square value of 7.44. Comparison between 9Ge175 and the Punk Rockshelter yields a chi-square value of .318.

The null hypothesis, that jar frequency is independent of site of recovery, can be rejected in the first two comparisons. This suggests that there is a significant difference between the representation of jars at the Dyar site and the remaining sites. The differences between the Ogeltree site and the remaining sites also appear significant in this regard. On the other hand, the null hypothesis could not be rejected for the differences between the Punk Rockshelter and 9Ge175. This suggests that the differences between the representation of jars at the Punk Rockshelter and 9Ge175 may be due to chance variation.

These simple statistical tests support the inference that due to differences in site permanence, the Dyar site would have the greatest frequency of jars, the semi-permanent Ogeltree site would have a lower representation, and the two special-use sites (Punk Rockshelter and 9Ge175) would have the lowest frequency of jars.

As stated earlier, determining the relative size of jars at each site is a second measurement that can be applied to help examine the degree of site permanence. A reliable comparison of jar size will be difficult for the Punk Rockshelter and site 9Ge175 because jars are so infrequent at these sites (sample sizes are 7 and 19 respectively). On the other hand, samples from the Dyar and Ogeltree sites are relatively large (89 and 54 vessels respectively), and should be adequate for size comparisons.

The diameter at rim will be used as an estimator of the size of jars. This assumes that rim diameter does not vary widely with respect to overall vessel proportions. To check the validity of this assumption, a correlation coefficient was calculated for the relationship between rim diameter and vessel height. Measurements of height were taken from measured drawings of the 15 nearly complete jars recovered from the Dyar site. A strong relationship was indicated ($r = 0.962$), and this correlation between rim diameter and vessel height is taken as support for the use of the former as an estimator of jar size.

The rims of jars in the Oconee Province frequently exhibit secondary form characteristics that can be used to assign relative dates to individual vessels. These characteristics, which include several kinds of decoration applied to folded or thickened rims, have been used to assign relative dates of 1 and 2 (early and late) to many Lamar period jars in this study. The criteria for temporal assignment were presented earlier in this chapter. It is thus possible, in the case of jars, to ensure that the lengthy span of occupation at the Dyar site, does not affect comparison with relatively short-lived occupations, such as the Ogeltree site and the Punk Rockshelter.

Although the intention of dividing the Dyar site sample into early and late jars was to increase the validity of comparison among sites, it became apparent that the size distributions of early and late jars differed within the site. The mean rim diameter for early jars was smaller (mean = 25.3 cm; standard deviation = 7.3) than for late jars (mean = 29.6 cm; standard deviation = 5.2). A t-test was performed to assess the significance of this difference. In a two-tailed test, the null hypothesis that the size of early jars is equal to the size of later jars was rejected at the .05 level of significance (calculated t = 2.12; n1 = 38; n2 = 22).

The observation, that jars at the Dyar site were generally larger during the late Dyar phase, was incidental to the design of the present research and is thus difficult to interpret at present. It can at least be suggested that future investigations explore the possibility that there may have been an increase in storage activity or in the volume of stored goods during the later occupation of the Dyar site.

Figure 35 illustrates the size frequency distributions of jars from the four sites. The early and late jars are presented separately for the Dyar site. The Ogeltree site was occupied entirely during the early Dyar phase. All but a single jar from the Punk Rockshelter could be assigned to the late Dyar phase. Nine jars from site 9Ge175 could be classified as early forms while only one rim from this site could be considered a late jar. Only the nine early jars from 9Ge175 appear in Figure 35.

It is apparent that the average diameter of both early and late jars from the Dyar site is greater than for any of the smaller sites. On the other hand, average diameters of jars from the three small sites are virtually indistinguishable from one another. T-tests were conducted to assess the differences in jar size between the Dyar site and each of the smaller sites. Only the early jars from the Dyar site were compared with jars from the Ogeltree site and 9Ge175. Only the late jars from the Dyar site were used in the comparison between jars from the Dyar site and the Punk Rockshelter. The only comparison found to yield differences significant at the .05 level was between the Dyar and Ogeltree sites ($n1 = 38$; $n2 = 40$; calculated t-value = 3.926). T-tests

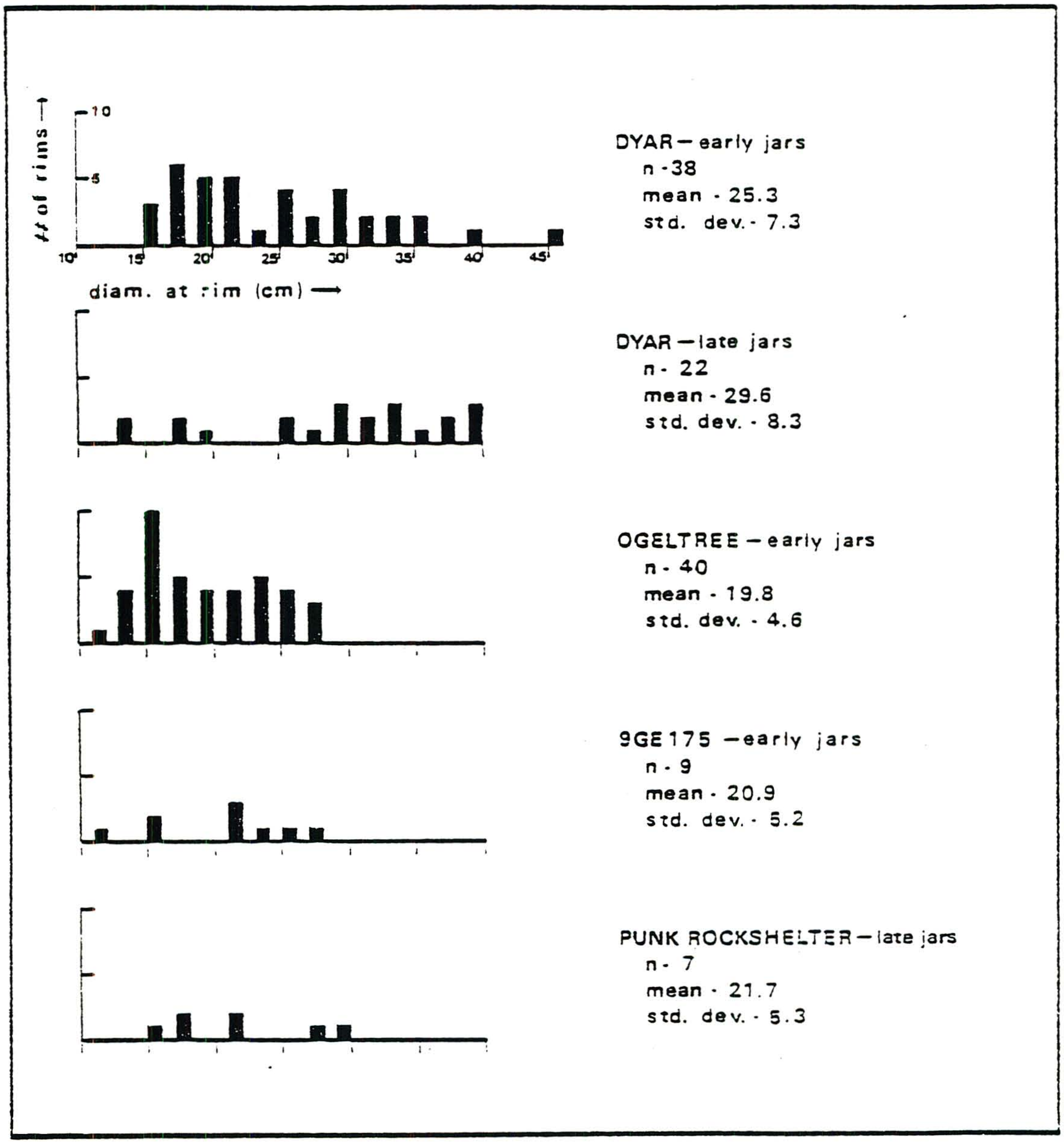


Figure 35. Size/frequency distribution of jars from each site.

were also conducted to assess the statistical significance of differences among the three small sites. In no instances could the null hypothesis (that the average rim diameters were equal) be rejected at the .05 level of significance. It may be that larger sample sizes from the Punk Rockshelter and 9Ge175 would enable a statistical distinction between these sites and the Ogeltree and Dyar sites. On the other hand, it is the relative absence of jars at these sites that indicates their highly specialized nature.

While the size of jars seems to support the expectations presented for each site at the beginning of this section, these patterns are statistically significant only for the disparity in jar size between the Dyar and Ogeltree sites. On the other hand, evidence provided by a comparison of relative frequencies of jars is less ambiguous. Taken together, these two measurements (jar frequency and jar size) support the hypotheses about the relative permanence of site occupation. With regard to both jar frequency and jar size, the Dyar site shows the greatest degree of permanence. The size and frequency of jars at the Ogeltree site supports the characterization of this site as a semi-permanent occupation. The hypothesis that occupation or use of the Punk Rockshelter and site 9Ge175 could be characterized as transient is supported by the low frequency of jars at these sites.

Relative Size of Groups

In what way can vessel form indicate the relative size of groups that visited or inhabited the sites? It is suggested here that the major determinant of vessel size for pots which are used for mixing, cooking, and serving is the quantity of food and thus the number of individuals for whom food is being prepared. It is further suggested that at least one of the vessel shape categories identified in this study can be confidently interpreted as a form in which foods were mixed for final preparation and serving. Several lines of evidence lend support to these assumptions.

First, in his analysis of vessel use, which is based on ethnographies of several southwestern United States Indian groups, Braun (1980:183) has noted that bowls are associated with activities that require unhampered access to vessel contents, but at the same time these vessel form reflect some concern for preventing spillage of contents. Such activities include mixing, serving, and eating. He notes further that the smaller the bowl, the more indivualized the associated activity. Conversely, Braun (1980:183) notes that "wide to extremely wide-mouthed bowls were employed in increasingly communal and high volume-of-flow contexts as serving and eating dishes."

Braun's description of the primary uses of bowls corresponds closely with Hally's (1982:15-16) suggestions of the ways in which cazuela bowls (shape category 1) were used by Southeastern Indians. Hally suggests that large carinated bowls (cazuelas with orifice diameters between 28 cm and 42 cm) were used for cooking and serving relatively large quantities of food, or for serving foods that had been partially or entirely cooked in other vessels. In support of this hypothesis, Hally lists several attributes of carinated bowls. Among these are:

1. The relatively high frequency with which archaeological specimens are heavily sooted suggests that carinated bowls were used frequently for cooking.
2. Carinated bowls always have a flat base and a relatively low profile. These attributes give the vessels relatively great stability, allowing them to be moved frequently during use. This attribute of stability ties in well with ethnographic descriptions of the way in which cooked foods were usually served in the Southeast. That is, most foods were served in communal vessels from which people ate in turn using their fingers or large spoons.
3. The large orifice and low profile of these vessels allowed easy access to vessel contents in

the manner described above. These same characteristics render the carinated bowls poorly suited for pouring.

4. The insloping rim would prevent spillage of contents during cooking, mixing, and serving, or when the vessel was moved.

According to Hally, small carinated bowls (orifice diameters less than 25 cm) were used in ways similar to the larger cazuelas, but with smaller quantities of food. Further support for Hally's interpretation of cazuela use is provided in Duane King's study of eighteenth century Cherokee pottery. When King asked modern Cherokee potters to describe the function of cazuela bowls, some responded by applying a Cherokee term that literally translates as "it causes to be mixed" (King 1977:159).

As indicated above, Hally's suggestions for the ways in which cazuelas were used by Southeastern Indians correspond closely with Braun's observations about the use of bowls by southwestern groups. Furthermore, both suggest that the size of bowls reflects the quantity of food prepared, and both indicate that large bowls are used communally rather than individually. With the assumption that cazuelas were used for mixing, cooking, and serving foods that were eaten communally, the relative size of these vessels at each site will serve as an indicator of the relative size of groups that lived at or visited the sites.

With the assumption that the size of cazuelas is an indicator of the relative size of social groups that lived at or visited the sites, the following expectations are held for each site:

1. Considering its large size and numerous structures, the Dyar site must have had many more permanent occupants than any of the other sites included in this study. It can thus be assumed that the potential for communally feeding larger groups of people is greater at the Dyar site than at the remaining three sites. Given that communal food sharing was practiced at least periodically by Lamar peoples, it follows that the Dyar site should have a greater frequency of large cazuelas than the remaining three sites. It is important to note that no assumptions regarding the internal structure of food-sharing groups are made here. That is, the size of minimal economic units at the Dyar site are not assumed to be larger than those at smaller sites. Rather, the assumption is made that food sharing beyond the minimal economic unit was more likely to occur at the Dyar site than at any other. There are abundant historical accounts of food sharing and communal feasting for Southeastern Indians, and there is no reason to assume that such practices were not followed during prehistoric times.

2. The Ogeltree site has been hypothesized as a semi-permanent site that was occupied during the warm season. There is some evidence that the site was occupied by males and females, as well as infants. The three burials recovered from the Ogeltree site have been identified as a young adult female and two infants, each interred separately. Because the hunting of white-tailed deer is an activity practiced by males in Southeastern Indian societies (Hudson 1976:259), the presence of this animal in the Ogeltree faunal assemblage suggests that males were present at the site. The presence of adults and infants as well as females and males suggests the hypothesis that individuals at the Ogeltree site may have comprised a single, kin-based minimal economic unit. If this hypothesis is correct, and if the size of cazuelas is an accurate reflection of the relative size of groups living at the site, cazuelas from the Ogeltree site will be smaller than those from the Dyar site.

3. Because the Punk Rockshelter is thought to have been a limited-activity site at which occupations were transitory, rather than permanent, group size is expected to have been smaller than at the large and permanent Dyar site. The nature of

activities performed at this site is poorly understood, and it is not possible at this time to construct more specific hypotheses about the differences in group size between the Punk Rockshelter and the Ogeltree site.

4. Site 9Ge175 is hypothesized to have been a location which was visited during the warm season for the purpose of collecting aquatic resources. The small size of the site, in conjunction with its hypothesized limited-use suggests that the size of groups visiting the site would have been small. Therefore it is expected that the sizes of cazuelas from 9Ge175 are smaller than those from the Dyar site.

Organizational aspects of prehistoric fishing in the Southeast are virtually unknown. It will be of considerable interest therefore, to determine whether the size of cazuelas (as a reflection of group size) at 9Ge175 is smaller, larger, or indistinguishable from that at the Ogeltree site.

As was the case for measurement of jar size, cazuela size will be measured by the vessel diameter at rim. Measurements of vessel height were taken from measured drawings of 15 nearly complete cazuelas from the Dyar site, the Punk Rockshelter, and from two Lamar sites at which only limited testing was done (survey sites B49 and

B5). A correlation coefficient calculated for the relationship of rim diameter to vessel height indicates a strong relationship between these two variables (r = 0.93093). The assumption that rim diameter can serve as an index of vessel size is thus supported.

Cazuelas, like jars, often exhibit secondary form characteristics which allow a determination of the relative date of vessels. These characteristics, which include particular incised design motifs, have been described in detail elsewhere in this chapter. Relative dates of 1 and 2 (early and late) were assigned to a large number of cazuelas from the Dyar site. The sample from site 9Ge175 was similarly differentiated. Unlike these two sites, Lamar occupation of the Ogeltree site was limited almost entirely to the early Dyar phase. The sample of cazuelas from the Ogeltree site then, may be considered as having a relative date of 1. The Punk Rockshelter appears to have been occupied primarily during the late Dyar phase. It should be noted that although 2 of the 25 cazuelas represented at this site can be assigned a relative date of 1, the vast majority of vessels from this site are more recent. The sample of cazuelas from the Punk Rockshelter is thus treated as a synchronic collection, dating to the late Dyar phase.

Descriptive summary statistics of the size/frequency distributions of cazuelas at each site appear in Figure 36.

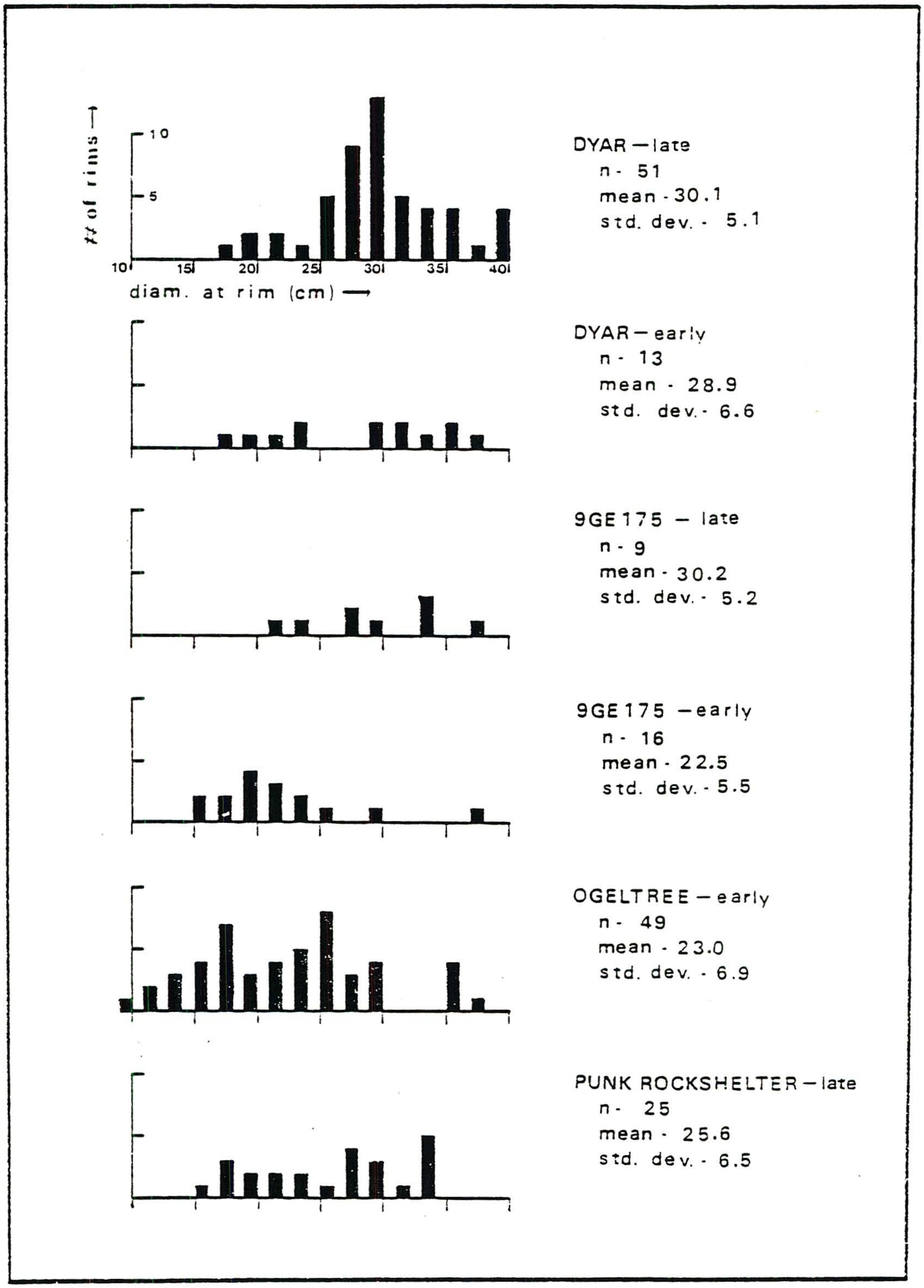


Figure 36. Size/frequency distribution of cazuelas from each site.

As might be expected, the average size of cazuelas at the Dyar site does not appear to have changed through time. Contrary to the unexpected change through time observed for jars at the Dyar site, cazuela size suggests stability of some aspects of vessel use at the site. In order to be certain that cazuela size does not vary significantly through time at the Dyar site, a t-test was performed to test this observation as the null hypothesis. The calculated t-value was .705. With 62 degrees of freedom the null hypothesis could not be rejected at the .05 level of significance. The size of early and late cazuelas at the Dyar site is indistinguishable on the basis of rim diameter.

Data presented in Figure 36 also suggest that, as expected, cazuelas are larger at the Dyar site than at the Ogeltree site or the Punk Rockshelter. Calculated t-scores for comparisons of early cazuelas between Dyar and Ogeltree ($t = 2.75$; $df = 60$) and of late cazuelas between Dyar and the Punk Rockshelter ($t = 3.20$; $df = 74$) indicate that these size differences are significant at the .01 level for two-tailed tests.

The situation is more complex for site 9Ge175. At this site there is an unexpected increase in the size of cazuelas through time. The average diameter at rim for early cazuelas is 22.5 cm, while the average rim diameter for late cazuelas is 30.2 cm. While, as expected, the size of early cazuelas at 9Ge175 is significantly smaller than those from the Dyar site, the average size of late cazuelas is nearly identical to the average cazuela size at the Dyar site. A two-tailed t-test indicates that differences in size between early and late cazuelas at 9Ge175 is significant at the .01 level of significance ($t = 3.51$; $df = 23$).

It is difficult to interpret the increase in cazuela size at site 9Ge175. This is especially true in light of the stability of site use through time that is indicated by faunal remains from this site. Faunal remains from all levels and all portions of the site indicate a highly specialized exploitation of aquatic resources. How then, can the discrepancy in the size of early and late cazuelas be explained.

Because there is evidence for the specific nature of site use at 9Ge175, it is possible to speculate further about the relative size of groups that visited the site. As noted earlier, little is known about the organizational aspects of fishing in the prehistoric Southeast. Early historic accounts indicate that fishing in the Southeast was an activity that could be practiced either by individuals acting alone or by groups of people, and it was an activity that was practiced by both males and females. Fishing by hook and line or with the use of a dip net are examples of techniques that could be practiced individually. On the other hand, James Adair (Williams 1930:432) indicates that fishing with weirs was an activity often practiced by groups of people at the rapids of southeastern rivers. Frank Speck (1909: 24) observed that during the summer months many Yuchi families would congregate at the banks of a river to fish and to intermingle socially for a time. The variability in group structure related to different fishing techniques leads to some interesting speculation. If fishing at 9Ge175 was more commonly practiced either by groups of cooperating families or by a few individuals at a time, the size of groups, measured by the size of cazuelas, may reflect the kind of organization that accompanied fishing in the Southeast.

At this point, of course, this hypothesis must be considered speculation. These speculations however, are based on the same assumption that underlies the present measurement of group size at each site. That is the assumption that the major determinant of cazuela size is the amount of food being prepared for consumption, and that the amount of food prepared for consumption is a reflection of group size. It may be argued that other factors, such as the locality of vessel manufacture, or the specific foods being prepared are important determinants of cazuela size.

Locality of vessel manufacture may be seen to affect vessel size in that if pots were to be transported for use away from the place of manufacture (assuming vessels were manufactured at the more permanent settlements), there might be a tendency to carry smaller vessels to special-use sites such as 9Ge175. Thus, the increased size of cazuelas at 9Ge175 may be seen as a result of a more permanent site occupation during the late Dyar phase. This does not help explain the fact that late Dyar cazuelas are larger at 9Ge175 than cazuelas at the Ogeltree site which, according to several criteria, appears to have been a more permanent settlement.

A second alternative explanation for the increased cazuela size at 9Ge175 is that different specific foods were being prepared during the late Dyar phase, and these required preparation in large quantity. For example, Jim Rudolph (1981) has suggested that exploitation of shellfish increased dramatically in the Oconee Province during the Lamar period. It is conceivable that large cazuelas were used for boiling shellfish, a process which usually took several hours (Swanton 1946:279). Although shellfish were not quantified in the faunal analysis, they appeared to have been equally plentiful in all strata of the 9Ge175 midden. Thus, increased use of shellfish does not appear to solve the question of changing cazuela size at 9Ge175. As indicated in Chapter VII, vertebrate faunal remains also demonstrate little change in animal exploitation through time at 9Ge175. Nonetheless, the suggestion that an answer may be found in the specific foods being prepared and consumed may provide a fruitful avenue of inquiry for future research at other sites in the Oconee Province. For the moment, the best explanation for increased size of cazuelas is considered to be an increase in the size of groups that visited 9Ge175 during the Dyar phase.

To summarize, an attempt has been made to measure the relative size of groups that lived at or visited four sites in the Oconee Province. The size of cazuelas, which are thought to have been vessels used for final preparation and serving of food, has served as an indicator of group size. As expected, the Dyar site showed a larger cazuela size than either the Ogeltree site or the Punk Rockshelter. These sites, in turn, could not be distinguished from one another on the basis of cazuela size. Site 9Ge175 had significantly smaller cazuelas during the early Dyar phase than during the late Dyar phase. This is interpreted as a reflection of the differing size of groups that visited the site to collect aquatic resources during the early and late Dyar phase.

Relative Diversity of Vessel-Related Activities

The third set of hypotheses to be investigated considers the relative diversity of activities performed at each site which involved the use of ceramic vessels. Several factors render measurement of this variable most problematical. The first is that it is difficult to be very specific about the uses to which vessels of a particular shape or size were put. As Swanton (1946: 549-55, 625) has noted, ceramic vessels were used by Southeastern Indians for activities as diverse as boiling, frying, baking, parching, dry and wet storage, transport, and even as musical instruments. Considering the great diversity of uses to which vessels are put, it is difficult to determine which or how many of the shape categories used in this study represent functionally distinct vessel types. The broad hypotheses stated above concerning the uses of jars and cazuelas represent the highest degree of specificity presently possible, and these suggest uses for only five of the 21 shape categories recognized in this study (categories 1, 8a, 8b, 8c, 8d).

An attempt to measure vessel shape diversity as an indicator of diversity in the range of uses of vessels is fraught with problems. The first is to determine how many of the 21 vessel shape categories actually represent functionally distinct kinds of vessels. Even if this could be determined with confidence, a second problem involves the assumption that a greater relative frequency of one kind of functionally distinct vessel than another indicates that the activity associated with the former was practiced more frequently. Control of these variables is beyond the scope of the present research.

In spite of such problems, some assessment of the range and diversity of different vessel shapes at each site, however subjective, should be presented. This is especially true because even though the range of vessel-related activities is a difficult variable to operationalize, it is relatively simple to posit general hypotheses for this variable at each site. The Dyar site, being a large, permanent settlement, and one which was occupied for several centuries, should show the greatest range of functionally distinct vessel shapes and by implication, a greater range of vessel-related activities. The Ogeltree site, if it was occupied on a semi-permanent basis by a single, small kin group, should reflect a broad range of warm season domestic activities. The Punk Rockshelter and 9Ge175, both thought to have been "limited-use sites" should show the greatest specialization (and lowest diversity) of vessel-related activities.

In light of the relevance of this variable to understanding site variability, a measurement of diversity or specialization of vessel-related activities at each site is presented below. First, the shape categories used for the classification of rimsherds must be combined into shape classes that are thought to more closely represent functionally distinct kinds of vessels. The diversity of these "functionally distinct" vessel classes can then serve as an index of the variety of vessel-related activities performed at each site.

The uncertainty with which functionally distinct classes can be identified introduces a degree of subjectivity to the measurement of vessel shape diversity. Diversity will be represented by a simple calculation of the proportion of the total vessel assemblage represented by the four most frequent shape classes at each site. This technique is similar to that used by Braun (1980: 185) in his comparison of vessels among several southwestern sites, and has the advantage that sample size does not affect the measurement of diversity. The greater the percentage of the total vessels that is included in the four most frequent vessel classes, the lower the diversity of vessel shapes at the site.

In recognition of the several measurement problems mentioned above, assessment of the statistical significance of any perceived differences among the sites should be viewed with caution. Following an assessment of vessel shape diversity, several general observations are made about the uses of vessels at each site. This latter discussion is based on observation of the three or four most frequent vessel shape classes present at each site.

Vessel shape categories were combined to produce the classification of hypothesized, functionally distinct vessel classes in the following way:

class A--These are cazuelas (shape category 1). Several shape characteristics described earlier led to the suggestion that these represent a distinct functional class of vessels. Among these are the insloping rim and relatively large orifice. Together, these characteristics allowed relatively free access to vessel contents while reducing the risk of spillage.

class B--These are shouldered bowls whose rims are modified to facilitate pouring (category 1a).

class C--This class includes unrestricted bowls that were suitable for wide variety of uses which involved unhampered access to vessel contents. Much variation is contained within this class, which combines vessels in shape categories 2a, 2b, 2c, and 3.

class D--These are shallow, unrestricted vessels that show little concern for prevention of spillage. These may have been employed for uses that required a large surface for application of heat, such as parching corn or evaporation of liquids. This class includes vessels in shape categories 2d and 3a.

class E--These are unrestricted vessels with an outflaring rim. This class includes vessels in shape categories 4 and 5. Such vessels were suited for a wide range of activities which required unhampered access to vessel contents. These are thought to differ from class C vessels in that the outflaring rim of class E vessels may have facilitated pouring.

class F--These are small bowls with slight restriction at the orifice. Because their small size makes them unsuitable for most cooking applications, Hally (1983) has suggested that similar bowls from the Little Egypt site were used for serving small amounts of food or for holding sauces, such as oil or salt solutions. These include vessels in shape categories 6a and 6b.

class G--These are outflaring rims that may be portions of restricted or unrestricted vessels (shape category 7). Because it was impossible to assign these rims to more specific vessel classes, class G rims, although calculated separately, will not be considered as among the four most frequent vessel classes at each site.

class H--These are small jars. Hally (1983) has suggested that the uses of jars are best differentiated according to their size. Evidence of interior surface pitting on jars from the Oconee Province supports this suggestion. Interior surface pitting is only found on large jars (class I). All jars (all variants of shape category 8) with diamters at rim less than 29 cm are included in class H. These vessels are thought to have been used in intermediate steps in food preparation, and for short or long term containment of small quantities of food.

class I--All jars (all variants of shape category 8) with rim diameters greater than 29 cm are included in class I. These vessels are thought to have been used for preparation and storage of large quantities of food.

classes J-M--Vessels in shape categories 9, 10, 11, and 12 are restricted forms whose function cannot be further characterized at present. Each of these categories will be considered a different functional class of vessel. Class J designates vessels in shape category 9.

class K--These are vessels in shape category 10.

class L--These are vessels in shape category 11.

class M--These are vessels in shape category 12.

The frequencies of each of these classes (A-M) at each site are presented in Table 15. Figures 37 provides a graphic representation of these frequencies. As indicated earlier, diversity will be represented by a simple calculation of the proportion of the total vessel assemblage represented by the four most frequent vessel classes at each site. Vessel class G is excluded from consideration because it is a catch-all for all outflaring rims that were too fragmentary to determine whether they represent restricted or unrestricted vessels. Table 16 shows the four most frequent vessel classes at each site in descending order of frequency. The four most frequent vessel classes represent 67% of the total vessel assemblage at the Dyar site, 81% at the Ogeltree site, 90% at the Punk Rockshelter, and 81% at site 9Ge175. As expected, this measurement of vessel diversity shows that the greatest diversity of vessel classes is found at the Dyar site. Also as expected, the lowest diversity of vessel classes if found at the Punk Rockshelter, which is thought to be a highly specialized site. A third expectation supported by the diversity measurement is that the semi-permanent Ogeltree site falls somewhere between these first two sites with regard to degree of vessel class diversity. Somewhat unexpectedly however, diversity values calculated for the Ogeltree site and site 9Ge175 (the latter is thought to be a highly specialized site) are identical (81 and 81).

Table 15. Frequency of each vessel class

	DYAR		OGELTREE		PUNK ROCKSHELTER		9GE175	
VESSEL CLASS	#	%	#	%	#	%	#	%
A	84	26.67	49	18.42	23	27.38	33	20.50
B	1	0.32	0	0.00	3	3.57	0	0.00
C	40	12.70	113	42.48	34	40.48	69	42.86
D	13	4.13	14	5.26	3	3.57	10	6.21
E	6	1.90	11	4.14	13	15.48	8	4.97
F	3	0.95	8	3.01	0	0.00	1	0.62
G	70	22.22	14	5.26	0	0.00	18	11.18
H	58	18.41	40	15.04	6	7.14	19	11.80
I	31	9.84	0	0.00	1	1.19	0	0.00
J	1	0.32	2	0.75	0	0.00	1	0.62
K	3	0.95	3	1.13	0	0.00	2	1.24
L	4	1.27	6	2.26	1	1.19	0	0.00
M	1	0.32	6	2.26	0	0.00	0	0.00
TOTALS	315	100.	266	100.	84	100.	161	100.

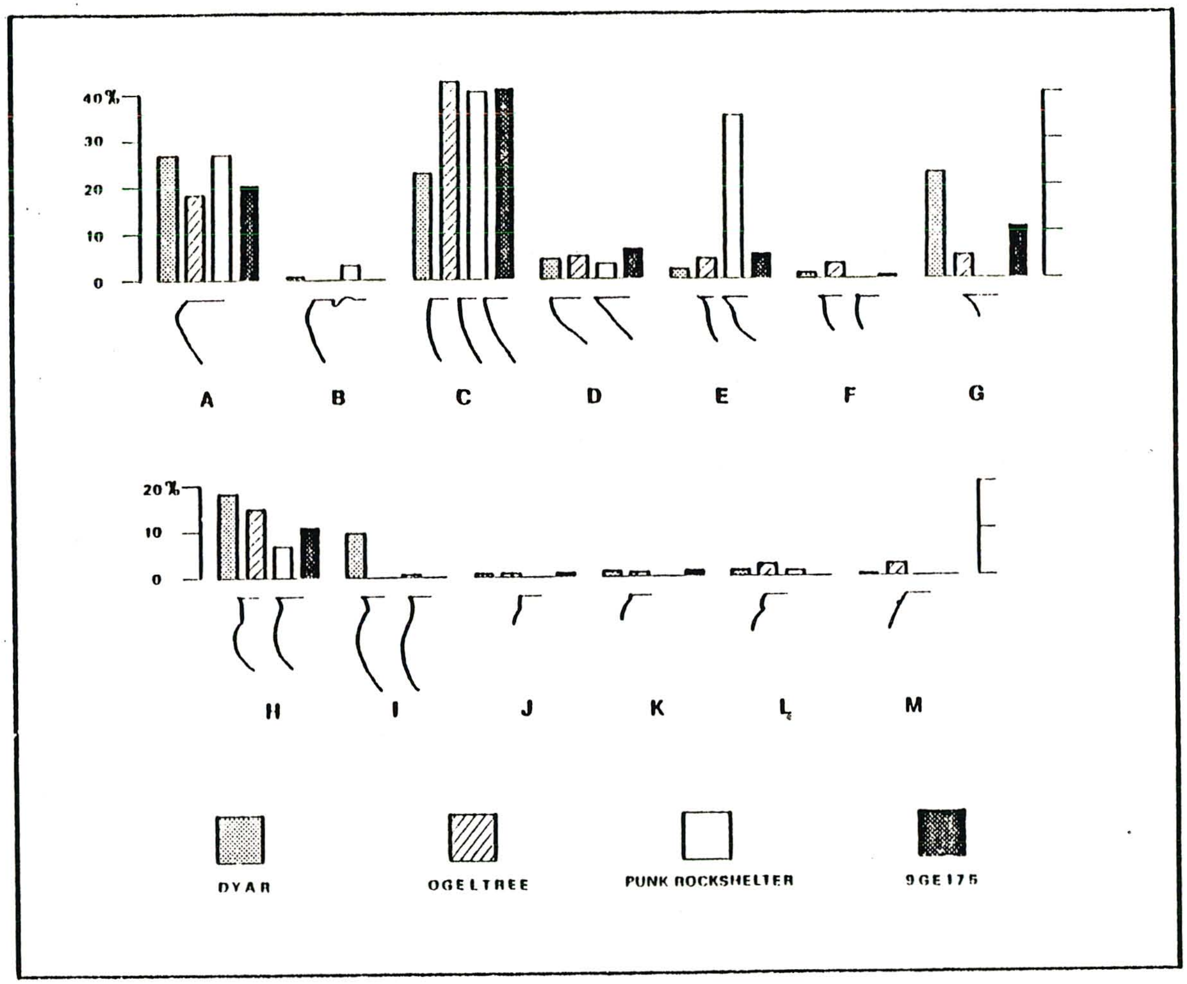


Figure 37. Relative frequency of each vessel class at each site.

Table 16. The four most frequent vessel classes at each site

Dyar Site:

cazuela	26.7%
small jar	18.4%
unrestricted bowl	12.7%
large jar	9.8%

diversity = 67

Ogeltree Site:

unrestricted bowl	42.5%
cazuela	18.4%
small jar	15.0%
shallow, unrestricted bowl	5.3%

diversity = 81

Punk Rockshelter:

unrestricted bowl	40.5%
cazuela	27.4%
unrestricted, flared-rim vessel	15.5%
small jar	7.1%

diversity = 90

Site 9Ge175:

unrestricted bowl	42.9%
cazuela	20.5%
small jar	11.8%
shallow, unrestricted bowl	6.2%

diversity = 81

To assess the significance of differences in frequency of the four most frequent shape classes at each site, six chi-square tests were performed, one for each possible combination of two sites. Differences between the Dyar site and the remaining three sites are significant at the .01 level (chi-square = 78.5, 53.0, and 61.9 for comparisons with Ogeltree, Punk Rockshelter, and 9Ge175 respectively; df = 5). Differences between the Ogeltree site and the Punk Rockshelter are also significant at the .01 level (chi-square = 31.4; df = 5). Differences between the Ogeltree site and 9Ge175 cannot be considered statistically significant (chi-square = 5.22; df = 4). The final comparison, of the Punk Rockshelter and 9Ge175, suggests that differences between these sites are significant only at the .05 level of significance (chi-square = 11.3; df = 5).

The similarity of vessel class frequencies at the Ogeltree site to those at 9Ge175 is striking. With the exception of a significant difference in the frequency of jars (demonstrated earlier), relative frequencies of the remaining vessel classes are virtually identical between these two sites. As discussed earlier, jars indicate degree of site permanence. Similarities and differences among these two sites in vessel shape class frequency may be interpreted in two ways. The first suggests that in spite of a difference in degree of site permanence, the range of vessel-related activities at these two sites was virtually identical. A second interpretation suggests that the identification of functionally distinct vessel classes used in this study is not fine-grained enough to reveal differences among these two sites. Because differences in vessel class frequencies appear significant for comparisons of the Ogeltree site with both the Dyar site and the Punk Rockshelter, the first interpretation is favored here.

It is interesting to note some of the similarities as well as the differences among the four sites. Three vessel classes are always included among the four most frequent classes from each site. These are cazuelas (class A), unrestricted bowls (class C), and small jars (class H). This observation suggests the possibility that there may be a "minimal vessel assemblage" which is found at most sites, and that differences among sites must be detected in the presence or absence of vessel forms which were used less frequently. Three more classes are among the four most frequent vessels at only one or two sites, and these call attention to differences in the use of vessels at each site. These latter include large jars (class I) at the Dyar site, shallow unrestricted vessels (class D) at 9Ge175 and the Ogeltree site, and unrestricted vessels with outflaring rims (class E) at the Punk Rockshelter. These six vessel classes (A, C, H, I, D, and E) are the only vessel classes which individually contribute more than 5% of the total vessel assemblage from at least one of the four sites.

The relative abundance of large jars at the Dyar site indicates that long-term storage of large quantities of food was an important vessel-related activity only at this site. Although shallow unrestricted vessels are among the four most frequent vessel classes only at 9Ge175 and the Ogeltree site, the relative frequencies of these vessels does not appear to vary greatly from those at the remaining two sites. In contrast, unrestricted vessels with outflaring rims are much more frequent at the Punk Rockshelter than at any other site. It was noted earlier that although vessels in this shape class could have been used for a wide variety of functions, their outflaring rim may have rendered these vessels more suitable for pouring than other unrestricted vessels. It is interesting to note in this regard that the relative frequency of vessels whose rims have been modified for pouring (class 1a) is greatest at the Punk Rockshelter. It is difficult to be more specific about what was being poured from these vessels (class 1a). There are three such vessels from the Punk Rockshelter. One of these (vessel #28) bears a sharply-defined, linear band of soot on the vessel interior directly opposite the spout. The sooting begins a few centimeters below the rim and extends toward the rim edge (upward). The vessel is also sooted on its exterior surface, indicating that liquids were heated, as well as poured from the vessel. The presence, at the Punk Rockshelter, of sooted vessels, and of vessels that appear to have been exposed to intense heat, is problematical because charcoal was rare at the site. It is possible that vessels were sooted while being used away from the site.

Summary

Analyses of vessel shape and size have been conducted to investigate three aspects of intersite variability. These are: 1) relative degree of site permanence; 2) relative size of groups that lived at or visited the sites; 3) relative diversity of vessel-related activities at each site. Degree of site permanence was measured by the relative frequency and size of jars, which are vessels thought to be related to storage. According to these criteria, the Dyar site had the most permanent occupation, the Ogeltree site was next in degree of site permanence, and the Punk Rockshelter and 9Ge175 had the least permanent occupations.

Size of groups that occupied the sites was measured by the relative size of cazuelas, which are vessels thought to have been used for final cooking steps and subsequent serving of food. According to this criterion, groups were larger at the Dyar site than any of the remaining sites. An exception was found in that during the late Dyar phase, site 9Ge175 may have been occupied or visited by larger groups.

Diversity of activities which required the use of vessels at each site was measured by the relative frequencies of vessel classes that are thought to represent functionally distinct kinds of vessels. According to this criterion, the range of vessel-related activities was greatest at the Dyar site, smaller at 9Ge175 and the Ogeltree site, and smallest at the Punk Rockshelter.

CHAPTER IX
SUMMARY AND CONCLUSIONS

At the beginning of this study, it was noted that a major problem in our current understanding of Mississippian societies is a poor knowledge of the small sites in late prehistoric, southeastern United States settlement systems. As a step toward understanding the role of small sites in Mississippian societies, detailed comparisons were presented among four sites, each of which appears to have played a differing role within a single Mississippian society of the Georgia Piedmont. One of these sites, the Dyar site, is a relatively large village with a single mound. The three remaining sites; the Ogeltree site, the Punk Rockshelter, and site 9Ge175, are small sites (each less than 2,000 m^2). For most Mississippian societies, such small sites are known only from surface collections. Frequently, archaeologists group such sites together as "special use" or "limited activity" sites. Detailed comparisons presented in this study indicate that although these three small sites differ in many ways from the large village site, there is also considerable variability among the small sites with regard to several important aspects of site use. Differences and similarities along four dimensions of site use are summarized below.

Relative Permanence of Site Occupation

One kind of data which provides evidence for relative permanence of site occupation is the presence or absence of feature types indicating that structures or dwellings existed at a site. The most abundant evidence for structures is found at the Dyar site, where remains of at least 17 domestic structures were encountered during excavations. Structures at the Dyar site were substantial constructions with depressed floors and with walls of wattle and daub. Some structures had wall-trench entranceways and prepared central hearths. In all structures which could be excavated to culturally sterile substrata (this was sometimes difficult because of the high water table), human burials were encountered. Village plan remained essentially unchanged through time at the Dyar site, and this provides additional evidence for site permanence. Throughout the four or five centuries of occupation at the Dyar site, structures were located around a plaza. Public structures, either temples or residences for high ranking individuals, were located on a mound at the western end of the plaza.

Of the three small sites, evidence for structures was found only at the Ogeltree site. The single structure recognized at the Ogeltree site was comparable in size, but does not appear to have been as substantial as structures at the Dyar site. As in structures located at the Dyar site, the structure at the Ogeltree site contained a central hearth. Three human burials were located around the central hearth in a pattern similar to that observed at the Dyar site structures. Unlike structures from the Dyar site, however, the Ogeltree structure did not have a dished-out or semi-subterranean floor. Furthermore, the posts which supported the Ogeltree structure were smaller in diameter than those at the Dyar site.

The relative frequency of jars, which provide evidence for storage activity, was a second criterion used in this study as a measurement of the degree of site permanence. Results of this criterion were substantially in agreement with degree of permanence as suggested by the presence or absence of structures at each site. The Dyar site had relatively more jars (and larger jars) than any other site. The Ogeltree site, in turn, had a significantly greater number of jars than the two remaining small sites. According to both criteria, the presence of structures and the frequency of jars, the most permanent occupation was at the Dyar site. The Ogeltree site appears to have been occupied at least on a semi-permanent basis, while occupation of the Punk Rockshelter and 9Ge175 may be interpreted as transient rather than permanent.

Season of Site Occupation

Evidence for season of site occupation was provided by an analysis of faunal remains from the Dyar site, the Ogeltree site, and 9Ge175. No faunal remains were recovered from the Punk Rockshelter, probably as a result of poor conditions for bone preservation at the site. The relative representation of animal species with marked seasons of abundance suggests that the Dyar site was occupied on a year-round basis. The Ogeltree site and 9Ge175 appear to have been occupied primarily during the warm season.

Relative Size of Groups Which Occupied the Sites

It is suggested in Chapter VIII that the major determinant of vessel size for pots which are used for mixing, cooking, and serving is the quantity of food and thus the number of individuals for whom food is being prepared. The relative size of cazuelas, a ceramic vessel form which is thought to have been used for mixing, cooking, and serving foods, provides a measure of the relative size of groups for which food was prepared at each site. As expected, the Dyar site showed a larger cazuela size than either the Ogeltree site or the Punk Rockshelter. These small sites, in turn, could not be distinguished from one another on the basis of cazuela size. The situation was somewhat more complex at 9Ge175. Site 9Ge175 had significantly smaller cazuelas during the early Dyar phase than during the late Dyar phase. The increased size of cazuelas at site 9Ge175 suggests that larger groups may have visited the site during the late Dyar phase.

Degree of Site Specialization

Perhaps it is better to view this aspect of site-use as the relative range or diversity of activites performed at each site. This is a most difficult attribute to measure archaeologically, because there is no question that many activities leave few traces in the archaeological record. The archaeologist is left with the prospect of measuring the diversity of only those kinds of behaviors which leave more or less direct evidence in the archaeological record. The relative diversity or specialization of two such kinds of behaviors was examined in this study. These are the exploitation of animal species and the use of ceramic vessel forms at each site.

Specialization with regard to animal exploitation was measured by the relative degree to which animals from aquatic habitats, as opposed to terrestrial habitats, were exploited. Faunal remains from the Dyar site show the least evidence of specialization in this regard, as both terrestrial and aquatic fauna are well represented. Faunal remains from 9Ge175, on the other hand, show the greatest degree of specialization toward exploitation of aquatic resources. The Ogeltree site falls between the Dyar site and 9Ge175 with regard to aquatic versus terrestrial resource specialization.

Diversity of activities which required the use of ceramic vessels at each site was measured by the relative frequencies of vessel classes which are thought to represent functionally distinct kinds of vessels. According to this criterion, the range of vessel-related activities was greatest at the Dyar site, smaller at 9Ge175 and the Ogeltree site, and smallest at the Punk Rockshelter.

In addition to an attempt to measure diversity of specific kinds of behaviors (animal exploitation and use of ceramic vessels), several more general observations about site specialization should be noted. One of these involves the assumption that a greater range of domestic activities would have been performed at sites which were permanently occupied than at those which were occupied only seasonally or for very brief periods. This variable, relative permanence of occupation, has been discussed above for each site. A second general observation is that at the Dyar site there is evidence for not only a broad range of domestic activities, but for public and ceremonial activities as well. This is suggested by the presence of a mound and plaza at the Dyar site. When all of these characteristics are considered, it is clear that a greater variety of activities must have taken place at the Dyar site. The Ogeltree site can be considered somewhat more specialized than the Dyar site. The Punk Rockshelter and 9Ge175 both appear to represent highly specialized occupations.

Small Sites in the Oconee Province

In what ways can an understanding of these similarities and differences among sites be integrated within an understanding of the structure of Mississippian settlement patterns? The model of the Mississippian adaptive niche, summarized in Chapter III, provides some useful insights. This model, in conjunction with an understanding of the distribution of important resources in the Georgia Piedmont (Chapter V), provides a conceptual framework for ways in which at least two small sites, Ogeltree and 9Ge175, may have been integrated within the larger settlement system of the Oconee Province.

According to B. Smith's (1978a) model, Mississippian peoples located their settlements in a way that would maximize access to two important warm season resources.

These are the fertile, easily tilled levee soils in river floodplains and the aquatic resources of oxbow lakes. As proposed in Chapter V, oxbow lakes, if they existed at all, probably were not common features in the Georgia Piedmont. It is suggested here that the need for aquatic resources by Mississippian peoples of the Piedmont was met by a different kind of geomorphological feature--the shoals and rapids of major streams.

The complementary distribution of favored horticultural soils and shoals in portions of the Piedmont differs from the situation found in the Middle Mississippi Valley. In the Mississippi Valley, oxbow lakes and favored horticultural soils exist in close juxtaposition. Thus it was possible for Mississippian settlements to be located adjacent to both of these resources. Because only limited amounts of floodplain soils occur adjacent to shoals in the Piedmont, at least two kinds of small sites can be expected near shoals. These are: (1) a limited number of small residences located adjacent to small tracts of floodplain at the shoals; and, (2) sites which were specialized toward the exploitation of aquatic resources. These specialized sites would have been visited by groups whose permanent or semi-permanent residences were located on tracts of desirable horticultural soils which were not adjacent to a source of aquatic resources. Two of the sites examined in this study (Ogeltree and 9Ge175) may qualify as representatives of these hypothetical site types.

The Ogeltree site, by virtue of its single structure, hearths, and burials, appears to be at least a semi-permanent residence. As noted earlier, however, several kinds of evidence indicate that this site represents a less permanent occupation than the Dyar site. First, the single structure at the Ogeltree site appears to have been less substantial than those at the Dyar site. Further support for semi-permanent occupation at the Ogeltree site is provided by the relative frequency of jars at each site. Faunal remains suggest that the Ogeltree site was occupied primarily during the warm season. Lastly, the Ogeltree site is located on one of the small pockets of floodplain soils at Long Shoals. The abundance of box turtles at the site, and the representation of a few deer suggest that garden plots may have been located nearby.

Site 9Ge175 differs from the Ogeltree site in a number of important ways. First, there is no evidence for structures, hearths, or burials at 9Ge175. Although it is possible that structures were located away from the excavated midden area, and therefore were not detected, the site faunal assemblage is composed almost entirely of aquatic species, and this indicates the specialized nature of site-use at 9Ge175. The location of the site, adjacent to a low fall in the river channel, may help explain the high representation of aquatic species at the site. It is possible that a fish weir existed at the southern end of the site. Ceramics from the site indicate that although the site was used more frequently during the early Dyar phase, 9Ge175 was repeatedly occupied throughout the Lamar period. Lastly, the low frequency of jars suggests that site occupation may be characterized as transient, rather than permanent or semi-permanent. These differences suggest that site 9Ge175 is best interpreted as a seasonally reoccupied site at which activities were centered around the exploitation of aquatic resources. The fact that pottery was plentiful at the site indicates that cooking was a common activity at the site. This suggests that the site was probably an encampment, rather than an ephemeral occupation which was visited for periods of less than a day. Given the complementary distribution of shoals and floodplain soils in this portion of the Oconee drainage, 9Ge175, and sites like it, were probably visited throughout the warm season by groups whose warm season or permanent residence was located on tracts of preferred horticultural soils away from a source of aquatic resources.

It is unfortunate that the specific nature of site-use at the Punk Rockshelter remains poorly understood. Investigation of site-use at the Punk Rockshelter is somewhat hampered by the fact that ceramics comprised nearly the entire artifact assemblage from the site. On the other hand, the absence of other artifacts in itself suggests that the site was the locus of some specialized activity. Evidence that the site is specialized in some way is provided by the site's ceramic vessel assemblage. The four most frequent vessel classes represented 90% of the total number of vessels at the site. This is a higher proportion than that noted at any other site. It is additionally of interest to note that the vessel assemblage consisted largely of complete and nearly complete vessels.

Several hypotheses about the nature of site-use at the Punk Rockshelter have been posited, but none are supported by archaeological evidence. One hypothesis was that the site represented a storage location. The Punk Rockshelter has a lower relative frequency of jars than any other site, and this indicates that storage was probably not an important activity. Another suggestion, based on the presence of numerous re-fired or completely oxidized sherds, is that the site was a location where ceramic vessels were produced. The existence of a stratum of blue clay in the southernmost recesses of the shelter lends support to this suggestion. However, charcoal was rare at the site, and this is contrary to what would be expected if pots were fired at the Punk Rockshelter. A final suggestion was that the Punk

Rockshelter was the location of a spring. It is difficult to understand why a spring would be used so intensively when the river channel itself is only 40 m away.

Unanswered Questions

This investigation of similarities and differences among four sites in the Oconee Province has raised several important questions for future research. For example, it has been suggested that extractive sites like 9Ge175 were visited during the warm season by groups whose permanent residences were located away from the shoals. This hypothesis should be tested with evidence beyond an evaluation of the degree of site specialization. Such testing will require excavation of permanent and semi-permanent settlements located away from the shoals. What kinds of evidence can shed light on this hypothesized intersite relationship? Faunal remains may provide an avenue of inquiry. For example, it might be expected that such sites would have faunal assemblages in which aquatic resources are poorly represented. Furthermore, if favorite fishing locations were used by several groups of people from different localities, it might be expected that variability in particular ceramic decorative techniques would be greater at extractive sites than at small homesteads. Similarly, technological studies of pottery may reveal that relatively fewer clay sources are represented in ceramic assemblages recovered from homesteads rather than those assemblages recovered from extractive sites.

It is interesting that the permanently occupied Mississippian homestead site type is not represented here. A few examples of this kind of settlement have been described for the Mississippi Valley. A considerable amount of survey and excavation will have to be conducted before it is clear whether or not these kinds of sites existed in the Oconee Province. The existence of semi-permanent sites such as the Ogeltree site raises some interesting questions. Are semi-permanent, warm season settlements common? Where did the occupants of the Ogeltree site reside during the cold season? It is possible that an answer to this question may be found at site 9Ge35, or at sites in the uplands, away from the river valley. Site density in some upland areas is as great as that found along the Oconee River itself (Elliott 1983). What kinds of sites existed in the up-lands, away from the major streams? Were these sites permanently occupied? Are they specialized encampments for hunting deer or collecting nuts? No examples of up-land Lamar sites have yet been excavated.

Answers to these questions, and others, will require extensive fieldwork and detailed analyses of excavated sites. It is hoped that some of the methods applied in this study will be of use to future investigations of settlement patterns in the Oconee Province. To be sure, this study has focused on only a few aspects of Mississippian settlement. It would be more interesting, for example, to have a ready-made typology of site types which could be used to determine the relative frequencies of homesteads, extractive sites, or villages that existed in a given Mississippian society. In the interest of exploring such major questions, archaeologists are often forced to make this leap of faith, to assume that surface collections or site size estimates are adequate bases for site characterization. In fact such assumptions are adequate for particular questions. Other questions however, such as the nature and degree of regional integration of various Mississippian groups, can only be addressed when there is a thorough understanding of the kinds of sites that comprise the settlement system. This kind of knowledge is accessible only through detailed comparisons among excavated sites which are components of the same settlement system.

APPENDIX 1. DIVERSITY AND EQUITABILITY INDICES

The Shannon-Weaver diversity index is as follows:

$$H' = \Sigma_i (-P_i) (Log_e P)$$

where H' = species diversity

$$P_1 = \frac{n}{N} \text{ or } \frac{\text{total MNI for each taxon}}{\text{total MNI for all taxa combined}}$$

Log_e (or 1_n) is the natural logarithm

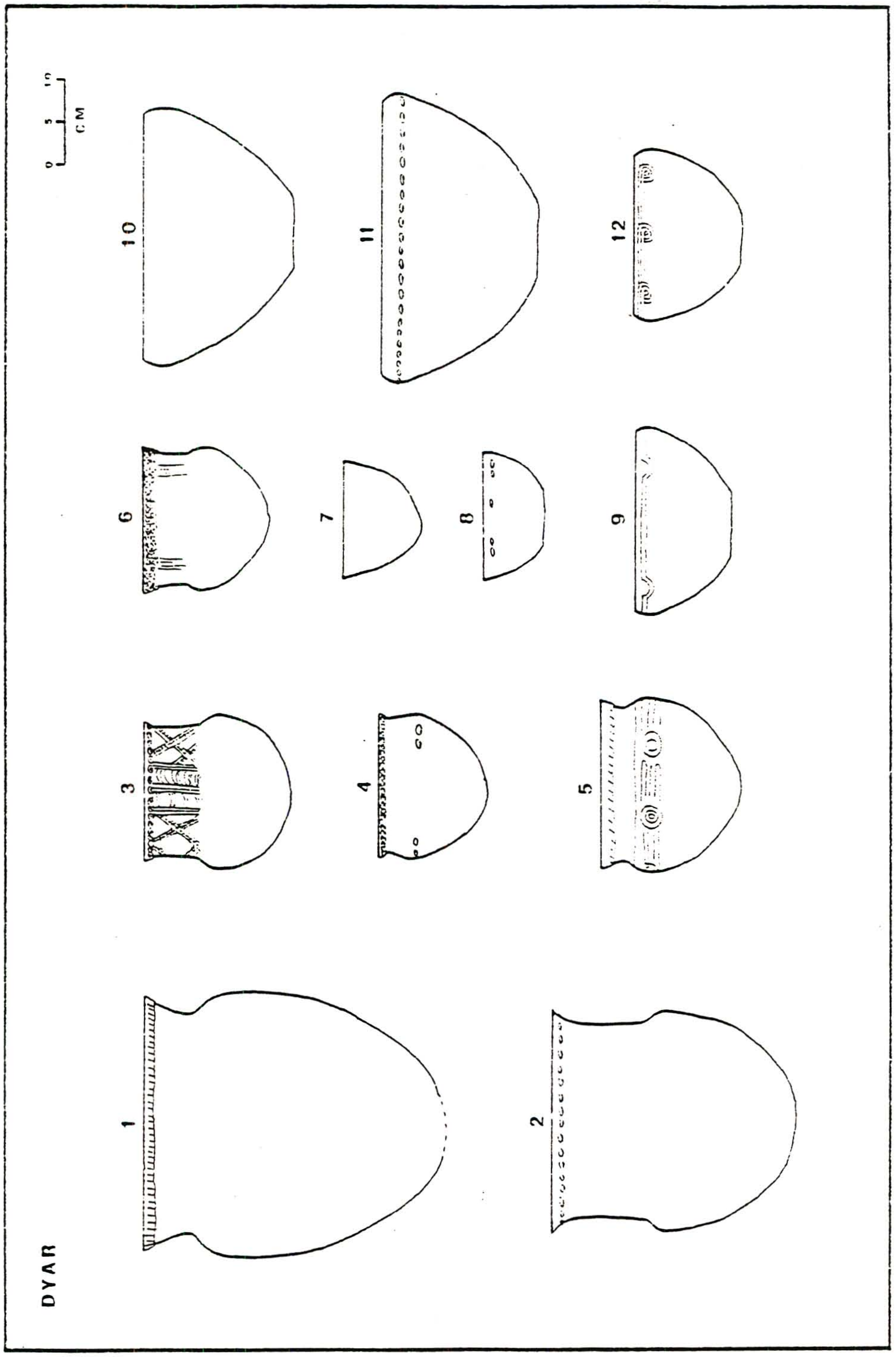
The equitability index (Sheldon 1969) is as follows:

$$D = \frac{H'}{Log_e X}$$

where E = equitability

X = total number of identified taxa

APPENDIX 2. MEASURED VESSEL DRAWINGS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5
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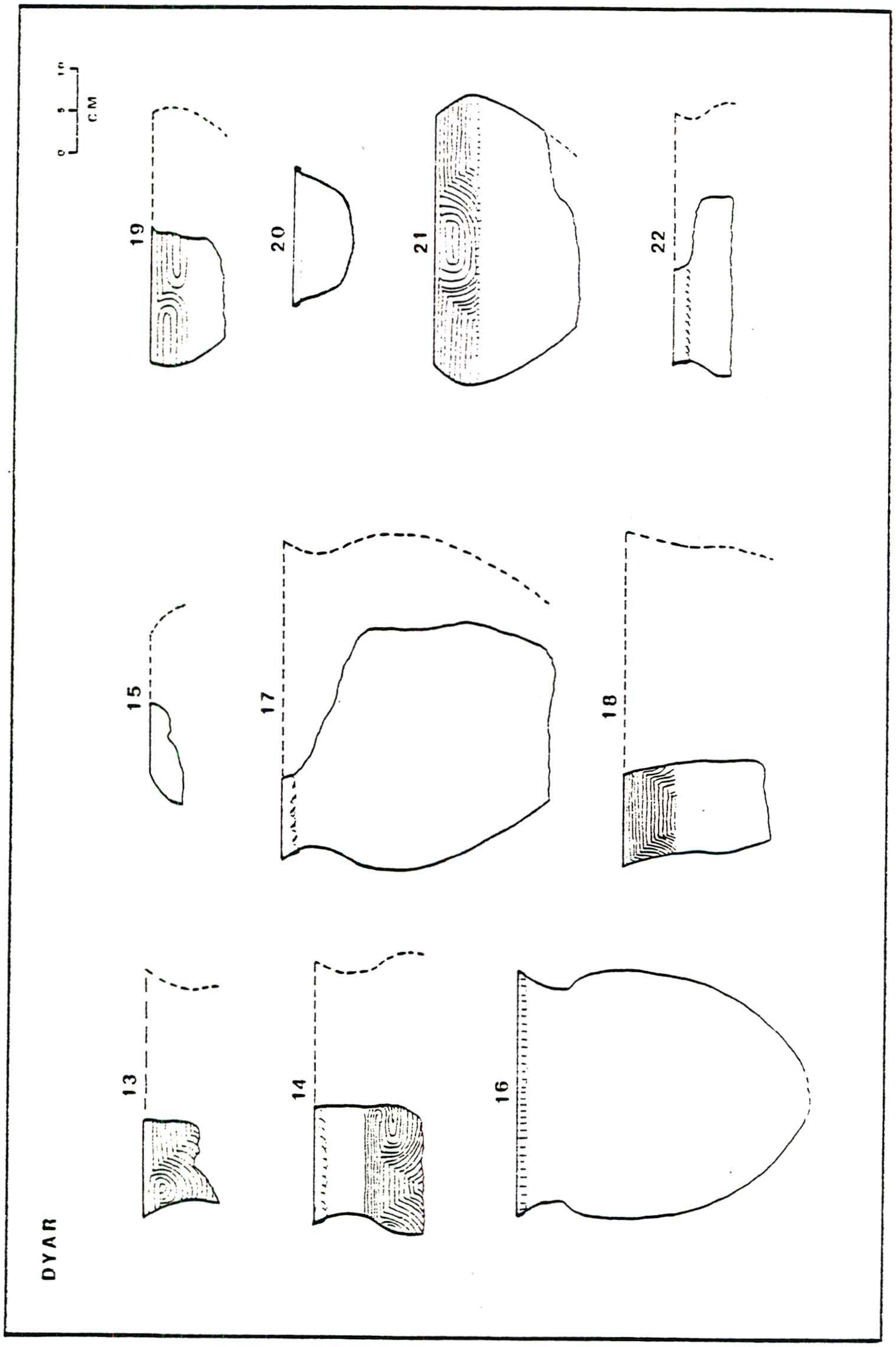
11
12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16
17
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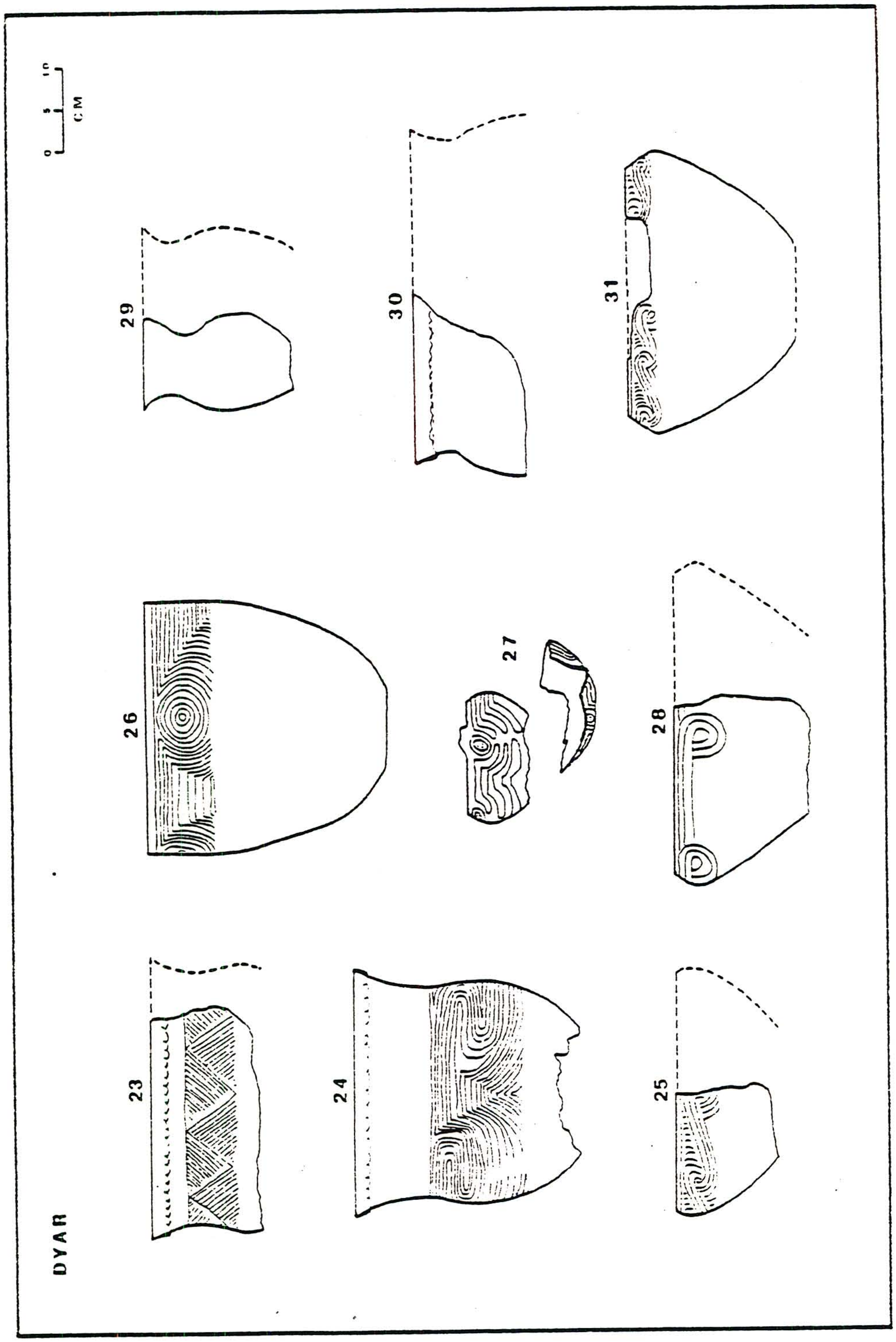
19
20
21
22
0 5 10
CM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CM
23
24
25
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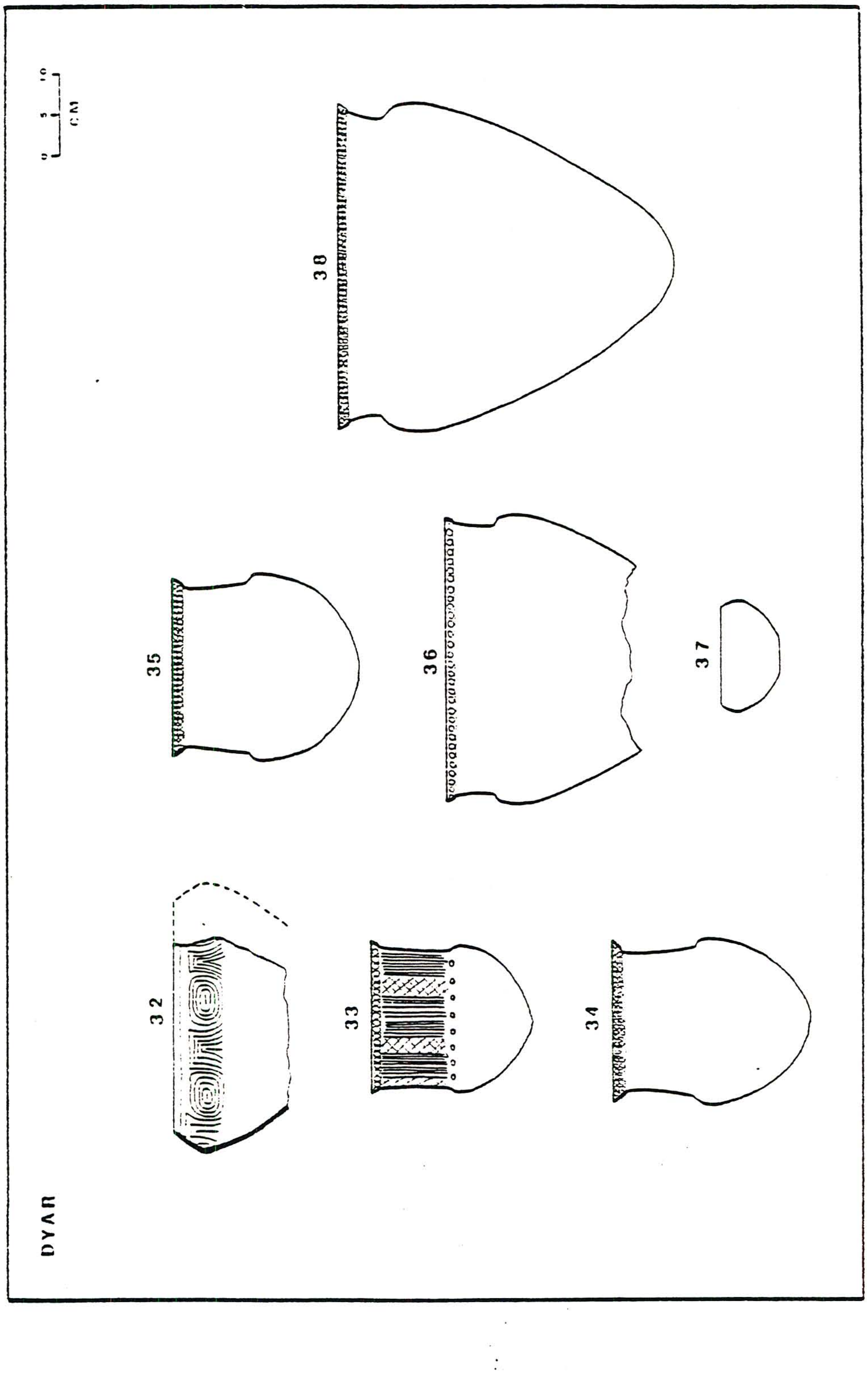
28
29
30
31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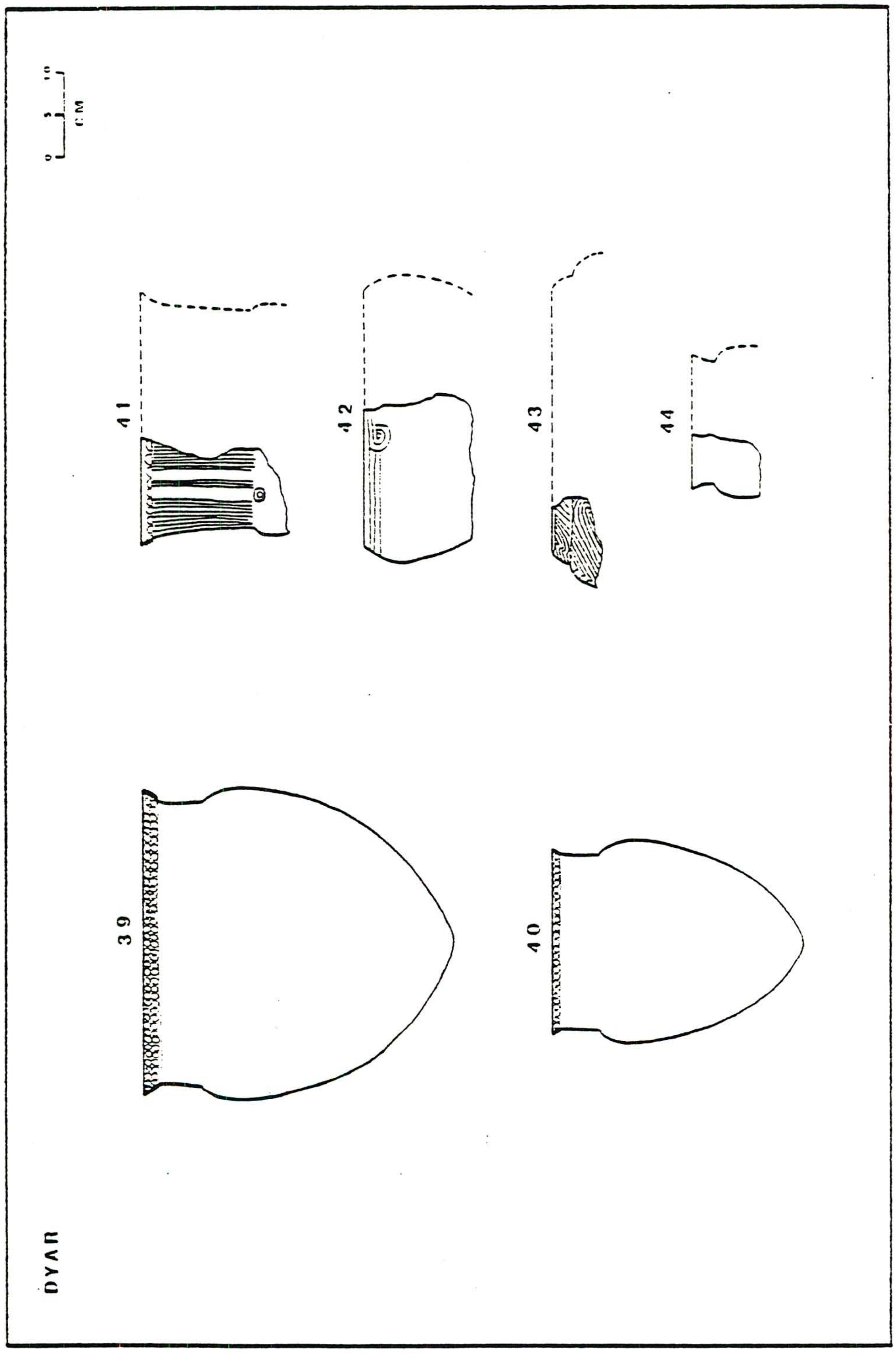
CM
32
33
34
35
36
37
38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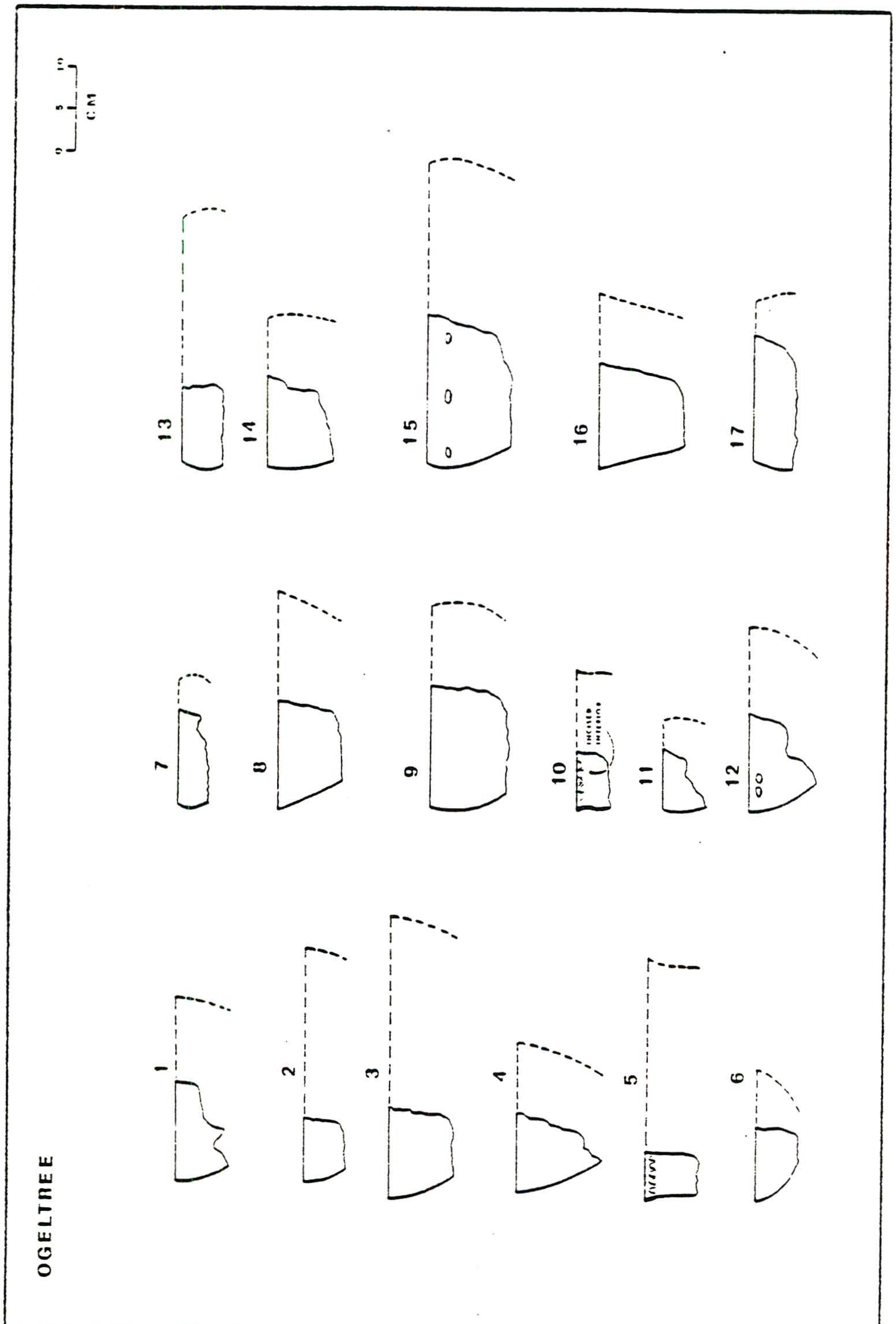
39
40
41
42
43
44
0 5 10
CM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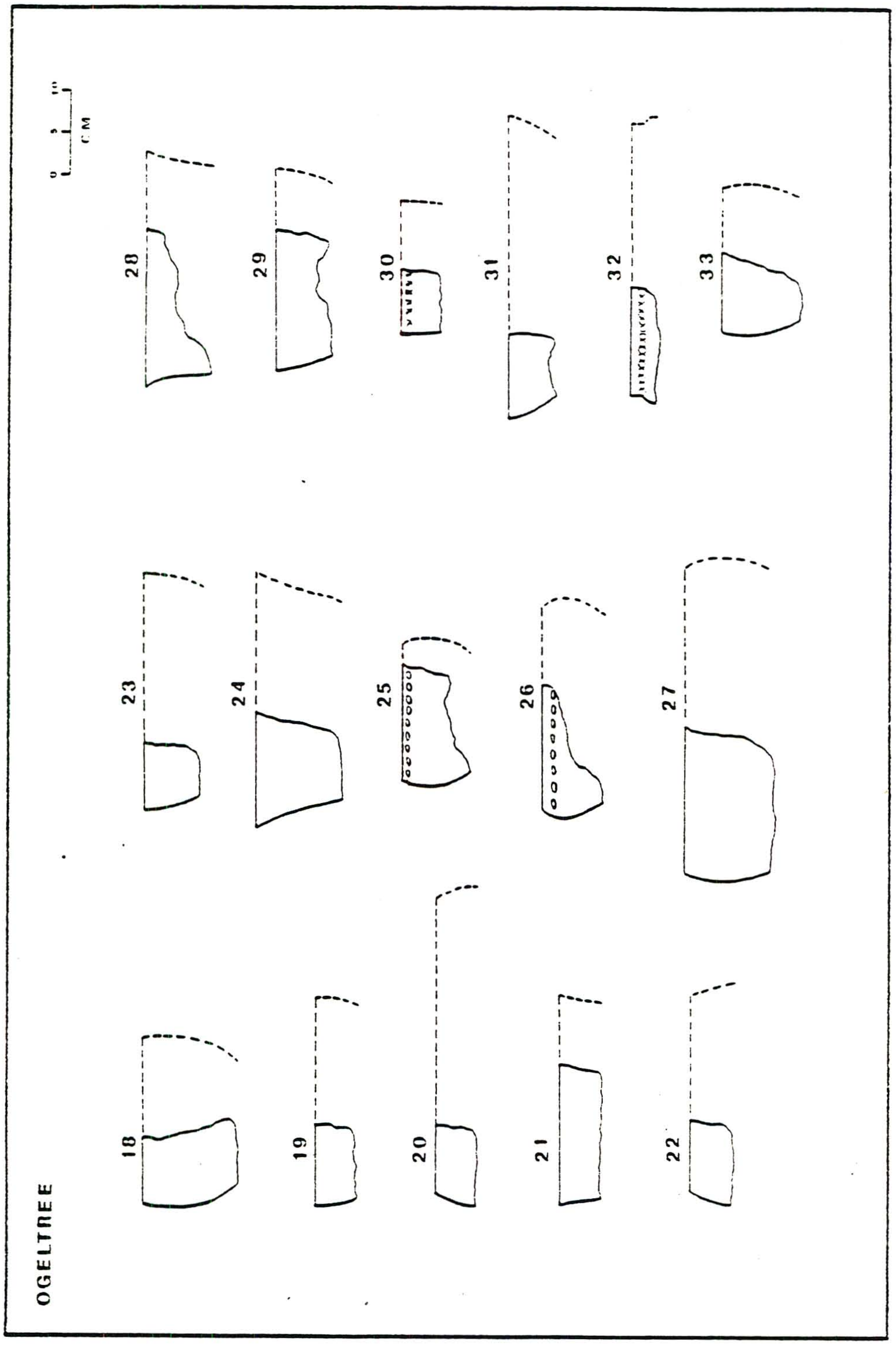
4
5
6
7
8
9
10
11
12
13
14
15
16
17
0 5 10
CM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24
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26
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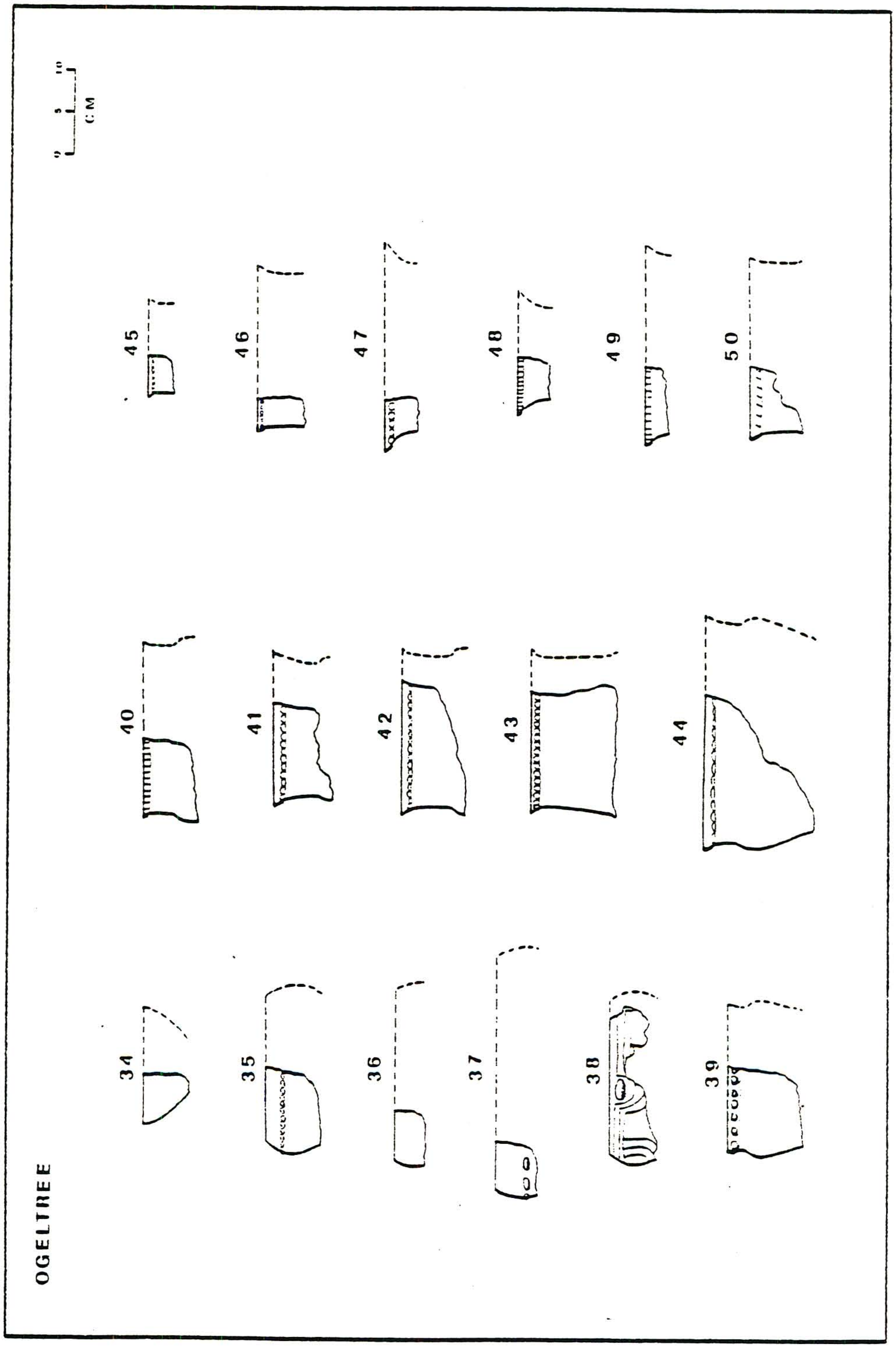
28
29
30
31
32
33
0 5 10
CM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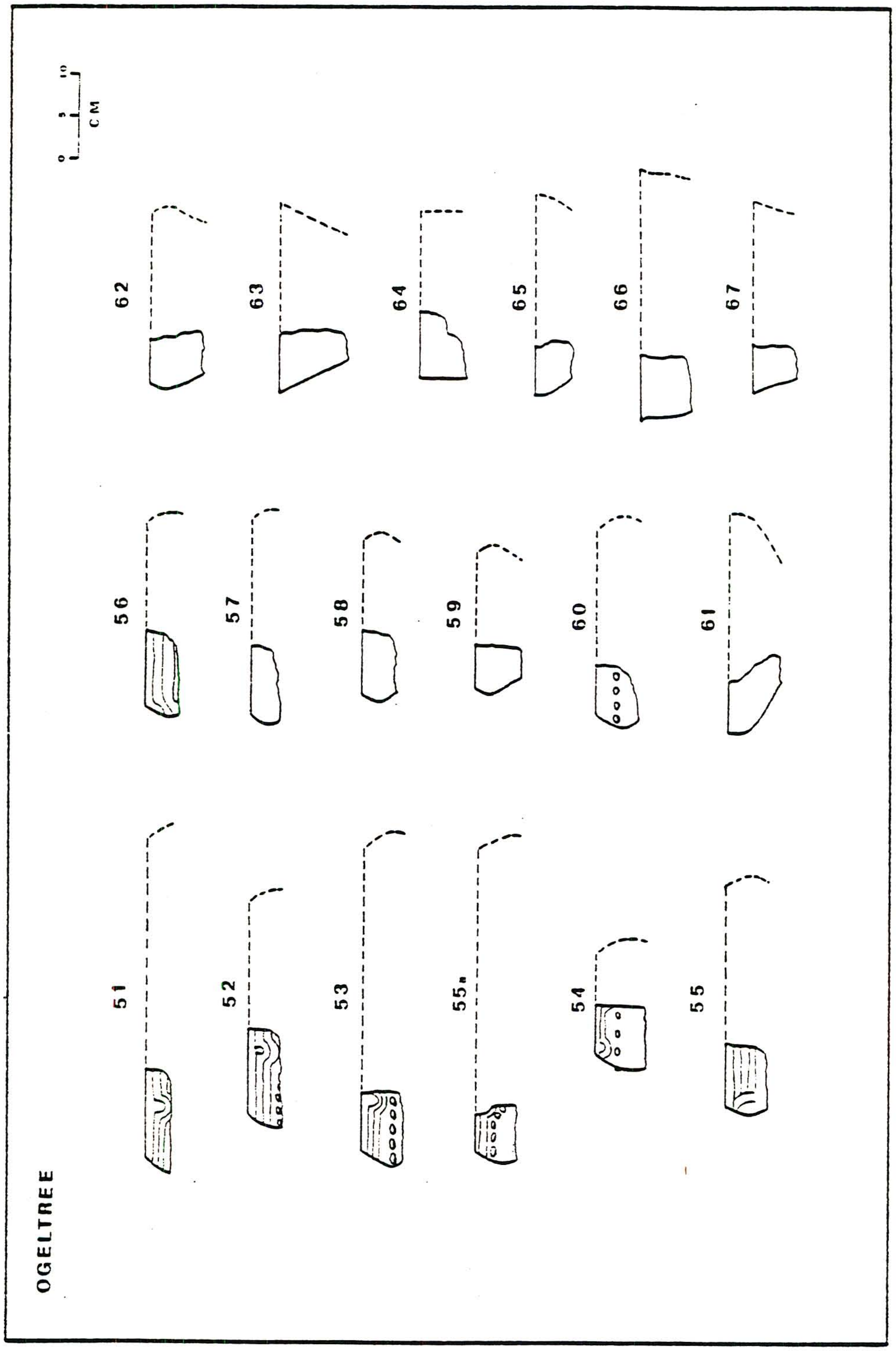
49
50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CM
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53
55a
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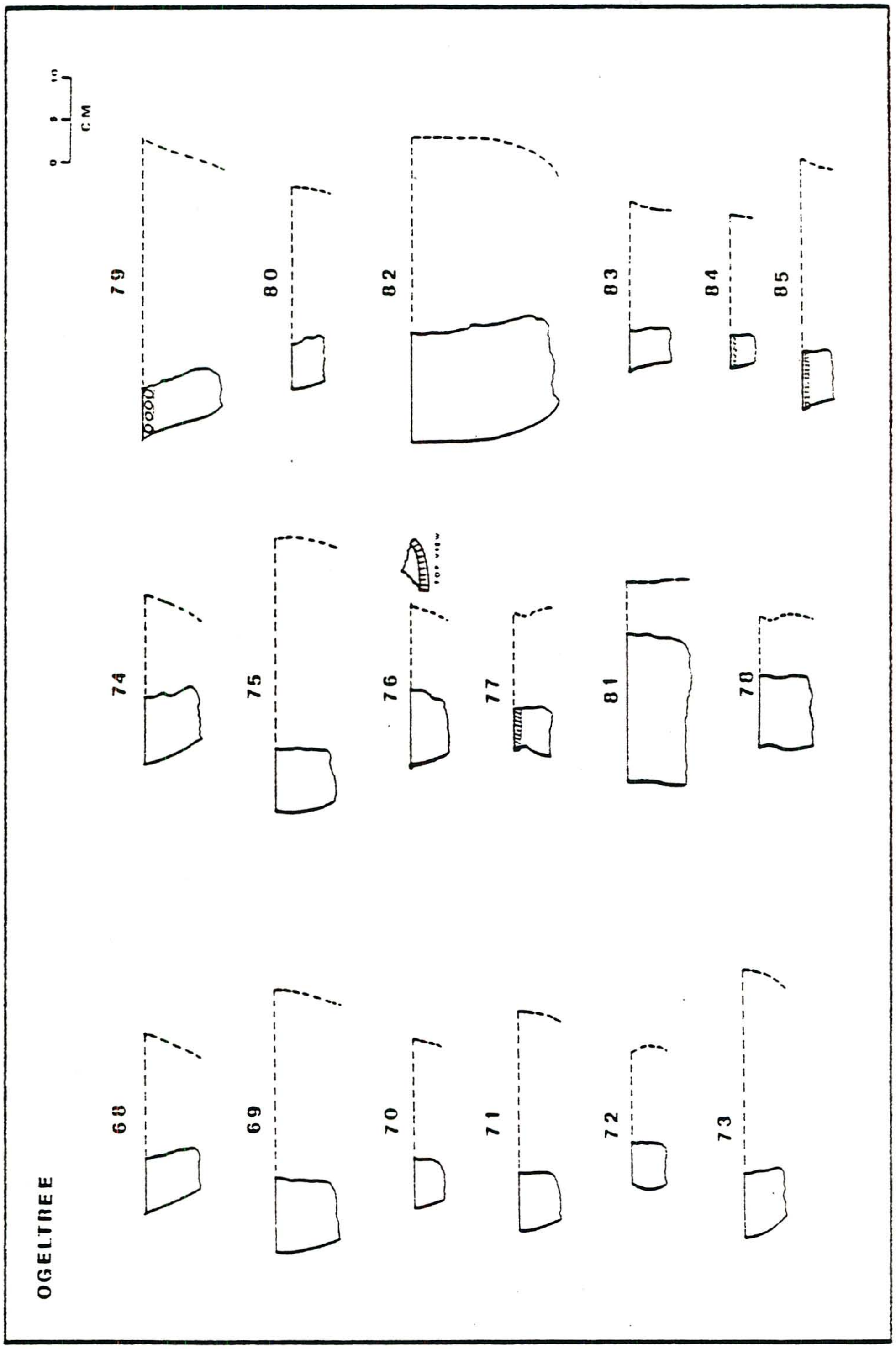
64
65
66
67


OGELTREE
68
69
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75
76
TOP VIEW
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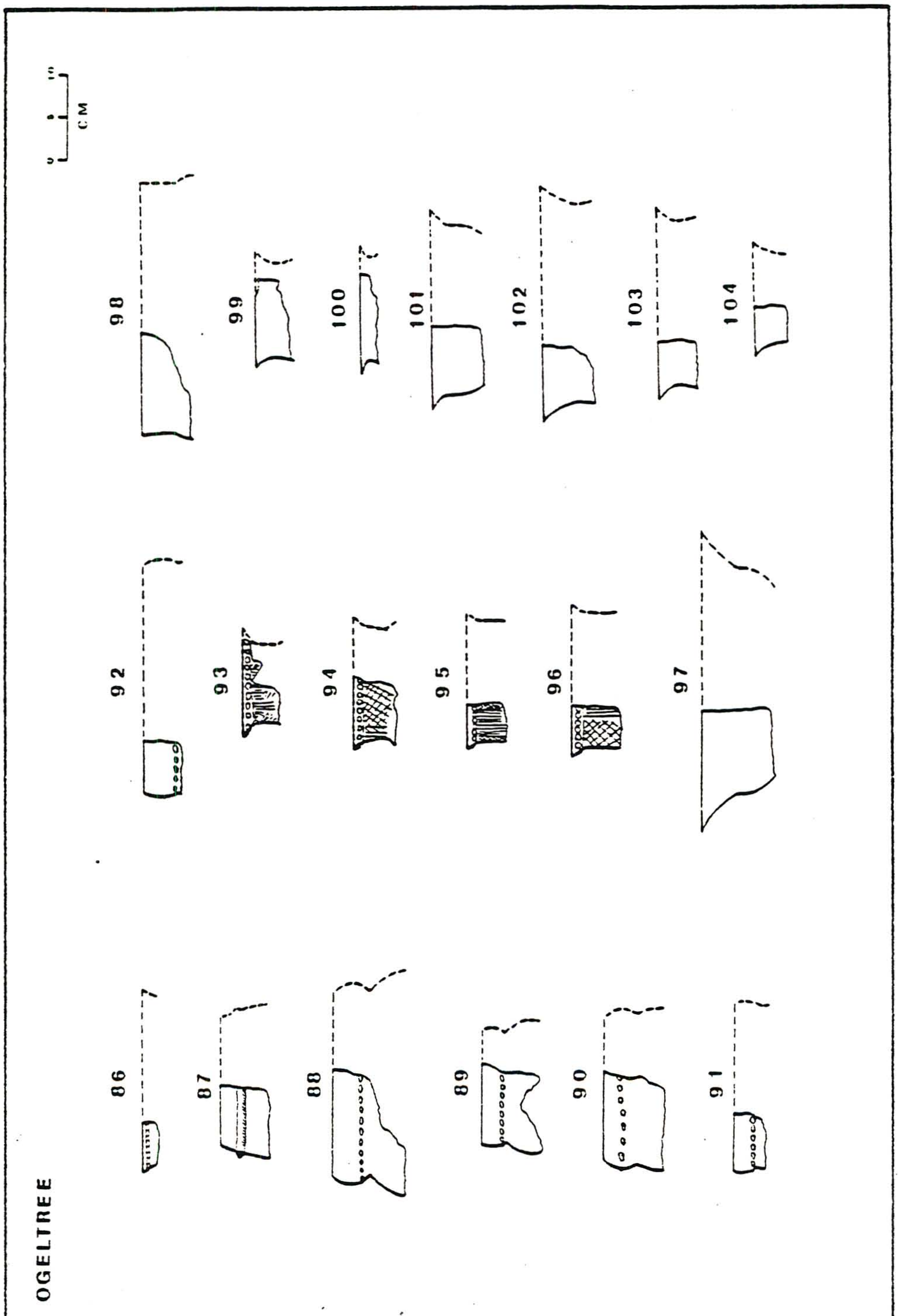
81
78
79
80
82
83
84
85
0 5 10
CM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101
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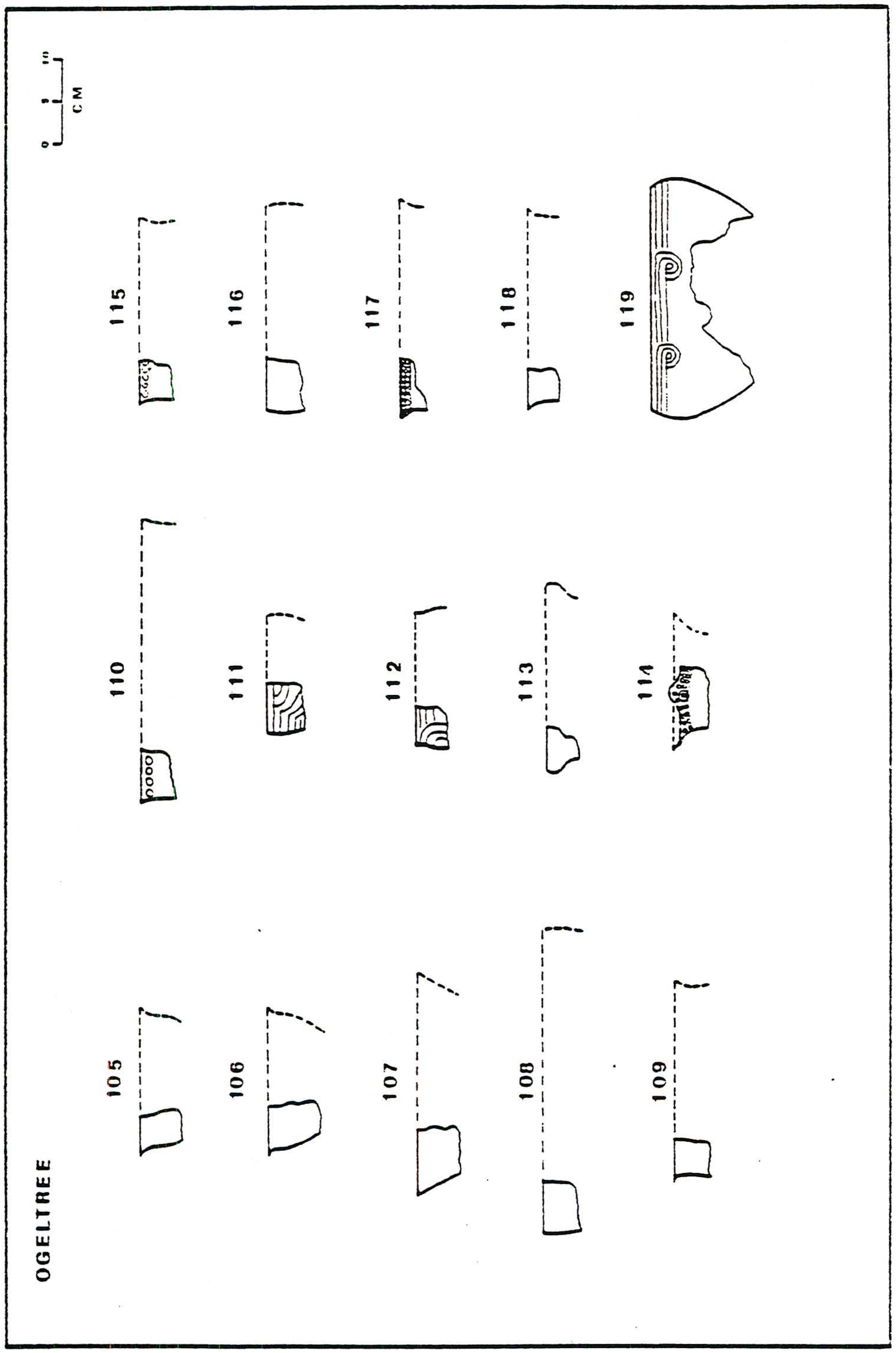
103
104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111
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115
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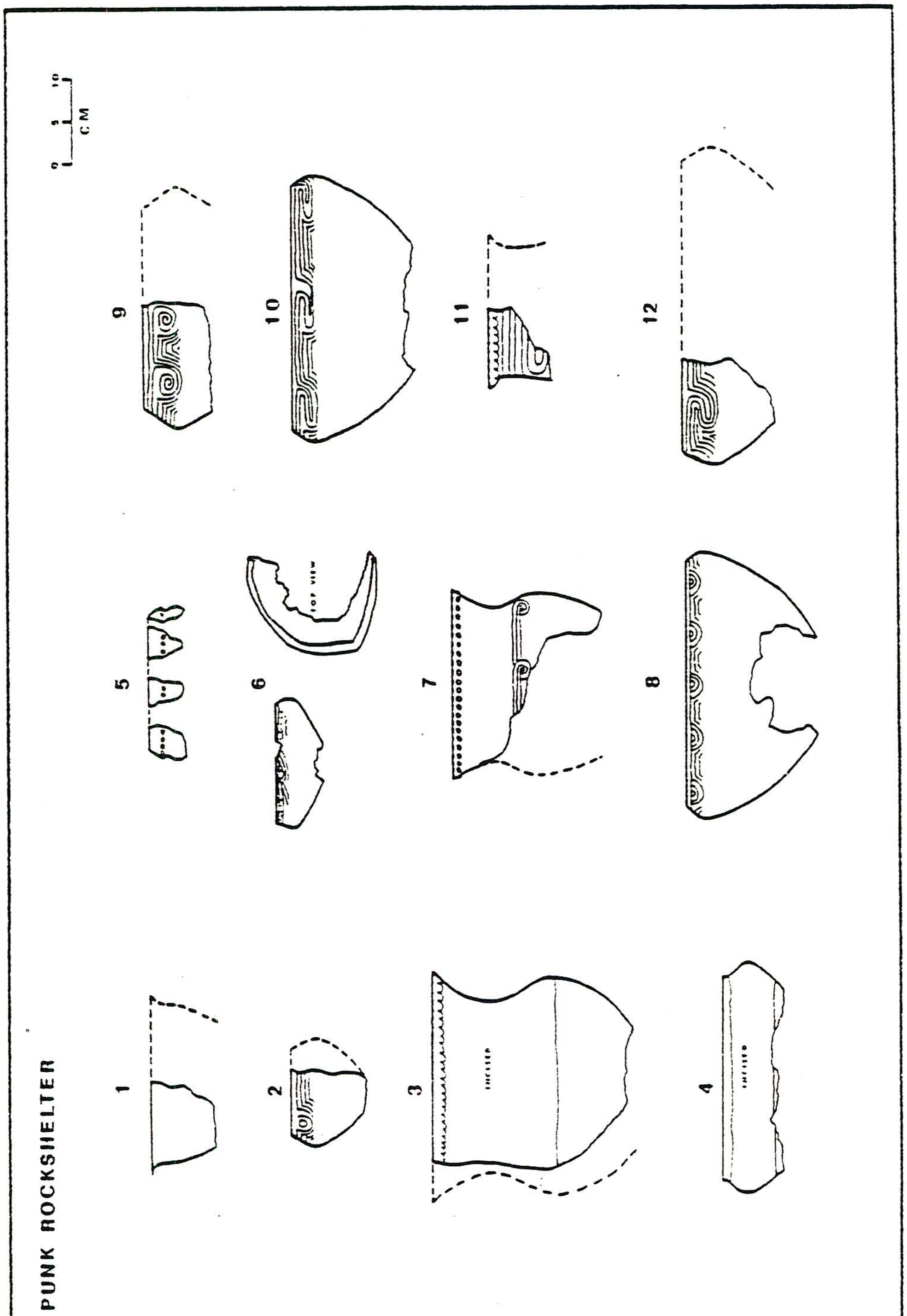
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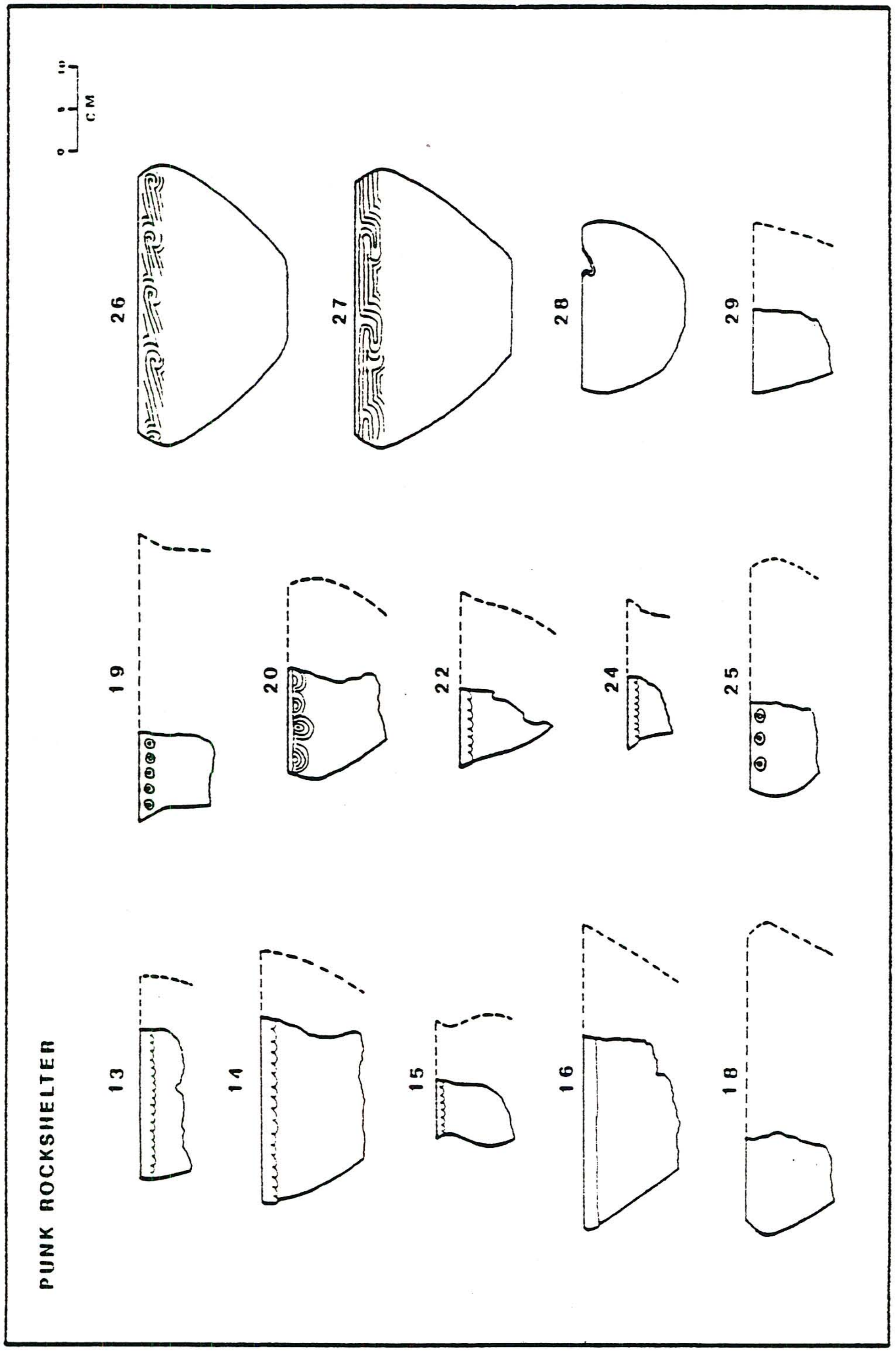
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27
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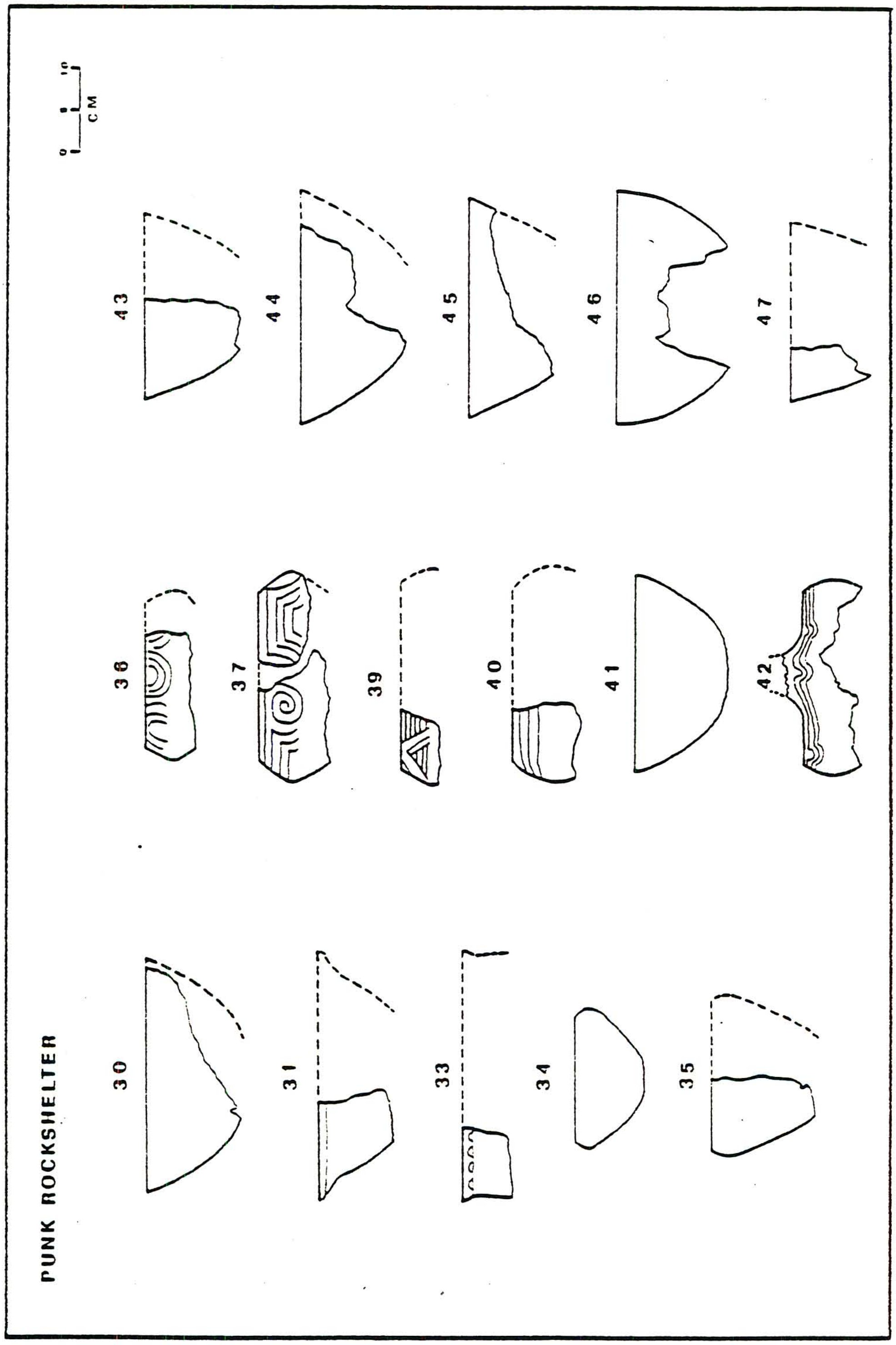
PUNK ROCKSHELTER
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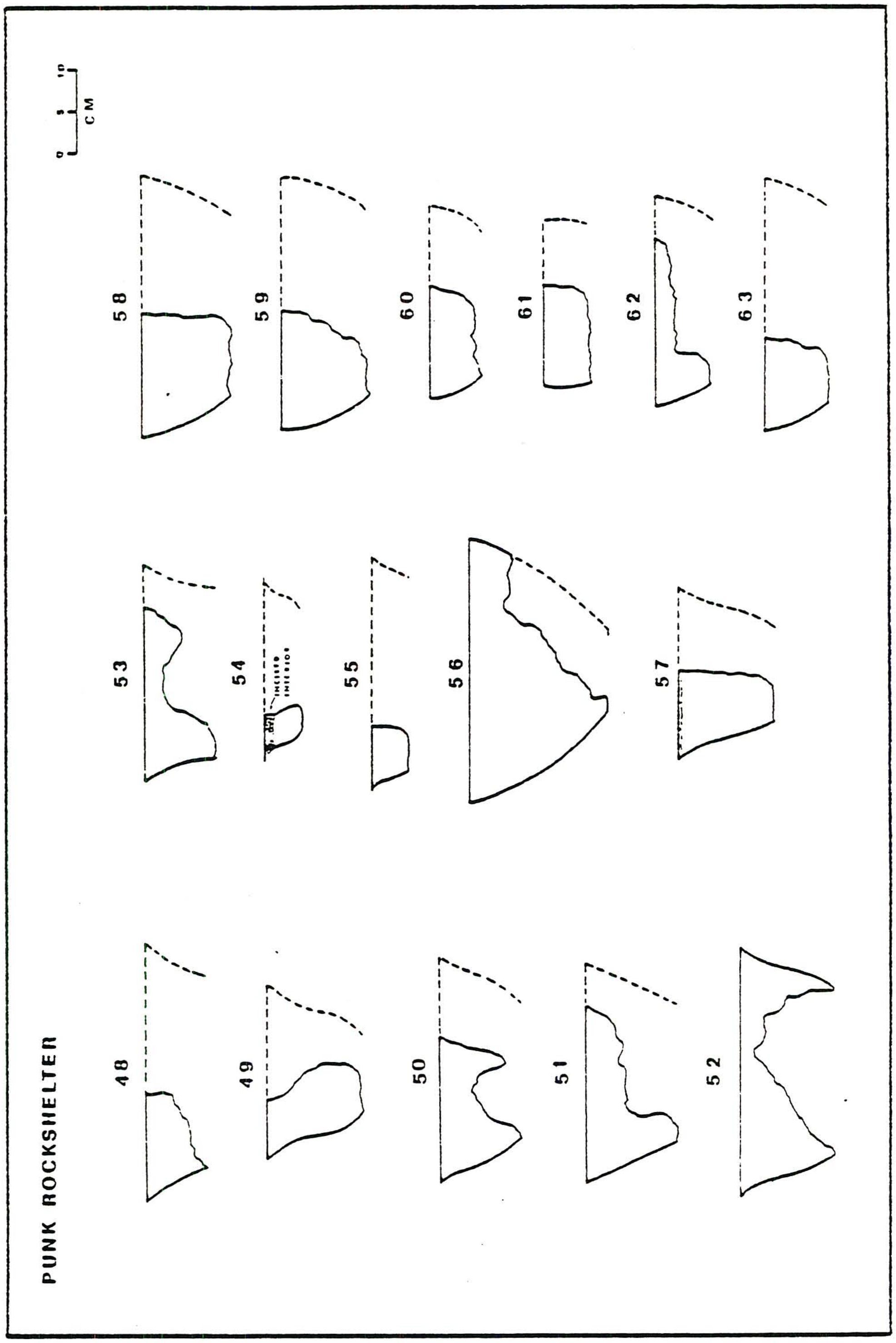
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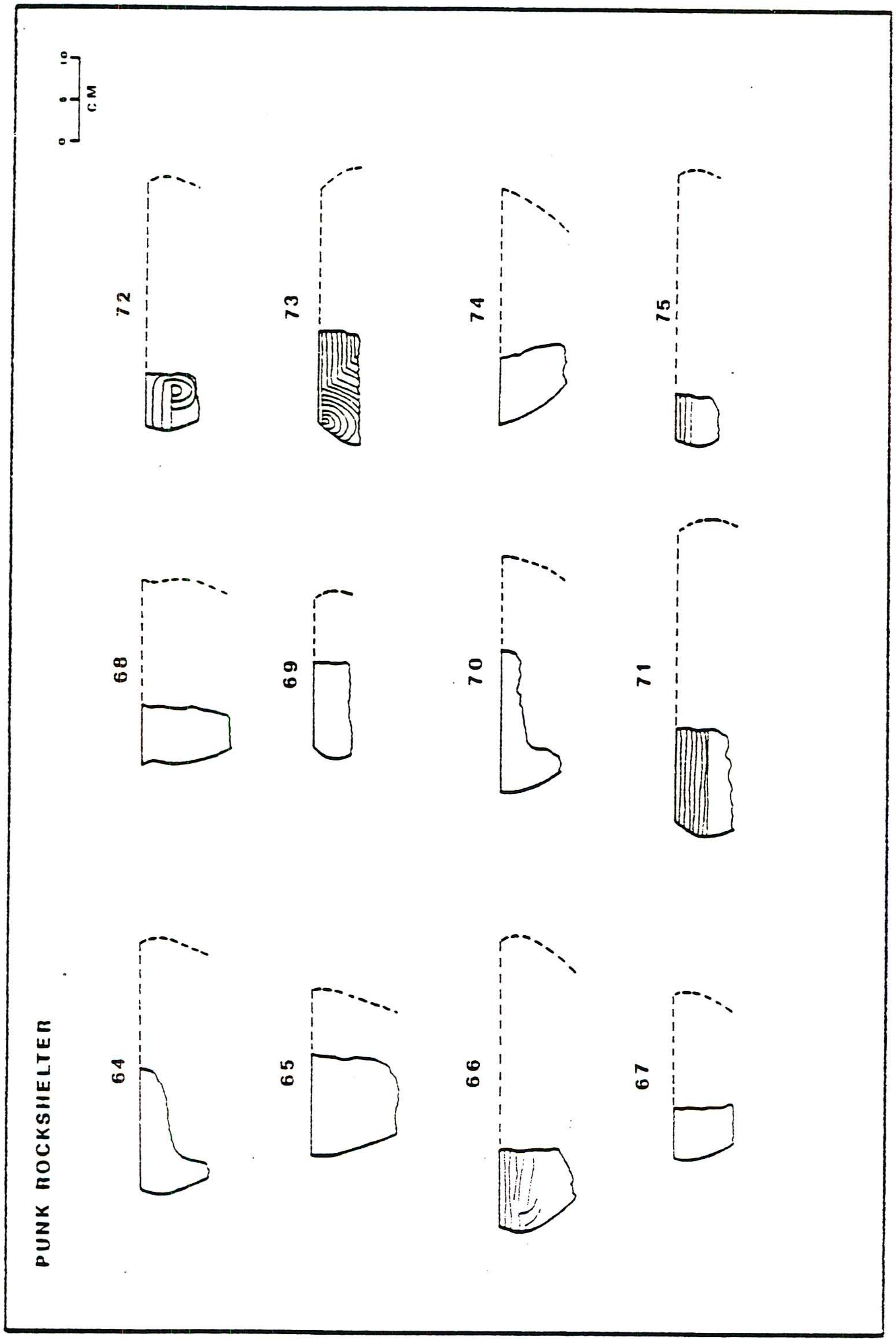
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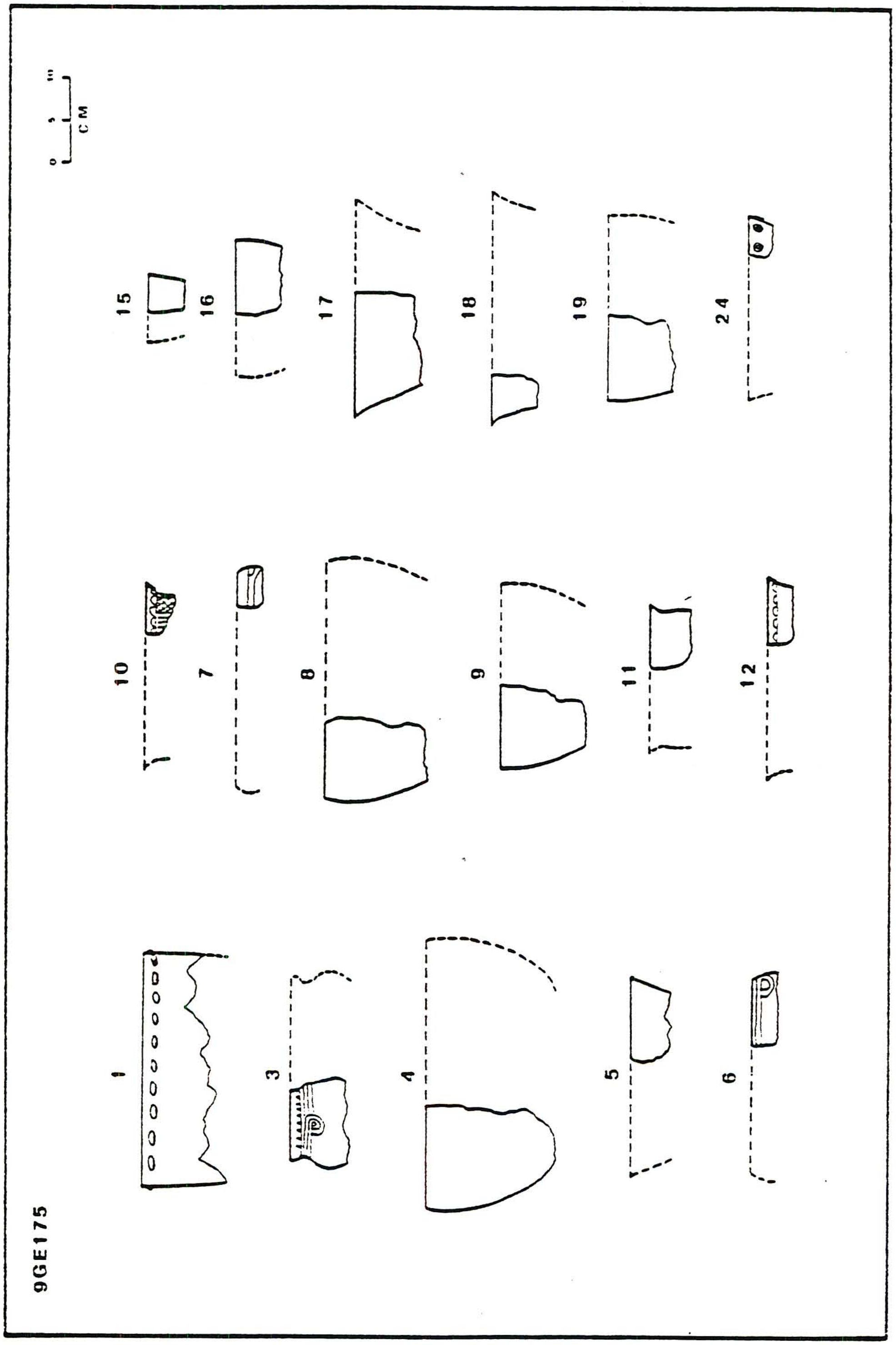
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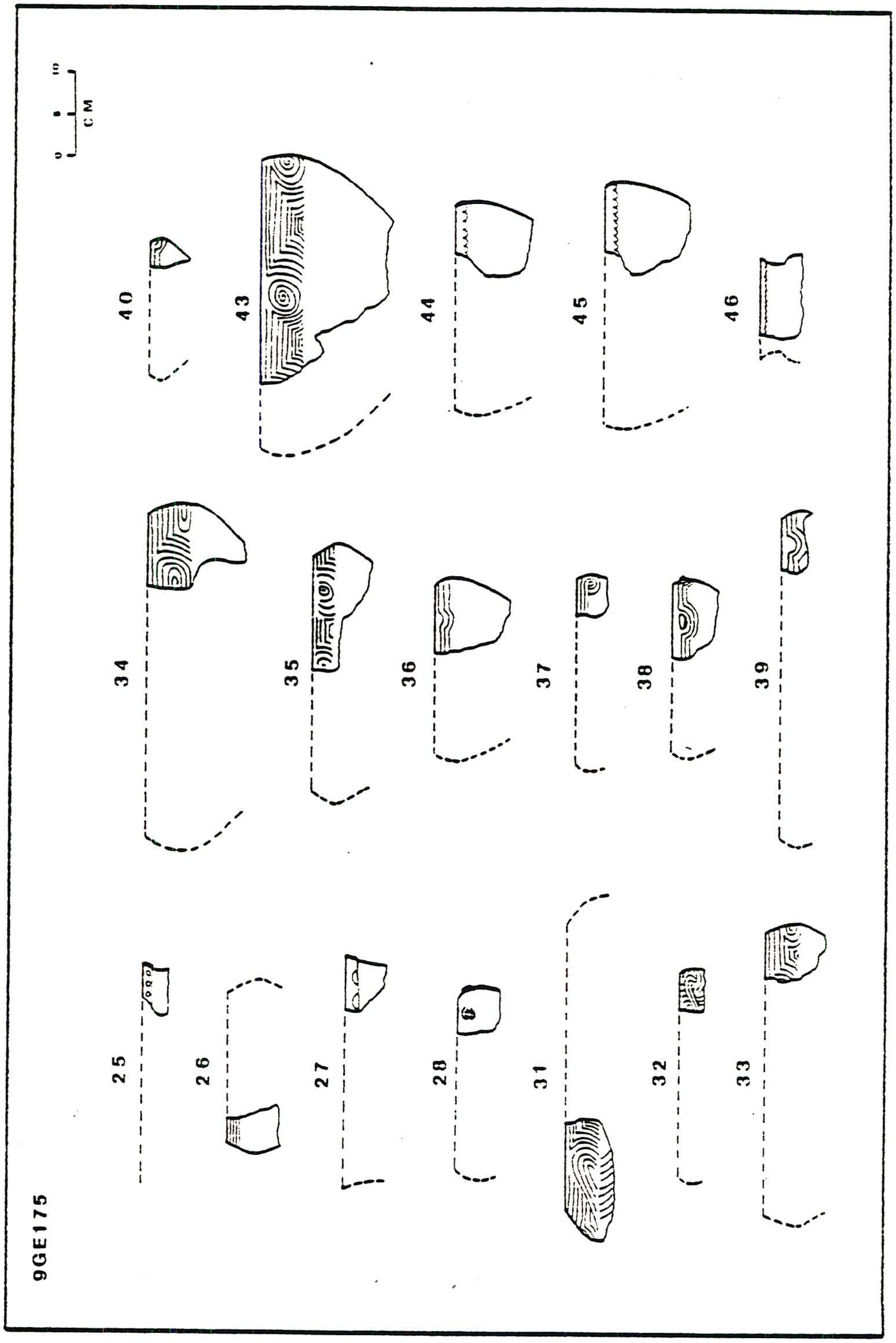
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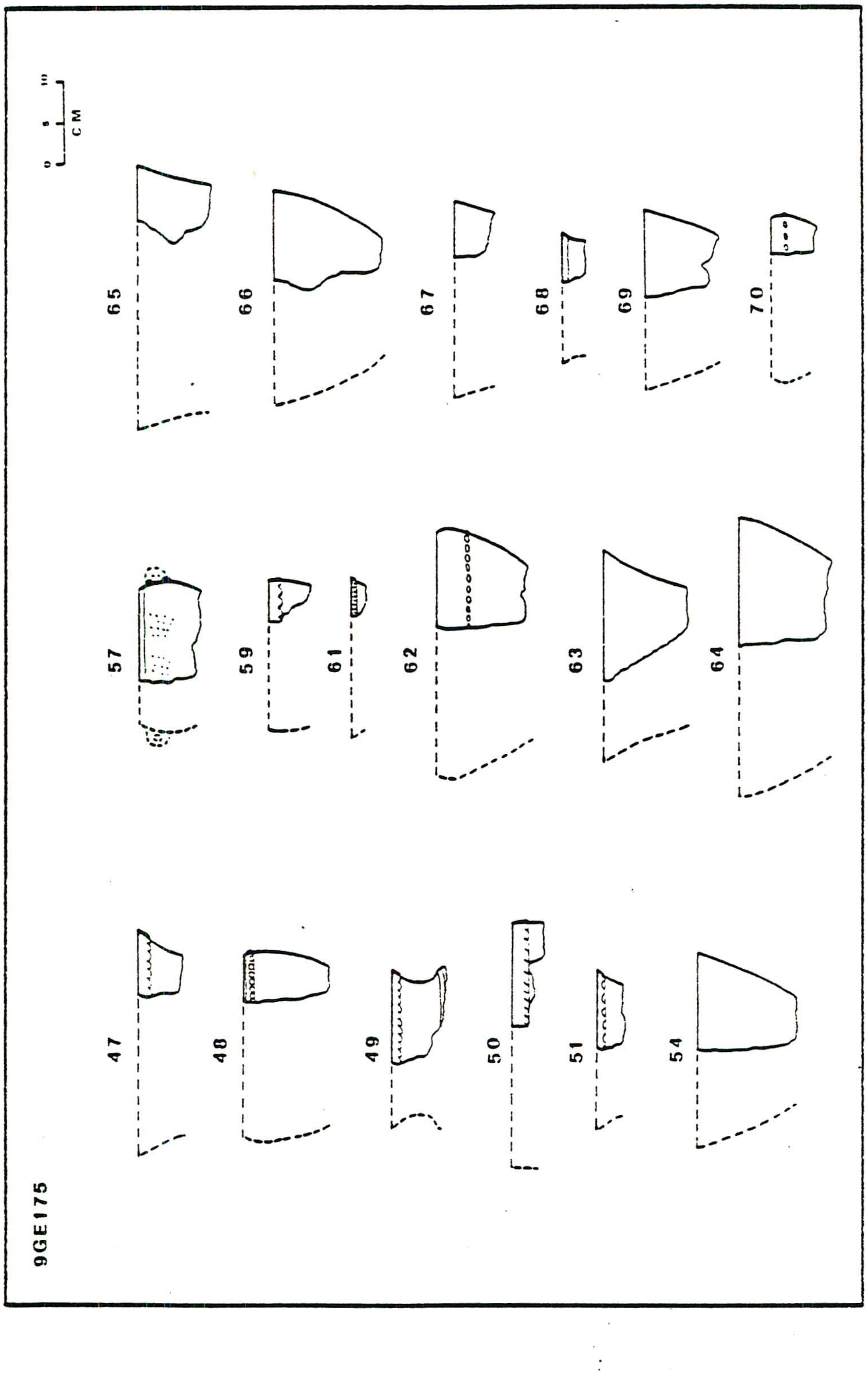
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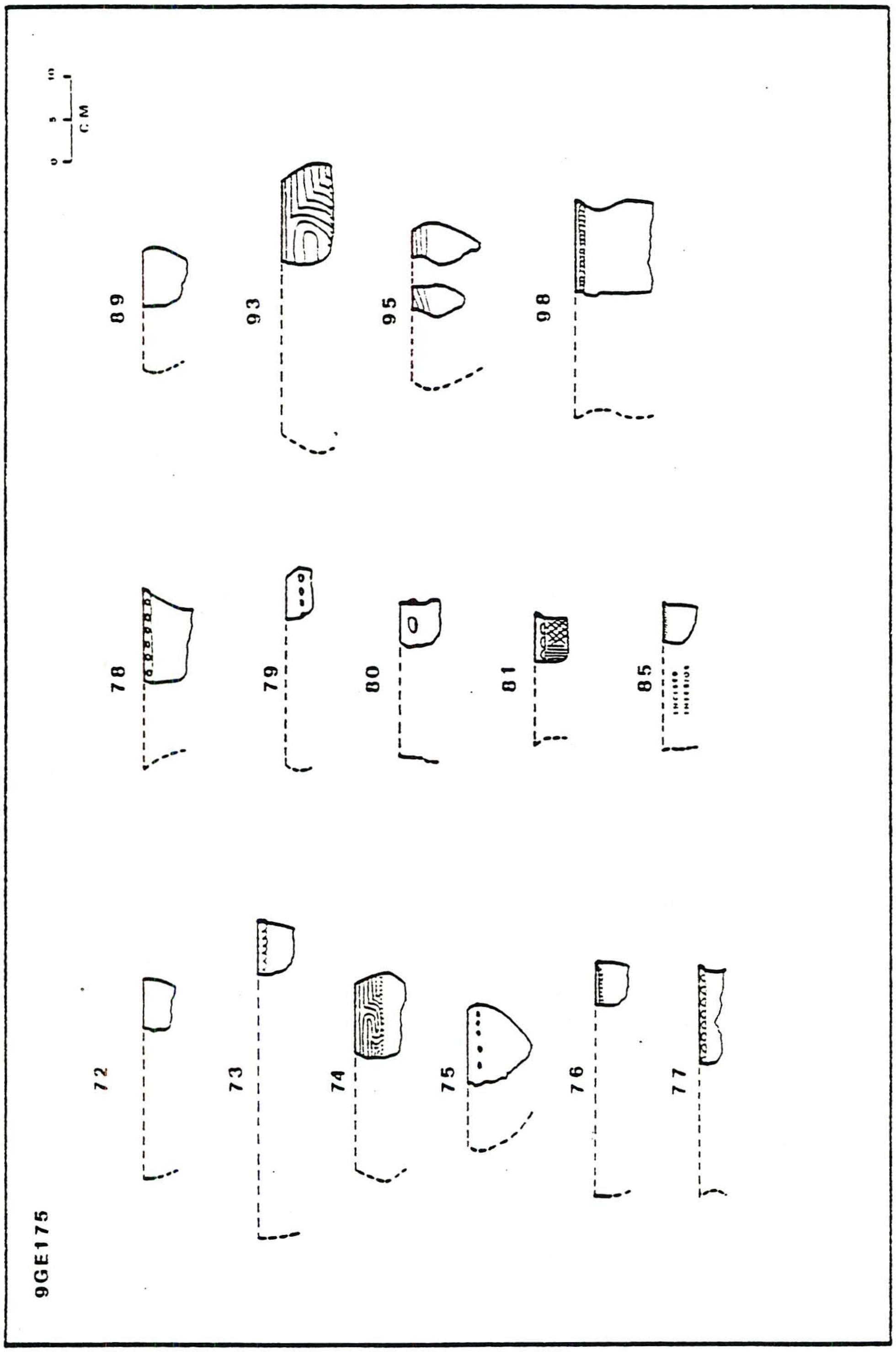
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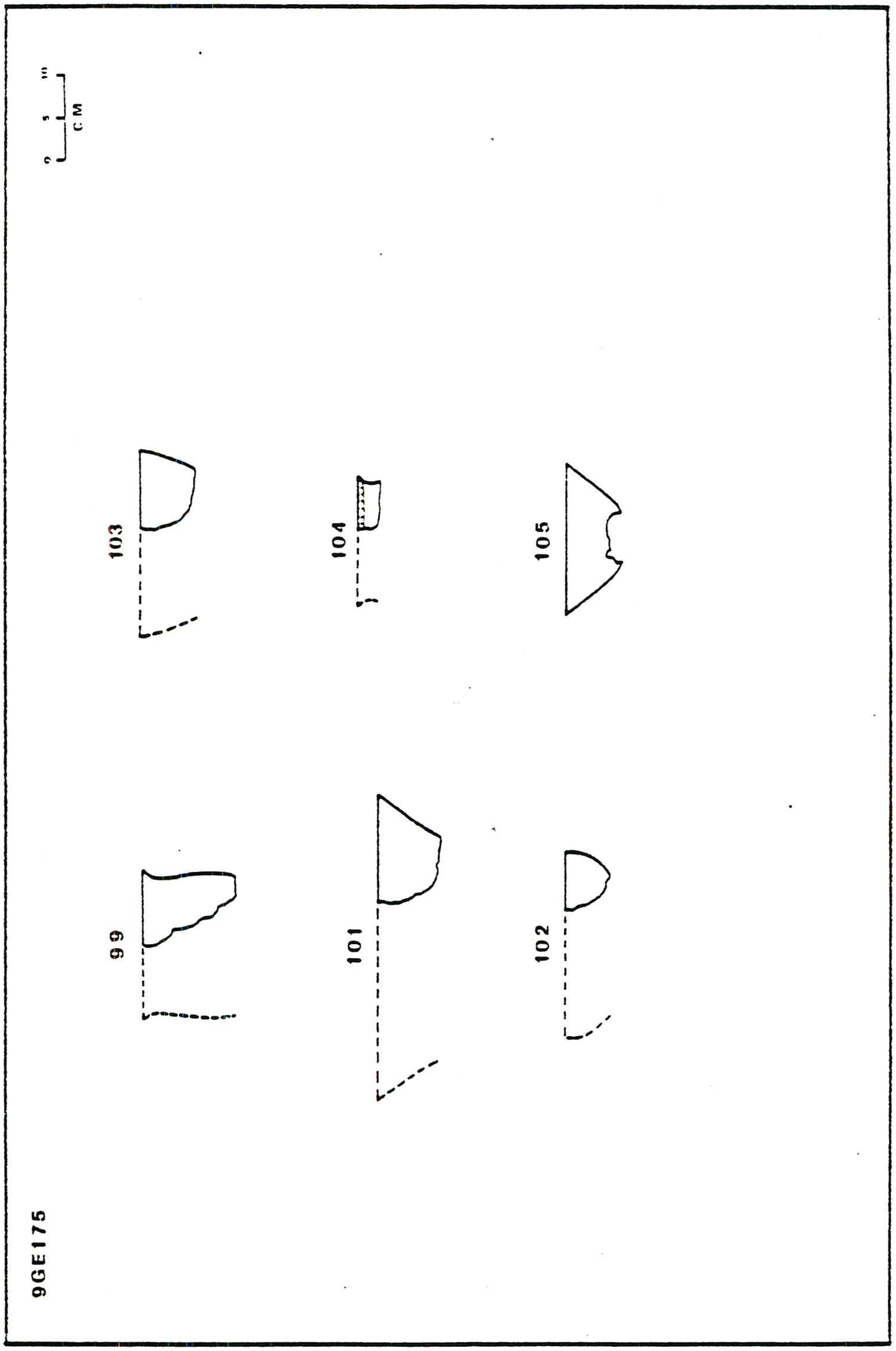
9GE175
99
101
102
103
104
105
CM

APPENDIX 3. VESSEL AND RIM DATA

SITE #	V.#	PROV/LOT#	SHAPE	DIAM	RIM	SURF	INC	ALT	RD
9GE5	1	18/24	8B/C	30	2	3		1,2	1
9GE5	2	12/29(B16)	8A	26	0	0,5,6		1	1
9GE5	3	18/F47	8A	16	3	1	1	1	1
9GE5	4	BU14/305	8D	17	1	0,6		1	1
9GE5	5	0/114	8B/C	19	2	1,3	2	1	1
9GE5	6	0/186	8A	17	1	0		1	1
9GE5	7	0/186D	2C	14	0	0		1	
9GE5	8	0/21	2C	15	0	0,6			
9GE5	9	12/35	1	21	0	1	2	1	1
9GE5	10	12/27	1	30	0	3			1
9GE5	11	12/2	1	32	0	3,6			1
9GE5	12	12/35	1	19	0	1,5	2	1	1
9GE5	13	0/333	8B/C	30	0	1	4		3
9GE5	14	0/333	8B/C	32	3	1	3		2
9GE5	15	0/66	1	16	0	0/5			
9GE5	16	0/7	8B/C	30	2	3		1,2	1
9GE5	17	11/6	8B/C	38	3	3		1,2	2
9GE5	18	11/4	8B/C	40	0	1	3	1	2
9GE5	19	11/4	1	30	0	2	3	1	2
9GE5	20	0/186	2C	16	5	0,5		1	
9GE5	21	11/7	1	30	0	1	3	1	2
9GE5	22	11/4	8D	30	3	0		1	2
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9GE5	24	11/4,6	8B	30	3	1	3	1	2
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9GE5	26	11/4,9	2B	30	0	1	3	1	2
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9GE5	32	11/4	1	28	0	1	3	1	2
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9GE5	36	18/21F	8B/C	34	1	0		1,2	1
9GE5	37	18/22F	1	12	0	0			
9GE5	38	18/5	8B/C	40	1	0		2	1
9GE5	39	18/22J	8B/C	36	1	0		1,2	1
9GE5	40	18/18D	8B/C	22	1	0			1
9GE5	41	25/13,F51	8A	30	1	1,6	1	1	1
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9GE5	44	15/25	8B/C	16	0	0			
9GE5	R1	25/1	11	38	0	1	4		3
9GE5	R2	25/1	1	30	0	1	3		2
9GE5	R3	25/1	1	36	0	1	3		2
9GE5	R4	25/1	2D	24	0	0,5			
9GE5	R5	25/1	4	30	3	0			2
9GE5	R6	25/6	1	20	0	1	3		2
9GE5	R7	25/10	1	40	0	1	3		2
9GE5	R8	25/13	8A	28	1	1	1		1
9GE5	R9	24/1	7	24	3	0			2
9GE5	R10	24/1	8D	18	3	0			2
9GE5	R11	24/1	1	34	0	1	3		2
9GE5	R12	24/1	1	28	0	1	3		2
9GE5	R13	24/3	10	30	0	1	3		2
9GE5	R14	24/3	8A	34	3	3			2
9GE5	R15	24/5	7	32	3	0			2

SITE #	V.#	PROV/LOT#	SHAPE	DIAM	RIM	SURF	INC	ALT	RD
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9GE5	R20	13/2	1	30	0	1,7	3		2
9GE5	R21	13/2	1	30	0	1	3		2
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9GE5	R24	13/2	1	40	0	1	3		2
9GE5	R25	13/2	1	34	0	1	4		3
9GE5	R26	13/2	1	34	0	1	4		3
9GE5	R27	13/2	7	30	3	0			2
9GE5	R28	13/2	7	30	3	0			2
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9GE5	R30	13/2	7	36	3	0			2
9GE5	R31	19/15	7	28	0	0			
9GE5	R32	19/15	2A	28	7	0,5			
9GE5	R33	19/19	8C	30	4	0			1
9GE5	R34	19/21	2D	20	0	0,5			
9GE5	R35	19/1	2D	18	0	0			
9GE5	R36	19/1	8B	24	0	0			
9GE5	R37	19/26	2A	22	0	0			
9GE5	R38	19/18	4	46	3	0			2
9GE5	R39	19/9	8B	30	0	4			
9GE5	R40	19/13	8A	22	5	0			
9GE5	R41	19/19	8A	18	0	1	1		1
9GE5	R42	19/20	1	24	0	0,6			1
9GE5	R43	19/16	8B	20	0	4			
9GE5	R44	19/23	7	34	4	0			1
9GE5	R45	19/40	1	16	0	0,5			
9GE5	R46	19/46	7	28	1	3			1
9GE5	R47	19/46	7	46	3	0			2
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9GE5	R54	19/28	8A	26	1	1	1		1
9GE5	R55	19/55	4	50	1	0			1
9GE5	R56	19/55	1	32	0	0			
9GE5	R57	19/54	7	28	0	0			
9GE5	R59	19/53	2D	20	0	0,5			
9GE5	R60	19/58	4	28	4	0			1
9GE5	R61	19/58	7	18	4	0			1
9GE5	R62	19/58	8A	22	5	0			
9GE5	R63	19/58	2D	14	0	0			
9GE5	R64	19/57	2B	16	0	0			
9GE5	R65	19/65	2A	26	6	0			
9GE5	R66	19/65	8D	24	0	4			
9GE5	R67	19/65	8B	14	0	4			
9GE5	R68	19/78	8C	32	0	0			
9GE5	R69	19/59	8B	18	0	4			
9GE5	R70	19/59	2A	26	0	0,5			
9GE5	R71	19/79	8C	20	0	0,5			
9GE5	R72	12/2	8A	28	2	0,5			1
9GE5	R73	12/1	2A	26	0	0,5			
9GE5	R74	12/12	2D	24	0	0,5		1	
9GE5	R75	12/20	2B	10	11	0,6			1

SITE #	V.#	PROV/LOT#	SHAPE	DIAM	RIM	SURF	INC	ALT	RD
9GE5	R76	12/78	1	40	0	1	3		2
9GE5	R77	12/76	1	32	0	1	2		1
9GE5	R78	12/62	8A	22	2	0			1
9GE5	R79	12/58	1	32	0	1	3		2
9GE5	R80	12/44	2C	34	0	0			
9GE5	R81	12/44	6B	12	0	0			
9GE5	R82	12/44	7	26	1	3			1
9GE5	R83	12/56	7	30	1	3			1
9GE5	R84	12/47	1	18	2	0			
9GE5	R85	12/22	2D	14	0	0,5			
9GE5	R86	12/22	8A	18	0	0			
9GE5	R87	12/22	8A	20	4	0			1
9GE5	R88	12/38	1	18	0	1	3		2
9GE5	R89	12/49	1	36	0	1,5	2		1
9GE5	R90	12/49	-	18	4	0			1
9GE5	R91	12/51	1	18	0	1	5		
9GE5	R92	13/4	8C	18	3	0,5			2
9GE5	R93	13/4	1	34	0	1	3		2
9GE5	R94	13/4	1	36	0	1	3		2
9GE5	R95	13/4	1	26	0	1	3		2
9GE5	R96	13/4	1	28	0	1	3		2
9GE5	R97	13/4	8B	26	3	0,5			2
9GE5	R98	13/4	7	30	3	0			2
9GE5	R99	13/4	7	44	3	0			2
9GE5	R100	13/6	7	28	3	3			2
9GE5	R101	13/6	7	36	3	0			2
9GE5	R102	13/6	7	24	4	0			1
9GE5	R103	13/6	8C	20	0	0			
9GE5	R104	13/8	8A	22	0	0			
9GE5	R105	13/8	2D	18	0	0			
9GE5	R106	13/8	1	32	0	1	4		3
9GE5	R107	13/8	7	30	3	0			2
9GE5	R108	13/8	7	34	4	0			1
9GE5	R109	0	2A	48	0	1	3		2
9GE5	R110	0	7	44	3	3			2
9GE5	R111	0	1	22	0	0,5			
9GE5	R112	18/24A	2A	10	0	0			
9GE5	R113	18/24A	8A	20	1	0,5			1
9GE5	R114	18/24A	7	16	5	0			
9GE5	R115	18/24A	2B	10	5	0			
9GE5	R116	18/24A	2B	22	0	0,6			
9GE5	R117	18/14A,2	3	24	0	0			
9GE5	R118	18/31	8A	26	11	0			1
9GE5	R119	11/23	8C	30	0	0		1	
9GE5	R120	11/23	2A	24	0	0,6			1
9GE5	R121	11/25	7	18	0	0			
9GE5	R122	11/25	6B	28	0	0			
9GE5	R123	11/21	7	28	0	0			
9GE5	R124	11/21	7	14	0	0			
9GE5	R125	11/21	8B	46	1	0			1
9GE5	R126	11/10	1	28	0	1	3		2
9GE5	R127	11/10	7	12	8	0			
9GE5	R128	11/10	7	22	3	0			2
9GE5	R129	11/10	8D	30	3	0			2
9GE5	R130	11/10	2A	14	0	0,5			
9GE5	R131	11/10	7	30	3	0			2
9GE5	R132	11/21	8A	36	1	0			1
9GE5	R133	11/21	8A	26	1	1	1		1
9GE5	R134	11/21	2A	10	0	0,5,6			1

SITE #	V.#	PROV/LOT#	SHAPE	DIAM	RIM	SURF	INC	ALT	RD
9GE5	R135	11/20	2B	12	0	0,6			
9GE5	R136	11/20	8A	24	1	1	1		1
9GE5	R137	11/20	7	26	0	3,6			1
9GE5	R138	11/20	8A	34	1	1	1		1
9GE5	R139	11/20	2A	20	0	0			
9GE5	R140	11/20	7	20	4	0			?
9GE5	R141	11/4	2B	38	0	1	3		2
9GE5	R142	11/4	2B	34	0	1	3		2
9GE5	R143	11/4,6	1	26	0	1	3		2
9GE5	R144	11/4	1	30	0	1	3		2
9GE5	R145	11/6	1	26	0	1	3		2
9GE5	R146	11/7	1	32	0	1	3		2
9GE5	R147	11/4	8B	36	3	0			2
9GE5	R148	11/4,9	2B	32	0	1	3		2
9GE5	R149	11/9	1	24	0	1	3		2
9GE5	R150	11/9	1	34	0	1,7	3		2
9GE5	R151	11/9	8	40	3	3			2
9GE5	R152	11/9	-	16	3	0			2
9GE5	R153	15/2	8	20	3	3			2
9GE5	R154	15/11	7	30	4	0			1
9GE5	R155	15/11	7	22	4	0			1
9GE5	R156	15/11	7	22	4	0			1
9GE5	R157	15/11	2C	14	0	0			
9GE5	R158	15/11	1	14	0	0,5			
9GE5	R159	15/7	1	28	0	1	3		2
9GE5	R160	15/7	1	38	0	1	3		2
9GE5	R161	15/7	7	26	4	0			1
9GE5	R162	15/7	1	32	0	1	3		2
9GE5	R163	15/7	7	37	3	3			2
9GE5	R164	15/9	1	22	0	1	3		2
9GE5	R165	15/9	10	10	0	0			
9GE5	R166	15/13	7	14	1	0			1
9GE5	167	15/13	7	20	0	0			
9GE5	R168	15/13	7	20	4	0			1
9GE5	R169	15/13	2B	30	0	4			
9GE5	R170	15/13	7	32	1	0			1
9GE5	R171	15/15	2B	18	9	0,5			
9GE5	R172	15/15	8A	24	0	0			
9GE5	R173	15/19	1	30	0	1	3		2
9GE5	R174	15/19	1	30	0	1	3		2
9GE5	R175	15/24	2C	24	0	0,5			
9GE5	R176	15/24	2B	30	0	0			
9GE5	R177	15/27	4	20	11	0			
9GE5	R178	15/25	8C	16	0	0,5			
9GE5	R179	15/34	2A	28	10	0,5			
9GE5	R180	22/8	7	34	0	0			
9GE5	R181	22/8	7	22	0	0			
9GE5	R182	21/1	7	30	4	3			1
9GE5	R183	21/1	7	32	1	3			1
9GE5	R184	20/6	1	28	0	0,5			
9GE5	R186	20/5	7	18	1	0			1
9GE5	R187	23/1	8A	12	0	0			
9GE5	188	23/1	1	24	0	3,5			1
9GE5	R189	23/1	8C	12	0	0			
9GE5	R190	23/4	2D	16	0	0,5			
9GE5	R191	0/67	8A	22	4	0,5			1
9GE5	R192	0/67	8C	26	0	0			
9GE5	R193	0/67	1	20	0	1	3		2
9GE5	R194	0/67	1	26	0	1	3		2

SITE #	V.#	PROV/LOT#	SHAPE	DIAM	RIM	SURF	INC	ALT	RD
9GE5	R195	0/67	1	28	0	1	3		2
9GE5	R196	0/59	1	18	0	1	2		1
9GE5	R197	0/61	8	30	0	8			
9GE5	R198	0/62	2C	20	0	4			
9GE5	R199	0/65	7	26	0	4			
9GE5	R200	0/66	1	22	0	0,5			
9GE5	R201	0/66	1	16	0	0,5			
9GE5	R202	0/66	10	10	5	0			
9GE5	R203	0/64	8A	18	0	0			
9GE5	R204	0/23	8B	32	2	3			1
9GE5	R205	0/23	4	24	2	0			
9GE5	R206	0/45	1	26	0	1	4		3
9GE5	R207	0/45	8B	32	3	1	3		2
9GE5	R208	0/45	7	32	3	0			2
9GE5	R209	0/45	7	32	3	0			2
9GE5	R210	0/45	1	28	0	1	3		2
9GE5	R211	0/45	1	22	0	1	3		2
9GE5	R212	0/45	1	32	0	1	3		2
9GE5	R213	0/25	7	36	3	3			2
9GE5	R214	0/20	7	36	0	1	3		2
9GE5	R215	0/20	8B	38	3	3			2
9GE5	R216	0/7	1	38	0	1,5	2		1
9GE5	R217	0/6	8A	24	0	0			
9GE5	R218	0/403	7	34	3	0			2
9GE5	R219	0/405	1	26	0	1	3		2
9GE5	R220	0/404	7	30	3	0			
9GE5	R221	0/404	7	30	3	0			
9GE5	R222	0/403	8A	34	3	0			2
9GE5	R223	0/403	7	30	3	0			2
9GE5	R224	0/403	1	30	0	1	3		2
9GE5	R225	0/403	1	30	0	1	3		2
9GE5	R226	0/403	1	34	0	1	3		2
9GE5	R227	0/335	2A	32	0	0			
9GE5	R228	0/334	8	22	2	0,5			1
9GE5	R229	0/317	8	26	3	0			2
9GE5	R230	0/317	8B	14	3	0			2
9GE5	R231	0/339	1	18	0	1,5	5		
9GE5	R232	0/339	7	18	0	0			
9GE5	R233	0/339	1	22	10	3			
9GE5	R234	0/333	2B	22	0	0,5			
9GE5	R235	0/333	8B	18	0	0,5			
9GE5	R236	0/333	8A	18	1	1	1		1
9GE5	R237	0/333	1	36	0	1	3		2
9GE5	R238	0/333	1	28	0	1	3		2
9GE5	R239	0/333	2D	14	0	0,5,6			
9GE5	R240	0/333	8B	22	0	0			
9GE5	R241	0/333	7	40	3	0			2
9GE5	R242	0/333	7	14	3	0			2
9GE5	243	0/333	7	24	1	0			1
9GE5	R244	0/333	8C	20	4	0			1
9GE5	245	0/333	1	34	0	1	2		1
9GE5	R246	0/333	8	14	0	0,5			
9GE5	R247	0/333	8C	28	3	3			2
9GE5	R248	0/333	1	30	0	1	3		2
9GE5	R249	0/333	1	12	0	0			
9GE5	R250	0/333	7	24	3	0			2
9GE5	R251	0/329	2A	26	0	0,5			
9GE5	R252	0/329	2C	28	0	0,5			
9GE5	R253	0/331	7	32	0	4			

SITE #	V.#	PROV/LOT#	SHAPE	DIAM	RIM	SURF	INC	ALT	RD
9GE5	R254	0/320	8A	18	1	1	1		1
9GE5	R255	0/320	1	30	0	0,5			
9GE5	R256	0/320	2B	14	0	0,5			
9GE5	R257	0/327	8	16	2	3			1
9GE5	R258	0/328	2D	24	0	3			
9GE5	R259	0/328	8D	14	0	0			
9GE5	R260	0/323	7	40	3	0			2
9GE5	R261	0/322	2D	12	0	0			
9GE5	R262	0/320	8	14	3	0			2
9GE5	R263	0/320	7	18	1	0			1
9GE5	R264	0/320	8C	16	1	0,5			1
9GE5	R265	0/320	11	36	0	1	5		2
9GE5	R266	0/320	11	16	0	1	5		2
9GE5	R267	0/320	2B	34	0	0,5			
9GE5	R268	0/320	9	26	0	0			
9GE5	R269	0/320	8	32	1	0			1
9GE5	R270	0/319	7	40	3	3			2
9GE5	R271	0/318	1	32	0	1	3		2
9GE5	R272	0/236	12	30	0	1	3		2
9GE5	R273	0/247	1	28	0	1	3		2
9GE5	R274	0/335	3	40	1	3			1
9GE153	1	2/208	2C	22	0	3			
9GE153	2	2/6	2C	28	0	3			
9GE153	3	2/51	2C	34	0	0			
9GE153	4	2/294	2C	20	0	0			
9GE153	5	2/301	7	29	4	0			1
9GE153	6	2/5	2D	16	0	0			
9GE153	7	2/5	1	15	0	0			
9GE153	8	2/301	3	26	0	0			
9GE153	9	2/8	2A	24	0	0			
9GE153	10	2/34,39	6B	17	6	0	5		
9GE153	11	2/301	2A	10	0	0			
9GE153	12	2/208	2C	22	0	0,6			
9GE153	13	2/9	1	30	0	0,6			1
9GE153	14	2/33	2A	18	0	0			
9GE153	15	1/2	1	36	0	0,6			1
9GE153	16	1/2	3	21	0	0			
9GE153	17	2/10	1	14	0	0			
9GE153	18	2/10	2A	20	0	0			
9GE153	19	2/34	2C	25	0	0			
9GE153	20	2/8	1	35	0	0			
9GE153	21	2/39	4	25	0	0			
9GE153	22	2/28	1	24	0	0			
9GE153	23	2/10	2C	28	0	0			
9GE153	24	2/51	4	30	0	0			
9GE153	25	2/7,8	2A	16	0	0,6			1
9GE153	26	2/33,45	1	24	0	0,6			1
9GE153	27	2/10	2A	36	0	0			
9GE153	28	2/10	4	28	0	0			
9GE153	29	2/7	2C	24	0	0			
9GE153	30	2/72	2B	16	4	0			1
9GE153	31	2/35,37	2D	36	0	3			
9GE153	32	2/6,10	9	32	1	0			1
9GE153	33	2/10	2A	17	0	0			
9GE153	34	2/294	2D	14	0	0			
9GE153	35	2/208	1	18	0	0,6			1
9GE153	36	2/208	1	20	0	0,5			

SITE #	V.#	PROV/LOT#	SHAPE	DIAM	RIM	SURF	INC	ALT	RD
9GE153	37	2/10	1	28	0	0,6			1
9GE153	38	2/7	1	18	0	1,6	2		1
9GE153	39	2/326	8B/C	17	3	0			1
9GE153	40	2/8	8B/C	22	2	0			1
9GE153	41	2/8	8A	19	1	0			1
9GE153	42	2/210	8A	20	1	0,5			1
9GE153	43	2/208	8A	20	1	0,5			1
9GE153	44	2/20	8B/C	28	1	0			1
9GE153	45	2/7	8B/C	12	1	3			1
9GE153	46	2/210	8B/C	20	1	3			1
9GE153	47	2/8	8	25	1	0			1
9GE153	48	2/34	8	15	2	0,5			1
9GE153	49	2/3,8	8	24	2	1	5		1
9GE153	50	2/210	8A	22	2	0			1
9GE153	51	2/51	1	38	0	1	2		1
9GE153	52	2/208	1	26	0	1,6	2		1
9GE153	53	2/10	1	36	0	1,6	2		1
9GE153	54	2/208	1	12	0	1,6	2		1
9GE153	55	2/9	1	26	0	1,6	2		1
9GE153	56	2/238	1	22	0	1	2		1
9GE153	57	2/3,4	1	23	0	0,5			
9GE153	58	2/279	1	19	0	0,5			
9GE153	59	2/31	1	16	0	0,5			
9GE153	60	2/39	1	22	0	0,5,6			1
9GE153	61	1/2	2D	26	0	3			
9GE153	62	2/236	1	20	0	0			
9GE153	63	1/4	3	23	0	3			
9GE153	64	2/208	2B	20	0	3			
9GE153	65	2/5	2D	24	0	3			
9GE153	66	1/4	6A	30	0	3			
9GE153	67	1/4	4	23	0	3			
9GE153	68	2/5	3	22	0	3			
9GE153	69	2/72,77	2C	32	0	3			
9GE153	70	2/5	2C	20	0	3			
9GE153	71	2/301	2C	26	0	0,5			
9GE153	72	2/305	1	16	0	0,5			
9GE153	73	2/208	2D	32	0	0,5			
9GE153	74	2/51	2C	20	0	0			
9GE153	75	1/2	2A	32	0	0			
9GE153	76	2/240	6A	18	6	0	5		
9GE153	77	2/26	8D	16	2	0	5		
9GE153	78	2/208	8D	16	0	0	5		
9GE153	79	2/294	4	36	1	3			1
9GE153	80	2/326	2C	24	0	0,5			
9GE153	81	2/301	9	24	0	-			
9GE153	82	2/12	2B	36	0	0			
9GE153	83	2/3	4	20	0	9			
9GE153	84	2/12	2C	18	4	9			1
9GE153	85	2/10	7	30	2	3			1
9GE153	86	2/33	7	22	2	3			1
9GE153	87	2/298	12	16	7	0,5			
9GE153	88	2/5	11	22	0	3,5,6			
9GE153	89	2/8	11	14	0	3,5,6			
9GE153	90	1/2	11	17	0	0,5,6			
9GE153	91	2/293	11	20	0	3,5,6			
9GE153	92	2/52	11	27	0	0,6			
9GE153	93	2/30,43,26	8A	13	1	1	1		1
9GE153	94	2/279	8A	16	1	1	1		1
9GE153	95	2/279	8A	16	1	1	1		1

SITE #	V.#	PROV/LOT#	SHAPE	DIAM	RIM	SURF	INC	ALT	RD
9GE153	96	-	8A	18	1	1	1		1
9GE153	97	2/26	5	36	0	4			
9GE153	98	2/293	9	30	0	0			
9GE153	99	2/305,312	8	14	0	0			
9GE153	100	2/305,40	8D	15	0	0			
9GE153	101	1/2	6A	24	0	0			
9GE153	102	2/52	8B/C	28	0	3			
9GE153	103	2/5	8	23	0	0			
9GE153	104	2/31	8A	14	0	0			
9GE153	105	2/33	6A	18	0	0			
9GE153	106	2/210	6A	18	0	9			
9GE153	107	2/210	3	27	0	11			
9GE153	108	2/302	2C	36	0	11			
9GE153	109	2/355	8	24	0	0			
9GE153	110	2/8	7	28	12	0			1
9GE153	111	2/240	2A	14	0	1	2		1
9GE153	112	2/43	10	16	0	1	2		1
9GE153	113	2/42	11	22	0	0			
9GE153	114	2/34	8	16	1	0			1
9GE153	115	2/30	8	22	12	0			1
9GE153	116	2/10,2	2A	24	0	12			
9GE153	117	2/210,293	8	26	1	0			1
9GE153	118	2/4	8	24	0	8			1
9GE153	119	2/7-10	1	26	0	1	2		1
9GE153	R1	2/36,37	8B	24	0	0			
9GE153	R2	2/24	2B	34	0	0			
9GE153	R3	2/24	2B	24	0	0			
9GE153	R4	2/40	6B	16	0	0			
9GE153	R5	2/27	1	26	0	0,5,6			1
9GE153	R6	2/27	1	26	0	0,5,6			1
9GE153	R7	2/27	2B	26	0	0			
9GE153	R8	2/39	2C	26	0	0			
9GE153	R9	2/277	2C	18	0	0			
9GE153	R10	2/301	2C	26	0	0			
9GE153	R11	2/276	2C	26	0	0			
9GE153	R12	2/208,210	2B	20	0	0			
9GE153	R13	2/210	10	30	0	3			
9GE153	R14	2/208	2C	26	0	0			
9GE153	R15	2/208	3	28	0	0			
9GE153	R16	2/208	2C	24	0	0			
9GE153	R17	2/208	3	20	0	0			
9GE153	R18	2/208	2D	22	0	0			
9GE153	R19	2/208	3	30	0	0			
9GE153	R20	2/208	2B	22	0	0			
9GE153	R21	2/208	2A	16	0	0			
9GE153	R22	2/208	2B	18	0	0			
9GE153	R23	2/208	10	26	0	0			
9GE153	R24	2/208	2C	28	0	0			
9GE153	R25	2/208	2C	18	0	0			
9GE153	R26	2/208	7	24	4	0			1
9GE153	R27	2/71	4	26	0	0			
9GE153	R28	2/71	2C	26	0	0			
9GE153	R29	2/77	8B	16	0	4			
9GE153	R30	2/73	12	18	0	0			
9GE153	R31	2/73	2C	16	0	0			
9GE153	R32	2/10	2B	30	0	0			
9GE153	R33	2/10	3	26	0	0			
9GE153	R34	2/10	2B	20	0	0			
9GE153	R35	2/10	1	16	0	0,5,6			1

SITE #	V.#	PROV/LOT#	SHAPE	DIAM	RIM	SURF	INC	ALT	RD
9GE153	R36	2/10	3	26	0	0			
9GE153	R37	2/10	2A	22	0	0			
9GE153	R38	2/10	2A	12	0	0			
9GE153	R39	2/10	7	22	0	0,5			
9GE153	R40	2/10	2A	22	0	0			
9GE153	R41	2/11	2	18	0	0			
9GE153	R42	2/12	12	14	0	0			
9GE153	R43	2/32	2B	26	0	0			
9GE153	R44	2/32	12	16	0	0			
9GE153	R45	2/32	2C	22	0	0			
9GE153	R46	2/30	2D	20	0	0,5			
9GE153	R47	2/30	1	14	0	0			
9GE153	R48	2/30	4	16	0	0			
9GE153	R49	2/34	2B	36	0	0			
9GE153	R50	2/34	3	30	0	0			
9GE153	R51	2/34	2C	24	0	0			
9GE153	R52	2/34	1	26	0	1	2		1
9GE153	R53	2/34	2B	28	0	0			
9GE153	R54	2/34	2B	24	0	0			
9GE153	R55	2/34	2D	20	0	0			
9GE153	R56	2/34	2B	36	0	0			
9GE153	R57	2/34	7	36	0	0			
9GE153	R58	2/34	1	18	0	1	2		1
9GE153	R59	2/34	2B	18	0	0			
9GE153	R60	2/26	2C	36	0	0			
9GE153	R61	2/26	2A	18	0	1	2		1
9GE153	R62	2/1	1	18	0	1	2		1
9GE153	R63	2/1	2B	22	0	0			
9GE153	R64	2/1	2B	18	0	0			
9GE153	R65	2/4	1	14	0	0			
9GE153	R66	2/4	12	16	0	0			
9GE153	R67	2/5	2B	16	0	0			
9GE153	R68	2/5	2A	18	0	0			
9GE153	R69	2/5	2B	26	0	0			
9GE153	R70	2/5	1	36	0	1	5		
9GE153	R71	2/6	2C	22	0	0			
9GE153	R72	2/6	2C	26	0	0			
9GE153	R73	2/6	2D	18	0	0			
9GE153	R74	2/6	2C	20	0	0			
9GE153	R75	2/7	2A	24	0	0			
9GE153	R76	2/7	3	22	0	0			
9GE153	R77	2/7	6B	18	0	0			
9GE153	R78	2/7	2B	28	0	0			
9GE153	R79	2/7	2B	28	0	0			
9GE153	R80	2/7	2C	24	0	0			
9GE153	R81	2/8	2B	22	0	0			
9GE153	R82	2/8	1	18	0	0,6			1
9GE153	R83	2/8	2C	20	0	0			
9GE153	R84	2/8	2B	20	0	0			
9GE153	R85	2/8	2C	22	0	0			
9GE153	R86	2/9	2A	24	0	0			
9GE153	R87	2/9	2C	26	0	0			
9GE153	R88	2/9	2A	26	0	0			
9GE153	R89	2/9	2B	20	0	0			
9GE153	R90	2/9	2B	28	0	0			
9GE153	R91	2/9	2A	34	0	0			
9GE153	R92	2/9	4	24	0	3			
9GE153	R93	2/9	2C	34	0	0			
9GE153	R94	2/9	2D	22	0	0			

SITE #	V.#	PROV/LOT#	SHAPE	DIAM	RIM	SURF	INC	ALT	RD
9GE153	R95	2/9	7	30	0	0			
9GE153	R96	2/5	1	18	0	1	5		
9GE153	R97	2/293	3	22	0	3			
9GE153	R98	2/4	7	20	1	0			1
9GE153	R99	2/240	7	30	1	0			1
9GE153	R100	2/1	8A	26	1	1	1		1
9GE153	R101	2/356	2D	12	0	13			
9GE153	R102	2/208	2D	18	0	0			
9GE153	R103	2/298	2B	24	0	0			
9GE153	R104	2/12	1	12	0	0,5			
9GE153	R105	2/27	3	28	4	0			1
9GE153	R106	2/8	4	24	4	0			1
9GE153	R107	2/72	3	28	4	0			1
9GE153	R108	2/34	7	18	4	0			1
9GE153	R109	1/4	7	24	4	0			1
9GE153	R110	1/4	8C	16	0	0			
9GE153	R111	1/4	2C	34	0	0			
9GE153	R112	1/4	2A	24	0	0			
9GE153	R113	1/4	3	26	0	0			
9GE153	R114	1/4	2A	18	0	0			
9GE153	R115	1/4	3	18	0	0			
9GE153	R116	1/4	2B	24	0	0			
9GE153	R117	1/4	1	30	0	0,5			
9GE153	R118	1/4	2B	22	0	12			
9GE153	R119	1/4	8D	26	1	0			1
9GE153	R120	1/4	8D	18	1	3			1
9GE153	R121	2/73	7	20	0	0			
9GE153	R122	2/73	2C	24	0	0			
9GE153	R123	2/239	2D	22	0	0			
9GE153	R124	2/239	7	22	0	0			
9GE153	R125	2/241	3	32	0	0			
9GE153	R126	2/241	8C	28	0	0			
9GE153	R127	2/279	3	36	0	0			
9GE153	R128	2/279	12	18	7	0,5			
9GE153	R129	2/52	8B	18	0	3			
9GE153	R130	2/51	1	22	0	1	2		1
9GE153	R131	2/51	2A	28	0	0			
9GE153	R132	2/51	2B	22	0	0			
9GE153	R133	2/293	2C	22	0	0			
9GE153	R134	2/8	2B	24	4	0			1
9GE153	R135	2/34	-	16	4	0			1
9GE153	R136	2/307	8A	16	1	1	1		1
9GE153	R137	2/279	8A	14	1	1	1		1
9GE153	R138	2/51	8A	22	1	1	1		1
9GE153	R139	2/279	8A	18	1	1	1		1
9GE153	R140	1/4	1	30	0	1	2		1
9GE153	R141	1/4	1	10	0	1	2		1
9GE153	R142	1/4	1	22	0	1	2		1
9GE153	R143	2/28	1	30	0	1	2		1
9GE153	R144	2/27	1	24	0	1,6	2		1
9GE153	R145	2/294	1	24	0	1	2		1
9GE153	R146	2/208	1	26	0	1	2		1
9GE153	R147	2/301	1	28	0	1	2		1
9GE153	148	2/293	1	26	0	1	2		1
9GE153	R149	2/30	1	28	0	1	2		1
9GE153	R150	2/33	1	18	0	1,6	2		1
9PM211	1	2/	6	20	0	0			
9PM211	2	2/	1	10	0	1	3?		2?
9PM211	3	2/	8B/C	27	3	1	3		2

SITE #	V.#	PROV/LOT#	SHAPE	DIAM	RIM	SURF	INC	ALT	RD
9PM211	4	2/	1	24	12	1	4		3
9PM211	5	2/	11	15	0	6			
9PM211	6	2/	1A	14	0	1	5		
9PM211	7	2/	8B/C	22	11	1,3,6	1		
9PM211	8	2/	1	28	0	1	5	1,4	
9PM211	9	2/	1	24	0	1	3		2
9PM211	10	2/	1	28	0	1	3	3	2
9PM211	11	2/	8A	18	3	1	3	1	2
9PM211	12	2/	1	34	0	1	3		2
9PM211	13	2/	2A	24	3	0			2
9PM211	14	2/	2C	30	3	0			2
9PM211	15	2/	8D	15	3	0			2
9PM211	16	2/	3	36	8	0			
9PM211	18	2/	1	34	0	0		1	
9PM211	19	2/	4	34	11	3			
9PM211	20	2/	1	22	0	1,3	5	1,3	
9PM211	22	2/	4	21	3	0			2
9PM211	24	2/	8B/C	18	3	0			2
9PM211	25	2/	1	26	11	0			
9PM211	26	2/	1	30	0	1	3	1	2
9PM211	27	2/	1	29	0	1,3	3	1	2
9PM211	28	2/	1A	20	0	0		1,5	
9PM211	29	2/	3	20	0	12			
9PM211	30	2/	2C	28	0	0		3	
9PM211	31	2/	5	30	8	0			
9PM211	33	2/	8D	30	1	3?			1
9PM211	35	2/	1	18	0	3		3	
9PM211	36	2/	1	17	0	1	5	1	
9PM211	37	2/	1	20	0	1,3	3		2
9PM211	39	2/	1	22	0	1	5		
9PM211	40	2/	1	20	0	1	2		1
9PM211	41	2/	2C	23	0	0		1	
9PM211	42	2/	1A	20	0	1,3	2	3	1
9PM211	43	2/	3	22	0	0		3	
9PM211	44	2/	3	28	0	0			
9PM211	45	2/	3	26	0	0			
9PM211	46	2/	2C	28	0	0			
9PM211	47	2/	3	21	0	0		3	
9PM211	48	2/	4	31	0	0			
9PM211	49	2/	4	21	0	0		3	
9PM211	50	2/	4	27	0	0		3	
9PM211	51	2/	3	26	0	0			
9PM211	52	2/	4	30	0	0			
9PM211	53	2/	4	26	0	0		3	
9PM211	54	2/	5	22	6	0	5		
9PM211	55	2/	4	28	0	3		3	
9PM211	56	2/	2C	31	0	3		2	
9PM211	57	2/	4	20	5	3			
9PM211	58	2/	2C	31	0	0			
9PM211	59	2/	2C	30	0	0			
9PM211	60	2/	2C	23	0	0			
9PM211	61	2/	2A	20	0	0			
9PM211	62	2/	2C	24	0	0			
9PM211	63	2/	2C	30	0	3			
9PM211	64	2/	1	30	0	0			
9PM211	65	2/	2C	20	0	3			
9PM211	66	2/	1	34	0	1	5		
9PM211	67	2/	2A	20	0	0			
9PM211	68	2/	8D	22	0	0			

SITE #	V.#	PROV/LOT#	SHAPE	DIAM	RIM	SURF	INC	ALT	RD
9PM211	69	2/	1	18	0	0			
9PM211	70	2/	2C	28	0	0			
9PM211	71	2/	1	34	0	1	5	1	
9PM211	72	2/	1	29	0	1	5		
9PM211	73	2/	1	27	0	1	3		2
9PM211	74	2/	2C	28	0	3		3	
9PM211	75	2/	1	32	0	1	2		1
9PM211	R1	2/	3	24	0	0			
9PM211	R2	2/	3	20	0	0			
9PM211	R3	2/	3	34	0	0			
9PM211	R4	2/	3	30	0	0			
9PM211	R5	2/	3	30	0	0			
9PM211	R6	2/	3	28	0	0			
9PM211	R7	2/	2B	24	0	0			
9PM211	R8	2/	2D	26	0	0			
9PM211	R9	2/	2C	24	0	0			
9PM211	R10	2/	2D	26	0	0			
9PM211	R11	2/	4	20	0	0			
9PM211	R12	2/	4	24	0	0			
9PM211	R13	2/	2D	24	0	0			
9PM211	R14	2/	3	22	0	0			
9PM211	R15	2/	2B	22	0	0			
9PM211	R16	2/	3	32	0	0			
9GE175	1	2/198,63	2B	28	5	0,6			1
9GE175	2								
9GE175	3	2/144	8D	22	2	1	2		1
9GE175	4	2/151	2A	32	0	0			
9GE175	5	2/38,148	3	24	0	0			
9GE175	6	2/145,148	1	24	0	1	2		1
9GE175	7	2/147	1	26	0	1	2		1
9GE175	8	2/113	2A	28	0	0			
9GE175	9	2/20,21	2B	22	0	0			
9GE175	10	2/197	8A	22	1	1	1		1
9GE175	11	2/208	8D	18	0	0			
9GE175	12	2/149	7	24	3	0			2
9GE175	13	2/148	-	-	2	0			
9GE175	14	2/148	-	-	3	0			
9GE175	15	2/145	3	8	0	0			
9GE175	16	2/63	2B	16	0	0			
9GE175	17	2/63	4	26	0	0		1	
9GE175	18	2/208,209	4	24	0	0			
9GE175	19	2/63	2B	22	0	0		1	
9GE175	20	2/63	8A	-	1	1	1		1
9GE175	21	2/20,63	-	-	1				
9GE175	22	2/63	7	26	2	0			1
9GE175	23	2/63	-	-	0	3			
9GE175	24	2/63	7	22	11	0			1
9GE175	25	2/35	8B/C	-	1	3			1
9GE175	26	2/38	1	18	0	1	2		1
9GE175	27	2/38	7	28	1	0			1
9GE175	28	2/38	1	20	0	0,6			1
9GE175	31	2/102	1	34	0	1	4		3
9GE175	32	2/49	1	24	0	1	4		3
9GE175	33	2/21	1	34	0	1	3		2
9GE175	34	2/49	1	38	0	1,3	3		2
9GE175	35	2/20,21	1	28	0	1	3	1	2
9GE175	36	2/214	1	20	0	1	2		1
9GE175	37	2/213	1	22	0	1	2		1
9GE175	38	2/24	1	20	0	1,6	2		1

SITE #	V.#	PROV/LOT#	SHAPE	DIAM	RIM	SURF	INC	ALT	RD
9GE175	39	2/207	1	38	0	1	2		1
9GE175	40	2/25	1	16	0	1	2		1
9GE175	42	2/48	7	-	3	0			
9GE175	43	2/21,18,49	1	34	0	1,3	3		2
9GE175	44	2/208	1	24	2	3			1
9GE175	45	2/25	1	28	3	3			2
9GE175	46	2/214,49	8B/C	12	3	3			1
9GE175	47	2/20	7	28	3	3			2
9GE175	48	2/24	2A	22	1	3			1
9GE175	49	2/20,21,49	8B/C	20	3	1	5		2
9GE175	50	2/20	2B	30	2	0			
9GE175	51	2/207	7	20	1	3			1
9GE175	52	2/20	7	-	3	0			
9GE175	53	2/20	-	-	-	0			
9GE175	54	2/20,21	3	24	0	9			
9GE175	55	2/102	7	-	10	0			
9GE175	56	2/25	-	16	10	0			
9GE175	57	2/222,20	2A	16	0	1,10	5		
9GE175	59	2/99	2B	18	3	3			2
9GE175	60	2/96	7	-	1	3			1
9GE175	61	2/20	7	20	2	0			1
9GE175	62	2/207	1	30	0	3,6			1
9GE175	63	2/20	4	26	0	0			
9GE175	64	2/51	2C	34	0	0			
9GE175	65	2/21	4	32	0	3			
9GE175	66	2/20	2C	26	0	3			
9GE175	67	2/29	3	24	0	0			
9GE175	68	2/159	7	16	0	0			
9GE175	69	2/207	3	22	0	0			
9GE175	70	2/213	1	20	0	0,6		1	1
9GE175	72	2/25	2C	24	0	0			
9GE175	73	2/212	2C	38	3	3			2
9GE175	74	2/212	1	22	0	1,7	3		2
9GE175	75	2/248	1	16	0	0,6			1
9GE175	76	2/212	2B	28	1	0			1
9GE175	77	2/248	8B/C	28	1	0			1
9GE175	78	2/214	8	22	1	0			1
9GE175	79	2/248	1	22	0	0,6			1
9GE175	80	2/212	9	18	0	0,6		1	
9GE175	81	2/248	8A	16	1	1	1		1
9GE175	85	2/226	6B	18	6	0			
9GE175	86	2/226,235	1	-	0	1	3		2
9GE175	89	2/226	1	14	0	0			
9GE175	92	2/222	7	36	3	-			2
9GE175	93	2/225	1	30	0	1	3	1	2
9GE175	94	2/221	1	-	0	1	2	1	1
9GE175	95	2/82,132	1	18	0	1	2	1	1
9GE175	96	2/172	1	-	0	1	4		3
9GE175	97	2/134	1	-	0	1	3		2
9GE175	98	2/119,111	8B/C	26	1	0			1
9GE175	99	2/120	8	18	0	0			
9GE175	100	2/70	7	28	1	3			1
9GE175	101	2/99	4	36	0	0			
9GE175	102	2/74	2D	22	0	0			
9GE175	103	2/148	2C	22	5	0			
9GE175	104	2/78	8	16	2	0			1
9GE175	105	2/262	3A	18	0	3			
9GE175	R1	2/214	3	22	0	0			
9GE175	R2	2/214	4	20	0	0			

SITE #	V.#	PROV/LOT#	SHAPE	DIAM	RIM	SURF	INC	ALT	RD
9GE175	R3	2/214	3	20	0	0			
9GE175	R4	2/212	2A	26	0	0			
9GE175	R5	2/212	2B	30	0	0			
9GE175	R6	2/212	3A	30	0	0			
9GE175	R7	2/208	7	30	0	0			
9GE175	R8	2/208	2C	32	0	0			
9GE175	R9	2/208	2B	26	0	0,5			
9GE175	R10	2/208	3	26	0	0			
9GE175	R11	2/208	3	24	0	0			
9GE175	R12	2/208	2A	26	0	0			
9GE175	R13	2/208	2D	16	0	0			
9GE175	R14	2/208	2A	26	0	0			
9GE175	R15	2/207	7	18	0	0			
9GE175	R16	2/209	4	30	0	0			
9GE175	R17	2/244	3A	28	0	0			
9GE175	R18	2/248	3	24	0	0			
9GE175	R19	2/248	3	24	0	0			
9GE175	R20	2/248	3	26	0	3			
9GE175	R21	2/248	3	28	0	0			
9GE175	R22	2/248	2C	16	0	0			
9GE175	R23	2/248	3	18	0	0			
9GE175	R24	2/225	8B	28	0	0			
9GE175	R25	2/225	3A	26	0	0			
9GE175	R26	2/243,246	3A	30	0	0			
9GE175	R27	2/230	2A	26	0	0			
9GE175	R28	2/38	2B	18	0	0			
9GE175	R29	2/38	3	30	0	0			
9GE175	R30	2/38	3	22	0	0			
9GE175	R31	2/38	10	18	0	0			
9GE175	R32	2/39	2B	20	0	0			
9GE175	R33	2/46	7	20	0	0			
9GE175	R34	2/45	2A	14	0	0			
9GE175	R35	2/262	1	24	0	1	3		2
9GE175	R36	2/266	1	34	0	1,3	3		2
9GE175	R37	2/144,146	2A	28	0	0			
9GE175	R38	2/49	3A	34	0	0			
9GE175	R39	2/21	3A	26	0	0			
9GE175	R40	2/138	1	22	0	1	2		1
9GE175	R41	2/266	1	30	0	1	4		3
9GE175	R42	2/82	10	20	11	0			
9GE175	R43	2/113	2C	28	0	3			
9GE175	R44	2/208	3	20	0	3			
9GE175	R45	2/208	2C	24	0	3			
9GE175	R46	2/73	3	22	0	0			
9GE175	R47	2/73	7	28	4	0			1
9GE175	R48	2/64	2C	22	0	0			
9GE175	R49	2/64	3A	22	0	0			
9GE175	R50	2/82	3	28	0	0			
9GE175	R51	2/49	3	16	0	0			
9GE175	R52	2/49	2A	26	0	0			
9GE175	R53	2/161	2C	20	0	0			
9GE175	R54	2/111	8C	24	0	0			
9GE175	R55	2/111	3	16	0	0			
9GE175	R56	2/142	3	20	0	0			
9GE175	R57	2/142	8B	24	4	3			1
9GE175	R58	2/141	4	22	0	0			
9GE175	R59	2/113	3	20	0	0			
9GE175	R60	2/132	2C	20	0	0			
9GE175	R61	2/132	3	22	0	0			

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BIOGRAPHICAL SKETCH

Gary Shapiro was born on July 20, 1954, in Richmond, Virginia. Shortly thereafter, his family relocated to Miami Beach, Florida, where Gary lived until 1972. After a brief encounter with theological school and a year of classes at the University of Miami, Gary enrolled in the University of Florida at Gainesville. At the University of Florida, classes taught by Drs. Margolis, Milanich, Wing, and Fairbanks helped Gary solidify his interest in anthropology, and particularly in archaeology. In 1976 Gary began graduate study in anthropology at the University of Georgia, where he received the master's degree in 1978. In 1979, he returned to the University of Florida to complete his graduate studies. He is currently a member of the Board of Directors of the LAMAR Institute.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate in scope and quality as a dissertation for the degree of Doctor of Philosophy.

Jerald T. Milanich
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August 1983

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