THE SOCIAL AND CHRONOLOGICAL DIMENSIONS OF VILLAGE OCCUPATION AT A NORTH FLORIDA WEEDEN ISLAND PERIOD SITE

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As chairman of my doctoral committee and principal investigator of the North Florida Archeological Project Jerald T. Milanich has shown me

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TABLE OF CONTENTS

Abstract of Dissertation Presented to the Graduate Council
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Chairman: Jerald T. Milanich
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The McKeithen site is a multi-mound and village complex of the Weeden Island period in North Florida. Three seasons of mapping and sampling excavations in the village area revealed a main occupation dating from about A.D. 150 to A.D. 750 which was divided into three phases for analysis. Chronological control for these divisions was provided by a series of ten radiocarbon dates from the village, a principal components factor score seriation of the proveniences, and an attribute analysis of a sample of rim sherds from three areas within the village.

In addition to a basic north-south division of the village area on the basis of the ratio of ceramics to lithics, three areas in the southern and eastern portions of the village were distinguished from the rest of the site on the basis of correlations among relative frequencies of two categories of non-local ceramics, non-local lithics, and total ceramic type diversity. The correlations between these assumed high-status indicators were highest during the final phase of the village occupation, from about A.D. 550 to A.D. 750, suggesting that during this phase non-local

trade came more directly under the control of an elite group which resided on and adjacent to Mound A, the largest and probably latest mound on the site. A population model was formulated using the estimated weight of ceramics in the midden, the estimated weight of the original vessels which these sherds represented, and ethnographically-derived estimates of ceramic breakage rates and size of ceramic inventory per household unit. This model suggests that if the site was occupied continuously rather than seasonally the ceramics in the midden could be explained by a population of no more than 300 to 400 persons. Given this upper bound for the estimated population of the site indicated by the model and the emerging division of superordinate and subordinate social groups indicated by the distributions of selected ceramic and lithic categories, it is hypothesized that the site was initially occupied by a tribal group (a primarily egalitarian society) with the emergence of a "Big Man" or proto-chiefdom level of organization by the end of the occupation. Whether this increasing centralization of authority was caused by, or resulted in, increased control over external trade remains an important question for research. Finally, given this hypothesized model of social organization and change, several predictions are ventured for the results of a site survey of the support area currently in progress.

Chairman

CHAPTER ONE
THE ARCHEOLOGY OF SOCIAL AND POLITICAL ORGANIZATION IN THE SOUTHEAST

The aboriginal political system which greeted the earliest Spanish and French explorers of sixteenth century "Florida"--as large portions of the Southeast United States were then known--was not so dissimilar from the explorers' Medieval roots that they were unable to interpret it in terms of the European system (Service 1975:81-83). In the area of present Northeastern Florida the first French chronicles treated with "_Roy_" and "_Royne_" the Timucua leaders and their first wives; and with "_leurs sujets_," the other Indians. By ties of kinship or friendship, reported the French, as many as forty of these "kings" served as vassals to another, more powerful lord, for example the "_très redouté Olata Ouae Outina_." Among other privileges it was the prerogative of these _caciques_ and their _mico_ (as the Spanish occasionally differentiated these two levels of political leadership) to retain more than one wife, to assemble and direct council from a seat more elevated than the others, to convoke groups of workers for planting and harvesting, and to conduct hostilities against neighboring groups. The death of one of these leaders began several days and nights of mourning, and all the chief's prized possessions were burned, along with his dwelling. So much were the caciques the official spokesmen for their people that their villages and the surrounding areas took on their names. Differentiated from this "king," but of sufficient distinction to address him in council, were the "*iaruars, c'est à dire leurs prestres et les plus anciens*" (summarized from Laudonnière in Lussagnet 1958).

While some form of status relationships seems to be common to all cultures, hierarchical ranking as noted in these and other reports on the Timucua represent a common pattern of aboriginal sociopolitical organization in the Southeast at the time of contact. Certainly more and less elaborate systems existed, as in the case of the highly centralized Natchez organization (Swanton 1911:100-108) or the relatively homogeneous bands seen by the DeSoto expedition on the western margins of the Southeast. Yet the Timucua form--village leadership centered in one individual, usually male, with the villages integrated into a more or less unsteady alliance under the leadership of a more powerful ruler in a central village--seems to have been the prevalent form of political organization in the Southeast at the time of earliest European contact (Hudson 1976:202-213). This level of political organization has come to be called the chiefdom, which Service (1962:173,144) delimits as follows:

> A chiefdom is largely familistic but not egalitarian; it has no government but does have authority and centralized direction; there is no private property in resources or entreprenurial market commerce, yet there are rank differences but no clear socio-economic or political classes. . . the rise of the chiefdom seems to have been related to a total environmental situation which was selective for specialization in production and redistribution of produce from a controlling center. . . . Chiefdoms are *redistributional societies* with a permanent central agency of coordination.

In defining the chiefdom level of organization R. N. Adams (1975: 228, 231) stresses the primacy of total group size in the evolution of chiefly societies:

> The patron-client relationship appears between the band and the chiefdom levels of integration. It is the principal process whereby individuals begin to concentrate power independent of the allocated power granted to them by their fellows.... The successful patron is he who succeeds in accumulating more so that he may give more away and thereby gain more clients. It is the size of the total client body that is the fundamental basis of power, since the basic source of power for the ranking individual is still allocation.... The building of support from a range of supporters means getting tribute in kind, accumulating this, and then providing periodic redistributional feasts.

The chiefdom as a political phenomenon represents a first step towards the institutionalization of power from the allocated, charismatic control practiced by tribal leaders and "Big Men" leading eventually, in an evolutionary framework, to the dogmatic centralization of the primitive state. Far from implying that the chiefdom was a half-way house between two more stable forms of political control, this balance between allocative and coercive power present in the chiefdom resulted in an eminently-workable adaptation to the levels of technology, population, and environment in the late prehistoric Southeast as demonstrated by its widespread occurrence at the time of contact. On the other hand, the tendency of the chiefdoms to form unstable confederacies (as, for example, that of the seventeenth century Creek) reveals an inclination towards the formation of identity or coordinative groups (in the sense of Adams 1975:209) going beyond the political boundaries of the central chief.

Social Organization and Status

An outstanding characteristic of the chiefdom which sets it apart from the tribe or band is that the power of the leader is inherited by virtue of the leader's membership in a kinship group (Service 1975:142). Of the Timucua Laudonnière (in Lussagnet 1958:44) observed that--

> Ils se marient chacun à sa femme, et est permis aux Roys d'en avoir deux ou trois, toutesfois il n'y a que la première honorée et recogneuë pour Royne, et n'y a aussi que les enfans de ceste première qui heritent du bien et de l'autorité du pere.

Swanton (1946:221-222) cites examples of such ascribed authority among the Chitimacha, Natchez, Creek, Chickasaw, coastal Algonquians and the piedmont eastern Siouans. While the most extreme examples are surely found among the Natchez and other lower Mississippi Valley groups, the Timucua provide a more typical example of a Southeastern chiefdom in action.

The movement from achieved status, which structures social relationships in pre-chiefdom societies, to the presence of both achieved and ascribed status in the chiefly society is potentially observable in archeological context. Status carried both symbolic identifications and material rewards. Some symbols of rank <u>or</u> achievement included tatoos, location of seat in council, and respect due an individual, while the material rewards of the ascribed statuses included possession of exotic clothing items such as the "Marten" or "Sable" robes reported by Elvas and Biedma (in Swanton 1946:440); feather mantles of duck down made by Natchez women for women of the Honored class (Le Page du Pratz in Swanton 1911:63); and the crowns of swan feathers which, according to the same source, could be worn exclusively by the sovereign. In reference to the Yuchi Speck states that fans of wild turkey feathers "were the proper possession of...old men and chiefs who spend much of their time in leisure.... During ceremonies to carry the fan is a sign of leadership" (in Swanton 1946:456). Other sorts of ornamentation, while not the exclusive perquisites of the chief, seemed to increase in quantity and elaboration among high status groups. Included in this category are beads, pearls, copper gorgets, and gold or silver ornaments. It appears that objects which were "expensive" either by dint of being manufactured from a scarce natural resource, a non-local one, or through a great deal of effort, were monopolized by high status individuals. Moreover, symbols of rank which did not fall into these categories and would, theoretically, have been equally available to all were controlled by strong cultural sanctions. Thus Adair (in Hudson 1976:203) says that bearers of unearned tatoos would be forced to remove them, and any taking a seat in council above his rank would be the object of public derision.

Kinship and Residence

In the overwhelming number of ethnohistorically-known groups in the Southeast, membership in the organized descent group was reckoned through the mother's line (Hudson 1976:185). A matrilineage thus consisted of a group of people who could trace their mutual relationship through a common female ancestor. A larger identity group based on the same rule of descent was in operation in the Southeast wherever ecological conditions and level of technology permitted large, stable aggregations of population in a localized area: this was the matrisib, an extension of the matrilineage to include those who believed they were descended from a common ancestress but who could not trace the actual geneological ties (Hudson 1976:191). (Some authors use clan or matriclan in this connection, but since these terms may connote compromise kin groups based on both a rule of residence and a rule of descent--[cf. Murdock 1949:66-67]--the term sib has been adopted here.) Both the lineage and the sib were exogamous groups, but while lineages were localized units within a village, sib membership cut across town affiliations and served as an identity unit for particular population segments over much larger areas. It is consistent with the expectation that status be inherited in a chiefdom that certain of these sibs were traditionally regarded as more prestigious than the others; among the Creek, for example, the Wind, Beaver, Bear, and Bird sibs were "recognized as leaders in the establishment and maintenance of peace in the nation" (Swanton 1928:113). Among the Natchez the Great Sun was chosen from a particular sib and probably from a particular lineage within that sib (Hudson 1976:207).

Most references to post-marital residence customs are unfortunately rather late, but seem to indicate a general uxorilocal pattern. Female ownership of the houses (or possibly ownership by the woman's sib) is mentioned among the Georgia coastal Guale by Father Ore (in Larson 1977) and might be interpreted as indirect evidence of uxorilocality. The following synthetic sketch of Creek practices in Swanton (1928:170) reveals a somewhat similar pattern:

> The Creek towns in the times we begin to have knowledge of them consisted of a succession of villages or neighborhoods scattered through the woods and along the streams, and connected by a network of trails. The unit of such a town consisted of a group of houses owned by women of one clan and occupied by themselves, their husbands, and their young children. In practice, it worked out something like this: a man, assisted by other members of his family or clan, might build a house in a new situation and clear the usual yard by hoeing up the surface weeds and grass for a considerable space around it. Now, when one of his daughters married her husband, drawn from some other, perhaps distant, locality, he would build another house on part of the same cleared space or in the immediate neighborhood where the couple would set up housekeeping. As his other girls married this process was repeated. When the children grew up the girls would continue to occupy the ancestral dwellings, or others erected for them in the neighborhood, while the boys would marry elsewhere.

Small sibs were often linked together into larger units or phratries which operated in much the same manner as sibs. Some of these linkages seem to have been habitual, as the Bear and Wolf were linked in 15 towns listed by Swanton (1928:129) while other associations varied from town to town.

Among at least the Creek, Choctaw, and Natchez the moiety offered a further organizing principle. This division operated on both the town level and the regional level, dividing sibs within a town into "red" and "white," and towns themselves into one of the two possible segments. This division is poorly understood, but among the Creek was thought by Swanton (1928:275) to be the historical remnant of an established group (the "Whites" whose towns are considered the oldest) merging with a foreign group (the "Tcilokogalgi," or "people of a different speech").

The minimal function of this dichotomy on the inter-town level was to organize sides for the ball game; on the intra-town level the two moieties also served as opposing teams for practice games (Swanton 1928:165). An interpretation of the functional significance of these games as regional regulatory devices in place of warfare is reinforced by the traditional identification of the White moiety with peace, and the Red with war. There is some slight evidence that the moieties may have had an additional exogamous function largely lost during the historic period (Swanton 1928:165). The identification of a town with a particular moiety seems to have been dependent on the fortunes of the ball games while the identification of a sib with a moiety was presumably permanent (C.H. Fairbanks, personal communication). Hudson suggests that the division originated on the intra-town level as an additional marriage structuring device beyond the sib, and that as such it may be quite old (1975:237).

Archeological Approaches

The work of William H. Sears (1954, 1956, 1961, 1968, and 1973 is a partial list) stands as one of the earliest attempts to focus attention on the relationships between archeologically-visible patterns and sociopolitical organization of archeological cultures. Without labelling the type of sociopolitical organization indicated, Sears points to evidence that the "strongly class-oriented social organization of the seventeenth-century Natchez" was a common characteristic of a Gulf coastal plain culture area extending from Tampa Bay in Florida west to East Texas (1954:339,343). Far from being a post-contact phenomenon this type of social organization, states Sears, seems to have had its roots in the Hopewellian period, if not earlier, and was particularly influenced by a more or less constant contact with Mesoamerican cultures and others of the circum-Caribbean area. By about A.D. 1100 - 1300 "it was the prevailing mode of social organization of. . .the lower Gulf Coastal Plain." This was, of course, not the only sociopolitical organization in the Southeast at conact time, and in fact stands in rather strong contrast to the "more democratic and more strongly kin-oriented systems recorded for groups in the hinterland, such as the upper, Muskogee-speaking Creeks and the various Siouan-speaking groups" (Sears 1954:343).

Since Sears' arguments in favor of the existence of hierarchically organized pre-Contact aboriginal societies have been used extensively in his more recent writings as well as by other archeologists, it is worthwhile to list in detail what he considered to be the archeological evidence for such stratification:

1. Special ornaments and retainer sacrifice for elite burials.
2. Deposition of trophy skulls and long bone bundles in burial mounds.
3. Mass deposit of special pottery, most made specifically for mortuary purposes.
4. Use of litters by the elite class which were sometimes included in the mounds.
5. Use of pole platforms or scaffolds in burials.
6. Reproduction of the temple mound in miniature as an early construction stage in the burial mound.
7. Possible sacrifice of wives.

8. Spatial patterns of burial placement interpretable as indicative of rank differences.
9. Variation of burial types.
10. Dwelling places on mounds for the elite.
11. Breakdown of organization on a clan or familial basis.
12. Multi-lineage political units of some size as well as inheritance of political, or politico-religious, offices by direct inheritance along "class" lines restricted to small, familial segments.

The salient feature of this list (adopted from Sears 1954) is that nearly all of Sears' proposed archeological correlates of ranked societies are visible only in a mortuary context. One of the few distinguishing features possibly visible in a village context is the breakdown, "at least in part, of organization on a clan or familial basis" in the movement from a segmentary to a stratified society (Sears 1954:343). However the political organization and inheritance of power among the most extreme examples of stratification in the Southeastern ethnohistoric record, the Natchez, were structured entirely along kinship lines, although there is interestingly no evidence for totemic sibs until after the remnants settled among the Creek and Cherokee (Swanton 1911:107-108). Rather than representing the breakdown of one set of organizational principles and the substitution of a different set, the appearance of more rigid social stratification seems to add another structural dimension to those already in operation.

Several of the suggested correlates are not general characteristics of social stratification, but rather the realization of general processes at particular sites. In a later paper Sears (1961) considers in more detail the classes of data which are amenable to interpretation in terms of social and religious organization. The five promising classes of data he proposes are settlement patterns, ceremonial structures, burials and grave goods, specialization in artifact manufacture, and artistic representation. As the mortuary data are essentially that considered above we may turn to the other data categories.

Within the broad topic of settlement patterns, which includes aspects of locational adjustment to the environment, Sears focuses attention on what he terms the "community pattern," or the "strictly social" aspects of settlement patterning. This includes both intra-site patterning and placement of sites in relation to each other:

> houses and room size, room plan, type and placement of special-purpose structures in the site, over-all site plan, and areal settlement patterns are all classes of evidence that have been interpreted in terms of kinship structure, social organization, and religious and political organization. (Sears 1961:227)

Under the category of ceremonial structures Sears includes all types of mounds and other earthworks, plazas, kivas, and ball courts as possibly amenable to socio-political interpretation. Presence of fortifications might also be mentioned in this category.

Specialization in artifact manufacture can be inferred, states Sears, from the "quality of workmanship, indicating complete mastery of the craft." Such evidence is significant since "the extent to which a society can afford to maintain specialized craftsmen is a reflection of its wealth and organization" (1961:22). Cited examples of artifact classes which demonstrate this degree of mastery include the specialized effigy forms and related wares of the Weeden Island cultures and the effigy pipes and copper ornaments of the Illinois and Ohio Hopewell cultures. Unfortunately, as Fairbanks (1961:238) points out, any artistic evaluation as to whether an artifact was or was not of a quality which could only have been produced by a full-or part-time specialist is highly subjective; more to the point might be compositional analyses such as neutron activation to discover artifacts which were widely-distributed from a single source, implying specialization of a site within a regional trade network with a possible concomitant specialization in production by particular individuals within the site.

Finally, Sears urges that besides serving as evidence for a class of artisans, each of the items so crafted ought to be thoroughly considered from an ethnohistoric perspective for possible analogies enabling reconstruction of the ceremonial role played by the specialized productions. This interesting avenue of research has recently been pursued by Flannery and Marcus (1976) in a study of Zapotec cosmology.

In a 1968 article Sears concentrates on the settlement pattern aspects of sociopolitical organization and defines three "levels of integration" visible in the Southeastern archeological record. The most homogeneous of these is the village community, where no specialized subgroup controlling social action was present, the villages were all about the same size, and many have their own minor ceremonial structures. Suggested examples of this level of integration are the Deptford culture sites in the Southeast. This reflects what would be termed a tribal or segmentary organization by many anthropologists.

Next on a scale of increasing organizational complexity is Sears' "priest state" which has been more commonly termed the chiefdom level of organization as described above. The settlement pattern correlated with this type of organization contains a number of very similar communities tied to a central ceremonial center which is a physically-distinct community inhabited by the top levels of the sociopolitical hierarchy as well as the subordinate social elements. Cited examples in the Southeastern United States are Etowah, Marksville, Mandeville, and possibly Crystal River. These sites serve as the organizational centers for the surrounding area; here "the ceremonialism reaches its quantitative and qualitative peaks" (Sears 1968:140). The priesthood constitutes the major portions of an "upper class or caste," representatives of which are also found at the larger villages "where, as the local leaders of the religion, or state cult, they control ritual and cultural patterns, in keeping with the standards of the state cult" (1968:140).

On a third more complex level of organization Sears differentiates between militaristic states featuring "conquest and replacement" and those proceeding by "conquest and incorporation." Although archeological correlates of these types of states are admittedly similar, Sears classes societies such as those indicated for Moundville and Cahokia with conquest and replacement states, where

> urban centers for sacred and secular control are present, as well as the residences of the specialists who can be supported by the same expanding economy which permits, and perhaps causes, conquest and expansion. Similarly, there are other centers, at a distance from the capital, that serve these same functions in the provinces. At the frontiers there are small, scattered communities and a few larger fortified settlements. (Sears 1968:147)

A warrior class is necessarily present here, and fortifications are an obvious correlate.

Sears has divided the continuum of cultural elaboration into somewhat different compartments than most Southeastern archeologists, and it is not the purpose of this study to quibble with the proposition that a state level of organization was reached by selected cultures in late pre-Contact times, as Sears suggests. Whether or not such a level of integration was present it is probable that population losses following European-introduced diseases (Swanton 1911:39-45) so disrupted the aboriginal socio-political systems that maintenance of the complex organizations soon became impossible.

That the ceramics found in Hopewellian mounds and villages and Weeden Island mounds and villages are not identical is an important clue to the status hierarchies in operation at those sites (Sears 1973). The difference between the ceramics in the two contexts, which Sears formalizes as the sacred-secular dichotomy, varies from period to period in the Southeast, starting from an absolute differentiation in the late Deptford period ("Yent Complex") to little or no difference in the succeeding Santa Rosa-Swift Creek period (or Green Point complex). During the Weeden Island period the division seems to have been rather strong, as it was in most Mississippian period sites.

As a particularly acute example of the sacred-secular dichotomy in operation Sears (1973:33) cites the Crystal River site on the North Florida Peninsular Gulf coast. Here excavations by Moore (1903, 1907) established a sacred complex dominated by Crystal River series ceramics (finely-executed zoned red, negative painted and incised wares, often on unusual vessel forms). This complex is in diametric opposition to that excavated by Bullen (1953) from the village midden areas, where only 11 decorated sherds were recovered among several thousand Pasco Plain ceramics, a coarse, limestone-tempered ware generally fashioned into open bowls. Clearly the relationship between these apparently-contemporaneous complexes speaks either for strong differentiation of function in ceramics, or strong social differentiation between the groups using the two complexes. We shall return to the "sacred-secular" dichotomy shortly.

Moundville and the Southeastern Chiefdom

Recent work by Peebles (1974) and Peebles and Kus (1977) has examined the concept of the chiefdom to argue that networks of redistribution are too general a category to be useful for defining a chiefdom, and that, in particular, the type of redistribution between different biotic zones often proposed as a causal factor in its development (cf. Service 1975) is not a constant correlate of the chiefdom (Peebles and Kus 1977:422-424). The complex chiefdom as it functioned in Hawaii (Earle 1973 in Peebles and Kus 1977) maintained balanced reciprocal exchanges of goods between kinsmen with each local unit of dispersed residence (the ahupua'a) as well as balanced reciprocal exchanges in unprocessed raw materials and some foodstuffs between groups of ahupua'a united into districts under local chiefs. While such exchanges of subsistence items were not processed through the paramount chief (who had control over several districts) during the period of the major agricultural festival the paramount chief received tribute of sumptuary items such as birds' feathers, sweet-smelling woods, and edible delicacies, some of which were eventually redistributed to other nobles of his entourage. If the paramount chief was at the heart of a redistributive network, then, it was for the control of "elite" items, not subsistence materials.

While Peebles' and Kus' argument seems more effective as a statement of the probable nature of exchange in a complex chiefdom rather than as an argument against the possible importance of redistributive networks of subsistence items controlled by a "Big Man" in a nascent chiefdom, the authors appropriately proceed to apply the ethnographic analogy to another probable complex chiefdom, the Mississippian period site of Moundville. Having removed ecological specialization and redistribution as necessary correlates of the chiefdom types of organization, they suggest five other archeologically-visible indications of the chiefdom, as follow:

1. The presence of both ascribed and achieved dimensions of status in the mortuary record.
2. A hierarchy of settlement types and sizes.
3. The location of settlements in areas assuring a high degree of subsistence sufficiency.
4. Activities such as the construction of large monuments which would require planning and a large labor force; or evidence of other activities transcending the domestic unit of production such as the part-time specialists maintained by Hawaiian and Polynesian chiefs for the manufacture of elite (or sumptuary) goods.

5. Evidence of society-wide (and thus centrally-motivated) efforts to cope with the least predictable elements of the social and natural environments. A conceivable example is the construction of fortifications as a buffer against warfare. (Summarized from Peebles and Kus 1977:431-433.)

The authors proceed to compare data from Moundville with this set of theoretical expectations for the chiefly society, concluding ultimately that Moundville satisfies all the above criteria. Analyses are reviewed from Peebles (1974) illustrating the presence of 12 major clusters of burials at the site, divisible into three major segments. The first and most complex of these appears to represent a superordinate (that is, holding ascribed status) social dimension and is found in mounds and cemeteries near mounds with associated copper axes, copper earspools, stone disks, shell beads, oblong copper gorgets, bear teeth, red or white paint, galena, and accompanying fragmentary or complete skeletons. The second and third segments are composed of an apparent subordinate social dimension which is internally distinguished by a dimension of achieved status, the markers for which include effigy vessels, animal bone, shall gorgets, freshwater shells, discoidals, and projectile points. The lowest, and by far the largest, of the two subordinate segments was buried either with no grave goods whatsoever, or with bowls, jars, water bottles, or simply sherds. Burials in this lowest segment are usually found in the cemeteries near mounds and in the village areas; when in mounds they appear to represent ritually-sacrificed retainers to superordinate burials.

As further support for these and other mortuary data which seem to indicate the two requisite independent dimensions of ascribed and achieved ranking, Peebles and Kus (1977:430-440) report the existence of an elite residential area containing larger and more complex dwellings than those in the rest of the village. Predictably, broken portions of the artifacts interpreted as markers for ascribed status burials occur predominantly in this same area.

As evidence for organization of production the authors cite a small activity area set apart from the residences which contained large quantities of finished shell beads, unworked shell, and beadworking tools. Another larger area close by yielded numerous large bone awls along with the stones used to sharpen them and may represent a hide-working area. Both of these activities were in the same quadrant of the site as the presumed high-status residence area. On the opposite side of the site were large fired hearths and caches of raw materials for ceramics which seem to indicate an area of specialized pottery production. In conjunction with the low variability in vessel form at Moundville this might be taken to indicate that most ceramics were not produced by the domestic units.

Archeology and Social Organization in the Southwest

While most of the archeological studies of social organization in the Southeast--especially the work of Sears--have investigated the nature of the political cadre using mortuary and settlement systems data, a very different approach to the more explicitly social aspects of organization has been evolving mainly in the Southwest. Whereas in the complex societies which characterized the post-A.D. 1 Southeast the most striking differentiations between individuals in a society were reflections of the hierarchical status relationships embedded in the society, in the more egalitarian societies of the Southwest the achieved statuses, the horizontal role and kinship differences, and a sexual division of labor became the most archeologically-visible cultural differentiations. Likewise the frequently obvious architectural configuration of settlement in the Southwest has lent an apparent security to attempts at identifying ceramic design elements with intra-settlement proveniences.

The often-cited studies of Deetz, Hill, and Longacre share a set of assumptions which has been more precisely stated by Schiffer (1976:24) than by any of the pioneers of social group residence area studies. Without preserving Schiffer's categories, I have paraphrased his Table 2.1 below, with important additions or modifications in parentheses:

I. Assumptions of the uxorilocality inference

A. The preferred rule or custom of post-marital residence was indeed uxorilocality.

B. Women make the pottery.

C. There is transmission of style motifs from mother to daughter.

D. The uxorilocal groups are localized within a village (and these locations remain stable over time).

E. Ceramics made in a residential area are used in that residential area.

F. Pottery in use in a residential unit will, when broken or abandoned, be deposited in the vicinity of that unit.

G. (Ceramic characteristics such as surface finish, design, and paste are not differentially-preserved in different residential areas of the site.)

H. There is insufficient post-occupational disturbance to significantly alter the patterns as originally deposited.

I. (The ceramics excavated by the archeologist constitute a representative sample of those present in the record.)

J. (The archeologist is looking for, can separate, and can consistently sort for the differences thus preserved in different areas of the site.)

K. (Either

1. there is no change over time in the ceramics made within a residential unit, or

2. the archeologist can differentiate between differences in design element distribution due to changes over time and those due to manufacture of a particular style within a particular residential unit.)

II. Corollary of the uxorilocality inference

A. If uxorilocal units are equivalent to design units there will be more sharing of designs within units than between units.

Deetz' (1965) study of three separate sites of the historic Arikara of South Dakota utilized, implicitly or explicitly, the above assumptions to hypothesize the breakdown of matrilineality and uxorilocality in the face of declining population, a pattern of trade with Europeans which tended to increase the importance of the males, a shortage of local building materials necessitating frequent moves, and constant warfare with the Dakota. Deetz used a form of row-and-column analysis to suggest that certain design elements, such as attributes of rim form and surface decoration, tended to become more randomly distributed in relation to each other over time. (Given the assumptions, a high degree of non-random association of design elements with other design elements would be expected in the pre-Contact situation.) Deetz supplied no tests of significance for the apparently-decreasing correlations between design elements, and Whallon (in Binford 1968) contends that the distribution is in fact random. Another critic (Dumond 1977:330-349) grants existence of assymetries in the data, but argues that a more reasonable interpretation of the increasing evenness in the design attribute distribution from early to late sites can be found in the specific accultural process experienced by the Arikara:

> the period of occupation of Medecine Crow was a time of very drastic population decrease, and apparently of the aggregation of surviving population into composite villages. Not only would such a process be expected to disrupt most stable social patterns, it could be expected to result in the sudden juxtaposition of people of different villages who might well represent mini-gradations of ceramic making quite above any postulated micro-mini traditions inhering in individual families in normal villages. In such cases one would expect to find an initial clustering of design attributes indicative of earlier inter-village differences in pottery modes, that were later relaxed in the general change in individual patterns of communication, innovation, and learning that would surely result in new communities. (Dumond 1977:335)

This implies more than a criticism of Deetz' conclusions; Dumond seems to be questioning what was termed a corollary of the uxorilocal inference above. Without insisting that any of the assumptions of the uxorilocal inference are wrong, Dumond denies that the result of the normal operation of these processes in "small but multi-lineage settlements of more than a few hundred people in face-to-face contact" would be detectable in light of the vagaries of deposition and recovery.

The impressive amount of discussion also generated by the now-classic Hill and Longacre studies is as much a tribute to their intrinsic interest as it is a result of the number of flaws which have been noted in their assumptions and analyses. Recalculation of the correlation coefficients by Plog (1976:28-29) on which Longacre (1970) based his conclusions of association between small, outlying sites and one of two sites with great kivas suggests that the original calculations were in error. In a later portion of the same study Longacre attempts to explain a perceived clustering of design frequencies in the Carter Ranch site into two groups discovered using a multiple regression analysis. While the proposed explanation is that of matrilocal residence areas, Dumond (1977:337) notes that the two areas are also perfectly correlated with the early and late extremes of relative dating within the pueblo and may thus represent chronological change rather than social variation. Plog (1976:31) questions the appropriateness of the multiple regression model itself on the basis that it results in correlation coefficients which are "unstable and extremely sensitive to sampling and measurement errors" when used for finding clusters in a matrix of high-correlated variables.

Nor has Hill's (1970) analysis of Broken K Pueblo escaped criticism. Dumond (1977:337-344) was unable to replicate the results of Hill's factor analytic procedures which were used to identify clusters of pottery types and attributes and, more indirectly, clusters of rooms from which the ceramics were excavated. Plog's (1976:35-41) examination of Hill's analysis arrives at different clusters than those proposed by Hill, while corroborating Hill's general conclusions of non-random distribution of the design elements.

Conclusions

The archeology of social systems as it is applied to the archeological record in North America is monolithic neither in its goals nor its methods, and cannot be termed, as we have seen, an unqualified success. Due to the relative poverty of chronological control in the Eastern United States applications have centered on discovering the broad outlines of socio-political organization; these studies typically depend heavily on mortuary data and areal settlement systems. The assumptions behind these studies thus include an adequate representation of the total community in the mortuary record; an adequate control of the chronological relationships among the sites investigated; and the correct imputation, on the part of the archeologist, of the relative value of the artifacts being used as indicative of status. Southwestern archeology, on the other hand, in its recent focus on the identification of kinship-based residence units within sites, has been forced to make an additional set of rather restrictive assumptions which include, minimally, those listed under "assumptions of the uxorilocality inference" above.

The most fundamental criticisms of these works question whether these assumptions ought to be granted. A discussion of the assumptions underlying the hypotheses is essential, as is the presentation of justification for their acceptance. Another category of criticism lies in the appropriateness of the particular statistical model used to demonstrate assymetries in the data, or in the proof that these assymetries are significant. By now it should be obvious that the researcher is obligated both to present as much of the basic data as possible, and to detail the underlying assumptions and limitations of the statistical model employed, as well as any non-standard methods used in the application or calculation of the statistics. Finally, and probably most difficult, a plausible connection must be demonstrated between the model (or hypothesis) which has been proposed and the assymetries which have been shown to exist. This is the most difficult phase of the argument because additional alternate hypotheses to explain perceived phenomena can always be proposed, and to the extent that these have some prior probability of being true, they must be disproved by "deducing" from them implications which can be shown to be false. Unfortunately informed investigators can disagree about the prior probability of a proposition, what constitutes a truth-retaining implication of a true hypothesis, and what varieties and strengths of proofs are required to show an implication to be false.

A Test of Certain Assumptions

The approaches considered above all have in common that, as Plog (1976:11) points out for the Longacre and Hill studies, the model derived from ethnographic data has not been directly tested by archeologists; rather "they have. . .interpreted archeological data given the assumption that the model is a valid one." A refreshing exception to this circularity of reasoning can be found in J. S. Otto's (1975) attempt to prove some of the assumptions habitually made by prehistoric archeologists using data from a well-documented historic context.

On Cannon's Point, St. Simons Island, Georgia, Otto excavated portions of several slave cabins, an overseer's house, and the refuse associated with the main planter's house from identical chronological contexts. By evaluating the material and subsistence remains recovered Otto was able to identify categories of material remains which best differentiated between the three units, which are known from historical documents to have been occupied by individuals of different ethnic, social, and economic statuses (Otto 1975:7-16). While the economic and cultural setting of the Couper Plantation limits its analogic value for aboriginal North Florida, Otto's reflections concerning elements shared by all stratified societies are of interest:

> In stratified societies, status positions associated with social roles or activities are ranked in hierarchies. Upper status individuals enjoy greater prestige and have preferred access to the resources of the natural and social environments. People occupying lower status positions have less prestige and suffer impaired access to resources. . . . Some members of a stratified community are relatively affluent, though others live in relative poverty. (Otto 1975:8)

Otto clearly demonstrates that--at least in the context of the 19th century plantation--it is clearly within the power of the archeologist to differentiate status relationships on the basis of material remains. The best indicator of difference between the free white laborers--the overseers--and the black slaves was the housing conditions, with both planter and overseer components far superior to those of the slaves in terms of "available living space; number of specialized rooms; the features available to occupants; the quality of construction materials; and expected durability" (Otto 1975:360). Most non-ceramic artifacts did not seem to clearly differentiate between the three groups; exceptions were certain bone and iron button types and pipes, all of which appeared more frequently in the two lower status groups. Faunal remains also reflect the status differences with the range of vertebrates increasing along with social status.

For our purposes, however, the most important category of status indicators identified by Otto are the ceramic materials. He concludes that the range of ceramic types increases with the status represented by the refuse component, and notes that certain ceramic types are especially good indicators of social status. In particular, the distribution of banded and transfer-printed wares had a high negative correlation with the banded wares characteristic of the slave and overseer sites and the transfer-printed wares characteristic of the elite plantation owners. One of the main factors conditioning this difference seems to have been the different sources of supply available to the different social segments (Otto 1975: 187). The planter's kitchen was stocked with ceramics supplied by a factor, who obtained his goods from Europe via New York packet lines. The slaves and overseers, on the other hand, may have acquired some of their ceramics from local shopkeepers who stocked the more traditional, "folk" pattern banded wares, possibly as a response to their customers own preferences; or may have been supplied with a limited range of inexpensive, utilitarian crockery by the planter.

Another explanation for the higher frequency of banded wares in the lower status occupations lies in the different vessel forms and functions represented by the banded versus the transfer-printed wares (Otto 1975: 199-219):

> At the slave cabin, 44% of the total tableware items were serving bowls, and 24% of the tableware at the overseer's house were serving bowls. . . . In contrast, only 8% of the identified tableware items at the planter's kitchen were serving bowls. . . . Though transfer-printed wares at the plantation appeared in table, tea, and chamber shapes, virtually all of the banded ware shapes at the three sites were serving bowls--the "common bowl" shape with foot rings and carinated, flaring sides. . . . The high frequency of serving bowls at the slave and overseer sites may be related to dietary differences which existed between the planter and subordinate classes in the plantation.

Zooarcheology and documentation confirm that the varied fare emanating from the famous Couper kitchen was in strong contrast to the traditional "one-pot" meals of the lower status groups. Coupled with the greater access of the elite group to exotic, expensive forms and the greater ability of the elite to afford specialized items with limited general utility, the more varied diet of the elite group contributed to the wider range of vessel forms present in its refuse. The differential decoration on different vessel forms, in turn, contributed to the differential distribution of ceramic types in the different midden contexts.

Otto then proceeds to make the potentially important generalization that the ceramics in the higher-status contexts were more "diverse" in terms of type classification and form (Otto 1975:161, 219). Otto's Table 11 (pp. 175-176) to which the reader is referred in support of the claim for differential ceramic diversity in type classification, reveals the following:

	Slave Cabin	Overseer	Planter's Kitchen
n of types	23	24	28
sample size	543	179	1242

The planter's kitchen refuse indeed contained a greater range of types but this should not necessarily be considered a greater diversity, since a measure of diversity must compensate for sample size. One such measure used in ecological studies is simply number of species/1000 individuals; another, which measures both diversity and evenness, is the Shannon-Weaver diversity index, or information index, often called $\bar{H}$ (Odum 1971:144). These two indices were calculated for the data Otto reports in Table 11 with the following results:

	Slave Cabin	Overseer	Planter's Kitchen
n of types/1000 sherds	.04	.13	.02
$\bar{H}$	2.39	2.47	1.40

By either of these measures the planter's refuse is the least, not the most, diverse, due to the large amounts of transfer-printed pearlware in the kitchen refuse. It is the overseer, who is participating in elements of both the elite and the folk culture, who leaves the most diverse refuse.

Similar diversity indices based on vessel form were also calculated from Tables 19-21 (Otto 1975:205-217) with these results:

	Slave Cabin	Overseer	Planter's Kitchen
sample size	126	128	309
n of forms/1000 sherds	.2	.14	.08
$\overline{H}$	1.9	1.87	2.08

Since the largest ceramic type category among the planters is found on vessels of many different forms, while the many types among the slaves and overseers are most often in the bowl form, the high-status component at Cannon's Point is clearly more diverse on the basis of the $\overline{H}$ index when ceramic diversity is computed on the basis of vessel form, as was predicted by Otto.

In a sense it is unfortunate that Otto was unable to demonstrate greater ceramic type diversity from the high-status occupation areas on Cannon's Point since this is precisely what one would anticipate for high-status residence localities within a pre-Contact Southeastern chiefdom. Let us examine the reasons behind the low ceramic type diversity of the planter's refuse and the hypothesized high diversity in the high-status occupation area of the chiefdom.

The first and most significant difference relates to the way in which ceramics were manufactured and acquired in the Southeastern aboriginal setting versus the modern economic market system in which the planter participated. According to Otto's 1977 reconstruction the planter regularly purchased ceramics for the big house as well as for the overseer and slaves. This resulted in the distribution of a special class of wares to these segments which was probably more limited in range of decoration and form than the large sets of matching table and teaware purchased by the planter for his own use. However, small portions of the planter's ceramics were apparently laterally-recycled through both the overseer and slave components; while the slaves also apparently received some discards from the overseers. Moreover, Otto's earlier analysis (1975:160-173) suggests that both the slaves and overseers may have purchased some of their own ceramics, probably purchasing individual items as they were able from local shopkeepers.

In a chiefdom, as we have seen, the situation is entirely different. With the possible exception of the archeological data from Moundville, the archeological record and the ethnohistoric documents suggest that at least utilitarian pottery was a household craft. Most ceramics were probably produced domestically by the women of the household in the variety of forms necessary to fulfill the functions to which they would be put. Several references to the extreme skill of the Natchez and Tunica potters (DuPratz and Dumont in Swanton 1946:549-550) suggest that they were capable of either utilitarian or more recherché productions. Le Page du Pratz, for example, commissioned of the Natchez potters a set of dishes and plates after the model of his French earthenware, and was well pleased with the "beautiful red color" of the result (Swanton 1946:549). As the focal point for a system of reciprocity based on (at a minimum) sumptuary items, the elite group, and the chief especially, controlled the flow of a large amount of goods. Some of these only passed through his hands, since strikingly unequal accumulations of wealth are not consistent with a chiefdom-level of organization. Some were lost from the village midden to the mounds through mortuary rituals. Over a certain period of time, however, it would appear inevitable that the chief would amass, and eventually break or lose, a more diverse lot of ceramics than those of a lower status, who normally had access only to the ceramics they themselves produced. Moreover, a greater percentage of the ceramics in the high-status area would be made up of sumptuary-type items, and items received through non-local trade, than would be the case in low-status areas.

Analogies from Otto's work in historic planter-slave systems on the Georgia coast to aboriginal cultures in North Florida must be drawn not through the specifics of either system but though the generalities true of both. In both situations, refuse of high-status components can be expected to evidence a greater percentage of goods which were deemed exotic. We have already seen that at the time of contact such goods included objects requiring a great amount of time and effort for their manufacture; objects made of a scarce or non-local resource; and objects needed for specialized functions not performed by lower status individuals--for example, a ritual or other symbolic control functions. Just as the differential relative frequencies of banded versus transfer-printed ware provided an index differentiating the refuse of status groups in Otto's study, ceramic types can be found whose relative frequencies will differentiate the status-group residences at a socially stratified aboriginal site. In this perspective those ceramics which Sears identified as "sacred" (1973) because of their high correlation with ranking individuals in mounds are simply elite goods which were removed from circulation with the death of the owner to avoid "the inflation that would result from the accumulation of these valuables in the system" (Peebles and Kus 1977:443-444). Purely utilitarian items fulfilling everyday functions--as the banded-ware bowls in the lower status overseer and slave components--will have a direct counterpart in the open, undecorated bowl form which can be expected to appear in higher relative percentages in the lower status areas of the aboriginal site.

The McKeithen Site

The data on which this dissertation draws result from sampling excavations in the village and plaza area of a multi-mound Weeden Island period site in Columbia County, Florida. As the first stage in a larger North Florida archeological project these excavations were meant to lay the chronological groundwork (in a literal _terra incognito_) for succeeding intensive excavations in the village areas and mounds of the McKeithen site and for interpretation of materials gathered from surrounding, supporting sites. This is done in Chapter Four, after a brief description of the site and the methods of excavation in Chapter Two, and reflections on the materials obtained in Chapter Three. Because the sampling nature of the excavations precluded complete excavation of entire structures, and because neither the regional survey nor the mortuary data are yet available, some classes of data normally used for testing hypotheses of social stratification cannot be applied. Far from being a disadvantage, this provides an opportunity to interpret distributions of material from within the village area in ways that are not normally attempted, since it has traditionally been felt that mortuary data, size and complexity of dwellings, and relative size and distribution of site types are more powerful indicators of social stratification.

The major hypothesis to be tested is that the McKeithen site represents the remains of a socially-stratified society and that these internal social differences can be recognized from the village remains themselves without reference to the ceremonial mounds. The implications of the hypothesis, which will be tested in Chapter Five, are as follows:

1. The high-status areas will be differentiable from the rest of the site on the basis of higher concentrations of non-local ceramic materials. The assumptions of this implication include:

   a. The village head and his lineage control whatever non-local trade is represented by the presence of the exotic ceramics.

   b. A larger portion of these non-local ceramics are retained within the high-status lineage or lineages than are redistributed randomly to all areas of the site.

2. High-status areas within the site will be differentiable from the rest of the site by a greater diversity in ceramic vessel form. The assumptions of this implication include:

   a. The village elite have preferential access to non-utilitarian vessel forms and to ceramics which are more elaborate than would be required to fulfill their designated function.

b. By virtue of their different roles in the political and religious life of the community, the village elite possess ceramic vessels which fulfill functions not required of ceramic vessels belonging to members of subordinate statuses. This might include items such as large storage vessels or totemistic representations.

3. As a corollary of the first two implications, high-status areas will be marked by a higher ceramic type diversity than other areas of the site. This assumes that:

a. The type concept, which is used here in the traditional taxonomic manner, is not simply a construct which is imposed on the aboriginal ceramics, as some archeologists insist (Rouse 1960:318) but rather reflects in some measure a formal and functional ideal for the culture to which it is applied (cf. Deetz 1967:43-65).

4. In addition to imported ceramics, materials such as bone, shell, and lithics which are not readily available locally will be more abundant in elite residential areas than elsewhere. This requires that assumptions similar to those on which the first and second implications are based be granted.

Before this problem can be effectively considered, the data-gathering mechanisms (Chapter Two) and data-analysis procedures (Chapter Three) must be set forth, and sufficient temporal control developed (Chapter Four) so that any patterning observed in the data can be ascribed to social rather than temporal variation (Chapter Five).

CHAPTER TWO
THE McKEITHEN SITE: ENVIRONMENTAL CONTEXT AND HISTORY OF EXCAVATION

The casual visitor to Florida, in eager anticipation of the beaches to the south, regards North Florida as a prolonged inconvenience. To the motorist jaded by the heroic proportions of the Appalachians, then lulled by the undulating Piedmont, the coastal plain of southern Georgia and Florida seems flat and featureless. To the more attentive observer, however, the still-rural landscapes of North Florida harbor a surprising natural diversity. Perched on formations of limestone and other marine deposits formed during periods of submersion as early as the Eocene, and reworked by the rising and falling seas of the Pleistocene, the soils of Columbia and Suwannee counties--which constitute the heart of the north Florida region--are derived principally from the Hawthorne Formation, a parent material rich in sand, clay, marl, limestone, fuller's earth, and phosphates (Rowland and Powell 1965:94-98.) Towards the north-central portion of the eastern extreme of Suwannee Country, and the western portion of Columbia County, thick remnants of this formation underlie the highest surface elevations in an east-west transect of the state at the lattitude of Wellborn (about 68m at 30° 13' N) and form an elevated ridge oriented north-south in the upper portion of the peninsula (see Fig. 1). Rather than flowing through a series of increasingly-large streams into lakes or the ocean, much of the water in North Florida percolates through the porous underlying limestone formations into the

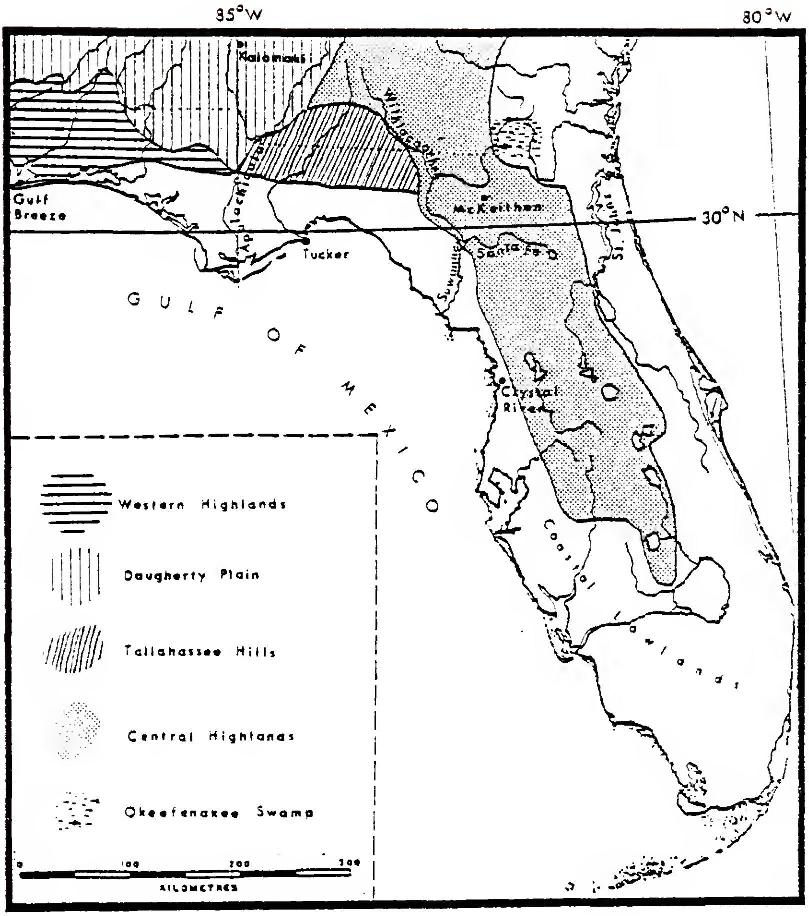


Fig. 1
Physiographic Provinces of the Coastal Plain in Florida, Southern Georgia, and Southeastern Alabama
Source: Cooke 1948:9; Veach and Stephenson 1911:28

underground freshwater reservoir. But in the vicinity of Wellborn originate the only significant flowing streams in Suwannee County due to these thick Hawthorne deposits which are more impervious to percolation than the Suwannee or Ocala limestones. The principal lakes in the two-county area can also be found along a narrow belt about 30km long trending northwest-southeast along a line drawn between present-day Live Oak and Lake City.

In the middle of this band of lakes, ideally situated to serve as the central site for a series of communities heavily dependent on these flowing and standing water resources, the McKeithen site is itself bordered on the north by a small stream known as Orange Creek. Until relatively recent times, when dams were erected upstream from the site, Orange Creek was a small but active stream, bordered on its south by 2-3m bluffs, and winding through a floodplain varying from 10 to 30m in width. The meander belt of the creek and the protected bluffs support mesic hammock and floodplain vegetation in which *Magnolia* spp., *Carya* spp., *Quercus nigra*, *Ilex opaca*, *Smilax* spp., *Vitis* spp., and *Cornus* spp. are the apparent dominants. Away from the creek, in those areas which have not been recently cleared, the sandy, well-drained soils of the Blanton and Lakeland association support a more xeric vegetation dominated by various oaks and pines, especially *Pinus taeda* and *P. elliotii*, *Quercus hemispherica*, *Q. laurifolia*, and *Q. virginiana*. Once an important canopy species, *Pinus palustris* has largely disappeared over the site due to recent selective lumbering. Given a regime of regular burning, however, an association of *Pinus palustris*, *Q. cinerea*, and Aristida stricta could have dominated the site and much of the surrounding area; little or no burning, on the other hand, would probably have allowed a mesic hammock vegation to develop. Other species important on the site today include Prunus spp., Crataegus spp., Diospyros virginiana, Vaccinium spp., Gaylussacia spp, Rubus spp., Rhus radicans, Gelsemium sempervirens, and Campsis radicans.

The climate in this portion of Florida is warm but temperate, with freezing temperatures occurring about 15 times a year. The highest mean monthly rainfall of 190mm occurs in July, while the lowest mean monthly precipitation of 25mm falls in November. The resultant yearly average, as measured at a Lake City station, is about 1300mm (Butson 1965:93-95). This exceeds the average annual potential evapotranspiration (PET) by about 20%, a comfortable surplus in view of the fact that the months of highest PET are also the months of greatest precipitation (Thornthwaite 1948).

The faunal component of the natural community in the North Florida area has been somewhat truncated by recent human expansion, but originally included the primarily carnivorous Felis concolor and Alligator mississipiensis, the canids Canis niger and Urocyon cinereoargenteus, the felid Lynx rufus, and Mustela vison, Ondatra zibethicus, Lutra canadensis, and a variety of raptorial birds, snakes, and fishes. The largest variety of species, and the species which certainly played the most important economic role, were primarily herbivorous, including (to name only the most prominent) a variety of birds, fishes, snakes, turtles, and tortoises, the marsupial Didelphis virginiana, and the mammals

Sylvilagus floridanus and *S. palustris*, *Sciurus* spp., *Procyon lotor*, *Ursus americanus*, and of course *Odocoileus virginianus*, the single most important faunal species for most Southeastern aboriginal sites.

The geographic extent of the North Florida archeological region has been defined by Milanich (n.d. b:10) as

> north of the Santa Fe River and south of the Okeefenokee Swamp and wiregrass-pine barrens which are found in Southeast Georgia . . . the western boundary is usually placed at the Aucilla River and the eastern at the beginning of the Atlantic coastal flatlands, which begin just east of Lake City. The Gulf coastal flatlands extend up almost to the Suwanee River and define the southwestern edge of the region.

Previous Research in North Florida

As a cultural area, however, the North Florida region is defined by default: it is that area north of North-central Florida, east of the St. Johns River valley, northeast of the peninsular Gulf coast, and south of the southern Georgia coastal plain in which virtually no professional archeology has been attempted. With the exception of the interior Georgia coastal plain, the prehistory of the cultural sub-areas surrounding North Florida is comparatively well known. The classic references on the archeology of the northern half of Florida--Goggin (1952) and Willey (1949)--bracket North Florida on the east and west. Recent short summaries by Milanich (1976) and Schnell (1975) discuss general chronologies in North-central Florida and southern Georgia.

Much interest and excavation in all these surrounding areas has recently focused on the cultural developments occurring during the first millenium A.D. During this period most Southeastern peoples seem to have made the transition from relatively egalitarian tribes to more complex chiefdoms with obvious heirarchical status distinctions. Other symptoms of this development are larger and more diversified settlements, networks of trade spanning hundreds of miles, a ceramic art which reaches a pinnacle of technical achievement, and the first tentative formations of a pan-Southeastern symbolic system. Coincident with these changes was the introduction of foreign cultigens, particularly maize, which can first be documented for the Floridian peninsula by the B.C./A.D. transition (Sears and Sears 1976).

The Weeden Island archeological complex defined on the basis of a primarily ceramic trait list (Willey 1945) and conventionally dated to between 800 and 1400 A.D. (Sears 1977) seems to hold a key position in this development. Encompassing the coastal area and, to a less well-known extent, the interior coastal plain between Mobile Bay and the Little Manatee River, the complex is composed of several local cultures which shared a unifying "sacred" ceramic series, presumably indicating shared systems of belief and sociopolitical structures. Reflecting the rise of interest in this period and the desire to address its still-unresolved chronological problems, a variety of papers and publications dealing with the sub-regions on all sides of North Florida have recently appeared. Weeden Island-related cultures in North-central Florida have recently been reviewed by Milanich (n.d.a), Smith (1971) and Hemmings (n.d.). The North Peninsular Gulf Coast area has been discussed by Kohler (1975). Still-unreconciled reconstructions of the Northwest Florida chronology can be found in Milanich (1974), Percy (1976) and

Sears (1963). The only extensive modern excavations in a major Weeden Island site have been reported by Sears (1956) for the Southwest Georgia area. Most recently Steinen (1976) has extensively reviewed the literature relating to problems of internal Weeden Island chronology, the areal distributions of the various local Weeden Island cultures, and the ceramic types diagnostic of the period. This recent expansion of Weeden Island studies makes a more intensive review of the literature unnecessary here.

For the North Florida region, however, two citations suffice to completely review the published archeological literature, and neither is particularly relevant to the period under investigation. In the late 1940's Goggin recovered a series of lithic materials he called the Santa Fe complex from two sites in Alachua and Suwannee counties. These included probable Paleo-Indian projectile points as well as other tools which, in retrospect, look as though they may belong to a later tradition (Goggin 1951). Collections by Goggin from a First Spanish period dump in the Ichetucknee River, probably associated with the Santa Catalina de Afuerica mission, yielded aboriginal ceramics of the Leon-Jefferson and St. Johns series as well as ceramic types typical of the late prehistoric period in North-central Florida: Alachua Cob Marked, Lochloosa Punctated, and Prairie Cord Marked (Deagan 1972). A continuing series of surveys and excavations at a nearby mission <u>visita</u> and associated aboriginal villages (8 Su 65 and others) should help clarify the nature of the proto-historic and early historic ceramic traditions in North Florida.

The occupation of the McKeithen site is bracketed--though not very precisely--by these temporal extremes. Professional interest was first drawn to the site by the landowner and his son; Leon A. McKeithen Jr. encouraged visits by Charles H. Fairbanks and David S. Phelps during the 1960's. The site was recognized as a major Weeden Island center, and Phelps drafted a contour map which accurately positioned the three major mounds now known as A, B, and C. The mounds form an almost perfect equilateral triangle with the base (defined by Mounds A and B) on an east-west line. Mound C lies 35m south of the creek bordering the site on the north. The mounds surround a central area which is nearly devoid of artifacts.

In June 1976 with funding first from the Wentworth Foundation and later from the National Science Foundation, proposal #76-82720, Jerald T. Milanich of the Florida State Museum initiated the North Florida Archeological Project. The initial thirty weeks of the project, under the field direction of the author, were devoted to mapping and sampling the extensive village area at the McKeithen site.

Summer 1976 Field Session

Today most of the eastern portion of the site (see Fig. 2) and about a third of the western portion are in planted slash pine. These areas were previously planted in watermelon, and before that--in the 1920's and 1930's--were in open pasture which was repeatedly burned to halt forest succession. That portion of the site along the creek and to the northwest which has not recently been cleared is in many places a thick tangle of secondary growth due to the selective lumbering of

FIG. 2
CONTOUR MAP OF THE MCKEITHEN SITE

longleaf and loblolly pines. The first task of the Summer 1976 field crew was to establish a grid through these natural obstacles over a roughly square 18 hectare area south of Orange Creek and west of State Road 135. The grid is oriented 6.5^{o} east of magnetic north, or about 7^{o} east of true north, to follow as closely as possible the lines of planted pines. North-south and east-west lines cross at 30m intervals resulting in a cell size of $900m^2$. This size, while somewhat larger than would have been ideal, was deemed the smallest practical reference unit for the initial sampling excavations given the known size of the site.

Although it would have been desirable to make an intensive surface collection over the entire site, time limitations forced us to settle for a 33% sample. The $900m^2$ grid units were numbered consecutively from 1 to 202 and 67 of these were selected (without replacement) by means of a random numbers table. Since surface cover and degree of surface disturbance varied greatly among the units, and since no large-scale attempt to remove leaf litter, pine straw, and vegetation could be undertaken, some method to compensate for the variety of collection conditions was necessary. Each surveyor was asked to rank the conditions for surface collection within the selected units from 1 (good) to 4 (poor) taking into account such factors as the presence of firelane cuts, amount of exposed ground surface, litter density, etc. Following a complete collection of all cultural materials seen on the surface of the selected units this score was multiplied by the number of cultural items recovered to compute a "value" for each grid unit which would, hopefully, reflect the intensity of occupation. Where no artifacts were recovered in an area scoring 4 it was not deemed that the area was sterile, but that there was no information; hence the number of units about which we gained information was 48, or about 24%. The resulting richness values were collapsed into four ranges (0, 1-5, 6-15, and 16 or more) which were shaded onto a map of the grid for easy visualization of the pattern (see Fig. 3). One area of intense occupation along the creek east of Mound C and arching away from the creek towards Mound A was obvious, as was another area extending east-west just south of mounds A and B. Since the richness values dropped off somewhat directly east of Mound A it was thought these two midden areas might be discontinuous.

Because we were interested in differentiating between the areas tentatively defined as two separated middens with the third area between and surrounding them of less interest, a stratified disproportionate random sampling strategy was chosen. The presumed midden along the creek was called Stratum 1, the other crescentic midden, Stratum 2, and the presumed plaza and outlying areas, Stratum 3. Stratifying the sample in this way helped ensure that all areas of the site would be adequately sampled. Since we were most interested in distinguishing between the first two strata--the areas where the most information applicable to the hypotheses would be preserved--the sampling proportion in these two areas was .001, while in Stratum 3 the sampled proportion was only .0003. To achieve this disproportionate sample 10 2 x 2m squares were excavated in each stratum. The disproportionality of the sample was based on the research hypotheses, while the total number of

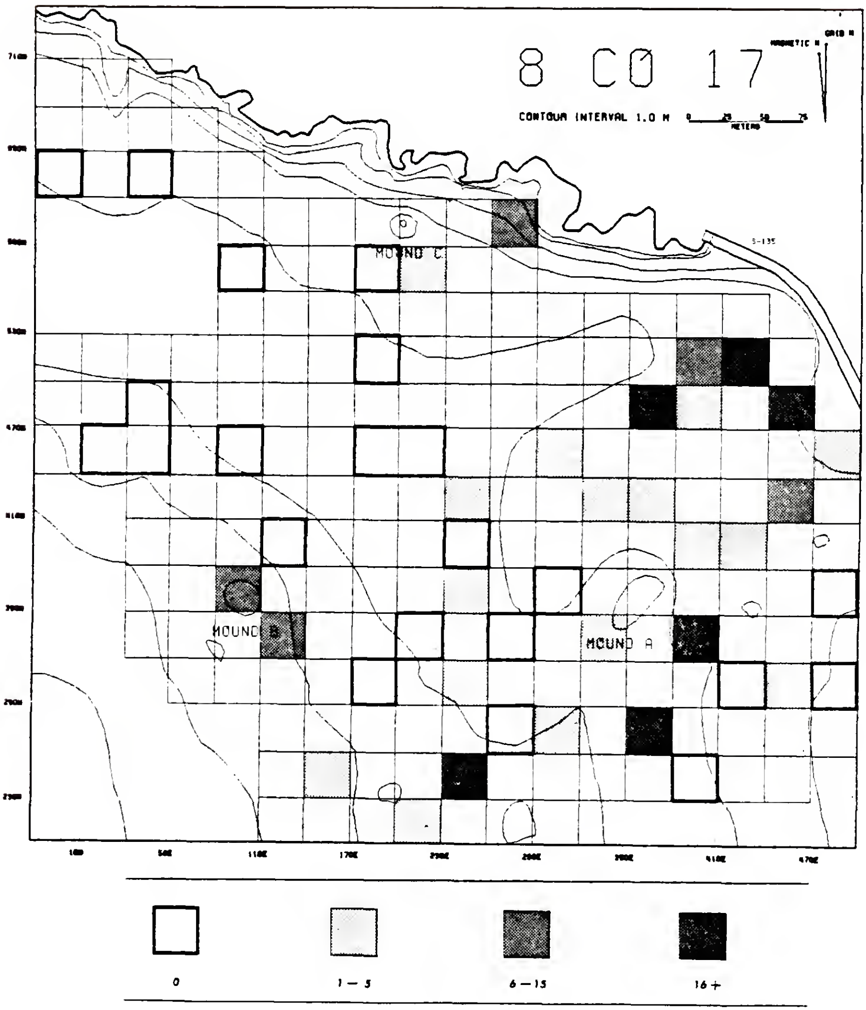
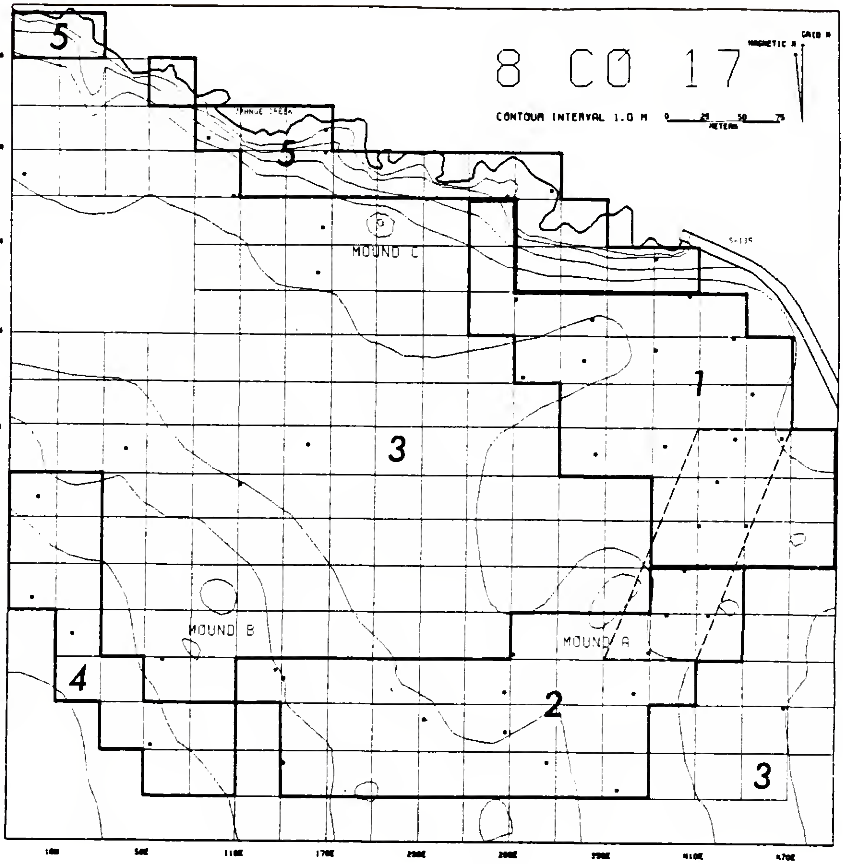


Fig. 3
Richness Values Computed from Total Surface Collection
of Randomly Selected 900m² Grid Units

units excavated was dictated by the time and personnel at hand. Figure 4 outlines the three strata used for this sample as well as the additions to the grid (strata 4 and 5) and the transect which are discussed later in the chapter.

To select the actual 2 x 2m units to be excavated, the 900m^2 grid units were renumbered consecutively within each stratum and using a random number table 10 grid units were selected from each stratum. Then, on paper, a 900m^2 grid unit was divided into 225 2 x 2m squares which were numbered consecutively. For each 900m^2 grid unit which had previously been selected we chose one 2 x 2m square using the table of random numbers. These squares were excavated by natural zones broken into arbitrary 10cm levels where zones exceeded 10cm in depth and the density of cultural materials made such a segregation desirable. All material was passed through a ¼" mesh mechanical shaker screen. All thirty squares were taken down either to sterile soil or to a level where cultural material was extremely scarce; all but one unit contained some cultural material. In several areas the depth of the undisturbed midden beneath the plow zone or accumulated humic deposits was a meter or more; the average depth of undisturbed midden was about 0.5m. In most areas the zone of undisturbed midden displayed no obvious stratification and was excavated in arbitrary 10cm levels. While lithics and ceramics were generally abundant, macroscopic floral and faunal remains were only occasionally encountered, apparently due to poor preservation in the acid soil conditions. Nearly all such material was carbonized (calcined) and was very fragmentary. At least one wall of every unit



Limits of probability strata

Limits of transect sample

2 x 2 m excavation unit

Fig. 4
Sampling Strata and Location of Tests in the
Probability and Transect Samples

was profiled and photographed; all features were separately recorded, mapped, and photographed, and large flotation samples were collected for further analysis. Thirteen samples of carbonized wood were taken for radiocarbon dating of which four from this field season were processed by the University of Miami laboratory (see Table 4).

Analysis of the Initial Probability Sample

After the recovered materials were washed and placed in marked boxes a tentative classification of the ceramics on the basis of recognized types was begun. The decorated ceramics were numbered and separated from the plain during the classification stage, and the lithics were characterized according to eight broad categories (e.g. heat-treated coral, worked flint) and worked items were further categorized into one of 28 analytical classes. For convenience this information was transferred to IBM cards (three cards per provenience) and then to an SPSS system file on direct-access disk (Nie et al., 1975). During this process the identification of each excavation unit with a sampling stratum was re-evaluated on the basis of the excavated materials (the original assesment having been based on the surface collections and spatial locations of the units). Three of the 2 x 2m squares placed in Stratum 1 yielded much less material than expected, and therefore seemed to fit better into Stratum 3. For the same reason three units in Stratum 2 seemed to belong in Stratum 3. On the other hand, some areas predicted to be relatively unproductive on the basis of the surface collections were re-assigned to the nearest midden stratum after excavations yielded high densities of material.

Recognizing that this re-assignment of units to strata--and even the identification of the two midden strata themselves as somehow distinct--was up to this point intuitive, a discriminant analysis was performed on the excavation units as characterized by the ceramic types and lithic categories they contained to see whether this classification could be justified solely on the basis of the amount and type of material in each unit, rather than on the basis of the unit's location within the site. If the classification was valid, the discriminant analysis would show which variables were most useful in differentiating between the three strata (see Klecka in Nie et al., 1975, Doran and Hodson 1975:209-213, or Bennett and Bowers 1976:95-117 for further discussion of the technique). The first phase of discriminant analysis derived a limited number of linear (discriminant) functions which summarize the variability between the redefined midden strata. The variables used were of both the shape and size variety; that is, it was anticipated that the two midden strata would differ from each other primarily in the relative frequencies of the ceramic and lithic categories (shape variables) while they would both differ from the plaza and outlying stratum on the basis of raw numbers of artifacts (size variables). Table 1 summarizes the raw frequencies of each of the redefined strata on which the discriminant analysis was based (categories having a total site frequency of less than five items were eliminated). Total lithic and ceramic counts for each unit were also entered as variables. All levels in each square were aggregated to characterize the square as an entity.

TABLE 1
CERAMIC AND LITHIC CATEGORIES BY REDEFINED SAMPLING STRATA

Category:	Stratum 1	Stratum 2	Stratum 3
Pasco Plain	2/ 0.03	5/ 0.09	1/ 0.02
smooth sand tempered plain	653/ 8.94	641/11.05	92/ 2.24
grit tempered plain	49/ 0.67	57/ 0.98	11/ 0.27
residual plain	1227/16.81	686/11.82	180/ 4.39
St. Johns Plain	36/ 0.49	46/ 0.79	11/ 0.27
St. Johns Check Stamped	1/ 0.01	7/ 0.12	2/ 0.05
Papys Bayou Incised	2/ 0.03	0/ 0.00	0/ 0.00
Papys Bayou Punctated	1/ 0.01	19/ 0.33	1/ 0.02
Weeden Island Plain	38/ 0.52	53/ 0.91	3/ 0.07
Weeden Island Red	29/ 0.40	7/ 0.12	5/ 0.12
Weeden Island Zoned Red	1/ 0.01	12/ 0.21	0/ 0.00
residual red	31/ 0.43	10/ 0.17	5/ 0.12
Weeden Island Punctated	19/ 0.26	62/ 1.07	9/ 0.22
Weeden Island Incised	27/ 0.37	27/ 0.47	2/ 0.05
Carrabelle Punctated	42/ 0.58	26/ 0.45	4/ 0.10
unidentified punctated	7/ 0.10	5/ 0.09	0/ 0.00
Carrabelle Incised	22/ 0.30	13/ 0.22	0/ 0.00
St. Petersburg Incised	1/ 0.01	0/ 0.00	0/ 0.00
Keith Incised	10/ 0.14	6/ 0.10	1/ 0.02
Indian Pass Incised	2/ 0.03	1/ 0.02	0/ 0.00
unidentified incised	34/ 0.47	33/ 0.57	7/ 0.17
Swift Creek Complicated Stamped	26/ 0.35	5/ 0.09	2/ 0.05
Crooked River Complicated Stamped	2/ 0.03	3/ 0.05	0/ 0.00
Old Bay Complicated Stamped	1/ 0.01	5/ 0.09	0/ 0.00
Napier Complicated Stamped	4/ 0.06	1/ 0.02	0/ 0.00
Kolomoki Complicated Stamped	3/ 0.04	0/ 0.00	0/ 0.00
St. Andrews Complicated Stamped	2/ 0.03	0/ 0.00	2/ 0.05
unidentified rectilinear	9/ 0.12	6/ 0.10	0/ 0.00
unidentified curvilinear	21/ 0.29	10/ 0.17	4/ 0.10
check stamped 4 - 6 checks/inch	7/ 0.10	12/ 0.21	0/ 0.00
check stamped 7 - 9 checks/inch	14/ 0.19	29/ 0.50	5/ 0/12
check stamped 10 + checks/inch	3/ 0.04	11/ 0.19	3/ 0.07
Deptford Linear Check Stamped	2/ 0.03	0/ 0.00	0/ 0.00
Deptford Simple and Cross-Simple	2/ 0.03	0/ 0.00	0/ 0.00
Savannah (?) Cord Marked	0/ 0.00	1/ 0.02	0/ 0.00
Alachua Cob Marked	2/ 0.03	0/ 0.00	0/ 0.00
Tucker Ridge Pinched	2/ 0.03	0/ 0.00	0/ 0.00
fabric marked	2/ 0.03	0/ 0.00	0/ 0.00
other ceramics	10/ 0.14	7/ 0.12	1/ 0.02
worked flint	80/ 1.10	33/ 0.57	4/ 0.10
worked coral	6/ 0.08	5/ 0.09	1/ 0.02
heat-treated flint	513/ 7.03	284/ 4.90	29/ 0.71
heat-treated coral	27/ 0.37	8/ 0.14	3/ 0.07
other flint	1071/14.67	404/ 6.97	68/ 1.66
other coral	86/ 1.18	18/ 0.31	11/ 0.27
other worked lithic	8/ 0.11	2/ 0.03	2/ 0.05
other lithic	20/ 0.27	12/ 0.21	3/ 0.07
mica	1/ 0.01	0/ 0.00	0/ 0.00

Note: data is in raw frequencies/mean per level

In discriminant analysis the number of functions derived for summarizing the dimensionality of the variability between the groups is at least one less than the predetermined number of groups. Given the three sampling strata the analysis phase of discriminant analysis defined two linear functions (similar to the factors of factor analysis) which summarized the inter-group variation. After the analysis phase, a classification phase was entered which derived scores for each unit on each linear function. The analytical program selected in step-wise fashion the 15 variables which were best able, in combination with each other, to discriminate between the three groups. These 15 variables and the order in which they were entered are shown in Table 2. Also shown is the lambda statistic which inversely expresses the degree of separation achieved among the groups by the variable included in that step in combination with any other variables already included in the function. A low lambda indicates a high degree of separation. The change in Rao's V (a generalized distance measure) indicates the degree of improvement in group separation achieved by the addition of the variable entered in that step. Both the lambda and "change in Rao's V" statistics can be tested for probability that the resultant value might be due to chance alone. All values for both statistics listed in Table 2 are significant at the .01 alpha level.

The standardized discriminant function coefficients for those variables loading more than ± 0.30 on either of the derived functions are also included in Table 2. These are interpreted like the loadings on factors in factor analysis: the higher the absolute value of the coef-

TABLE 2
VARIABLES SELECTED BY STEPWISE DISCRIMINANT ANALYSIS PROCEDURE AND STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

Step Number	Variable Entered	Wilks' Lambda	Change in Rao's V
1	total lithics	0.49	27.6
2	Carrabelle Punctated (%)	0.31	30.2
3	Old Bay Complicated Stamped (%)	0.22	11.6
4	smooth sand tempered plain (%)	0.17	10.3
5	unidentified punctated (%)	0.14	10.9
6	Weeden Island Zoned Red (%)	0.10	39.2
7	residual red (%)	0.07	20.7
8	heat-treated unworked flint (%)	0.05	32.0
9	total ceramics	0.03	87.5
10	heat-treated unworked coral (%)	0.02	77.3
11	Crooked River Complicated Stamped (%)	0.01	110.1
12	other coral (not heat-treated, unworked,%)	0.01	61.4
13	check stamped 4 - 6 checks/inch	0.01	56.2
14	Napier Complicated Stamped (%)	0.01	55.7
15	check stamped 7 - 9 checks/inch (%)	0.01	121.0

Standardized Discriminant Function Coefficients

Variable	Function 1	Function 2
Weeden Island Zoned Red (%)	0.36	
unidentified punctated (%)		-0.55
Napier Complicated Stamped (%)		0.59
heat-treated unworked coral (%)		0.37
total ceramics	0.63	-0.61
total lithics		1.03
residual red (%)	-0.34	
check stamped 4 - 6 checks/inch (%)		0.31
heat-treated unworked flint (%)	0.31	

ficient, the greater the contribution of that variable to that function; the sign of the coefficient indicates whether that contribution is positive or negative. Thus, since scores can be obtained for each unit on each function, a unit scoring high on Function 1 can be expected to be high in absolute amount of ceramics and in relative amount of Weeden Island Zoned Red (both of which make positive contributions to Function 1) but to be low in relative amounts of the residual red ceramic category (which make a negative contribution to Function 1). High scores on Function 2, because of the overwhelming contribution of absolute amount of lithic material to this function, are primarily indicative of large amounts of lithics, with the relative importance of heat-treated unworked coral evidently a contributing factor. A high score on this function also indicates a small amount of ceramics, though Napier Complicated Stamped and check stamped with 4-6 checks per linear inch are relatively more abundant in high-scoring units than elsewhere.

In Fig. 5 each unit is placed according to its score on the two functions. As expected, units from the third stratum (each shown in the two-dimensional space of Fig. 5 as a "3") were differentiated from units in the first two strata--the midden areas--primarily by the total amount of ceramics. Function 1 is the horizontal dimension in Fig. 5, and is primarily determined by the size variable of raw numbers of ceramics. While the two midden strata have overlapping scores on the first (horizontal) function, they are well-differentiated by the second, shown as the vertical dimension in the figure. This function is a continuum between abundant lithics and few ceramics, towards its positive pole,

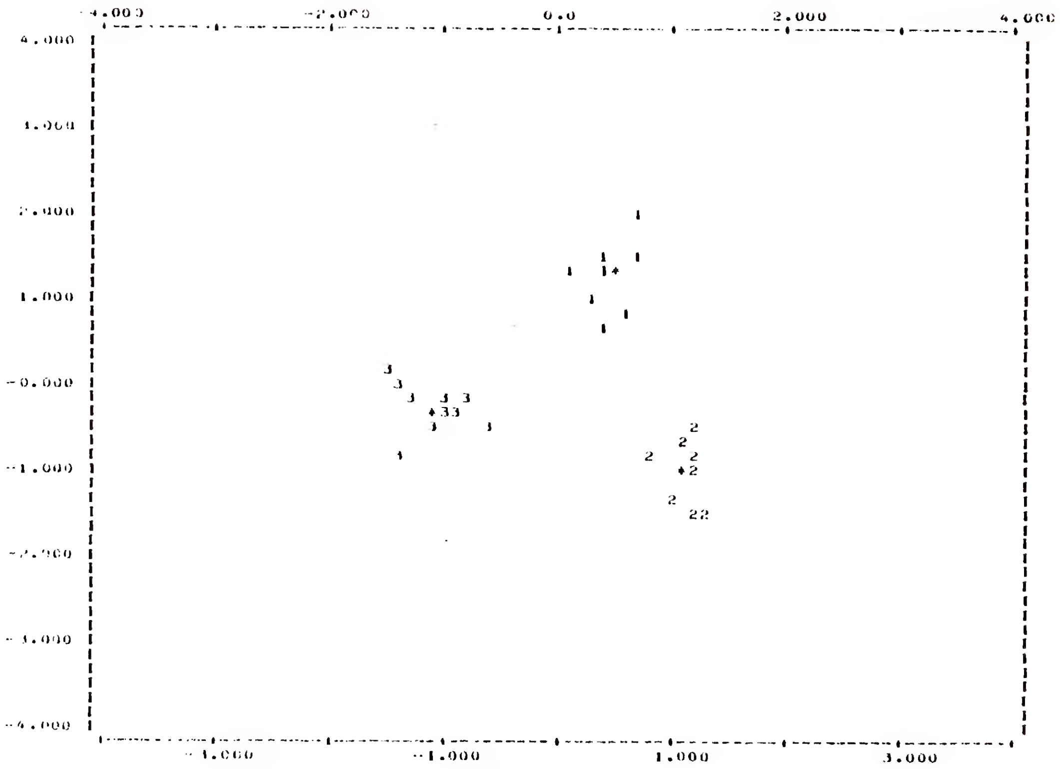


Fig. 5

Excavation Units in Revised Strata 1, 2, and 3 Plotted Against Two Discriminant Functions

Note: * denotes a group centroid. Function 1 is the horizontal axis, Function 2 the vertical axis.

and abundant lithics and few ceramics, towards its negative pole. Somewhat surprisingly, this second linear function is also primarily determined by size variables. We see that the midden by the creek is typically high in lithics, and low in ceramics; the southern midden ridge is the opposite. The shape variables are informative in that they indicate the relation of certain ceramic and lithic categories to this trend towards concentration of lithics in one area, and ceramics in another. Thus Napier Complicated Stamped and check stamped with large checks are relatively more abundant in the northern midden, in spite of the general trend towards fewer ceramics in this midden area. Likewise, on the first function, the relatively greater importance of Weeden Island Zoned Red versus small amounts of residual red in the southern midden area probably accounts for the location of the second stratum's centroid beyond that (to the right) of the first stratum's centroid. Where red filming on a Weeden Island paste occurs in the midden by the creek it is usually the unzoned variant classified as Weeden Island Red (Sears 1948).

During analysis several lacunae were noted in the distribution of the excavated units in the summer sample. In particular it seemed desirable to extend the grid to the southwest and to test this area, as a decline in the density of cultural material in this direction had not been reached. In most cases the grid stopped along the northern bluff line of the creek which marked the northern extremity of the site; it was decided to extend the grid to the north to include the creek meander belt and bluff line. Finally, an area east of Mound A and the plaza area where the two midden strata seemed to join had been inadequately tested by the probability sample, but was a critical area for interpreting the relative temporal placement of the two midden strata.

Winter 1977 Field Session

The first activity during the next field season, therefore, was to extend the grid to the southwest and to the north along the creek, and to sample these areas at the same proportions used for the adjacent areas during the previous summer. Fourteen $900m^2$ grid units were added to the southwest of which four were selected in which to excavate 2 x 2m tests by means of a random number table. The actual location of the test within the grid unit was likewise determined by resort to the random number table. The same strategy along the creek resulted in 19 grid units added to the site within which six tests were excavated. During this time work on the contour map was completed and the elevations were tied into the absolute sea-level datum.

Finally a transect was drawn across the eastern portion of the site, between productive tests in the north and southern strata. Six 2 x 2m units were excavated at approximately 30m intervals along this line. Then the first, third, and fifth tests in this transect were duplicated 30m to the east.

The Southwestern extension

The four squares excavated in the newly-gridded southwest area were uniformly poor in cultural materials. The extent of the occupation in this direction was now securely bracketed.

The Creek bluffs and meander belt

Two of the tests excavated in this extension to the grid contained very small amounts of cultural material; these were the tests on the bottom of the floodplain of the creek. The remaining four tests were on or near the bluff and produced abundant cultural material and features. Apparently there was no occupation in areas of high flood potential yet the creek was a valued resource with a high density of occupation on top of the bluff and even on the bluffs sloping down towards the creek bed. Near the eastern end of the site about halfway down a rather steep section of the bluff one test intercepted a staggered row of postmolds with extremely rich midden on one side suggestive of a structure. Two radiocarbon samples from this feature were dated to A.D. 640 $\pm$ 95 and 650 $\pm$ 70.

The Transect

Most of the tests in the transect were quite productive of both material and features, though the cultural material in the area of the transect is generally less dense and the deposits less deep than along the creek or the southern midden ridge. Towards the middle of the transect markedly lower densities of material were encountered. Two linear features bordered on one side by postmolds were partially excavated where they coincided with the tests. One of these was radiocarbon-dated to A.D. 785 $\pm$ 75, the latest apparently valid date from the site. As will be shown below, the types of material from this transect area were somewhat different than those from the northern and southern middens. Both the materials and the carbon date suggested that this midden was occupied late in the site history.

Analysis of the Winter Sample

The initial stages of the analysis proceeded along the lines followed for the summer sample. Ceramics and lithics were identified to type or category and the information added to that from the previous sample.

There was enough information now on hand to produce reliable estimates of the relative amounts of each ceramic type in the site as a unit and in each of its sub-areas. Artifactual densities over the site as a whole could also be plotted. In Fig. 6 a shaded isopleth map of the artifact densities across the site is superimposed over a gridded map of the site with even-meter contour lines displayed. Densities are found by dividing the total artifact count in each unit (faunal remains were excluded from these totals) by the volume excavated. The actual densities of artifacts per cubic meter are output on the map at the location of the test. Dark areas indicate zones of high artifact density. Each level of shading on this and the similar maps to be discussed later connect areas with similar scores on the variable being mapped. The values for areas between units are found using the standard SYMAP interpolation procedure which is automatically computed "based on the number and distribution of data points, so that seven points, on the average, will be found on the initial search" (Dougenik and Sheehan 1975:III/33). The interfaces between shadings represent the actual contour lines. The unshaded zones inside the gridded area represent the lowest data values--in this case, the lowest densities of artifacts. Because units in the transect (a non-probability sample) were included among the data points,

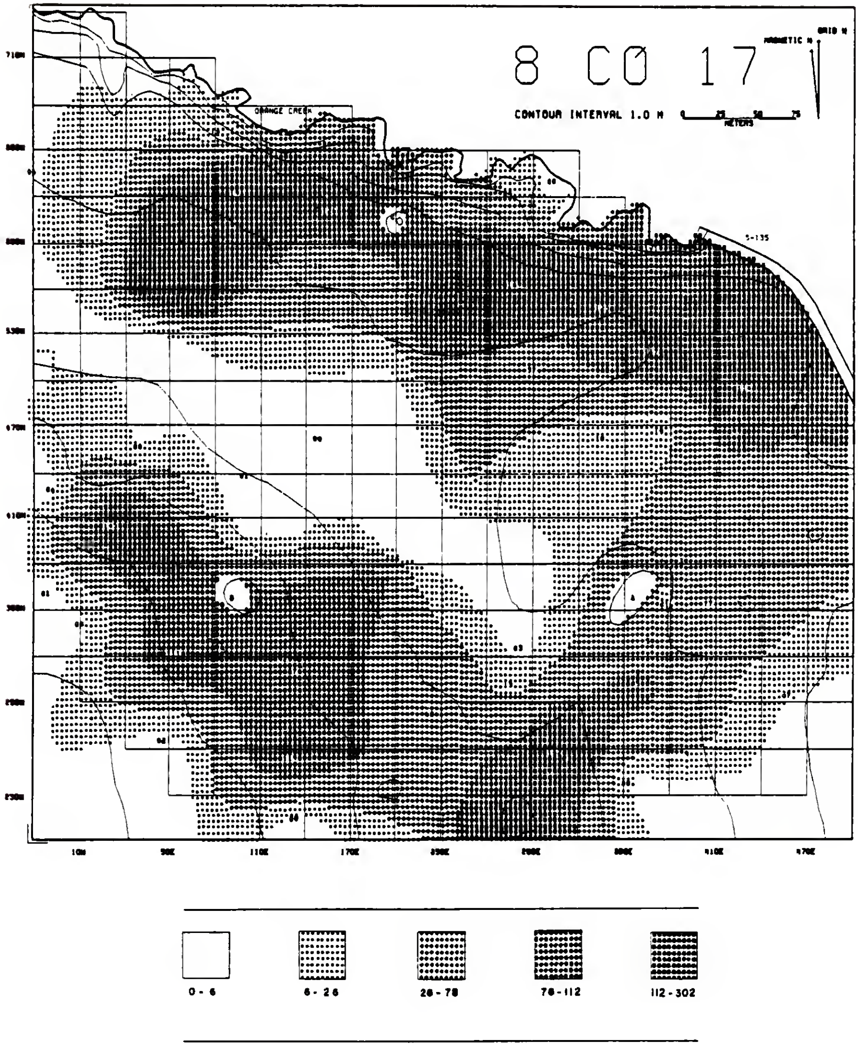


FIG. 6
ARTIFACT DENSITY PER CUBIC METER

a check was run to see whether the distribution of the points was random, or whether this addition tended to make the distribution uniform. The resultant "point distribution coefficient" (Dougenik and Sheehan 1975:III/27) is 1.05, well within the 0.91-1.25 range which is considered to represent a random distribution. While such a distribution is desirable for statistical purposes, a uniformly-distributed sample is more accurate for mapping purposes, and minor errors in interpolation are probably present in some areas of maps having a point distribution coefficient of less than 1.25 (Dougenik and Sheehan 1975:III/28). The highest artifactual densities are found in the midden along the creek and in the area south of Mound B, indicating either a longer or a more intense occupation of these areas (cf. Binford et al., 1970:70-71). The area between the mounds has relatively little cultural material, as might be expected from a plaza arrangement such as seen by early explorers and documented for several Mississippian period sites (Chapman 1976:121-146). At McKeithen, however, the area west of the plaza has never been occupied, resulting in a horseshoe-shaped distribution for the village debris which is open to the west. Of course it can not be assumed that this entire semicircle was occupied at one time, since all levels of each unit have been aggregated to produce this map. A similar plan can be found at the Kolomoki site at least during what Sears (1956:94) believed to be the full Mississippian or "Kolomoki" period, when a horseshoe-shaped village area open to the east partially encircled the large platform mound on the eastern side of the site. In Chapter Five the shifting patterns of site occupation over time at McKeithen will be considered.

The initial stratification of the site into two very large midden areas had worked well and had demonstrated that there were significant negative correlations between ceramic and lithic distributions as well as differences in the relative frequency distributions of certain ceramic types. However, the inclusion in the discriminant analysis of the size variables, which were the best discriminators, had somewhat masked the importance of the differences in the distributions of minority ceramic types. Moreover, discriminant analysis deals with a predetermined number of groups. If there were clear-cut horizontal distributions of groups of decorated ceramic types indicative of social residence units within the site, a cluster analysis would be necessary to discover groupings as opposed to a discriminant analysis used to interpret groupings. Cluster analysis is a tool which has seen extensive recent use in archeology because of its utility in forming classifications. Examples can be cited of use in analysis of mortuary remains to find groupings of burials indicative of status relationships (Peebles 1972), to develop classifications of projectile points (Christenson and Read 1977) and of course for developing ceramic typology (Whallon 1971). Cluster analysis is a family of techniques the variety of which is explored by Blashfield and Aldenderfer (n.d.). The particular approach utilized here is the common heirarchic-agglomerative procedure utilizing the complete linkage strategy performed on a matrix of distance measurements utilizing a Euclidean metric (program details as always, can be found in the appendix).

For this analysis only the 26 units having a density of 40 artifacts/m^3 or greater were used. Distances between units were calculated on the basis of the percentages of 32 minority plain and decorated ceramic types. (Extremely rare types were excluded.) The optimum configuration of the excavated units was reached at six clusters with one group of seven units, two of four, two of three, and one unit which did not link with the others at this level. Table 3 shows the relative frequency of each ceramic type in the cluster in which it is most frequent. More Weeden Island series types reach their highest percentages in groups 2 and 3 than in the other groups; complicated stamping is best represented in groups 2 and 5, while sherds of a chalky paste are most common in groups 3 and 6. Group 1, the largest category, contains peaks for Weeden Island Red, Carrabelle Incised, a small check stamped, and Crooked River Complicated Stamped. The distribution of these groups over the site is shown in Fig. 7.

In addition to a slight tendency for ceramic types from certain series to act as identifying criteria for a single group, there is a tendency for groups to cluster within certain site locales. Thus although the trends are weak, more units identified with Group 1 can be seen in the midden along the creek than in the rest of the site, while groups 2, 3, and 4 are most strongly identified with the southern midden ridge, and the groups 5 and 6 with the eastern midden area.

The results of this analysis certainly do not constitute a test of the hypothesis that kinship-based residence groups are localized in specific areas of the site and are identifiable by specific ceramic

TABLE 3
DISTRIBUTIONS OF MINORITY CERAMIC TYPES AS INDICATED BY CLUSTER ANALYSIS OF AGGREGATED EXCAVATION UNITS IN THE PROBABILITY SAMPLE

Types by series:	Groups:					
	1	2	3	4	5	6
Weeden Island series						
Weeden Island Plain				5.8		
Weeden Island Red	1.0					
Weeden Island Zoned Red			2.0			
Weeden Island Punctated			5.7			
Weeden Island Incised				2.9		
Carrabelle Punctated					2.4	
Carrabelle Incised	1.0					
Keith Incised			0.6			
Indian Pass Incised				1.2		
Tucker Ridge Pinched					0.3	
Check stamped series						
4 - 6 checks/inch			0.6			
7 - 9 checks/inch						1.6
10 + checks/inch	0.5					
Deptford Linear Check Stamped		0.5				
Complicated Stamped series						
Crooked River Complicated Stamped	0.3					
Swift Creek Complicated Stamped					3.8	
Old Bay Complicated Stamped		0.3				
Napier Complicated Stamped			0.3			
Kolomoki Complicated Stamped					0.3	
unidentified rectilinear						1.6
unidentified curvilinear		1.3				
Deptford Simple and Cross-Simple				0.2		
Chalky wares						
St. Johns Plain						17.5
St. Johns Check Stamped						1.6
Papys Bayou Incised			0.3			
Papys Bayou Punctated						1.6
Pasco series						
Pasco Plain					0.6	

Note: data are in percentage form

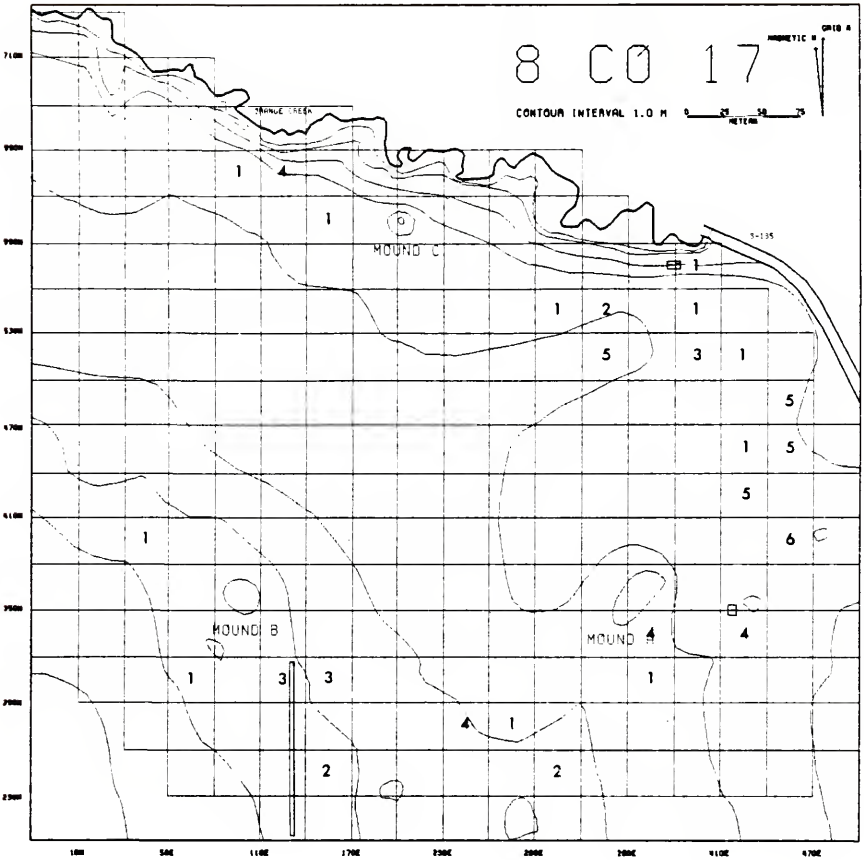


Fig. 7
Location of Intensive Excavations in Relation to
Assignement of Units to Groups by Cluster Analysis

types. They do indicate that there is a patterning to the areal distribution of some of the minority ceramic types. This pattern is not clear, at this stage in the analysis, for three major reasons. The first and most obvious distortion results from having ignored the temporal dimension of change by aggregating all levels of a unit to produce a single score. It is probable that ceramics from different temporal segments of the occupation are being used as defining characteristics for individual clusters as in the case of Group 2, in which both Deptford Linear Check Stamped and Old Bay Complicated Stamped attain peak average relative frequencies.

A second problem is that each data point is represented by a single 2 x 2m test which may have intercepted any of a number of different functional areas in or around a structure. Such possible functional differences cannot be controlled for in this type of sample.

A third difficulty is that the groups selected by the cluster analysis are identified by several ceramic types, while a single type, or possibly even a unit of design included within the range of a single type, may be the necessary target level in the search for design variation correlations with residence areas.

A different approach to analysis is necessary to avoid this last difficulty. The second difficulty can be partially controlled by excavation of larger areas to see whether or not there is significant microareal variation in the distribution of ceramic categories which might be assignable to functional differences. The first difficulty, that of temporal control, is addressed in the analysis of the next season's materials.

Summer 1977 Field Session

The final season of village area excavation reported here was devoted to the excavation of a cluster sample from each of the three major midden areas defined by the analyses described above. The purpose of more intensive excavations in a particular locale was to expose whole structures, if possible, so as to discover what important functional distributions of ceramics might be present in and around different types of structures. Of course, it was extremely desirable to learn more about the structures themselves. Moreover, earlier attempts to develop chronologies from individual, scattered 2 x 2m tests had shown that a much larger sample from a particular locality would be necessary if there was to be any hope of separating within-site horizontal variation from vertical, temporal variation.

The discriminant analysis reported above, in combination with the cluster analysis, had indicated that there were at least three major midden areas within the site: the northern midden by the creek, the eastern village area, and the southern midden ridge. Unless the differences between these were purely temporal, it would be hazardous to develop a single seriation for the entire site and to assume that the ordering so obtained was chronological. For this reason, three areas were selected for more intensive excavation. On the basis of the radiocarbon dates already in hand the area around 312N133E in the southern midden area was believed to be relatively early; the vicinity of square 350N416E in the eastern midden appeared to be late; while the locale opened around square 580N376E in the creek midden was thought to be temporally intermediate. The three areas were thus selected to include the maximum possible spatial and temporal variation.

The Northern Midden Area: Intensive Excavations

During the previous winter square 586N376E had yielded a staggered row of probable postmolds bounded on the western side by a strip of rich midden which continued into the wall beyond the bounds of the unit. Figure 8 shows a plan of the extended excavations in this area and the original surface contours before excavation. As is obvious the entire structure intercepted by the original test was not preserved; the northern and western portions were destroyed by erosional action, apparently in prehistoric times, while the center and a portion of the southern periphery were unexcavatable due to large trees.

From the oval section of postmolds that remained, however, a structure measuring about 3m north-south and 5m east-west can be extrapolated. This is much smaller than Deptford house structures reported by Milanich (1973) on Cumberland Island, Georgia, as ranging between 7 x 10m and 4 x 8m, and also smaller than a Weeden Island period house structure near the Appalachicola River in Northwest Florida which was reported to be 8.9 x 6.2m (Milanich 1974:13).

From the surface contours superimposed on the plan in Fig. 8 it can be seen that at present the ground slants down towards the creek about 90cm between the southernmost and northernmost postmolds, a slope of about 25°. There was also a slant, though of only 70cm (20°), during the time the structure was in use, raising a question as whether it could comfortably have been used as a residence. No living floor was

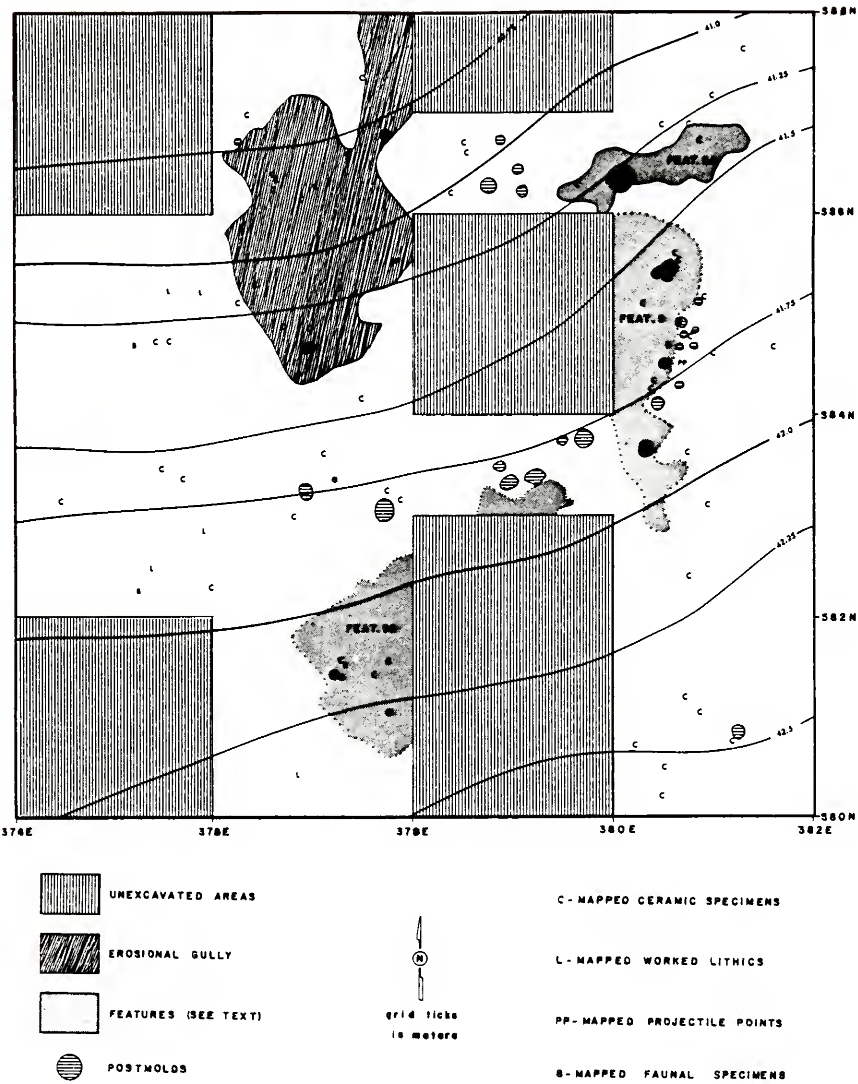


Fig. 8
Plan view of Intensive Excavations in the Northern Midden

visible in the matrix, which was pocked by Geomys burrows and root disturbances. Feature 9 first became visible at about the level the postmolds bottomed out, suggesting that the interior area was dug out between 5 and 20cm below the depth of the surrounding ground. As can be seen in Table 4, two radiocarbon dates from Feature 9 average A.D. 647 $\pm$ 55 using the formula in Long and Rippeteau (1974:209) for averaging radiocarbon dates from the same temporal context. Table 5 lists the cultural contents of each of the three major features from this sample. Features 9 and 9A were similar in containing numerous fragments of bone, all of which was calcined; one of these from Feature 9 was a fragmentary squirrel humerus, while the rest were identifiable only to mammal, or not at all. Feature 9D, on the other hand, contained only six bone fragments, only half of which are burnt or calcined. It likewise contains a higher ratio of ceramics to lithics than the other two features. In their contents and their placement relative to the structure the two northern, linear features are reminiscent of features excavated inside the periphery of a Potano house at 8 Al 100 (Milanich 1972:44). Using ethnohistoric Timucuan parallels Milanich interpreted these as refuse from smudges under the benches or beds lining the interior of the house wall. The earlier radiocarbon date from Feature 9D suggests that it was not associated with this structure at all. Excavations in the creek floodplain to the west have shown that the creek was an active stream which changed its course at least once during the occupation of the site. Since excavations in this area also showed a large erosional gully had been active during the occupation of the site (see Fig. 8), it

TABLE 4
RADIOCARBON DATES AND PROVENIENCES: MOUND B AND MIDDEN

FS #	Area of site	Unit	Provenience/ Association	Processor Number	Uncorrected Date	Average Date (if applicable)
63	Northern midden/ probability sample	558N290E	Feature 2 possible hearth	UM-929 UM-933 UM-934	A.D.1390±70 A.D.1535±70 A.D.1260±65	A.D.1395±40
115	Northern midden/ probability sample	527N431E	postmold associated with Feature 6	UM-930	A.D. 510±75	
263	Northern midden/ northern extension, probability sample	584N380E	Feature 9	UM-1092	A.D. 650±70	A.D. 647±55
264			Feature 9 and associated postmold	UM-1091	A.D. 640±95	
416	Northern midden/ cluster sample	580N376E	Feature 9-D	UM-1257	A.D. 145±100	
181	Southern midden/ probability sample	250N140E	postmold associated with burnt sand	UM-930	A.D. 420±95	
630	Southern midden/ cluster sample	306N133E	Feature 12 probable hearth	UM-1259	A.D. 245±80	
202	Southern midden/ probability sample	312N133E	Feature 8	UM-931	30 B.C. ± 95	
310	Eastern midden/ transect sample	350N416E	Feature 10	UM-1093	A.D. 785±75	
505	Eastern midden/ cluster sample	354N418E	Feature 10-D	UM-1258	A.D. 265±70	
777 778A	Mound B Mound B			UM-1235 UM-1234	A.D. 465±75 A.D. 370±75	A.D. 418±53
782	Mound B		(excluded from Mound B average using Chauvenet's criterion; Long and Rippeteau 1974:208)	UM-1233	80 B.C. ± 65	

TABLE 5
CULTURAL FEATURES, CREEK MIDDEN, CLUSTER SAMPLE

Material category	Feature number: 9	9A	9D
smooth sand tempered plain	25/ 35.7	20/ 50	16/39
grit tempered plain	1/ 1.4	5/ 12.5	5/12
residual plain	27/ 38.6	10/ 25	10/24
Weeden Island Plain	1/ 1.4	1/ 2.5	1/ 2.4
Weeden Island Red	2/ 2.9		1/ 2.4
Weeden Island Zoned Red			1/ 2.4
residual red	1/ 1.4	1/ 2.5	1/ 2.4
Weeden Island Incised			1/ 2.4
Weeden Island Incised & Punctated	2/ 2.9		
Carrabelle Punctated	3/ 4.3		2/ 4.9
unidentified punctated		1/ 2.5	
Carrabelle Incised	2/ 2.9		1/ 2.4
Keith Incised		1/ 2.5	
unidentified incised	1/ 1.4		
check stamped with 4-6 checks/inch		1/ 2.5	
Swift Creek Complicated Stamped	1/ 1.4		1/ 2.4
Crooked River Complicated Stamped	2/ 2.9		1/ 2.4
unidentified rect. complicated stamped	1/ 1.4		
unidentified curv. complicated stamped	1/ 1.4		
total N of ceramics	70/ 99	40/100	41/99.1
worked flint	1/ 5.9	1/ 8.3	
heat-treated flint	5/ 29.4	4/ 33.3	
other flint	8/ 47.1	4/ 33.3	
heat-treated coral	2/ 11.8		
other coral	1/ 5.9	2/ 16.7	
other worked lithic		1/ 8.3	
other lithic			
total N of lithics	17/100.1	12/ 99.9	0
calcined bone	39/100	14/ 74	
other bone		5/ 26	
ratio ceramics/lithics	3.5	3.3	5.9
ratio worked/total lithics	0.05	0.08	0.50
ratio flint/coral	0.15	0.17	0.0
ratio heat-treated/total lithics	0.55	0.33	0.0

Note: data are in raw frequencies/relative frequencies

seems likely that the creek bluff was deforested and unstable. If Feature 9D was associated with an earlier structure, the portion of that structure to the north of the feature was destroyed by creek meandering, flooding, or erosion before the occupation of the structure dated to A.D. 647.

The letters on the plan in Fig. 8 indicate artifacts which were mapped in place. This included all sherds 5 x 5cm or larger, worked lithics, and the large faunal fragments which were rare enough in this acidic matrix to be mapped individually. As might be expected these bits of refuse were concentrated along the row of postmolds and help define the original wall of the structure. One of the few mapped lithics in the eastern half of the excavations was a fist-sized fragment of limestone on one side of the large northeastern postmold. This apparently served as a wedge for the corner post. Judging from the poor definition of the postmolds and the absence of carbonized wood, the posts associated with the structure seem to have rotted in place rather than burned, making their identification more difficult. All were sectioned along two vertical planes to differentiate them from the numerous burrows and root traces in the matrix. Only a small proportion of the stains so sectioned were eventually accepted as postmolds. It is possible that the western posts, of which no trace could be found, were borrowed for other, later uses. However, their probable former placement can be estimated by continuing the arc of the existing postmolds through the areas with high concentrations of mapped specimens.

The Midden East of Mound A: Intensive Excavations

The second area to be more intensively tested was the vicinity of the square with the linear feature yielding the A.D. 785 date. This was square 350N416E, excavated as a part of the transect of the eastern midden area, and located 55m ESE of the top Mound A. Feature 10, from which the carbonized wood for the date was taken, was bounded on one side by a row of postmolds, just as Feature 9 had been; from our very small exposure it seemed likely that this was a portion of a structure. As in Feature 9, the dark-stained humic deposit rich in cultural material which constituted Feature 10 and distinguished it from the light tan sandy matrix began below the top mapping elevation of the postmolds which delimited it, and continued about 40cm below them (see plan view of excavation in Fig. 9). Table 6 lists the contents of each of the major features in this area. Features 10 and 10C were very similar in depths, general size, an abundant lithic and faunal inventory, and a high percentage of burnt and calcined bones. More importantly, both features contained four small fragments of a daub-like material, which appeared to be partially-fired clay, sometimes bearing impressions of what might be sticks or reeds. Since these were not found in the matrix around the features they would seem to be related to the function of the features, rather than the structure as a whole. Features 10, 10C, and 10D also contained a concentration of large rim sherds, along their sides and bottoms, though it would an exaggeration to say that they were sherd-lined. It is suggested that features 10 and 10C were shallow earth ovens inside which foods were cooked with a smoldering fire.

TABLE 6
CULTURAL FEATURES, EASTERN MIDDEN AREA, CLUSTER SAMPLE

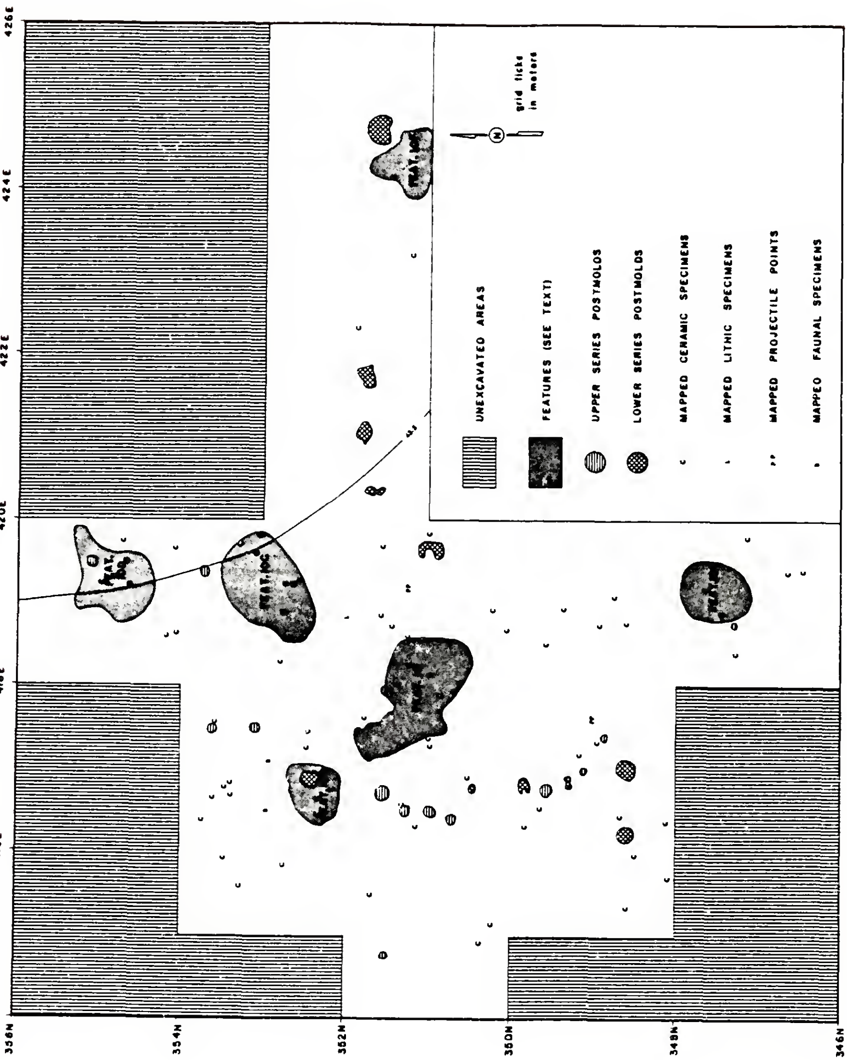
Material category	Feature number: 10	10B	10C	10D	10E	10F
smooth sand tempered plain	17/43	9/32	4/ 7	22/40	1/17	6/67
grit tempered plain	2/ 5		6/11		1/17	
residual plain	7/18	11/39	32/58	29/52	3/50	2/22
Weeden Island Plain	1/ 3	2/ 7	5/ 9	1/ 2		
Weeden Island Red	1/ 3					
Weeden Island Punctated	4/10	1/ 4				
Weeden Island Incised	3/ 8	1/ 4	3/ 6	1/ 2		
Carrabelle Punctated	4/10		2/ 4			
Carrabelle Incised				1/ 2		
Keith Incised		2/ 7				1/11
Papys Bayou Incised		1/ 4				
Indian Pass Incised					1/17	
St. Petersburg Incised			1/ 2			
Pasco Complicated Stamped		1/ 4				
Kolomoki Complicated Stamped			1/ 2			
unidentified rect. complicated stamped				1/ 2		
unidentified curv. complicated stamped			1/ 2			
total N of ceramics	39/100	28/101	55/101	55/100	6/100	9/100
daub-like fragments	4		4			
worked flint		2/33	1/ 3	1/ 9		
heat-treated flint	16/52	2/33	11/37	5/45		3/11
other flint	14/45	2/33	17/57	5/45		24/89
worked coral	1/ 3					
other worked lithics			1/ 3			
total N of lithics	31/100	6/99	30/100	11/99	0	27/100
calcined bone	50/61		40/85	21/91	4/57	15/100
other bone	32/39	4/100	7/15	2/ 9	3/45	
ratio ceramics/lithics	1.3	4.7	1.8	5.0	---	0.33
ratio worked/total lithics	0.03	0.33	0.07	0.09	---	0.00
ratio flint/coral	30.0	---	---	---	---	---
ratio heat-treated/total lithics	0.52	0.33	0.37	0.45	---	0.11

Note: data are in raw frequencies/relative frequencies

These three features along with 10B appear to be associated with the structure partially outlined by the upper series of postmolds in Fig. 9. Feature 10D, which yielded a radiocarbon date of A.D. 265, and 10E, which had a lower mapping elevation than the upper features, may relate to a structure hazily defined by a lower series of postmolds unlike the upper series, which had apparently rotted in place. The posts below appear to have burned. Neither of these structures was complete or well-defined. A borrow pit centered 10m ENE of Feature 10F appears to have partially destroyed the upper series of postmolds. This borrow, apparently for the construction of Mound A, reduced the depth of the midden at least as far away from the borrow's center as the 43.5m surface contour indicated in Fig. 9. If the A.D. 785 date from Feature 10 adequately dates the structure defined by the upper series of postmolds, and if the material removed from this adjacent depression was used as fill for Mound A, then the large platform mound must in part post-date the A.D. 785 structure from which it borrowed. This is the closest to the mound of at least five borrows which probably provided material for the construction of Mound A.

While neither of these structures is complete, the later one can be roughly estimated in size. If the incomplete arc of postmolds separating Feature 10 from 10B is extended to include 10C within the structure, as seems reasonable, it could not have been less than 5m north-south, nor less than 3m east-west. This is approximately the size of the structure adjacent to the creek, but its incompleteness precludes an identification of its function.

Fig. 9
Plan view of Intensive Excavations in the Eastern Midden


356N
354N
352N
350N
348N
346N
414E
416E
418E
420E
422E
424E
426E
N
grid ticks in meters
UNEXCAVATED AREAS
FEATURES (SEE TEXT)
UPPER SERIES POSTMOLDS
LOWER SERIES POSTMOLDS
MAPPED CERAMIC SPECIMENS
MAPPED LITHIC SPECIMENS
MAPPED PROJECTILE POINTS
MAPPED FAUNAL SPECIMENS

The Southern Midden Ridge: Intensive Excavations

The third area to be more intensively sampled was the vicinity of square 312N133E where Feature 8, excavated in the summer of 1976, had yielded a radiocarbon date of 30 B.C. Feature 8 was a round, symmetrical pit nearly a meter deep, with straight, steep sides, which was definitely constructed early in the occupation of this area of the site, since the backdirt from the excavation of the pit clearly underlay, in profile, the main midden accumulation. Despite its excellent context, the date seems open to question in view of the ceramic inventory, presented in Table 7. Nevertheless, the relatively early occupation of this area of the site is underscored by the A.D. 245 date from Feature 12, an apparent hearth in square 306N133E, 6m south of Feature 8.

The original plan for the excavation of this third area was to open up as much horizontal area as possible in all directions adjacent to square 312N133E, in order to delimit the structure (if any) to which the feature pertained. However, no clear structural evidence was found. It was decided to take advantage of the opportunity to excavate a transect across what appeared to be two low ridges south of square 312N133E. Altogether, 27 2 x 2m tests were opened, most of them along the 133E line. For the northernmost 16m adjacent 2 x 2m squares were excavated along this north-south line; over the next 29m, every other possible 2 x 2 along this line was excavated; and as the southernmost extreme of the midden was approached, tests were placed at approximate 10m intervals. One of the southernmost tests was placed in a depression filled to a depth of 60cm with dark grey plow zone material which elsewhere averages

TABLE 7
CULTURAL FEATURES, SOUTHERN MIDDEN RIDGE, CLUSTER SAMPLE

Material category:	Feature number: 8	12
smooth sand tempered plain	52/ 38	4/ 33
grit tempered plain	3/ 2	2/ 17
residual plain	39/ 28	3/ 25
St. Johns Plain	1/ 1	1/ 8
Papys Bayou Punctated	1/ 1	
Weeden Island Plain	7/ 5	
residual red	1/ 1	1/ 8
Weeden Island Punctated	6/ 4	
Weeden Island Incised	4/ 3	
Carrabelle Punctated	5/ 4	
Carrabelle Incised	1/ 1	1/ 8
Keith Incised	1/ 1	
unidentified incised	3/ 2	
check stamped 4 - 6 checks/inch	4/ 3	
check stamped 7 - 9 checks/inch	6/ 4	
cord marked	1/ 1	
unidentified punctated	1/ 1	
total ceramics	136/100	12/ 99
worked flint	1/ 7	
heat-treated flint	9/ 60	1/ 33
other flint	4/ 27	1/ 33
silicified coral	1/ 7	
other lithics		1/ 33
total lithics	15/101	3/ 99
calcined bone	118/ 79	
other bone	32/ 21	
ratio ceramics/lithics	9.1	4.0
ratio worked/total lithics	0.07	0.0
ratio flint/coral	14.0	---
ratio heat-treated/total lithics	0.27	0.33

Note: data are in raw frequencies/relative frequencies

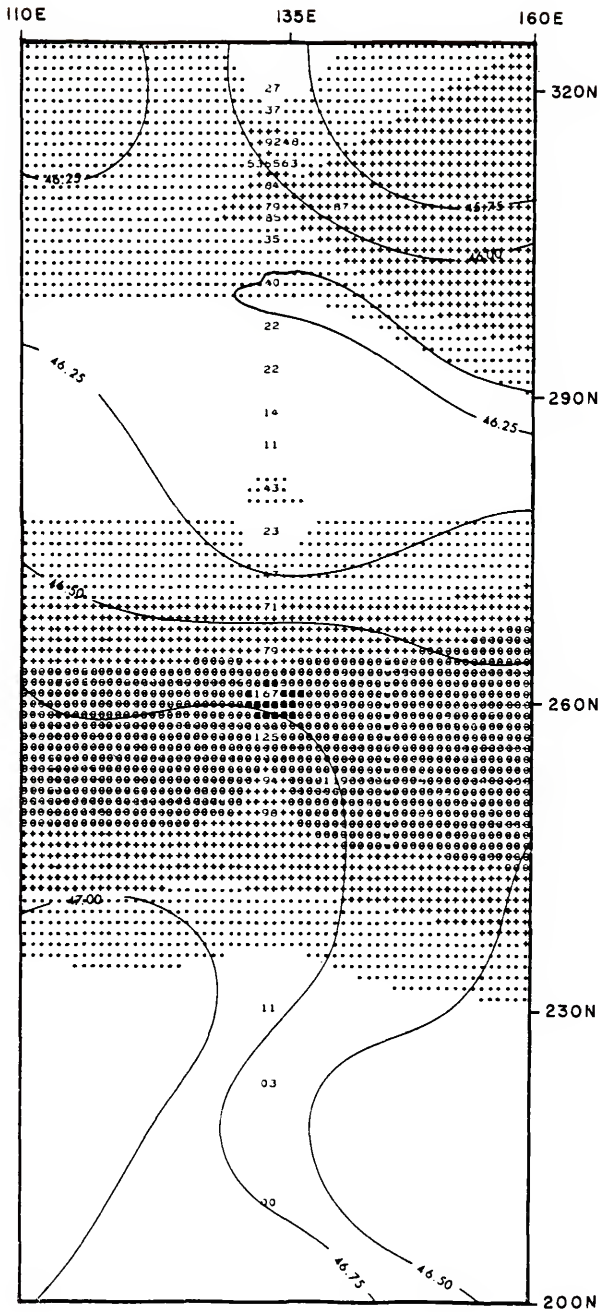
about 25cm deep. This depression was apparently one of the three or four borrows for the construction of Mound B, which was partially filled during years of cultivation earlier in this century. In reality there was only one ridge, and what had first appeared to be a second ridge to the south was a portion of the natural terrace on which the site is located set off by the somewhat linear borrow to the south.

It should be mentioned here that the portion of the site now planted in pines has undergone considerable leveling of its prominences and filling in of its depressions. Within the memory of local informants Mound A was considerably higher and steeper in outline than it is now. Such is also the case for the midden ridges. The northern of the two prominences tested was, like the terrace to the south, a natural elevation which was chosen for habitation. Figure 10 shows the density of artifacts within the area of this cluster sample; the two peaks are just north of the northern ridge, and towards the northern part of the southern terrace. These areas of peak density, which are now slightly higher in elevation than the areas to the north and south, are less prominent than they were during the occupation of the site. Along the long north-south profile exposed intermittently by these tests, it can be seen that Zone I (the plow zone) is more shallow in these two areas than to the north and south. As will be seen in Chapter Five the northern of the two areas with high artifact concentrations was the earlier.

Faunal Remains

The faunal materials from all three intensive excavations along with the material from the earlier probability and transect samples were

Fig. 10
Plan view of Excavations in the Southern Midden:
Isopleth map of Artifact Density


110E
135E
160E
320N
290N
260N
230N
200N
46.25
45.75
46.25
46.25
46.50
47.00
46.75
46.50
27
37
22
22
14
11
43
23
71
79
167
125
98
11
03

analyzed by the author using the facilities of the Florida State Museum Zooarcheology Laboratory with the assistance of Dr. Elizabeth S. Wing and Elizabeth M. Reitz. In general, faunal preservation was very poor. Large identifiable bone fragments were treated on excavation with a mixture of Ethulose and Carbowax but this stabilization was often insufficient in view of the advanced decalcification of the bone brought on by continuous leaching in the sandy acid soils. Fully 65% of the recovered fragments were preserved because they had been partially burnt or completely calcined, and these were always very fragmentary. The average weight of each recovered bone fragments was only 0.25gm.

All identified species (excluding terrestrial snails and obviously modern inclusions) from the midden are listed in Table 8 by number of fragments per element. Of the more than 3000 bone fragments excavated and sorted, 92.0% were identifiable only to phyllum (e.g. Mollusca), class (e.g. Aves), or were completely unidentifiable. Of the few remaining fragments identifiable beyond class, 92% were deer. Under these conditions of obvious differential preservation no attempt has been made to quantify minimum number of individuals or amount of meat represented. No seasonal information was preserved in the sample.

Nevertheless, it is interesting to note that all the positively-identified shells and the shark could not have been obtained locally. The freshwater mussels (Unionidae) might have been obtainable no more than 10km distant, in the Suwanee River, but the salt-water species must have originated on the Gulf littoral (the nearest source would be the Steinhatchee-Deadman Bay area 70km distant) or the Atlantic coastal

TABLE 8
FAUNAL REMAINS: MIDDEN EXCAVATIONS

Taxa:	Element: columella	valve	carapace	plastron	scute	vertebrae	spine	tooth	auditory bulla	coracoid	scapula	humerus	radius	metacarpal	carpal	femur	tibia	metatarsal	unid. long bone	phalange	unidentified	Total
MOLLUSCA																						
cf. *Busycon* spp.	1																					1
cf. *Crassostrea v.*		1																				1
cf. *Uniodidae*		2																				2
unidentified		3																				3
CHONDRICHTHYES																						
Carcharhinus cf. *milberti*								1														1
OSTEICHTHYES																						
Amia calva						1																1
Siluriformes cf. Ictaluridae						2	1															3
Ictalurus sp.						1																1
Micropterus salmoides						1																1
unidentified						1	1															2
REPTILIA																						
Emydidae			6							1												7
Kinosternon spp.			5																			5
Trionyx ferox			1																			1
Deirochelys reticularia			1	1																		2
unidentified turtle			2																			2
Alligator mississipiensis					1																	2

AVES																						
unidentified																			16			16
MAMMALIA																						
cf. Sciurus spp.																1						1
Odocoileus virginiana						11		26	2		1	20	2	1	4	7	15	7	111	13		220
unidentified																					1462	1462
UNIDENTIFIED																					1530	1530
	1	6	15	1	1	17	2	27	2	1	1	20	2	1	4	8	15	7	127	13	2992	3263

areas, possibly from the area of the mouth of the St. Johns River, 100km distant. Of the eight examples of these exotic fauna, five were obtained from the midden directly southeast of Mound B, an area representing less than 1/3 of the total excavated volume.

Of the remaining species, it is perhaps surprising that any fish were identified under these conditions of preservation. Most of the non-deer fauna which survived was calcined, while most of the identified deer survived because it was relatively more massive. It seems likely that fish were very under-represented in the sample, and that if the true proportions were known, they would approximate those at a probably-contemporaneous habitation site in North-central Florida, 8 Al 169 (Cumbaa 1972:48) where approximately 90% of the recorded individuals in the faunal collection originated in swamp and aquatic ecosystems. A similarly heavy reliance on aquatic resources at the McKeithen site would explain the site location in relation to the water resources described at the beginning of the chapter.

No analysis has yet been completed on the flotation samples extracted from the features, although pollen samples are currently being examined.

Before the important question of chronology can be examined in Chapter Four it is necessary to examine more closely the kinds and amounts of cultural material recovered from the village excavations. This is the subject of Chapter Three.

CHAPTER THREE
CERAMIC POPULATION ESTIMATES AND MATERIALS ANALYSIS

In Chapter Two the sampling phase of an anticipated multi-stage sample of the village area at the McKeithen site was described. As a first step, an intensive surface collection over a fraction of the gridded area was used to stratify the site into three sub-groups for excavation. Two of these were believed to be midden areas, the other the plaza and outlying fringes of the village. Following the surface collection, the first phase of the excavation was a probability sample since this eliminated the effects of bias in the computation of population parameters while controlling the other undesirable source of variation in the data--the so-called "random sampling bias" (Anderson and Zelditch 1968:195). The site was stratified for three major reasons:

1. The variability in the computed richness value (hoped to be an estimate of artifact density) for each gridded unit in the surface collection was high enough to indicate that a simple random sample would yield population estimates with very wide confidence intervals (Asch 1975:174).
2. If strata were drawn across the site such that the two areas with high richness values were isolated from the third area with apparently less dense cultural material, the resulting intra-group homogeneity should considerably narrow the eventual confidence intervals around the population estimates.

3. Stratification before selection of grid units to be excavated helps assure a more uniform distribution of tests across the site by eliminating the possibility of extreme clustering in sample location.

Given a stratified probability sampling design, the decision to sample the strata disproportionately was justified in this manner:

1. The village areas themselves were of primary interest, not their fringes, or the central, clear area. A proportionate sample of each stratum without altering the total number of units excavated would have resulted in the excavation of five units in each of the two midden strata, rather than the 10 actually excavated.
2. As large a sample of cultural materials and features as possible was desirable in order to maximize recovery of infrequent data categories.
3. Direct comparison of the two village areas was required by the research hypotheses; hence these were sampled at the same proportion, but more intensively than the intervening areas.

In addition to the three original strata, two additional probability samples were excavated from southwestern and northern extensions to the gridded area.

Estimation of artifact populations from the excavations used only the probability sample and the results of the transect and cluster samples were disregarded since they contain an unknown amount of bias. To compute a point estimate of the total artifacts at the site, the mean for each of the sampling strata is first computed, then weighted by the inverse of the sampling proportion for that stratum. Multiplying this weight factor by the mean and summing the products results in a point estimate for the total population for that artifact at the site (Sudman 1976:126). This procedure is illustrated in Table 9 for the computation of the total number of ceramics at the site.

The reliability of the resultant estimate is found by multiplying the variances around the means of each of the sampling strata by the squares of the strata population sizes, and summing the products (Sudman 1976:128). The square root of this figure is the standard deviation of the total sample estimate. The finite population correction factor which corrects estimates for small populations sampled at a fraction of 0.05 or more can be ignored for this data, since sampling proportions vary between 0.003 and 0.0014 (Read 1975:54).

Applying this procedure to the point estimate of 6,613,000 sherds recoverable using ¼" mesh screen (and ignoring discards averaging less than one gram in weight) a one standard deviation confidence interval around the means results in a range of 4,774,800 - 8,451,200 sherds. That is, there is a 67% probability that the true number of ceramics in the village midden falls within this range of values. This is a surprisingly wide confidence interval, resulting from the mediocre prediction of artifactual densities provided by the surface collections which were used to construct the sampling strata. In fact, in each of the initial strata, units of both high and low artifactual densities were excavated, considerably adding to the variance around the means for each

TABLE 9
PROBABILITY SAMPLES:
SAMPLING STRATA AND ESTIMATES OF TOTAL SITE CERAMIC POPULATION

Stratum	Location	Identification	Area (m^2)	Excavated area (m2)	Sample proportion	N of ceramics	mean	Est. ceramic population
1	northern and eastern areas	village midden	29700	40	.0013	1686	168.6	1,296,923
2	southern and eastern areas	village midden	29700	40	.0013	1672	167.2	1.286,102
3	central, west-ern, and extreme southeast	plaza and outlying	122400	40	.0003	1163	116.3	3,559,826
4	southwestern extension	marginal	12600	16	.0012	18	4.5	14,175
5	northern creek bluffs and bot-toms	village and marginal	17100	24	.0014	640	106.7	456,002
			211500	160		5179		

Overall sampling proportion in probability sample = 0.00076   Overall mean number of ceramics/unit = 129.5

stratum. Of the two additions to the sample excavated during Winter 1977 only the southwestern stratum was homogeneous. In retrospect, a larger sample of the grid units should have been surface collected, as the 33% sample used proved to be inadequate to accurately delineate sampling strata. Unfortunately, given the amount and variability of surface cover and the depth of the midden deposits, it is not certain that even a total collection would have indicated the true extent of the midden deposits.

The totals for each of the ceramic and lithic categories can be calculated as were the total ceramics at the site. These estimates provide the best single summary of the relative frequency of each artifact category in the village as a whole, since they are unbiased, in that each area of the site had equal opportunity to be sampled. This information is presented in Table 10 by the percentage of each type or category in the total ceramic or lithic assemblage.

Ceramics at the McKeithen Site

For a more detailed analysis than the simple classification presented in Table 10 a series of 366 large rim sherds was drawn from the total excavated sample. Sherds were chosen which had enough rim to allow estimation of the vessel diameter at the orifice, and which had enough body to categorize the design element, if any was present. All sherds from each of the three cluster samples which satisfied these requirements were selected for analysis; an additional 34 sherds were selected from the probability sample and surface collections to enlarge rare type categories. Because of these unmeasurable biases, the following

TABLE 10
ESTIMATES OF TRUE RELATIVE FREQUENCIES OF CERAMIC TYPES AND LITHIC CATEGORIES IN THE VILLAGE AREA

Ceramics:	%
Weeden Island series	
Weeden Island Plain	2.54
Weeden Island Red	0.94
Weeden Island Zoned Red	0.18
Weeden Island Punctated	1.49
Weeden Island Incised	1.16
Carrabelle Punctated	1.84
Carrabelle Incised	0.94
St. Petersburg Incised	0.04
Keith Incised	0.39
Indian Pass Incised	0.08
Tucker Ridge Pinched	0.12
St. Johns paste	
St. Johns Plain	1.86
St. Johns Check Stamped	0.32
Papys Bayou Incised	0.05
Papys Bayou Punctated	0.28
Other check stamped ceramics	
4-6 checks/inch	0.37
7-9 checks/inch	1.17
10-12 checks/inch	0.49
Deptford Linear Check Stamped	0.05
Complicated Stamped ceramics	
Swift Creek Complicated Stamped	0.54
Crooked River Complicated Stamped	0.13
Old Bay Complicated Stamped	0.12
Napier Complicated Stamped	0.18
Kolomoki Complicated Stamped	0.04
St. Andrews Complicated Stamped	0.14
unidentified rectilinear	0.39
unidentified curvilinear	0.67
Pasco paste	
Pasco Plain	0.16
Residual categories	
smooth sand tempered plain	30.00
grit tempered plain	2.42
residual plain	47.77
residual red	0.92
unidentified incised	1.30
unidentified punctated	0.18
other[1]	0.74
	100.01

Lithics:	%
worked or utilized flint	5.28
worked or utilized coral	0.51
heat-treated flint (excluding worked or utilized)	30.75
heat-treated coral (excluding worked or utilized)	1.42
other flint	55.32
other coral	4.63
other worked lithic	0.62
other lithic	1.45
mica	0.02
	100.00

[1] includes Pasco Complicated Stamped, Deptford Simple Stamped, Deptford Cross Simple Stamped, Thomas Simple Stamped, Savannah (?) Cord Marked, Alachua Cob Marked, unidentified fabric impressed, St. Johns complicated stamped, St. Johns Incised, Basin Bayou Incised, and Little Manattee Zoned Stamped.

description of the attributes typical of each ceramic type are presented in narrative form, rather than in a crosstabulation table with associated chi-square statistics. These summaries serve as descriptions of the types listed in Table 10, and give the reader an idea of the range of variability within each of the classifications.

Most of the attributes used here are self-explanatory. The vessel shape category utilized very general attribute states to minimize the number of sherds which could not be categorized. Attribute states used were plate, dish, bowl, and vase, in order of decreasing base/wall angle and estimated original width/height ratio. A tall, narrow jar form was differentiated from the tall, narrow vase form on the basis of restriction at or below the orifice. These forms are generalized from Willey's (1949:496-506) study, and representative examples of some of the above shapes may be found in figures 69:c (plate), 69:a,b,d-j (bowl), 71:h-n (vase, equivalent to Willey's beaker form) and 70:a-d (jar). The dish form used in this study is intermediate in profile between the open bowl and the plate forms; examples can be found in O'Brien (1972:56, 72 figures 34:c and 56:c) who refers to them as "shallow, pan-like bowls."

Generalized wall orientation and lip form states are illustrated in Fig. 11.

Ratio-level measurements of wall and lip thickness, orifice diameter, vessel depth, spacing of incised lines, punctation size and spacing, land and groove width, and number of checks per $4cm^2$ area were made when applicable and possible. (Table 10 reports check stamped ceramics by number of checks per linear inch. This sytem was retained as a

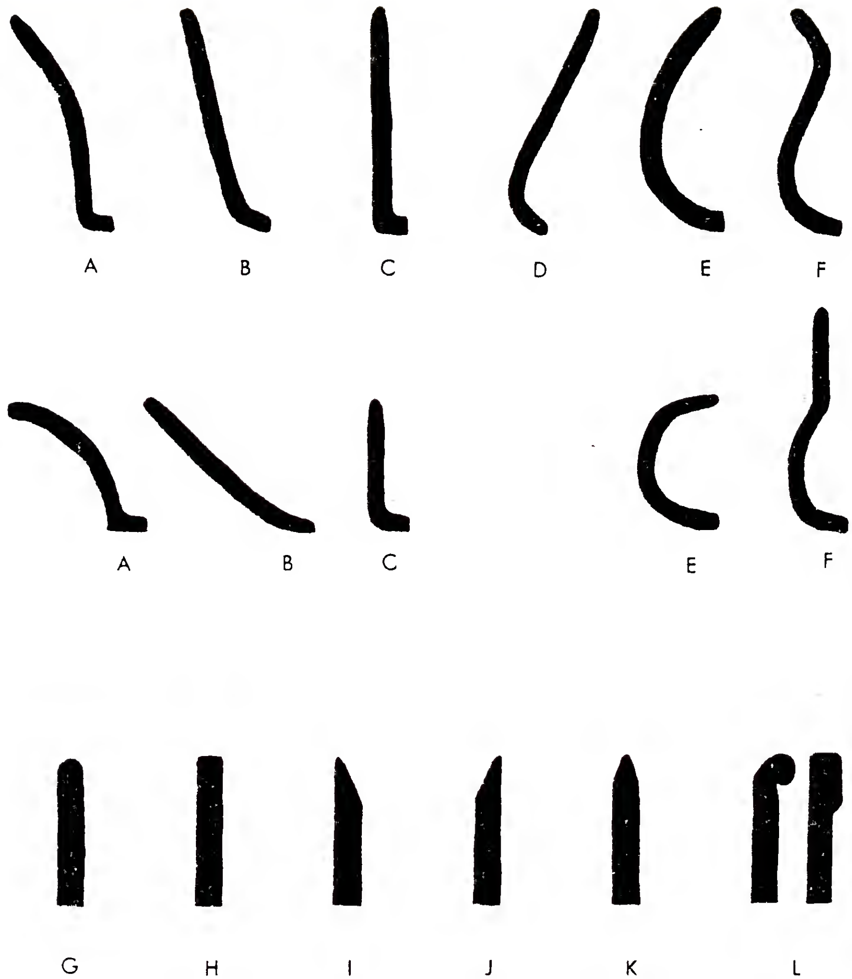


Fig. 11
Wall Profile and Lip Form States Used in the Attribute Analysis
Wall profiles: A outcurved; B outslanting; C vertical; D inslanting; E incurving; F compound. Lip forms: G round; H flat; I beveled towards interior; J beveled towards exterior; K sharpened; L folded.

classificatory device to facilitate comparison with earlier work, for example Sears 1963. Nevertheless, for the attribute analysis, the number of checks was measured on an area basis to eliminate possible ambiguities resulting from whether to measure checks along their long or narrow axis.)

The following comments summarize the ceramics at the site by type as if the modal states for the nominal and ordinal attributes and the means for the ratio-level attributes for each ceramic type were combined on a single vessel; this is the so-called "modal vessel." Other attribute states are cited where these constitute an important minority of observations on an attribute within a type classification, or where the observed frequency of an attribute state for a type dramatically exceeds the frequency expected for that attribute state in reference to the total sample.

Weeden Island Series

Weeden Island Plain. n=102. Modal vessel is a bowl with outslanting walls, a folded lip over a single incised line on the exterior, and smooth interior and exterior surfaces. The paste texture is fine with small but abundant sand inclusions, very sparse white inclusions, and a cross-section which is dark throughout, with black exterior, interior, and core. Mean wall thickness = 7.8mm; mean lip thickness = 8.2mm, mean vessel diameter at orifice= 18.8cm. Variations include a dish form (23.5% versus 11.8% for all types); inslanting wall profile (18.8%); a pointed lateral rim flange on one specimen; a burnished exterior on 21.2% (versus 12.8% for the total sample); and very sparse mica inclusions in 8.7% (versus 6.6% for the total sample). Burnt external carbon encrustations were noted on 9.8% of the sample in the comments; fire-clouding, usually on the exterior and often around the lip, was noted in 34.3% of the specimens.

Weeden Island Zoned Red. n=10. Modal vessel is a bowl with outslanting walls, a folded lip over a single incised line on the both the interior and exterior surfaces with red filming present on both the interior and exterior. The filming is contained inside zones set off by a single fine incised line which may be straight or curvilinear. Paste texture is fine with small but abundant sand inclusions and very sparse red inclusions. In cross-section the paste is light tan or light grey on both the interior and exterior, with no distinct coring present. Mean wall thickness = 7.8mm, mean lip thickness = 9.2mm, and mean vessel diameter at orifice = 23.3cm. Important variations include the dish form, which occurs on 40% of the specimens, much higher than the 11.8% occurrence among all types taken together. Presence of mica was noted in 20% of the specimens versus 6.9% in the total sample. Two specimens exhibit external fire-clouding, and one external carbon encrustations.

Weeden Island Red. n=7. Described by Sears (1956:19) on the basis of a misunderstanding with Willey; yet this type is substantially different from Weeden Island Zoned Red at McKeithen, so retention as a type is recommended. Modal vessel is a bowl with outslanting walls and a folded lip with no incision underneath. Filming always occurs on the interior and, usually, on the exterior as well, covering the entire wall. Paste texture is fine with small but abundant sand inclusions, and sparse black and red inclusions. In cross-section the exterior surface is a medium to dark reddish-brown to reddish grey, while the interior surface and the core is black. Mean wall thickness = 7.4mm, mean lip thickness = 7.1mm, and mean vessel diameter at orifice = 20cm. Important variations include the presence of a single incised line under the lip on the exterior only. Plate and dish forms occur on 33.4% of the specimens, higher than the 13.8% constituted by these forms in the total sample. Mica occurs in 28.6% of the specimens compared to 6.9% in the total sample. Two specimens exhibit external fire-clouding.

Weeden Island Punctated. n=12. Modal vessel is a bowl with out-slanting walls, a folded lip set off by more than one incised line and punctations on the exterior. The interior is smoothed and the exterior is smoothed or burnished. The most common decoration is a series of 1-2 mm adjacent linear punctations on the exterior in a variety of arrangements. Paste texture is fine with small but abundant sand inclusions and very sparse red inclusions. In cross-section the paste is black throughout, at the core and on both surfaces. Mean wall thicknesses = 7.3mm, mean lip thickness = 7.5mm, and mean vessel diameter at orifice = 16.4cm. This type and the next are highly variable in design and shape, but generally excellent in execution. Important variations include plate and dish forms (27.3% versus 13.8% in the total sample); compound wall profiles (16.7% versus 5.5% in the total sample); a single row of punctations under the lip with no incised line (25% versus 2.5% in the total sample); lips decorated on both the top and the exterior (25% versus 3% in the total sample); very fine paste texture (33.3% versus

9.1% in the total sample); and presence of mica inclusions (25% versus 6.6% in the total sample.) Interior and exterior surfaces are light tan or light grey almost as frequently as they are black. Exterior fire clouding and carbon encrustations occur on one specimen each. Lip additions of adornos (too fragmentary to characterize) or triangular lateral flanges occur on one specimen each. The interior decorated surface on the rim of a Weeden Island Punctated dish is illustrated in Fig. 12a.

Weeden Island Incised. n=8. Only vessel form in sample is a bowl with either inslanting or incurving walls and a folded lip over one or more incised lines on the exterior. Interiors and exteriors are smoothed, and incised lines of medium width or of two distinct widths decorate the exterior. The motif is generally curvilinear and complex, usually in combination with 2-4mm triangular punctations spaced 2-5mm apart which occur in zones demarcated by the incisions. Paste texture is variable, ranging from very fine (25%) to coarse (37.5%) with fine sand inclusions moderately abundant and red inclusions very sparse. Exterior surface in cross-section is usually dark brown or dark grey to black; the interior surface is medium brown or medium grey to black, with no distinct core present. Mean wall thickness = 7.4mm; lip thickness = 7.5mm; diameter at orifice = 13.7cm. Important variations: lip may be set off by both incised lines and punctations (12.5% versus 3.0% in the total sample); decoration may occur on both top of lip and exterior (12.5% versus 3.0% in the total sample); several specimens exhibit two different shapes of punctations--the small triangular form, and a large round form. One

FIG. 12
EXCAVATED CERAMICS
A Weeden Island Punctated; B - F Carrabelle Punctated. Proveniences: A 310N133E Zone II level 3; B 527N431E Feature 6; C Balk between 350N 418E and 352N418E, Feature 10; D 350N418E Zone I; E 583N378E Zone II level 4; F 348N416E Zone II level 1. Scale 1:1.

specimen is entirely filmed with red, and two others show traces of red filming. Lateral triangular or rounded rim flanges occur on one specimen each; one specimen exhibits external carbon encrustations. A classic example of the type is illustrated in Fig. 13d.

Carrabelle Punctated. n = 31. Modal vessel is a bowl with incurving walls and a folded lip set off by a single incised line on the exterior. Interior is smoothed and undecorated; the exterior is smoothed and, where there is enough wall to ascertain the extent of the decoration, it is usually confined to a band below the rim. The decoration consists of a series of punctations which for analysis were grouped into six main categories: round to oblong (13.3%, Fig. 14); triangular (26.7%, Fig. 12f); fingernail (16.7%, Fig. 12c-12e); hollow reed (23.3%, Fig. 12b); linear (10.0%), and rectangular to square (3.3%). Another 6.7% fit none of these categories. The modal punctation diameter is 4-6mm, and the modal distance separating the punctations is 5-8mm. Paste is either fine or intermediate in texture; sand inclusions are small but abundant. The paste in cross-section is most often dark throughout with a black exterior and a dark brown to dark grey interior surface. Mean wall thickness = 6.8mm; mean lip thickness = 6.0mm; and mean vessel diameter at orifice = 16.4cm. Important variations: a vase form is occasional (10.7% versus 1.7% in the total sample); some lips are flattened on top (26.7% versus 20.0% in the total sample. Very sparse white inclusions in the paste occur in 41.9% of the specimens (versus 48.4% for the sample as a whole) while sparse to very abundant red inclusions can be found in 58.1% of the specimens (versus 50.5% of the total sample).

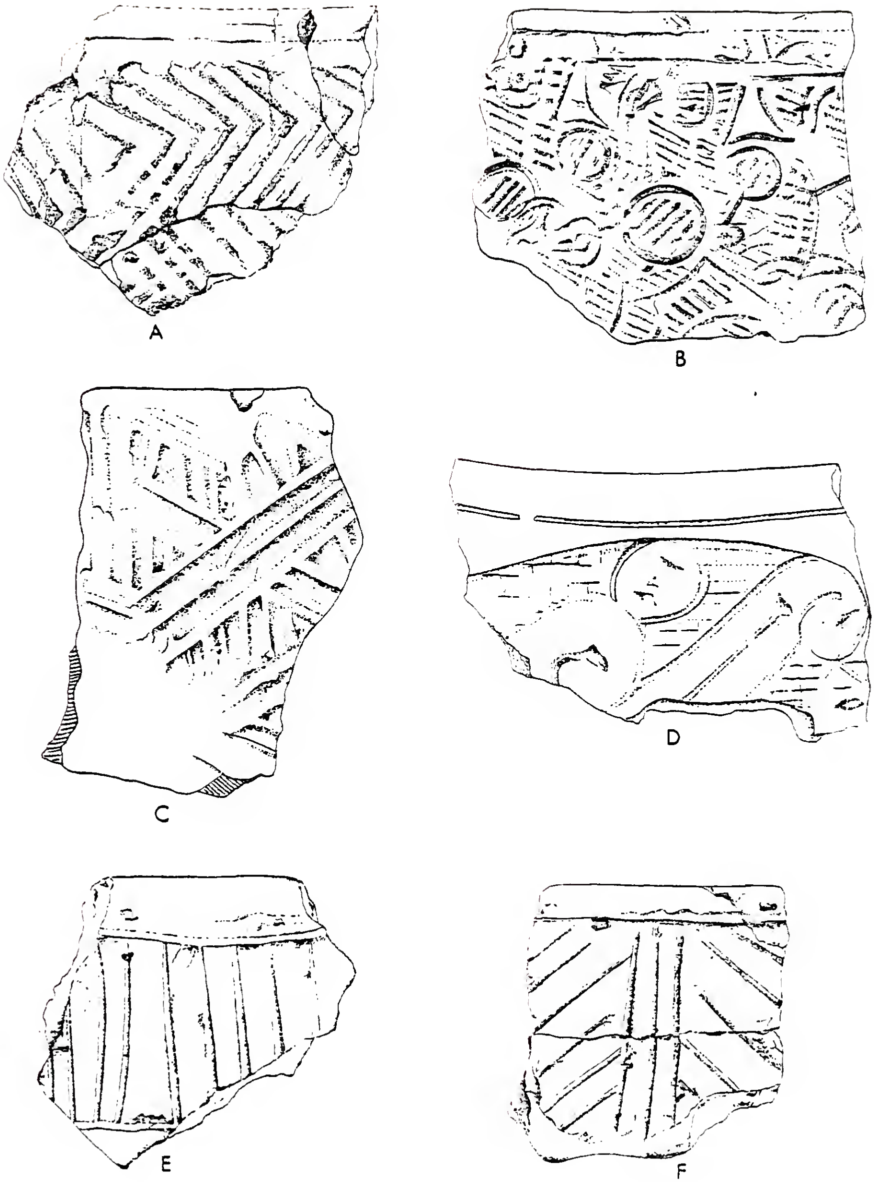


FIG. 13
EXCAVATED CERAMICS

A Crooked River Complicated Stamped; B "St. Johns complicated stamped"; C Napier Complicated Stamped; D Weeden Island Incised; E and F Carrabelle Incised. Provenciences: A 312N135E Zone II level 5; B 270N133E Zone II level 4; C 583N378E Zone II level 5; D 586N380E Zone II level 1; E 558N 400E Zone II level 2; F 254N133E Zone II level 4. Scale 1:1.

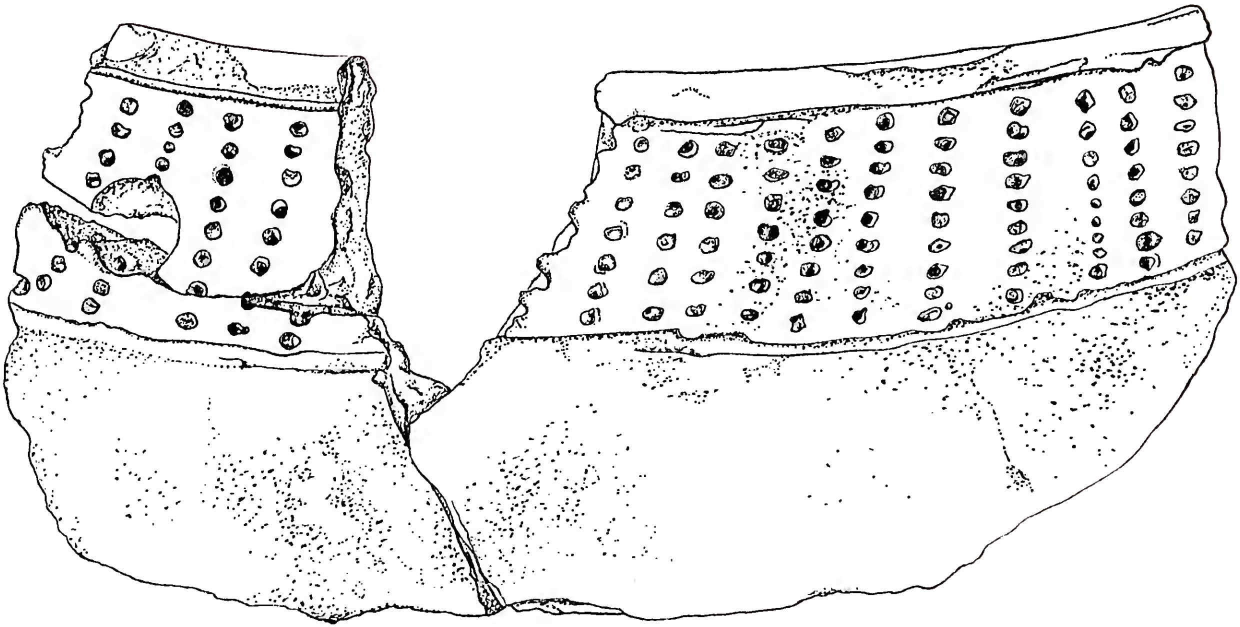


FIG. 14
EXCAVATED CERAMICS--CARRABELLE PUNCTATED
Cross-matched from 348N418E Zone II level 2 and 348N418E Zone II level 4. Scale 1:1

External carbon encrustations occur on 25.8% of the specimens; external fire-clouding on 12.9%.

Carrabelle Incised. n = 38. Modal form is bowl with inslanting or incurving walls and a folded lip over a single incised line on the exterior. Both the interior and exterior surfaces are smoothed, and where there is enough wall to determine the extent of the decoration it is confined to a band below the rim. The most common decorative motif is composed of fine incised lines spaced 4-6mm apart running in one direction on a diagonal to the rim. Paste texture is fine or intermediate with abundant fine sand inclusions, sparse to very sparse white inclusions, and intermediate to very sparse red inclusions. In cross-section a dark central core is surrounded by black interior and exterior surfaces. Mean wall thickness = 7.2mm, mean lip thickness = 6.4mm, and mean vessel diameter at orifice = 17.4cm. Important variations: a jar form was noted in 4.6% of the specimens (the only jars in the total sample); outslanting (17.9%) and compound (16.7%) wall profiles were occasional; lips brought to a thin leading edge (sharpened) account for 21.9% of these specimens (versus 7.1% for the total sample); triangular or rounded lateral flanges occur on 3 specimens (7.9% versus 2.5% for the total sample.) Other common decorative motifs are vertical lines (15.4%) or diagonal lines in two directions separated by a single vertical line forming a series of "trees." A minority of sherds exhibit abundant sand inclusions of intermediate size (15.8%) and very sparse mica inclusions were noted in 7.9% of the specimens. Fire-clouding was noticeable on 13.2% of the specimens, and 15.8% exhibited carbon encrustations on the interior or exterior. Two motifs are illustrated in Fig. 13e and f.

Keith Incised. n = 5. Modal vessel is a bowl with inslanting walls and a rounded lip over a single incised line on the exterior. Both the interior and exterior surfaces are smoothed. Incised lines of medium width spaced at 6-10mm intervals are placed diagonally to the rim in two directions, crossing at approximate 90° angles. Paste is intermediate in texture, fine sand inclusions are abundant, and white and red inclusions very sparse. Interior and exterior surface colors are variable with specimens equally distributed between light reddish-brown and reddish-grey tones and black tones. Most exhibit a black central core. Mean wall thickness = 8.2mm; mean lip thickness = 6.4mm; and mean vessel diameter at orifice = 21.5cm. Fire-clouding and carbon encrustations were noted on one specimen each.

Tucker Ridge Pinched. n = 3. Sample too small to characterize.

St. Johns paste

St. Johns Plain. n = 10. Modal vessel is a bowl with inslanting walls and a folded lip which is undecorated. Interior and exterior surfaces are smoothed and the paste is fine in texture. Sand inclusions are generally small and sparse while abundance of sponge spicules ranges from intermediate to very dense. White inclusions are sparse, and reddish-brown inclusions are very sparse. Paste is generally dark throughout with black interior and exterior surfaces. Mean wall thickness is only 6.5mm, mean lip thickness 6.8mm, and mean diameter at orifice 14.7cm. Important variations include outslanting walls on 30%

of the specimens; a single inclised line on the exterior under the lip in 40% of the specimens (versus 86.1% in the total sample) and dark brown to dark grey color on 20% of the exteriors and 30% of the interiors. Fire-clouding was noted on 40% of the sherds, and carbon encrustations on 20%.

St. Johns Check Stamped. n = 4. Modal vessel form is a bowl with vertical walls and a sharpened (thinned) lip which may be either undecorated or set off by a single incised line on the exterior. Interior surfaces are smoothed, while the exterior seems to be paddle stamped over the entire surface. Checks are either square or parallelogram in shape with land and groove widths both normally 1-2mm. Number of checks per $4cm^2$ area is highly variable, ranging from 0-9 to 50-79. Paste texture is fine with sparse, fine sand inclusions. Density of sponge spicules ranges from sparse to very abundant; white inclusions are sparse, and reddish-brown inclusions are absent or very sparse. Interior and exterior surface colors have no mode in this small sample; a dark central core is generally present. Mean wall thickness = 7.0mm; mean lip thickness = 6.8mm; mean diameter at orifice = 25.3cm.

St. Johns complicated stamped. n = 5. This is not a formally defined type, but a logical appellation for a Swift Creek-like curvilinear complicated stamping on a St. Johns chalky paste. Only form represented is a bowl, usually with inslanting or incurving walls and a folded lip with no incision below. The interior surface is smoothed, and the exterior appears to be entirely paddle stamped. Motifs include bull's-eyes, concentric ovals or eyes set in a field of flowing lines, and a unique arrangement of circles filled with parallel, straight lands set in a field of check stamps (Fig. 13b.) Land width is generally very narrow--less than or equal to 1mm--and groove width only slightly wider at 1-2mm. Paste texture is fine, with sparse inclusions of fine sand, sparse to very abundant sponge spicules, and very sparse white inclusions. Exterior surfaces may be either light tan to light grey or dark brown to dark grey; interior surfaces are either black or dark brown to dark grey; all have a dark central core. Mean wall thickness = 5.6mm; mean lip thickness = 6.4mm; and mean vessel diameter at orifice = 17.6cm. Variants include outslanting walls (20%), a lip which is flattened (20%) or beveled towards the interior (20%); a single incised line on the exterior under the lip (40%); and very sparse reddish-brown inclusions (40%).

Papys Bayou Incised. n = 1. Sample too small to characterize.

Papys Bayou Punctated. n = 1. Sample too small to characterize.

Other Check Stamped ceramics

Wakulla Check Stamped. n = 9. Bowl is the modal form; walls are most commonly inslanting, culminating in a folded lip which is not usually set off from the paddle stamping covering the entire exterior. Interior surface is usually smoothed. Rectangular checks are more common than square; on half of the rectangular specimens the lands in one direction are somewhat wider than the lands in the other direction. Land and groove width is most often 1-2mm. Number of checks per $4cm^2$ area is bimodal, peaking at 10-19 and again at 40-49. Paste texture is intermediate with a moderate amount of fine sand inclusions. Interior and exterior surface color is most often dark brown to dark grey with a dark central core. Mean wall thickness = 6.4mm; mean lip thickness = 7.4mm; and mean diameter at orifice = 20.8cm. Variations include compound wall profiles (25% versus 5% in the total sample), a single incised line under the lip on the exterior (33%) and sparse to very sparse white inclusions (44%). Two specimens exhibit carbon encrustations; fire-clouding was noted on one specimen.

Gulf Check Stamped. n = 1. Sample too small too characterize.

Other Complicated Stamped Ceramics

Swift Creek Complicated Stamped. n = 8. Only form represented is the bowl, usually with either outcurving or inslanting walls and folded lips not set off from the paddle stamped decoration which usually covers the entire exterior of the vessel. Interiors are smoothed. The bull's-eye and the barred circle are common motifs. Land width is generally 1 - 2mm, and groove width 2 - 3mm. Paste is intermediate in texture with abundant fine sand inclusions. Exterior surface is most often dark brown to dark grey and the interior surface black. Presence of coring is highly variable, equally split between none at all, a dark central core, and a dark central core adjoining a dark interior surface. Mean wall thickness = 7.3mm; mean lip thickness = 6.4mm; and mean diameter at orifice = 23.8cm. Variants include a flattened lip (25%), a single incised line on the exterior under the lip (37.5%), and sparse to very sparse red inclusions (50%). Internal and external fire-clouding was noted on one specimen, and carbon encrustations on two.

<u>Crooked River Complicated Stamped</u>. n = 7. Bowl is most frequent form, generally with inslanting walls and a folded lip usually set off by a single incised line on the exterior. The interior surfaces are smoothed; on the exterior the rectilinear complicated stamp seems to cover the entire vessel. The common design element is the chevron (Fig. 13a). Land width varies from 1-3mm while the groove width is generally 2-3mm. Paste is fine in texture with abundant fine sand inclusions and very sparse white and red inclusions. Exterior surface is generally black; the interior surface, either black or medium brown to medium grey; in cross-section, the paste looks uniformly dark throughout. Mean wall thickness = 7.1mm; mean lip thickness = 7.1mm; and mean vessel diameter at orifice = 18.7cm. Both a dish (14.3%) and a vase (14.3%) form were noted, as were incurving wall profiles (28.6%), undecorated lips (42.9%), and very sparse mica inclusions (14.3%).

<u>Old Bay Complicated Stamped</u>. n = 4. Only form represented is the bowl with either vertical or inslanting walls and a flattened lip above a single incised line on the exterior. The interior surface is smoothed. The exterior paddle stamping covers the entire wall and possibly the entire exterior. The motif is a series of concentric circles or bull's-eyes set in a field of check stamps. The land width is generally very narrow, less than or equal to 1mm; the groove width is generally 1-2mm. The checks are small, usually 50-79 per $4cm^2$ area, and the paste texture coarse with a moderate amount of intermediate size sand inclusions and sparse to very sparse white inclusions. The exterior and interior surfaces are usually light tan to light grey surrounding a dark central

core. Mean wall thickness = 8.0mm; mean lip thickness = 7.3mm; and mean vessel diameter at orifice = 18.0cm. Variants include lips which are rounded or folded. Since the author found it impossible to distinguish between Willey's New River Complicated Stamped (1949:386) and his Old Bay Complicated Stamped (1949:437) only the latter type was used for classification.

Napier Complicated Stamped. n = 4. Only form represented is the bowl with outslanting, vertical, or incurving walls and a folded lip over a single incised line on the exterior. The interior surface is smoothed while the exterior appears to be stamped on the walls only with a motif generally composed of parallel lands zoned into a diamond shape, separated by three or more lands. The lands are generally narrow, from less than 1mm to 2mm in width, while the grooves range from 3-4mm in width. The paste texture ranges from fine to coarse with abundant sand inclusions of intermediate size and very sparse red inclusions. Interior and exterior surface color is highly variable, ranging from a light grey or light tan to a dark grey or dark brown with some darker coring towards the center and the interior surface usually present. Mean wall thickness = 7.0mm; mean lip thickness = 5.8mm; and mean vessel diameter at orifice = 19.3cm. A variant which is atypical in both its design motif and its large land and groove width is illustrated in Fig. 13c.

Kolomoki Complicated Stamped. n = 1. Sample too small to characterize.

St. Andrews Complicated Stamped. n = 1. Sample too small to characterize.

Other Ceramics

Plain. n = 84. A residual category which includes the smooth sand tempered plain, grit tempered plain, and residual plain groups listed in Table 10, but excludes named paste variants such as Pasco Plain and St. Johns Plain. The bowl is the overwhelmingly dominant form (90.5%) with the dish form (6.0%) next in frequency. Outslanting walls are most common (28.6%) followed by an incurving wall profile (23.8%). The most common treatment of the lip is flattening (29.8%) followed by a simple, unmodified round form (26.2%). The lip is rarely (7.1%) set off by a single incised line on the exterior which is usually partly obliterated. The interior surface is generally smoothed (69%) but may be unsmoothed (29.8%). Likewise the exterior may be smoothed (53%) or unsmoothed (45.8%). The paste is intermediate in texture (40.5%) or fine (33.3%) with abundant inclusions of fine sand (34.5%) or a moderate amount of fine sand inclusions (21.4%). Very sparse white inclusions occur in 60.7% of the specimens; very sparse black inclusions in 27.4%, and very sparse red inclusions in 44%. Exterior surface color is most frequently black (45.2%) or dark brown to dark grey (25%); likewise on the interior surface black is the most common color (44%) followed by dark brown to dark grey (28.6%). The paste, then, is usually dark throughout (34.5%) but in 22.6% a darker central core is present. Mean wall thickness = 7.4mm; mean lip thickness = 6.5mm; and diameter at orifice = 17.2cm.

Deptford Simple/Cross Simple Stamped. n = 1. Sample too small to characterize.

<u>Savannah (?) Cord Marked</u>. n = 1. Sample too small to characterize.

<u>Basin Bayou Incised</u>. n = 1. Sample too small to characterize.

Discussion

It would be possible to divide this group into analytical classes in several different ways. One dichotomy between the types in the analysis could be made on the basis of presumed locus of origin; that is, local versus non-local. Such a division would permit the location of areas in the site which contain a preponderance of non-local ceramics. Both paste and design can be used as indicators of origin. While the technical analyses of local clay sources and a comparison with the paste of the McKeithen ceramics is just beginning, early indications are that clays easily exploitable in the immediate vicinity of the site contain neither sponge spicules nor micaceous inclusions (Ann Cordell: personal communication). Ceramic types which proved to contain high densities of sponge spicules include--

St. Johns Plain
St. Johns Check Stamped
"St. Johns complicated stamped"
Papys Bayou Punctated
Papys Bayou Incised

In only a few ceramic types was the incidence of micaceous inclusions noted in more than 10% of the specimens. These include--

Weeden Island Red (28.6%)
Weeden Island Zoned Red (20%)
Weeden Island Punctated (25%)
Weeden Island Incised (12.5%)
Crooked River Complicated Stamped (14.3%)

In other instances known regional distributions of ceramic types indicate a non-local origin. Such is the case with Kolomoki Complicated Stamped, which has a well-documented geographical distribution peaking in the Chattahoochee River area of southwestern Georgia (Sears 1956; Steinen 1976). Likewise, Napier Complicated Stamped seems to have a piedmont Georgia center of distribution (Sears 1956, Wauchope 1966). Pasco series ceramics reach their peak frequencies at the Crystal River site on the North Peninsular Florida Gulf Coast (Kohler 1975, Bullen 1953). This is a very minimal list; other ceramics which could probably be considered non-local (such as Old Bay and St. Andrews Complicated Stamped, Tucker Ridge Pinched, and Indian Pass Incised) have not been included because they are such minor types wherever they are present that it is difficult to pinpoint centers of high frequency.

Another possible dichotomy could be drawn between those types which are represented almost exclusively by the bowl form (which comprises 83.6% of the sample above) and those types in which more exotic forms are well represented. In Chapter One evidence was presented to predict a high diversity of vessel shape in high-status areas. Selecting ceramic types which include more than 25% non-bowl forms, and excluding types for which the sample is less than five specimens, the following list results:

Weeden Island Plain (26.4% non-bowl)
Weeden Island Red (33.4% non-bowl)
Weeden Island Zoned Red (37.5% non-bowl)
Weeden Island Punctated (27.3% non-bowl)
Crooked River Complicated Stamped (28.6% non-bowl)

The presence of polishing or burnishing is an uncommon attribute state for surface finish in this sample. A similar list results by isolating types for which exterior polishing or burnishing occurs on more than 25% of the specimens (again excluding rare types):

Weeden Island Zoned Red (28.6% polished)
Weeden Island Punctated (50% polished)
Weeden Island Incised (25% polished)

Presence of lip additions such as adornos and lateral flanges add increased diversity to vessel form without obvious practical significance, and occur in a frequency of 10% or higher on the following list of ceramic types:

Weeden Island Zoned Red (10%)
Weeden Island Plain (16.7%)
Weeden Island Incised (25%)

Such lists could be continued using presence of other traits such as filming or painting, interior surface burnishing, and occurrence of extra fine paste texture as classificatory variables. The four ceramic types which occur most frequently in all such lists are the Weeden Island decorated ceramics, in the strict sense:

Weeden Island Red
Weeden Island Zoned Red
Weeden Island Punctated
Weeden Island Incised

Of course these constitute what has been called the sacred ceramic series (Sears 1973) which at the McKeithen site constitutes some 3.77% of the total ceramics in the village area. In all cases in the village these are either "utility" or "abstract" forms which could have had a utilitarian function even though some contain form modifications which have no clear utilitarian advantage (Sears 1956:23). Effigy forms have not as yet been identified from the village context, though they are known to occur in Mound C (Milanich n.d.b). Where these ceramic types are found in the village (and as will be shown in Chapter Five, the distribution is uneven) they exhibit about the same percentage of carbon encrustations as the total sample of ceramics, suggesting that at least some were used for the mundane functions of food preparation in spite of their decorative appearance.

Lithics at the McKeithen Site

The worked or utilized lithics (which by reference to Table 10 include about 6.4% of the total lithics in the village) are of two major materials: flint (used in the traditionally broad archeological sense) which is by far the more abundant, and is presumably available locally; and silicified coral, which is available within 10km of the site in and adjacent to the Suwannee River.

Though the projectile points taxonomies of Bullen (1975) or Cambron and Hulse (1975) have not been used, the general range of projectile points includes Bullen's Pinellas, Tampa, Ichetucknee, "Florida Copena," Jackson, and Duval, with the Florida Archaic Stemmed points and a possible fragmentary Santa Fe point coming from the surface collections, plow zones, and the creek bordering the site to the north. The excavated series of points includes specimens conforming to Cambron and Hulse's definitions of Hamilton, Montgomery, Bradley Spike, Greeneville, Guntersville, Nodena, and possibly Coosa point types.

For analytical purposes the excavated series of reasonably complete projectile points was visually divided into ten similar classes primarily on the basis of shape, and, secondarily, size characteristics. Some of these analytical groups equate with a published taxon; others subdivide or crosscut existing taxa. A single example of each group is illustrated in Fig. 15. The descriptive terminology follows Cambron and Hulse's pseudo-botanical approach.

The Projectile Points

Group 1. n = 7. Concave base; biconvex or median-ridged in cross-section; blade straight or incurvate; 3 specimens have expanded, pointed auriculate bases; two (including the illustrated specimen, Fig. 15a) have serrated edges. Includes Bullen's Pinellas subtype 3. Length: maximum 26mm; minimum 19mm. Width: maximum 22mm; minimum 13mm. Six are of flint, and four of these are heat-treated. One specimen is of silicified coral.

Group 2. n = 10. Base rounded or excurvate; cross-section biconvex or median ridged; blade excurvate with acute distal end. Includes Bullen's Tampa; Cambron and Hulse's Montgomery. Length: maximum 49mm; minimum 24mm. Width: maximum 26mm; minimum 13mm. One specimen of silicified coral, the remaining of flint, of which three appear heat-treated, including the specimen in Fig. 15b.

Group 3. n = 16. Base usually straight; cross-section biconvex or flattened; blade straight or slightly excurvate with acute distal end. Includes Pinellas variants; similar to Group 7 but with a lower length/width ratio. Length: maximum 39mm; minimum 24mm. Width: maximum 22mm; minimum 12mm. 14 specimens of flint; three of these are heat-treated. One specimen of silicified coral, and one specimen (Fig. 15c) on fine milky quartz.

Group 4. n = 7. A group of crude and variable small points of which four are assymetrical. Two specimens, including the illustrated

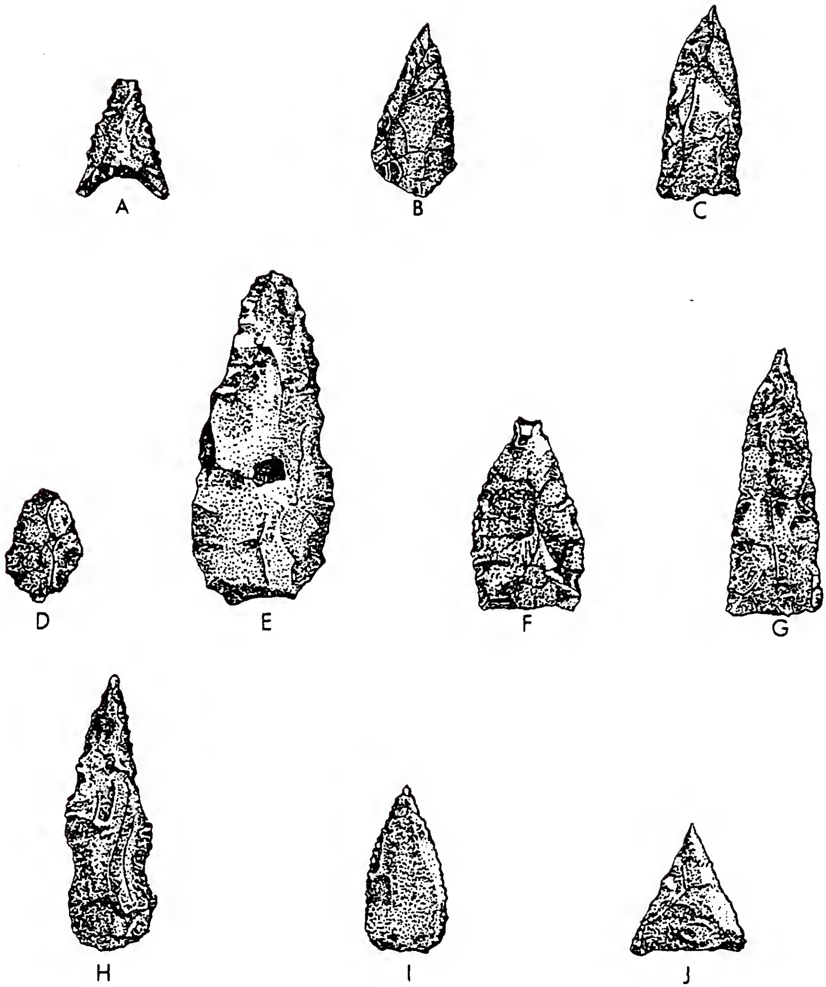


Fig. 15
Excavated Examples of Projectile Point Categories
A Group 1; B Group 2; C Group 3; D Group 4; E Group 5; F Group 6; G Group 7; H Group 8; I Group 9; J Group 10. Proveniences: A 586N380E Zone II level 4; B 586N376E Zone II level 3; C 558N400E Zone II level 4; D 582N380E Zone II level 4; E 620N105E Zone II level 3; F 606N166E level 3; G 350N414E Zone II level 5; H 350N414E Zone II level 1; I 434N421E Zone II level 1; J 312N133E Zone II level 2. Scale 1:1.

example in Fig. 15d, have a suggestion of a short rounded stem. Distal end may be obtuse or acute; blade is straight or recurvate. Includes Cambron and Hulse's Coosa point. Length: maximum 23mm; minimum 16mm. Width: maximum 23mm; minimum 16mm. Width: maximum 16mm; minimum 10mm. Six specimens are of flint, of which two appear heat-treated; one specimen is of silicified coral.

Group 5. n = 9. Base usually straight with a pronounced median ridge in most specimens; blade is straight or excurvate. Most of these are relatively long, thick and crude, and five have portions of cortex remaining on the blade. Includes Cambron and Hulse's Bradley Spike type. Length: Maximum 56mm; minimum 37mm. Width: maximum 26mm; minimum 18mm. Only three of the specimens are of flint; two of these are of a very poor grade stone, and one is heat-treated. The other five are made from silicified coral; this is the only group for which coral was the preferred raw material. Some of the specimens, including that illustrated in Fig. 15e, resemble Bullen's Itchetucknee point in outline, but fail to meet the "small, nicely made" criteria.

Group 6. n = 16. Important features are the parallel sides with a straight base; many are flattened in cross-section. Blade may also be somewhat excurvate. Includes Bullen's Florida Copena, and Cambron and Hulse's Greeneville. Length: maximum 39mm; minimum 25mm. Width: maximum 27mm; minimum 13mm. One specimen is on a unique, high-quality olive-green chert, apparently non-local; 12 are of flint, of which 4 are heat-treated; four specimens are of silicified coral of which one (Fig. 15f) appears heat-treated.

Group 7. n = 5. Long, narrow points, well thinned, with straight or slightly concave bases, straight, nearly parallel or slightly excurvate sides; basally thinned. Distal point very acute. Includes Bullen's Pinellas, especially subtypes 1 and 2; Cambron and Hulse's Guntersville. Length: maximum 45mm; minimum 34mm. Width: maximum 18mm; minimum 17mm. All specimens are of flint; one appears heat-treated. See illustration Fig. 15g.

Group 8. n = 9. Quite narrow, thick, and short to medium length points, usually with a prominent medial ridge. Bases are variable with most straight, some convex; sides straight or slightly excurvate. One specimen (Fig. 15h) exhibits slight side-notching towards the base, and might be classified as a Duval point using Bullen's typology. Others appear to resemble Cambron and Hulse's Flint River Spike or Nodena points. Length: maximum: 46mm; minimum 30mm. Width: maximum 15mm; minimum 11mm. All are of flint; two appear to be heat-treated.

Group 9. n = 6. A variable lot of small points with acute distal ends all of which are beveled either on one edge or on two opposite sides and edges. The illustrated specimen (Fig. 15i) is thinned with fluting flakes on both faces and would probably be classified as Ichetucknee in Bullen's typology; the remaining points may be Pinellas variations. Length: maximum 32 mm; minimum 17mm. Width: maximum 18mm; minimum 11mm. All specimens are of flint; one appears to be heat-treated slightly at the base only.

Group 10. n = 14. A homogeneous group of more or less equilateral form, straight or excurvate sides, usually biconvex or flattened in cross-section. Four have the remains of the striking platforms on one of the basal corners; another four have suggestions of very small auricles on one or both of the basal corners. Most would probably be classified as Bullen's Pinellas subtype 4. Length: maximum 25mm; minimum 11mm. Width: maximum 28mm; minimum 16mm. Only one specimen is on silicified coral; one is on a poor-grade consolidated sandstone-like material. Others are flint; six of these are heat-treated.

In addition to these ten groups is a miscellaneous category of 29 projectile points too fragmentary to classify (Group 14). Groups 11 and 13 are composed of points from disturbed contexts and the creek which probably pertain to the Archaic and Paleo-Indian periods.

Other Worked Lithics

Other worked lithics at the site were divided into 15 categories by shape, size, and presumed function. Since the comments which follow are made without the benefit of an intensive microscopic use-wear analysis, all functional assignments are tentative. One specimen of each of these categories is illustrated in Fig. 16 or Fig. 17.

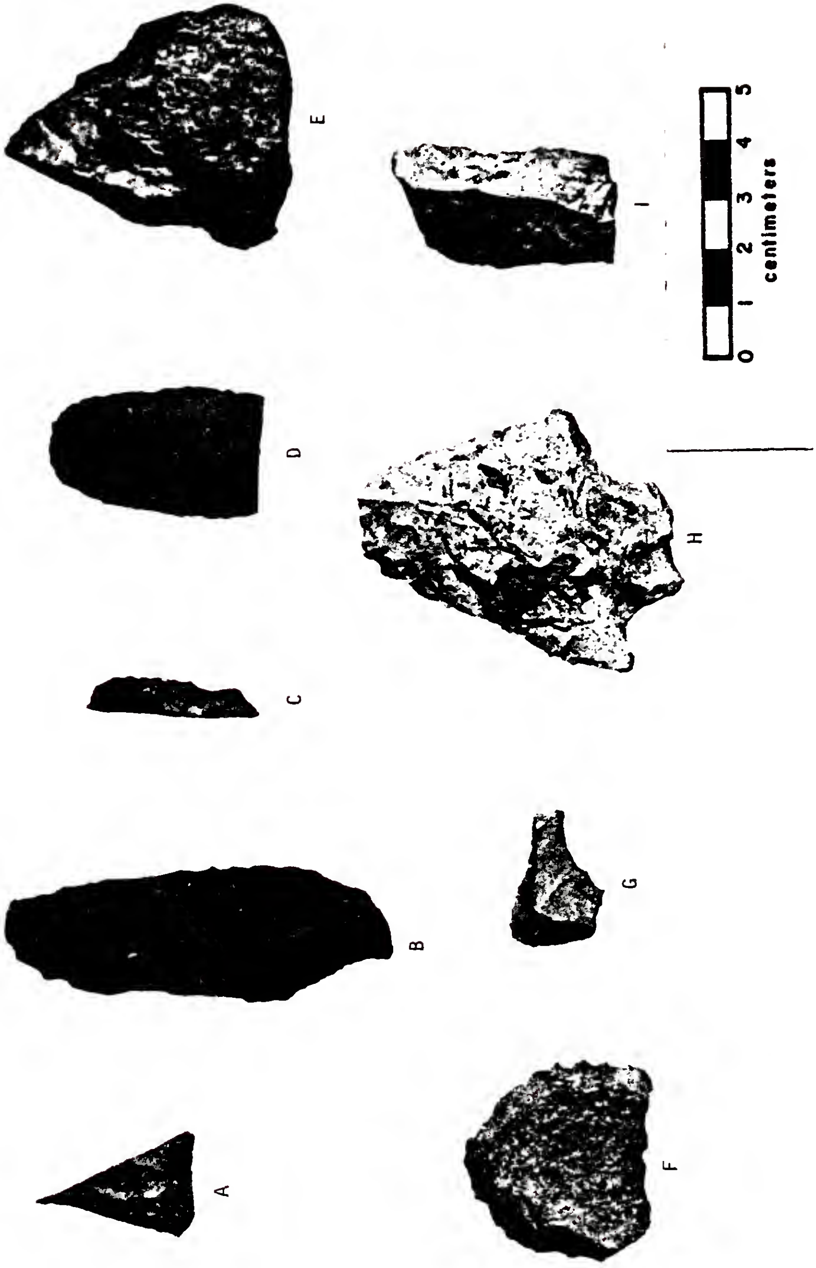
Group 12: n = 9. A functional category of drills and awls, sharing acuminate or mucronate distal ends, but otherwise exhibiting a variety of forms. Except for the thinned, elongated distal point, most could be classified as Pinellas variants. Eight specimens are of flint, of which two are heat-treated; one is of silicified coral. Fig. 16a.

Group 15. n = 8. A diverse group of hafted tools, probably knives. All are assymetrical. One unusually fine specimen, on an apparently non-local flint, is illustrated in Fig. 16b. Six of the other specimens

Fig. 16

Categories of Worked and Utilized Lithics

A Group 12; B Group 15; C Group 16; D Group 17; E Group 18; F Group 19; G Group 20; H Group 22; I Group 23. Proveniences: A 620N105E Zone II level 3; B 298N133E Zone II level 2; C 558N290E Zone III; D 580N376E Zone II level 5; E 462N433E Zone II level 2; F 620N284E Zone II level 4; G 527N431E Zone II level 1; H 584N374E Zone II level 5; I 541N344E Zone II level 2.


A
B
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0 1 2 3 4 5
centimeters

are of flint; one of these appears heat-treated. One specimen is of silicified coral.

Group 16. n = 19. This is a group of microblades of two different varieties. The first (16 specimens) appears to originate from a projectile point-like tool which was broken along its medial axis resulting in two small blades with one retouched side and one flat side. The other 13 specimens are similar, but where the first group is finely retouched along the blade edge, these show evidence of use, but not reworking. All the first variety are of flint; two appear heat-treated. The second group includes three specimens of silicified coral, and 10 on flint of which three appear heat-treated. One of the retouched specimens is illustrated in Fig. 16c.

Group 17. n = 13. A diverse group of side and end scrapers, some of which, for example the specimen illustrated in Fig. 16d, could alternatively be considered projectile point blanks. These are typically biconvex in cross-section, but three have strong medial ridges on one or both sides. Four are unifacially flaked, while nine are bifacially flaked. Cortex is present on seven of the specimens; three are silicified coral, the other ten are flint, of which one appears heat-treated.

Group 18. n = 9. A group of small hammerstone-like tools, all of which are utilized, but only one of which is bifacially flaked; another is unifacially flaked. All but two exhibit some cortex. Six of the specimens were formed from large flakes; two of the nine are silicified coral, of which one appears heat-treated. The illustrated specimen in Fig. 16e is typical of the group.

<u>Group 19</u>. n = 5. A group of side scrapers, two of which are unifacially retouched, and three of which are bifacially retouched. Not a homogeneous group. Two specimens, including the scraper illustrated in Fig. 16f, are medially thinned (fluted) for use as a hafted tool. All are of flint.

<u>Group 20</u>. n = 11. A group of scrapers with a peculiar assymetrical form (the specimen in Fig. 16g is typical). These apparently functioned as side and/or end scrapers, but have a 1-2cm spur coming off of one side, possibly for hafting. All are formed from flakes. Either the concave side or the distal end (if the spur is considered the proximal end) show signs of use as a scraper. Two specimens are on silicified coral; the other are flint, and two appear heat-treated. Both this group and Group 16 resemble microflints pictured from Poverty Point collections (Web and Haag 1953:236).

<u>Group 22</u>. n = 5. Large stemmed, assymetrical knives, all of which are broken except the illustrated specimen (Fig. 16h) which may well be a broken and subsequently reworked Florida Stemmed Archaic point. Four of the five are flint; of these three are heat-treated. The other specimen is silicified coral.

<u>Group 23</u>. n = 5. These are blade-like flakes, unretouched but with slight to moderate edge wear; all have a strong medial ridge running parallel to the cutting edges; most have straight, parallel sides as does the specimen in Fig. 16i. All are on non-thermally altered flint.

<u>Group 24</u>. n = 4. Medium to large hammerstones and cores reused as hammerstones; three show signs of heavy battering along one edge. These

are somewhat similar to specimens from Group 18 but are larger, with the working edge set at a less acute angle. All are flint. Fig. 17a.

Group 25. n = 3. Round or (as the specimen illustrated in Fig. 17b) elongated quartz "pecking stones." Illustrated example has a flake missing from either end, but otherwise is regular and smooth. These are presumably non-local in origin; a cache of four similar items, all brought to an edge by removing flakes from one or two faces, was found in Mound B (J. T. Milanich: personal communication).

Group 26. n = 15. These are small quartzite pebbles, smoothed from use or water action. Most are elongated and cylindrical; two are round; one is disk-shaped. These can be found in local stream beds, but do not seem to naturally occur in the matrix of the site. They could have been used for shaping, smoothing, or burnishing ceramics. Four examples are illustrated in Fig. 17c.

Group 27. n = 2. These are flat stone disks, possibly used as hones; the illustrated specimen bears two faint grooves on one side. One of the two is made of a sandy limestone; the other is a quartzite. Fig. 17d.

Two groups of 27 miscellaneous retouched flakes and 35 miscellaneous utilized flakes complete the worked lithic inventory from all village excavations to date.

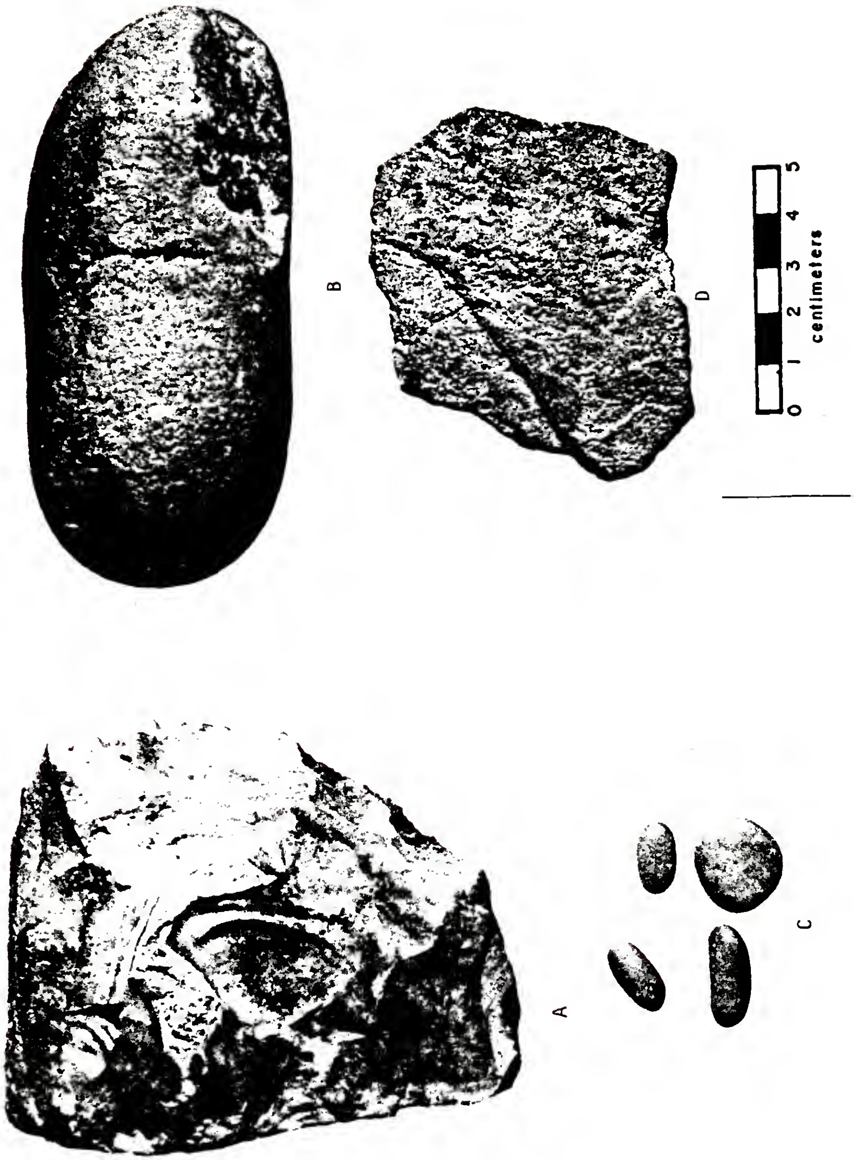
Discussion

While typologies of projectile points are far from easy to create, the items do seem to be manufactured according to a limited set of preconceived notions (cf. Deetz' "mental template," 1967:45-52) and are

Fig. 17

Categories of Worked and Utilized Lithics

A Group 24; B Group 25; C Group 26; D Group 27. Proveniences: A 620N284E Zone II level 2; B Surface collections west of Mound C; C Various proveniences; D 296N284E Zone II.


A
B
C
D
0 1 2 3 4 5
centimeters

rather carefully executed. The other lithics in this sample, however, are much less formal. Objects which presumably shared common functions of scraping or cutting take on a bewildering variety of forms, as if the manufacturer had casually selected any remotely suitable item and made it work for the purpose at hand, discarding it after use. Among the non-projectile point worked lithics there are two exceptions to this lack of formalism. One is Group 16, the small microblades, several of which are carefully bifacially retouched according to a common pattern. The other is the class of large stemmed assymetrical knives which are quite similar in form.

The identification of the small triangular projectile points in the sample as arrow points seems logical, and the role of the bow and arrow in both warfare and hunting is well documented for the early historic period. Although chronology is properly the subject of the next two chapters, it is important to note that several variants of the small triangular points which are commonly termed "Mississippian" (Wauchope 1966:162-163) appear at the McKeithen site in a pre-Mississippian context. Workers in neighboring states have also discovered the presence of "Mississippian" points in earlier horizons; for example, DeJarnette and Knight (1976:12-16) report Madison points at the LaGrange site in a possible Late Woodland McElvey assemblage. Of the several variations of the Pinellas form (Bullen 1975:8) at the McKeithen site, most seem to occur during the entire occupation. Only Group 1, the concave-based variant, seems to mark the late period of occupation at the site. If the McKeithen radiocarbon dates are accurate, and if these small triangular points mark the introduction of the bow and arrow to North Florida, then Brain's postulated Late Marksville period introduction of the bow and arrow to the Lower Valley can be seen as an approximately contemporaneous event (Brain 1976:59). But the chronology for the projectile points was derived primarily through their associations with the ceramics, and it is to the ceramic seriation that we now turn.

CHAPTER IV
THE CHRONOLOGICAL DIMENSIONS OF MATERIAL VARIATION

The McKeithen site is important to the understanding of Gulf Coastal Woodland period chronology. It is an inland site which contains stratified deposits pertaining almost solely to the Weeden Island period with a slight Deptford period component present in some areas below Weeden Island deposits. The total midden varies in depth from over one meter in some locations adjacent to the creek, to an average depth of 60-70cm in the southern and eastern sections of the village area, where the top 20cm has been disturbed by plowing. In most areas there is little evidence of obvious stratification within the midden. Typically, the midden stratum (Zone II), which underlies either a plowed humic zone or forest duff and humus, is mottled medium to dark greyish-tan in color grading into a light tan sand stratum (Zone III). In profile the midden zone was sometimes divided into an "A" (upper and somewhat darker) portion and a "B" portion which was transitional to Zone III. These sub-strata are not, however, pedological A & B zones. During excavation these subdivisions were not differentiated and Zone II was removed in arbitrary 10cm levels except when features were encountered. Changes in relative frequencies of different material categories were subtle and gradual, not obviously divisible into separate occupational periods.

During initial analysis bar histograms of the sort recommended by Ford (1962) for ceramic seriation were drawn for several units using the artifacts from a single 2 x 2m excavation unit broken down into levels. Some changes in relative frequencies of ceramic types were noted although when individual units alone were considered these changes were erratic. A method of scanning large numbers of units for similar trends of change was needed, preferably without the necessity of drawing bar histograms for each unit. Such a method would need to scan for changes of relative frequency of ceramic types and lithic categories which were consistent from unit to unit in order to eliminate as noise changes occurring only within a particular unit.

Selection of Units for Seriation

R. C. Dunnell (1970) emphasized that a seriation must be limited to a local area if it is to be considered a chronological ordering rather than a simple linear ordering along an unknown dimension. James A. Ford (1962:41) likewise realized that "material must be collected from a limited geographical area so that differences in kinds or quantities of material are not due to this factor." How "local" must a seriation be to be a chronology? In a site such as McKeithen where there are theoretical reasons to anticipate the existence of localities marked by the material correlates of social status differentiations it might be assumed that a seriation indiscriminately employing units selected from the entire site would include areas affected by social differentiation. The results of seriating a complex site as a unit could be misleading. If particular ceramic types were monopolized by an elite class and these types were used in chronological ordering of units from the site, then the ordering produced might reflect position within a social hierarchy rather than chronology. Thus the elite residence area, although contemporaneous with the rest of the village, would inevitably be placed at the extreme top or bottom of the seriation.

Since the results of discriminant and cluster analyses sketched in Chapter Two indicated at least three somewhat different areas within the site, it was decided to excavate larger samples from each of these local areas and to seriate them separately. The multivariate analysis indicated material differences among these three areas in addition to their obvious spatial separation. From radiocarbon dates already available, temporal distinctions were also suspected. The resulting block excavations in the summer of 1977 were described in Chapter Two as the cluster samples. Guided by the results of the cluster analysis the individual levels in the isolated excavation units of the probability and transect samples could be tied into the appropriate local seriation. Finally, it was hoped that the three resulting seriations could be tied to one another on the basis of radiocarbon dates and the chronological aspects of the attribute analysis, which were expected to reveal contemporaneous changes across the site cross-cutting both ceramic type definitions and status areas.

Choice of a Method

Before this could be done, however, it was necessary to choose a seriation method which could strain the "noise" inevitably introduced in material changes over time by the presence of local disturbance, activity areas, or abnormal depositional processes. Such a method would delineate the consistent trends of changes over time in the several stratigraphic columns in each local area. It was also desirable to find a method which could use the additional information contained in the stratigraphic series rather than a simple seriation of levels from all tests in a local area which would treat them as if they were unrelated.

The approach selected was not so much a seriation in the usual sense as it was an attempt to discover dimensions of change over time in the artifacts working from known relationships of levels within a given excavation unit. Using only those levels within selected squares where ceramics totaled 30 or more items, a principal components factor analysis was performed for each of the three predefined groups of units and scores for each of the levels on each of the factors were output. The family of techniques known as factor analysis is useful for resolving the complexity of any large data matrix (as made up by the rows of levels--cases--and columns of ceramic categories--variables) into a relatively small number of vectors, or factors, which summarize the dimensions of variability in the matrix. Since it was necessary to elicit factors to summarize the ceramic changes between levels an R-mode factor technique was chosen. The resultant factors were evaluated for a potential chronological interpretation by comparing the output factor scores for each level in excavation units where the stratigraphy appeared undisturbed with the assumed order of deposition of the levels as seen during excavation.

Such an approach to establishing chronology is relatively new but not unprecedented. The "micro-seriation" method proposed by LeBlanc (1975) utilized a factor analysis both to discover attributes which changed over time and to score proveniences along the dimensions established by the factor which was assumed, on the basis of independent evidence, to be chronological. This seriation differed in at least two major ways from the present endeavor. There may be other differences involved but LeBlanc is so vague as to the type of "factor analysis" used that one cannot be sure.

First, LeBlanc's analysis was based on a non-typological approach using attributes rather than ceramic types. The main stated reason for this was that while specific ceramic types may only be recognizable in a small portion of the ceramic sample at least one specific attribute is usually recognizable on even a small ceramic fragment, thus increasing the sample size available to the seriation. An unstated reason for following an attribute analytic approach seems to have been the small number of types represented in the ceramic sample, suggesting the need to break down the type concept into component attributes in an attempt to distinguish shorter periods of time than might be allowed by the slow changes in relative frequency of formal types. Unlike LeBlanc's approach the present study retains the type concept for the principal components seriation in the belief that the larger number of ceramic types in this analysis makes the method more useful here than it would be for an analysis of Cibola painted ceramics. Attribute analysis is used in the present study to present overall trends of change from a different perspective than the multivariate seriation and to tie the seriation of each local area to other areas within the site.

LeBlanc's factor analysis began from data matrices composed of relative frequencies, as does the present study, but then proceeded to the calculation of a dissimilarity coefficient based on the Brainerd-Robinson similarity coefficient. The present study utilizes the SPSS FACTOR subprogram (Nie et al., 1975:468-514) which derives correlation coefficients on the relative percentages of selected ceramic types in selected units.

Another archeological application of factor analysis for seriation utilized a Q-mode principal components analysis to reduce a matrix of distance coefficients derived from temporally-sensitive variables into a single temporally-interpretable dimension (Marquardt 1974). This is a complex method which differs in several respects from the present undertaking, particularly in its use of:

1. Q-mode components analysis rather than interpretation of factor scores derived from R-mode analysis;
2. Use of ratio-scale variables which are mutually uncorrelated (i.e. "number of red-slipped bowl sherds with heavy glaze black paint/number of red-slipped bowl sherds with black paint anywhere; number of red-slipped jar sherds with white paint/ total number of red-slipped jar sherds." Marquardt 1974:173).

The present study, although it uses relative frequencies of ceramic types as the raw data for the generation of the correlation coefficients utilized by the principal components procedure, minimizes the "closed array effect" of mechanical correlation between percentages of individual ceramic types by using only selected types from the total sample over which the original percentages were calculated.

3. As an intermediate step Marquardt calculated "taxonomic distance coefficients" between units on the basis of the ratio-scale variables selected by a preliminary R-mode principal components analysis, then utilized a matrix of these coefficients for his Q-mode analysis.

The present study by-passes both the considerable added complexities and the possible advantages of this procedure by working directly with the factor scores produced for each unit by the original R-mode principal components analysis.

Interestingly, in an unpublished paper where he considers the R-mode factor score approach to chronological ordering, Marquardt (n.d.:61) admits the technique has "intuitive appeal" so long as "we feel comfortable with the interpretation of the principal factor as time."

Principal Components Analysis, Rotation, and Factor Scores

An exhaustive mathematical description of the variety of factor analysis called principal components analysis, or principal components factor analysis, is outside the scope of this thesis. Readers are referred to Rummel (1970) for an undemanding introduction to the field, and to Doran and Hodson (1975:187-204) for a short discussion of archaeological applications and the relationship of the technique to common factor analysis. As usual, technical specifications for the computer programs can be found in the appendix.

Briefly, however, the family of techniques known as factor analysis share with the cluster analytic family possibilities for the reduction of a data matrix into a more manageable form which will indicate the relationship of either the observations (e.g. provenience units) to each other, in Q-mode analysis, or the variables (e.g. percentages of ceramic types) to each other, in R-mode analysis. Both techniques begin this process by computing some sort of similarity matrix of the variables or the cases to each other. This analysis uses the R-mode approach on a matrix of Pearson product-moment correlation coefficients. The factoring technique, called either principal axes or principal components analysis, was chosen not only because it is relatively straight forward and more easily comprehensible than other factoring techniques, but also because it is judged to be less sensitive to random error than other techniques Rummel (1970:345). Rummel (1970:344-5) characterizes the principal axes approach as follows:

> The technique is useful for determining the minimum orthogonal factors required to reproduce the data. . . . The first factor measures the most variance and successive factors will account for decreasing porportions of variance.

The discovery of principal components (or axes) is most easily understood by a geometric analogy. Suppose each of the provenience units ultimately to be seriated were represented in multi-dimensional space, where the number of dimensions equals the lesser of the number of attributes, or the number of proveniences minus one. Now suppose that a vector can be found which passes through this swarm of points along its most diffuse axis--that is, along its dimensions of greatest variability. This would be the principal component of the data set. In the techniques used here the second vector would be required to pass through the swarm of points at right angles to the first; that is, it would be orthogonal to, or uncorrelated with, the first component. If there is a high degree of correlation among some of the variables originally used to locate the unit in the n-dimensional space, then the number of components which are required to adequately summarize the variability of the data set will be fewer than the number of variables for each observation. This is normally the case and this potential for data reduction is a particularly attractive feature of factoring techniques.

The contribution of each variable to each of the factors can be measured exactly using the principal components model. These are expressed as loadings on the factor and may be understood as the correlation coefficients between the variables and the factors. A factor score may also be computed for each case in the analysis using the factor score coefficients. When the factor score coefficients are multiplied by the standardized value of the variable they represent, and added to the products of the other variables and weights, the resultant factor score recreates the position of a case along a factor. Obviously, if the variables which make an important contribution to a factor (i.e. have a high absolute value loading) are chronologically sensitive, and if independent evidence verifies that the continuum measured by the factor is indeed correlated with the effects of the passage of time on the material culture, then the factor scores of the units along this dimension can be interpreted as ordinal placements along an axis measuring date of production for the deposited materials. If two or more of the units along this linear dimension can be assigned absolute dates, then changes in the factor scores along that dimension can be scaled in relation to the passage of time between the absolute dates. The more dates available, the more accurate this scaling.

A Test of the Principal Component Seriation Technique

An imaginary stratigraphic sequence with 10 levels and 10 ceramic types which changed through the stratigraphic sequence in a known manner was constructed as a test for this technique. Table 11 displays the relative frequency of each ceramic type by level. These relative frequencies constituted the raw data input to the SPSS FACTOR sub-program (Nie et al., 1975:468-514). The plasmode (used in the sense of Benfer 1972; see also Marquardt 1975:101-110) was specifically designed to test the effects of rotational methods of the placement for each level derived by the factor scores.

In the unrotated factors elicited by principal components analysis all the variables normally display high positive loadings on the first factor, a general factor. For successive, but not all, factors smaller groups of variables will have high loadings. These are known as group factors and are qualitifed as bipolar if both high positive and high negative loadings are present, as is generally the case.

Because principal components analysis summarizes the maximum amount of variance in the data on the first factor, it would be desirable to interpret the first factor in a substantive sense. In the present example the first factor would ideally summarize the chronological trends in the data. However, because of the high loadings of all variables on the first factor in the unrotated matrix (Rummel 1970:372-374) such an interpretation is usually impossible. To be interpreted chronologically a factor would most conveniently be bipolar with "early" ceramic types displaying high loadings of one sign, and late ceramic types high loadings of the opposite sign.

Several critieria for rotation are possible (see Rummel 1970:368-421). One subset of techniques, orthogonal rotation, preserves the relative orientation of the original axes of the principal component analysis while rotating these axes through space. If the rotation seeks to delineate the maximum possible number of highly correlated variables it is known as Varimax rotation. Such a rotation minimizes the number of intermediate loadings of variables on factors by concentrating loadings near the (standardized) maximum of $\pm$ 1.0 or near the minimum of 0. A related orthogonal technique which seeks to limit the number of factors for which a variable has significant loadings, rather than simplifying the loadings on a specific factor, is known as Quartimax. Finally, the technique known as oblique rotation allows the axes to move out of their uncorrelated relationship if such relaxation of orthogonality results in a clearer delineation of clusters of variables. This rotational method is more mathematically intricate but results in a simpler solution if there is a correlation between clusters of variables.

The variables presented in Table 11 are of several types. A, C, and H follow the symmetrical "battleship-shaped curve" usually assumed, in seriation studies, to monitor the rise, peak, and eventual decline in relative frequency of a particular attribute or specific combination of attributes (type). The frequency of type A is ten times that of type C, however, and both of these types were deposited throughout the

TABLE 11
RAW DATA MATRIX FOR PRINCIPAL COMPONENTS SERIATION EXAMPLE

Level:	Artifact Categories (percentages):										
	A	B	C	D	E	F	G	H	I	J	TOTAL
1	10.0	20.0	1.0	0.0	10.0	10.0	10.0	0.0	38.0	1.0	100.0
2	14.0	16.0	1.4	0.0	13.0	17.0	10.0	0.0	28.6	0.0	100.0
3	18.0	12.0	1.8	0.0	15.0	25.0	10.0	0.0	18.2	0.0	100.0
4	22.0	8.0	2.2	0.0	17.0	23.0	10.0	5.0	10.0	2.8	100.0
5	25.0	4.0	2.5	0.0	19.0	21.0	11.0	9.0	8.5	0.0	100.0
6	25.0	0.0	2.5	4.0	21.0	19.0	10.0	10.0	8.5	0.0	100.0
7	22.0	0.0	2.2	8.0	23.0	17.0	10.0	5.0	10.0	2.8	100.0
8	18.0	0.0	1.8	12.0	25.0	15.0	10.0	0.0	18.2	0.0	100.0
9	14.0	0.0	1.4	16.0	17.0	13.0	10.0	0.0	28.6	0.0	100.0
10	10.0	0.0	1.0	20.0	10.0	10.0	10.0	0.0	29.0	10.0	100.0

stratigraphic sequence while type H appears only in the middle depths of the deposits (which are assumed to be undisturbed). Types E and F display a similar rise, peak, and decline in frequency but are assymetrical; type E reaches maximum relative frequency in level 8 and type f in level 3. Types B and D exhibit only portions of the ideal sequence. Type G fails to change through time and type I has two popularity peaks of which the upper (the later in this idealized sequence) is the higher. Finally, type J appears intermittently throughout the sequence with a single surge in the lowest level.

Principal components analysis of this data matrix yields the unrotated factor matrix in Table 12. The first factor is a continuum between those variables which peak in the middle of the sequence and have high positive loadings, and those peaking at the extremes, which have large negative loadings. This general factor has chronological interest but cannot be used to order the levels into a chronological sequence. Factor scores for levels at either extreme of the stratigraphic column are high in value and negative in sign for the somewhat tautological reason that they contain the highest percentages of those types (B, D, J, but especially I) which have high negative loadings on the factor.

The second factor, however, isolates those values which peak at either end of the sequence; variables having late peaks display high negative loadings, and variables with early peaks, high positive loadings on the factor. Types F and E, with maxima towards the beginning and end of the sequence, respectively, have lower loadings on the second factor than do types B and D, although they do have loadings of the proper sign. The third factor is difficult to interpret since both type G, which is

TABLE 12
PRINCIPAL COMPONENTS SERIATION EXAMPLE:
UNROTATED FACTOR MATRIX

Artifact categories:	Factors: 1	2	3
A	0.99	0.04	-0.01
B	-0.36	-0.91	0.03
C	0.99	0.04	-0.01
D	-0.42	0.88	-0.05
E	0.73	0.39	-0.47
F	0.76	-0.38	-0.08
G	0.50	-0.12	0.64
H	0.85	0.08	0.34
I	-0.95	-0.19	-0.02
J	-0.44	0.54	0.51
Eigenvalue	5.47	2.27	1.02
Percent of variation	54.7	22.7	10.2

nearly constant throughout the sequence, and Type J, which is intermittent and erratic throughout the sequence, exhibit high positive loadings along its dimension. Although the computer derived more than three factors it is usual to stop interpretation of factors with eigenvalues of less than 1.0, or which explain less than 10% of the variation in the data set (Rummel 1970:366).

In this simple example rotation might not be necessary since Factor Two provides a satisfactory chronological continuum. Nevertheless, since rotation was required to interpret the results of the more complex analyses which follow, the effects of three different rotational techniques are briefly outlined.

Table 13 presents the loadings of each variable after a Varimax rotation and the resultant factor scores for each level. The first and second factors are quite similar to the unrotated factors although Factor Two has been somewhat simplified by a lower loading of Type J than in the original unrotated matrix. Factor Three has now become specific to Type J which, along with the neutral loading for the constant variable, Type G, allows an interpretation of "intermittency" or "discontinuity" for this factor. The factor scores on Factor Two, also listed in Table 13, reverse the order of levels 3 and 4, 6 and 7, and 9 and 10, probably due to interference from Type 10 in these levels. An "ordering efficiency" can be computed by counting the number of levels which score higher than the uppermost level since the scores of this factor trend from negative to positive with increasing depth. Each level in order of increasing depth is scored in this manner against the

TABLE 13
PRINCIPAL COMPONENTS SERIATION EXAMPLE:
VARIMAX ROTATED FACTOR MATRIX

Artifact Category:	Factors: 1	2	3	Factor Score Coefficients, Factor 2:
A	0.85	0.04	-0.22	-0.02
B	-0.39	-0.90	-0.09	-0.71
C	0.85	0.03	-0.22	-0.02
D	-0.29	0.87	0.27	0.70
E	0.53	0.40	-0.40	-0.19
F	0.43	-0.26	-0.18	0.25
G	0.28	-0.05	-0.06	0.03
H	0.96	-0.02	-0.04	-0.02
I	-0.81	-0.14	0.02	0.09
J	-0.13	0.27	0.94	-0.32

Factor Scores by Level

Level:	Factor Score:
1	-1.65
2	-1.05
3	-0.48
4	-0.70
5	-0.15
6	0.29
7	0.26
8	0.87
9	1.55
10	1.06

levels below it and the number of correct orderings is divided by the total number of orderings ((number of levels-1)+(number of levels-2)+ . . . .) to obtain the ordering efficiency statistic used below. For the second factor this is 42/45 or 93.3%. Since this is the best ordering efficiency achieved by any of the factors in the analysis Factor Two would be chosen as an approximation of chronological dimension. Factor Two as rotated by the Quartimax criterion seems a "purer" chronological factor than its unrotated counterpart, but still permits interference by the erratic variable.

The Quartimax rotated factor matrix in Table 14 is similar in most respects to that of the Varimax rotation but provides a more accurate ordering of levels by their factor scores on Factor Two, probably due to the more symmetrical balancing of the loadings of Types E and F achieved by the Quartimax rotation. Still, levels 9 and 10 are reversed from their positions in the idealized sequence, resulting in a very good, but still imperfect, 97.8% ordering efficiency for the rotated factors.

Only the oblique rotation presented in Table 15 correctly reproduces the ideal ordering (i.e. has 100% ordering efficiency). Several statistics are presented for this rotation which were avoided for the orthogonal transformations. The factor pattern matrix is the best indication of the existence of clusters of variables. The factor structure matrix is the matrix of Pearson product-moment correlations of the variables with the factors and as such is influenced by the correlations between the factors which are reported in the factor correlation matrix. Factor scores are calculated from the rotated factor pattern matrix. In

TABLE 14
PRINCIPAL COMPONENTS SERIATION EXAMPLE:
QUARTIMAX ROTATED FACTOR MATRIX

Artifact Category:	Factors: 1	2	3	Factor Score Coefficients, Factor 2
A	0.99	-0.02	-0.10	-0.03
B	-0.42	-0.89	-0.09	-0.59
C	0.99	-0.02	-0.10	-0.03
D	-0.35	0.91	0.18	0.60
E	0.72	0.40	-0.38	0.00
F	0.73	-0.38	-0.07	0.03
G	0.37	-0.07	-0.02	0.05
H	0.87	-0.04	0.10	-0.03
I	-0.98	-0.08	-0.08	0.06
J	-0.29	0.33	0.90	-0.18

Factor Scores by Level

Level:	Factor Scores:
1	-1.39
2	-1.07
3	-0.80
4	-0.78
5	-0.22
6	0.22
7	0.43
8	1.02
9	1.41
10	1.18

TABLE 15
PRINCIPAL COMPONENTS SERIATION EXAMPLE:
OBLIQUE ROTATED FACTOR MATRICES

Artifact Category	Factor Pattern Factors: 1	2	3	Factor Structure Factors: 1	2	3
A	0.47	-0.01	0.07	0.89	0.01	0.49
B	-0.20	-0.90	-0.03	-0.37	-0.92	-0.11
C	0.47	-0.01	0.07	0.89	0.01	0.49
D	-0.20	0.88	-0.04	-0.34	0.91	-0.29
E	-0.06	0.06	0.01	0.51	0.38	0.18
F	-0.06	-0.04	0.02	0.50	-0.36	0.31
G	-0.02	-0.00	1.02	0.48	-0.09	0.99
H	1.03	0.01	0.06	0.99	0.01	0.57
I	-0.31	-0.01	-0.06	-0.84	-0.14	-0.42
J	-0.02	0.02	-0.01	-0.17	0.43	-0.20

Factor Correlations

	Factor 1	Factor 2	Factor 3
Factor 1	1.00	0.03	0.51
Factor 2	0.03	1.00	-0.09
Factor 3	0.51	-0.09	1.00

Factor Score Coefficients on Factor 2

Artifact Category:	Coefficient:
A	-0.01
B	-0.57
C	-0.01
D	0.56
E	-0.02
F	0.03
G	0.01
H	0.01
I	0.01
J	-0.04

Factor Scores on Factor 2 by Level

Level:	Factor Scores:
1	-1.46
2	-1.14
3	-0.83
4	-0.59
5	-0.25
6	0.30
7	0.54
8	0.86
9	1.19
10	1.38

orthogonal rotation the factor structure and factor pattern matrices are identical (see Rummel 1970:396-405). Factor Two in this analysis is essentially uncorrelated with the other two significant factors while 25% of the variation in Factor Three is accounted for by its linear dependence on Factor One and vice versa.

The results of this analysis of the plasmode can be summarized as follows:

1. The raw number of ceramics of each type relative to the other types is unimportant since the calculation of correlation coefficients from the matrix of percentages for each ceramic type has the effect of standardization. That is, both rare and common ceramic types have the same potential importance (Doran and Hodson 1975). Types A and C in the above analysis always have identical loadings even though Type A is ten times more abundant.
2. "Lenticular" variables such as A, C, and H, upon which traditional graphic seriations are based, are useless for this type of ordering. Instead, variables which approach an ideal linear increase or decrease over time will load heavily on the factors which provide correct ordering of the levels as known from the stratigraphy of every unit (cf. Marquardt 1974:101-110). In effect, this approach scores all the variables and, ideally, concentrates into one factor those which linearly increase or decrease throughout the sequence.

3. The heuristic approach of scanning the factor scores produced by all factors against the known sequence of deposits can result in the selection of factors which have chronological interpretability.
4. Of the rotational methods attempted, oblique rotation gave the only perfect reproduction of the known ordering of the levels in the plasmode. It is possible that this is due to the nature of the plasmode, however, and given the fact that independent evidence is available for evaluating the results of the rotated factors in the analysis which follow, both Quartimax (which gave good results in the plasmode) and oblique rotations will be performed with selection of the rotated factors having the highest ordering efficiency from either rotation.
5. The usage of relative frequency data matrices, despite cautions by Marquardt (1975:128) is defensible in view of the practical success in interpreting the plasmode. Moreover, the use of relative frequencies of ceramic types has a long history of use in the Southeast and the concept of "popularity" of a ceramic type as expressed by its relative frequency in the assemblage, has intuitive appeal.

The following section applies this technique to each of the cluster samples at the McKeithen Site. In all cases but one a preliminary principal components analysis using all ceramic types and lithic categories was used to reduce the number of variables in the final analysis.

The Factor Score Seriations

Northern Midden Area

In this area, located on the creek bluff towards the northeastern extreme of the site, several units had to be discarded because of potential mixing due to erosional features. All levels in the northernmost and westernmost tier of excavation units were excluded from the analysis for this reason. Of the 21 cases used in this seriation ten were individual levels or features from 2 x 2m excavation units and the remaining cases were horizontally-aggregated levels from adjacent units. Thus, proveniences in Group 2, for example, represented levels at the same depths from squares 582N380E, 583N378E, and 582N376E. Where individual cases had associated radiocarbon dates they were not lumped with other units if at all possible. Each case had more than 25 ceramic items; the total ceramics in the 21 cases equalled 1437. The lithics were more unevenly distributed with one case having none at all and 10 cases having less than 30 lithic items which would have been ideal for calculation of percentages. The total lithic count in the 21 cases equalled 819. In light of these problems, any conclusions concerning differential vertical distribution of the lithics drawn from this analysis would need to be corroborated by independent means. Rather than employ the initial matrix-reducing step followed by final analysis which was necessary in other areas, this analysis was completed in one step since an acceptable ordering efficiency of 90% average per group was achieved on the variable-eliminating run. Thirty-two variables were processed over the 21 cases with Factor 5 (see Table 16) selected as providing the best

TABLE 16
PRINCIPAL COMPONENTS ANALYSIS OF NORTHERN MIDDEN AREA: FACTORS DERIVED AND UNROTATED FACTOR MATRIX FOR FACTOR FIVE

Factor	Eigenvalue	Percent of Variation
1	5.26	16.4
2	4.33	13.5
3	3.95	12.3
4	3.19	10.0
5	2.70	8.4
6	2.07	6.5
7	1.96	6.1
8	1.46	4.6
9	1.35	4.2
10	1.09	3.4

Artifact Category	Unrotated Loadings, Factor Five
smooth sand tempered plain	-0.27
grit tempered plain	0.16
residual plain	-0.02
St. Johns Plain	-0.20
Weeden Island Plain	0.43
Weeden Island Red	-0.26
Weeden Island Zoned Red	-0.10
residual red	-0.17
Weeden Island Punctated	0.21
Weeden Island Incised	0.08
Carrabelle Punctated	-0.14
Carrabelle Incised	0.30
Keith Incised	0.54
unidentified incised	-0.14
Swift Creek Complicated Stamped	0.08
Crooked River Complicated Stamped	0.21
Napier Complicated Stamped	0.48
St. Andrews Complicated Stamped	0.62
unidentified rectilinear	0.01
unidentified curvilinear	0.17
check stamped 4 - 6 checks/inch	-0.05
check stamped 7 - 9 checks/inch	-0.45
Deptford Simple and Cross-Simple	-0.02
Tucker Ridge Pinched	0.08
worked flint	-0.51
worked coral	0.20
heat-treated flint	-0.04
heat-treated coral	0.15
other flint	0.16
other coral	0.42
other worked lithics	-0.45
other lithics	-0.39

ordering efficiency. The rotated factor pattern matrix and factor score coefficients are listed for each variable on this factor in Table 17. Table 18 presents the automatically computed factor scores for each case in the analysis.

After inspecting the factor pattern matrix, which is appropriate since it was used to construct the factor scores on the basis of which this factor was selected, the variables loading about $\pm$ 0.3 are interpreted as having a significant contribution to the factor (cf. Bennett and Bowers 1976:10). Thus, Weeden Island Plain (0.37), Carrabelle Incised (0.30), and Napier Complicated Stamped (0.30) are the ceramic types in this area which consistently occur in greatest relative frequency in the deepest midden strata. The single strongest variable--check stamped ceramics with 7-9 checks/inch (-0.91)--and worked flint (-0.83) consistently occur in greatest frequency in the shallowest levels of the midden. Since an effort has been made to exclude disturbed units and since the linear dimension of Factor 5 correctly orders the three radiocarbon dated levels from this area, high relative frequencies of Weeden Island Plain, Carrabelle Incised, and Napier Complicated Stamped in this area of the midden can be designated markers for an early occupation. In the same manner, high relative frequency of check stamped ceramics (7-9 checks/inch) and worked flint, which are coupled with low percentages of the three early markers, are indicative of later occupation in this area. The significance of these markers is discussed at the end of this chapter.

TABLE 17
PRINCIPAL COMPONENTS ANALYSIS OF NORTHERN MIDDEN AREA: ROTATED FACTOR PATTERN, STRUCTURE, FACTOR SCORE COEFFICIENTS, AND FACTOR CORRELATIONS

Factor Correlations

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor 1	1.00	0.12	0.17	-0.09	0.08
Factor 2	0.12	1.00	0.01	-0.00	0.04
Factor 3	0.17	0.01	1.00	-0.04	0.09
Factor 4	-0.09	-0.00	-0.04	1.00	0.02
Factor 5	0.08	0.04	0.08	0.02	1.00

Artifact Category	Loadings on Rotated Factor 5		
	Factor Pattern	Factor Structure	Factor Score Coefficients
smooth sand tempered plain	-0.28	-0.36	-0.10
grit tempered plain	0.16	0.22	0.05
residual plain	-0.14	-0.18	-0.05
St. Johns Plain	0.04	-0.14	0.06
Weeden Island Plain	0.37	0.50	0.13
Weeden Island Red	0.04	0.14	-0.00
Weeden Island Zoned Red	-0.09	0.06	-0.08
residual red	-0.11	-0.00	-0.06
Weeden Island Punctated	0.01	-0.09	0.02
Weeden Island Incised	0.01	-0.03	0.01
Carrabelle Punctated	0.18	0.28	0.04
Carrabelle Incised	0.30	0.32	0.12
Keith Incised	0.24	0.33	0.08
unidentified incised	-0.02	-0.04	-0.01
Swift Creek Complicated Stamped	0.29	0.35	0.12
Crooked River Complicated Stamped	0.19	0.34	0.05
Napier Complicated Stamped	0.30	0.16	0.15
St. Andrews Complicated Stamped	0.05	0.13	-0.02
unidentified rect. complicated stamped	-0.20	-0.37	-0.05
unidentified curv. complicated stamped	0.05	0.08	0.01
check stamped with 4-6 checks/inch	0.26	0.22	0.13
check stamped with 7-9 checks/inch	-0.91	-0.88	-0.40
Deptford Simple & Cross Simple Stamped	0.23	0.29	0.09
Tucker Ridge Pinched	-0.04	-0.11	0.00
worked or utilized flint	-0.83	-0.86	-0.35
worked or utilized silicified coral	-0.00	0.10	-0.05
thermally-altered flint debitage	0.07	0.09	0.02
thermally-altered coral debitage	-0.02	-0.10	0.00
other flint debitage	-0.05	-0.12	-0.01
other coral debitage	-0.11	-0.06	-0.08
other worked lithics	0.04	0.11	0.02
other lithics	0.04	0.12	0.02

TABLE 18
FACTOR SCORES FOR PROVENIENCES INCLUDED IN
PRINCIPAL COMPONENTS ANALYSIS OF NORTHERN MIDDEN AREA

Cases						Factor Scores for Cases on Factor 5 after Oblique Rotation
FS #	Northing	Easting	Zone	Level	Aggregated Group [d]	
109	527	431	II	1	--	-2.45
110	527	431	II	2	--	-0.23
111	527	431	II	3	--	0.21[a]
112	527	431	II	4	--	0.59
					3E	0.81
62	558	290	III	--	--	-2.75
66	558	290	IV	--	--	0.26
			II	1	1A	-0.02
			II	2	1B	0.40
			II	3	1C	0.59
			II	4	1D	0.10
			II	5	1E	0.20
422	580	376	Feature 9-D			0.50[b]
			III	--	1F	1.27
			II	1	2A	-0.07
			II	2	2B	-0.81
			II	3	2C	0.24
			II	4	2D	0.50
			II	5	2E	0.69
			III	--	2F	0.82
266	584	380	Feature 9		--	-0.85[c]

[a]approximately contemporaneous with Feature 6, radiocarbon dated to A.D. 510 ± 75.
[b]radiocarbon dated to A.D. 145 ± 100
[c]radiocarbon dated to A.D. 650 ± 70 and A.D. 640 ± 95; dates average to A.D. 647 ± 55.
[d]Group 3E consists of Zone II levels 5 and 6 in square 527N431E.
Group 2 is composed of horizontally-aggregated levels from squares 582N380E, 583N378E, and 582N376E.
Group 1 is composed of horizontally-aggregated levels from squares 580N376E and 580N380E.

This seriation can be extended to other areas of the site by multiplying the factor score coefficients in Table 17 by the standardized percentages of each ceramic type in any level and summing the products. The percentages must be standardized on the basis of the means and standard deviations of the ceramic types in the proveniences used to establish the original factors. The resultant factor scores can be meshed with those obtained by the original analysis to extend the range of the seriation.

By trial and error a significant feature was found in that attempts to extend this seriation to squares which were not placed in Group 1 by the cluster analysis yielded low ordering efficiencies. Thus, a sequence of ceramic and lithic changes derived using this area of the village cannot be extended successfully to include the entire village; different sequences of ceramic and lithic change occur in different localities of the site, as had been predicted.

The additional proveniences tied into this local sequence by computed factor scores are listed in Table 19 along with their factor scores and the ordering efficiency per unit achieved by applying this techniques. The other units along the creek to which this local sequence was applied were excavated during the probabalistic phase of the sampling and had no near neighbors for aggregation purposes. Factor scores were computed only for levels with 30 or more ceramics; Zone I, the humus stratum, was excluded.

The Eastern Midden Area

The midden in this locality is less dense than it is along the creek therefore lumping of levels from adjacent squares was even more

TABLE 19
EXTENSION OF NORTHERN MIDDEN AREA SERIATION TO ADJACENT VILLAGE AREAS BY COMPUTED FACTOR SCORES

Cases						Computed Factor Scores for Cases on Factor 5; Northern Midden Seriation
FS #	Northing	Easting	Zone	Level	Ordering Efficiency	
42	620	105	II	1		-2.52
43	620	105	II	2		-2.72
44	620	105	II	3		-1.83
45	620	105	III	1		-1.51
46	620	105	III	2		-0.37
47	620	105	III	3		0.93
49	620	105	IV	2		-3.06
					66.7%	
31	606	166	--	2		-0.35
33	606	166	--	4		-2.31
34	606	166	--	5		-2.49
					0%	
88	558	400	II	1		-1.61
90	558	400	II	2		-2.41
91	558	400	II	3		-0.26
					66.7%	
101	516	380	II	--		-0.93
					--	
270	462	433	II	1		0.47
					--	
217	402	20	II	1		-4.35
218	402	20	II	2		0.25
220	402	20	II	4		-2.28
221	402	20	II	5		0.45
					83.3%	
210	318	62	II	2		-6.14
211	318	62	II	3		0.69
213	318	62	II	4		-0.12
					66.7%	
141	296	366	II	1		-0.12
					--	

283.4%/5 = 56.7%
mean ordering efficiency

necessary. Of the 25 cases in the analysis only seven were unaggregated provenience units. As before, level 1 of Zone II in one square was lumped with that of an adjacent square so there was no loss in vertical discrimination due to this agggregation. The ceramic sample in the ordered cases equalled 1105; the lithic sample was 874.

A preliminary run utilizing 42 variables over 25 cases indicated three factors which exhibited potential for chronological interpretation on the basis of their orderings of known stratigraphic sequences. The 14 variables with significant loadings on these factors were used in a final run with the selection of Factor 3, oblique rotation, with a mean ordering efficiency of 66.7% per case, as the factor most closely simulating the effects of the passage of time on the material culture. The loadings of the variables on this factor in the unrotated and rotated matrices are displayed in Table 20 along with the factor score coefficients used to mesh outlying units with the sequence in this area. Table 21 lists factor scores for each case in the analysis and the associated radiocarbon dates, where applicable. As shown, high positive scores indicate a late placement in the analysis and high (absolute value) negative scores an early placement for the case. High relative frequencies of Weeden Island Incised, Weeden Island Punctated, and Carrabelle Punctated (primarily the fingernail and linear indented varieties) are indicative of a late deposition for a provenience. Although no variables have negative loadings with an absolute value greater than 0.3, this is not a strongly developed bipolar factor and the weak negative loading of -0.11 for St. Johns Plain might be taken as

TABLE 20
PRINCIPAL COMPONENTS ANALYSIS OF EASTERN MIDDEN AREA:
FACTORS DERIVED,
UNROTATED AND OBLIQUE ROTATED MATRIX FOR FACTOR ONE

Factor	Eigenvalue	% of Variation
1	1.98	19.8
2	1.66	16.6
3	1.49	14.9
4	1.34	13.4
5	1.05	10.5

Artifact Category (%)	Unrotated Loadings, Factor One	Loadings after Oblique Rotation	
		Factor Pattern	Factor Structure
smooth sand tempered plain	0.00	0.08	0.06
St. Johns Plain	-0.11	-0.11	-0.10
Weeden Island Plain	0.10	-0.01	-0.02
Weeden Island Red	0.47	0.08	0.20
Weeden Island Zoned Red	0.10	-0.04	-0.07
Weeden Island Punctated	0.71	0.88	0.90
Weeden Island Incised	0.76	0.62	0.65
Carrabelle Punctated	0.29	0.68	0.65
Indian Pass Incised	-0.48	0.02	-0.03
Old Bay Complicated Stamped	-0.55	-0.03	-0.10

Factor Correlations

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor 1	1.00	-0.01	-0.08	0.01	0.11

Factor Score Coefficients

Artifact Category	Factor Score Coefficients (on standardized variables)
smooth sand tempered plain	0.07
St. Johns Plain	-0.07
Weeden Island Plain	0.01
Weeden Island Red	-0.01
Weeden Island Zoned Red	-0.03
Weeden Island Punctated	0.53
Weeden Island Incised	0.35
Carrabelle Punctated	0.44
Indian Pass Incised	0.03
Old Bay Complicated Stamped	0.00

TABLE 21
FACTOR SCORES FOR PROVENIENCES INCLUDED IN PRINCIPAL COMPONENTS ANALYSIS OF THE EASTERN MIDDEN AREA

FS #	Northing	Easting	Zone	Level	Aggregated Group[e]	Factor Scores on Oblique Rotated Factor 1
497	354	418	II	3	--	-0.40
480	354	418	Feature	10-D	--	-0.40[a]
515	351	420	II	1	--	0.16[b]
517	351	420	II	2	--	-0.22
527	351	423	II	1	--	-0.38[c]
533	351	423	II	3	--	-0.34
			II	1	1A	0.28
			II	2	1B	-0.13
			II	3	1C	-0.16
			II	4	1D	-0.42
			III & II	5	1E	-0.77
			II	1	2A	-0.29
			II	2	2B	-0.26
			II	3	2C	-0.06
			Feature	10-C	--	0.53
			II	4	2D	-0.31
			II	1	3A	-0.74
			II	2	3B	-0.02
			II	3	3C	0.02
			Feature	10	--	4.59[d]
			II	4	3D	-0.19
			III		3E	0.17
			II	1	4A	0.28
			II	2	4B	-0.56
			II	3	4C	-0.82
			III & II	4	4D	0.46

[a]Radiocarbon dated to A.D. 265 $\pm$ 80.
[b]Because this unit is on the edge of a borrow pit which removed portions of the upper part of the midden, these should probably be thought of as Zone II levels 2 and 3, respectively.
[c]This unit is even more affected by the borrow; these levels are probably equivalent to Zone II levels 3 and 5, respectively.
[d]Radiocarbon dated to A.D. 785 $\pm$ 75.
[e]Group 1 consists of horizontally-aggregated levels of squares 352N415E, 350N414E, and 348N415E. Group 2 is composed of squares 352N416E and 352N-418E; Group 3 of 350N416E and 350N418E; and Group 4 of 348N416E and 348N418E.

indicative of an early status for the type in this area. Of course, an absence of the late markers would likewise suggest an early deposition for a provenience.

The attempt to expand this sequence to adjacent areas in the eastern portion of the site was hampered by the generally low densities of material in this area. Only four proveniences from the tests in the transect satisfied the requirement of having more than 30 ceramics, not including plow zone proveniences. These cases are listed in Table 22 by provenience and computed factor scores. Proveniences were selected as possible extensions to this seriation on the basis of their membership in either Group 5 or 6 in the cluster analysis described in Chapter Two. As before levels with less than 30 ceramics, and Zone I, were excluded.

The Southwestern Midden Area

Finally, a third seriation was performed based on the cluster sample excavated to the southeast of Mound B. In addition to the units of the cluster sample, levels of nearby squares excavated during the probability sample were also included. Each of these two samples was seriated separately but early and late variables were so similar that the northern and southern areas were combined for final analysis. Although the two localities have generally similar sequences of material change, most of the proveniences from the northern ridge seem to have been deposited before those in the southern area. A variable-eliminating run reduced the matrix to 16 variables and 36 cases. The ceramic sample totalled 2017; the lithic sample 835, with most of the lithics from the southern half of the line of tests which transected two separate occupational areas.

TABLE 22
EXTENSION OF EASTERN MIDDEN AREA SERIATION TO SIMILAR AREAS IN VILLAGE BY COMPUTED FACTOR SCORES

Cases						Computed Factor Scores
FS #	Northing	Easting	Zone	Level	Ordering Efficiency	
131	490	442	II	1		-0.21
132	490	442	II	2		-0.98
					100%	
323	462	463	II	1		-0.45
324	462	463	II	2		0.30
					0%	

100/2 = 50%
mean ordering efficiency

In the seriation for this locality it was found that Quartimax rotation gave better results than the oblique rotation used elsewhere. As the latter had been selected in the first place for its heuristic success, it did not seem a violation of procedure to choose that method which yielded the best ordering efficiency. Factor 1 of the Quartimax-rotated principal component analysis resulted in factor scores with 62.9% ordering efficiency. The unrotated and rotated loadings of variables on Factor 1 are shown in Table 23 along with the factor score coefficients used in calculating factor scores for other units in the southern midden area. (Only units belonging to Groups 2, 3, and 4 in the cluster analysis of Chapter Two were used to extend the seriation.) The proveniences used to establish this sequence are listed in Table 24. Table 25 lists the 26 proveniences from the southern midden which were tied into this local sequence along with their factor scores.

In this sequence negative loadings indicate early variables and positive loadings signify late variables. Variables with significant negative loadings on Factor 1 in the Quartimax rotated matrix (i.e. those with popularity peaks towards the base of the midden deposit) include grit tempered plain (-0.41), Carrabelle Punctated (-0.58), and unidentified rectilinear complicated stamped (-0.29). Significant variables with their highest relative frequency towards the top of the midden deposit are St. Johns Check Stamped (0.55), unidentified curvilinear complicated stamped (0.82), St. Johns Complicated Stamped (0.85), and a projectile point category, group 1 (0.60).

TABLE 23
PRINCIPAL COMPONENTS ANALYSIS OF SOUTHERN MIDDEN AREA:
FACTORS DERIVED,
UNROTATED AND QUARTIMAX ROTATED LOADINS ON FACTOR ONE

Factor	Eigenvalue	% of Variation
1	2.84	17.8
2	2.05	12.8
3	1.83	11.4
4	1.67	10.5
5	1.38	8.6
6	1.23	7.7
7	1.16	7.3

Artifact Category (%)	Unrotated Loadings, Factor One	Loadings after Quartimax Rotation
grit tempered plain	-0.40	-0.40
St. Johns Check Stamped	0.65	0.55
Papys Bayou Punctated	-0.11	-0.04
Weeden Island Plain	0.16	0.08
Weeden Island Red	0.03	-0.00
Weeden Island Zoned Red	0.07	0.10
Weeden Island Punctated	0.25	0.10
Weeden Island Incised	-0.39	-0.16
Carrabelle Punctated	-0.65	-0.58
unidentified incised	-0.09	-0.29
unidentified curv. complicated stamped	0.80	0.82
check stamped with 7-9 checks/inch	0.07	-0.05
St. Johns Complicated Stamped	0.80	0.85
worked or utilized flint	-0.17	-0.02
non-thermally-altered coral debitage	-0.25	-0.16
lithic group 1	0.46	0.60

Artifact Category	Factor Score Coefficients on Factor One
grit tempered plain	-0.15
St. Johns Check Stamped	0.18
Papys Bayou Punctated	-0.00
Weeden Island Plain	0.02
Weeden Island Red	-0.00
Weeden Island Zoned Red	0.02
Weeden Island Punctated	0.01
Weeden Island Incised	-0.01
Carrabelle Punctated	-0.20
unidentified incised	-0.14
unidentified curv. complicated stamped	0.30
check stamped with 7-9 checks/inch	-0.03
St. Johns Complicated Stamped	0.32
worked or utilized flint	0.02
non-thermally-altered coral debitage	-0.04
lithic group 1	0.25

TABLE 24
FACTOR SCORES FOR PROVENIENCES INCLUDED IN THE PRINCIPAL COMPONENTS ANALYSIS OF THE SOUTHERN MIDDEN AREA

FS #	Northing	Easting	Zone	Level	Aggregated Group[d]	Factor Scores on Quartimax Rotated Factor One
191	306	140	II	4	--	-0.60
192	306	140	II	5	--	-1.04
199	312	133	II	5	--	0.15
200	312	133	II	6	--	-0.45
206	312	133	Feature 8		--	-0.86[a]
			II	1	1A	-0.08
			II	2	1B	-0.26
			II	1	2A	0.21
			II	2	2B	-0.48
			II	3	2C	-0.37
			II	4	2D	-0.23
			II	5	2E	-0.68
			II	6	2F	-0.60
			II	7	2G	-0.08
			II	1	3A	-0.46
			II	2	3B	-0.81
			II	3	3C	-0.69[b]
			II	4	3D	0.02
			II	5	3E	-0.65
			II	6	3F	-0.28
			II	7	3G	-0.65
			II	8	3H	-0.83
			II	4	4A	3.48
			II	1	5A	1.27
			II	2	5B	2.18
			II	3	5C	1.69
			II	4	5D	1.73
			II	5	5E	-0.50
			II	1	6A	0.67
			II	2	6B	0.77
			II	3	6C	0.08[c]
			II	4	6D	-0.13
			II	5	6E	-0.62
			II	6	6F	-0.28

[a]Radiocarbon dated to 30 B.C. ± 95.
[b]Associated with Feature 12, radiocarbon dated to A.D. 245 ± 70
[c]An associated postmold radiocarbon dated to A.D. 420 ± 95.
[d]Group 1 is composed of squares 314N133E, 316N133E, and 312N135E. Group 2: 310N131E, 310N133E, and 310N135E. Group 3: 302N133E, 304N133E, 306N133E, and 308N133E. Group 4: 282N133E, 278N133E, 274N133E, and 270N133E. Group 5: 266N133E, 262N133E, and 258N133E. Group 6: 254N133E, 250N133E, 250N140E, and 246N133E.

TABLE 25
EXTENSION OF SOUTHERN MIDDEN AREA SERIATION TO SIMILAR AREAS IN VILLAGE BY COMPUTED FACTOR SCORES

FS #	Northing	Easting	Zone	Level	Ordering Efficiency	Computed Factor Scores
240	648	136	II	1		-1.27
241	648	136	II	2		-0.48
242	648	136	II	3		-0.52
					33.3%	
72	541	344	II	1		-0.78
74	541	344	II	3		-0.28
78	541	344	II	5		-1.41
79	541	344	III	--		-0.96
					66.7%	
170	278	232	II	1		0.56
					--	

100/2 = 50%
mean ordering efficiency

Before discussing the significance of these seriations in more detail, the results of the attribute analysis by depth categories for each midden area rather than by type classification will be briefly presented.

Chronological Implications of the Attribute Analysis

For the following section depth categories in each midden area were defined by lumping two adjacent vertical levels, excluding Zone I. Thus, depth category 1 was composed of Zone II levels 1 and 2, and so forth. The deepest group (depth category 3 in the eastern midden area and 4 in the other two areas) included the relevant levels in Zone II and any artifacts from Zone III, if present. Significance of relationship for nominal variables was calculated using the chi-square procedure on row and column tables. Relationships of the ordinal and ratio variables were found using a non-parametric Kruskal-Wallis one-way analysis of variance procedure with a chi-square test for significance. As usual, more details can be found in the appendix. All relationships with an *alpha* level of 0.2 or less are reported.

Northern Midden Area

Table 26 shows the significant relationships of attribute states with depths for each of the four depth categories, along with the associated *alpha* level of significance on the chi-square test. One interesting continuous trend in change over time is a decrease in both land and groove widths on stamped sherds (n=12) although only the decrease in groove width yields a significant test statistic. These sherds include both check stamped and complicated stamped designs. Density of black inclusions in the paste also decrease regularly over time. Number of checks on check stamped sherds increases over time but the sample is too small to claim significance (n=5). The presence of a dark central core decreases slightly in frequency from Depth 4 to 3 then increases significantly with decreasing depth. This is accompanied by a general tendency towards darker exterior and interior surface coloration although neither of these trends yield significant test statistics. Folded and sharpened lip forms generally increase in relative frequency over time at the expense of the rounded, generally unmodified, form. This is somewhat surprising in view of the fact that Weeden Island Plain, almost invariably with folded lips, appears in highest relative frequency in lower levels. These analyses are not as contradictory as they first seem; rather, they suggest that the folded lip form is introduced on Weeden Island Plain and later appears on other types as well. Paste texture changes fairly dramatically from coarsest in Depth 4 to finest in Depth 3, with ceramics from the upper two depth categories intermediate in texture.

In general the most important changes seem to take place between the deposition times of the fourth and third depth groups, suggesting a quite early date for the lowest levels of the sample, or a discontinuity in the deposition. The very small number of Deptford series ceramics, primarily from the lower levels of the several tests along the creek, reinforce this suggestion. Between the times of deposition of the third through first depth categories, however, changes are slow. This implies the possibility of a break in the occupation of the site after a nominal

TABLE 26
SIGNIFICANT RELATIONSHIPS BETWEEN CERAMIC ATTRIBUTE STATES AND DEPTH: NORTHERN MIDDEN AREA

Depth	Attribute	Alpha Level of Significance
1	narrowest groove width, paddle stamped ceramics	0.10
	highest relative frequencies sharpened and folded lips	0.20
	highest incidence of interior coring	0.10
2	fewest black inclusions in paste	0.12
3	largest vessel diameter at orifice	0.18
	incisions most closely spaced	0.18
	largest groove width; paddle stamped ceramics	0.10
	finest paste texture	0.05
	most black inclusions in paste	0.12
	highest relative frequencies of lips which are rounded or beveled towards interior of vessel	0.20
	least interior coring	0.10
4	smallest vessel diameter at orifice	0.18
	incisions most widely spaced	0.18
	coarsest paste texture	0.05

Deptford occupation followed by an intensive, relatively continuous, Weeden Island occupation. The stratigraphic evidence in one test also indicates discontinuity between Deptford and Weeden Island inhabitation.

It is possible to coordinate the depth categories used for the attribute analysis and the factor seriation by finding the central tendency of the factor scores for the proveniences belonging to each depth category then assigning this score to the midpoint of the depth category. The appropriate measurement of central tendency for the factor scores is the median since the factor scores are interpreted as ordinal indicators of chronological relationships between proveniences. The medians of the factor scores for each depth category, using only the levels from the cluster sample from which the seriation was generated, are as follows:

Depth Category	Median Factor Score
1	-0.15
2	0.24
3	0.60
4	(no levels seriated due to small sample size)

Eastern Midden Area

The significant relationships of attribute states with depths for each of the three depth categories in this locality are shown in Table 27. Again, the land and groove widths for paddle-stamped ceramics decrease over time but here sample sizes are too small to be significant

TABLE 27
SIGNIFICANT RELATIONSHIPS BETWEEN CERAMIC ATTRIBUTE STATES AND DEPTH: EASTERN MIDDEN AREA

Depth	Attribute	Alpha Level of Significance
1	most red inclusions in paste	0.16
2	fewest micaceous inclusions in paste	0.11
	highest relative frequencies of vessels with inslanting and vertical walls	0.17
	most sponge spicule inclusions in paste	0.03
3	most micaceous inclusions in paste	0.11
	fewest sponge spicule inclusions in paste	0.03
	fewest red inclusions in paste	0.16
	highest relative frequencies of vessels with incurving and out-slanting walls	0.17

(n=5). Occurrence frequency of micaceous and white inclusions generally decreases through time; sponge spicule density first increases drastically then decreases slightly; and red inclusions increase drastically at first from the third to second depth categories, then slowly from the second to first category.

The factor seriation is meshed with the attribute analysis depth categories in the manner reported above:

Depth Category	Median Factor Score
1	-0.28
2	-0.24
3	1.44

Southwestern Midden Area

Table 28 lists the significant correlations between attribute states and depth based on the rim sherds selected for attribute analysis from the cluster samples. Unlike stamped ceramics from the other two areas the land and groove widths in these ceramics increase over time, although neither trend is significant (n=10). Paste texture clearly changes from coarse to fine during the occupation of this locality. The incidence of micaceous inclusions decreases gradually from Depth 4 to Depth 2, then increases rapidly and peaks in Depth 1. An important trend of gradual change which this locality shares with the northern midden area is the increasing incidence of a dark central core. This is probably caused by a decrease in firing time or temperature although other considerations such as use of clays with higher organic content or

TABLE 28
SIGNIFICANT RELATIONSHIPS BETWEEN CERAMIC ATTRIBUTE STATES
DEPTH: SOUTHERN MIDDEN AREA

Depth	Attribute	Alpha Level of Significance
1	finest paste texture	0.09
	most micaceous inclusions in paste	0.17
	most interior coring	0.08
2	fewest micaceous inclusions in paste	0.17
3	highest incidence of atypical or unique ceramic designs	0.18
4	coarsest paste texture	0.09
	least interior coring	0.08

increased incidence of firing in a reducing atmosphere could be contributing factors (Shepard 1975:213-223). Exterior and interior surface colors remain about the same throughout the sequence.

When the median factor score for levels in each of these depth categories is tabulated the following decrease in score over depth appears:

Depth Category	Median Factor Score
1	0.21
2	-0.13
3	-0.58
4	-0.65

Coordinating the Chronologies

A typological sequence has been presented for each of three areas within the site which was intensively sampled. These in turn have been coordinated with the significant changes in the attributes of the ceramics in each of the three localities. Units which were excavated during the probability or transect samples have been tied into one of these sequences depending on their general artifact configuration as illustrated by the cluster analysis in Chapter Two. It now remains to link these local sequences together and discuss the chronology of the site as a unit.

Discarding the A.D. 1395 date from the northern midden area and averaging the two dates on Feature 9 from the northeastern midden region, three radiocarbon dates remain from the northern midden, two from the eastern, and three from the southern. This involves accepting, with reservations, the 30 B.C. date on Feature 8 in the southern midden area.

In Figure 18 the radiocarbon dates for each midden area have been plotted along a time scale with one standard deviation around each date represented by a heavy bar to the left of the pertinent stratigraphic column. Each date derives from a provenience which has an associated factor score; thus the factor scores between two dates in any midden area can be approximately scaled in relation to the time line. Since the midpoints for each depth category are the medians on the factor scores for proveniences from that depth category, these too can be approximately scaled in relation to the factor dimension and, therefore, in relation to the time line. The salient characteristics of the ceramics for each depth category as determined by attribute analysis are also listed. Each circle on the left-hand side of the stratigraphic columns represents a provenience located by its factor score. The identity of these proveniences can be found in the tables embedded in this chapter.

Since the portions of each column extending above or below the extreme radiocarbon dates for that midden area cannot be scaled,they have been relatively positioned so as to create the best accord between the ceramic types and attributes for the depth categories when the chart is read across columns (that is, during any given time period). Below and above each stratigraphic column are listed the early and late ceramic and lithic categories which made significant contributions to the factor along which proveniences have been placed. The scaling for the factor scores is listed to the left of each column. The column representing the eastern midden area presented special problems because of

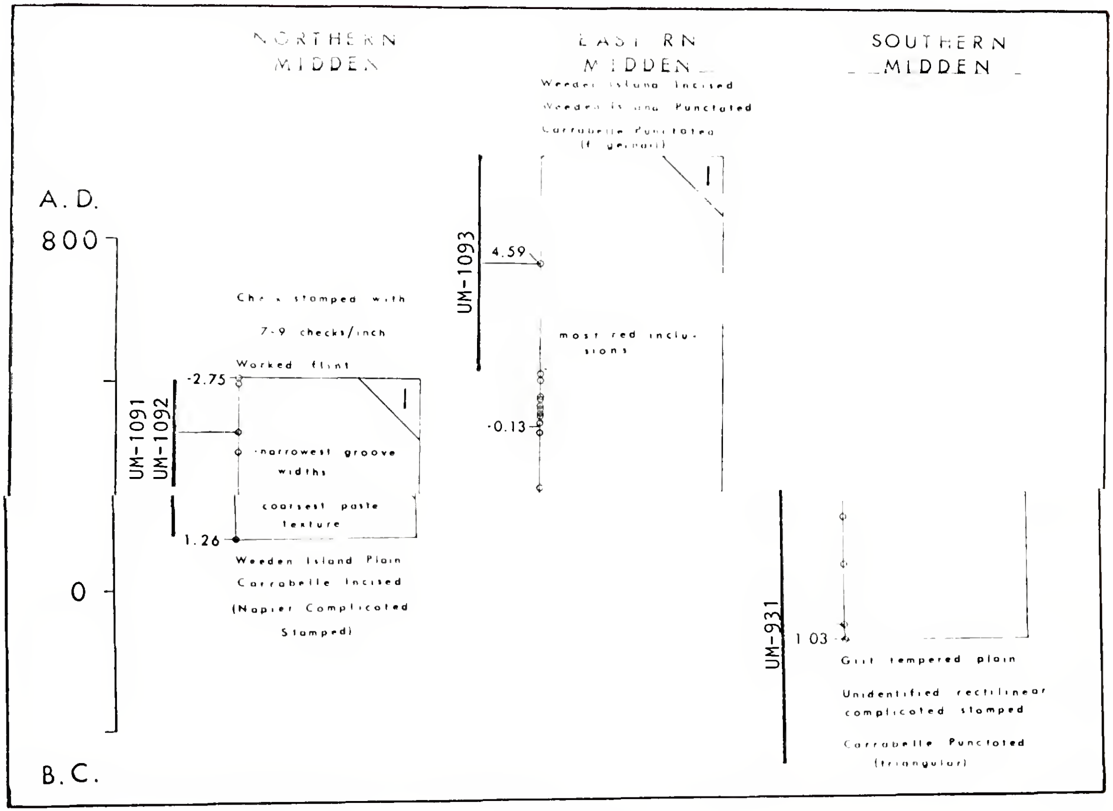


Fig. 18
Coordination of the three Principal Components Seriations with Attribute Analyses and Radiocarbon Dates

the score (4.59) for Feature 10. This normally would have been used to scale the remainder of the column since it is a radiocarbon dated provenience; however the score is an obvious outlier and if it had been used for scaling purposes would have compressed most of the proveniences into the bottom quarter of the column. Therefore, the factor score for the median of depth category 1 was placed in such a way as to allow Depth 3 in the eastern midden (in which incidence of micaceous paste inclusions reached maximum frequency) to overlap with Depth 1 of the southern midden which also contained ceramics exhibiting highest incidence of micaceous inclusions. Although the stratigraphic columns for these two midden areas overlap in the figure, the range of confidence intervals (one standard deviation) of the radiocarbon dates indicate the possibility that at least the cluster-sampled portion of the southern midden could have been deposited entirely prior to occupation of the eastern midden.

Discussion

In his well-known sequence G. R. Willey separated the Weeden Island period into early and late divisions primarily on the replacement of Swift Creek Complicated Stamped pottery (late variety) by Wakulla Check Stamped pottery (Willey 1949:397), noting that:

> (the) two periods, Weeden Island I and II, follow in that order after Santa Rosa-Swift Creek. Weeden Island I is noted by the first appearance of the Weeden Island series of pottery types. The only exception to this is the type Weeden Island Plain. As now defined, Weeden Island Plain covers a great range of vessel forms, some of which first appear in the Santa Rosa-Swift Creek period . . . .

> Some types, such as Weeden Island Punctated, are more common in . . . Weeden Island II than in Weeden Island I.

In much of Florida Santa Rosa-Swift Creek is no longer recognized as an appropriate name for the period immediately following the Deptford period and preceding the Weeden Island period. J. T. Milanich (n.d. a) points out that in Florida Swift Creek ceramics reach their peak frequencies in the Panhandle highland forests east of Pensacola where there are few ceramics of the Santa Rosa complex. Santa Rosa series ceramics, on the other hand, occur primarily on the Gulf coast west of Pensacola.

The temporal equivalent (in North Florida and the North Peninsular Gulf Coast) of the Santa Rosa and Swift Creek complexes on the Panhandle coast has been called Proto-Weeden Island by Milanich (n.n. a). At the Garden Patch site, a Deptford and Proto-Weeden Island mound and village complex on the North Peninsular Gulf Coast, the ceramic sequence began with a complex marked by Deptford series ceramics, West Florida Cord Marked, and Swift Creek Complicated Stamped, and terminated in upper midden levels containing St. Johns Plain and Rusking Dentate Stamped (Kohler 1975:40). The transition from Deptford to Proto-Weeden Island is marked by an increase in the amount of plain ceramics (including Pasco Plain, in this area) and low percentages occurrences of Crooked River Complicated Stamped and Thomas Simple Stamped.

Willey's dichotomy of the Weeden Island period has been further subdivided by Percy and Brose (1974) with additional specifications in Percy (1976). Briefly, these subdivisions are:

Weeden Island 1. Dominant ceramic type is late variety Swift Creek Complicated Stamped; Weeden Island types including Weeden Island Incised, Keith Incised, Carrabelle Incised, and Carrabelle Punctated appear for the first time. Reported at Hall, Mound Field, Bird Hammock, Carrabelle (Pits III and IV), Sowell (III and IV), Fort Walton (VI), and Parrish Lake (Area G).

Weeden Island 2. The other incised and punctated types in the Weeden Island series appear alongside those found during Weeden Island I. Represented at Bird Hammock, Hall, Carrabelle (III and IV), Sowell (III and IV), Fort Walton (I and VI), and Stoutamire.

Weeden Island 3. Introduction of check stamping coupled with slight decline in importance of complicated stamping. Represented at Hall, Sowell (III and IV), Fort Walton (I and VI), Stoutamire, and southern end of Torreya Site.

Weeden Island 4. Complicated stamped disappears; check stamping increases in importance. Represented at Sowell (III and IV), Fort Walton (VI), and Torreya (northern end).

Weeden Island 5. Cob-marked pottery appears but check stamped ceramics are clearly dominant. Weeden Island series types have become less abundant.

Although in its specificity, this appears to be an improvement over Willey's very general period assignments, the Percy and Brose scheme cannot be applied equally well to all the local Weeden Island cultures. In the North Florida and North Peninsular Gulf coastal regions especially, it is doubtful that Wakulla Check Stamped was ever the "dominant" ceramic type, even in very late Weeden Island period sites. In contrast to the 66% of total ceramics reported at 8 Li 8 (Percy 1976:81) or the 42%

reported from level 1 of test 3 at the Tucker Site (Sears 1963:10) Wakulla Check Stamped rarely exceeds 5% in the latest levels at the McKeithen Site which date around A.D. 600-A.D. 800. The same is true for Swift Creek Complicated Stamped; the earliest levels at McKeithen contain far less than many probably contemporaneous sites to the west.

Despite these differences in relative abundance of the temporal markers the general scheme of ceramic change proposed by both Willey and Percy and Brose for the Florida Panhandle is reflected in several major trends of ceramic change at the North Florida McKeithen Site. Certainly, small-checked stamped ceramics increase in later levels; in the southwestern midden area this is St. Johns Check Stamped while in the northern midden it is Wakulla Check Stamped. As predicted by Willey, Weeden Island Plain seems to show up quite early in the sequence (it loads as an early variable in the northern midden seriation) while Weeden Island Punctated is more abundant in later levels than in earlier levels in the second midden area. Moreover, as predicted by both chronologies, Swift Creek Complicated Stamped (undifferentiated as to early or late) and large-checked stamped ceramics come close to having significant loadings as early variables in the seriation for the midden adjacent to the creek; that is, they have a weak tendency to occur in greater relative abundance towards the bottom of the midden deposits.

The early position of Napier Complicated Stamped in the northern midden sequence has been parenthesized in Figure 18 due to the small sample size (n=5) in the analysis. On a stylistic basis this type has been placed immediately before Woodstock Complicated Stamped in a developmental sequence ending in Etowah Complicated Stamped (Sears 1958:167). This results in a Middle Woodland placement for the type. Alternatively, Wauchope has proposed that the Etowah type developed directly from Napier Complicated Stamped ceramics (1948:204-207), forcing Napier into the Woodland to Mississippian transitional phase. The earlier position for Napier proposed by Sears seems more in line with the few examples from McKeithen, and is consonant with Fairbanks' (1952:288) impression of Napier as a relatively early complicated stamped type. An understanding of the temporal significance of Napier Complicated Stamped has been hindered by its minority representation in all sites except one in central Georgia and its rarity in stratified contexts (Ferguson 1971:56, 66-68).

In general, all the rectilinear complicated stamped types at McKeithen are slightly better represented in early levels than in late. This should be no surprise as Willey (1949:383-386) assigned both Crooked River Complicated Stamped and St. Andrews Complicated Stamped to the Santa Rosa-Swift Creek period.

Carrabelle Punctated is included in Figure 18 as an early type in the southern midden area and a later type in the eastern midden area. There seems to be a marked shift through time in the style of punctation characterizing the type. The earliest representatives (the early Carrabelle Punctated from the southern midden) typically bear small, well-spaced triangular punctations not unlike those in the later Weeden Island Punctated, though the paste is coarser. Small round punctations reminiscent of Santa Rosa Punctated are also early, but are rather uncommon. Over time punctation styles proliferate with crescentic and linear fingernail impressions and the donut-like "hollow reed" impressions reaching highest relative frequencies late in the occupation at McKeithen; this is the Carrabelle Punctated which appears as a late marker in the eastern midden area. Given this differential temporal distribution the establishment of a type-variety system to formally recognize these variants might prove very useful.

Although only seven Kolomoki Complicated Stamped sherds have been excavated from the village midden, these are all in the middle and upper levels of late units. If more were present and the type could have been included in the seriations it seems likely that the type would have been selected as a late marker along with Wakulla Check Stamped and St. Johns Complicated Stamped. This reinforces Sears' hypothesis that the Kolomoki period in southwest Georgia is the temporal equivalent of the late Weeden Island period in Florida. However, if the early absolute dates for Weeden Island so far obtained from McKeithen are accurate, the Mississippian-influenced vessels from Kolomoki (Sears 1965:85) suggest that the Kolomoki period extended beyond A.D. 785, the most recent date from the McKeithen village.

The Gulf Coastal Plain

On a stylistic basis and on the presence of actual trade sherds in several sites Sears has argued for certain temporal equivalencies between the Florida-southwest Georgia area and the lower Mississippi valley area. Specifically, he equated Deptford with Tchefuncte; Santa Rosa-Swift Creek with Marksville and early Troyville; Weeden Island I and "I-b" with late

Troyville and early Coles Creek; and Weeden Island II/Kolomoki with Late Coles Creek (Sears 1956:81-82). Selected dates for each of the lower Mississippi valley periods as viewed from the lower Yazoo Basin region (Phillips 1970:7, 945-957) place Marksville from about 100 B.C. to A.D. 300; Baytown (Phillips' respecification of Ford's Troyville period) from about A.D. 300 to A.D. 700; and Coles Creek from about A.D. 700 to A.D. 1000.

In addition to the rare Deptford sherds, a few sherds each of Basin Bayou Incised, St. Andrews Complicated Stamped, and Crooked River Complicated Stamped indicate that occupation of the McKeithen Site began during that elusive "plain," or Proto-Weeden Island period, seen in much of the northern half of peninsular Florida. This probably overlaps with the Santa Rosa and Swift Creek periods to the north and west, and follows the Crystal River florescence on the North Peninsular Florida Gulf Coast. Yet, with the exception of one example of galena from the southwestern midden area, there are no characteristic Hopewellian artifacts known from the McKeithen middens or mounds. At least three partly alternative explanations could be offered to explain the lack of obvious Hopewellian influence in the early mound (Mound B) and village areas at McKeithen:

1. As Sears points out, few Hopewellian artifacts are found in Early Swift Creek mounds possibly because of a "one-way" flow of materials from south to north in late Hopewell-influenced cultures. Sears calls the sacred complex of this period the "Green Point" complex and differentiates it from an earlier Deptford-related "Yent" complex seen at Crystal River (main

temple mound and encircling embankment) and early portions of Mandeville (1962:16).

2. In its earliest phase North Florida Weeden Island may have developed contemporaneously and in competition with a declining Hopewellian sphere of ideational or economic influence just as a late Weeden Island culture to the northwest at Kolomoki apparently partook of traits relating to the spread of Mississippianism while retaining a distinct ceramic tradition.

3. Despite its excellent context the earliest village date of 30 B.C. ± 95 may be in error.

Based on the information now in hand I place the main occupation of the McKeithen village areas from circa A.D. 150-A.D. 750, recognizing the possibility of continued use of Mound A and its immediate vicinity by later outlying agricultural settlements. Using Willey's culture periods, the village occupation is placed in terminal Santa Rosa-Swift Creek through Weeden Island II; using Percy and Brose's time frame, from earliest Weeden Island I to Weeden Island 4 (?). Until the regional survey now in progress is complete, and the excavated materials from Mound A have been correlated with the village sequence, it is useless to speculate whether or not the abandonment of the village coincides with the end of the manufacture of Weeden Island ceramics in North Florida.

CHAPTER FIVE
THE SOCIAL DIMENSIONS OF MATERIAL VARIATION

In Chapter One ethnohistoric evidence was discussed to suggest that in North Florida, as in much of the Southeast at the time of contact, systems of both ascribed and achieved statuses were embedded in many of the aboriginal societies. The European observers were able to differentiate superordinate, intermediate, and subordinate members of a society not only through the attitudes and actions of the group, but more importantly, for the archeologist, by differences in the items surrounding, worn, used, given, and received by members of different status groups. Archeological evidence from Moundville was cited to demonstrate that this pattern, far from being a recent development in the Southeast, must have originated not later than the beginning of the Mississippian period, which most archeologists now agree began about A.D. 900 in portions of the Southeast and Midwest.

It is not easy to differentiate a chiefdom from a tribal level of integration in the archeological record, however. We have seen that relative size of population, appearance of burials ranked along two dimensions, and some degree of craft specialization may serve to divide the evolutionary continuum into analytical slices for the convenience of the archeologist. Yet not only is it difficult to place precise numbers on the size of a population at an aboriginal site, but it is also difficult to specify thresholds for population size above which it is adaptive for a society to maintain an "information specialist" or chief to process the increased flow of information resulting from increased population size (Flannery 1972). It has been suggested that societies composed of residential associations of less than 100 people are ordinarily integrated in a very loose band organization, and that above 100 people additional organization systems appear which are still based on kinship, although it may in some cases be fictive (Service 1962:111). This level of organization has been called tribal (Service 1962:110-142). Typically, leadership is still weak and based on allocated power; ritual regulation may serve as the most important device in helping "maintain undegraded environments, limit inter-group raiding, adjust man-land ratios, facilitate trade, redistribute natural resources, and 'level' any differences which threaten society's egalitarian structure" (Flannery 1972:402).

Cross-cultural comparative data place the threshold for the chiefdom level of integration discussed in Chapter One at around 500 persons (Sanders and Price 1968:81-84; Birdsell 1968). This, however, is an extremely approximate number.

Does the McKeithen site represent the remains of a chiefly society? It is easier for the archeologist to demonstrate increasingly non-random distributions of the possible material correlates of ranking in a complex site than it is to point to a specific archeological phase as marking the transition between the tribe and the chiefdom. In Chapter One it was hypothesized that such non-random distributions could be shown at the McKeithen site. Specifically, it was stated that if hierarchical ranking were present at the site, then--

1. Non-local ceramics would be concentrated in elite residential areas;
2. Vessels with a high diversity of form would be concentrated in the elite residential areas;
3. The diversity of ceramic types would be highest in the elite residential areas; and

4. Non-local materials such as bone, shell, and lithics would be concentrated in the elite residential areas.

To test the hypothesis the occupation of the site has been divided into early, middle, and late phases, and levels with more than 30 ceramics (or aggregated groups, in the areas of the more intensive excavations) have been assigned to one of the phases by their position on the master chart in Fig. 18. The early phase is composed of levels which appear, following the chart, to have been deposited prior to A.D. 250. The late phase is composed of levels deposited after A.D. 550, and the middle phase consists of levels placed between these temporal extremes. The standard deviations of the radiocarbon dates used to construct the chart suggest that not too much weight can be placed on differences between temporally-adjacent phases; however, there should be significant chronological differences between levels deposited during the early and late phases.

The first test implication concerns the distribution of the ceramics presumed to be non-local on the basis of paste or style. These ceramic types were identified in Chapter Three as probable trade items:

Pasco Plain
St. Johns Plain
St. Johns Check Stamped
"St. Johns complicated stamped"
Papys Bayou Punctated
Papys Bayou Incised
Crooked River Complicated Stamped
Kolomoki Complicated Stamped
Napier Complicated Stamped
Weeden Island Incised
Weeden Island Punctated
Weeden Island Zoned Red
Weeden Island Red

The last four of these constitute a special category, however, since these are the ceramics also distinguished by a high diversity of vessel form, lip additions, surface finish, and fineness of paste.

Therefore the percentages of the first nine of these ceramic types have been aggregated by provenience and for convenience are hereafter called trade ceramics. The percentages of the last four types have likewise been aggregated, and since the relationship between these ceramics and presumed high-status burials has been noted elsewhere, this is called the elite category for convenience. To map the distributions of the elite category is to map the distribution of high shape diversity.

The strategy for testing the implications will be to map the distributions of each artifact category to locate areas which are set apart from the rest of the site by high frequencies of that category. However, it is difficult to test the significance of the patterns produced by mapping any one artifact category. What has been done is to find the relative variation of any category in each phase by calculating a coefficient of variation (CV) which expresses in percentage form the ratio of the standard deviation divided by the mean. A high CV indicated a great deal of variation in the relative frequencies of a variable across the site while a low CV suggests a normal peaked distribution for the variable. To formally test each implication it is convenient to test them two at a time, showing by the maps where each category is most frequently represented, and demonstrating by correlation coefficients and an accompanying test of significance the strength of the observed relationships. On the basis of Otto's (1975) work, each category is tested for its correlation with the elite ceramics, which are postulated to be the best indicator of location of high-status residence, just as high frequencies of transfer-printed ware were the best ceramic indicator of high-status housing areas on a nineteenth-century plantation.

For the following isopleth maps levels from a single unit belonging to the same phase were aggregated. Because the number of data points is smaller for each of these maps than for the similar isopleth map shown in Fig. 6, the maximum search radius for the SYMAP interpolation algorithm was limited to 50m. The shading is to the same scale on each of the maps in a particular time series so that they may be directly compared.

Proveniences deposited during the earliest phase have the highest mean relative frequency of trade ceramics (3.52%); those of the middle phase, a slightly lower mean (3.26%); and those of the last phase, a still lower mean percentage of trade ceramics (2.05%). The distributions of trade ceramics across the site in each phase are shown in Figs. 19 - 21; Table 29 displays summary statistics for each of the categories of materials on the maps. In each of the first two phases there appear two areas on each map which display high concentrations of trade sherds; during the last phase only a single area northeast of Mound A shows such a concentration. The greatest disparities in the distributions of trade sherds across the site occur during the last phase of occupation when the CV reaches 119%.

Do the elite ceramics have isomorphic distributions? The changing depositional patterns for this ceramic category in each of the three phases are shown in Fig. 22 - 24. The correlation coefficients for the relative frequencies of trade and elite ceramics by phase are shown in Table 29 along with the alpha level of significance for a chi-square statistic of a two-tailed test measuring the probability of wrongly rejecting the null hypothesis that there is no relationship between the trade and elite categories when in fact such a relationship does not exist.

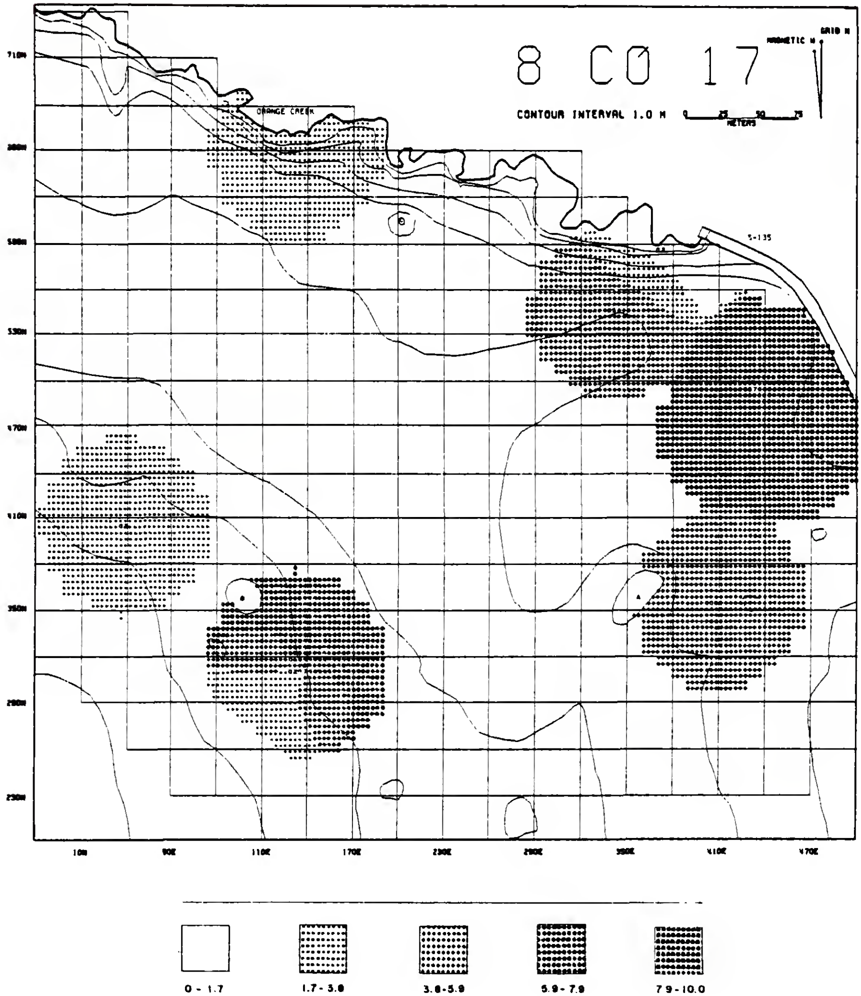


FIG. 19
PERCENTAGES OF TRADE CERAMICS IN CERAMIC ASSEMBLAGE, EARLY PHASE

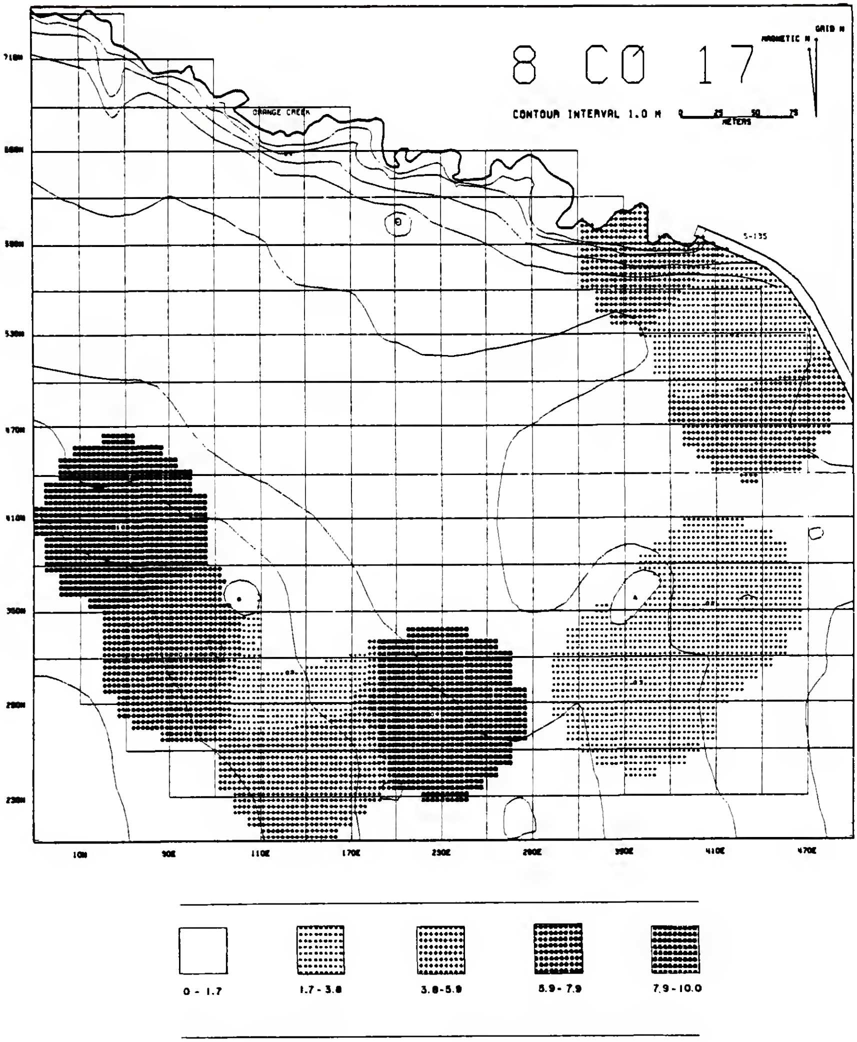


FIG. 20
PERCENTAGES OF TRADE CERAMICS IN CERAMIC ASSEMBLAGE, MIDDLE PHASE

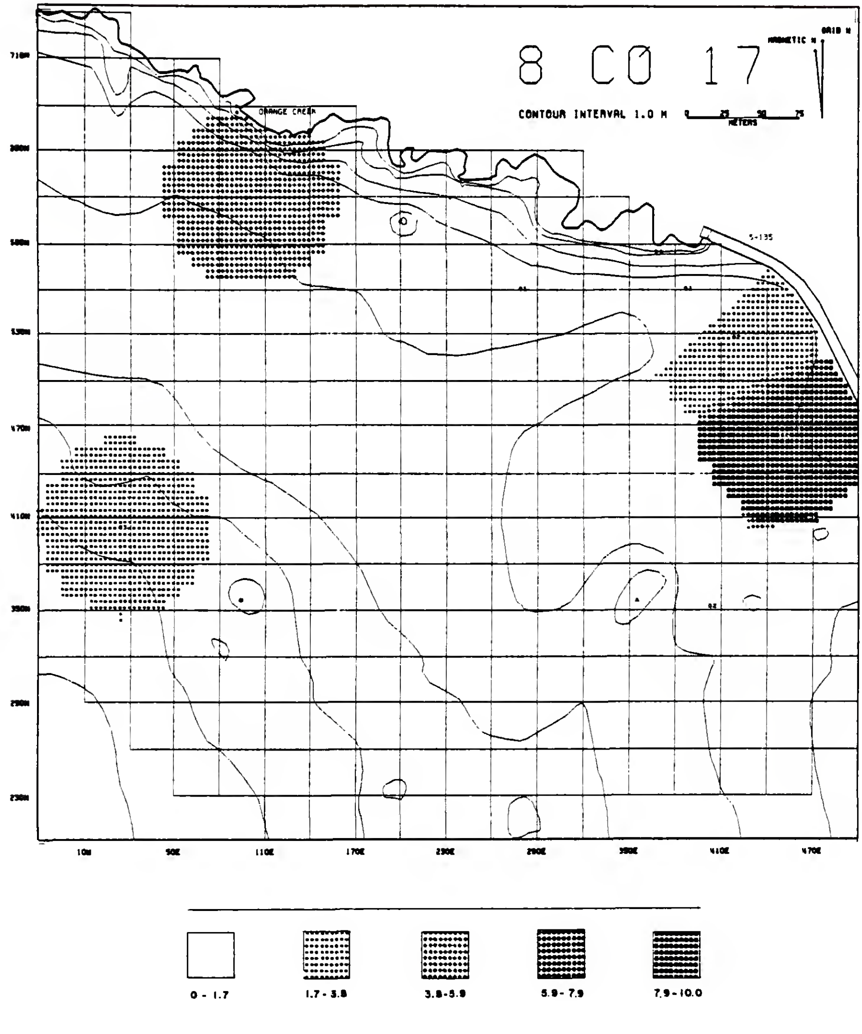


FIG. 21
PERCENTAGES OF TRADE CERAMICS IN CERAMIC ASSEMBLAGE, LATE PHASE

TABLE 29
VARIATIONS OVER TIME IN THE CENTRAL TENDENCIES, DISPERSIONS, AND CORRELATIONS OF THE MAPPING VARIABLES

	Early Phase	Middle Phase	Late Phase
N of proveniences	14	15	11
% trade ceramics:			
mean	3.52	3.26	2.05
standard deviation	2.65	3.21	2.44
coefficient of variation	75.3	98.5	119.0
correlation with % elite ceramics:			
r	0.43	0.07	0.60
r^2	0.19	0.01	0.35
alpha level of significance	0.06	0.40	0.03
% elite ceramics:			
mean	3.60	4.69	2.57
standard deviation	3.86	2.95	2.06
coefficient of variation	106.9	62.9	80.2
Ceramic diversity index ($\bar{H}$):			
mean	1.46	1.37	1.40
standard deviation	0.30	0.33	0.21
coefficient of variation	20.3	24.4	14.9
correlation with % elite ceramics:			
r	0.53	0.36	0.39
r^2	0.28	0.13	0.15
alpha level of significance	0.02	0.09	0.12
% non-local lithics:			
mean	7.57	2.67	7.18
standard deviation	7.83	3.48	3.16
coefficient of variation	103.4	130.4	44.0
correlation with % elite ceramics:			
r	0.07	-0.62	0.44
r^2	0.01	0.38	0.20
alpha level of significance	0.40	0.01	0.09

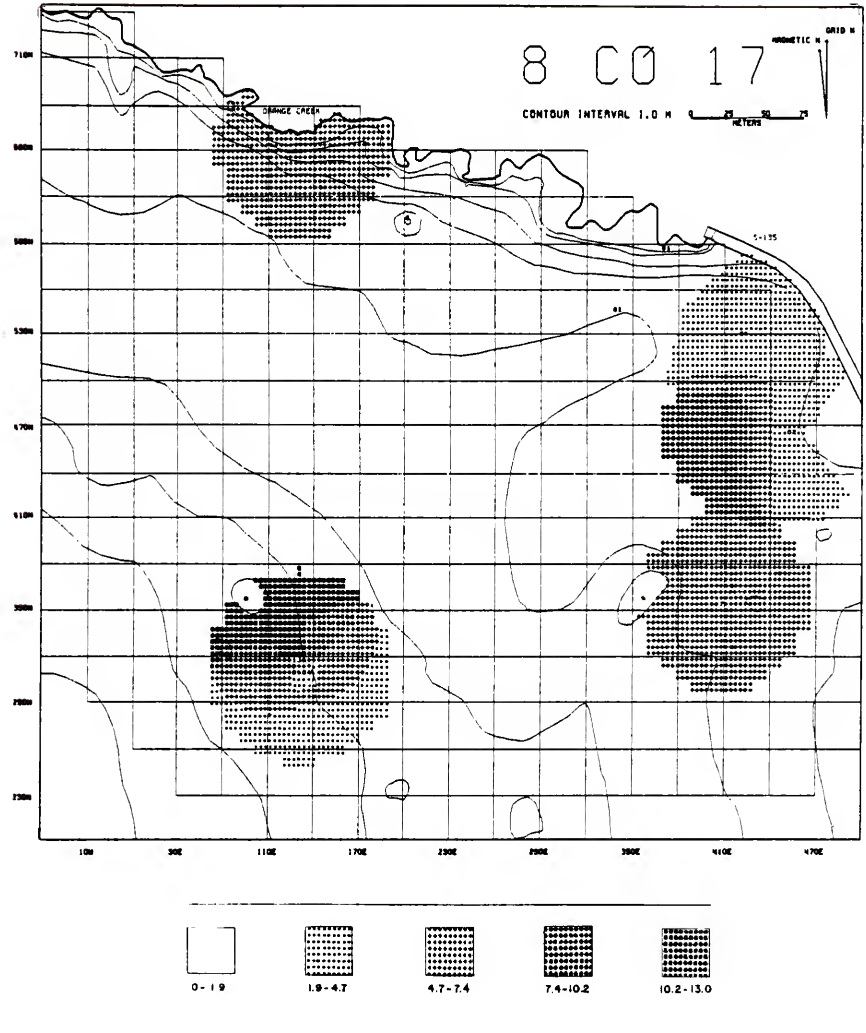


FIG. 22
PERCENTAGES OF ELITE CERAMICS IN CERAMIC ASSEMBLAGE, EARLY PHASE

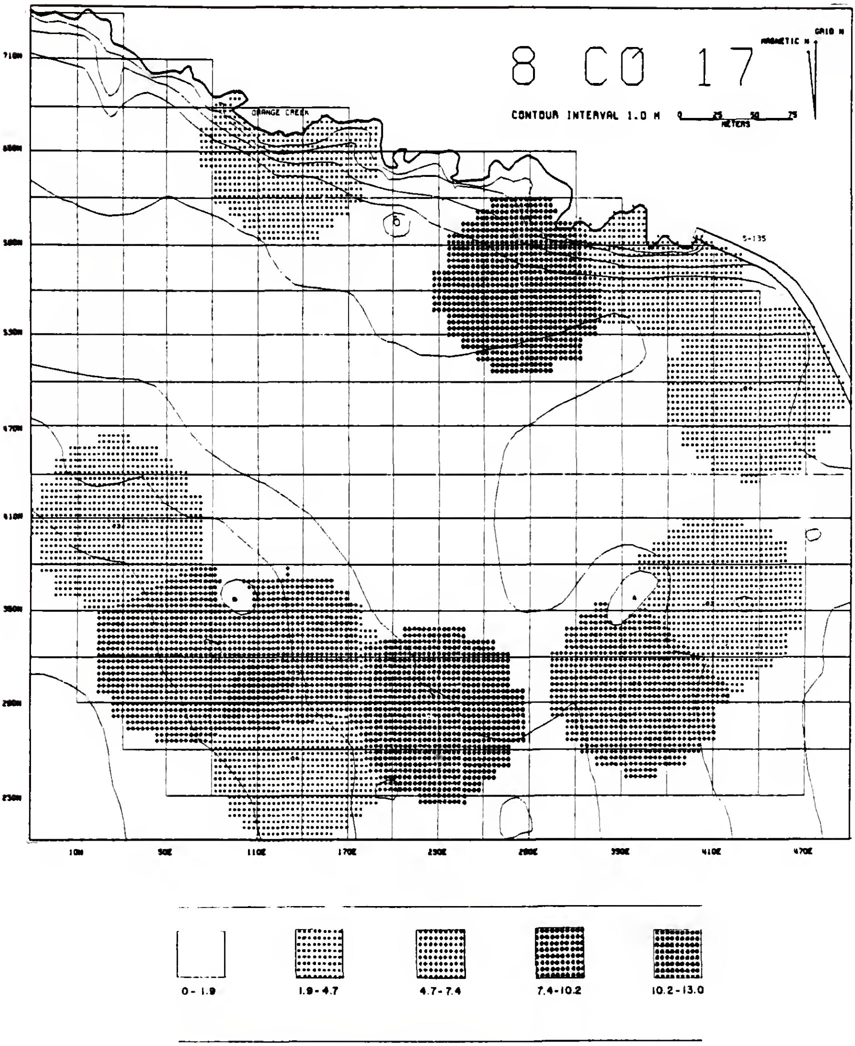


FIG. 23
PERCENTAGES OF ELITE CERAMICS IN CERAMIC ASSEMBLAGE, MIDDLE PHASE

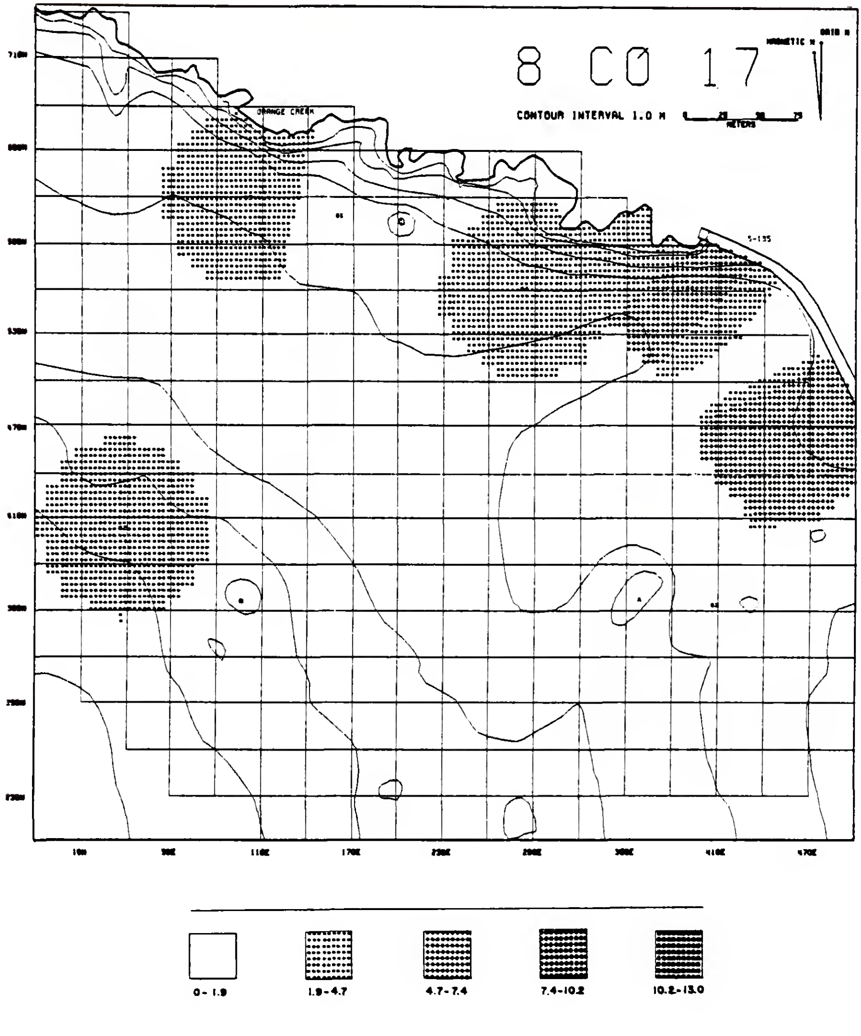


FIG. 24
PERCENTAGES OF ELITE CERAMICS IN CERAMIC ASSEMBLAGE, LATE PHASE

During the early phase of occupation high relative frequencies of the postulated elite types appear in the same areas which displayed high relative frequencies of the presumed trade wares. The correlation coefficient between the two categories during this phase indicates a moderate relationship ($r^2 = 0.19$) which is significant at the alpha level of 0.15 but not at the more stringent level of 0.05.

During the middle phase there is virtually no relationship between the two categories ($r^2 = 0.01$). Whereas Fig. 20 shows high concentrations of trade ceramics in the southwestern and south-central portions of the village during this phase, Fig. 23 displays high relative frequencies of elite ceramics in the south-central and north-central portions of the village area.

During the final phase of the occupation high relative frequencies of the two categories coincide in the east-central portion of the village northeast of Mound A. The correlation coefficient between the categories during this phase is rather high ($r^2 = 0.35$) and is significant at the alpha level of 0.05.

While the mean relative frequencies of the trade types decline steadily over time the percentage of elite types peaks during the middle phase. By the final phase, however, the mean relative frequency of the elite types declines to only 2.57%, considerably less than the 3.6% of total ceramics represented by the elite wares during the first phase of the occupation.

Given these distributions the presence of a high-status area in the east-central portion of the village during the last phase of occupation seems plausible. Status-differentiated areas during the preceeding phases are less clearcut due to the lower correlations between the trade and elite ceramics. Nevertheless the east-central area and the area just southeast of Mound B are somewhat differentiated from the rest of the site on both variables during the earliest phase of occupation.

The third test implication for the hypothesis predicted that the ceramic type diversity will be higher in the high-status areas than elsewhere in the site due to the greater diversity of materials to which the elite had access. The diversity index used is $\overline{H}$, the Shannon-Weaver index introduced in Chapter One. This varies between 0.0 when all sherds in a provenience are classifiable into a single type or category, and the natural logarithm of the number of taxa in the provenience. This is not an entirely independent test of the hypothesis since proveniences with higher relative frequencies of trade and elite ceramic types might tend to display slightly higher diversity indices on that basis alone. However, since ceramics could be placed into one of 46 categories, only 13 of which were considered to be trade or elite in this analysis, the presence of other classifications such as check stamped and minority Weeden Island decorated types contribute strongly to high diversity indices.

As can be seen from Table 29 ceramic diversity is at least weakly correlated with the distribution of elite ceramics in all three phases, with the strongest correlation ($r^2 = 0.28$) in the early phase. The disparities of scores across the site on the index are greatest during the middle phase (CV = 24.4%) while the most homogeneous distribution of ceramic diversity is in the final phase (CV = 14.9%). While it can be said that ceramic diversity is correlated with the distribution of elite ceramics during all three phases, it is possible that this is as much due to a mechanical effect of higher diversity in proveniences with higher relative frequencies of elite ceramics as it is due to the channeling of diverse goods through elite control.

The horizontal distributions of the index are mapped for each phase in Fig. 25 - 27. In each phase either the highest or the second-highest score for the index coincides in location with one of the peaks for the distribution of high relative frequencies of elite ceramics.

The fourth test implication states that non-local materials such as bone, shell, and lithics other than local flints ought to be found in higher relative frequencies in elite residential areas. The problems of dealing with the perishable bone and shell categories have already been discussed. The most that can be said about the distribution of these items is that five of the eight elements of exotic fauna which were recovered from the village came from the village area directly southeast of Mound B, an area representing less than one-third of the total volume of excavations. This is the same area which showed correlations between trade and elite wares during the early phase of the occupation.

The relative frequencies of the exotic lithics can be mapped just as were the ceramics, but a decision is required as to whether the silicified coral, available about 10km from the site, ought to be considered non-local. In the distributions in Figs. 28 - 30 the relative frequencies of silicified coral along with quartz, galena, mica, and obviously non-local flint in the total lithic complex have been plotted for each of the three phases. During the first phase the distributions of these non-local lithics are independent of the distributions of the elite ceramics (r^2 = 0.01), and during the second phase the two categories

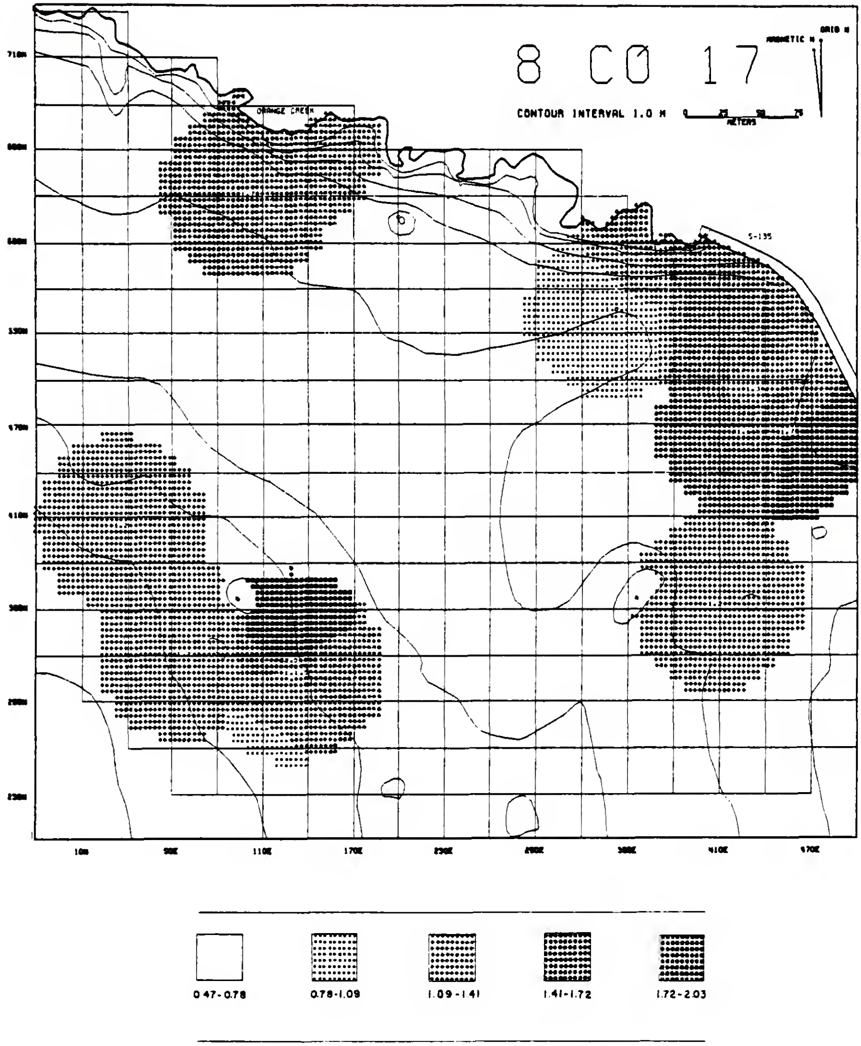


FIG. 25
CERAMIC TYPE DIVERSITY, $\overline{H}$ INDEX, EARLY PHASE

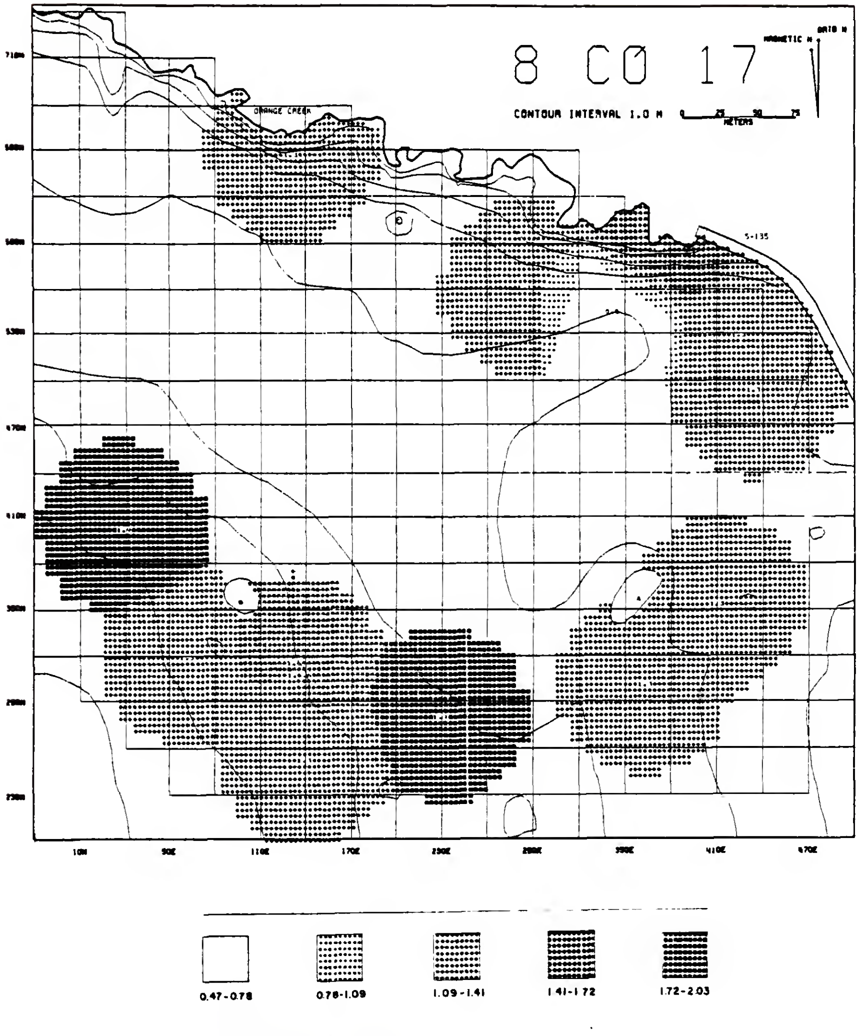


FIG. 26
CERAMIC TYPE DIVERSITY, $\bar{H}$ INDEX, MIDDLE PHASE

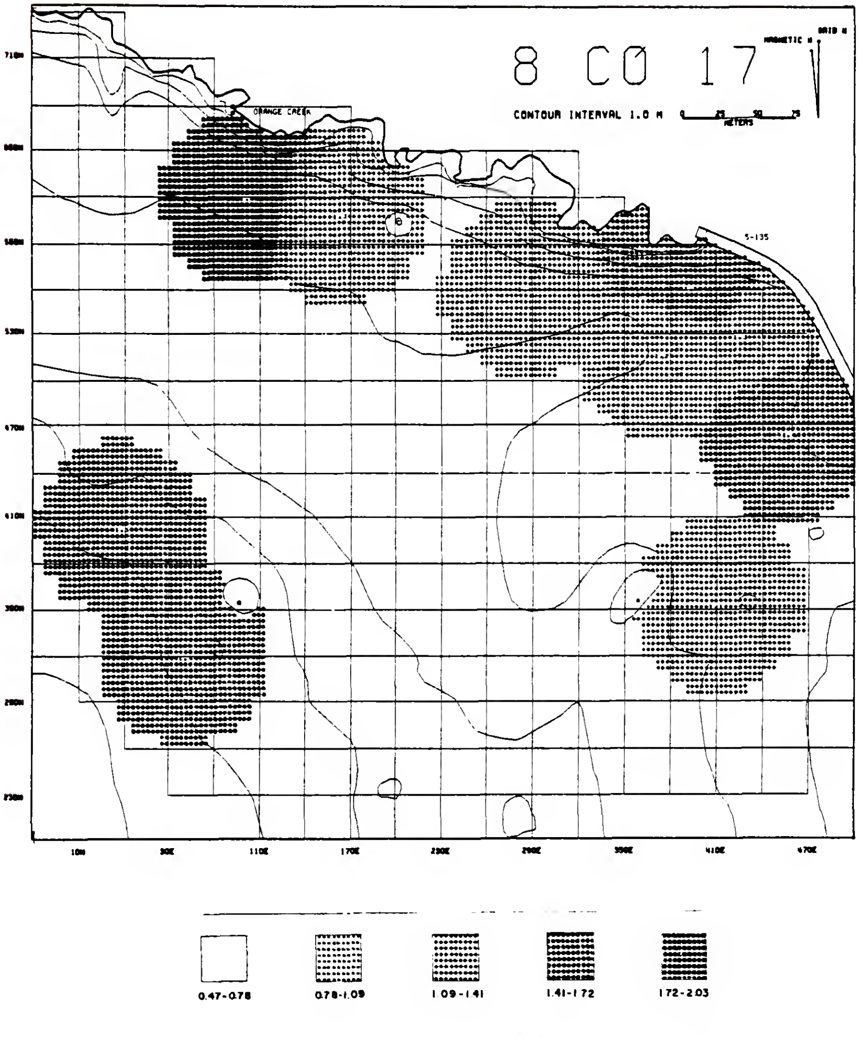


FIG. 27
CERAMIC TYPE DIVERSITY, $\overline{H}$ INDEX, LATE PHASE

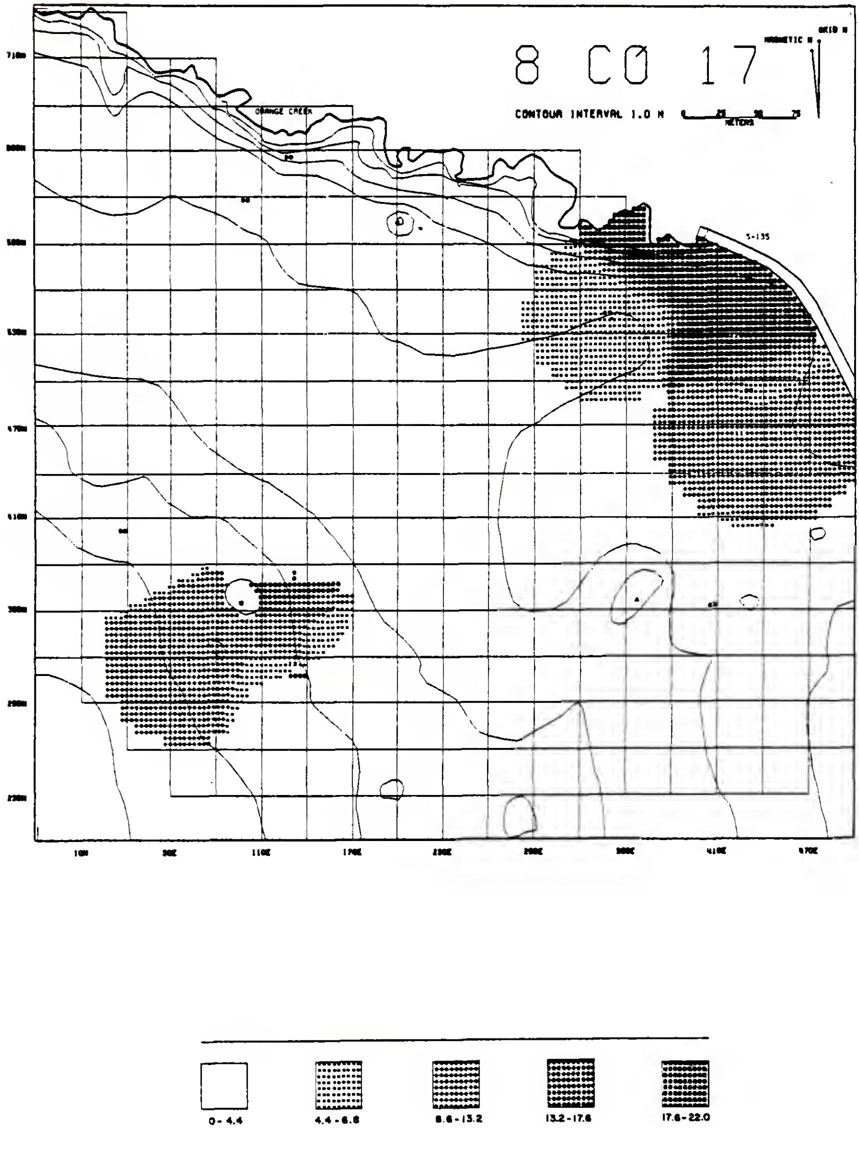


FIG. 28
PERCENTAGE OF NON-LOCAL LITHICS IN LITHIC ASSEMBLAGE, EARLY PHASE

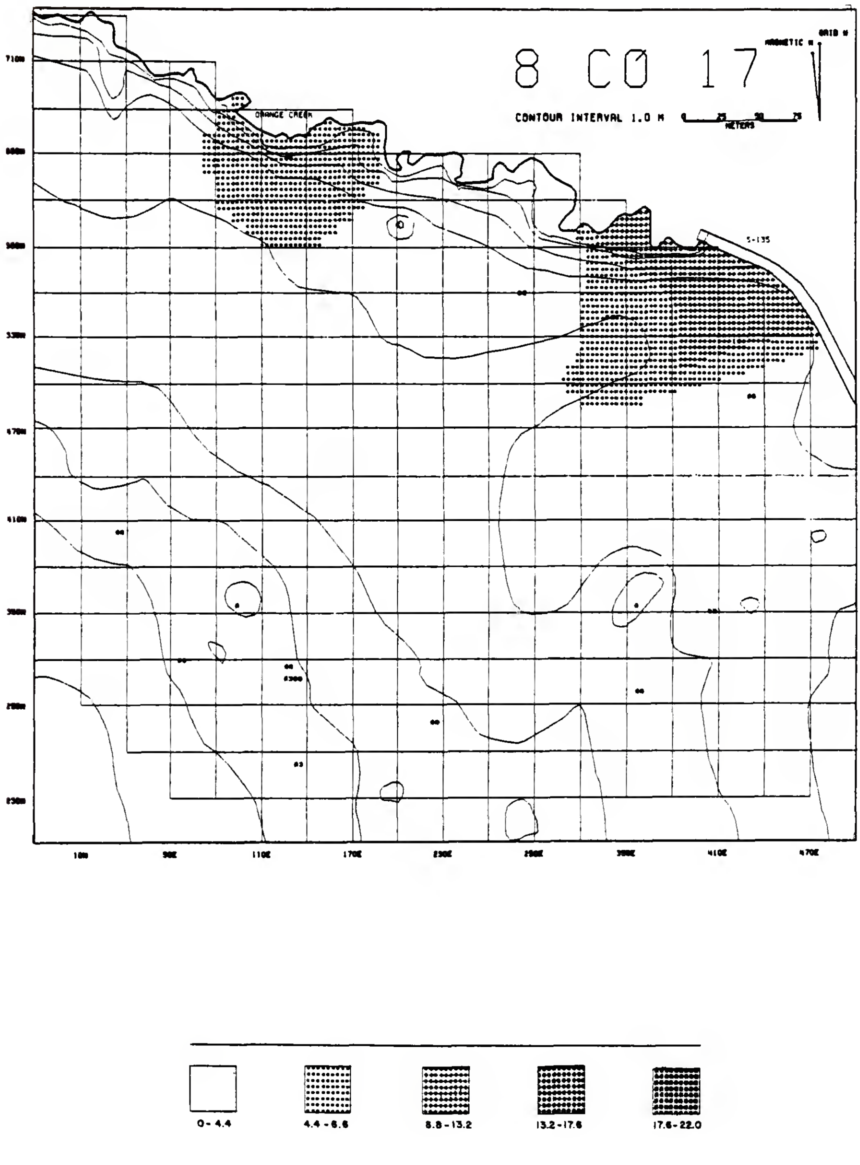


FIG. 29
PERCENTAGES OF NON-LOCAL LITHICS IN LITHIC ASSEMBLAGE, MIDDLE PHASE

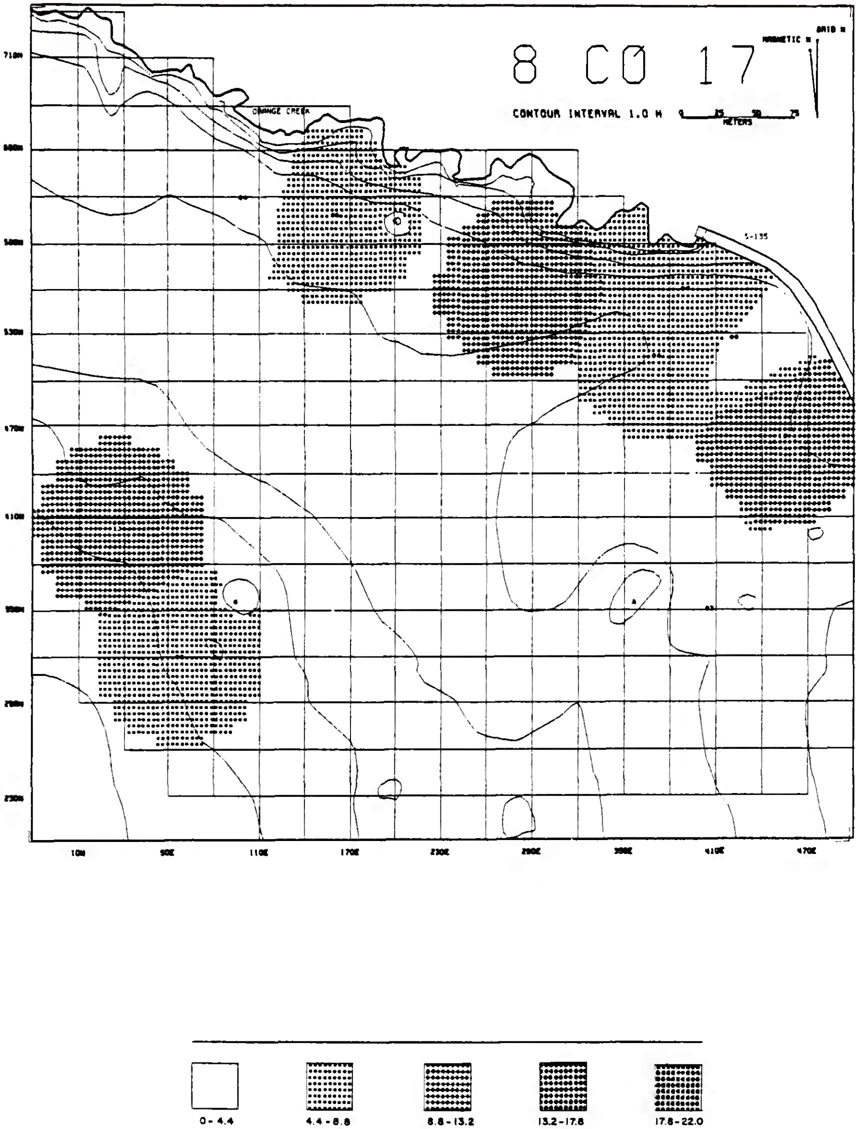


FIG. 30
PERCENTAGES OF NON-LOCAL LITHICS IN LITHIC ASSEMBLAGE, LATE PHASE

have a strong negative correlation. Only during the final phase is there a moderate positive correlation between the two categories (r^2 = 0.14). Although this is not significant at the 0.05 alpha level (alpha = 0.09) it seems more important when considered as another line of evidence concerning the increased dependence in the final phase between non-local items and the postulated material correlates of high status.

In sum, it has been found that--

1. The ceramics identified as probable trade wares were moderately correlated with the elite ceramic types (which exhibit a high diversity of form and other characteristics setting them apart from the other other ceramics) in the early phase of the occupation. They are independent of the elite ceramics during the middle phase, and are correlated most strongly with elite ceramics during the final phase of occupation. Thus the first and second test implications are corroborated for the final phase, ambiguous for the first phase, and disproven for the middle phase of occupation.

2. Although trade ceramics decline steadily in relative frequency over time, they also become less evenly dispersed across the site over time, suggesting growing monopolization over non-local trade by the elite members of society.

3. Elite ceramics first rise and then decline in relative frequency over time, but unlike trade ceramics there is a general trend towards increased homogeneity in their distributions across the site.

4. The mean ceramic diversity index generally declines over time. The site displays the maximum amount of organization in terms of relative variability across the site on the diversity index during the middle phase. Ceramic diversity is most highly correlated with the distribution of elite ceramics during the early phase of occupation, but is weakly correlated during the middle and late phases.

5. Non-local lithics are positively correlated with elite ceramics only during the final phase of occupation when the relationship is only moderately strong.

The first, third, and fourth implications of the hypothesis are thus corroborated for the final phase of occupation, more than were shown to be true for the other two phases. While the second implication cannot be tested directly, the high degree of differential distribution of elite ceramics in the first and last phases of occupation, as suggested by the coefficients of variation, indicates an organized rather than an even distribution of the high-status ceramic types across the site. This is verified by reference to the maps for each phase.

The implications which were corroborated were deduced, in a loose sense, from the hypothesis that vertical social differentiation existed at the McKeithen site and would be visible from differential distributions of material remains. This was shown to be especially true for the final phase of the occupation of the site, implying either that such social differentiation did not exist during the earlier phases, or that it is not visible from the categories of material examined.

If such social differentiation were not present during the earlier phases it might be concluded that a status-differentiated society emerged during the course of the occupation, possibly with the impetus of a decline in external trade resulting in increasing opportunity or necessity for the elite group to monopolize the increasingly rare materials and symbols represented by the exotic artifacts.

Interesting as such an hypothesis is, there is at least one alternative with some degree of prior probability which would seem to explain the observed pattern of change over time equally well. If the site was occupied for its full duration by a vertically-differentiated society such as a chiefdom, the weakening exterior ties with Northwest Florida and Georgia indicated by the declining relative frequencies of ceramic types believed to originate in these areas might have prompted a decline in the rate at which these non-local goods were redistributed to subordinate segments of the village. This in turn would result in higher correlations of the frequencies of these materials at their presumed point-of-entry in the village: the high-status area. This alternative also provides a convenient avenue for speculation concerning the demise of the site, since it is well known that chiefdoms are only viable insofar as the elite are successful redistributors (Adama 1975: 231-233).

Possibly investigation of the population levels at the site can help differentiate between these two alternatives. If it can be shown that the population at the site was relatively lower than what would be expected for a chiefdom then the second alternative, which posits the existence of a chiefdom for the entire span of the occupation of the site, becomes less attractive. On the other hand if the material remains at the site suggest populations in excess of about 500 for most of the occupation then the second alternative becomes more probable than the first.

Archeologists have proposed several techniques for estimating the size of population at prehistoric sites. One time-honored approach based on ethnographic studies estimates population at 0.1 times the floor area of the dwellings in meters (Naroll 1962). However, this does not take into account the different spatial requirements of different residential patterns, and cannot take into account the amount of space utilized outside the dwellings themselves, a particularly important consideration for hunter-gatherers. Several refinements (e.g. Wiessner 1974:344-350) have been proposed to take such factors into consideration.

Another approach to the problem of estimating population size works from an estimated number of structures and assumes a constant number of people per household based on the most relevant ethnohistoric evidence for the study area (e.g. Marcus 1976). Both methods are useful, of course, only when excavations have been extensive enough to allow an accurate estimate of the total number and function of structures, or where house mounds or other architectural remains are visible.

Both approaches, moreover, share a common weakness: they do not control for duration of occupation. Thus, forty structures in the archeological record may represent a community which at a given moment consisted on one, ten, or forty houses, and there is no way of establishing the contemporaneity of the units with the temporal controls available to archeologists in the eastern United States. Other similar types of estimation, such as estimates based on total site size, are properly applied only to occupations of very short duration. Such was not the case at McKeithen, where the occupational span is conservatively estimated at 600 years, from A.D. 150 to A.D. 750.

Given the relatively accurate estimates for site population of features and materials provided by the probability sample there might be two possible approaches to the estimation of human population at the McKeithen site. One could simply multiply the number of house structures intercepted in the course of sampling by the inverse of the appropriate sampling proportions, then multiply by an estimated number of people per household. Corrected for both estimated duration of each structure and the estimated length of total site occupation, the resulting estimate of human population might be adequate if the nature of the sample was such that the excavator could unambiguously decide if in fact a structure had been intercepted, and whether the structure had functioned as a household unit. The 2 x 2m exposure achieved by the probability sample was always inadequate to address the second objection, and occasionally unable to respond to the first. Another avenue for population estimation more suitable for the type of sample on which the estimation would be based was needed.

Recently interest in ceramic technology and "ceramic ecology" has provided at least three studies of the size of the household ceramic inventory and the breakage rates of various functional categories of ceramics in primitive and peasant cultures. While one of these had the explicit purpose of warning the archeologist against overly simplistic seriational strategies or reconstructions of the ceramic inventory at any time (David 1972), DeBoer (1974) and Foster (1960) have suggested uses for population estimation. Foster (1960:606) recognized that "if it were possible to assign an average life to the pottery remnants at a particular archeological site, and if it were possible to estimate the average number of pots in a kitchen, the total sherd count at any period would permit calculation of both population size and duration of occupation." (Foster, however, omitted mention of two other intervening variables: sherds per vessel, and either population size or duration of occupation, to solve for the other.) The derivation of the parameters necessary to arrive at a population model based on rates of ceramic breakage is discussed below.

In Chapter Two it was calculated that in the McKeithen village midden there are 6,613,000 sherds weighing more than one gram (or roughly one or more square centimeters in size); there is a known confidence interval for this estimate. At that time this estimate may have struck the reader as a sterile exercise.

However it is possible to construct a model based on ethnographically-derived breakage rates of ceramic vessels and standing stock of ceramics per household, combined with archeological estimates of house size and number of vessels represented in the village midden to form a population estimate for the site. The model constructed here makes the following assumptions:

1. The total weight of the ceramics in the midden is 31,279,500 gm with a confidence interval of 20,598,100 gm. This was found by computing a mean weight for each sherd in the midden (4.73gm ± 1.8gm) on the basis of a grab sample of four proveniences containing a total of 149 sherds. The mean estimate of weight/sherd is multiplied by the mean estimate of the number of ceramics in the midden to yield a point estimate of the weight of ceramics in the midden. Repeating this process using the upper bounds for these estimates results in a maximum estimate for the total weight of ceramics in the midden; the interval between the upper and lower bounds on the estimate represents the confidence interval.

2. The average vessel weight at the site was 900gm ± 379gm. This estimate resulted from a census of 25 Weeden Island period vessels in the collections of the Florida State Museum. Unfortunately most of these vessels come from burial mounds, so it is not known how good an estimate this is for the vessels in use in the village. A mean estimate for the number of vessels represented by the total amount of ceramics in the midden may be computed by dividing the mean estimate for the total weight of ceramics in the midden by the mean estimate for vessel weight, yielding an estimate of 34,755 vessels in the village archeological record. Dividing the upper bound for the total grams of ceramics in the village (51,877,600gm) by the minimum estimate for vessel weight (521gm) yields a maximum estimate of 99,573 for the number of vessels in the village midden. Conversely, dividing the minimum estimate of total grams of ceramics in the village (10,681,400) by the maximum estimate of grams/vessel (1279) yields a minimum estimate of 8,351 for the number of vessels in the village archeological record.

3. The average inventory of ceramic vessels per household is estimated at 30 following ethnographic work by David and Hennig (1972) among the North Cameroon

Fulani. An estimate of 50-75 vessels per modern peasant household in Tzintzuntzan, Mexico, is admitted by Foster (1960) to be higher than would be expected in most prehistoric sites.

4. The breakage rate per year is estimated to be 0.138 for utilitarian vessels and 0.056 for elite vessels. The first is obtained by averaging breakage rates for bowls and medium to small cooking vessels observed by David and Hennig among the Fulani (David 1972:142). The second, slower breakage rate is from the same source and averages breakage rates observed for cooking/storage, storage, and "other" vessels. Although both of these estimates are lower than those observed by Foster (1960) in Tzintzuntzan, Foster agrees that storage and "fiesta" vessels enjoy a "considerably longer" life span than vessels in everyday use. In studying ceramic longevity among the Conibo along the Upper Ucayali in eastern Peru, De Boer (1974) has also observed higher breakage rates than those reported by David and Hennig; however, despite De Boer's (1974:336) claims to the contrary, the impermanent nature of Conibo settlements must contribute to the high breakage rates he reports. In the model used below, the use of such high breakage rates would result in lower population estimates for the site.

5. Given the failure to completely excavate a household structure at the McKeithen site, the houses there are assumed to be similar in size to the one excavated by Milanich (1972) at the Richardson site in Alachua County, where the single house structure completely excavated had a floor area of about $45m^2$. Applying Naroll's (1962) constant to this floor area an average of 4.5 persons per household can be estimated. Since the McKeithen and Richardson sites are separated by 65km and at least 800 years such an analogy must be drawn with caution.

6. The McKeithen site is assumed to have been occupied steadily rather than seasonally for a period of 600 years. While there is no direct support for this assumption due to poor faunal preservation at the site, Cumbaa (1972:42-44) has presented zooarcheological evidence that an approximately contemporaneous site in North-central Florida, 8 Al 169, can be interpreted as a sedentary village occupied the entire year. The similar positioning of this site and the McKeithen site in relation to abundant water resources strengthens this analogy.

7. It is assumed that ceramic imports are balanced by exports, and neither is considered in this model.

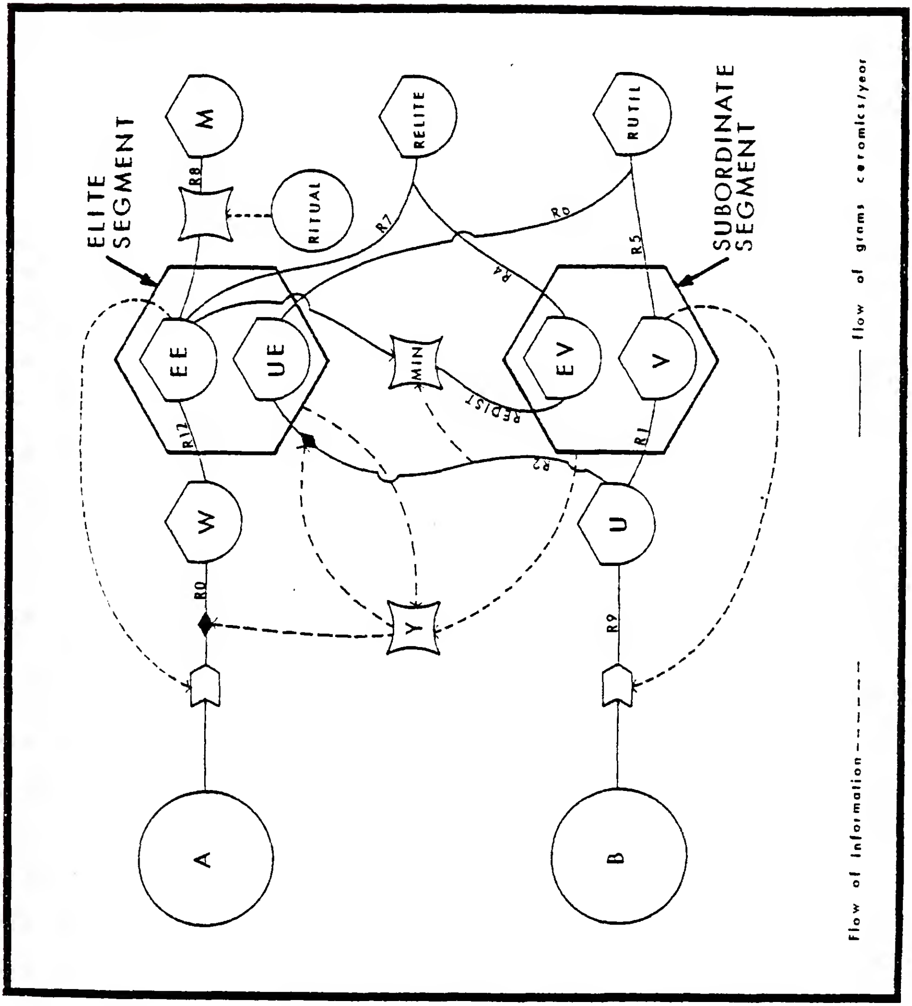
An energy-flow diagram (H.T. Odum 1971) for the model developed to estimate population size is presented in Fig. 31. (Although the actual flows are conceived as grams of ceramics or in one case bits of information the language is still applicable.)

Compartments A and B represent clay sources which are assumed to be inexhaustible. Compartment C is an energy source which inputs an arbitrary constant (0.1) into switch Y, the function of which is to switch off production of elite ceramics (taking place in compartment W) in the event that the total ceramics in use in the superordinate sector become more than 0.1 times the total ceramics in use in the subordinate sector. The production of utilitarian ceramics takes place in compartment U.

All the elite ceramics produced in W flow via R12 into EE, the compartment symbolizing elite ceramics in elite use. A constant proportion of these elite ceramics in high-status use break and enter the village archeological record as elite ceramics (RELITE) via R7; the breakage rate is set at 0.056. Every 20 years the death of a major figure in the village (triggered by the impulse-generator named RITUAL) results in a flow of 10% of the elite ceramics in high-status use (the contents of EE) along R8into a burial mound (M) where the ceramics gradually accumulate.

But not all the "elite" ceramics are in use by the elite. Following the lead of the archeological record, which indicates only a higher proportion of elite ceramics in the high-status areas, not a complete monopolization of these ceramics by the elite, a portion of the elite ceramics in high-status use is redistributed to the subordinate seg-

Fig. 31
Energy-flow Diagram of Population-Estimation Model


ELITE SEGMENT
SUBORDINATE SEGMENT
A
B
W
U
Y
MIN
EE
UE
EV
V
M
RITUAL
RELITE
RUTIL
REDIST
R0
R1
R2
R4
R5
R6
R7
R8
R9
R12
Flow of Information - - - -
—— flow of grams ceramics/year

ments of the society, possibly as markers or rewards for achieved status. These flow along REDIST into EV, the compartment containing ceramics in use by the non-elite segment. These ceramics are not redistributed unless the elite are receiving utilitarian items from the subordinate segment, however; the MIN switch sets REDIST equal to the lesser of 0.75 times R2 (the rate at which the elite receive utilitarian ceramics from the subordinate segment) or 0.075 times EE, the total elite ceramics in high-status use. In this manner the elite compartment does not dispense all its vessels, but rewards the manufacture and receipt of utilitarian vessels from the subordinate segment. Elite ceramics in village use also break and enter the village midden as elite ceramics (RELITE) at the constant rate of 0.056 times the contents of EV.

Utilitarian ceramics in production (U) are distributed along R1 to the subordinate segment of the village (V) and along R2 to the elite (UE, or utilitarian ceramics in elite use). The total ceramics in use by the elite segment is once again limited by switch Y to 0.1 times that of the total ceramics in use in the subordinate segment. Studies such as that by Peebles and Kus (1977:438) suggest that the population ratios between superordinate and subordinate segments in a chiefdom approximate 1:15-20. Since the household inventory of ceramics in the elite segment was probably larger than that in the subordinate segment, the ceramic ratio has been allowed to approach but not exceed 1:10 in this model. From either UE or V ceramics break at a constant rate of 0.138 and enter the archeological record as utilitarian ceramics (RUTIL) via R6 and R5.

The two major requirements of the simulation are that the weight of ceramics deposited in the midden and the ratio of utilitarian to elite ceramics at the end of the simulation approximate the estimates made for the McKeithen site on the basis of the probability sample.

The model was implemented using the Continuous System Modeling Program (CSMP); program details can be found in the appendix. The end conditions for RUTIL, RELITE, and M could be manipulated using different initial conditions for EE and V, or different rates of production for R0 and R9.

In the first simulation presented here the ceramic production rates were set in approximate equilibrium with the breakage rates such that the total amount of ceramics in use at the site (and hence the inferred human population) was the same for the entire 600-year period. With the production and breakage rates in equilibrium the initial conditions for amount of ceramics in use at the beginning of the run were iteratively incremented until the desired amount of ceramics appeared in the midden at the end of a simulation, terminating the run.

The results of this no-growth model are shown in Fig. 32. The state of XBAR (the mean number of households in the village, reported at six year intervals) is estimated from the amount of ceramics in use at any one time (EE + UE + EV + V) divided by the mean estimate of weight per vessels and vessels per household. XBAR is printed to the left side of a histogram which plots its current value. The POPBAR in the right-hand column is the mean estimate for population size based on the number

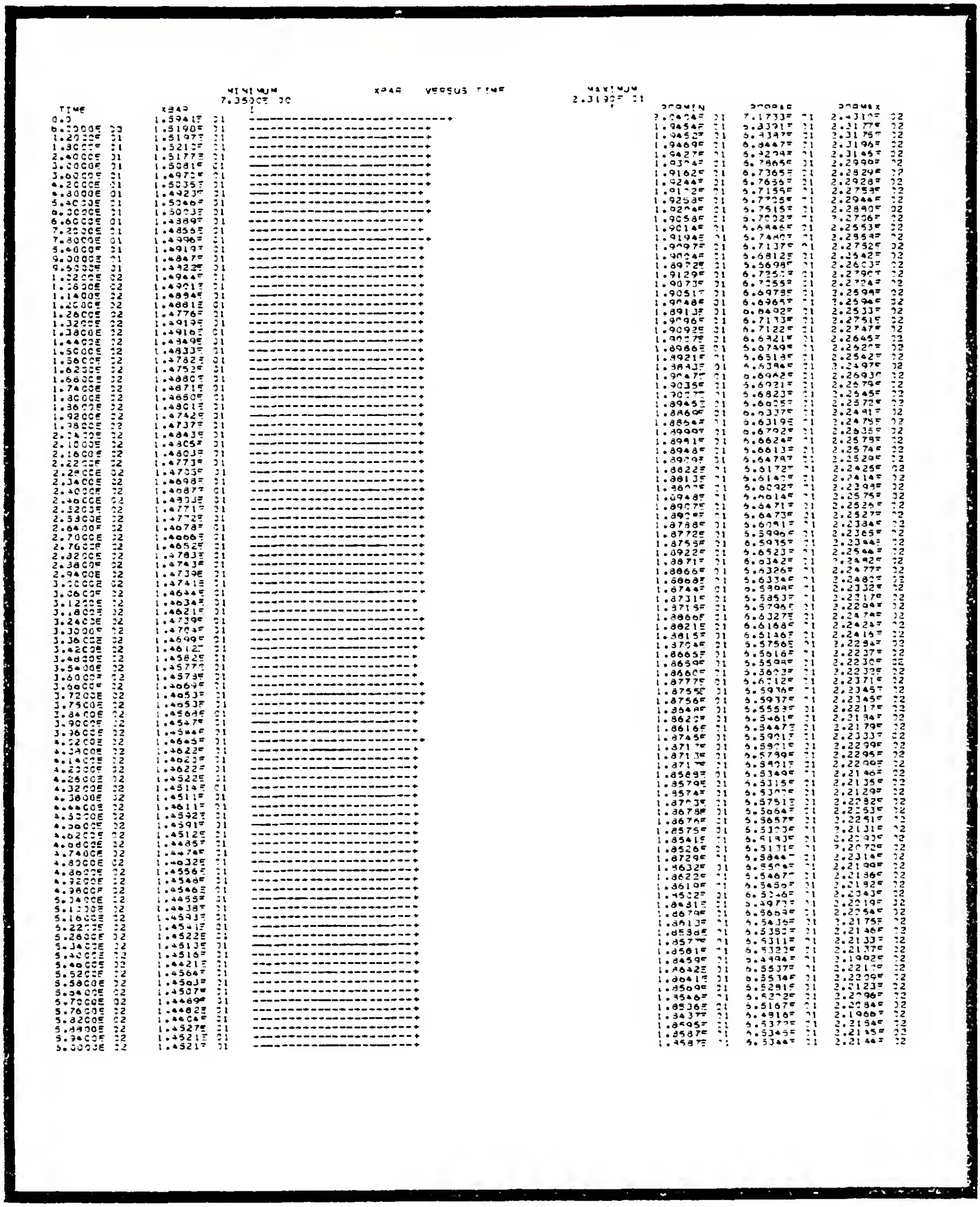


FIG. 32
STEADY-STATE POPULATION MODEL

of households reported by XBAR times 4.5. POPMIN is derived by dividing the total number of vessels in use at any time by the minimum estimate of weight per vessel, and multiplying the resultant maximum estimate of number of households at any time by a slightly higher constant of 5 persons per household, yielding a maximum population estimate for the site at any time.

All numbers in Fig. 32 are in scientific notation. At year 600 the run terminated, having simulated the deposition of the required grams of ceramics in the archeolgical record. This model indicates that the total amount of ceramics in the midden could have been deposited by a group of 14-15 households composed of 65-67 persons occupying the site continuously for 600 years. This is the mean estimate, utilizing XBAR and POPBAR. The minimum estimate, which provides a lowest possible population estimate, suggests that in the case of a no-growth, permanent occupation of the site for 600 years, the deposited ceramics can be explained by no fewer than 19 people. The maximum estimate indicates that under these conditions the ceramics could have been deposited by no more than 225 people. Intuitively these seem like reasonable bounds, although most archeologists might favor the maximum estimate over the mean, and regard the minimum estimate as too small.

There is no <u>a priori</u> reason to assume a no-growth model for the site, however. In fact, if the inferred introduction of the bow and arrow towards the beginning of the occupation, and a postulated increase in horticultural efficiency towards the end of the occupation (Milanich: personal communication) are correct, a growth in population (and of course in ceramics, which is the "handle" on population) would be anticipated.

The next simulation assumed an initial colonizing population of about 10 households (roughly 45 persons) and ceramic production rates in equilibrium with breakage rates. However, this time the ceramic production rates (and therefore the inferred human population) were iteratively increased until the desired end conditions were met at the end of a run, terminating the simulation.

The results of this simulation are shown in Fig. 33. The population shows the early stages of an exponential growth curve with an average rate of increase of about 0.1/year. At the end of the simulation the mean population estimate is 96 persons. The maximum and minimum estimates are 324 and 27, respectively.

A final model for population growth was explored in a third simulation, the results of which are shown in Fig. 34. Here the same small colonizing population of 45 persons used in the second simulation again provides the initial conditions. This group undergoes an exponential rate of growth with an average increase of about 0.13/year until, at year 400 when an estimated population of about 104 persons is occupying the site, an event (here simulated by a CSMP STEP function which decreases the rate of ceramic production) causes the population to decrease so that by year 600 the resident population is only about 33 persons. In this simulation the population level reached at the peak of occupation is a maximum of 351 and a minimum of about 30. The "event" causing the decrease in population could represent, for example, the suggested dispersal of some members of the population to outlying areas in order

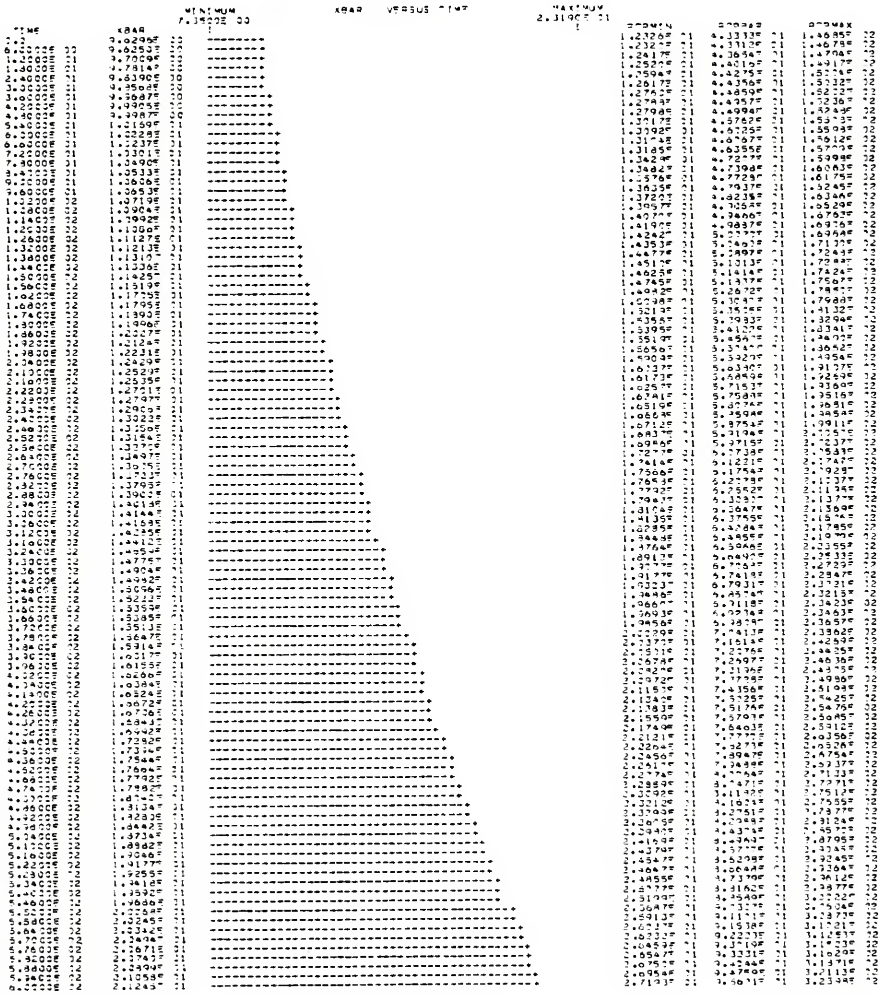
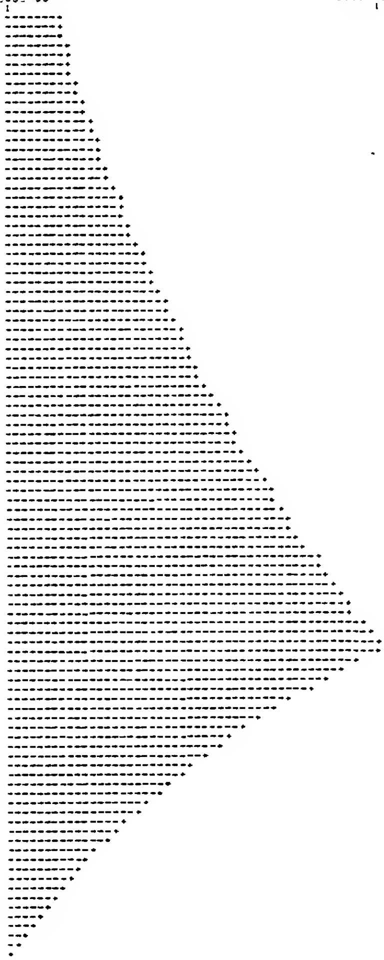


FIG. 33
CONSTANT EXPANSION POPULATION MODEL

MINIMUM 7.3500E 00 | XBAR VERSUS TIME | MAXIMUM 2.3190E 01



TIME	XBAR	POPMIN	POPBAR	POPMAX
0.0	9.6296E 00	1.2326E 01	4.3323E 01	1.4685E 02
6.0000E 00	9.7330E 00	1.2420E 01	4.3564E 01	1.4797E 02
1.2000E 01	9.8037E 00	1.2549E 01	4.4117E 01	1.4951E 02
1.8000E 01	9.9375E 00	1.2720E 01	4.4720E 01	1.5155E 02
2.4000E 01	1.0046E 01	1.2858E 01	4.5205E 01	1.5319E 02
3.0000E 01	1.0116E 01	1.2949E 01	4.5522E 01	1.5427E 02
3.6000E 01	1.0178E 01	1.3025E 01	4.5802E 01	1.5522E 02
4.2000E 01	1.0365E 01	1.3267E 01	4.6641E 01	1.5606E 02
4.8000E 01	1.0430E 01	1.3350E 01	4.6933E 01	1.5905E 02
5.4000E 01	1.0663E 01	1.3648E 01	4.7983E 01	1.6261E 02
6.0000E 01	1.0751E 01	1.3799E 01	4.8514E 01	1.6441E 02
6.6000E 01	1.0848E 01	1.3895E 01	4.8914E 01	1.6542E 02
7.2000E 01	1.0973E 01	1.4046E 01	4.9380E 01	1.6734E 02
7.8000E 01	1.1235E 01	1.4391E 01	5.0558E 01	1.7134E 02
8.4000E 01	1.1334E 01	1.4508E 01	5.1004E 01	1.7285E 02
9.0000E 01	1.1437E 01	1.4640E 01	5.1467E 01	1.7442E 02
9.6000E 01	1.1592E 01	1.4837E 01	5.2163E 01	1.7677E 02
1.0200E 02	1.1727E 01	1.5011E 01	5.2772E 01	1.7884E 02
1.0800E 02	1.1997E 01	1.5354E 01	5.3985E 01	1.8295E 02
1.1400E 02	1.2136E 01	1.5535E 01	5.4614E 01	1.8508E 02
1.2000E 02	1.2306E 01	1.5752E 01	5.5377E 01	1.8757E 02
1.2600E 02	1.2392E 01	1.5861E 01	5.5763E 01	1.8897E 02
1.3200E 02	1.2557E 01	1.6074E 01	5.6509E 01	1.9150E 02
1.3800E 02	1.2732E 01	1.6295E 01	5.7292E 01	1.9416E 02
1.4400E 02	1.3005E 01	1.6646E 01	5.8521E 01	1.9832E 02
1.5000E 02	1.3175E 01	1.6864E 01	5.9288E 01	2.0092E 02
1.5600E 02	1.3337E 01	1.7072E 01	6.0014E 01	2.0339E 02
1.6200E 02	1.3495E 01	1.7279E 01	6.0743E 01	2.0585E 02
1.6800E 02	1.3668E 01	1.7495E 01	6.1507E 01	2.0844E 02
1.7400E 02	1.3810E 01	1.7677E 01	6.2146E 01	2.1061E 02
1.8000E 02	1.4007E 01	1.7928E 01	6.3029E 01	2.1360E 02
1.8600E 02	1.4149E 01	1.8113E 01	6.3659E 01	2.1577E 02
1.9200E 02	1.4500E 01	1.8561E 01	6.5252E 01	2.2113E 02
1.9800E 02	1.4706E 01	1.8824E 01	6.6175E 01	2.2426E 02
2.0400E 02	1.4855E 01	1.9015E 01	6.6845E 01	2.2654E 02
2.1000E 02	1.5046E 01	1.9259E 01	6.7704E 01	2.2945E 02
2.1600E 02	1.5250E 01	1.9525E 01	6.8654E 01	2.3266E 02
2.2200E 02	1.5389E 01	1.9697E 01	6.9249E 01	2.3468E 02
2.2800E 02	1.5574E 01	1.9934E 01	7.0081E 01	2.3750E 02
2.3400E 02	1.5788E 01	2.0209E 01	7.1046E 01	2.4077E 02
2.4000E 02	1.6011E 01	2.0494E 01	7.2050E 01	2.4417E 02
2.4600E 02	1.6340E 01	2.0915E 01	7.3531E 01	2.4919E 02
2.5200E 02	1.6563E 01	2.1231E 01	7.4534E 01	2.5259E 02
2.5800E 02	1.6796E 01	2.1499E 01	7.5581E 01	2.5614E 02
2.6400E 02	1.6926E 01	2.1655E 01	7.6165E 01	2.5812E 02
2.7000E 02	1.7154E 01	2.1957E 01	7.7194E 01	2.6160E 02
2.7600E 02	1.7393E 01	2.2263E 01	7.8269E 01	2.6525E 02
2.8200E 02	1.7505E 01	2.2534E 01	7.7221E 01	2.6847E 02
2.8800E 02	1.8016E 01	2.3061E 01	8.1072E 01	2.7475E 02
2.9400E 02	1.8265E 01	2.3379E 01	8.2191E 01	2.7854E 02
3.0000E 02	1.8527E 01	2.3714E 01	8.3371E 01	2.8253E 02
3.0600E 02	1.8693E 01	2.3927E 01	8.4116E 01	2.8507E 02
3.1200E 02	1.8946E 01	2.4251E 01	8.5256E 01	2.8892E 02
3.1800E 02	1.9215E 01	2.4595E 01	8.6467E 01	2.9303E 02
3.2400E 02	1.9375E 01	2.4930E 01	8.7138E 01	2.9547E 02
3.3000E 02	1.9619E 01	2.5112E 01	8.8253E 01	2.9918E 02
3.3600E 02	1.9990E 01	2.5459E 01	8.9503E 01	3.0332E 02
3.4200E 02	2.0353E 01	2.6052E 01	9.1589E 01	3.1039E 02
3.4800E 02	2.0585E 01	2.6349E 01	9.2634E 01	3.1393E 02
3.5400E 02	2.0871E 01	2.6714E 01	9.3917E 01	3.1828E 02
3.6000E 02	2.1160E 01	2.7093E 01	9.5247E 01	3.2278E 02
3.6600E 02	2.1320E 01	2.7290E 01	9.5941E 01	3.2513E 02
3.7200E 02	2.1609E 01	2.7663E 01	9.7241E 01	3.2954E 02
3.7800E 02	2.1711E 01	2.8046E 01	9.8599E 01	3.3414E 02
3.8400E 02	2.2383E 01	2.8650E 01	1.0072E 02	3.4134E 02
3.9000E 02	2.2583E 01	2.9035E 01	1.0207E 02	3.4592E 02
3.9600E 02	2.2995E 01	2.9437E 01	1.0349E 02	3.5071E 02
4.0200E 02	2.3023E 01	2.9469E 01	1.0360E 02	3.5109E 02
4.0800E 02	2.2231E 01	2.8458E 01	1.0004E 02	3.3900E 02
4.1400E 02	2.1493E 01	2.7499E 01	9.6676E 01	3.2762E 02
4.2000E 02	2.0785E 01	2.6634E 01	9.3531E 01	3.1697E 02
4.2600E 02	2.0032E 01	2.5642E 01	9.0146E 01	3.0550E 02
4.3200E 02	1.9356E 01	2.4779E 01	8.7113E 01	2.9522E 02
4.3800E 02	1.8729E 01	2.3977E 01	8.4279E 01	2.8561E 02
4.4400E 02	1.8063E 01	2.3121E 01	8.1285E 01	2.7546E 02
4.5000E 02	1.7466E 01	2.2357E 01	7.8597E 01	2.6636E 02
4.5600E 02	1.6740E 01	2.1427E 01	7.5328E 01	2.5528E 02
4.6200E 02	1.6341E 01	2.0917E 01	7.3536E 01	2.4920E 02
4.6800E 02	1.5625E 01	2.0001E 01	7.0317E 01	2.3829E 02
4.7400E 02	1.5129E 01	1.9365E 01	6.8081E 01	2.3072E 02
4.8000E 02	1.4689E 01	1.8932E 01	6.6099E 01	2.2430E 02
4.8600E 02	1.4173E 01	1.8142E 01	6.3779E 01	2.1614E 02
4.9200E 02	1.3707E 01	1.7546E 01	6.1684E 01	2.0904E 02
4.9800E 02	1.3291E 01	1.7012E 01	5.9839E 01	2.0269E 02
5.0400E 02	1.2428E 01	1.6420E 01	5.7726E 01	1.9563E 02
5.1000E 02	1.2273E 01	1.5713E 01	5.5230E 01	1.8717E 02
5.1600E 02	1.1866E 01	1.5214E 01	5.3487E 01	1.8126E 02
5.2200E 02	1.1460E 01	1.4695E 01	5.1661E 01	1.7507E 02
5.2800E 02	1.1133E 01	1.4250E 01	5.0099E 01	1.6978E 02
5.3400E 02	1.0776E 01	1.3793E 01	4.8491E 01	1.6433E 02
5.4000E 02	1.0334E 01	1.3227E 01	4.6503E 01	1.5759E 02
5.4600E 02	1.0080E 01	1.2902E 01	4.5363E 01	1.5372E 02
5.5200E 02	9.6493E 00	1.2351E 01	4.3422E 01	1.4715E 02
5.5800E 02	9.3753E 00	1.2000E 01	4.2149E 01	1.4297E 02
5.6400E 02	9.0518E 00	1.1598E 01	4.0773E 01	1.3834E 02
5.7000E 02	8.7557E 00	1.1207E 01	3.9401E 01	1.3352E 02
5.7600E 02	8.4481E 00	1.0865E 01	3.8196E 01	1.2944E 02
5.8200E 02	8.2009E 00	1.0497E 01	3.6904E 01	1.2506E 02
5.8800E 02	7.8442E 00	1.0041E 01	3.5299E 01	1.1962E 02
5.9400E 02	7.5960E 00	9.7229E 00	3.4182E 01	1.1584E 02
6.0000E 02	7.3758E 00	9.4410E 00	3.3191E 01	1.1248E 02

FIG. 34
EXPANSION-DISPERSION POPULATION MODEL

to farm more intensively. Such a move itself could be regarded as a reaction to higher population levels in turn caused by increased sedentism or introduction of more efficient cultigens.

If we grant the assumptions on which these simulations are based then no matter which model of population growth is selected, it is doubtful that the population at the site ever exceeded 300-400 persons, barely approaching the range of population size expected on the basis of ethnographic analogy for a chiefdom.

On this basis we can clearly discard the alternative hypothesis, which required that a chiefdom-level society occupy the site for its duration of use. In fact, if the above models are interpreted strictly, it seems unlikely that sufficient population levels were ever attained (at least at the site itself) to support a chiefdom-level of organization. Rather, the coalescence of non-local and elite ceramics with non-local lithics during the final stages of the occupation might best be interpreted as the increasing centralization characterizing the proto-chiefdom "Big Man" systems as defined by Adams (1975:227-237). In many portions of the Southeast such systems were eventually replaced by societies represented at sites such as Moundville and Etowah to which few archeologists would deny the label of chiefdom.

CHAPTER SIX
HETEROGENEITY AND CHANGE IN A WEEDEN ISLAND VILLAGE

Excavations at the McKeithen site have identified a local manifestation of the Weeden Island culture which shared more ceramic and organizational traits with contemporaneous inland Northwest Florida sites than with Cades Pond sites in North-central Florida. The occupation proved to be surprisingly early, apparently extending from not later than A.D. 150 to at least A.D. 750. The three phases into which the occupational continuum has been divided probably correspond, in a general way, to the periods of construction and use of the three mounds at the site.

The Early Phase

Prior to about A.D. 250 the occupation of the site was most intense southwest and southeast of Mound B and near the creek in the northeast portion of the site. From the evidence now available it seems that during part of this phase Mound B along with the area adjacent to it on the southeast side functioned as the residence area for an important lineage in a tribal village (in the sense of Service 1962) having trade ties primarily with Northwest Florida and Georgia. The identification of high-status residential areas with mounds in this and the final phase of occupation is in accord with ethnographic evidence from later periods. When seen by DeSoto, the town of Osachile, which Swanton (1945:41) locates between the Suwannee and Aucilla rivers, was composed of an artificial earthen platform on which were located the dwellings "of the lord and his family and the people of his service." A plaza was immediately adjacent to the platform and although the wording of the second-hand report is ambiguous, it seems as though both frontage on the plaza and location adjacent to the earthen platform characterized the dwellings "of the noblest and most important personnages" (Garcilaso 1962: 170-171).

The projectile points of this phase, especially lithic group 7, were relatively longer and narrower than later points at the site but already exhibited the characteristic stemless triangular shape of later phases. Rectilinear cimplicated stamping such as seen on the Napier and Crooked River types was more frequent during this phase than later in the occupation. Weeden Island Plain and Carrabelle Incised, although fabricated the length of the occupation, reached their highest relative frequencies at this time. Carrabelle Punctated was uncommon during the early phase but when present usually bore small triangular punctations. Weeden Island Zoned Red was the principal ceramic type which seems to have had some significance as a status marker during this phase.

The Middle Phase

From approximately A.D. 250-A.D. 550 most of the area around the plaza was probably occupied at one time or another with the exception of the western side of the site and the area adjacent to Mound C, although it seems probable that Mound C was in use during this time. The disturbed nature of this mound makes its deposition difficult to determine, but the absence of settlement in the vicinity of the mound during its apparent period of use sets it apart from the other two mounds to the south. Since excavation suggests that the two southern mounds were raised over a single burial in a high-status residence or possibly a "feast council house" (Milanich: personal communication) and since Mound C contains the disturbed remains of many burials, it is probable that Mound C was different in function than the other two mounds to the south. Its identification as a burial place for a lineage-elite (as suggested by Fairbanks 1965:61, though not necessarily in the ramage framework he presumes) is perhaps strengthened by its lack of association with a high-status residential area.

During this phase trade with East Florida began and trade with Northwest Florida and Georgia reached a peak. Rectilinear complicated stamped ceramics diminished in importance and types such as St. Johns Check Stamped and "St. Johns complicated stamped" appeared by the end of the phase. Ceramic paste textures became finer but ceramics appeared to become less thoroughly fired. The lands and grooves on the complicated and check stamped ceramics decreased in width. Among the ceramic types which appear to have value as status markers Weeden Island Red, Weeden Island Zoned Red, Weeden Island Incised, and Weeden Island Punctated all seem to have been in use, with a higher percentage of the red-filmed types in the northern midden area and the incised and punctated types in the southern midden. By the end of the phase the several variants of Pinellas, Ichetucknee, and Tampa projectile points are all present at the site. The high-status area appears to have moved to the southeast mid-way between Mounds B and A following the abandonment of the area directly southeast of Mound B. The identification of the high-status area is based on the distribution of the presumed elite ceramics, since there seems to be little correlation between the distributions of elite ceramic markers and other non-local ceramics during this phase. For this reason, and on the basis of the population model presented above, it is suggested that the society was organized primarily through kinship ties with weak allocated power not effectively centralized with a particular lineage as demonstrated by the lack of control over external trade.

The Late Phase

The only structural evidence from the site dates to the post-A.D. 550 phase. One structure, only partially excavatable, was suggested by an oval row of postmolds set at variable intervals (probably not all were recovered). The structure was very small, possibly no more than 3 x 5m, and located on a 20-25^{o} slope on the southern bluff of Orange Creek. A few fragments of a daub-like material from the most recent features within the eastern area of the site suggest that wattle-and-daub construction might have been introduced or developed before the abandonment of the site. George Percy (1976) has also reported possible daub from 8 Ja 104, a Weeden Island site on the west side of the Apalachicola River in interior Northwest Florida which he dates to approximately A.D. 500-700.

During this phase of the occupation at McKeithen check stamped ceramics continued to increase in frequency and the checks became smaller. With the possible exception of Kolomoke Complicated Stamped curvilinear complicated stamping declined in frequency, and rectilinear complicated stamping became very rare. The long, narrow projectile point form which characterized the early phase disappeared, but the concave-based triangular, occasionally-serrated, variant of the Pinellas point increased in abundance. While some worked silicifed coral was sill present in this period, particularly in the high-status areas, flint increased in relative importance as a raw material for worked lithics.

Frequencies of ceramics presumed to originate in Northwest Florida and Georgia decreased noticeably during this period, while trade with the St. Johns area apparently remained stable. Weeden Island Red and especially Weeden Island Zoned Red decreased in frequency or disappeared while Weeden Island Incised and Weeden Island Punctated continued to increase in relative frequency; the net effect, however, was lower total percentages of the elite ceramic markers at the site. During this phase the area northeast of Mound A was differentiated from the rest of the site on the basis of an association of the postulated material correlates of superordinate residence: high relative frequencies of non-local lithics, elite ceramics, other non-local ceramics, and high total ceramic diversity. Occupation at this time was densest in the northeastern portion of the site, east of Mound A, along the creek, and northwest of Mound B. The most important residence of the dominant lineage in a surgent "Big Man" or proto-chiefdom society is presumed to have occupied Mound A; other members of the lineage, apparently participating in the same sphere of influence, seem to have been located to the northeast of the mound, adjacent to the plaza.

The increased control of non-local trade during this phase indicated by the distributions of selected ceramics and lithics suggests an increased centralization of authority in a general context of decreasing contact with extra-areal cultures. At the same time there was a speculated increased dependence on maize agriculture. Although it cannot be proven with the temporal controls and the small sample presently available, it seems as though there was an absolute decrease in population size at the site during this phase. If this was so, then outlying settlements probably gained in population and relocated to take advantage of agriculturally-productive soils. Given the low agricultural potential of the Blanton and Lakeland sands at the central site it is conceivable that such a trend could have eventually resulted in a vacant ceremonial center used for seasonal redistributive and reintegrative functions after about A.D 800 (cf. Brose and Percy 1975). The relative self-sufficiency and isolation of the agricultural hamlets would be predicted to have had a decentralizing effect on political authority.

Some Predictions for Future Research

Richard N. Adams (1975:203-217) has argued that there is a fundamental growth sequence which must occur in the formation of new levels of complexity in social integration. This growth sequence is composed of identity, coordination, and centralization phases. The segmentary lineage or tribal group which established itself as a coordinative entity during the early phase of the occupation at McKeithen underwent increasing centralization of authority and by the final phase of occupation attained, at least, a semi-centralized proto-chiefdom level of complexity. But the postulated disperal of population into outlying areas interrupted the normal growth sequence at this point, leaving a series of agricultural hamlets sharing mutual identification but not control. Recoordination may have been achieved, but recentralization may have been interrupted by population intrusion from the Georgia coastal area (Milanich 1971). The relatively low agricultural potential of the North Florida soils in relation to some areas to the north and west could also have resulted in swidden systems which were too centrifugal in settlement pattern to respond well to centralizing influence.

If the views presented in this and the previous chapter adequately reflect the events in Middle to Late Woodland North Florida and processes which prompted them, then the following predictions should be supported by future work in the area:

1. There were relatively few outlying sites in the McKeithen support area during the first two phases of occupation (i.e. prior to about A.D. 550). Those that were present were located so as to maximize access to aquatic resources. They will prove to exhibit relatively few of the ceramic types which characterize the high-status areas at McKeithen, but may contain high frequencies of ceramics pertaining to a specific micro-tradition; for example, a particular variant of Carrabelle Incised. If this is true, these micro-traditions probably were related to kinship units which could be traced back to the McKeithen site. Burial mounds particular to some of these local kinship groups may be present.

2. There was a dramatic increase in the number of small outlying sites in an expanding area around the McKeithen site after about A.D. 550. Since these were located in relation to soils with a relatively high agricultural potential, few of the outlying sites will prove to have been occupied during all three phases. There was little ceremonial elaboration at these sites, possibly even an absence of burial mounds. Ceremonial centralization at the McKeithen site was strong and few or no elite ceramic types will be found in the outlying sites.
3. After about A.D. 750 these outlying sites continued to increase in size and number, and additional ceremonial elaboration may have appeared as the McKeithen site was abandoned or, at best, served only for ceremonial identification or coordinative ritual.

It is my hope that future work in the vicinity of the McKeithen site will prove or disprove these theses, and that further research in the McKeithen village will be directed towards the delineation of kin group and moiety boundaries, and the nature and extent of plant domestication at the site, neither of which could be addressed within the confines of this study.

APPENDIX
DETAILS ON COMPUTERIZED ANALYSES

Discriminant Analysis

The discriminant analysis referred to on pages 50-56 utilized the SPSS subprogram DISCRIMINANT on the 30 excavation units of the initial probability sample. The SPSS version current at the time was 6.02. The GROUP specification was used to assign tests to these groups for analysis:

Group 1 (northern midden)	Group 2 (southern midden)	Group 3 (plaza/outlying)
606N166E	252N314E	296N284E
620N105E	278N232E	637N34W
558N290E	250N140E	570N156E
541N344E	306N140E	502N298E
512N337E	312N133E	456N343E
558N400E	318N62E	462N384E
516N380E	402N20E	234N360E
527N431E	296N366E	272N284E
490N442E		454N36E
		433N110E
		322N290E
		288N467E

The 30th unit excavated in the course of the probability sample, 459N156E, was assigned to Group 3 but as it was entirely sterile was not entered in the analysis.

The method specified for the analysis was MAHAL, which calls a step-wise procedure for selecting the discriminating variable which maximizes the largest Mahalanobis distance between two groups for the two closest groups on the variable (Nie et al. 1975: 453). The MAXSTEPS specification was set to 15. The specified options were 3,5,6,7,8,10, and 11. All other default options for the subprogram were in effect. During the classification phase the units were reassigned to the redefined groups with 100% accuracy using the discriminant functions previously derived.

Since these groups were not identical to the strata used during the excavation of the probability sample (although they are similar) the ceramic and lithic counts presented in Table 1 (p. 51) cannot be used for estimation of material populations or relative frequencies at the site. Reassignement of squares after stratification is a dubious process but one which seems justified, in this case, by the clear north-south dichotomy revealed by the analysis.

Cluster Analysis

The cluster analysis reported in pages 62-66 utilized the SAS procedure CLUSTER, release 76.4 (Barr et al. 1976:72-79). This procedure defines the distance between two clusters as the maximum distance between an observation (here, a test excavation) in one cluster and an observation in another cluster; this is called a complete linkage method of clustering because of the difficulty with which clusters join each other (Blashfield and Aldenderfer n.d.:II/9). All default options were used. The optimum number of clusters was found by calculating the maximum (Euclidean) distance within any cluster, then by taking the ratio of the number of distances within clusters which were less than or equal to this maximum, over the number of distances in the whole data set which were less than or equal to this maximum. Small ratios are thus ideal and and indicate compact, widely spaced clusters. In this analysis the lowest ratio (0.25) was reached at 15 clusters, but this was judges to be a trivial solution, since there were only 26 units in the analysis to begin with. The next best ratio of 0.28 was reached at 6 clusters and was selected as the optimum clustering.

Principal Components Seriation

These analyses are described quite thoroughly in Chapter Four. The SPSS subprogram FACTOR was used, specifying PA1 and the rotation method named in the text for the particular analysis. All other default options were used, including the default value of zero for DELTA when OBLIQUE was specified as the rotational method.

Non-parametric Analysis of Ceramic Attributes Versus Depth

Because the sample sizes were ordinarily small and the probability distributions unknown, a non-parametric Kruskall-Wallis test was used to investigate the hypothesis that attibutes measured on an ordinal or higher scale varied significantly with depth in the midden. Ceramics from each of the three intensively excavated areas were tested separately to minimize intra-site comparisons using the arbitrary depth categories which were defined (using FORTRAN notation) as Depth =(Zone * 10) + level. The dependent variables tested in this manner against the independent variable depth were:

number of checks/$4cm^2$
wall thickness
lip thickness
rim diameter
spacing between incised lines
punctation size
land width
groove width
paste texture
abundance of micaceous inclusions
abundance of sponge spicules
abundance of white inclusions
abundance of black inclusions
abundance of red inclusions

The Chi-Square statistic and its significance were interpreted after correction for ties. The SPSS Release 7.1 NPAR TESTS subprogram was used.

For the consideration of nominal variables versus depth a simple contingency table analysis called by the SPSS subprogram CROSSTABS was used. The depth variables were computed as above and then grouped into four categories: 10-21 = 1; 22-23 = 2; 24-25 = 3; 26 - highest = 4; any other values were assigned as missing. The nominal-level variables cross-classified with depth included:

- vessel form
- wall orientation
- lip form
- lip decoration
- location of lip decoration
- interior surface treatment
- location of interior surface decoration
- exterior surface treatment
- exterior surface color
- location of exterior surface decoration
- incised motif
- punctation shape
- punctation arrangement
- filming
- stamping
- sand inclusions (by size and abundance)
- interior surface color
- core color

A copy of the attribute catalogue used for the analysis detailing the states for each variables is on file in the Department of Social Science, Florida State Museum, Gainesville.

Computerized Isopleth Maps

SYMAP Version 5.20 was used to produce figures 6,10, and 19-30. Of these the first two utilized no important options. For the last set of figures the following package of F-MAP electives was used:

Elective	Effect
4	specified the minimum non-zero value as the value range minimum
5	specified the maximum value as the value range maximum
7	specified a symbolism which left lowest data level unshaded
8	suppressed contour or boundary lines between data levels
18	set invalidated missing data values equal to zero
23	suppressed printing of missing or invalid data point symbols
35	set maximum search radius for interpolation procedure to 1.9 (the equivalent, on this scale, of 50 meters)

In general the boundaries between the data levels were found in the default manner; that is, the range was divided into five levels of equal width. In a few cases this procedure was altered due to an uneven distribution of tests within levels which made pattern-detection difficult. In each, however, the numeric criteria for membership in the grouped categories are shown below the figures. During reproduction the SYMAP output was superimposed on Gould Plotter output containing the site name, scale, north arrows, map border, even meter contour lines, Orange Creek, and the 900m^2 grid units.

The proveniences used for mapping the site during the early phase of occupation, and for use in Table 29, are as follow:

Square	Zone	Level	Feature	Aggregated Group/Depth
620N105E	II	3		
541N344E	II	1,5		
	III			
527N431E	II	4		and 3/E
490N442E	III	2		
306N140E	II	5		
312N133E			8	
318N62E	II	3		
402N20E	II	5		
648N136E	II	1		
584N380E			9D	and 1/C,F
462N433E	II	1		
350N416E				1/D,E
304N133E				3/B,H

The proveniences used for mapping the site during the middle phase of occupation, and for use in Table 29, follow on the next page:

Square	Zone	Level	Feature	Aggregated Group/Depth
541N344E	II	3		
558N290E	IV			
527N431E	II	3		
490N442E	II	1		
296N366E	II	1		
278N232E	II	1		
250N140E				6/A,C,E
306N140E	II	4		
312N133E	II	5,6		
318N62E	II	4		
402N20E	II	2		
648N136E	II	2,3		
580N376E	II	1,4		
354N418E	II	3	and 10D	and 1/D
304N133E				3/A,C,E

The proveniences used for mapping the site during the late phase of occupation, and for use in Table 29, are as follow:

Square	Zone	Level	Feature	Aggregated Group/Depth
606N166E		2,4,5		
620N105E		all		
558N400E	II	1,2,3		
558N290E	III			
516N380E	II			
527N431E	II	1,2		
318N62E	II	2		
402N20E	II	1,2		
584N380E			9	and 2/B
350N416E				1/A,B,C
462N463E	II	2		

Population Simulations

The package used for simulation of the population model discussed on pages 208-223 was CSMP (Speckhart and Green 1976). A source listing for the run which produced the output in Fig. 34 on page 222 follows; for simplicity the iterative loop which arrived at the proper initial conditions has been left out:

```
0000 TITLE ELITE-UTILITARIAN CERAMIC PRODUCTION-DISTRIBUTION MODEL
0001 TITLE MCKEITHEN SITE, 8 CO 17
```

```
* ALL FLOWS IN GRAMS CERAMICS/YEAR;
* ALL STORAGES IN GRAMS CERAMICS
INITIAL
INCON UCHSU=10000
INCON ECHSU=6000
INCON ECLSU=4000
INCON RECU=1
INCON RECE=1
INCON HSC=900
INCON SECU=240000
INCON SECM=30000
INCON MNDS=1
PARAM N=20,ERROR=.2,X0=25500
CONST C2=.138
CONST C1=.056
DYNAMIC
NOSORT
      R5=C2*V
      R8=(.1*EE)*IMPULS(N,N)
      R1=IMPL(X0,ERROR,FOFX)
      FOFX=U-(.1*R1)
SORT
W=INTGRL(HSC,R0-R12)
      FAZOUT=-.01*STEP(400.0)
      C11=.147+FAZOUT
      C10=.1786+FAZOUT
      R0=(C10*EE)*Y
      R12=R0
      Y=COMPAR(.1*NELITE,ELITE)
      NELITE=V+EV
      ELITE=EE+UE
EE=INTGRL(ECHSU,R12-R7-REDIST-R8)
      REDIST=AMIN1(.75*R2,.075*EE)
      R2=(.1*R1)*Y
      R7=C1*EE
M=INTGRL(MNDS,R8)
U=INTGRL(SECM,R9-R2-R1)
      R9=C11*V
V=INTGRL(SECU,R1+REDIST-R5)
EV=INTGRL(ECLSU,REDIST-R4)
      R4=C1*EV
UE=INTGRL(UCHSU,R2-R6)
      R6=C2*UE
RUTIL=INTGRL(RECU,R5+R6)
RELITE=INTRL(RECE,R4+R7)
      XBAR=(NELITE+ELITE)/27000
      XMIN=.32*XBAR
```

```
      XMAX=3.05*XBAR
      POPBAR=4.5*XBAR
      POPMIN=4*XMIN
      POPMAX=5*XMAX
* XBAR IS THE APPROXIMATE NUMBER OF HOUSES AT ANY TIME
* FIGURED FROM THE 'STANDING CROP' OF CERAMICS IN EACH
* HOUSE.  XMIN & XMAX ARE DERIVED BY SUBTRACTING OR ADDING
* 1 STANDARD DEVIATION FROM ESTIMATES OF VESSEL WIEGHT,
* SHERD WEIGHT, AND NUMBER OF SHERDS IN THE MIDDEN.
* POPBAR MULTIPLIES THE AVERAGE ESTIMATE FOR NUMBER OF
* RESIDENTIAL UNITS BY AN ESTIMATE FOR NUMBER OF PEOPLE
* PER HOUSEHOLD, DERIVED FROM FLOOR AREA OF POTANO SITES
* IN GAINESVILLE AREA TIMES NAROLL'S CONSTANT.  POPMIN AND
* POPMAX MULTIPLY SLIGHTLY HIGHER AND LOWER ESTIMATES OF
* PEOPLE PER HOUSEHOLD BY THE UPPER AND LOWER ESTIMATES FOR
* NUMBER OF HOUSEHOLDS.

TERMINAL

TIMER DELT=.5,FINTIM=600,OUTDEL=6
METHOD RECT
PRINT EE,V,RUTIL,RELITE,M,XBAR,UE
PRTPLT XBAR (7.35,23.19,POPMIN,POPBAR,POPMAX)
END
STOP
ENDJOB
```

LIST OF REFERENCES

Adams, R. N.
1975 Energy and structure, a theory of social power. University of Texas Press, Austin.

Anderson, Theodore R. and Morris Zelditch, Jr.
1968 A basic course in statistics with sociological applications. Holt, Rinehart, and Winston, New York.

Asch, David L.
1975 On sample size problems and the uses of non-probabalistic sampling. In Sampling in Archaeology, edited by James W. Mueller, pp. 170-191. University of Arizona Press, Tucson.

Barr, Anthony J., James H. Goodnight, John P. Sall, and Jane T. Helwig
1976 A user's guide to SAS/76. SAS Institute, Inc., Raleigh.

Benfer, Robert A.
1972 Factor analysis as numerical induction: how to judge a book by its cover. American Anthropologist 74:530-554.

Bennett, Spencer, and David Bowers
1976 An introduction to multivariate techniques for social and behavioural sciences. Macmillan, London.

Binford, Lewis R., Sally R. Binford, Robert Whallon, and Margaret Ann Hardin
1970 Archeology at Hatchery West. Memoirs of the Society for American Archeology 24.

Binford, Sally R. and L. R. Binford
1968 New perspectives in archeology. Aldine, Chicago.

Birdsell, Joseph B.
1968 Some predictions for the Pleistocene based on equilibrium systems among recent hunter-gatherers. In Man the Hunter, edited by Richard B. Lee and Irven DeVore, pp. 229-240. Aldine, Chicago.

Blashfield, Roger K. and Mark S. Aldenderfer
n.d. A consumer report on cluster analysis software. Xerox.

Brain, Jeffrey P.
1976 The question of corn agriculture in the lower Mississippi Valley. Southeastern Archaeological Conference Bulletin 19:57-60.

Brose, Davis S. and George W. Percy
1974 An Outline of Weeden Island ceremonial activities in Northwest Florida. Paper presented at the 39th Annual Meeting of the Society for Americn Archaeology, Washington, D.C.

Bullen, Ripley P.
1953 The famous Crystal River site. Florida Anthropologist 6:9-37.

Bullen, Ripley P.
1975 A guide to the identification of Florida projectile points. Kendall Books, Gainesville, Florida.

Butson, Keith D.
1965 Climate. In Soil Survey, Suwannee County, Florida, series 1961. No. 21, pp. 93-95. U.S. Government Printing Office.

Cambron, James W. and David C. Hulse
1975 Handbook of Alabama archaeology, Part I. Archaeological Research Associates of Alabama, Inc., n.p.

Chapman, Carl H.
1976 Internal settlement designs of two Mississippian tradition ceremonial centers in southeastern Missouri. In Cultural Change and Continuity: essays in honor of James Bennett Griffin, edited by Charles E. Cleland, pp. 121-146. Academic Press, New York.

Christenson, Andrew L., and Dwight W. Read
1977 Numerical taxonomy, R-mode factor analysis, and archaeological classification. American Antiquity 42:163-179.

Cleland, Charles E., ed.
1976 Cultural change and continuity: essays in honor of James Bennett Griffin. Academic Press, New York.

Cleland, Charles E.
1977 For the director: research essays in honor of James B. Griffin. Anthropological Papers 61. University of Michigan, Ann Arbor.

Cooke, C. Wythe
1948 Geology of Florida. Geological Bulletin 29. Florida Geological Survey, Tallahassee.

Cumbaa, Stephen L.
1972 An intensive harvest economy in North-central Florida. Unpublished M.A. thesis, Department of Anthropology, University of Florida.

David, Nicholas
1972 On the life span of pottery, type frequencies, and archaeological inference. American Antiquity 37:141-142.

David, Nicholas and Hilke Hennig
1972 The ethnography of pottery: a Fulani case seen in archaeological perspective. McCaleb Module in Anthropology 21:1-29.

Deagan, Kathleen A.
1972 Fig Springs: the mid-seventeenth century in North-central Florida. Historical Archaeology 6:23-46.

DeBoer, Warren R.
1974 Ceramic longevity and archeological interpretation: an example from Upper Ucayali, Peru. American Antiquity 39:335-342.

Deetz, James A.
1965 The dynamics of stylistic change in Arikara ceramics. Illinois Studies in Anthropology 4.

Deetz, James A.
1967 Invitation to archeology. Natural History Press, Garden City.

DeJarnette, David L. and Vernon J. Knight Jr.
1976 Lagrange. Journal of Alabama Archaeology 12:1-60.

Doran, J. E. and F. R. Hodson
1975 Mathematics and computers in archaeology. Harvard University Press, Cambridge.

Dougenik, James A. and David E. Sheehan
1975 SYMAP user's reference manual. Laboratory for Computer Graphics and Spatial Analysis, Graduate School of Design, Harvard University.

Dumond, Don E.
1977 Science in archaeology: the saints go marching in. American Antiquity 42:330-349.

Dunnell, Robert C.
1970 Seriation method and its evalation. American Antiquity 35:305-319.

Earle, Timothy K.
1973 Control hierarchies in the traditional economy Halelea district, Kauai Hawaii. Ph.D. dissertation, Department of Anthropology, University of Michigan. University Microfilms, Ann Arbor.

Fairbanks, Charles H.
1952 Creek and pre-Creek. In Archeology of the Eastern United States, edited by James B. Griffin, pp. 285-300. University of Chicago Press, Chicago.

Fairbanks, Charles H.
1961 Comment. Current Anthropology 2:237-238.

Fairbanks, Charles H.
1965 Gulf complex subsistence economy. Southeastern Archaeological Conference Bulletin 3:57-62.

Ferguson, Leland G.
1971 South Appalachian Mississippian. Ph.D. dissertation, Department of Anthropology, University of North Caroline. University Microfilms, Ann Arbor.

Flannery, Kent V.
1976 The early Mesoamerican house. In The Early Mesoamerican Village, edited by K. V. Flannery, pp. 16-24. Academic Press, New York.

Flannery, Kent V. and Joyce Marcus
1976 Formative Oaxaca and the Zapotec cosmos. American Scientist 64:374-383.

Ford, James A.
1962 A quantitative method for deriving cultural chronology. Pan American Union, Technical Manual 1.

Foster, George M.
1960 Life-expectancy of utilitarian pottery in Tzintzuntzan, Michoacan, Mexico. American Antiquity 25:606-609.

Garcilaso de la Vega
1962 The Florida of the Inca (Translated by John and Jeanette Varner). University of Texas Press, Austin.

Gibson, Jon L.
1974 Aboriginal warfare in the Southeast: an alternative perspective. American Antiquity 39:130-133.

Goggin, John M.
1951 An early lithic complex from central Florida. American Antiquity 16:46-49.

Goggin, John M.
1952 Space and time perspective in northern St. Johns archeology, Florida. Yale University Publications in Anthropology 47.

Haag, W. G. and C. H. Webb
1953 Microblades at Poverty Point sites. American Antiquity 18:254-258.

Hemmings, E. Thomas
n.d. Cades Pond subsistence, settlement, and ceremonialism. Manuscript in possession of author.

Hill, James A.
1970 Broken K Pueblo: prehistoric social organization in the American southwest. University of Arizona Anthropological Papers 18.

Hudson, Charles M.
1976 The southeastern Indians. University of Tennessee Press, Knoxville.

Kohler, Timothy A.
1975 The Garden Patch site: a minor Weeden Island ceremonial center on the North Peninsular Florida Gulf Coast. Unpublished M.A. thesis, Department of Anthropology, University of Florida.

Larson, Lewis Jr.
1977 Historic Guale Indians of the Georgia coast and the impact of the Spanish mission effort. Manuscript in press.

LeBlanc, Steven A.
1975 Micro-seriation: a method for fine chronological differentiation. American Antiquity 40:22-38.

Lee, Richard B. and Irven DeVore (editors)
1968 Man the Hunter. Aldine, Chicago.

Long, Austin and Bruce Rippeteau
1974 Testing contemporaneity and averaging radiocarbon dates. American Antiquity 39:205-215.

Longacre, William A.
1970 Archeology as anthropology, a case study. University of Arizona Anthropological Papers 17.

Lussagnet, Suzanne, Ed.
1958 Les Français en Floride: Pays d'outre mer, deuxième série: les classiques de la colonisation, no. 2. Presses Universitaires de France, Paris.

Marcus, Joyce
1976 The size of the early Mesoamerican village. In The Early Mesoamerican Village, edited by K. V. Flannery, pp. 79-90. Academic Press, New York.

Marquardt, William H.
1974 A temporal perspective on late prehistoric societies in the eastern Cibola area: factor analytic approaches to short-term chronological investigation. Ph.D. dissertation, Department of Anthropology, Washington University. University Microfilms, Ann Arbor.

Marquardt, William H.
n.d. Advances in archaeological seriation. Manuscript.

Milanich, Jerald T.
1971 The Alachua tradition of North-Central Florida. Contributions of the Florida State Museum, Anthropology and History 17.

Milanich, Jerald T.
1972 Excavations at the Richardson site, Alachua county, Florida: an early 17th century Potano Indian village (with notes on Potano culture change). Florida Department of State, Bureau of Historic Sites and Properties Bulletin 2, pp. 35-61.

Milanich, Jerald T.
1973 A Deptford phase house structure. Florida Anthropologist 26:105-118.

Milanich, Jerald T.
1974 Life in a 9th century Indian household: a Weeden Island fall-winter site on the upper Apalachicola River, Florida. Florida Department of State, Bureau of Historic Sites and Properties Bulletin 4, pp. 1-44.

Milanich, Jerald T.
1976 The aboriginal cultures of North-central Florida. Florida State Museum Miscellaneous Project Report Series 7. Mimeograph.

Milanich, Jerald T.
n.d.a The concept of Weeden Island and a chronology for peninsular Florida. Manuscript in possession of author.

Milanich, Jerald T.
n.d.b Weeden Island in North Florida: archeological investigation of a possible complex society. Proposal to National Science Foundation, 1976.

Moore, Clarence B.
1907 Crystal River revisited. Journal of the Academy of Natural Sciences of Philadelphia, 2nd series, 13:407-427.

Mueller, James W. (editor)
1975 Sampling in archeology. University of Arizona Press, Tucson.

Murdock, George Peter
1949 Social structure. Macmillan, New York.

Naroll, Raoul
1962 Floor area and settlement population. American Antiquity 27:587-588.

Nie, Norman H., C. H. Hull, J. G. Jenkins, K. Steinbrenner, and D. H. Bent
1975 Statistical package for the social sciences, 2nd edition. McGraw-Hill, New York.

O'Brien, Patricia Joan
1972 A formal analysis of Cahokia ceramics from the Powell tract. Illinois Archaeological Survey Monograph 3.

Odum, E. P.
1971 Fundamentals of ecology, 3rd edition. W. B. Saunders, Philadelphia.

Odum, H. T.
1971 An energy circuit language for ecological and social systems: its physical basis. In Systems Analysis and Simulation in Ecology, edited by B. C. Patten. Vol. 2:129-211. Academic Press, New York.

Otto, John Solomon
1975 Status differences and the archeological record--a comparison of planter, overseer, and slave sites from Cannon's Point Plantation (1794-1861), St. Simons Island, Georgia. Ph. D. dissertation, Department of Anthropology, University of Florida. University Microfilms, Ann Arbor.

Otto, John Solomon
1977 Artifacts and status differences--a comparison of ceramics from planter, overseer, and slave sites on an antebellum plantation. In Research Strategies in Historical Archeology, edited by Stanley South, pp. 91-118. Academic Press, New York.

Patten, B. C. (editor)
1971 Systems Analysis and Simulation in Ecology. Academic Press, New York.

Peebles, Christopher S.
1972 Monothetic-divisive analysis of the Moundville burials--an initial report. Newsletter of Computer Archeology 8(2):1-13.

Peebles, Christopher S.
1974 Moundville: the organization of a prehistoric community and culture. Ph.D. dissertation, Department of Anthropology, University of California, Santa Barbara. University Microfilms, Ann Arbor.

Peebles, Christopher S. and Susan M. Kus
1977 Some archaeological correlates of ranked societies. American Antiquity 42:421-448.

Percy, George W.
1976 Salvage investigations at the Scholz steam plant site (8 Ja 104), a Middle Woodland habitation site in Jackson County, Florida. Miscellaneous Project Report Series 35. Florida Department of State, Bureau of Historic Sites and Properties, Division of Archives, History, and Records Management. Tallahassee.

Percy, George W. and David S. Brose
1974 Weeden Island ecology, subsistence, and village life in northwest Florida. Paper presented at thr 39th Annual Meeting of the Society for American Archaeology, Washington, D.C.

Phillips, Phillip
1970 Archaeological survey in the lower Yazoo Basin, Mississippi, 1949-1955. Papers of the Peabody Museum of Archaeology and Ethnology 60. Cambridge.

Plog, Stephen
1976 The inference of prehistoric social organization from ceramic design variability. Michigan Discussions in Anthropology 1:1-47.

Read, Dwight W.
1975 Regional sampling. In Sampling in Archeology, edited by James W. Mueller, pp. 45-60. University of Arizona Press, Tucson.

Rouse, Irving
1960 The classification of artifacts in archaeology. American Antiquity 25:313-323.

Rowland, L. O. and D. P. Powell
1965 Geology, physiography, and drainage. In Soil Survey, Suwannee County, Florida, series 1961, No. 21, pp. 95-99. U. S. Government Printing Office.

Rummel, R. J.
1970 Applied factor analysis. Northwestern University Press, Evanston.

Sanders, W. T. and B. J. Price
1968 Mesoamerica, the evolution of a civilization. Random House, New York.

Schiffer, Michael B.
1976 Behavioral archeology. Academic Press, New York.

Schnell, Frank T.
1975 The Woodland period south of the fall line. Early Georgia 3:27-36.

Sears, Elsie and William H. Sears
1976 Preliminary report on the prehistoric corn pollen from Fort Center, Florida. Southeastern Archaeological Conference Bulletin 19:53-56.

Sears, William H.
1948 Excavations at Kolomoki, season I, 1948. University of Georgia Series in Anthropology 2. Athens.

Sears, William H.
1954 The sociopolitical organization of pre-Columbian cultures on the Gulf coastal plain. American Anthropologist 56:339-346.

Sears, William H.
1956 Excavations at Kolomoki: final report. University of Georgia Series in Anthropology 5. Athens.

Sears, William H.
1958 The Wilbanks site (9CK-5), Georgia. River Basin Surveys Papers 12, Smithsonian Institution Bureau of American Ethnology Bulletin 169.

Sears, William H.
1961 The study of social and religious systems in North American archeology. Current Anthropology 2:223-231.

Sears, William H.
1962 The Hopewellian affiliations of certain sites on the Gulf coast of Florida. American Antiquity 28:5-18.

Sears, William H.
1963 The Tucker site on Alligator Harbor, Franklin County, Florida. Contributions of the Florida State Museum, Social Sciences, 9. Gainesville.

Sears, William H.
1968 The state and settlement patterns in the New World. In Settlement Archaeology, edited by K. C. Chang, pp. 134-153. National Press Books, Palo Alto.

Sears, William H.
1973 The sacred and secular in prehistoric ceramics. In Variation in Anthropology, edited by D. W. Lathrap and J. Douglas, pp. 31-42. Illinois Archaeological Survey.

Sears, William H.
1977 Prehistoric culture areas and culture change on the Gulf coastal plain. In For the Director: Research Essays in Honor of James B. Griffin, edited by Charles E. Cleland. Anthropological Papers 61:152-185. University of Michigan, Ann Arbor.

Service, Elman R.
1962 Primitive social organization. Random House, New York.

Service, Elman R.
1975 The origins of the state and civilization. W. W. Norton and Co., New York.

Shepard, Anna O.
1975 Ceramics for the archaeologist. Publication 609, Carnegie Institution of Washington.

Smith, Samuel D.
1971 A reinterpretation of the Cades Pond archeological period. Unpublished M. A. thesis, Department of Anthropology, University of Florida.

Speckhart, Frank H. and Walter L. Green
1976 A guide to using CSMP--the Continuous System Modeling Program. Prentice-Hall, New Jersey.

Steinen, Karl T.
1976 The Weeden Island ceramic complex: an analysis of distribution. Ph. D. dissertation, Department of Anthropology, University of Florida. University Microfilms, Ann Arbor.

Sudman, Seymour
1976 Applied sampling. Academic Press, New York.

Swanton, John R.
1911 Indian tribes of the lower Mississippi Valley and adjacent coast of Gulf of Mexico. Bureau of American Ethnology, Bulletin 43.

Swanton, John R.
1928 Social organization and social usages of the Indians of the Creek Confederacy. Bureau of American Ethnology, Annual Report 42, pp. 23-472.

Swanton, John R.
1946 The Indians of the southeastern United States. Bureau of American Ethnology, Bulletin 137.

Thornthwaite, C. W.
1948 An approach toward a rational classification of climate. The Geographical Review 38:55-94.

Veach, Otto and L. W. Stephenson
1911 Preliminary report on the geology of the coastal plain of Georgia. Georgia Geological Survey Bulletin 26. Atlanta.

Wauchope, Robert
1958 The ceramic sequence in the Etowah drainage, northwest Georgia. American Antiquity 13:201-209.

Wauchope, Robert
1966 Archaeological survey of northern Georgia. Memoirs of the Society for American Archaeology 21.

Whallon, Robert Jr.
1968 Investigations of late prehistoric social organization in New York State. In New Perspectives in Archeology, edited by S. R. Binford and L. R. Binford, pp. 223-244. Aldine, Chicago.

Whallon, Robert Jr.
1971 A computer program for monothetic subdivisive classification in archeology. Technical Reports 1. Museum of Anthropology, University of Michigan, Ann Arbor.

Wiessner, Polly
1974 A functional estimator of population from floor area. American Antiquity 39:343-350.

Willey, Gordon R.
1945 The Weeden Island culture: a preliminary definition. American Antiquity 10:225-254.

Willey, Gordon R.
1949 Archeology of the Florida Gulf coast. Smithsonian Miscellaneous Collections 113. Smithsonian Institution, Washington.

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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.

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