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PATTERNS OF MISSISSIPPIAN PERIOD ADAPTATION IN COASTAL GEORGIA

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IN COASTAL GEORGIA

by

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CHARLES EDWARD PEARSON
Patterns of Mississippian Period Adaptation in Coastal Georgia
(Under the direction of WILFRID C. BAILEY)

Settlement and subsistence data are utilized in an attempt to assess aspects of prehistoric adaptation in coastal Georgia. Data is derived from archaeological survey and test excavations conducted on Ossabaw Island, Georgia.

The settlement and subsistence systems of two Mississippian Period phases are analyzed and compared. These are the Savannah Phase (A.D. 1150-A.D. 1350) and the Irene Phase (A.D. 1350-A.D. 1550).

The settlement structure of each phase is examined in light of rank-size distributions, hierarchical arrangement, and site locational relationships to sets of quantified environmental variables. The settlement models developed indicate significant differences between the settlement structures of the two phases. The Savannah Phase is characterized by a "nucleated" settlement structure, while the Irene Phase is characterized by a "dispersed" settlement structure.

The quantitative analysis of subsistence data indicates little difference between the subsistence system of the two phases. Each exhibit a primary reliance on marsh-estuary resources, especially shellfish, and lesser reliance on land mammals. The species exploited by Ossabaw Island's prehistoric population are shown to differ expectedly from those exploited by inland Mississippian groups. This is considered reflective of the unique environmental conditions found in coastal Georgia.

The models of Mississippian Period settlement and subsistence developed from the Ossabaw Island data provide a base line for the

explanation and comparison of the adaptive systems of other populations in coastal Georgia.

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CHAPTER I

INTRODUCTION

The use of settlement and subsistence data have long been important in the assessment of prehistoric adaptation. David Clarke (1968:117) has stated that "In advantageous circumstances the archaeologist can isolate and model the two main categories of strategy within the economic subsystem of his culture: the strategy of site location and the strategy of subsistence organization." It is assumed that the strategies of settlement and subsistence are the result of patterned behavior and that they themselves are patterned and understandable. Since the interpretation of patterns of behavior is dependent upon a knowledge of the context in which they take place, the analysis of archaeological settlement and subsistence data within an ecological frame of reference should permit meaningful statements to be made concerning the interrelationships between a human population and its natural and sociocultural environment. Utilizing such an approach, this study considers Mississippian Period settlement and subsistence data from Ossabaw Island, Georgia, and proposes a general model of adaptation for the region.

In this study, the term Mississippian is used to refer to those cultural manifestations which occurred on the Georgia coast between approximatley A.D. 1000 and A.D. 1500. This is a somewhat broad use of the concept "Mississippian" in its strict usage (Griffin 1967) since the coastal area of Georgia is both geographically and culturally peripheral to the main manifestations of Mississippian development. The cultural manifestations of the Mississippian Period on the Georgia coast are the Savannah phase (circa A.D. 1150-A.D. 1350) and the Irene phase (A.D. 1350-A.D. 1550). In order to approach the question of Mississippian Period adaptation, an archaeological scheme of overall survey, individual site mapping, and test excavation was employed.

Previous archaeological investigations in coastal Georgia have centered on burial mound excavation and attempts to define or refine the cultural sequence of the area. The result has been a rather detailed knowledge of ceramics and ceramic change but very little knowledge of other socio-cultural activities, especially cultural adaptation. By combining archaeological settlement and subsistence data with ecological data this study presents a view of Mississippian Period adaptation on Ossabaw Island and allows the formulation of accurate statements about certain facets of the complex cultural systems that operated there. A major emphasis of this study will be an attempt to model the general patterns of Mississippian Period settlement and subsistence on Ossabaw Island and to examine any variability which may have existed between the Savannah and Irene phases in terms of these strategies. Although this study was carried out within narrow temporal and spatial parameters, the results should permit the development of meaningful and useful generalizations concerning late prehistoric adaptations on the coast of Georgia.

Concepts and Assumptions

The concepts and the theoretical framework employed in this study are derived from a number of studies concerning settlement and subsistence, including Chang 1968; Gummerman 1971; Larson 1970; Smith 1975; Struever 1968, 1971; and Trigger 1978, 1971. These studies have, in turn, drawn heavily from the ideas of Julian Steward and Leslie White concerning cultural adaptation (Steward 1955; White 1949).

Cultural Adaptation

Largely due to the influence of Julian Steward's concepts of cultural ecology and Leslie White's premise that total cultures were the result of their technology interacting with the natural environment, cultural adaptation has been viewed mainly as an adaptation to the natural environment (Steward 1955:30-42; White 1949). This concept has assumed that archaeologically recoverable data, e.g., site location, material culture, floral and faunal remains, are only reflective of a people's interrelationships with their physical surroundings. As Trigger (1971:3) points out, since the procedure has been to look at "core" features of cultures, the nature of archaeological data has inevitably resulted in a focus on the economic or technological aspects of culture. The result has often been an inability to explain variability and complexity of prehistoric cultural systems. Although it is realized that archaeological data associated with adaptation to the physical environment is often the easiest to isolate and identify, cultural adaptation herein will be considered to include a population's adjustments to and interaction with both the natural and social environment.

Settlement System

This study considers the Mississippian Period settlement system on

Ossabaw Island as a subsystem of larger, more complex cultural systems operating on the island. A system or subsystem is defined by Hall and Fagan (1968:81) as a "set of objects together with relationships between the objects and their attributes". They point out that the structure of a system is found in the interrelationships between the objects and not in the objects themselves. The relatedness of parts within a system can only be observed when the larger unit (the cultural system) and the subunits (subsystems) are bounded in some manner. The objects, the connections, and the boundaries of cultural systems and subsystems are considered to be choices of the archaeologist and are dependent upon the problem at hand. It should be pointed out that when the term "settlement pattern" is used in this study it implies only the idea of the spatial distribution of sites and not any systemic relations between them.

The objects of the settlement system are the individual sites themselves. The attributes are the various properties of the sites used in the analysis (e.g., site size, presence of burial mounds, site relationship to various environmental variables, etc.). The connections are those relations that "tie the system together" (Hall and Fagan 1968:81), the assumption being that certain types of cultural interrelationships existed among the settlements of each of the two phases being studied. It is these relationships which are actually being sought in this study. Handling all possible relationships that existed within a settlement system is virtually impossible. An attempt is therefore made to discern only those relationships which are considered essential and important in developing a general model of settlement and which are reasonable in light of the data. The relationships of particular interest are those that exist within and among sites of different levels of a settlement hierarchy and those that exist between sites and specific aspects of the natural environment.

Establishing realistic boundaries for cultural systems is often difficult if not impossible with archaeological data. Archaeologists generally have temporal boundaries within which to view structure but rarely in settlement system analysis have they been able to develop realistic spatial or physical boundaries. This study has, at least, partial control over both spatial and temporal boundaries. Spatial boundaries are rather easily determined in that Ossabaw Island is a relatively isolated and discrete geographic unit. Temporal boundaries are provided by the time span of the Savannah and Irene phases which have been well defined and described, mainly on the basis of ceramics, by a number of workers (Caldwell 1952, 1971; Caldwell and McCann 1941; Williams 1968).

Subsistence system

The subsistence system is considered composed of those strategies (seasonality, selectivity, scheduling, etc) involved in the procurement of food. Of particular importance in this study is the assessment of the patterns of coastal subsistence in relation to the generally accepted patterns of Mississippian Period subsistence. It is assumed that because of the unique marsh-estuary environment of the coastal region patterns of Mississippian subsistence in the area will vary from those found in the interior Southeast. This fact has generally been assumed by most authors, however, none have attempted to demonstrate this quantitatively as is done here.

Subsistence strategy is generally assumed to be an important affector of site location and site function. To a limited extent subsistence data will be used to test proposals about site function.

An understanding of both settlement and subsistence strategy requires a knowledge of the specific resources being exploited out of the total resources available in the ecosystem. Therefore, the following chapter presents a rather detailed description of Ossabaw Island's natural environment with emphasis being placed upon those elements considered important in understanding Mississippian Period settlement and subsistence.

Model

As used in this study the term "model" is considered a simplified theoretical diagram depicting adaptation to the natural and sociocultural environment. Models allow for the presentation of generalized information in highly compressed form. This use of model is succintly described by Clarke (1972:12):

> Models are pieces of machinery that relate observations to theoretical ideas, they may be used for many different purposes and they vary widely in the form of machinery thay employ, the class of observations they focus upon and the manner in which they relate the observations to the theory or hypothesis... Models are often partial representations, which simplify the complex observations by the selective elimination of detail incidental to the purpose of the model. The model may thus isolate the essential factors and interrelationships which together largely account for the variability of interest in the observations...

The models developed herein utilize qualitative and quantitative measures of settlement, subsistence, and environmental phenomena that are considered important components of cultural adaptation. Settlement data, e.g., site size, site location, hypothesized site function, and subsistence data are considered meaningful and interpretable reflections of the overall adaptation of the prehistoric human populations being studied.

As with almost all other models based on archaeological data the models presented here must be considered hypothetical in nature. They are based on particular sets of collected data and seem reasonable in light of this data and the tests placed upon them. As hypothetical constructs the models of settlement and subsistence are seen as a comparative as well as explanatory devices which provide a base line for further study. Changes and alterations in the models are conceivable and, in fact, expected with the collection of additional data.

An assumption inherent in this study is that Ossabaw's Mississippian population employed a strategy of maximization of exploitation of desired sets of resources with a minimization of effort. The implication is that settlements are not randomly distributed but were located in respect to access to important resources. It is doubtful that site location decisions were made on a regional (in this case island-wide) level but rather that such decisions were more likely made at a lower "community" or social group level. The critical and useful aspect of the minimization/maximization concept is that peoples with similar patterns of behavior, given similar and appropriate sets of environmental conditions will make similar choices for settlement location (Plog and Hill 1971:13). The resulting pattern of sites to environmental resources is then a reflection of a pattern(s) of behavior shared by the population.

Since "environmental resources" encompasses both natural and social environmental factors, the distribution of sites on Ossabaw Island will reflect the role that any site played in the overall settlement system. The determination of a site's role is dependent upon selection of those factors that express site function and differentiation.

Organization

The environmental setting of Ossabaw Island is presented in Chapter II. The data presented provides the background upon which human patterns of adaptation interacted. Chapter III presents essential archaeological data including information on previous research and the known archaeological characteristics of the Savannah and Irene phases. A detailed description of the archaeological methods and techniques used to gather settlement and subsistence data is presented in Chapter IV. Procedures of settlement system analysis and results and interpretations are presented in Chapter V, while Chapter VI presents a discussion of the analysis and results of subsistence data. Chapter VII consists of a discussion and a summary of the results of analyses and presents several generalizations about patterns of adaptation in coastal Georgia.

CHAPTER II

ENVIRONMENTAL SETTING

The following sections present a rather detailed description of the environmental conditions on Ossabaw Island. These descriptions are necessary in that they identify the types and the variability of those natural resources considered to be important affectors of Mississippian Period adaptation. Where feasible, quantification of these variables is attempted.

The description is designed to portray, as accurately as possible, the environmental conditions of the pre-contact period. Early historic accounts are used when possible. However, they often tend to be too generalized and ambiguous for this purpose. Heavy reliance has therefore been placed on several recent ecological studies of coastal Georgia (See especially Hillestad *et al*. 1975; and Johnson *et al* 1974).

Regional Setting

Ossabaw Island is one of a chain of barrier islands laying off the Atlantic Coast of the southeastern United States (Fig. 1). These islands, commonly known as the sea islands, extend from North Island, South Carolina (latitude 33°15'N) to Anastasia Island, Florida (latitude 29°50'N).

The islands are all geologically and ecologically young and share similar biotic and physiographic features. They were formed as

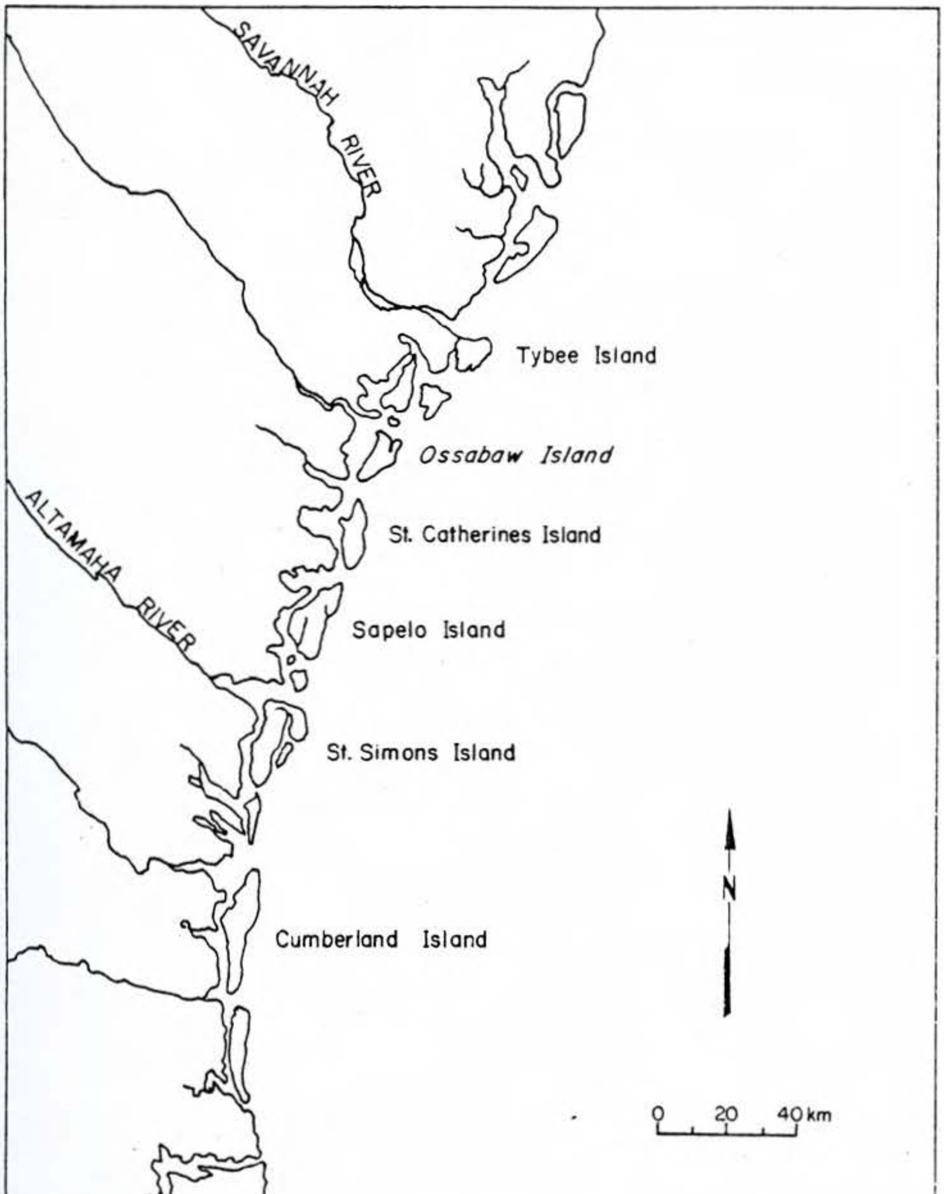

Figure 1. The coastal region of Georgia.

the result of Pleistocene and Post-Pleistocene (Holocene) geologic forces, principally sea level fluctuation, sedimentation, and estuarine erosion. An extensive salt marsh, interlaced with tidal creeks and rivers, separates the islands from the mainland. All of this region is to a great extent influenced by daily tidal changes. Most of the islands are separated from each other by sounds which are the result of fresh water streams emptying into the ocean. The principal rivers in the region are the St. Marys, the Satilla, the Altamaha, the Savannah, the Wateree, and the Peedee.

Included in the sea island region is a narrow strip of the adjacent mainland. This strip, 5 to 10 kilometers wide, is environmentally and culturally similar to the islands. This whole coastal region is bordered on the west by an area of extensive pine forests, commonly called the Pine Barrens.

Relief in this region is minimal. Elevations of the islands typically ranges from sea level to about 8 meters though individual sand dunes are often higher. The older (Pleistocene) islands, or portions of islands, are generally flat and interspersed with gentle ridges and depressions. The younger (Holocene) sections are characterized by steep parallel dune ridges.

Although Shelford (1963:63) includes all of the sea islands in his Magnolia-deer-oak faciation, Kuchler (1964) would consider the live oak (*Quercus virginiana*) and the sea oat (*Uniola paniculata*) as the potential dominants for the region. The more recent, and most reliable work by Johnson *et al*., (1974) supports Kuchler in projecting a Maritime Live Oak Forest as the climax situation for the region. This forest type is characterized by a dominance of live oak, due mainly to its tolerance to salt spray, xeric conditions and infertile soil.

The coastal marshes have little floral species variety in comparison with the adjacent island uplands. Areas of marsh totally inundated by tidal flow are almost completely dominated by salt resistant cord grass (*Spartina alterniflora*). In marsh areas that are dryer and less affected by tidal action needle rush (*Juncus roemarianus*) is dominant. These two species often occur in extensive pure stands.

A wide variety of animal species are found in the sea island region. The marsh-estuary area provides a seasonal and year round home for large numbers of fish, crustacea and molluscs. On the islands themselves occur a variety of mammals and reptiles. The most important of these are the white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), marsh rabbit (*Sylvilagus palustris*), and the alligator (*Alligator mississippiensis*).

Local Environmental Setting

Ossabaw Island is the third largest of Georgia's coastal islands, consisting of approximately 4,800 hectares of high land. The island is in Chatham County, 20 kilometers southeast of Savannah, and is separated from the mainland by a 5 to 6 kilometer wide expanse of salt marsh and tidal rivers. Ossabaw Island is not one continuous land mass but is cut by a number of salt water creeks and divided by stretches of salt marsh (Fig. 2). The study area conforms to that area now legally defined as Ossabaw Island, bordered on the east by the Atlantic Ocean, on the south by St. Catherines Sound, on the west by the Bear

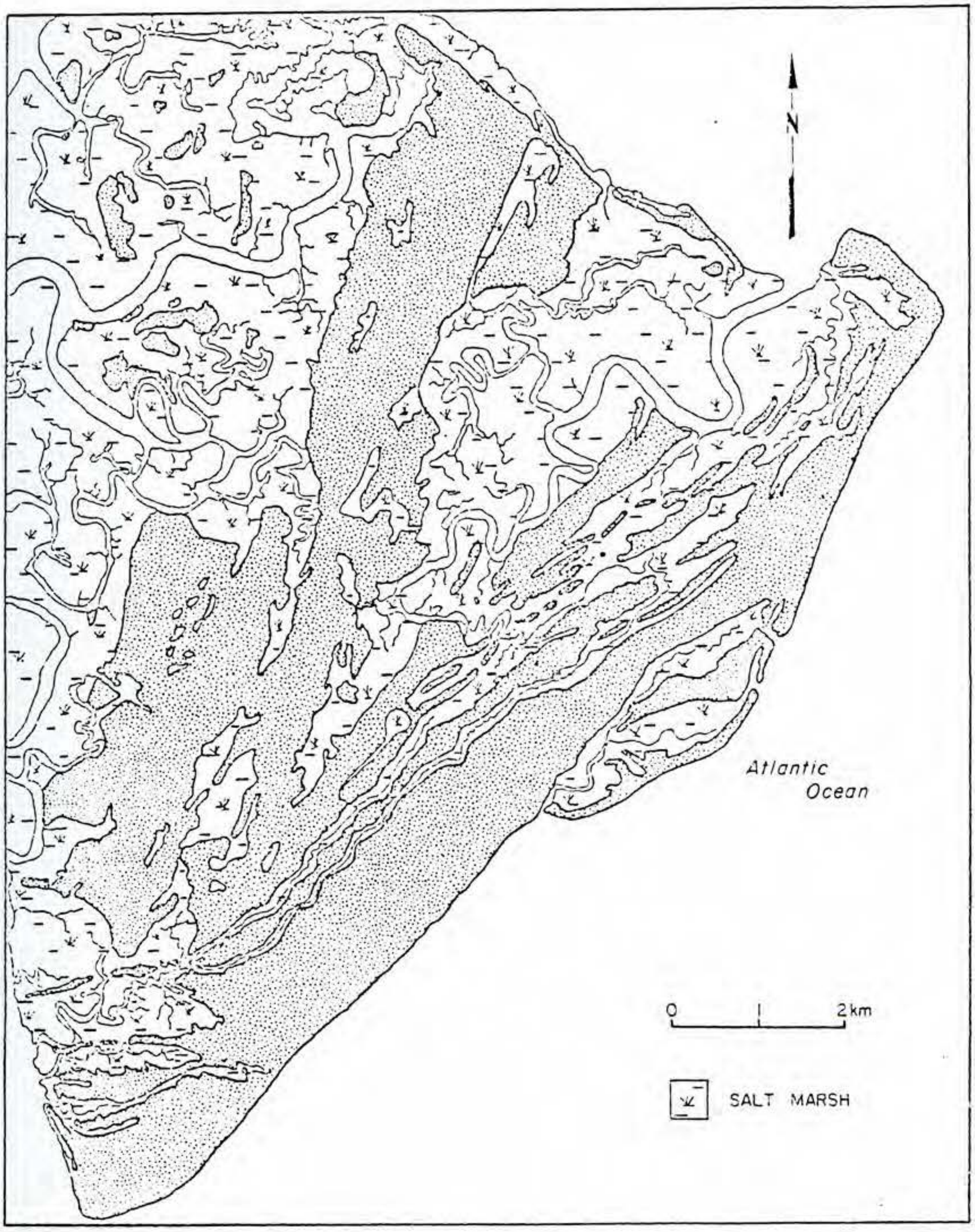

Figure 2. Ossabaw Island.

River, and on the north by Ossabaw Sound. Included in the study area are a number of small islands or "hammocks" situated in the marsh west of the main portion of the island. The island is a discrete, easily definable, somewhat isolated geographic area and it seems reasonable to assume that it was so considered by prehistoric occupants.

Several recent studies (See Hillestad et al. 1975; Johnson et al. 1974, and Larson 1970) provide pertinent information needed to reconstruct the biotic and abiotic communities of the island during the period of Mississippian occupation. While modern environmental studies may not be totally adequate in describing environmental conditions of five hundred years ago, Johnson et al. (1974:92) point out that it is unlikely that habitat change resulting from modern agricultural or timber management has resulted in any drastic changes in species composition on the islands. Though it is possible that modern selective hunting and/or disease may have caused extirpation of some forms, historic evidence is generally available to identify these cases.

Abiotic Environmental Factors

Climate

The subtropical latitude and the maritime location are major controls of the local climate. The ocean has a moderating effect on the climate, preventing unusually high temperatures during summer months and during the winter months keeping the island's temperature several degrees warmer than those inland (Wilkes et al. 1974:67).

Winters are mild and short. Cold spells, the result of polar air masses, are moderated by the ocean and only unusually strong outbreaks cause freezing on the island. These cold spells, which usually last only 2 to 3 days, alternate with periods of milder weather. The freeze-free growing season averages about 275 days and on the average less than 20 days a year have freezing temperatures (Carter 1974).

Summers are warm and humid. The highest temperatures are in the high 80's and 90's (30° to 40° C). Minimum summer temperatures are usually in the low 70's and only rarely drop below 70°F (21°C).

Average annual rainfall is between 120 and 130 centimeters. Almost one-half of this total falls between June and October. Most of this summer precipitation occurs in the form of afternoon thunderstorms. November through February is the driest period of the year.

Heavy rainfall in the fall is most commonly associated with hurricane conditions. Hurricanes along the southeastern Atlantic Coastal area tend to follow the warm lighter air of the Gulf Stream. Ossabaw Island is about 100 kilometers from the Gulf Stream and consequently has been less exposed to and affected by hurricanes than areas to the north or south (Gibson 1948). The extremely heavy rains often associated with hurricanes rarely cause serious flood damage since soil drainage and runoff is rapid.

Temperature and precipitation data for the area is presented in Fig. 3. The collecting station was in Savannah, about 20 kilometers away and the data represents a 30 year record covering the period 1931 through 1960.

Geology

Ossabaw Island was formed during two geologic periods. The western section is a Pleistocene formation, known as the Silver Bluff

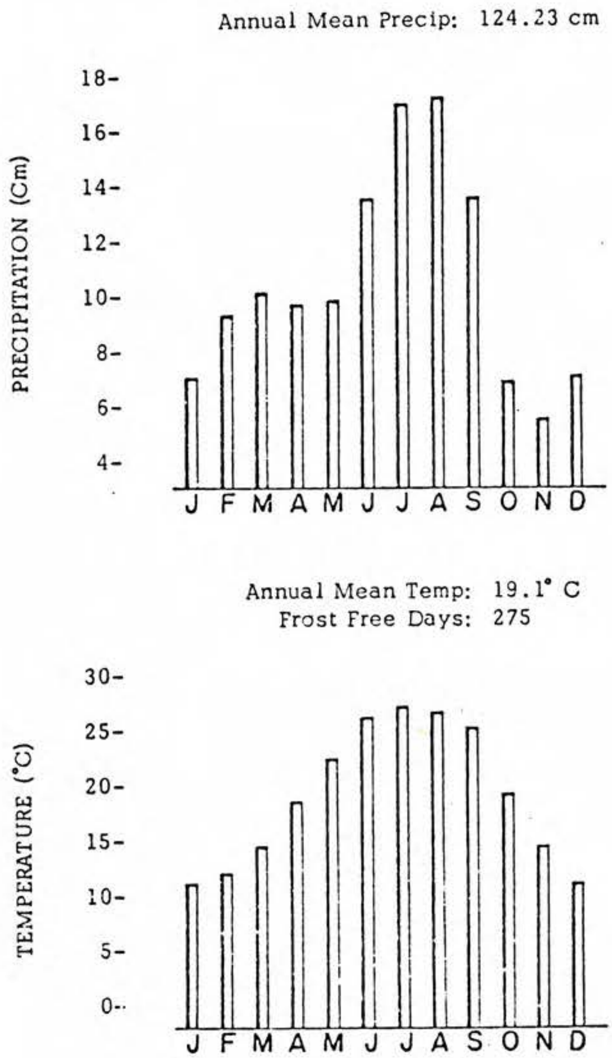

Figure 3. Climatic data for Ossabaw Island (after Carter 1974; data converted to metrics). Collecting station: Savannah, Georgia. Period of Record: 1960-1971.

Formation, and is the sixth and last of a series of barrier islands formed during stages of the Pleistocene when sea level was higher than it is now (Fig. 4). Hoyt (1967, 1968) has provided the most widely accepted theory of barrier island formation. He hypothesized that barrier islands began as a series of wind deposited dune ridges that formed along the shoreline. The dunes that were large enough and strong enough to not be destroyed during slight submergence became islands. The area landward of the dunes was flooded, forming lagoons. Sediment carried by rivers eventually filled these lagoon areas producing salt marshes.

The Wilcomico Formation is the oldest of the barrier island formations in Georgia and was formed when sea level was 25 to 30 meters above the present sea level. The major remnant of the Wilcomico Formation is Trail Ridge in southeast Georgia which today forms the eastern boundary of the Okefenokee Swamp. At the time of formation the swamp was a salt marsh. The other barrier island formations are all the result of similar geologic forces. The Silver Bluff Formation includes most of the major islands on the Georgia coast. These are Wilmington, Skidaway, parts of Ossabaw, most of St. Catherines, Sapelo, St. Simons, Jekyll, and Cumberland Islands. Radiocarbon determinations from Sapelo Island indicate a formation date of 36,000 to 25,000 years ago for the Silver Bluff islands (Hoyt et al. 1968:381). After these islands were formed sea level was lowered due to increased glaciation. With sea level rise, beginning about 18,000 years ago the areas around and behind the Silver Bluff Formation were flooded, isolating them from the mainland. With sea level stabilization about 6,000 years ago, river

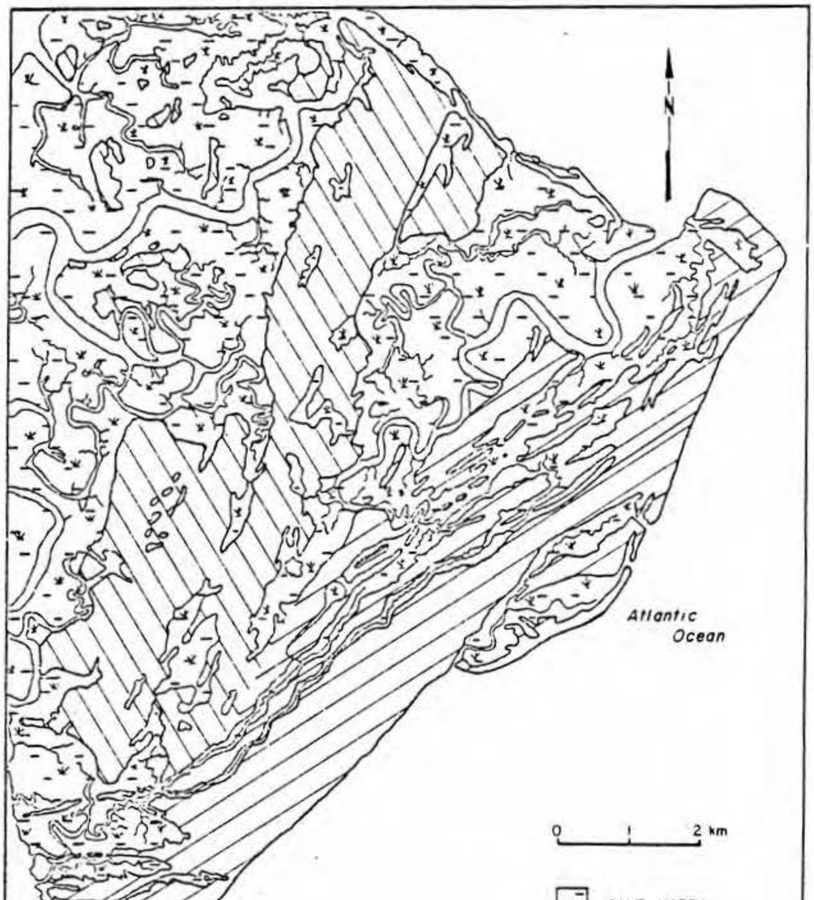

Figure 4. Geologic zones of Ossabaw Island.

sedimentation began to fill in behind the islands and salt marshes began to develop.

The eastern portion of Ossabaw Island is of Holocene origin and is only 4,000 to 6,000 years old (Fig. 4). Other Holocene islands on the Georgia coast are Tybee, Little Tybee, Wassaw, Blackbeard, Little St. Simons, Sea Island, and Little Cumberland. All have been formed as the result of dune building and accumulation since sea level stabilization.

The Pleistocene and Holocene age formations on the island have distinctly different physiographic and biotic characteristics. The Pleistocene section is very nearly level, exhibiting a mature soil profile, and offers wider expanses of well drained soil than does the Holocene section. The Holocene portion, which constitutes roughly the eastern one-half of the island, is characterized by a series of parallel dune ridges separated by low areas. These low areas are poorly drained and often form seasonal ponds. Because of the lack of broad stretches of level ground, the steepness of the dune ridges and the intervening low areas, the Holocene portion is much less suitable for habitation than the western Pleistocene section.

Fresh Water

Rainfall is the only source of water on the island. Fresh water would therefore have been available to prehistoric inhabitants in only two forms: standing water in ponds and sloughs, and shallow subsurface groundwater.

Although ponds and sloughs are numerous, during the dryer months of the year many of the smaller ponds become dry and only the deeper and larger ones contain water throughout the year. It is likely that during extended periods of drought even the larger bodies of trapped rainwater may dry up. Surface water would therefore have represented a seasonal but not necessarily a permanent water source.

Shallow subsurface ground water, however, would have provided such a permanent source of water. Rainwater percolating into the sandy island soil forms a lens-like aquifer of water above sea level beneath the island. The fresh water recharging this aquifer from rainfall on the island is lighter than the salt water recharging it from the sea and forms a layer floating on top of the sea water (Hillestad et al. 1975:49). This water source could have been easily reached with shallow wells.

Since fresh water is so uniformly and easily obtained it is impossible at this time to measure the influence of any water sources upon any particular site location.

Soils

Soils tend to be porous sands subject to severe leaching. They are usually excessively drained although low areas are poorly drained, often producing ponds or swamps. Soils also tend to be acid and infertile (Johnson et al. 1974).

Soils are considered to be an important and quantifiable factor influencing the location of sites. The United States Department of Agriculture Soil Survey of Bryan and Chatham Counties (Wilkes et al. 1974) was used to determine the soil characteristics of Ossabaw Island. Soil types have been ranked in terms of their assumed value to Mississippian Period human populations.

The rankings are based mainly on drainage characteristics of the soil. Drainage characteristics are at present the most logical means of ranking soils since they involve such factors as possibility of year-round settlement and agricultural potential.

Year-round settlements could have been located only on the better drained soils since those soils that are poorly drained are also often flooded during the wetter (summer) months.

None of the island soils are very fertile but the better drained soils are more amenable to agriculture than the poorly drained soils. Well drained soils today provide the best agricultural land on Ossabaw Island. The few small fields that are currently under cultivation are all located on the best drained soil type. Seasonally wet and poorly drained soils can be farmed only with the construction of extensive drainage works. It is unlikely that the prehistoric inhabitants of the island farmed these low wet areas.

The seven soil types present are listed below by rank and are briefly described. Soil type 1 is considered the most desirable soil type for settlement and type 7 the least desirable.

1. Lakeland Sand (Lp)-Lakeland Sand is excessivley drained, low in fertility, with acidity ranging from extremely acid to strongly acid. The seasonally high water table is deeper than 150 cm below the ground surface. Lakeland soil comprises 12.4% of the soils on the island.
2. Chipley Fine Sand (Cm)-This soil is moderately well drained, low in fertility, strongly to very strongly acid, and the seasonally high ground water table is 35 cm to 90 cm below the surface. Chipley Fine Sand comprises 11.7% of the island's soils.
3. Olustee Fine Sand (Ol)-Olustee soil is poorly drained, low in fertility, strongly to very strongly acid, and has a seasonally high ground

water table at 35 cm to 70 cm below the surface. Olustee sand makes up 12.9% of the soils on the island.

4. Leon Fine Sand (Lr)-This soil is poorly drained. Fertility is low, and acidity ranges from extremely acid to strongly acid. The seasonally high water table is 15 cm to 38 cm below the surface. Seven percent of the soils on Ossabaw are Leon Fine Sand.

5. Ellebelle Loamy Sand (El)-This soil is poorly drained, low in fertility, very strongly acid and the seasonally high water is at or near the surface for extended periods during the summer, producing the hazard of flooding. This soil comprises 12.6% of the Ossabaw soils.

6. Kirshaw-Osier Complex (Kic)-These two soils form the dune ridges and valleys that make up the eastern and most recent (Holocene) portion of Ossabaw Island. Kershaw soil forms the ridges (dunes) and is excessively drained, while the Osier soil occurs in the valleys and is poorly drained and frequently flooded. These soils are very low in fertility and very strongly acid. Kershaw-Osier Complex soils comprise 39.4% of the island's soils.

7. Capers Soil (Ch)-Capers soil is the very poorly drained soil of the tidal marsh flats and is included in the analysis only because two small Irene phase middens are located in the marsh on this soil. This soil is flooded when tides are higher than normal, has high salt content, and vegetation cover is mainly salt resistant grasses.

<u>Biotic Communities</u>

Ossabaw Island and its resources will be considered in terms of three ecozones: (1) the beach or strand area; (2) the island uplands or high ground; and (3) the marsh-estuary area. It is not assumed that the

Mississippian Period populations conceived on the island in terms of these three zones, but because of the differences in biotic and abiotic features of these areas this division seems acceptable and usable.

Strand Section

The strand section can essentially be considered as the beach. It consists of the offshore, the shore, and the dune area. The strand section is 16 kilometers in length and averages about 200 meters in width. Here, as on the other sea islands, there is a broad gently sloping shoal area just off shore which is in almost constant turbulance because of wave action. The beach area is also gently sloping and is that area lying between the high tide line and the low tide line. The dune area immediately behind the beach consists of ridges of aeolian sand running parallel to the beach. The whole strand area is constantly being altered by wind and sea action. This total area is made up of fine quartz sand. The beach line is interrupted by one tidal inlet through which the tide moves in and out daily. Behind the beach this inlet forms a shallow lagoon which today is considered an excellent fishing area.

Vegetation. The strand area is a particularly harsh environment. Only a restricted number of plant species have successfully adapted to the strand area, and of these, few would have been useful to prehistoric inhabitants of the island (Larson 1970:71).

The dominant plant species occupying the strand area is the sea oat (*Uniola paniculata*). The sea oat is important in that its root system serves to stabilize sand and thus aids in dune formation. Sea oat seeds serve as animal food and it is possible that they were utilized by prehistoric inhabitants. (Sea oat spikelets have been identified from an Irene phase site in Bryan County to the west and about 10 kilometers from the beach (Bates 1975:9).

Few other plants grow directly on the beach and foredune area. As one moves landward from the strand section, however, a zonation of plant communities occurs. This zonation results in a graduation away from the beach in terms of plant species composition. The foredunes contain mainly the salt resistant plants while landward the dunes are progressively characterized by less salt resistant plants.

Fauna. Although there is a greater variety of animals than plants found in the strand area, most are visitors and are not permanent inhabitants of the strand.

There are several varieties of intertidal species living on the beach, but they represent an unimportant exploitable food resource.

Several species of shore birds occur on the beach and a number of species nest in the dunes. Those species that have been recorded as nesting are: Royal tern (*Thalasseus maximus*), Least tern (*Sterna albifrons*), American oyster catcher (*Haematopus palliatus*), Wilson's Plover (*Charadrius wilsonia*), Willet (*Atoptrophorus semiplamatus*), Black skimmer (*Rynchops nigra*), Gull-billed tern (*Gelochelidon nilotical*) (Teal 1959). Although numerous other species utilize the beach it seems likely that only the eggs of nesting birds would have provided a convenient food source.

No mammals are permanent occupants of the strand area. The most common visitors are the white-tailed deer, the raccoon, and the marsh rabbit.

The most important animal visiting the beach in terms of possible prehistoric exploitation is the sea turtle (Caretta caretta caretta). In the summer months female turtles come up on the beaches to lay and both the turtles and their eggs would have provided an important and easily exploited food source.

Island Uplands Section

The island uplands section includes all of the highland above normal tidal influence and not characterized as true beach or strand area. This section includes old dune ridges now overgrown with forest vegetation.

Vegetation. Much of the forest cover on Ossabaw Island has been greatly changed by extensive agriculture in the 18th and 19th centuries. There has been only a minimum of agricultural activity during this century and much of the island has grown back in secondary succession forests. Information on primary forest conditions as well as on forest succession is, however, available from recent studies dealing with the Georgia coast in general and Cumberland Island in particular (Hillestad et al. 1975; Johnson et al. 1974).

The primary natural forest type on the island can be characterized in general as a subtropical Broad-Leafed Mixed Hardwood Forest (Hillestad et al. 1975:112-113). More specifically it is a Maritime Live Oak Forest (Johnson et al. 1974:74). The Maritime Live Oak Forest is characterized by a distinct dominance of the live oak (Quercus virginiana).

> ...the Maritime Live Oak Forest is a long lived near climax community that becomes established as a result of an

> interaction of physical factors that reduce competition from other species and protects the community from fire. Once established this forest type is quite stable and resistent to change because of the long life span of the tree (live oak), its ability to sprout prolifically and its adaptation to site characteristics. Also, occasional fires may deter invasion by climax species (Johnson et al. 1974:82).

A conspicuous feature of the Maritime Live Oak Forest is the abundance of broadleaf evergreens, lianas, and epiphites. There are relatively few herbaceous plants.

Spanish moss (Tillandsia asneoides) drapes larger trees and is probably the second most important plant in the live oak forest. In addition to providing nesting habitat for birds and food for deer, it is to a large extent responsible for the dark, humid atmosphere beneath the forest canopy.

Other dominant species of plants in the live oak forest are: water oak (Quercus nigra), magnolia (Magnolia grandiflora), loblolly pine (Pinus taeda), American holly (Ilex opaca), Youpon (Ilex vomatoria), pignut hickory (Carya glabra), gum (Nyssa sp.), and cabbage palm (Sabal palmetto).

Forest Communities. Differences in forest species composition though slight, did exist in the mature forest of the sea islands. These differences appear to be due mainly to soil drainage characteristics (Wilkes et al. 1974). Soil data from Ossabaw Island, coupled with soil and vegetation data from Cumberland Island (Hillestad et al. 1975:95-104), is used to divide the forest on Ossabaw Island into four communities that would have offered different plant resources to Mississippian Period populations. These four communities which are considered valuable in analyzing variability in site location are: Mixed Oak Hardwood Forest, Oak Palmetto Forest, Lowland Mixed Forest, and High Marsh.

Given certain assumptions about Savannah and Irene phase subsistence it is possible to quantify these forest communities in terms of their probable exploitative value. The most valuable non-cultivated plant resources would have been acorns and nuts. Acorns of the live oak would have been especially important since they contain little tanic acid and require none of the leaching processes necessary for many of the red oaks. The value of acorn and nut producing forests is compounded by the possibility of exploiting the wildlife, especially deer, that feed there. The four forest communities were therefore ranked in terms of nut and acorn production. The ranked communities, from most valuable to least valuable, are briefly described below.

1. Mixed Oak Hardwood Forest

The Mixed Oak Hardwood Forest was the predominant natural forest community of Ossabaw Island during the late prehistoric period. Today much of the area that was a mixed oak hardwood community is prehistoric times has been under cultivation and has a higher percentage of pine than existed in the natural state. This plant community occurs on moderately drained (Chipley) and well drained (Lakeland) soils. These soils occur on the higher broad ridges of the island's western half. Mixed oak hardwood forest also occurs on the well drained narrow dune ridges (Kirkland soils) of the Holocene portion of the island. This community comprised approximately 64% of the forest on Ossabaw Island.

Dominant overstory species of this community are live oas (Quercus virginiana), laurel oak (Quercus laurifolia), American holly (Ilex opaca), southern magnolia (Magnolia grandiflora), red bay (Persea borbonia), southern red cedar (Juniperus silicicola), longleaf pine (Pinus palustris), loblolly pine (Pinus taeda), myrtle oak (Quercus myrtifolia), water oak (Quercus nigra), pignut hickory (Carya glabra), and cabbage palm (Sabal palmetto).

Important species of the understory are Youpon (Ilex vomitoria), bamboo briar (Smilax auriculata), muscadine grape (Vitis rotundifolia), bayberry (Myrica cerifera), sparkelberry (Vaccinium arboreum), and some scattered clumps of saw palmetto (Serenoa repens).

2. Oak-Palmetto Forest

This biotic community occurs on poorly drained nearly level soils which have a prominent humus layer. These are the Leon and Olustee soils which are sandy to loamy, poorly drained, and seasonally wet. This forest type would have covered approximately 20% of Ossabaw Island.

Dominant plant species of the overstory canopy are: Live oak (Quercus virginiana), red bay (Persea borbonia), and rusty lyonia (Lyonia ferruginea). Less common plants species are American holly (Ilex opaca), American olive (Osmanthus americanus), swamp red bay (Persea palustrus), myrtle oak (Quercus myrtifolia), and slash pine (Pinus elliottii).

Dominant understory species are: saw palmetto (Serenoa repens), muscadine grape (Vitis rotundifolia), saw brier (Smilax glauca), bamboo brier (Smilax auriculata), bayberry (Myrica cerifera), and sparkelberry (Vaccinium arboreum).

3. Lowland Mixed Forest

This biotic community occurs in depressions and drainageways and is characterized by very poorly drained soils. This is Ellebelle Loamy

Sand. Most of this lowland forest is dominated by evergreens but it does contain some deciduous species. This community comprised 13% of Ossabaw Island's forest.

Major overstory canopy species are: swamp red bay (Persea palustrus), red bay (Persea borbonia), loblolly bay (Gordonia lasianthus), sweet bay (Magnolia virginiana), water oak (Quercus nigra), red maple (Acer rubrum), and loblolly pine (Pinus taeda). Major understory plant species are: fetterbush (Lyonia lucida), bayberry (Myrica cerifera), muscadine grape (Vitis rotundifolia), saw palmetto (Serenoa repens), peppervine (Ampelopsis arborea), and switchcane (Arundinaria tecta).

4. High Marsh

Two Irene phase sites consisting of single shell middens are located in the salt marsh. The vegetation consists of marsh or cord grass (Spartina alterniflora) with a minor amount of salcornia (Salcornis europaea). These plants appear to have no exploitive value in terms of consumption. Since the open marsh would provide an unsuitable spot for habitation it is assumed these sites are the result of brief periods of occupation directed at exploitation of marsh-estuary fauna. High marsh was given the lowest forest community rank.

Island Uplands Fauna

Mammals. Mammals on the barrier islands are varied and abundant. The live oak forest, because of the abundance of edible plant species, provides an excellent habitat for a number of omnivorous and herbiverous mammals. The most important food source produced are acorns, especially those of the live oak. Laural oak, saw palmetto, smilax and grapes also provide important sources of food for animals.

Species population size is restricted on the sea islands, and immigration is limited by the water and marsh barriers. The result is a restriction of the possibilities of genetic exchange and the development of phenotypically distinguishable island subspecies. The most important result of this partial speciation has been the creation of smaller sized individuals.

The largest land mammal inhabiting Ossabaw Island was the black bear (*Ursus americanus*). Though none of the sea islands currently have bear populations, there have been a number of reports of sightings on the islands in the recent past (Hillestad *et al*. 1975:95). Black bears are found today in the swamps of the Altamaha River on the mainland. There are no reported archaeological finds of bear remains on Ossabaw Island, although they have been recovered on the immediately adjacent mainland (Caldwell and McCann 1941; Pearson n.d.).

The white-tailed deer is the largest mammal now living on the island. The subspecies *Odocoileus virginianus nigrabarbis* occurs on Blackbeard and Sapelo Islands, and probably occurred on all of the sea islands in the past. Restocking in recent years has however produced a varying genetic background on the other islands (Johnson *et al*. 1974:98).

Smaller mammals found on Ossabaw Island include raccoon (*Procyon lotoc*), marsh rabbit (*Sylvilagus palustris*), bobcat (*Lynx rufus*), river otter (*Lutra canadensis*), and mink (*Mustela vison*). Tompkins (1965) reports that the gray squirrel (*Sciurus carolinensis*) is a recent introduction to the island.

The opossum (*Didelphis marsupialis*), which is conspicuous on several of the sea islands, is today absent from Ossabaw Island (Johnson *et al.* 1974:94).

Reptiles and Amphibians. A total of 28 species of reptiles (exclusive of estuarine and marine forms) and 13 species of amphibians have been reported for the sea islands.

The American alligator (*Alligator mississippiansis*) is the largest reptile on Ossabaw Island. The numerous ponds, sloughs, and the salt water marsh provide an ideal habitat for this species.

Numerous snakes are found on the island, the largest being the diamondback rattlesnake (*Crotalus adamanteus*). The rattlesnake is found in most of the terrestrial habitats of the island.

Martoff (1963) lists two turtles as being permanent residents on Sapelo Island, while Hillestad *et al.* (1975:135) lists four as occurring on Cumberland Island. These are the Mud turtle (*Kinosternon subrubrum*), Snapping turtle (*Chelydra serpentina*), Striped mud turtle (*Kinosternon bauri*), and the Yellow-bellied turtle (*Pseudemys scripto*). It is expected that all, or some, of these forms are found on Ossabaw Island.

Birds. Ossabaw Island's live oak forests provide important feeding and nesting habitats for large numbers of birds, both seasonal visitors and permanent inhabitants. Ponds provide habitats for several types of wading birds. Today there are two wading bird rookeries located in ponds on the island and a similar situation likely existed in the past.

The wild turkey (*Meleagris gallopavo*) was formerly native to Ossabaw Island. Although they were killed off during the historic period, they have recently been reintroduced and are thriving.

Because of its location on the Atlantic Flyway, large numbers of wintering waterfowl visit Ossabaw Island, feeding in the freshwater ponds as well as the salt water marshes. Dabbling ducks such as the mallard (Anas platyrhynchos), black duck (Anas rubripes), pintail (Anas acuta), baldpates (Mareca americana), and wood ducks (Aix sponsa) comprise the bulk of the overwintering fowl.

Several types of birds of prey are found on Ossabaw Island. One of the largest and most conspicuous today is the osprey (Pardion haliaetus). The rarely seen southern bald eagle (Haliaetus leucocephalus) once nested on the island.

Marsh-Estuary Area

The vast marshes that separate Ossabaw Island and the other sea islands from the mainland are the result of sedimentation carried down by fresh water rivers. Deposition is continuing in the marsh at a very slow rate. Tides, which inundate the marshes when high, disperse river sediment across the marsh in a shallow layer and any suspended material drops out. Tidal creeks form an extensive drainage system in the marshes. These creeks and the larger rivers provide ease of passage through the marsh as well as access to its rich resources.

Tidal activity on the coast of Georgia influences all creatures of the marsh habitat as well as many living on higher land. Many land animals and birds feed in the marsh at low tide and their life cycle is greatly influenced by tidal action. The tidal cycle is approximately 12 hours, i.e.,a low tide and a high tide alternately occurring every 6 hours. Each tide is approximately one hour later than the previous day. The tidal range along the central Georgia coast is one of the greatest on the eastern United States coast. The average range is about 2 meters. This dramatic rise and fall results in many of the smaller tidal creeks being dry for several hours around the low tide and limits their use as a means of boat transport to those periods of higher tide. It can be seen that the tides, the location of salt water creeks, and the size of these creeks were probably important factors in the location of prehistoric sites.

Vegetation. Well over one-half of the marsh area is covered by a single species of marsh grass, *Spartina alterniflora*. Because of its tolerance to salinity and tidal fluctuation, this plant occupies most of the tidally flooded portion of the marsh. The second most common plant species in the marsh is the needle rush (*Juncus roemarianus*). The needle rush occurs in higher sections of the marsh which are infrequently flooded (Johnson *et al*. 1974:130). Both needle rush and Spartina often occur in extensive pure stands.

A number of other salt resistant plants are found in those portions of the marsh that are rarely flooded by the tide. These include salcornia (*Salcornia europaea*), tide bush (*Iva frutescens*), groundsell tree (*Baccharis halmifolica*), and salt myrtle (*Baccharis glomerulifolia*).

Fauna. The harshness of the salt marsh restricts the number of resident mammals in the area to a few species. Animals found in the marsh include raccoon, marsh rabbit, mink and otter.

The largest mammal that resides in the marsh-estuary area is the bottle nose dolphin (*Tursiops truncatus*) which frequently visits the smaller tidal creeks to feed.

One important animal in the marsh-estuary area is the diamondback terrapin (Malaclemys terrapin). This salt water turtle lives in the estuary area throughout the year and judging from the amount of terrapin shell in prehistoric coastal sites it was extensively exploited.

Shellfish are extremely abundant in the marshes and seem to have been the most important food source for all prehistoric inhabitants of the Georgia coast. The Eastern Oyster, (Crassostrea virginica), is probably the most common mollusk in the marsh and it forms, by far, the bulk of the food remains at coastal sites.

Other marine mollusks found in the estuary area are the southern quahog or hardshell clam (Mercenaria mercenaria), stout tagelus (Tagelus plebeius), Atlantic ribbed mussel (Modiolus demissus), cross barred venus shell (Chione cancellatra), channeled whelk (Busycon canaliculatum), knobbed whelk (Busycon carica), lightning whelk (Busycon contrarium), and marsh periwinkle (Littorina irrorata). All of these molluscs are found in Mississippian Period middens on Ossabaw Island as well as in most other prehistoric sites reported in the Georgia coast.

Two crustaceans are commonly found in the estuary and were probably of some importance in coastal subsistence. The blue crab (Callinectus sapidus) is a common inhabitant of the marsh area. Middens on Ossabaw Island have produced blue crab claw remains. These crabs are easily taken today with a simple trap or by using a dip net and a piece of meat as bait. The stone crab (Menippes mercenarias), although less numerous than the blue crab, is found in the area and is also easily taken.

Large numbers of shrimp (Penaeus sp.) are found in the estuary area. Though shrimp remains have not been identified in any archaeological context on the Georgia coast, this may well be a factor of preservation rather than nonexploitation. Shrimp occupy the creeks and rivers of the marshes during most of the warm months of the year and use the smaller tidal creeks as spawning areas in the spring.

Fish. A variety of species of fish occur in large quantities in the tidal creeks. The estuary provides a rich feeding ground for fish and serves as a spawning area for many species.

Bony or teleost fish that are common in the area include sea catfish (Arius felis), striped mullet (Mugil cephalus), spotted trout or weakfish (Cynoscion nebulosus), black drum (Pogonia cromis), sheepshead (Archosargus probotocephalus), channel bass (Sciaenops ocellata), croaker (Micropogon undulatus), and spot (Leiostomus xanthurus).

Many of these fish are commonly found in the smallest of the tidal creeks and it would have been a simple matter to catch them using nets or weirs.

Summary

This section has presented detailed information on Ossabaw's natural resources. Knowledge of the environmental choices available to prehistoric inhabitants is considered essential in understanding settlement distribution. When possible, those resources that were considered important affectors of settlement were quantified. The data presented will later be used in attempting to determine their influence on Savannah and Irene phase populations.

The exploitable resources found on and around Ossabaw Island, especially in the marsh-estuary area, would have provided an abundant and year-round food supply for Mississippian Period inhabitants. This reflects the fact that the sea islands occupy a transition zone between three major biotic communities; the island high ground, the marsh-estuary area, and the open ocean. The first two of these communities seem to have been the most important for subsistence purposes.

The abutment of these two zones, each biotically rich yet distinct, allowed man to exploit both. Ecologists have pointed out that transition zones, or ecotones, display increases in both the number and variety of animal species (Odum 1971:157-159). This situation, known as the "edge effect" occurs because there is an overlapping of species from each of the adjoining communities in the transition zone. Ossabaw Island displays a rather unique transition situation in that the difference between the communities is so dramatic that there is little species overlap. Even without species overlap, however, the juxtaposition of two, and possibly three, accessible and exploitable communities provided a subsistence advantage to prehistoric inhabitants of the sea island region.

Of importance to this study is the fact that no location on the island is completely physically isolated from any available resource in the region. The marshes, the tidal creeks, the various forest communities, fresh water sources, and the beach were accessible from all parts of the island. It would seem then that the location of any site would not, in itself, have restricted its inhabitants from any of these resources. Nor did it allow complete monopolization of a resource. This does not mean, of course, that socio-cultural factors may not have regulated the use of, or access to, particular resources. Settlement differentiation and location, as a reflection of environmental adaptation, must be viewed not in terms of absolutes, but in terms of preferred access to a particular resource or set of resources.

This section has presented an assessment of the total exploitative possibilities available on Ossabaw Island. The next section deals with our present archaeological knowledge of the Savannah and Irene phases and places them in cultural perspective.

CHAPTER III

THE MISSISSIPPIAN PERIOD IN COASTAL GEORGIA

This section presents an overview of our present knowledge of the Mississippian Period on the Georgia coast. The Mississippian Period in this area consists of two recognized archaeological phases; the Savannah phase and the Irene phase. Emphasis in this section is placed on delineating those attributes which are useful in identifying each of these cultural manifestations.

Previous Archaeological Research

The cultural manifestation of the Mississippian Period on the Georgia coast, though well represented in the literature, is known from a rather limited amount of archaeological investigation. The earliest work that recognized the distinctive ceramic complexes which came to be associated with the Mississippian Period on the coast was that of Clarence B. Moore (1897). Moore excavated a large number of mounds along the Georgia coast. His excavations centered almost entirely on burial mounds, providing little or no information on other cultural aspects. His work does, however, provide useful information on the intensity and distribution of Mississippian sites in the coastal area of Georgia.

In the late 1930's, as a result of Federal Government sponsored archaeological projects, J.R. Caldwell and Antonio Waring divided the prehistory of the lower Savannah River area into a series of "arbitrary chronological intervals during each of which a typologically distinct pottery complex was in vogue over most of the area (Caldwell and Waring 1939b:6)." Using pottery complexes to define cultural intervals they established a provisional chronology with Savannah and Irene as the last complexes in the sequence (Caldwell and Waring 1939b:7). The work at the Irene Mound site on the Savannah River during the years 1937-1940 supported the existence of these ceramic complexes and stratigraphically demonstrated the relationship between the Savannah and Irene ceramic complexes (Caldwell and McCann 1941; Fewkes 1938). The dates assigned to the Savannah phase range from circa A.D. 1150 to A.D. 1350 and for the Irene phase from circa A.D. 1350 to A.D. 1550 (Caldwell 1971:89-92), based upon the stratigraphic position of ceramics at the Irene mound site and upon several radiocarbon determinations from St. Catherines Island (Caldwell 1971, 1972).

The most intensive archaeological investigations of any Mississippian site on the coast were carried out at the Irene Mound site. Since that time a number of minor excavations have been conducted at coastal Mississippian sites (Caldwell 1943; Cook 1970, 1971, 1978; Cook and Pearson 1973; Goad 1975; Larson 1958b, 1970; Martinez 1975; Pearson 1977; Wallace 1975). Several extensive archaeological surveys in the area and immediately inland have provided information on the overall distribution of Mississippian Period sites (Caldwell 1972; DePratter 1973, 1974a, 1974b, 1975; Fish 1976; Hally, Zurel and Gresham 1975; Larson 1958a; Pearson 1977).

Archaeological Research on Ossabaw Island

Until recently previous archaeological research on Ossabaw Island had been minimal. In 1871, D. Brown (1873) submitted a brief report to the Smithsonian Institution concerning an Ossabaw Island shell heap. The U.S. National Museum contains material from Ossabaw Island donated by W.H. Phillips, evidently collected in the 1890's.

C.B. Moore (1897) undertook the most extensive excavations on the island. In 1896 he excavated 9 burial mounds (three at Bluff Field (Ch 160) and 6 at Middle Settlement (Ch 158N, and Ch 158S). The descriptions given by Moore indicate that most of the mounds at these sites date to the Mississippian Period.

In 1971 test excavations were conducted at a large Archaic site (Ch 35) on Ossabaw Island by the University of Georgia (Crusoe and DePratter 1977). An extensive archaeological survey of the island was undertaken by Shorter College, Rome, Georgia during the Springs of 1972 and 1973. This survey work was continued by Chester DePratter in 1974 and 1977. His report (DePratter 1974b) provides the most complete record of prehistoric site distribution available for any of the sea islands. Survey and test excavations were undertaken by this author during the last three years in a study of Irene phase settlement on the island (Pearson 1977) and to gather data for the present study.

Mississippian Period Manifestations in Coastal Georgia

Savannah Phase A.D. 1150-A.D. 1350

The majority of our information on the Savannah phase is derived from archaeological research done in the 1930's and 1940's in the area around the mouth of the Savannah River. This knowledge concerns burial practices and ceramics since these have been the areas of interest of most workers. The Savannah phase has generally been divided into two subphases; Savannah I and Savannah II, each characterized by a specific ceramic complex (Caldwell 1952), however, in the settlement and subsistence analyses which follow the Savannah phase is considered as a single unit.

Savannah I

Savannah I is characterized by Savannah Fine Cordmarked and Savannah Burnished Plain ceramics. Savannah Check Stamped pottery occurs as a minor ware and Caldwell (1952:318) suggests this reflects a late Savannah I time period. Savannah I ceramics contain both clay and sand or grit temper. Caldwell (1952) sees Savannah I as a period of transition from the Wilmington phase to Savannah II.

Savannah I sites on the coast (Caldwell 1952:317) include: the Oemler site, the Dotson site, the Deptford site burial mound, one burial mound at the Cedar Grove site, and the Indian Kings tomb, all of which are located in Chatham County. Farther south are the Cox and Eulonia mounds, both assumed to be of a Savannah I date (Caldwell 1952; Waring 1968a). Two sites on Ossabaw Island, Ch 158N and Ch 160, appear to have significant Savannah I occupation. The Savannah I ceramic complex is reported from St. Simons Island, Georgia (Martinez 1975), from sites near the mouth of the Altamaha River (F.C. Cook personal communication) and from as far south as Amelia Island Florida (Hemmings and Deagan 1973).

The structure of Savannah I burial mounds is typified by a central shell deposit or core covered and flanked with sand in which small shell lenses are often found (Caldwell 1952:318). These mounds are low, rarely more than 1.5 m high, and average 10 to 20 m in diameter. Cremations (often of several individuals) are generally found associated with the central shell core. Other forms of interment include primary (generally flexed) and bundle burials. Urn burials are rare and generally contain cremations. Shell beads and shell cups are often included as grave furniture or offerings (Caldwell 1952:318). At the Indian Kings Tomb or Haven Home site, Waring (1968b) recovered a dog effigy bowl.

Other cultural information about the Savannah I subphase is lacking. Savannah I ceramics are associated with shell middens and it is assumed that subsistence relied heavily on marsh-estuary resources.

Savannah II

Information on the Savannah II subphase comes largely from work at the Irene Mound site near Savannah, Georgia (Caldwell and McCann 1941). Several other sites have been reported on the coast including the Norman mound (Larson 1957) mounds at Lewis Creek near the mouth of the Altamaha (Cook 1970), several mounds in Glynn County, Georgia (Cook and Pearson 1973), and a number of the mounds excavated by C.B. Moore (1897).

Savannah II ceramics consist of the two earlier types, Savannah Fine Cordmarked and Savannah Burnished Plain with the addition of Savannah Check Stamped and Savannah Complicated Stamped (Caldwell and Waring 1939a).

It is during the Savannah II subphase that strong and definite Mississippian influence is noted on the coast (Caldwell 1952; Williams 1968). Among the most prominent expressions of this influence is the platform mound at the Irene Mound site (Caldwell and McCann 1941). This platform mound consisted of eight superimposed building stages, the first seven dating to the Savannah II subphase. The last stage of building is associated with the Irene phase. Several of the Savannah phase stages of the mound had structures on their summits. These structures are square or rectangular and constructed of wattle and daub. There are no indications that the mound was used as a substructure mound during the Irene phase.

Burial mounds similar to those found during Savannah I continue to be made (Caldwell and McCann 1941; Cook 1970; Cook and Pearson 1973; Larson 1957; Moore 1897). Artifacts associated with burials are more abundant than those found at Savannah I sites. These artifacts include: shell beads, ear pins, dippers or cups, and gorgets; ceramic vessels; bone awls and fish hooks; clay pipes; stone celts; and stone chisels. Urn burials become more common during the Savannah II subphase.

Subsistence data is generally lacking for Savannah II sites. What is available suggests a heavy reliance on marsh-estuary resoorces coupled with the hunting of land mammals, especially the white-tailed deer (Caldwell and McCann 1941). Little is known of the relative importance of horticulture at this time though maize has been found at Savannah II sites (F.C. Cook personal communication).

As initially defined the ceramic complex associated with the Savannah phase is apparently confined to the coastal areas of Georgia, possibly parts of extreme northeastern Florida, parts of coastal South Carolina, and inland along the major river valleys of this region. Several Savannah phase sites have been reported for the Pine Barrens region of Georgia (Hally, Zurel and Gresham 1975; Fish 1976). Generally Savannah phase sites in this area are small and widely dispersed and rarely display the full range of Savannah ceramic types. Fish (1976) notes that in Screven and Effingham Counties, Georgia, the larger Savannah phase sites with the full range of ceramic types were located near the Savannah River.

James Stoltman (1974) reports several Savannah phase sites in South Carolina at Groton Plantation along the Savannah River, and the Hollywood Mounds in the Savannah River valley south of Augusta possibly display a late Savannah phase occupation (Caldwell 1952; DeBaillou 1965; Thomas 1894).

Savannah or Savannah-like ceramics occur at sites on the Savannah River (Kelly and Neitzel 1961; Lee 1976) and sporadically appear in other portions of north Georgia (Fairbanks 1950; Sears 1958; Wauchope 1966). In these inland areas, however, the full range of Savannah ceramics is not present and the decorative motifs of Savannah Complicated Stamped differs from that on the coast.

The available data suggests that, following Caldwell (1952), the full expression of the Savannah phase ceramic complexes was indeed confined to the coastal areas and to portions of the lower Savannah and possibly other river drainages with a diffusion and local adaptation of some types throughout portions of inland and north Georgia. This differential distribution of Savannah phase ceramic types coupled with the lack of data for large areas makes strict delineation of the geographical range of the Savannah phase difficult.

The Irene Phase A.D. 1350-A.D. 1550

The focus of prior archaeological investigations of Irene phase sites permits little discussion of any socio-cultural aspects except for ceramic designs and mortuary customs. This emphasis on ceramics has to some extent been necessitated by the archaeological conditions in coastal Georgia, where preservation of other cultural features such as architecture is minimal. Work at several sites near Savannah (Caldwell 1943) and especially the excavations at the Irene Mound site (Caldwell and McCann 1941) provide most of our information concerning the Irene phase. A major concern of these investigators was ceramic typology and the use of ceramic change in the establishment of cultural chronologies. Three Irene pottery types were recognized: Irene Complicated Stamped, Irene Incised, and Irene Plain. Subsequent investigations have followed this initial typological scheme with only minor variations (Larson 1958a).

More recent work on the Irene phase has discussed the distribution of Irene phase sites (DePratter 1974b) and aspects of Irene phase settlement and subsistence (Pearson 1977).

Irene phase ceramics appear to be part of the much larger southeastern ceramic manifestation called Lamar (Caldwell 1952:319; Fairbanks 1952:295; Kelly 1938; Sears 1956). Lamar or Lamar-like pottery constitutes the Late Mississippian ceramic manifestation in central and north Georgia, much of South Carolina and parts of Tennessee and

Alabama. Regional variation in "Lamar-like" pottery does exist but the current level concerning Lamar ceramics does not permit ease in identifying the geographical distribution of these variants. Until precise quantitative distinctions are available for identifying types of Lamar it is necessary to rely on the established qualitative and geographic differences.

Irene phase ceramics differ from other Lamar ceramics in minor but recognizable ways. Major differences are that the former has more elaborate incidental rim decoration and more consistent use of the filfot cross design motif. Irene Complicated Stamped vessels tend to be more elongated and have more sharply flared rims than the inland Lamar types (Caldwell 1952:319). Irene phase ceramics also differ from the Lamar variant found in South and North Carolina known as Pee Dee (Coe 1952). The Pee Dee ceramics in South Carolina tend to have large rim nodes while these appear to be rare in Irene phase contexts. There is also some slight variation in vessel shapes. Irene Complicated Stamped vessels are more conoidal (Caldwell 1952:319-320).

In broad cultural perspective the Irene phase is most appropriately considered as being the coastal manifestation of the Late Mississippian Period (Caldwell 1952:319; Kelly 1938:40; Larson 1958b). Mississippian cultural attributes at the Irene Mound site include square wall trench houses, shell artifacts such as engraved shell gorgets and shell dippers and Lamer-like ceramics.

The rareness of some of these traits would seem to indicate that coastal populations were somewhat isolated from the mainstream of Mississippian cultural development. No platform mounds are known from

Irene phase contexts suggesting a lack of the complex socio-political activities generally associated with these structures.

As early as 1939, Caldwell and Waring (1939a, 1939b) demonstrated that the distribution of the Irene ceramic complex extended from St. Simons Island on the central Georgia coast, northward into the southern part of South Carolina and up the Savannah River drainage as far as Augusta. More recent work by Larson (1958a) as well as archaeological surveys conducted by the University of Georgia have further delineated the distribution of Irene phase sites.

No Irene phase ceramics have been reported south of St. Simons Island. On St. Simons Island, Preston Holder recovered Irene phase pottery in W.P.A. excavations. More recently an Irene phase burial mound has been excavated on the island (Cook 1978).

It is interesting to note that the southern boundary of these ceramics corresponds with early historic accounts of an aboriginal linguistic and political boundary (Swanton 1922). Larson (1958a) demonstrated that the early Spanish accounts of the boundary between the Timucua of north Florida and the Guale of the Georgia coast corresponded to the boundary between the distribution of St. Johns phase pottery to the south and Irene phase ceramics to the north. Spanish accounts (See Lanning 1935; Swanton 1922; Wallace 1975) stress the linguistic, political, and social differences between the Timucua and the Guale and it seems that the ceramics reflect this difference.

Irene phase sites are found mainly in the narrow strip along the Georgia and South Carolina coast corresponding to the maritime live oak forest region mentioned earlier. Only along the Altamaha and the Savannah Rivers have these sites been found any distance inland. The Pine Barrens which begin just inland from the coast seem to have been a western environmental barrier for Irene phase populations. The reason why Irene phase sites are not found in the Pine Barrens region is not known, especially since recent work has shown that material from other archaeological phases, including Savannah, is rather abundant in this area (Fish 1976; Hally, Zurel and Gresham 1975).

The northern archaeological boundary for the Irene phase has generally been considered to be the Savannah River. Anderson (1974), however, has recently shown that Irene, or at least Irene-like ceramics, are found as far north as Charleston, South Carolina. The available data suggests that the Irene phase is slightly more restricted in its distribution than is the Savannah phase.

CHAPTER IV

ARCHAEOLOGICAL PROCEDURES

The archaeological techniques utilized in this study consisted of island-wide survey, surface collecting, plane table mapping of individual sites, and conducting test excavations at several sites. Each of these procedures is discussed in this section as are several operating assumptions and definitions necessary to this study.

Survey

The site data utilized in this study is derived from several archaeological surveys conducted on Ossabaw Island. The initial survey was conducted during the springs of 1972 and 1973 by Patrick Garrow and students from Shorter College, Rome, Georgia. This survey was continued in the winter of 1974 and the winter of 1977 by Chester DePratter (1974a). No report was produced by Garrow, however, his maps, notes, and collections were made available to DePratter and this information is included in DePratter's report (1974a). These two surveys included approximately four months of field work and located a total of 203 archaeological sites. Included in this number are several sites which had previously been located by Mrs. Eleanor West and other residents of Ossabaw Island. Four months of field work were conducted by the author during the summers of 1974, 1976, and 1977. This work consisted of site mapping and testing with a minimum amount of survey being conducted, though additional sites were found. Of the more than 200 archaeological sites located on Ossabaw Island, 65 have been identified on the basis of ceramics as having Mississippian Period components. A total of 12 of these sites contain Savannah phase components and 61 have evidence of Irene phase occupation.

A major consideration in prehistoric settlement analysis involves the representativeness of the sample of sites utilized. This representativeness is seen as a factor both of the sort of survey strategy employed in locating sites, and of the conditions of the area surveyed. None of the surveys of Ossabaw Island have made use of any systematic sampling procedures in locating sites. The Shorter College surveys consisted of walking and search and sweep operations conducted by teams of 2 to 3 persons. Individuals were spaced 5 to 20 meters apart depending upon ground cover conditions. The available maps indicate that most of the survey was confined at or near the marsh edge of the island. The surveys conducted by DePratter employed similar techniques, except that portions were conducted by a single individual. The 1974 survey conducted by DePratter tended to restrict its coverage to areas near the marsh edge. The 1977 survey directed by DePratter, however, consisted of a comprehensive and extensive coverage of much of the southern portion of the island. This survey used probes to test for subsurface midden and located a number of sites in this manner.

The majority of the work conducted by this author was directed toward surface collecting, mapping, and testing previously recorded sites. In walking to and from sites an attempt was made to locate additional sites. Survey technique consisted of a walking sweep and search technique to cover swaths 10 to 50 meters wide. The amount of area that could be seen using this method was greatly dependent on ground cover conditions. The majority of the area covered by the author was confined to the marsh edge of the southeastern section of the island.

The conduct of the surveys and their ability to locate sites was influenced by the conditions presented by the survey area. Heavy ground cover and palmetto thickets, common on the island,make survey and site location difficult. For all of the surveys, sites were generally recognized by the presence of shell "scatters" or shell middens and occasionally by the presence of ceramic scatters. Sites were most easily found in exposed areas such as along the marsh edge, in roads, and in plowed fields, although several sites were located by probing.

Mississippian Period coastal sites generally consist of a cluster or clusters of circular shell middens 2 to 10 meters in diameter and up to a meter high. Although most easily found in exposed areas, even in areas of heavy ground cover sites with relatively undisturbed middens are easily recognized. Intensive agriculture carried out on the island in the 19th century has, however, resulted in the destruction or disturbance of sites, some to such an extent that they are probably unrecognizable from the surface. Subsurface testing is required to locate these partially destroyed or hidden sites.

Approximatley 30% to 35% of the habitable portion of the island has been covered by these surveys. This includes approximately 65% of the marsh edge of the island. The area covered by all surveys is presented in Fig. 5. This coverage, though relatively small, includes portions of all the various types of biotic and physiographic areas on the island. With the exception of the beach front, sites were found in each of these areas and provide information for comprehending the range of variation in site location.

Based on the factors discussed, e.g. incompleteness of the survey, concentration on the marsh edge, the difficulty of locating sites due to ground cover conditions and the likelihood of the existence of many disturbed sites, it can be assumed that sites remain to be found. The majority of the large sites, because of their extensive and easily seen shell deposits, are assumed to have been located. Smaller sites, which are more likely to have been missed by the survey techniques employed, may be under-represented in the sample of sites used.

The inadequacies of the survey data make it impossible to estimate the percentage of the total Mississippian Period site population represented by the 65 known sites. But, as mentioned above, it is assumed that these sites do provide a reasonable estimate of the range of variation in the settlements that existed on the island and are adequate for the sorts of analyses used in this study.

Mapping and Testing

Surface collections were made at all sites. An attempt was made to collect all or large amounts of pottery at each site. To increase the small surface collections obtained at many sites, to gather subsistence data, and to obtain site size measurements, a procedure of mapping the distribution of cultural debris (shell middens and/or ceramics) within individual sites and of excavating 1 X 1 meter square test pits in randomly selected middens was employed. An alidade and plane table were used for mapping. An attempt was made to test 10% of

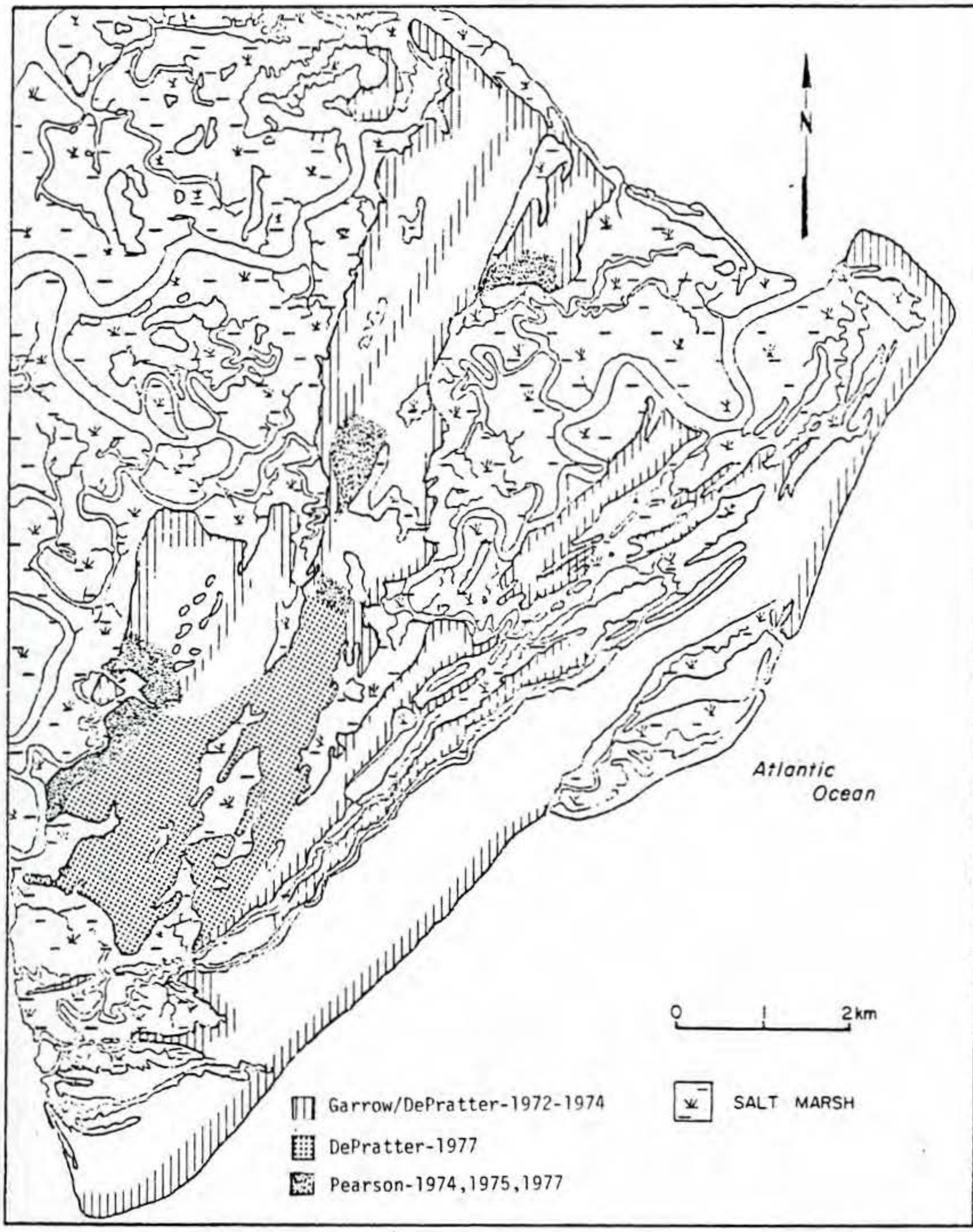

Figure 5. Areas surveyed.

the middens in each site, however, time and ground conditions did not permit this. For the same reason not all of the sites were plane table mapper and tested although size measurements are available for all sites.

All of the material from these tests was screened through a ¼ inch mesh screen. All ceramic, faunal, and floral material retained in the screen was saved. Additionally,samples of complete midden matrix were taken from the majority of the middens excavated for use in faunal analysis.

Even with the testing program, several of the smaller sites produced only a single sherd and collections from several of the larger sites are small. Since this study is an attempt to look at the overall settlement and subsistence systems even those sites that produced very little cultural material are included in the following analyses. The majority of analyses conducted with the data deal with groups or classes of sites rather than with individual sites. Adequate and usable collections are available for each group of sites. Ceramic data for all sites is presented in Appendix I. Subsistence data is presented in Appendix III.

The designation of what actually constitutes a "site" is an important aspect of this and other studies of prehistoric settlement. The factors that lead to the determination of where one site ends and another begins are rarely stated explicitly by archaeologists. Spatial separation, seemingly the most logical factor, is used in this study. A "site" is considered to be any cultural deposition that is at least 100 meters from any other cultural debris.

Savannah and Irene phase sites found on Ossabaw Island and in the coastal area in general consist of linear shell middens stretched along the marsh edge and/or as clusters of individual shell middens. These middens, composed of shell, bone, ceramics, and other cultural debris are generally circular, 2 to 10 meters in diameter, and are up to a meter high. These clusters of middens seem to reflect an orderly pattern of trash disposal since areas between middens are usually free of shell or other debris. Several of the sites that were mapped displayed discrete clusters of shell middens which may indicate individual house trash deposits.

More complete information concerning archaeological techniques and methods employed in this study are presented in conjunction with the analyses in the following chapters.

All field records, maps, and materials recovered from the work conducted on Ossabaw Island are deposited in the Laboratory of Archaeology, Department of Anthropology, University of Georgia and on Ossabaw Island, Georgia.

CHAPTER V

SETTLEMENT SYSTEM ANALYSIS

Introduction

The configuration of settlements within a system reflects the kinds of socio-cultural structures and adaptive strategies used by a population. Assessment of the elements, the structure, and the relationships that occur within a settlement system is one of the more efficient ways to approach the question of cultural adaptation. This chapter attempts to assess the structure of Mississippian settlement on Ossabaw Island. Several different techniques will be sequentially employed to analyze the Savannah and Irene phase settlement systems operant on the island. At all stages of analysis emphasis will be placed upon examining the patterns and variability of settlement existing within each phase as well as upon examining the differences between the two phases.

First, settlement-size distribution analysis will be employed to assess the general "state" of the settlement systems of each phase. Cluster analysis will then be used to formulate hierarchical models of settlement for each phase. Sites in each level of the proposed hierarchies will then be compared against sets of quantified environmental variables to determine the relative importance of these variables in the overall strategy of site location during each phase. Variability between levels of the porposed hierarchies will be further explored by examining the distribution of various categories of material culture remains across sites.

A total of 65 different Mississippian Period sites are used in this analysis. All of these sites have been identified on the basis of ceramic collections. Of these 65 sites, 61 contain identified Irene phase components and only 12 contain Savannah phase components. Eight sites indicate evidence of occupation during both phases. The great difference between the number of sites associated with each phase is apparently a real difference and is not due to sampling error.

Information on site sizes, ceramic collections, and other important variables are given in Appendices I and II. Locations of sites for each phase are shown in Figs. 10 and 11.

One point of interest concerning the two sets of settlement data is that, though there are five times more Irene phase sites than Savannah phase sites in the sample, there is not this great difference in terms of the total area of occupation represented by the two phases. The total area of Savannah phase occupation is estimated at 540,162 m^2 and for the Irene phase it is estimated at 655,245 m^2, only 1.2 times larger. In general, the relationship between the number of sites present in each phase and the total area occupied by these sites indicates that the Savannah phase is characterized by a small number of sites, one or two of which are very large. The Irene phase, on the other hand, is characterized by a large number of sites, most of which are of moderate size. This initial assessment indicates rather significant differences between the settlement structure of the two phases. The following sections will examine and discuss in detail these apparent differences.

Settlement Size Distribution Analysis

A variety of techniques and models have been developed by geographers to analyze and explain settlement systems. Analyses that deal with the size distribution of settlements have been used extensively on modern settlement systems, and appear to be applicable to archaeological data sets for a number of reasons. First, analysis of settlement size distributions does not require the stringent initial conditions and a priori assumptions necessary when using other geographical models such as central place theory (King 1961; Smith 1974). Size distribution analysis requires only that the settlement system in question be a single operating unit and that the elements, that is settlements, that are used be representative of the total population comprising the system. Second, the principal variable used in size distribution anlaysis is that of settlement size. Settlement size is,in most instances, an easily obtainable archaeological measure and is one that is common to all sites. Population rather than settlement size is the measure used by geographers in size distribution analysis of modern settlement systems. Until reliable and realistic techniques are developed for determining the population of prehistoric settlements, settlement size is seen as the most logical equivalent. In this study, site size, in conjunction with location is considered to be the most adequate available measure of cultural response to environmental variation.

Settlement size is considered by most geographers and anthropologists to be a useful indicator of the number and kinds of activities carried out at a site (Haggett 1971:115-117). Within a settlement system, then, variation in site size can be considered as at least an initial indicator of possible variation in site function.

Settlement size distributions are normally viewed in terms of the relationship between the size of a settlement and its rank. In the literature these are generally referred to as rank-size distributions (Haggett 1971). When presented graphically, usually in logarithmic scale, rank-size distributions are considered useful in making generalized assessments of the "state" of the system (Dziewonski 1972, 1975).

Rank-size distributions have been developed and explained using actual settlement places as data. In many prehistoric settlement systems, however, smaller sites may represent occupations of brief duration. This is assumed to be true for the smaller sites on Ossabaw Island. Thus the validity of using small, possibly nonhabitation sites in size distribution analysis may be questioned.

For this study, it is argued that the inclusion of these smaller sites will provide for the graphic representation of the overall structure of a settlement system. Since other sets of prehistoric settlement data generally contain these types of nonhabitation sites, all sites must be included if we are to use size distributions as a basis for comparing and explaining the two sets of settlement data used here as well as that of the structure of other prehistoric settlement systems.

Although a number of mathematical formulae have been developed to explain rank-size distributions, there is still considerable debate as to whether observed regularities can be explained theoretically or should be considered only as empirical regularities (Haggett 1971; Dziewonski 1972, 1975). There is a general consensus, however, that adherence to, or deviation from, a particular distribution is a reflection of identifiable socioeconomic factors (Berry 1961; Dziewonski 1972).

Two major types of distributions relating settlement rank and settlement size have been observed. A log-normal or rank-size distribution is one in which the distribution of settlements by size is truncated log-normal, whereas a primate distribution is one in which a stratum of small settlements is dominated by a single or a few very large settlements (Berry 1961). These two distributions are not mutually exclusive, but are best seen as the two ends of a continuum each of which is the result of quite different causal factors (Berry 1961; Vapnarsky 1969).

In general, log-normal distributions appear to be typical of larger countries that have a long tradition of urbanization and are politically and economically complex (Berry 1961). On the other hand, primate distributions are associated with countries that are small, have "simple" economic and political systems, have a short history of urbanization, and have generally resulted from "fewer forces" (Berry 1961: 584).

Many geographers have questioned the relationship of the continuous distribution displayed by settlement size to the discrete hierarchical arrangement proposed for many settlement systems (Berry and Garrison 1958; Stewart 1958; Haggett 1971; Dziewonski 1972, 1975). Dziewonski (1972:76) suggests that rank-size distributions do possess "latent hierarchical structure" and that they "may be considered as a test in the evaluation of hierarchical models of city size." If so, then settlement size distributions should provide a base from which to examine the hierarchical characteristics proposed to exist in many Mississippian and other prehistoric settlement systems. This approach is taken up in a later section.

In an attempt to explore the obvious variability that exists in rank-size distributions, Brian Berry (1961) has established a graphical typology of these distributions. Using data from 38 countries, Berry developed a set of curves depicting the relationship between city size and city rank with the conditions of primacy and log-normality as the two limiting types (Fig. 6). Important for prehistorians are the evolutionary implications of Berry's model with the assumption that a settlement system's rank-size configuration changes "in close correspondence to changes in socioeconomic, cultural, and political development (Dziewondki 1975:149)".

Despite some difficulties inherent in its application to archaeological data sets, analysis of the size distributions of prehistoric settlements should allow for initial examination and assessment of the overall structure of settlement systems. In addition, rank-size distributions would appear to provide a useful way to compare prehistoric settlement systems.

In this study, rank-size analysis is used primarily to assess the overall "state" of the Savannah and Irene phase settlement systems on Ossabaw Island and in the formulation and examination of the probable settlement hierarchy that existed during each phase. The rank-size relationship of the settlement data from Ossabaw Island is first examined in light of Berry's model.

Figure 7 presents the two sets of settlement data with rank plotted against site size on a logarithmic scale. Both sets of data appear

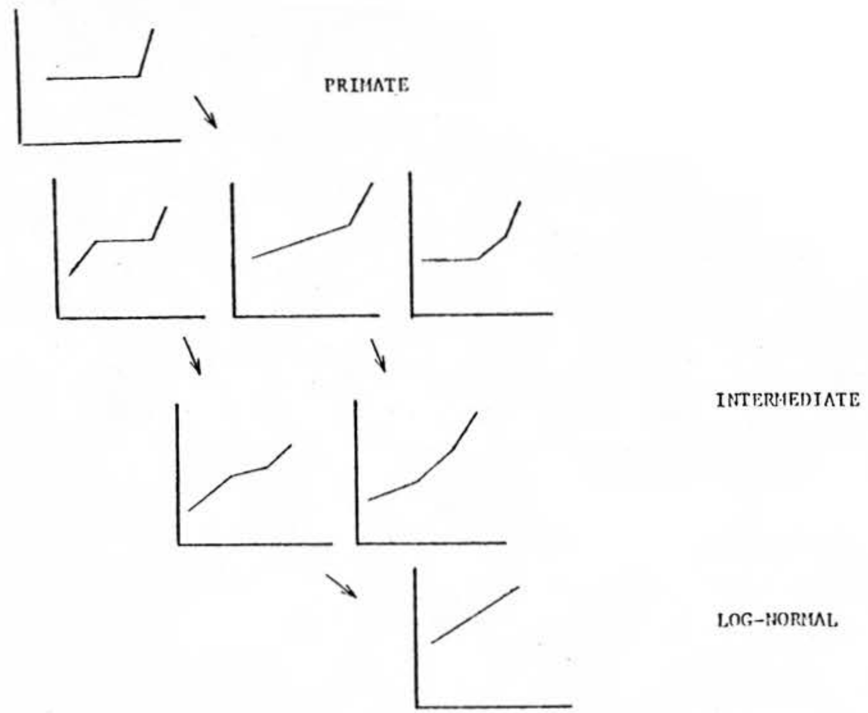

Figure 6. Developmental model of settlement size distribution.

most similar to Berry's intermediate type of distribution. Each displays some tendency toward primacy, having one site which is much larger than any others.

The primate distribution suggests that most of the interaction between Ossabaw Island and the mainland was channeled through the largest site during each phase. These sites probably occupied the apex of their respective settlement system in terms of many or most socio-cultural activities (Berry 1961; Vapnarsky 1969). This distribution fits what Vapnarsky (1969:595) terms a "low closure/high interdependence" situation, in which there is a great deal of interaction among settlements within a region, with only a few settlements handling interaction outside the region. Vapnarsky suggests that such a situation is to be expected in a relatively small, homogeneous, somewhat isolated region. Ossabaw Island is such a region.

Of interest is the fact that the primate settlement of each phase is centrally located on the island (Figs. 10 and 11). These larger sites are assumed to be more functionally complex and support a greater range of activities than other sites. Their central location reflects the fact that activities will centralize within a region for maximum efficiency (Morrill 1970:62). This central location would reduce the effort(s) needed to extend all manner of socio-cultural control or influence over the island.

Factors of the physical environment can, of course, influence site location. Later analysis indicates that other locations on the island exhibit environmental settings almost identical to that found at sites Ch 158N and Ch 158S yet they produced no large settlements. One environmental advantage that these two primate sites do have over other sites is their location, adjacent to a saltwater creek which provides the most direct access to the mainland available from the island.

During the Savannah phase the largest site, Ch 158N, is 2.7 times larger than the second largest Savannah phase site. The largest Irene phase site, Ch 158S, is 2.5 times larger than the second ranked Irene phase site. Some authors (Haggett 1971:102) have suggested that this ratio between the largest and second largest settlement is an indicator of the relative importance of the "primate" settlement in terms of the settlement system as a whole. Here there is little difference between the two ratios. However, if we look at the size of these largest sites in relation to all of the sites in their respective phase as well as to each other there is considerable difference. The largest Irene phase site comprises only 21% of the total area of site occupation during the Irene phase. The largest Savannah phase site occupied 60% of the total area of Savannah phase occupation. Additionally, this largest Savannah phase site is 2.3 times larger than even the largest Irene phase site.

These figures suggest the greater importance of a single large site during the Savannah phase than during the Irene phase. This site probably served as the major population, political, economic, and religious center for the island. During the Irene phase, while there is still one "primate" site which may be considered a center, it appears less important in relation to the remainder of the Irene phase settlement system than did the Savannah phase primate site. Additionally, the largest Irene phase site is much smaller than the largest Savannah phase site. It would appear that the structure of the settlement system has shifted

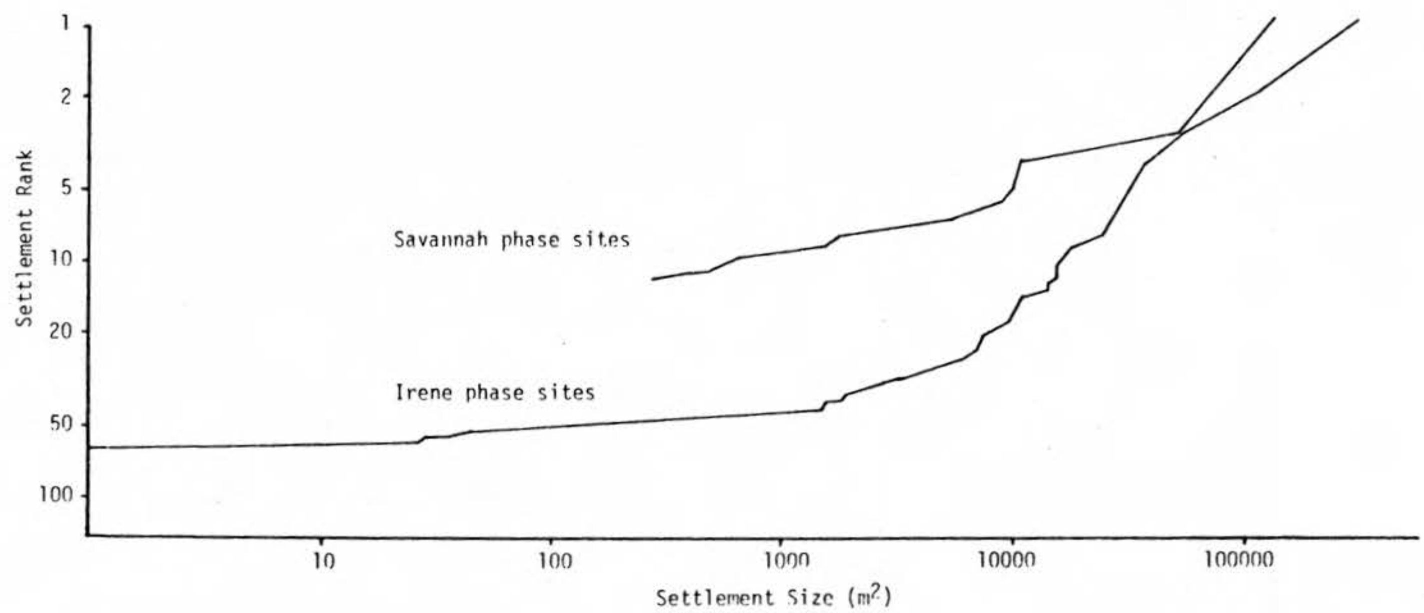

Figure 7. Rank-Size curves of settlement size data

away from one dominated by a single large site.

Fig. 7 also illustrates a lack of small and medium sized sites during the Savannah phase. During the Irene phase large numbers of small sites appear and there is a substantial increase in the number of medium sized sites.

The Savannah phase settlement is characterized by what is here called a "nucleated" settlement structure and pattern. This is a pattern in which the settlement system is characterized by the overwhelming dominance of a single site. This site is assumed to have been the population and socio-cultural center of Ossabaw Island's Savannah phase population.

During the Irene phase we see an increase in small and medium sized sites and a decrease in the size of the largest site. Structurally we can argue that the major or "primate" settlement has lost some of its importance as a center while medium sized sites have developed and undoubtedly absorbed many functions formerly associated only with the largest site.

Although we do not know the exact configuration of population distribution on the island during the Irene phase, it is assumed that many of the medium sized sites are permanent settlements, which taken together would account for a large proportion of the total Irene phase population. Some of the medium sized sites and most of the smaller sites may represent temporary or seasonal occupations and are probably associated with a single or a narrow range of activities. The Irene phase settlement structure, which is much less centralized than that found during the Savannah phase, is termed a "dispersed" pattern.

It would appear that, although many factors affect them, settlement size distributions are useful in comparing sets of data and in making low-level generalizations about the data. The size distributions shown here suggest substantial differences between the structure of the Savannah and Irene phase settlement systems. These differences are assumed to reflect real socio-cultural differences between the two phases.

Analysis of the Settlement Hierarchies

The hierarchical organization of settlement systems has been discussed extensively, primarily in terms of the relationships between the size of settlements and their functional range (See Haggett 1971). Several studies of Mississippian settlement systems have discussed site hierarchies (Brandt 1972; Fowler 1972, 1974; Peebles 1974; Price 1973, 1974; Rolingson 1976). The underlying assumption of these studies has been that functional variability, for example, range of activities, did exist among levels in the proposed hierarchies. The identification of hierarchical levels within Mississippian settlement systems has been based upon obvious features such as both the presence or absence of mounds, and the type of mounds present at a site. Although these are not considered to be usable criteria for establishment of the settlement hierarchies of the Mississippian populations that occupied Ossabaw Island, site size is considered to be a practical and reasonable variable with which to identify the settlement hierarchies that may have existed. It has been suggested that site size is reflective of the range and kinds of activities being carried out at a site. Therefore, sites of equivilent size would theoretically display similar socio-cultural traits and thus occupy approximately the same functional position or level in the settlement hierarchy. This assumption forms the basis of much of the later analysis. As mentioned earlier, Dziewonski (1972:76) argues that the settlement size continuum can be used to evaluate the hierarchical structure of settlement systems. To identify reasonably objective hierarchical levels within a continuum of site sizes some means of grouping sites into discrete size classes is necessary. Cluster analysis is used as an objective means for achieving these groupings.

Cluster analysis

The general computational method utilized in the cluster analysis of Savannah and Irene phase settlements is Ward's Method used in the computer program HCLUS, a program developed by John Wood of Northern Arizona University and modified by Donald Graybill of the University of Georgia (Graybill 1974; Wood 1974). Ward's Method is a hierarchical agglomerative clustering technique in which clustering proceeds by progressive fusion beginning with the individual cases, that is, site sizes, and ending with the total population (Anderberg 1973:142-145).

Dendrograms of the two cluster analyses are presented in Figs. 8 and 9. Cluster "merge levels", which are a measure of cluster distance, are scaled along the vertical axes of these Figures.

No hard and fast rules can be used in determining the selection of a "best" cluster solution. Selection can be based partially upon a priori assumptions about the data (e.g. the expected number of hierarchical levels in a settlement system) and partially upon the amount of "information" gained or lost at any particular step in the cluster analysis (Graybill 1975). As the number of clusters present in a solution increases the amount of information available per cluster also increases. As information (and clusters) increase there is a corresponding decrease in "resolution" or difference between clusters, such that the selection of a solution containing many clusters results in minimal intercluster difference. A cluster solution at a point intermediate between the extremes of maximum information and maximum resolution is desired.

Based on these criteria, a three cluster solution appears reasonable for the Savannah phase sites while a four cluster solution was selected for the Irene phase data. The criteria of information and resolution are simply aids in selecting a solution and the solution chosen must ultimately satisfy conditions of the problem at hand. These three and four level hierarchies are reasonable in light of the types of hierarchies suggested for other Mississippian settlement systems (See Brandt 1972; Fowler 1972, 1974; Peebles 1974; Price 1974) as well as those suggested for settlement systems in general (Haggett 1971:114-142).

There is no suggestion here of direct equilivency between the size classes of each phase. That is, it is not assumed that the Class II Savannah phase sites necessarily correspond in all socio-cultural manifestations to Class II Irene phase sites. That there may be variance between size classes is suggested by the differences in the mean size of the size classes obtained in the cluster analysis (Table I). These differences are seen as reflective of the structural differences in the two settlement systems. These differences are not seen as prohibitive of the use of site size classes since functional equilivency between classes in each phase is considered only in the broadest sense.

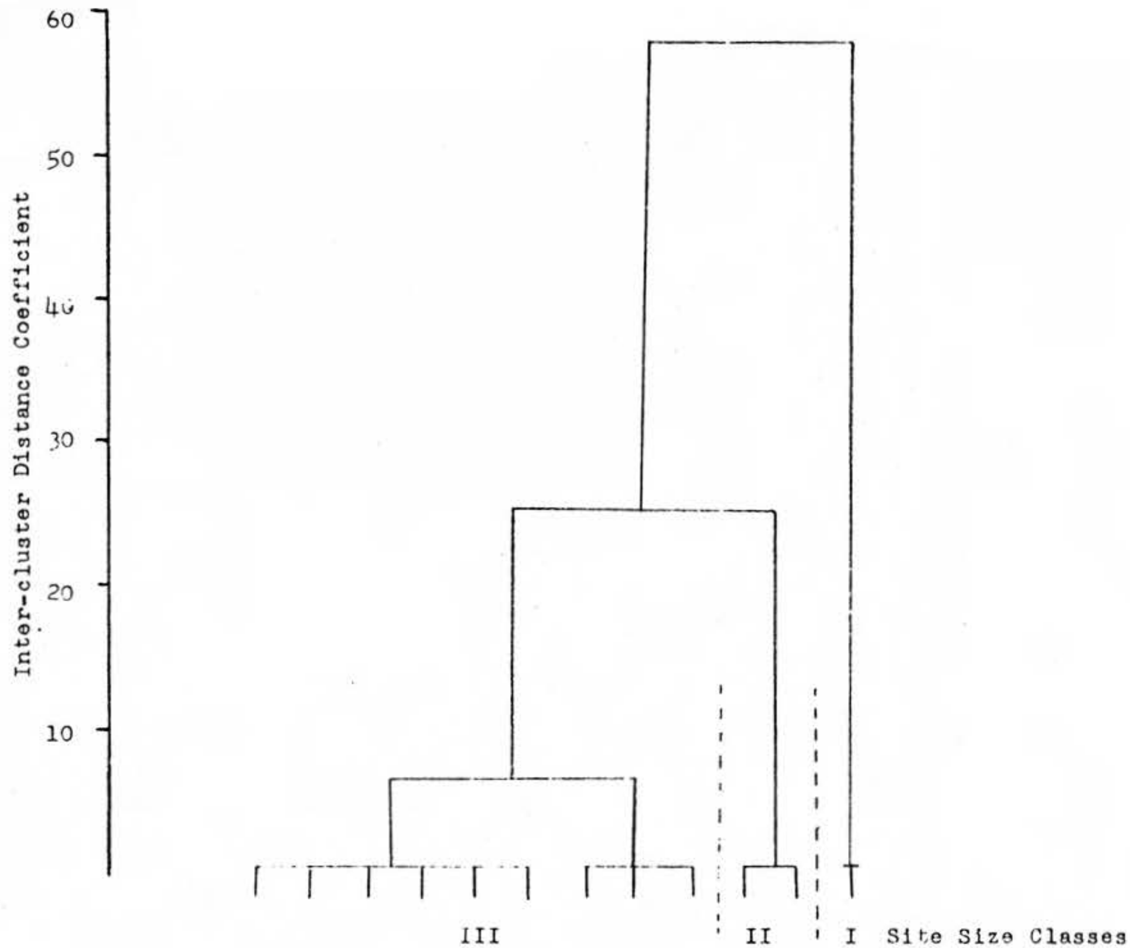

Figure 8. Dendrogram of Cluster Analysis of Savannah Phase site sizes.

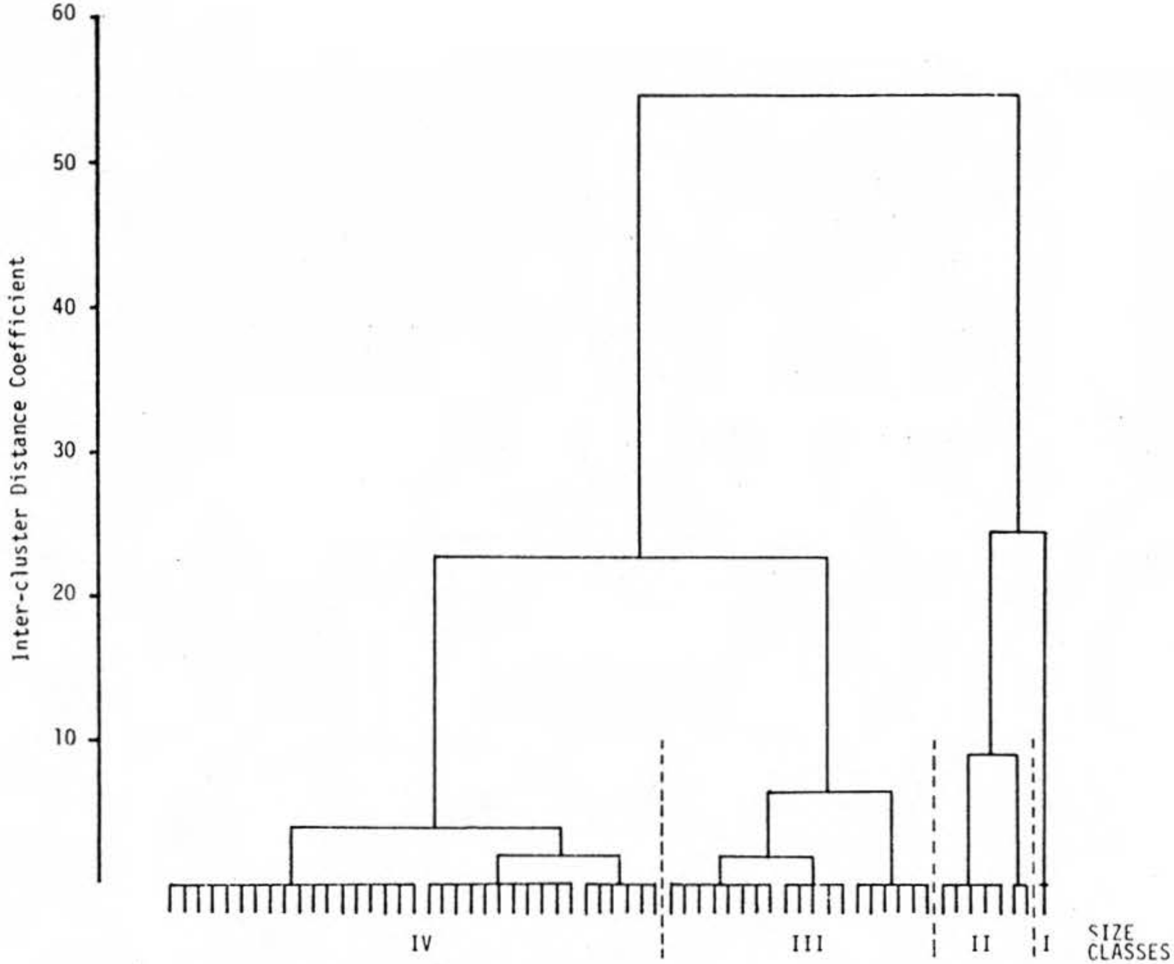

Figure 9. Dendrogram of cluster analysis of Irene Phase Site Sizes.

	Savannah phase		Irene phase	
Site Size Class	Mean	Range	Mean	Range
I	324,000		140,000	
II	87,630	55,740-119,520	37,735	26,002-55,740
III	4,574	279-11,148	15,460	6,630-17,789
IV			1,331	1-4,896

Table 1. Mean size and size range of site size classes (m^2).

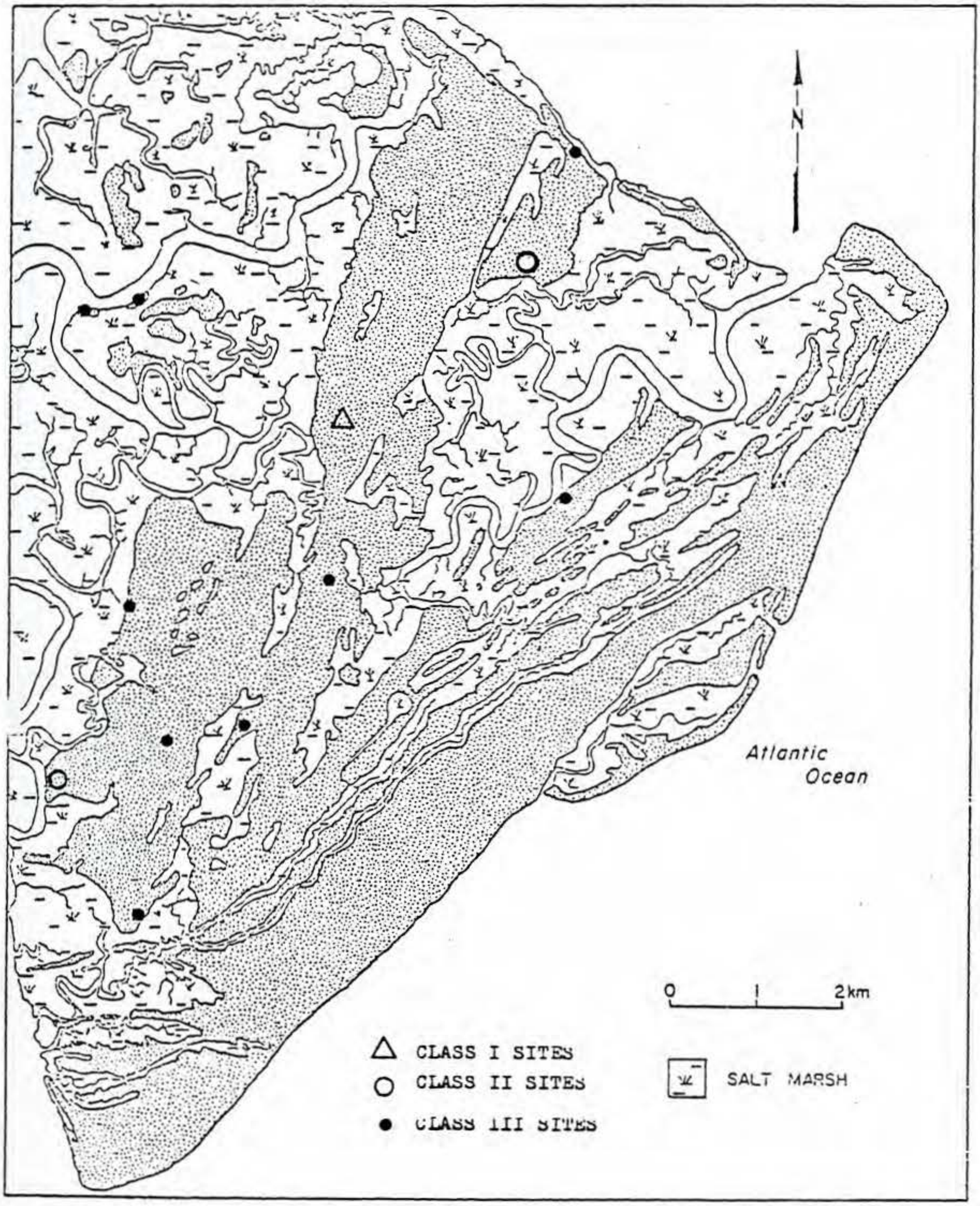

Figure 10. Location of Savannah Phase sites.

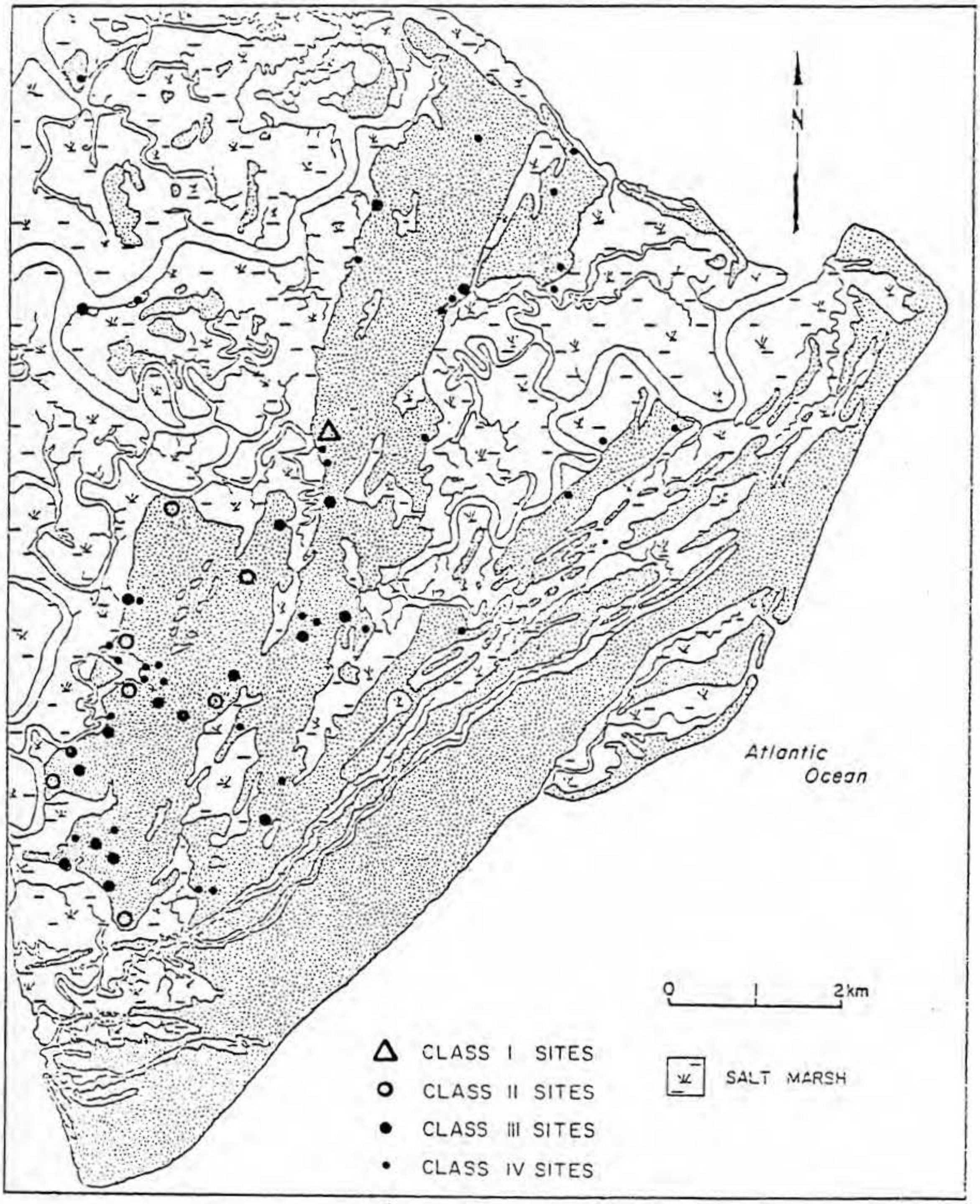

Figure 11. Location of Irene Phase sites.

Also, most of the analyses and interpretations presented below consider the position of site size classes in relationship to their own settlement system rather than between settlement systems.

Cluster analysis as used here, is essentially a search technique and is not a measure of the relative strength of the hypothetical hierarchical models presented. As such, it has been used to identify analytical units (site size classes or hierarchical levels) about which a variety of questions can then be asked. The following discussion considers aspects of the structure and differences of the proposed hierarchies of the two phases.

Regularities in settlement hierarchies have been observed and discussed at length and theoretical explanations for these distributions have been presented (Haggett 1971). One way to assess structural differences between the Savannah and Irene phase settlement hierarchies is to examine the frequency distribution of sites within each system.

Figure 12 is a histogram of site frequency per size class for both phases. Essentially these distributions reflect the expected pattern--a large number of small sites and a few large sites. Geographers have shown that the curve produced from the data in Fig. 12, the so-called J-shaped curve, corresponds to theoretical expectations of the size distribution of settlements operating within a system (Berry and Garrison 1958; Haggett 1971).

Differences between the two settlement systems do exist in terms of their frequency distributions. The Savannah phase lacks the smallest range of sites found during the Irene phase and has fewer middle range sites. This difference can be further examined by comparing the actual

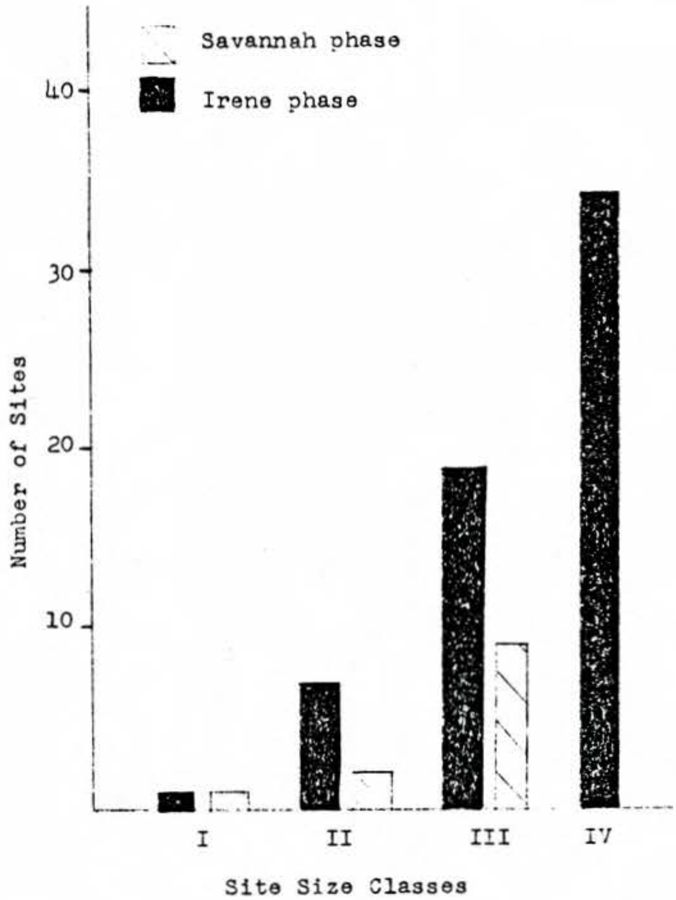

Figure 12. Frequency distribution of sites by size class.

number of sites in each level of the proposed hierarchies to the number expected theoretically. Simon (1955), utilizing stochastic processes and probability concepts, derived equations that accurately describe the frequency distributions of settlement systems. Berry and Garrison (1958) have modified Simon's model slightly and shown its applicability to geographical data. Following Berry and Garrison, the modified version of Simon's equation was applied to the Ossabaw Island data set to develop the expected number of sites in each level of the hierarchy of each phase. These results are presented in Table 2.

This data is graphically presented in Fig. 13. This figure demonstrates that in the broad sense both sets of settlement data are similar in that they both adhere to the J-shaped surve in terms of the relative frequency of sites per site size class, although the Savannah phase contains fewer sites than the Irene phase and has no Class IV component.

When comparing the known frequency of sites in each phase against the expected number derived from Simon's equations, differences appear. There are more middle sized sites during the Irene phase (Classes II and especially III) than would be expected and fewer Class I and IV sites. Minor differences also appear in the Savannah phase.

It is impossible, of course, to equate the Mississippian Period settlement system of Ossabaw Island with the modern societies upon which Simon's formula has been developed. These formulae do, however, provide a base line for comparing sets of data and appear to be useful here. The data indicates that during the Irene phase there is an increase in the number of middle sized sites and the development of a range of smaller sites, evidently non-existant during the Savannah phase.

Site Size Class	Observed Number	Observed Cumulative percent	Expected Number	Expected Cumulative percent
Savannah phase				
I	1	.08	1	.11
II	2	.25	2	.33
III	9	1.00	6	1.00
Irene phase				
I	1	.02	3	.06
II	7	.13	5	.16
III	19	.42	10	.36
IV	34	1.00	31	1.00

H_0: There is no difference between the observed and theoretical distributions of sites.

Statistical test: Kolomogorov-Smirnov test of goodness of fit (see Siegel 1956:47-52)

Results: Savannah phase: D = .08
Irene phase: D = .06
There is no significant difference between the observed and theoretical distributions at p = .01 level of significance.

Expected values obtained by using the following formulae:
1. $f(1) = nk/2$
2. $f(i)/f(i-1) = (i-1)/(i+1)$

where: nk = total number of sites
f(i) = number of sites of Site Size Class i

Expected distribution of settlement sizes obtained by application of formula 1, and successive application of formula 1 using i=2, i=3, and i=4. Note that when using the formula size class 1 is the class with the largest number of sites or the smallest size class. (after Berry and Garrison 1958).

Table 2. Site Size Class composition compared to theoretical (expected) distribution.

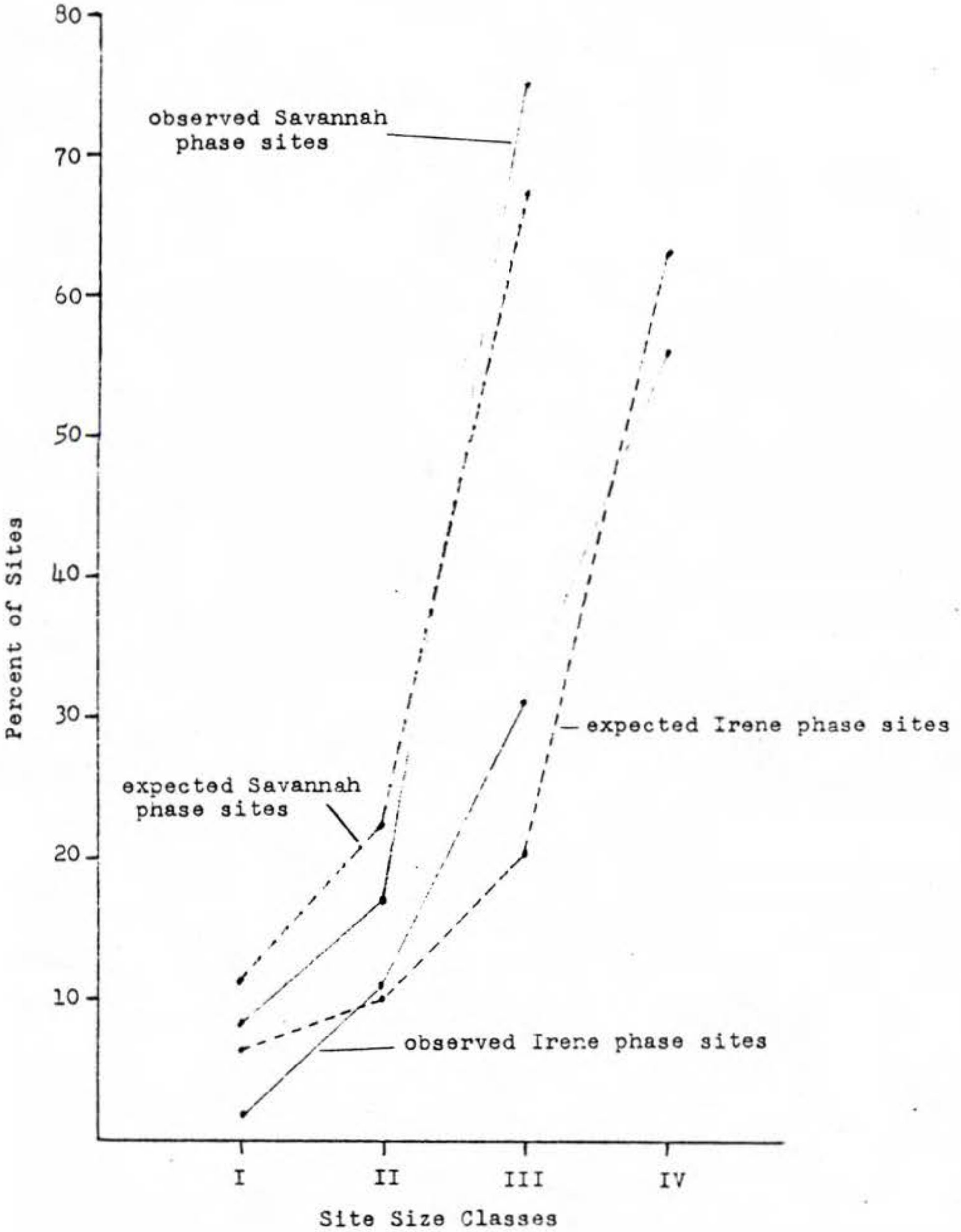

Figure 13. Graphs of observed vs expected number of sites per Site Size Class (expected derived from Simon's (1955) formulae).

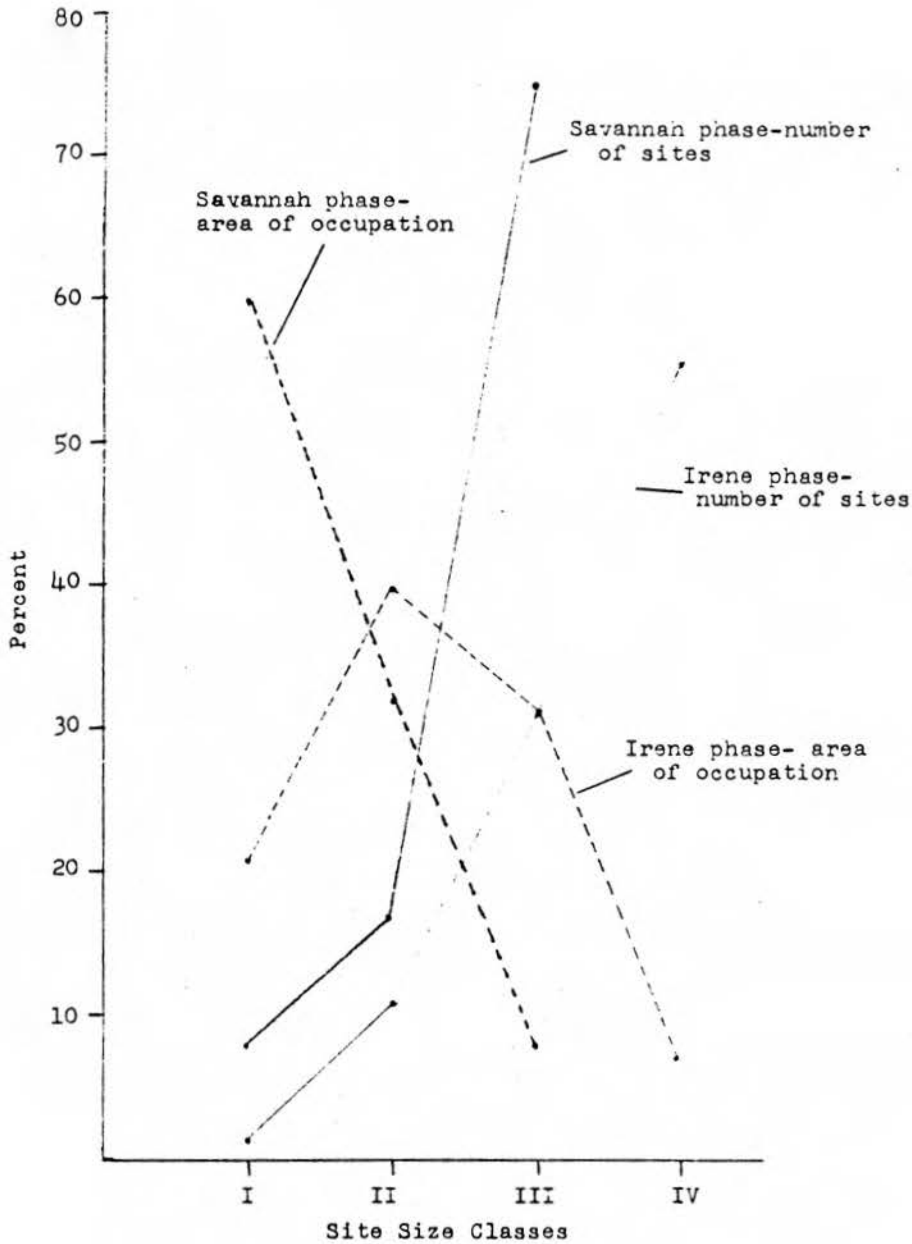

Figure 14. Graphs of relative number of sites vs relative area of occupation per Site Size Class.

increasing relative importance. Apparently there is a shift away from a structure totally dominated by a single site to one in which middle sized sites are increasing in number and presumably importance, evidently at the expense of the largest site(s). While this structural shift occured there was still an attempt during each phase to maximize spatial efficiency within the settlement systems through the central location of the primate settlement. Additionally, during the Irene phase there is a proliferation of very small sites scattered over the island, sites which are unknown during the Savannah phase.

Based on the analyses presented here, the overall indications are that significant structural changes did occur in settlement during the Mississippian Period. These changes are characterized by: 1. an increase in the total number of sites; 2. an increase in the total area of site occupation; 3. a shift from a "nucleated" settlement structure in which a single site is totally dominant, to one in which a number of middle sized sites develop and evidently become important in relation to the rest of the system (a "dispersed" pattern); 4. an increase in, or possibly the appearance of, a large number of small probably temporary special activity sites scattered over the island.

Site Size Classes and Environmental Variability

Ossabaw Island's Mississippian Period settlement system can be further analyzed by considering the relationships that existed between settlement locations in each of the levels of the proposed hierarchies and sets of quantified environmental variables. It is initially assumed that the sites within each level of a hierarchy are, in a broad sense, "functionally similar". The variability proposed to exist between each of the levels of the hierarchies is therefore expected to be reflected in differential site relationships to these sets of environmental variables.

The environmental variables used, which are considered to be important affectors of site location, are (a) the soil type upon which a site is located; (b) the forest community within which a site is situated; (c) the distance of a site from the salt marsh; and (d) the distance of a site from tidal creeks. Within each variable set, rankings have been established based upon the assumed importance of the variable to the Mississippian Period populations. The justification for the rankings given soil and forest communities are given in Chapter II. Even though these rankings are somewhat subjective, they are considered logical and plausible in light of available data on Mississippian Period adaptation in coastal Georgia.

Table 3 presents, for both the Savannah and Irene phases, the frequency distribution of sites in each site size class across forest communities and soil types.

Table 3 indicates that there is apparently a selection for locating sites in Mixed Oak Hardwook forest communities during both phases. Most of the variability that does appear with respect to site location and forest communities is observed among the smaller size classes. This is most obvious among the Class IV Irene phase sites. The food value of the Mixed Oak Hardwood forest may have been important for supporting long term occupation or larger populations. The variation evident in the distribution of sites may also indicate that the food resources of

Size Classes	Forest Communities 1 (Mixed Oak-Hardwood)	2 (Oak-Palmetto)	3 (Lowland-Mixed)	4 (High Marsh)
Savannah phase				
I	1			
II	2			
III	5	4		
total	8	4		
Irene phase				
I	1			
II	6		1	
III	13	5	1	
IV	15	11	6	2
total	35	16	8	2

Table 3. Site frequencies cross-tabulated by size class and forest communities.

the Mixed Oak Hardwood forest were not as important in determining the location of smaller sites. Other factors, perhaps accessibility to marsh resources, may have entered into the choice of location for the smaller sites.

This table suggests that large sites are most likely to be found in association with the most valued forest community. To obtain, at least, an initial idea of whether this selectivity holds for the total site population, the observed proportion of sites located in each forest community is compared against the proportion of sites expected to be found in each community. The expected proportion is determined directly from the areal percentage of each of the forest communities on the island. Forest Community IV, High Marsh is omitted from the analysis since there is no reasonable way to estimate its area relative to the other communities.

Figure 15 presents graphs of the expected number of sites per forest community and for each phase the observed number of sites per forest community. This figure suggests that there is no great difference between the observed and expected proportion of sites found in association with any particular forest community. The differences that do occur are mainly in the Savannah pahse data where there appears to be a selection for the Oak Palmetto Forest Community and a selection against the Lowland Mixed Forest Community.

In combination, Table 3 and Fig. 15 suggest that for both phases there is a tendency to locate large sites on the most valued forest community but that there is little selectivity for or against forest communities when total site populations are considered.

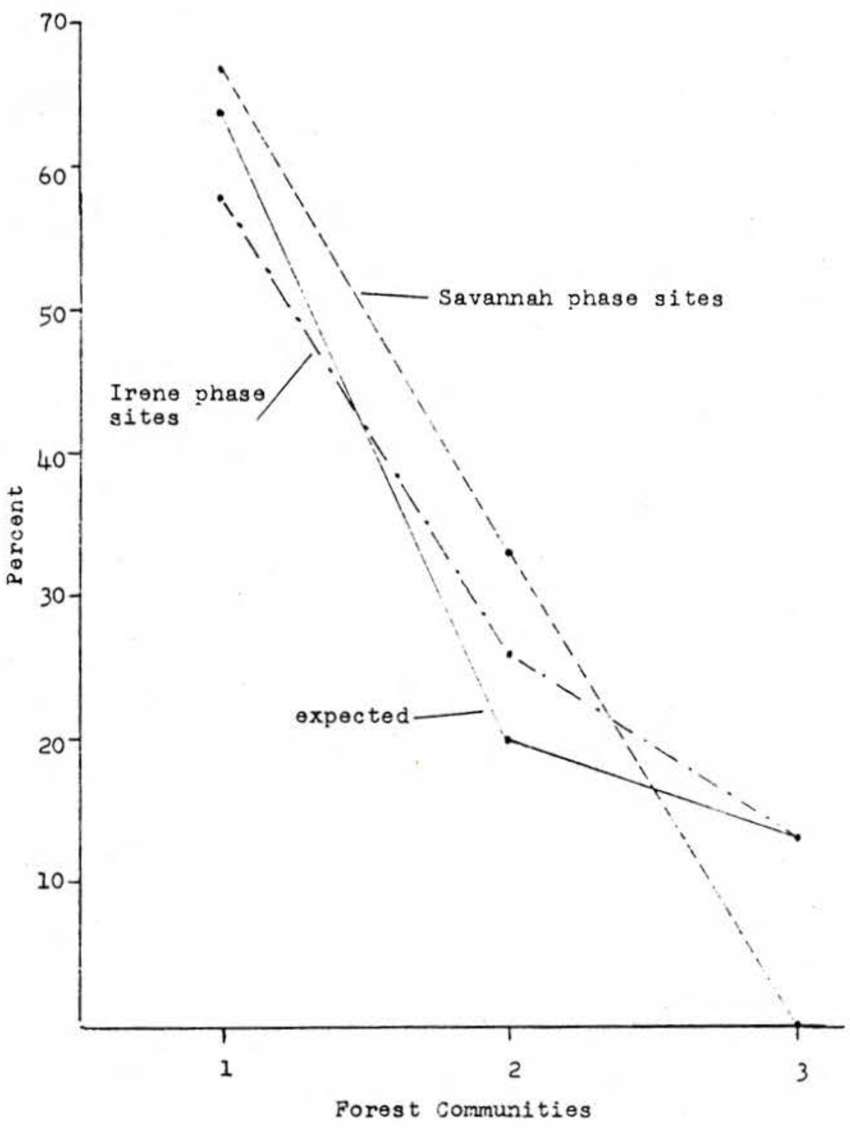

Figure 15. Graphs of observed vs expected number of sites per Forest Community.

Size Classes	Soil Types 1 Lp	2 Cm	3 Ol	4 Lr	5 El	6 Kic	7 Ch
Savannah phase							
I	1						
II	2						
III	3	1	1	3		1	
total	6	1	1	3		1	
Irene phase							
I	1						
II	4	2			1		
III	6	7	2	3	1		
IV	8	7	8	3	6	3	2
total	19	13	10	6	8	3	2

Table 4. Site frequencies cross-tabulated by size class and soil types.

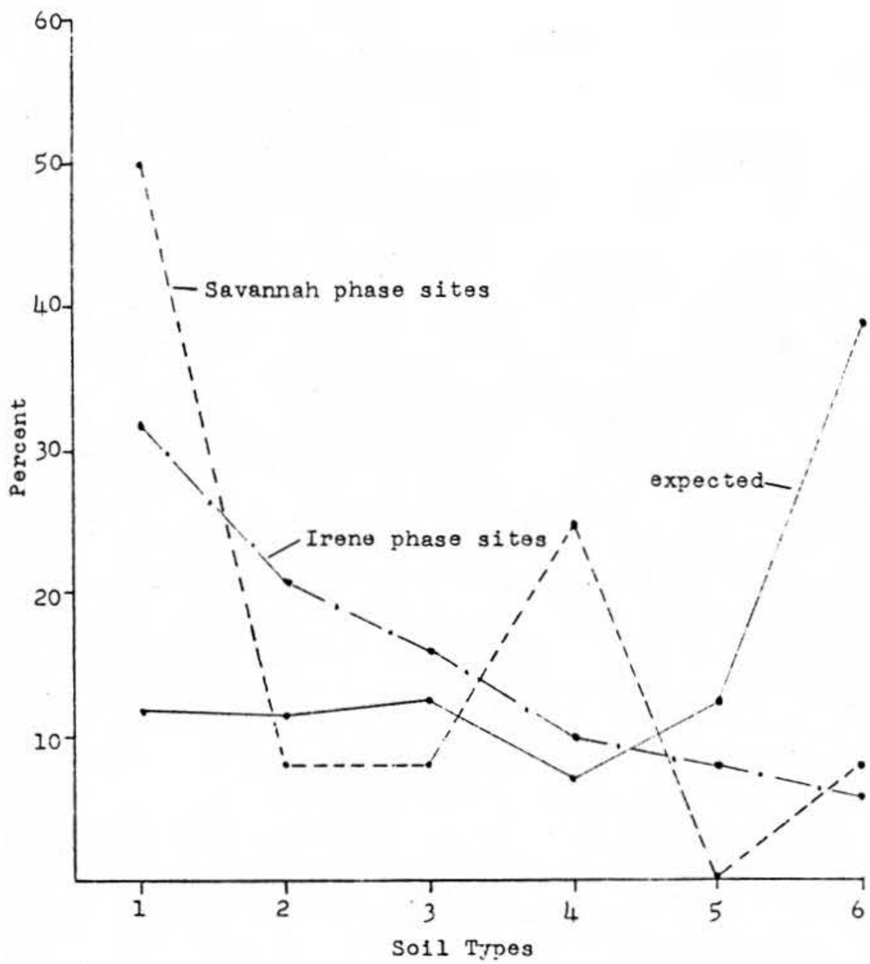

Figure 16. Graphs of observed vs expected number of sites per Soil Type.

another.

For both phases there is an obvious selection for the most valued soil type (Lp) and a selection against the two most poorly drained and least valued soil types (El and Kic). There are fewer Savannah phase sites associated with soil types 2 and 3 (Cm and Ol) than would be expected and more Irene phase sites than expected. During both phases there is a selection for locating sites on soil type 4 (Lr).

Figures 15 and 16 can only be considered as rough measures of the sorts of processes evident in the strategy of site location during each phase. They do suggest certain patterns. A great deal of variation is evident between the observed and the expected in terms of site location and soil types. Little variation is seen between the observed and expected proportion of sites in terms of forest communities. This is interpreted as indicating that soil type was a more important influence on site location than was forest community. This seems logical considering that soil type would have a direct affect on the feasibility of the placement of habitation structures, would directly affect the feasibility of year round settlement, and would be important in terms of the practicability of horticultural activities. The resources of any of the forest communities would be accessable from almost any point on the island and are unlikely to have been major factors in actual site location.

One point of interest shown in Fig. 16 which should be discussed is the apparent selection for soil type 2, 3, and 4 during the Irene phase. The previous discussion of settlement structure indicated that during the Irene phase there was an increase in the number of medium sized sites resulting in what is called a "dispersed" pattern of settlement. It is assumed that many or most of these settlements (Class II and III sites) were permanent habitation sites. As these settlements developed, an attempt would have been made to locate them in the most desirable locations relative to a variety of environmental and social factors, including soil types. It also is assumed that because of some of these factors, a portion of these middle-sized sites would have to opt for locating on soil types of a lesser value than the most desirable yet on types that still would permit permanent habitation. Such a trend is to some extent supported by the data in Fig. 16.

There are a total of 26 Class II and III Irene phase sites. Ten (38%) are located on soil type 1, assumed to be the most valued soil type for permanent habitation. Fourteen (54%) are located on soil types 2,3, or 4. These soil types are less than desirable yet still suitable for permanent settlement and are amenable to agriculture. It is suggested that many of the sites in this latter group were permanent settlements forced to locate on these less than desirable soils because of socio-cultural spatial considerations. Only 2(8%) of the Class II and III sites are located on those poorly drained soils which would be totally unsuitable for permanent settlement or for prehistoric horticulture.

Available archaeological evidence indicates that extensive exploitation of salt marsh resources was undertaken by coastal Mississippian Period populations (Larson 1970; Pearson 1977). It would be logical to assume that site locations were in some way influenced by these resources, depending on the types of activities occuring at sites.

Although it is not possible at this time to quantify accurately the actual amounts and variation in availability of food resources in the marsh area, site distance from the marsh can be used as a plausible measure of its importance to site location.

Table 5 presents data on site distances from the marsh edge for each phase. Most of the sites for both phases are adjecent to or within 100 meters of the marsh edge. Some variability does exist in distance from the marsh, mainly among the smaller sites. However, most are located within 100 meters of the marsh edge. This pattern of site location is seen as indicative of the general importance of marsh resources to all Mississippian Period settlements, regardless of size.

Table 6 presents data on site distances from nearest creek. This measure is considered to be important because creeks allow access into the marsh, thus increasing the exploitable area available to a site. Creeks are also important in providing a means of movement onto and off the island.

Tables 5 and 6 indicate greater variability in site distances from creeks than site distances from the marsh. Seventy-five percent of the Savannah phase sites are located adjacent to the marsh, while 50% are adjacent to creeks. During the Irene phase, 60% of the sites are located adjacent to the marsh and only 27% are adjacent to creeks.

In general, a site's distance from the marsh or a creek is related to its size. This is most dramatically expressed by the difference between the largest and smallest classes of sites in each phase. For both phases, all Class I sites are located adjacent to saltwater creeks

Size Classes	Distance Categories 1 (0-100m)	 2 (100-200m)	 3 (over 200m)
Savannah phase			
I	1		
II	2		
III	6		3
total	9		3
Irene phase			
I	1		
II	5		2
III	10	3	6
IV	21	4	9
total	37	7	17

Table 5. Site frequencies cross-tabulated by size class and distance from marsh.

Size Classes	Distance Categories 1 (0-100m)	2 (100-200m)	3 (over 200m)
Savannah phase			
I	1		
II	2		
III	4		5
total	7		5
Irene phase			
I	1		
II	2	2	3
III	6	2	11
IV	8	7	19
total	17	11	33

Table 6. Site frequencies cross-tabulated by size class and distance from nearest tidal creek.

and thus next to the marsh. On the other hand, while 67% of the Class III Savannah phase sites and 60% of the Class IV Irene phase sites are located adjacent to the marsh, only 44% and 35% of the smallest Savannah and Irene phase sites are located adjacent to creeks. It appears that although proximity to the marsh was important for most sites, immediate access into the marsh or off the island was not an important consideration in the location of most of the smaller sites.

The data presented suggest that variability does exist among sites at different levels of the proposed hierarchies in regard to relationship to certain environmental variables. The larger sites are associated with more "valued" environmental situations than are the smaller sites. This pattern is apparent for both the Savannah and Irene phases.

Overall Environmental Rank

It is apparent that size classes do demonstrate patterned differences in relation to certain environmental variables. It is suggested that this variation is reflective of a site's role or function within the total settlement system. It seems that the usefulness of the size classes would be more meaningful if a single quantifiable environmental difference could be observed between classes. One way to accomplish this is to examine the total environmental rank for each site size class. This rank is found by simply summing all of the environmental ranks for each site and then finding the mean of this total for each size class. For example, for the Savannah phase Class II there are two sites each of which has a rank of 1 for forest communities, a rank of 1 for soil types, and a rank of 1 for both of the distance measures. The sum of these ranks for both sites equals 8.

The Overall Environmental Rank, which is the mean rank for each size class, is found by dividing the total rank (8) by the number of sites in the class (2). The Overall Environmental Rank obtained for Savannah phase Class II sites is 4.0.

The Class having the lowest score contains sites which, overall, are located at points of optimum environmental conditions. Table 7 presents data for determining the Overall Environmental Rank for both sets of settlement data.

Not surprisingly, the Overall Environmental Rank for Class I sites is the lowest at 4.0 while the smaller classes of sites is each phase have the highest rank. There is no difference between the ranks obtained for Savannah phase Class I and II sites, though it is suggested on other grounds, that these Classes of sites are functionally different. The small number of Savannah phase settlements on the island would have permitted the smaller and presumably less important Class II sites to be located in areas of optimum environmental value.

Conclusions

All of the data presented on site size class relationship to environmental variables suggests that patterned variability does exist. More importantly, though it has been suggested that the overall structure of the Savannah and Irene phase settlement systems are markedly different, they reflect broadly similar patterns in terms of site location and environmental conditions. For both phases, as site size decreases, there is an increasing variability in site location and a general lessening of overall "environmental qualtiy" associated with

Size Class	Number of sites in Class (N)	Sum of All Environmental Ranks for Class (SE)	Overall Environmental Rank (SE/N)
Savannah phase			
I	1	4	4.0
II	2	8	4.0
III	9	73	8.1
Irene phase			
I	1	4	4.0
II	7	48	6.9
III	19	146	7.7
IV	34	312	9.2

Table 7. Overall Environmental Rank.

site location. Many of the smaller range of sites, especially among the Irene phase Class IV sites, are located on seasonally wet or flooded soils, which may be indicative of short term or seasonal occupation. Few are located near tidal creeks that would provide access into the marsh or off the island. Most, however, are located adjacent to the salt marsh. A decrease in site size corresponds to a selection for location in areas of decreased overall environmental value. This is interpreted as indicating increasing exploitative specialization as sites become smaller, with a concomitant decrease in functional complexity and activity range variability.

The larger sites are associated with more "valued" environmental conditions than are the smaller sites. In each phase, the single largest and presumably most important site is associated with optimum environmental conditions. It is also noted that these two sites adjoin one another and are optimally located near the center of the island. It would appear that these two sites were strategically located to permit ease in both the exploitation of several resource zones and in extending control over the island. The size and optimum geographical and environmental location of these sites suggest that a wide range of cultural activities may have been sustained at these sites. Additionally, these sites are located adjacent to that salt water creek which provides the most direct access to the mainland from the island. Much or all off-island interaction was likely funneled through these sites, thus adding to their importance as island centers.

Site Size Classes and Cultural Variability

The previous section has focused on extra-cultural variables as measures of site variability and as a means of identifying site function. In this section cultural variables are used in the analysis of site size class variability. The assumption being that observed differences in cultural variables are possible reflections of socio-cultural differences.

With the exception of ceramics, artifactual material is rare at coastal sites. This discussion will consider the only two variables which are currently considered usable as indicators of variability: ceramics and burial mounds. Subsistence material, which may also indicate variability, is considered in a later section.

Site Size Classes and Burial Mound Distribution

Burial mounds are discussed here since they are to some extent, indicators of the relative importance of a site, of permanency of settlement, and possibly of socio-religious autonomy. The presence, size, and number of burial mounds can be used as rough measures of functional differences between sites of site size classes.

Savannah Phase

Burial mounds are known at only two of the Savannah phase sites on Ossabaw Island. One of these is the Class I site, Ch 158N, and the other is a Class II site, Ch 160. Ch 158N is the largest site on the island. This site contains five burial mounds, three of which date totally or partially to the Savannah phase. This is the largest number of mounds found at any site on the island. All of these mounds were excavated by C.B. Moore in 1896, and their phase identification has been based on his report (Moore 1897).

Moore's descriptions indicate that two of the Savannah phase mounds at this site (mounds B and C) are the largest mounds known on the island. Mound B was approximately 7 feet high and over 46 feet in diameter. Mound C was 8 feet high and had an estimated diameter of over 65 feet. Both mounds were constructed of sand with some shell layer inclusions and each had a central shell deposit with associated cremations (Moore 1897:101-112). The pottery in both mounds was plain, cordmarked, "basket marked", and check stamped. Moore (1897) reports no complicated stamped pottery from either of these mounds. His descriptions suggest that both mounds date from the Savannah I subphase to the early or middle Savannah II subphase.

These mounds contained a fairly large number of burials (more than 130 together) of individuals of both sexes and all ages. It would be interesting, and important, if either of these mounds also served as platform mounds, in light of the assumed importance of this site as the population and socio-cultural center of the Savannah phase population on Ossabaw Island. Other studies of Mississippian populations suggest that platform mounds are associated with apical political and religious activities. If platform mounds existed on Ossabaw Island, it seems plausable to assume that they would be located at this site. Unfortunately Moore's excavation techniques and reporting prevent this determination. He does note, however, that both mounds B and C were of rather complex construction containing shell, sand, and "dark sand" layers (Moore 1897:100-110). It should also be noted that these mounds are almost as large as the only known platform mound on the coast, the Irene Mound (Caldwell and McCann 1941). A possibility may exist that one or both of these mounds served at some time as platform mounds.

A smaller mound at this site, mound D, appears to date in part to a late Savannah phase occupation (Moore 1897:114). This mound was a little over 3 feet high and had an undetermined diameter. It was of sand construction and contained a number of shell masses and layers. A large mass of calcined human bone was found in association with a central shell core. In addition to cremations and primary flexed burials, the mound contained a number of urn burials. All of these urn burials contain cremations of infants or adults. Several of the burial urns are typical Savannah phase pottery types; check stamped and cord marked. Moore (1897:114-115) also notes that the presence of complicated stamped sherds in the mound and of complicated stamped vessels used as burial urns. These urns could represent Savannah Complicated Stamped or Irene Complicated Stamped vessels, however, Moore's descriptions prevent this discrimination. If the vessels are Savannah Complicated Stamped then the mound is of a late Savannah phase date. Additionally,Caldwell (1952) points out that urn burial is a practice which appears late in the Savannah phase. It may be that these urn burials, or some of them, are, in fact, Irene phase burials which have been placed in an earlier Savannah II subphase mound.

The only other Savannah phase site with known burial mounds is Ch 160, called by Moore the Bluff Field (Moore 1897:131-136). Moore excavated three mounds at this site, two of which (mounds A and B) date to the Savannah phase. These mounds are small, the highest being only a little over 2 feet high at the time of Moore's excavation. Both of these mounds are constructed of sand which has some shell layers and masses included. Only one, Mound A, had a central pit with associated cremations. Cordmarked and plain pottery were the only types recovered from the mounds. Moore's descriptions suggest that both of these mounds date to the earlier part of the Savannah phase.

The known Savannah phase sites with burial mounds are the two largest Savannah phase sites. This would seem to suggest their importance as socio-religious centers as well as centers of population. More importantly, the largest Savannah phase site also contains the most and the largest burial mounds known on the island. None of the smaller (Class III) Savannah phase sites contain burial mounds. Some of these sites may represent seasonal or short-term occupation, where mounds would be unlikely to be constructed. Those that may have been permanent settlements evidently relied on the largest sites for burial and associated activity.

Irene phase

A total of 8 Irene phase sites are known to have associated burial mounds.

The Class I site, Ch 158S, the largest known Irene phase site on the island, is the only Irene phase site to contain multiple burial mounds. This site contains two Irene phase mounds, both of which were excavated by C.B. Moore (1897). It should be noted that one of these mounds is mound D, which may be a late Savannah phase mound but which possibly contains some Irene phase burials.

The only Class II site containing a burial mound is Ch 150. This mound has not been excavated and is identified totally on the basis of surface ceramics.

Six Class III sites contain burial mounds, only one of which (at Ch 198) has been partially excavated. The burial mounds at the Class III sites appear to be smaller than those at either Class I or Class II sites. Whether these mounds are small at these sites simply because they served fewer people or because they are in fact functionally different from those found at the larger sites is not known.

It is interesting to note that none of the Class III sites with burial mounds contain any indication of extensive pre-Irene phase occupation. The two larger sites with mounds both show evidence of pre-Irene phase occupation. These Class III settlements with mounds apparently developed during the Irene phase as a result of the restructuring of the settlement system as proposed occured or as a result of actual population expansion during this time. It is suggested that the Class III Irene phase sites with mounds are permanent settlements containing socially distinct units. The burial mounds at these sites likely served only the inhabitants of that particular settlement.

The occurance, number and size of burial mounds at sites does seem to support the proposed functional variability of the site size classes. For both phases, the largest sites seem to have been the centers of burial mound construction and thus of associated mortuary activities. Several middle sized Irene phase sites contain burial mounds, reflective of their increased socio-cultural importance and autonomy. None of the smaller range of sites in either phase contains known burial mounds. Many of these sites, especially during the Irene phase, were probably briefly or seasonally occupied.

Site Size Classes and Ceramic Variability

This section discusses ceramics as indicators of site size class variability. The underlying assumption of this discussion is that observed differences in ceramics between site size classes are reflections of socio-cultural differences.

Ceramic surface collections were made at all 65 sites. Only Mississippian Period ceramics are discussed in the following analyses. Although an attempt was made to collect the maximum number of sherds at a site, many sites produced very few surface ceramics. Additional ceramic data were obtained from the 1 X 1 meter test pits previously described. Even so, several sites produced only small ceramic collections; in some cases only one identifiable sherd. Appendix I provides a complete listing of ceramics recovered.

Sources of Error

Because of the nature of the ceramic data certain potential errors are inherent in their analysis. One problem, that of insufficient sample size from any one site, is recognized. This was noted among the Savannah phase sites in particular, many of which have been extensively disturbed making surface collection difficult. The problem of small sample size is to some extent alleviated by dealing with groups (site size classes) rather than with individual sites. The lumping of ceramics from sites in each class provides reasonable sample sizes for comparison and analysis.

Combining surface collections with excavated samples may also introduce potential error. There was no other means to obtain large enough collections for analysis. In no instances was any great difference observed between the composition of a site's surface collection and it's excavated sample.

The sources of error possible in the ceramic data are not seen as prohibitive in terms of the limited generalizations that are developed here. Questions which go beyond analyzing ceramic variability across site size classes would require more rigorous collection procedures.

Ceramics and Ceramic Variability

The ceramic analysis that follows utilized the typologies established through earlier research (Caldwell and Waring 1939a; Caldwell and McCann 1941; Willians 1968). If, as proposed, site size classes differ in the types of cultural activities they sustain, this would be expressed by differences in their pottery type composition. This assumes that functional variability in ceramic use existed.

This ceramic variability may, of course, be indicative of temporal rather than functional differences between sites. For the present, data are available for identifying temporal differences within the Savannah phase only. Where applicable this question is considered in the discussion of Savannah phase ceramics.

Savannah Phase Ceramic Variability

Several Savannah phase sites are multicomponent, containing earlier and later archaeological components and producing variable surface collections at several sites. Those types definitely associated with non-Savannah phase ceramic complexes were excluded from analysis. It is impossible, however, to segregate Savannah Plain or Burnished Plain from other plain types. Thus the plain pottery from surface collections may derive from other phases, particularly the Irene phase. A large number of unclassified ceramics occur in the Savannah phase collections. Many of these are decorated wares too eroded or worn for identification. Table 8 presents data on ceramic variability from Savannah phase sites.

The most common Savannah phase pottery type is Savannah Fine Cordmarked, composing 27% of the total collection. Savannah Fine Cordmarked as found on Ossabaw Island is similar to that described in the initial type description (Caldwell and Waring 1939a). Most commonly this type is associated with straight rimed globular vessels. Only in a few instances are flared rim vessels represented. Quite often the cord marking is criss-crossed. Generally this technique appears to be confined to the upper portion of vessels just below the rim.

Plain wares are the second most common pottery type represented. In this study, plain pottery that has been burnished or polished is distinguished from non-burnished wares, even though the original type descriptions considered only the type Savannah Burnished Plain. Caldwell (1943) noted the two categories (Plain and Burnished Plain) and that the proportion of each type varied from site to site. He (Caldwell 1943:19) suggested that Burnished Plain wares were related to mortuary practices since this type is often the predominant type in Savannah phase burial mounds.

In the Ossabaw Island collection Burnished Plain comprises 8% of the total ceramic collection, and Savannah Plain 10%. Both of these types occur mainly as hemispherical bowls with straight or slightly incurved sides.

Savannah Complicated Stamped accounts for 8% of the total Savannah phase collection and Savannah Check Stamped for 7% of the total collection. These two types occur on globular vessels with straight rims, or, infrequently, with flared rims.

A rather large percentage (9%) of clay tempered wares appear in the collection, most of which are cord-marked wares. Some of these are probably of a Savannah phase date while others are similar to the earlier Wilmington Cord Marked (Caldwell and Waring 1939a). The majority of these clay tempered wares are from Ch 158N, a site with extensive Wilmington phase occupation.

Comparison of the Ossabaw Island Savannah phase ceramic collections with those from other sites presents some difficulties. First, there are few available collections for comparison and, secondly, those that are available are from burial mounds. Among known Savannah phase burial mounds a great deal of ceramic variability exists. For example, some sites contain a full range of Savannah phase ceramics but in varying proportions (Caldwell 1952) while at other sites only portions of the ceramic complex are represented (Caldwell 1943). This variability exists among contemporaneous sites (Cook 1970; Cook and Pearson 1973; Caldwell 1971; Larson 1957).

The indications are that a good deal of variability exists among Savannah phase burial mounds on the coast, and among the sites on Ossabaw Island in terms of ceramic composition. It would appear that this variability is a reflection of both temporal and sociocultural differences.

Pottery Type	Total Count	Total %
Savannah Fine Cord-Marked	393	26.57
Savannah Check Stamped	110	7.43
Savannah Complicated Stamped	116	7.84
Plain	143	9.67
Burnished Plain	121	8.18
Clay Tempered Wares	129	8.72
Unclassified	467	31.58
Total	1479	

Table 8. Total Savannah phase ceramic variation.

Ceramics and Savannah Phase Site Size Class Variability

The variability in known Savannah phase ceramic collections coupled with the problems discussed above suggest that only minimal information is obtainable from the collection concerning functional variability between site size classes. Table 9 presents data on ceramic variability by site size classes.

Figure 17 presents graphs of the frequency (%) distribution of ceramic types for each of the Savannah phase site size classes. Some variability is discernable in these graphs. The Class I and Class II site collections are similar, displaying a high percentage of Savannah Fine Cord-marked, a smaller percentage of Savannah Check Stamped, and even smaller quantities of Savannah Complicated Stamped. These site classes do vary in terms of their Plain, Burnished Plain, and clay tempered compliments. Some of this variability is probably due to the inclusion of ceramics from other phases.

The Class III sites are the most divergent. Savannah Fine Cord-marked is again the most prevalent ceramic type, but in lesser proportion than in Class I and Class II sites. Savannah Complicated Stamped is the second most common type, followed by Savannah Check Stamped.

Based on these graphs substantial differences appear to exist between Class III and Class I and II sites. It may be argued, however, that this difference is temporal rather than functional, a question which may be answered to some extent by analyzing individual sites rather than size classes. Figure 18 presents ceramic composition data from the four Savannah phase sites (1 Class I site, 1 Class II site and 2 Class III sites) with the largest ceramic collections. In this

Pottery Types	Class I		Class II		Class III	
	Total Count	%	Total Count	%	Total Count	%
Savannah Fine Cord-Marked	234	30.67	49	31.61	110	19.61
Savannah Check Stamped	31	4.06	15	9.68	64	11.41
Savannah Complicated Stamped	30	3.93	0		86	15.33
Plain	85	11.14	41	26.45	17	3.03
Burnished Plain	67	8.78	3	1.94	51	9.09
Clay Tempered Wares	110	14.42	3	1.94	16	2.85
Unclassified	206	30.00	44	28.39	217	38.69
Totals	763		155		561	

Table 9. Savannah phase ceramic variation by Site Size Class.

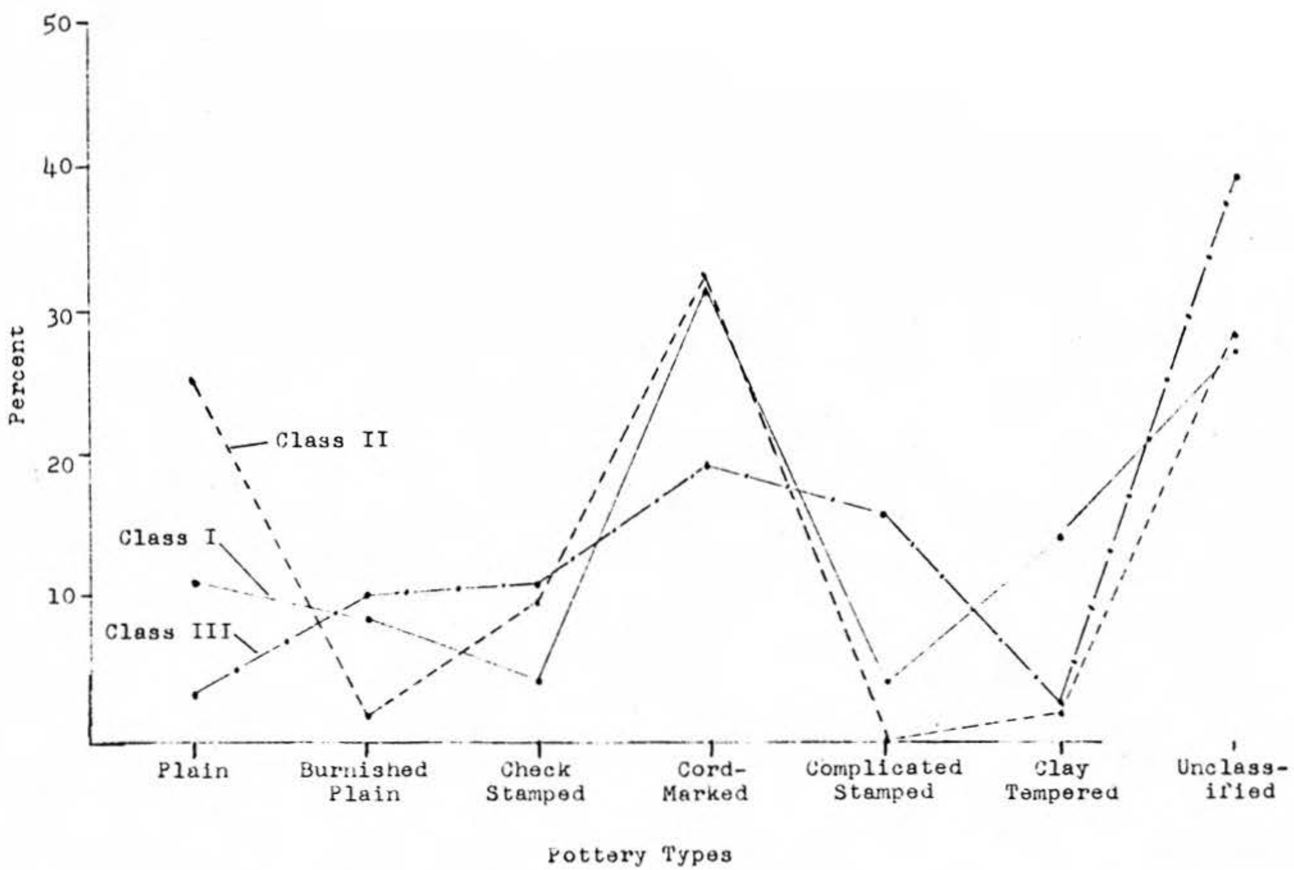

Figure 17. Frequency distribution of Savannah Phase pottery types by Site Size Class.

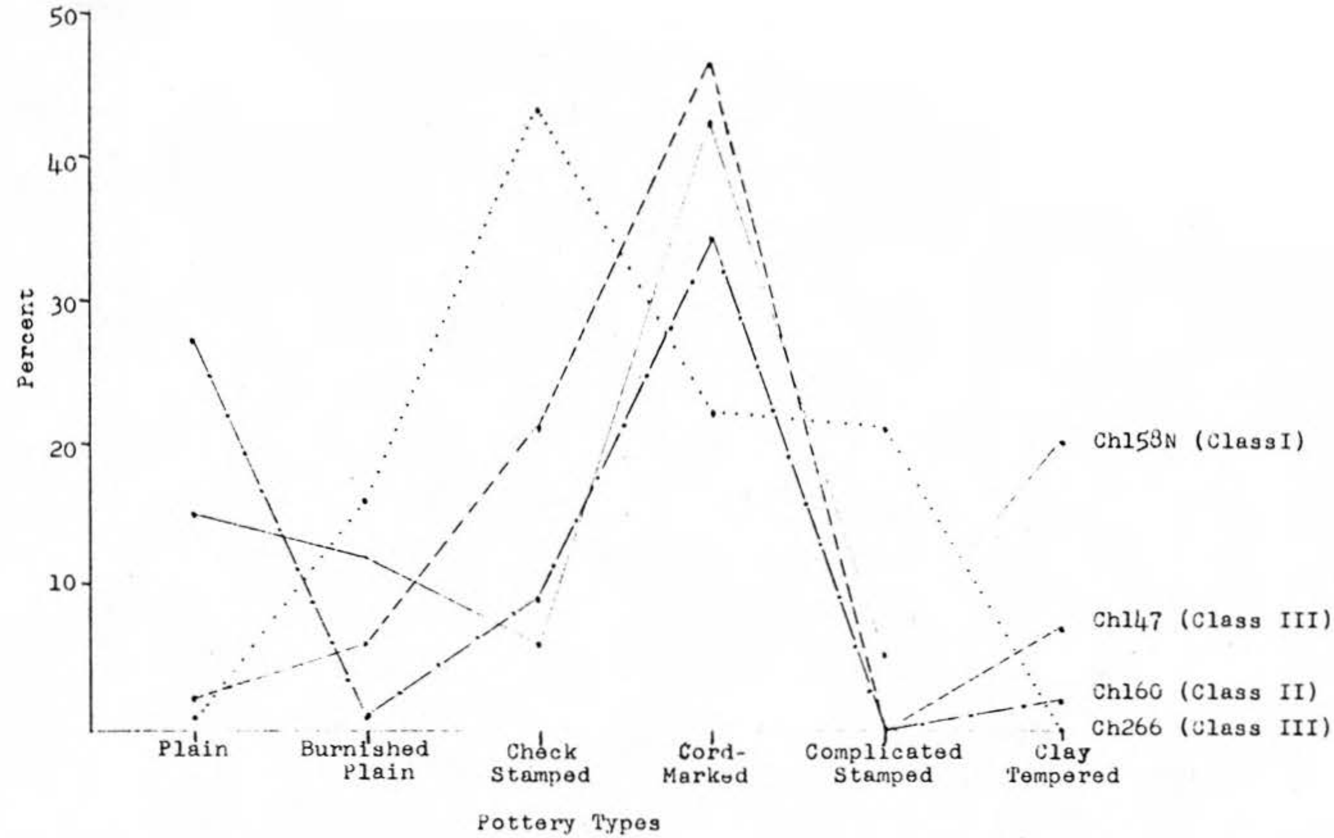

Figure 18. Frequency distribution of Savannah Phase pottery types at four sites.

analysis unclassified ceramics were deleted.

Figure 18 suggests that some divergence does occur between Savannah phase sites. While three of the four sites representing size classes I through III are similar, one Class III site, Ch 266, is clearly divergent. This site has a high percentage of Savannah Check Stamped and Savannah Complicated Stamped pottery and no clay tempered wares, while the other sites have higher percentages of cordmarked and small amounts of clay tempered ceramics. This difference suggests a temporal rather than a functional variability. The sites Ch 158N, Ch 147, and Ch 160 represent mainly an early to middle Savannah phase occupation while Ch 266 represents a very late Savannah phase occupation.

This brief analysis suggests that the temporal variability evident in Savannah pahse ceramics may overshadow or, at least obscure, any functional variability which may occur. Earlier analyses of site locational relationship to environmental setting have shown that functional variability likely exists between Savannah phase sites, however, it appears that the ceramic collection available is inadequate to measure this assumed difference.

Irene Phase Ceramics and Site Size Class Variability

The Irene phase ceramic collection is more amenable to analysis than the Savannah phase collection based on sample size. Additionally, few Irene phase sites are multicomponent, a factor which minimizes the possibility of a mixing of ceramic data. Surface collected ceramics not associated with the Irene phase were excluded from the following discussion. Table 10 presents data on the range of variability in the Irene phase ceramic collection.

Pottery Types	Total Count	Total %
Irene Complicated Stamped	3316	68.10
Irene Incised	74	1.51
Plain	289	5.94
Burnished Plain	477	9.80
Savannah Check Stamped	4	0.08
Savannah Fine Cord-Marked	11	0.23
Clay Tempered Wares	46	0.94
Unclassified	652	13.39
Total	4869	

Table 10. Total Irene phase ceramic variation.

The most prevalent ceramic type is Irene Complicated Stamped making up 68% of the total Irene phase collections. The preponderence of this type at other Irene phase sites has been noted (Caldwell 1943:25; Goad 1975; Pearson n.d.) where it generally comprises approximately 70% of the total collections. As found on Ossabaw Island, Irene Complicated Stamped is indistinguishable from the published type descriptions (Caldwell and Waring 1939a). It is generally found on globular shaped jars with flared rims and rarely occurs on bowl shaped vessels. The majority of Irene Complicated Stamped vessels display incidental rim decoration.

Plain wares (Plain and Burnished Plain) are the second most common pottery type. These are generally hemispherical or sharp shouldered "cazeula" bowls. Rarely does Plain or Burnished Plain occur in the globular jar form. When it does it normally has incidental rim decoration similar to that found on Complicated Stamped wares.

The type, Irene Incised, forms only 1.5% of the collection. It is found almost exclusively in the form of burnished bowls with the incising just below the rim. In the rare instances that incising occured on jar shaped vessels it occured on the shoulder of the vessel.

These four pottery types comprise the majority of the Irene phase ceramics. Minor wares definitely assigned to an Irene phase context include check stamped and cord marked wares. These are identified as Savannah Check Stamped and Savannah Fine Cord-marked.

Several clay tempered sherds were found in the test pits excavated in Irene phase shell middens. Most of these clay tempered sherds are cord marked or plain and appear similar to Wilmington phase ceramics (circa A.D. 700 - A.D. 1100). It is assumed that these sherds occur in

Irene phase contexts by chance. For the present these sherds are not considered Irene phase wares and are simply grouped together as clay tempered wares.

Site Size Class and Ceramic Variability

Table 11 presents data on Irene phase ceramic variability by site size class. This table indicates that Class I has a greater percentage of Irene Plain and a smaller percentage of Irene Complicated Stamped than the other site size classes. As mentioned earlier, the Class I site has extensive pre-Irene phase occupation and it is likely that some plain ceramics from these earlier phases have been included in the ceramic collection. The lack of Irene Incised in Class II sites is unexplainable at this time.

The ceramic data is presented in graphical form to enable visual interpretation in Fig. 19. This figure suggests that there is very little difference in the ceramic composition of the four site size classes. The major difference appears in the increased quantities of Irene Plain in Class I sites as mentioned above.

Discussion

Ceramics do not appear to be useful as indicators of variability between site size classes. It is likely that the ceramic categories used (especially for Irene phase ceramics) are too gross and a finer scaled ceramic analysis is required. Such an analysis may be possible with Irene phase ceramics through the use of incidental rim decoration, a common element on Irene phase ceramics. An earlier study (Pearson 1977), suggested that Irene phase rim decorative motifs are patterned in

Pottery Types	Class I		Class II		Class III		Class IV	
	Total Count	%	Total Count	%	Total Count	%	Total Count	%
Irene Complicated Stamped	404	60.75	666	66.87	1023	69.97	1223	70.05
Irene Incised	15	2.26	0		25	1.71	34	1.95
Plain	105	15.79	36	3.61	75	5.13	73	4.18
Burnished Plain	49	7.37	129	12.95	116	7.93	183	10.48
Savannah Check Stamped	2	0.30	1	0.10	1	0.07	0	
Savannah Fine Cord-Marked	4	0.60	1	0.10	6	0.41	0	
Clay Tempered Wares	5	0.75	24	2.41	4	0.27	13	0.74
Unclassified	81	12.18	139	13.96	212	14.50	220	12.60
Totals	665		996		1462		1746	

Table 11. Irene phase ceramic variation by Site Size Class.

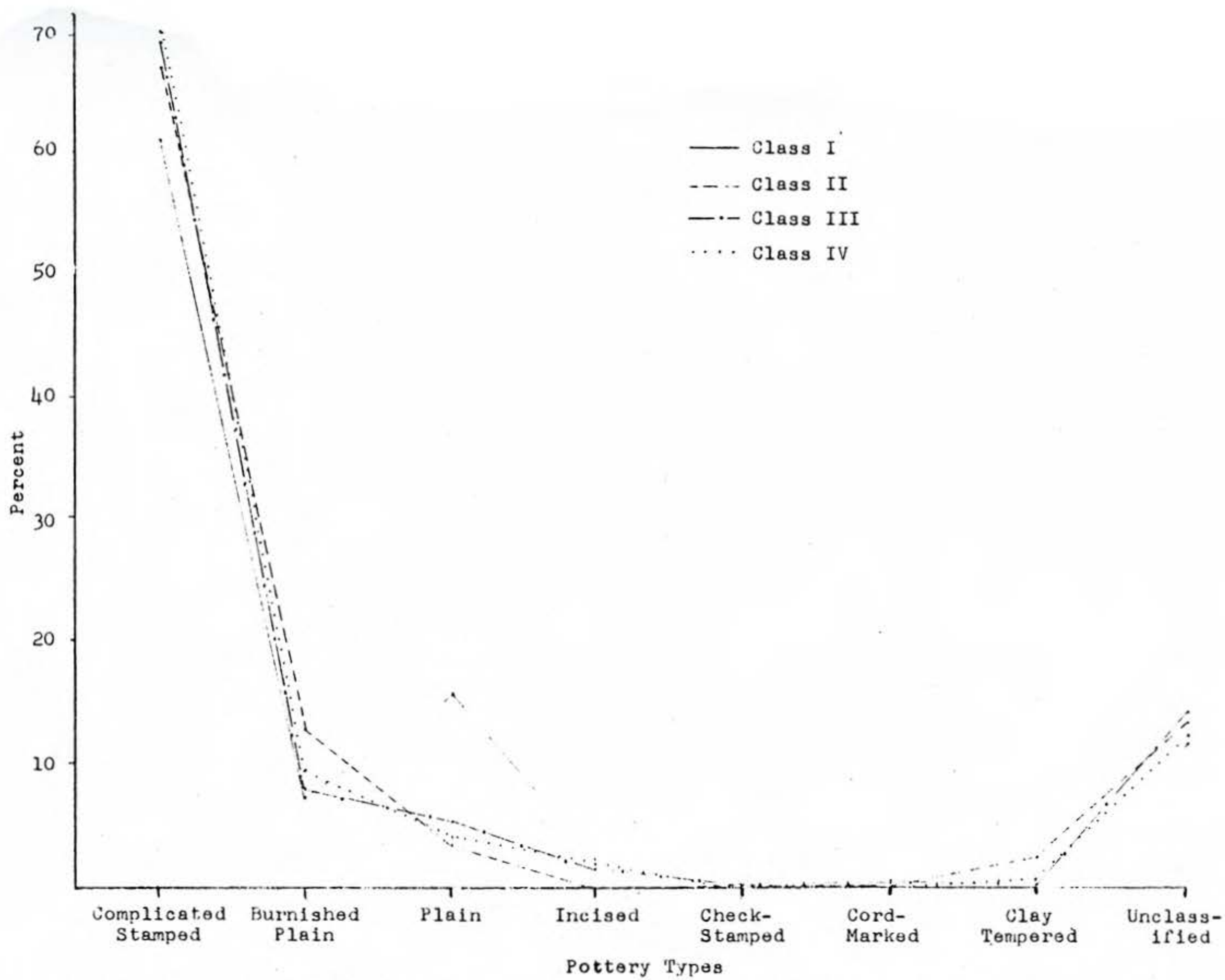

Figure 19. Frequency distribution of Irene Phase pottery types by Site Size Class.

terms of their occurance on various vessel forms and in terms of their spatial distribution among Ossabaw Island sites. This approach appears to have potential in delineating social or temporal aggregates. Unfortunately the rim sherd sample is too small to be useful in this type of analysis.

The ceramic analysis presented here does suggest that rather striking differences exist between the two phases in terms of the variability extant in ceramic collections from different sites. Little variability is seen among the four Irene phase site size classes in terms of proportional representation of the various pottery types (Fig. 19). In fact, this consistency is evidently found at all known Irene phase sites (Caldwell 1943; Cook 1971, 1978; Goad 1975; Pearson 1977). The Savannah phase, on the other hand, displays a great diversity in ceramic collections. This is seen among the proposed levels of the hierarchy on Ossabaw Island (Fig. 17) and between individual Savannah phase sites both on and off the island.

The Savannah phase ceramic variability is, in part, related to temporal factors. However, this fact does not seem to adequately explain all of the existing variability among Savannah phase ceramic collections, especially if we consider that the time spans for both the Savannah and Irene phases are equal. Why does the Irene phase show remarkable ceramic consistency through time and space while the Savannah phase displays greater variability? It is suggested that socio-cultural factors in large part underlay these differences. Although these factors are presently unidentifiable,the differences in the "structure" of these two phases (as evident in the settlement structure) suggests very different socio-cultural configurations.

Summary and Discussion

This section has been directed at assessing the structure of the Savannah and Irene phase settlement systems on Ossabaw Island. Factors which are considered important affectors of settlement location have been utilized along with identifiable characteristics of settlement structure, to develop a model of settlement for each phase. These models, in broader perspective, are perceived as generalized statements about cultural adaptation during the Mississippian Period on Ossabaw and, to some extent, in coastal Georgia.

This section presents a summary and discussion of the patterns and variability evident in the proposed settlement system of each phase and of the general trends evident in settlement throughout the Mississippian Period.

The Settlement Hierarchy

The two site hierarchies developed appear reasonable in light of the available archaeological data. The nature of the data permits only generalized statements to be made concerning the types of cultural activities associated with each level of the proposed hierarchies but allows for an assessment of the relative importance of each level in the total settlement system.

Class I. This class is represented by a single site in each phase. The Savannah phase Class I site is Ch 158N and is also the largest site on the island (324,000 m^2) and contains the majority of the Savannah phase burial mounds on the island. Ch 158S is the Irene phase Class I site and is the second largest site on the island (140,000 m^2).

Based on the environmental and archaeological factors discussed, these sites were probably the centers of economic, social, and religious importance for the island during their respective phases. These two sites are geographically located so as to minimize the efforts needed to extend control over the island and to maintain off-island interactions.

The size, presence of extensive pre-Mississippian Period occupations, and the number and size of burial mounds all differentiate these Class I sites from others in their phases. These factors, coupled with ideal environmental conditions also suggest that these sites were permanent settlements.

The relative importance of these sites as centers with respect to the island as a whole apparently varied. The Savannah phase Class I site was apparently extremely important as the population center and presumably acted as the foci for the majority of the socio-political activities on the island. If, as is postulated, the local population existed as a discrete social unit at some levels of socio-cultural activity then it is probable that this site acted as the island center for particular socio-cultural systems.

The Irene phase Class I site was apparently less important than its Savannah phase counterpart. It maintained itself as the largest site on the island but it does not appear to have contained the majority of the island's population. The presence of burial mounds at several medium sized sites suggests that some of the social correlates of mortuary activity had been absorbed by these sites at the expense of the largest site.

Class II. This class contains two Savannah phase sites and seven Irene phase sites, several of which have been extensively disturbed by modern agriculture.

The Savannah phase Class II sites have a mean size of 87,630 m^2, much larger than the mean size for comparable Irene phase sites, 37,735 m^2. The total area of Class II sites and the relative proportions of area they represent for each phase is very different. Class II Savannah phase sites cover an area of 175,260 m^2 and provide 32% of the total Savannah phase occupation. Irene phase Class II sites cover an area of 264,144 m^2 and comprise 40% of the total Irene phase occupation. Absolutely and relatively the Irene phase Class II sites were apparently more important within their settlement system than were the Savannah phase Class II sites in theirs.

One Savannah phase Class II site, Ch 160, and one Irene phase Class II site, Ch 150, contain burial mounds. The two Savannah phase Class II sites contain evidence of pre-Mississippian occupation and one, Ch 155, contains evidence of extensive Irene phase occupation. Only three of the Irene phase Class II sites contain evidence of significant pre-Irene occupation, suggesting that the majority of the Class II Irene phase sites developed during the Irene phase and supporting the hypothesis that a major structural difference between Savannah and Irene phase settlement was the growth and development of middle sized sites during the latter phase.

It is assumed that many of the Irene phase Class II sites represent permanent settlement. The one exception may be site Ch 202, which is located on El soil, a type which is seasonally wet or flooded.

It is difficult to place functional titles on these sites except to say that, in general, they made up the second level of the hierarchy during each phase and that their relative importance grew through time.

Class III. This class contains nine Savannah phase sites and nineteen Irene phase sites. Class III Savannah phase sites comprise a total area of 40,886 m^2 or 8% of the total Savannah phase area on the island. Irene phase Class III sites comprise an area of 205,835 m^2 or 31% of the total area occupied during the Irene phase. These figures emphasize the absolute and relative importance of this range of Irene phase sites with respect to the Savannah phase sites. These differences in number and importance of sites in this size class further supports the suggested shift in settlement structure during these two phases.

It is noted, however, that because of differences evident in the structure of the two settlement systems, these size classes may not be presumed equivalent in all aspects of socio-cultural activities. Some of the Savannah phase Class III sites may be more appropriately considered similar to Irene phase Class IV sites.

Only two (10.5%) of the Class III Irene phase sites contain evidence or pre-Irene phase occupation (Ch 176 and Ch 145). One of these sites, Ch 145, is located on one of the small hammocks in the marsh west of the main island (Fig. 11). This hammock would have provided an ideal base from which to exploit marsh-estuary resources. It may be that this site was occupied through a long period of prehistory only for this reason, and, as such, was functionally different from other Class III sites.

Six (67%) of the Savannah phase Class III sites display evidence of occupation during other phases. Of these, four contain ceramics from earlier periods. This data tends to suggest that a large number of Class III sites developed during the Irene phase in previously unocc-upied areas. This does not appear to have been the general trend during the Savannah phase.

None of the Savannah phase Class III sites contain burial mounds, while six of the Irene phase sites have mounds. These mounds are much smaller than those found at the larger sites, probably because they ser-ved a smaller population or because they were functionally different from those at larger sites.

If burial mounds are, to some extent, indicators of both permancy of settlement and socio-religious autonomy, those Irene phase Class III sites with burial mounds may have been small permanent settlements with the mounds at each site serving only the inhabitants of that particular settlement.

Many Class III Irene phase sites, including all of those with burial mounds, are postulated to have been established as the result of a com-bination of shifts in settlement structure and population expansion dur-ing the Mississippian Period. It is interesting to note here that only one of the Class III sites with burial mounds is located on the most desirable soil type (Lp). The others are located on soil types 2,3, or 4, supporting the hypothesis that as permanent settlements developed or dispersed themselves over the island some would have to opt for locating on soil types other than the most desirable. The settlement strategy was apparently to select a less valuable soil type but one amenable to permanent settlement (i.e. no seasonal flooding).

A number of Class III settlements for both phases are assumed to represent seasonal or temporary occupations. The large number of these sites during the Irene phase is assumed to have been the result of a seasonal dispersal of a portion of the population over the island. It is assumed, however, that the island as a whole and many of the large sites maintained permanent populations.

Class IV. This range of smaller sites, present only during the Irene phase, consists of 35 sites. These sites demonstrate the greatest diversity of location among all of the site classes. In general, these sites are considered to have been the location of a single, or, at most, a limited range of cultural activities. Most were probably short-term occupations, perhaps representing only a single day's occupation.

Variations in the location of these sites does occur indicating that several different kinds of Class IV sites may have existed. Since most of these sites are considered to have been limited activity extractive sites the variability in site location probably represents variability in the type of resource(s) being procured and possibly processed at different sites. Available data suggests that many Class IV sites represent shellfish gathering stations.

The reason for the almost total lack of smaller sites during the Savannah pahse is unknown. It would appear that there was little use of temporary, special activity sites during the Savannah phase possibly reflecting a lack of the seasonal dispersal of population over the island as is proposed for the Irene phase.

It is apparent that significant structural differences existed between the Savannah and Irene phase settlement systems. The Savannah phase is characterized by what is here called a "nucleated" pattern of settlement while the Irene phase is characterized by a "dispersed" pattern. These terms reflect the structure of the settlement system as well as some of the assumed patterns of population dispersal over the island during the year.

The settlement systems are in other respects similar, especially in terms of the strategy of site location. In both phases, larger settlement location is dictated by similar environmental factors, in particular those related to the exploitation of marsh-estuary resources, possibility of year round settlement, and feasibility of agriculture. During both phases there is more variability in terms of smaller site location with these sites, in general, being located in less valued environmental settings than are larger sites.

Abundant archaeological and historical evidence exists which documents the change from a highly complex and structured socio-political organization extant during the Mississippian Period to the less complex cultural systems known among the historic groups of the Southeastern United States. This change was accompanied by the loss of many of the material attributes of the Mississippian Period including large villages and platform mounds. It is suggested that the shift from a nucleated to a dispersed settlement structure found on Ossabaw Island is, in part, a reflection of this pan-Southeastern breakdown of the complex Mississippian socio-cultural system. Apparently, this change occured on the Georgia coast before European contact.

Shifts from a nucleated pattern of settlement during the Middle Mississippian Period to a dispersed pattern in the Late Mississippian have been noted elsewhere (Green and Munson 1977; David J. Hally, personal communication). A wide variety of socio-cultural factors likely lie behind the observed shift from a nucleated to a dispersed system. Green and Munson (1977) have suggested that, in southwestern Indiana, a nucleated settlement pattern is possibly a response to warfare. The ethnohistorical literature of the Southeast provides a number of examples demonstrating the relationship between nucleation and warfare. James Adair (1968) noted that among the Choctaw compact villages were found only on the frontiers adjacent to the Chickasaws and Creeks. In the interior of their territory the Choctaw lived in dispersed settlements. Among the Cherokee, Fogelson and Kutsche (1961) found the same phenomena and Swanton (1928:438), relying on narratives of the DeSoto expedition, concluded that the Creeks had towns only on their borders and lived in a dispersed pattern in the interior of their territory. Rowlands (1972) has shown that the nucleation of populations is a common response to warfare throughout the world. Generally, nucleated settlements were also fortified, about which there is no data for the Ossabaw Island settlements.

The dispersed pattern of settlement, on the other hand, has the advantage of minimizing the effort needed to exploit various resources. This may especially be true if agriculture was important on the coast.

Larson (1970) has suggested that during the late prehistoric period on the Georgia coast frequent shifts in settlement were probable due to the poorness of the soil and to the lack of large expanses of suitable agricultural land. The soil map of Ossabaw Island indicates the diverse nature of soils showing that much of the agriculturally suitable soils exist as small pockets (Wilkes et al. 1974). The restricted local distribution of a soil together with its agricultural potential were "the primary reasons for the scattered and small size of the agricultural production unit (Larson 1970:297)."

Archaeological evidence for agriculture is scanty for the Georgia coast largely because of the lack of extensive excavations or the employment of suitable recovery techniques. It is assumed that cultivated crops were, to varying degrees, important to both Savannah and Irene phase populations and a variety of factors related to horticulture may have contributed to the observed settlement patterns of the two phases. The large sites of both phases tend to be located on the largest expanses of the most desirable agricultural land (Lakeland Fine Sand) on the island. Soil overuse and exhaustion during the Savannah and Irene phases may have necessitated the dispersal of populations during the Irene phase in order to exploit the smaller plots of soil.

A variety of causal factors likely lie behind the observed differences in the structure of settlement of the two phases. The nature of the available archaeological data does not, however, permit an evaluation of most of these factors. Information on one important influence on settlement, subsistence strategy, is retrievable from the archaeological record. The following chapters of this dissertation examine subsistence data from the Savannah and Irene phases and develop a model of subsistence strategy for both phases. Emphasis is placed on an assessment of the pattern of subsistence evident during each phase and in determining if the observable differences in settlement can be attributed to differences in the patterns of subsistence of Savannah and Irene phase populations.

CHAPTER VI

SUBSISTENCE SYSTEM ANALYSIS

Introduction

This chapter discusses the subsistence strategy of Ossabaw Island's Savannah and Irene phase populations based on the analysis of a variety of data. The similarities and differences in the subsistence patterns of the two phases will be assessed by examining this data in light of various individual strategies of subsistence. One assumption generally fundamental in a discussion of Mississippian Period subsistence is that the subsistence strategy was built around the exigencies of maize, bean, and squash horticulture. This assumption is not necessarily valid for the Georgia coast. The general poorness of the area's soils for agriculture, and the extreme abundance of the marsh-estuary system in terms of fish and shellfish dictates a type of subsistence different from that supposed to have been practiced by inland Mississippian groups. The coastal populations, although horticultural, relied heavily on the resources of the marshes and estuaries.

In particular, they appear to have relied heavily on the shellfish, fish, and mammals which abound in this region. For this reason the emphasis on subsistence analysis is placed upon the patterns of animal exploitation rather than upon plant exploitation. Plant remains, both wild and cultivated, were recovered in very small quantities and are discussed minimally.

Since it has been proposed that functional variability existed among sites, one would expect that subsistence remains would vary from site to site dependent upon the type of activities occuring there or upon the time of year the site was occupied. It is also possible that differences in the subsistence patterns of the two phases may be responsible for the substantial differences observed in their settlement structures. To identify this possible variability, as well as the overall subsistence strategy for each phase, data from several sites in each phase assumed to have been functionally different were gathered.

Subsistence data are analyzed in terms of addressing several questions concerning the patterns of exploitation employed during each phase. These include: 1. What were the types and relative importance of various species in the diet of each phase?; 2. What species, if any, were selected for in preference over others?; 3. Are there differences in the faunal collections from the two phases which would suggest variations in the subsistence strategies of the Savannah and Irene phase populations?; and 4. What do the faunal remains suggest concerning site function and season of occupation?

Previous attempts to examine the subsistence of Mississippian Period coastal populations have been cursory or incomplete. Listings of species recovered and brief statements concerning the probable patterns of subsistence have been the most common approach (Caldwell 1943; Caldwell and McCann 1941; Larson 1970). Lewis Larson (1970) has provided an overview of subsistence practices of the late prehistoric populations of the region but has relied mainly on historical documentation and not archaeological data. The few studies which have attempted, at least, preliminary quantification of faunal remains (Wallace 1975; Martinez 1975) have resulted in broad sweeping statements about seasonality and shifting subsistence strategy which are unsupported by the quality of the data bases used.

In order to understand the position of coastal subsistence patterns relative to the general Mississippian Period pattern, comparisons must be made with other data sets. Unfortunately, few studies of Mississippian Period populations contain the sort of quantified subsistence data which permit reasonable comparisons with the Ossabaw Island material. Those studies that are relied upon for comparative purposes include David J. Hally's (Roth 1977) data from the Little Egypt site, a Mississippian Period site in north Georgia; Barry Lewis' (1974) study of Mississippian Period subsistence in southeastern Missouri, in particular his data from the Callahan-Thompson site; and, especially, upon Bruce D. Smith's (1975) study dealing with the patterns of animal exploitation practiced by Middle Mississippian Valley populations. Although these studies are most extensively relied upon, other comparative data is called upon where appropriate.

In the analyses and interpretations presented, the limitations of the data base are kept in mind. The conclusions are put forth as tentative statements which may require modification with additional data. The conclusions are logical in light of the data and analysis presented and provide a base line of information concerning the general patterns of subsistence practiced in coastal Georgia during the Mississippian Period.

Analysis and Data Collection

Two sets of subsistence data were collected and each was analyzed differently. One analysis was conducted on a sample of subsistence materials obtained from the excavation and screening (¼" screen mesh) of 1 X 1 meter test pits excavated in a total of 26 middens at five sites. This sample is here referred to as the "screen sample". The other sample used in analysis consisted of column samples of complete midden matrix taken from three sites. This sample is referred to as the "column sample". The nature of the samples dictated that different techniques be employed in the analysis of each.

The sites selected for the screen sample analysis provide a cross section of presumed site types based on the size classes discussed previously. Three of the sites chosen represent Irene phase occupations and two are Savannah phase sites. The Irene phase sites are Ch 202, Ch 198, and Ch 255. The location of these sites is shown in Fig. 20.

Ch 202 is a large Irene phase site comprising an area of 55,070 m^2 at which 84 shell middens were mapped. Eight middens were tested at this site. Ch 198 is a medium sized Irene phase site covering an area of 9,766 m^2. A small burial mound and 14 middens were located at this site. Subsistence material for this site was obtained from test excavations in two middens. Ch 255 is a small Irene phase site consisting of four shell middens covering an area of 1,858 m^2. Three middens were tested at this site.

The two Savannah phase sites used were Ch 158N and Ch 266 (Fig. 20). A major reason for selecting these sites is that they are the only Savannah phase sites on the island containing relatively undisturbed

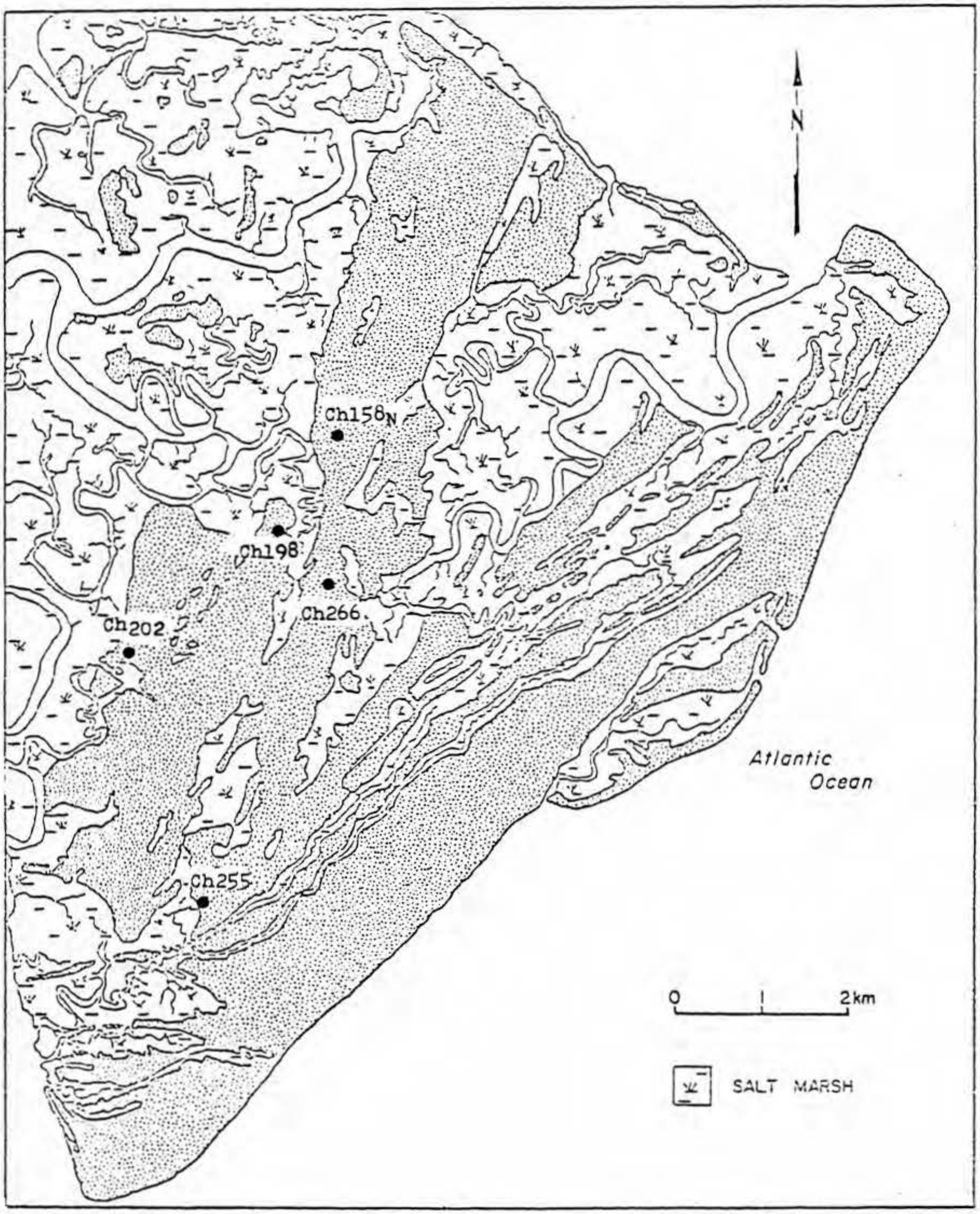

Figure 20. Sites providing data for subsistence analysis.

middens. Ch 158N is the largest prehistoric site on Ossabaw Island and is rather complex in terms of its cultural component composition. The Savannah phase portion of the site comprises an estimated area of 324,000 m^2. Within this area 188 shell middens have been mapped, however much of the site area has been disturbed by recent agriculture and this number probably represents less than one half of the total number of middens at the site. Five burial mounds are located at Ch 158N, three of which are totally or partially associated with the Savannah phase. Eight middens were tested at this site.

Ch 266 is a Class III Savannah phase site containing nine middens and covering an area of 5,562 m^2. Five middens were tested at this site.

When selecting middens for testing, an attempt was made to obtain a broad areal coverage of the site. This was done by selecting, for example, every 3rd or 10th midden or some other interval which would provide a reasonable (circa 10% or greater) sample.

This sampling procedure could not be rigidly adhered to since middens selected were often too disturbed or overgrown to permit adequate testing. In these instances, the closest adjacent midden was selected for testing. At site Ch 158N considerably fewer than 10% of the known middens were tested, because portions of the site were mapped, and additional middens added, after the testing had been completed.

It should be noted that the sample used here does not comprise the total number of middens and sites tested during the course of the fieldwork. In all, a total of 56 middens were tested at 19 different sites. The time and effort involved in analyzing all of these materials was prohibitive and the present sample was selected as one which would provide adequate information on the subsistence strategies of each phase.

Shell, especially oyster, comprised the bulk of the recovered material in all middens tested. Because of the difficulties involved in handling this tremendous quantity of shell, no attempt was made to retain or quantify shellfish in the screen sample. The various species of molluscs recovered in each midden are noted (Appendix III), however, the analysis of the screened sample excludes shellfish from quantitative consideration. The screen sample provides information on the non-mollusca segment of the diet of the two phases. Column sampling was utilized to provide quantitative data on all subsistence remains, including molluscs.

The column sampling consisted of taking, and quantitatively analyzing complete samples of midden matrix. Samples were taken from a selected midden at each of three sites. The sites selected were Ch 158N, Ch 266, and Ch 255. The middens selected also provided data for the screen sample. These sites represent both phases and a range of site types in terms of size and geographical location.

These two types of analysis, the column sampling and the ¼ inch screened sample, are complimentary to one another in terms of the kind of subsistence information they provide. When taken together they are considered sufficient to provide information on the basic patterns of the subsistence strategy of both phases. The result of each of these analyses are discussed below.

The Screen Sample

The screen sample provides information on the non-molluscan segment of the diet. Floral remains were rare in this sample, therefore, this discussion centers mainly around the assessment of the faunal species recovered. The analysis concerns itself with an assessment of the types of animals exploited and the relative importance of each species. For each midden analyzed the basic information obtained consisted of the identification of species represented, the number of skeletal elements represented for each identified species, the minimum number of individuals (MNI) represented by each species, and the estimated amount of edible meat provided by each species. The results of this analysis are presented in tabular form in Table 12 in combined form by phase. Subsistence data by site and midden is given in Appendix III. Table 12 will be referred to frequently in the following discussion.

Estimation of Minimum Number of Individuals (MNI)

Grayson (1973) has recently discussed the various ways in which MNI is computed and the variability which can occur in the final results when different techniques are utilized. It is important, therefore, that the analyst be explicit and consistent in the manner in which MNI is determined. MNI here was determined by counting the greatest number of unique skeletal elements for any single species (Ziegler 1973:25). In this determination, age, size, and other distinguishing characteristics were taken into account when applicable.

As Grayson (1973:433) has noted, the unit of analysis (i.e. excavation unit or level) used to estimate MNI is an important consideration in faunal analysis, in that, the use of different analytical units results in differing estimates of MNI for the same data set. In the analysis presented here each shell midden tested is considered a separate analytical unit and MNI is computed as such. This means that fuanal remains from a site were not lumped together in determining MNI but rather each midden was treated as a separate unit. This approach tends to maximize the MNI count for each site (Grayson 1973). It is possible that the remains of one deer, for example, may be found in two different middens and be counted as two individuals rather than one. On the other hand, the remains of several deer from several middens could be counted as one individual if the material from all middens were lumped in the estimation of MNI.

There is no "correct" way to approach the MNI delimna. The decision as to how to treat material from various excavation units must be based on assumptions about the data and the conditions behind its deposition. Here, each midden is treated as a single depositional unit and MNI is determined on this assumption. It is, of course, possible that the remains of one animal could be distributed across several middens. This is impossible to determine, however, except in those situations involving a highly unique form.

Despite its inherent difficulties, the determination of MNI is an accepted and standard archaeological procedure and is used here to provide a basis for present and future comparisons.

Meat Weight Estimates

The estimated amount of usable meat provided by each identified species was also calculated. This figure is valuable as a measure of the relative (%) importance of each species but is not necessarily useful as an indication of the actual amount of meat provided. Average weight values for species are taken from a variety of sources. Data pertaining to coastal Georgia or to the Southeast were used where available.

Table 12 presents the total figures on faunal remains for each phase (Appendix III provides a list of this information for each site and midden separately). An examination of this table indicates that the non-mollusca faunal sample collection from the five sites is small. This, of course, has some implications for interpreting the intensity of exploitation of these fauna but, additionally, it prohibits a rigorus and sophisticated analysis of the data such as that undertaken by Bruce Smith (1975) on faunal remains from several Mississippian Period sites in the Middle Mississippi Valley. The data can, however, be used to elucidate the general patterns of exploitation for each phase and to address the questions of selectivity and intensity of exploitation of certain species.

Patterns of Exploitation

Mammals

Mammals, especially deer, make up the overwhelming majority of the estimated meat yield for all identified non-mollusca species, constituting 96% of the estimated meat yield for the Savannah phase and 98% for the Irene phase (Table 12). Only three mammal species, the white-tailed deer (Odocoileus virginianus), the raccoon (Procyon lotor), and the marsh rabbit (Sylvilagus palustris) have been identified from the faunal remains. These three species have been identified for both phases and will be discussed below.

White-tailed Deer

The white-tailed deer was the most heavily exploited species for both phases, providing 78% of the total estimated meat yield during the Savannah phase and 85% during the Irene phase. The subspecies, _Odocoileus virginianus nigribarbis_, occurs on several of the sea islands today and is assumed to have occupied all of the sea islands in the past (Johnson _et al_. 1974:59). This subspecies is characteristically much smaller than the mainland variety. As found on Blackbeard Island, where it exists in its pure form (Johnson _et al_. 1974:99), this deer species averages about 30 kg in weight with mature bucks weighing up to 40kg (Johnson _et al_. 1974:99). This 30 kg figure is used in the determination of estimated meat yield. The figure used for determining the edible portion of total deer weight is 58% (Hamilton 1947).

The importance of the white-tailed deer is characteristic of almost every Mississippian group studied (Lewis 1974; Parmalle 1957, 1970; Roth 1977; Smith 1975; van der Schalie and Parmalee 1960). Abundant historical evidence also exists which demonstrates the importance of the white-tailed deer to aboriginal populations of the Southeastern United States. Swanton (1946) points out the importance of deer to historic groups because of its relative ease of capture in relation to its high return. This is especially true since all parts of the deer were utilized; the flesh and marrow were eaten, and the bones, hide, sinew, and antler provided raw material for the manufacture of tools, clothing, containers, etc.

The relative importance of the white-tailed deer in the Ossabaw Island collection falls within the range of that found at other Mississippian Period sites. Smith (1975:Table 30) estimates that deer provided from 86% to 94% of the total annual meat yield of the seven most important food species in the groups he studied in the Middle Mississippi Valley area. Lewis (1974:75) estimates that deer provided 75% of the total meat yield at the Callahan-Thompson site in Missouri. No comparative data is available from Mississippian Period sites in the coastal region of Georgia, however, in north Georgia, Roth (1977: Table 44) shows a slightly lower figure of 65% as the contribution of deer to the total meat yield at the Little Egypt site. This lower percentage figure is due to the rather high estimate of MNI for black bear (Ursus americanus) at this site (22 individuals from 45 elements).

If we consider the contribution of deer in relation to only the most important food animals (in this case the three mammal species) as did Smith in his analysis (1975), deer provide 81% and 88% of the estimated meat yield for the Savannah and Irene phases respectively. This represents only a slight increase over the total faunal collection figures due to the overwhelming importance of mammals in the total collection.

Some characteristics of the deer faunal collection should be noted. Deer bone, especially long bones, from all middens tended to be extremely fragmented. In fact, not a single complete long bone was recovered. This would suggest that an attempt was made to gain the maximum food value from the deer by breaking the bone for marrow extraction or to obtain bone splinters for awl manufacture. This

Table 12. Subsistence data from the screen sample.

	Elements	Percent of Elements	MNI	Weight per individual (kg)	Percent edible meat	Meat yield (kg)	Meat yield (%)
Savannah phase							
CLASS MAMMALIA							
White-tailed deer (Odocoileus virginianus nigribarbis)	50	10.37	11	30.0	0.57	188.1	77.66
Raccoon (Procyon lotor)	21	4.36	7	8.0	0.70	39.2	16.18
Marsh rabbit (Sylvilagus palustrus)	16	3.32	5	1.3	0.70	4.6	1.90
Unidentified mammal	64	13.28					
TOTAL MAMMAL	151	31.33				231.9	95.74
CLASS PISCES							
Longnose gar (Lepisosteur osseus)	1	0.21	1	1.1	0.80	0.9	0.37
Sea catfish (Arius felis)	9	1.87	3	.7	0.80	1.7	0.70
Mullet (Mugil sp.)	6	1.24	1	.5	0.80	0.4	0.17
Spotted seatrout (Cynoscion nebulosus)	13	2.70	2	.9	0.80	1.4	0.58
Channel Bass (Sciaonops ocellata)	6	1.24	2	1.1	0.80	1.8	0.74
Drum (Sciaenidae)	1	0.21	1	1.1	0.80	0.9	0.37
Flounder (Paralichthys sp.)	1	0.21	1	1.0	0.80	0.8	0.33
Unidentified fish	32	6.64					
TOTAL FISH	69	14.32				7.9	3.26

Table 12. Continued.

	Elements	Percent of Elements	MNI	Weight per individual (kg)	Percent edible meat	Meat yield (kg)	Meat Yield (%)
CLASS REPTILIA							
Turtles:							
Diamondback terrapin (Malaclemys terrapin centrata)	75	15.56	6	0.7	0.20	0.8	0.33
Yellow-bellied turtle (Pseudemys scripta scripta)	6	1.24	1	0.7	0.20	0.1	0.04
Pond slider (Pseudemys sp.)	7	1.45	2	0.7	0.20	0.3	0.12
Eastern mud turtle (Kinosternon subrubrum subrubrum)	7	1.45	2	0.3	0.20	0.1	0.04
Unidentified turtle	136	28.22					
TOTAL TURTLE	231	47.93				1.3	0.54
Other Reptiles:							
Rattlesnake (Crotalus sp.)	1	0.21	1	1.3	0.50	0.7	0.29
TOTAL REPTILE	232	48.14				2.0	0.93
CLASS AVES							
Clapper rail (Rallus longirostris)	2	0.41	1	0.3	0.70	0.4	0.17
Unidentified bird	3	0.62					
TOTAL BIRD	5	1.04				0.4	0.17
CLASS CRUSTACEA							
Blue crab (Callinectus sapidus)	25	5.19					
SAVANNAH PHASE TOTAL ALL CATEGORIES	482					242.4	

Table 12. Continued.

	Elements	Percent of Elements	MNI	Weight per individual (kg)	Percent edible meat	Meat yield (kg)	Meat Yield (%)
Irene phase							
CLASS MAMMALIA							
White-tailed deer (Odocoileus virginianus nigribarbis)	102	27.49	12	30.0	0.57	205.2	85.26
Raccoon (Procyon lotor)	9	2.43	5	8.0	0.70	28.0	11.63
Marsh rabbit (Sylvilagus palustrus)	6	1.62	2	1.3	0.80	1.8	0.76
Unidentified mammal	11						
TOTAL MAMMAL	128	34.50				235.0	97.67
CLASS PISCES							
Sea catfish (Arius felis)	39	10.51	5	0.7	0.80	2.8	1.16
Southern kingfish (Menticirrhus americanus)	2	0.54	1	0.3	0.80	0.2	0.08
Drum (Sciaenidae)	1	0.27	1	1.1	0.80	0.9	0.37
Unidentified fish	90	24.26					
TOTAL FISH	132	35.58				3.9	1.62

Table 12. Continued.

	Elements	Percent of Elements	MNI	Weight per individual (kg)	Percent edible meat	Meat yield (kg)	Meat yield (%)
CLASS REPTILIA							
Turtles:							
Diamondback terrapin (Malaclemys terrapin centrata)	25	6.74	5	0.7	0.20	0.7	0.29
Eastern mud turtle (Kinosternon subrubrum subrubrum)	8	2.16	2	0.3	0.20	0.1	0.04
Mud trutle (Kinosternidae)	3	0.81	2	0.3	0.20	0.1	0.04
Unidentified turtle	49	13.21					
Total Turtle	85	22.91				0.9	0.40
Other reptiles:							
Black racer (Coluber constrictor constrictor)	3	0.81	1	0.6	0.50	0.3	0.12
Unidentified reptile	3						
TOTAL REPTILE	91	24.53				1.2	0.59
CLASS AVES							
Wood duck (Aix sponsa)	1	0.27	1	0.7	0.70	0.5	0.21
Unidentified bird	4	1.08					
TOTAL BIRD	5	1.35				0.5	0.21
CLASS CRUSTACEA							
Blue crab (Callinectus sapidus)	15	4.04					
IRENE PHASE TOTAL ALL CATEGORIES	371					240.6	

characteristic has been noted in other Mississippian Period faunal collections (Lewis 1974:51; Pearson n.d.). Because of the fragmented nature of the identified deer bone, it is assumed that a large percentage of the unidentified mammal bone that was recovered is deer.

Deer bone was recovered at all sites tested and in all but five of the middens analyzed (Appendix III). The occurance of deer bone in over 80% of the middens tested helps substantiate its assumed importance and widespread exploitation. This also tentatively suggests that the hunting and/or butchering and consumption of deer was not restricted to particular sites or locations within sites.

In order to investigate the possibility that preferential use of deer may have existed, skeletal elements from each site were compared. This compiled data for deer meat cuts is presented in Table 13. The data suggests no apparent difference by site or by phase in the utilization of deer, nor does it suggest any overall patterns of selection or utilization of specific meat cuts.

Raccoon

The raccoon, Procyon lotor, represents the second most important mammal species exploited. This species provided 16% of the estimated total meat yield for the Savannah phase and 12% for the Irene phase (Table 12).

Raccoons are ubiquitous on the coastal islands and are very common on Ossabaw Island today, occupying all of the habitats on the island. The raccoon is relatively easily hunted on the islands, partially because its activities are largely regulated by tidal fluctuations.

Element	Provenience Ch158N	Ch266	Total Savannah Phase	Ch198	Ch202	Ch255	Total Irene Phase
Scapula	3		3			2	2
Humerus					1		1
Radius	3		3	1	1		2
Ulna							
Carpals							
Metacarpals	1	2	3	1		4	5
Total forelimb			9				10
Pelvis		2	2	2	2		4
Femur					2		2
Tibia-fibula	2	2	4		7	1	8
Calcanius					1		1
Astragalus	1	1	2				
Tarsals	2		2				
Metatarsals	3	3	6	1	2	3	6
Total hindquarter			15				21
Other	5	7	12	1	13	12	26

Table 13. Distribution of deer meat cuts.

During low tides raccoons frequent the marshes and tidal flats to feed. Here they are easily seen, though not so easily killed. During periods of high tide, raccoons return to the highland to forage or sleep, commonly nesting or sleeping in larger trees growing along the marsh edge. Here the raccoons are easily seen and taken. Today, a common fall and winter hunting technique is to walk along the marsh edge at high tide looking in the trees for nesting raccoons.

Estimated meat yield for raccoons is based on an average individual weight of 8 kg given by Golley (1962:183), and an estimated percentage of edible meat of 70% of live weight (White 1953; Cleland 1966).

Raccoon remains are commonly represented in Mississippian Period faunal assembledges. Although no quantified data is available, raccoon remains have been reported at other Mississippian Period sites in coastal Georgia (Caldwell 1943; Caldwell and McCann 1941; Larson 1970; Pearson 1977, n.d.). The contribution of raccoon to the total estimated meat yield in the Ossabaw Island collections is slightly higher than those given by Smith for sites in the Middle Mississippi Valley (Smith 1975:Table 30). His estimates for the relative importance of raccoon in terms of estimated meat yield range from 0.6% to 5% for the seven sites analyzed. Lewis (1974:52) estimates raccoon provided 0.01% of the estimated edible meat yield at the Callahan-Thompson site in Missouri. At the Little Egypt site raccoon provided 0.8% of the total estimated meat yield (Roth 1977:Table 44).

The higher representation of raccoon in the Ossabaw data may be related to several factors. It may be attributed to an actual cultural dietary preference or, and possibly more likely, it may reflect the high raccoon densities on the islands and the relative ease with which raccoons can be exploited because of their tidally controlled activities. The question of whether or not this high percentage of raccoon is related to a high population of raccoons on the island will be discussed later.

Marsh Rabbit

The third mammal species represented in the screen sample is the marsh rabbit, Sylvilagus palustris. This species represents only a slight contribution to the estimated meat yield for each phase, 2% for the Savannah phase and 0.7% for the Irene phase. This rabbit is found throughout the coastal lowlands and is seldom found far from a source of water (Golley 1962:85). Tomkins (1955) suggests that marsh rabbit populations are extremely high in the brackish water swamps of the Savannah and Altamaha Rivers. The marsh rabbit is small, having an average weight of 1.3 kg (Golley 1962:85). This figure is used in conjunction with a value of 70% provided by White (1953) as an estimate of the percentage of edible meat per individual in the calculation of estimated meat yield for the species (Table 12).

In studies that have attempted to quantify subsistence data, rabbit tends to provide only a small percentage of the estimated meat yield. Smith (1975) estimates that rabbit provided from 0.1% to 2% of the total meat yield in the sites he analyzed. Rabbit comprised 0.02% of the total meat yield at the Callahan-Thompson site in Missouri (Lewis 1974:52) and 0.1% of the total meat yield at the Little Egypt site (Roth 1977:Table 44). Rabbit remains have been reported from several other Mississippian sites on the Georgia coast (Caldwell 1943; Caldwell and McCann 1941; Larson 1970; Pearson n.d.) though none of the data is quantified.

The patterns of mammal exploitation practiced by the Savannah and Irene phase populations of Ossabaw Island are in some ways similar to those suggested for other Mississippian populations and in other ways unique. The importance of the white-tailed deer is characteristic of most Mississippian populations studied and the relative importance of the three mammal species exploited is similar to that found in other Mississippian Period faunal collections.

The most striking difference in the Ossabaw Island faunal collection relative to other Mississippian Period collections is the limited range of identified mammal species represented. Smith (1975) records a range of from 10 to 24 different mammal species at the sites he analyzed, Lewis (1974) lists 15 different mammal species from a site in southeastern Missouri and Parmalee (1957) lists 19 mammal species from the Cahokia site. Mississippian Period sites in Georgia provide a similar number of species; 18 at the Little Egypt site (Roth 1977), 15 at the Etowah site (van der Schalie and Parmalee 1960), and 11 at the Irene Mound site (Caldwell and McCann 1941).

The exploitation of such a narrow spectrum of mammals can, in part, be explained by the unique natural situation and environmental conditions found on Ossabaw and the other sea islands. Some of the species commonly found in other Mississippian faunal assembledges and missing from the Ossabaw collections are the opossum (Didelphis marsupialus), the black bear (Ursus americanus), and the gray squirrel (Sciurus carolinensis). The opossum, though common on the mainland and some of the sea islands, is absent today from several of the islands, including Ossabaw. Recent ecological studies (Johnson et al. 1974) have proposed that the opossum was at one time present on most or all of the sea islands but was exterminated on some due to historic hunting practices. It has been suggested that this extermination probably occured just after the Civil War when hunting pressure would have been high because other food supplies were scarce (Johnson et al. 1974:55-57).

It would appear from the faunal sample from Ossabaw Island, that the opossum may have been absent from the island prior to the historic period. This of course, assumes that the opossum would have been exploited by coastal populations if available. That it was utilized is evidenced by the faunal collections from mainland coastal sites such as the Irene Mound site (Caldwell and McCann 1941), the Pine Harbor site (Larson 1970), and the Redbird Creek site (Pearson n.d.). All of these sites are Mississippian Period sites located on the mainland adjacent to, or not far from the sea islands.

The opossum has also been reported from archaeological sites on other islands. On Sapelo Island, Waring and Larson (1968) and on St. Simon Island, Marrinan (1975) recovered opossum bones from Archaic Period sites. Martinez (1975) recovered opossum bone from a Woodland (?) Period site, also on St. Simons Island. The opossum evidently did occur prehistorically on some and possibly all of the Pleistocene islands on the Georgia coast. It is suggested that its absence from many of the islands today is due to long term exploitation by prehistoric human populations and not by historic over hunting. The opossum is not inclined to swim and once its population was diminished on the islands it was unlikely to be reestablished from the mainland. Deer, raccoon, and marsh rabbit, on the other hand, are excellent swimmers allowing for repopulation of the islands by these species.

The gray squirrel is also absent from the Ossabaw Island collection, though it tends to be a common species in other Mississippian Period faunal collections. Tomkins (1955) states that the gray squirrel was absent on several of the sea islands, including Ossabaw, and has only been recently introduced. This proposed lack of a squirrel population on Ossabaw Island would explain their absence in the faunal collection. The gray squirrel was hunted by coastal Mississippian populations since squirrel remains are noted at several mainland sites (Caldwell and McCann 1941; Pearson n.d.). Waring and Larson (1968) report a single gray squirrel bone from an Archaic Period site on Sapelo Island, one of the islands where Tomkins (1955) states squirrels have been only recently introduced, suggesting the possible occurance of squirrels on the island prehistorically (though it is possible the faunal remains on the island may represent individuals actually killed on the mainland). Like the opossum, it appears that the gray squirrel may have been exterminated or had its populations reduced on the islands by prehistoric populations. Additionally, as with the opossum, the squirrel is a poor swimmer and is unlikely to have repopulated the islands from the mainland.

It would appear that the opossum and the gray squirrel, animals commonly exploited by Mississippian populations elsewhere, including on the mainland adjacent to Ossabaw Island, are missing from the Ossabaw Island collection because these species did not occur or occured only in minimal numbers on the island during the Mississippian Period. Their absence from the island is probably partly due to over exploitation by prehistoric populations.

The black bear (Ursus americanus) is another mammal species commonly represented in Mississippian faunal collections yet missing from the Ossabaw Island material. Bear are not found on Ossabaw Island today, although they have occured there and on other sea islands in the past (Johnson et al. 1974). The small size of the island would have limited the size of the bear population and even slight hunting pressure would have exterminated or reduced their population to a minimum. It would appear that few, if any, bear lived on the island during the Mississippian Period.

Other animals that were expected to be found in the faunal collection from Ossabaw Island are the otter (Lutra canadensis), mink (Mustela vison), and the bobcat (Lynx rufus). These species occur on the island today and probably occured there in the past. Based on other Mississippian faunal collections these species would be expected to be rare occurances in the Ossabaw Island faunal collection. They are assumed to be missing from the Ossabaw sample because of the small sample size.

Pisces

Fish comprise the second most important food source in the screen sample (Table 12). Identified fish provide 3.3% and 1.6% respectively of the Savannah and Irene phase total estimated meat yield. Some difficulties encountered with the fish bone sample need be mentioned. First, fish remains are undoubtably underrepresented due to the collection procedures employed in this sample. A number of individuals (Marrinan 1975; Crook 1978; Pearson 1978) have pointed out that the fish bone recovered in coastal Georgia middens often represent extremely small individuals. Many of these fish bones probably passed through the ¼in. screen and were not recovered. Additionally, bone is well preserved in shell middens and many small or fragmented fish bones were recovered but are unidentifiable. This, added to the fact that many fish bones are undiagnostic, results in rather high counts of unidentifiable fish bone. Certain fish species, however, have very diagnositc and easily identified skeletal elements. On the Georgia coast, for example, catfish (Arius felis) spines and gar (Lepisosteus sp.) scales can generally be identified with relative ease, perhaps resulting in an over representation of these two species in archaeologically recovered samples. These factors limit, but do not prohibit, the interpretation of the fish remains used here.

Recent studies by the Georgia Game and Fish Commission on the fisheries resources of coastal Georgia, provide rather complete information on the distribution, relative seasonal abundance, and size composition of the fauna found in the tidal waters adjacent to Ossabaw Island (Mahood et al. 1974). This data was obtained from seining operations in the smaller tidal creeks and trawling carried out in the larger creeks and sounds. It is assumed that these modern records are fairly representative of prehistoric conditions.

Of the ten major species of fish taken in the small tidal creeks by seining, most represent young fish since the upper creeks serve as "nursery" areas (Mahood et al. 1974). Trawling in the larger creeks and rivers produced essentially the same species as found in the small creeks, but the catch generally consisted of larger sized individuals.

All of the fish species identified in the Savannah and Irene phase faunal collections are among those commonly found in the tidal creeks and rivers today. Additionally, the large majority of fish vertebra found in the Ossabaw Island faunal collection are from small individuals, probably indicating heavy exploitation of smaller tidal creeks. Many of the fish represented were too small to have been taken by hook. Since fish hooks are rare at Savannah and Irene phase sites (Pearson 1977:41), it would appear that many of the fish were taken with nets and/or weirs. The smaller tidal creeks would probably be the easiest place to stretch nets or to set up weirs.

No fresh water fish species are identified in the faunal sample and, with the exception of several species of minnows, no fresh water fish are found on Ossabaw Island today.

Reptiles

Turtles are represented in the faunal collections of both phases (Table 12). The most common species represented is the diamondback terrapin (Malaclymes terrapin centrata). The diamondback terrapin is very common in coastal Georgia, inhabiting the salt marshes throughout the year. This terrapin feeds mainly on periwinkles in the short spartina marsh during high tide (Johnson et al. 1974:79). Female terrapin come ashore and lay eggs just above the high tide line in late May and early June (Martoff 1963). Terrapin can be easily captured with nets in tidal creeks and this could have been done prehistorically. Additionally, females and their eggs can be collected during the nesting period.

Diamondback terrapin remains are commonly found at archaeological sites on the Georgia coast (Caldwell and McCann 1941; Larson 1970; Marrinan 1975; Martinez 1975; Pearson 1977), and were apparently utilized over a long prehistoric period. They are generally the most abundant turtle species represented at coastal sites.

The other turtle species are fresh water species. The yellow bellied mud turtle (Pseudemys scripta scripta), is common throughout the coastal region and utilized the numerous fresh water ponds and sloughs on Ossabaw Island. The eastern mud turtle (Kinosternon subrubrum subrubrum) inhabits shallow water such as small ponds and marshes and has a strong tolerance for brackish water (Conant 1975:43), one of the reasons for its abundance on the coastal islands.

The narrow range of turtle species exploited on Ossabaw Island in relation to other Mississippian populations (See Smith 1975) is due to the restricted number of species living on the island (Johnson et al. 1974:62). One turtle which could be expected to appear but does not is the loggerhead sea turtle, Caretta caretta caretta. Loggerheads would have provided an abundant and easily exploited food source during the summer months when they come ashore on the beaches to lay (Pearson 1977:27-28). Sea turtle remains have been reported from other archaeological sites on the Georgia coast but in very few numbers (Marrinan 1975; Wallace 1975; Waring and Larson 1968) and their absence from the Ossabaw Island collection is not totally understood. It is probably attributable to the small sample size and to the possibility that turtles were butchered and processed on the beach.

Other reptile species identified include a rattlesnake (Crotalus sp.), either a diamondback or canebrake rattlesnake and a black racer (Coluber constrictor). It is assumed that snakes were used for food, especially in light of one of the Le Moyne drawings, probably depicting the northeast Florida coast in the 1560's, showing Indians drying a number of fish and animals, including a snake, over a fire (Lorant 1946:83).

The American alligator (Alligator mississippiensis) is not represented in the faunal collection from Ossabaw Island. The alligator was, and is, common throughout the coastal region of Georgia and is represented in other Mississippian Period sites in the area (Caldwell and McCann 1941; Pearson n.d.). When available, the alligator was probably exploited for food. Its absence from the Ossabaw collection is probably due to the small size of the sample.

A variety of reptile species were apparently utilized by Ossabaw Island's Mississippian Period populations but these contributed very little to the overall diet (less than 1% of the estimated total meat yield in each phase). This reflects a pattern found at other Mississippian sites (Lewis 1974; Roth 1977; Smith 1975).

Aves

Very few bird remains were recovered and only two species, clapper rail and wood duck, are identified (Table 12). The clapper rail (Rallus longirostris) is common in the salt marshes and today is a popular game bird. Information on clapper rail populations in the Ossabaw Island area are not available, however, prior to 1948 the annual harvest by Georgia hunters was near 80,000 birds (Oney 1954).

The other bird species identified, the wood duck (Aix sponsa),is also common on the sea islands. The wood duck is a permanent resident of the island and inhabits the fresh water ponds and marshes.

As with mammals, one of the more striking aspects of the bird remains from Ossabaw Island is its lack of certain species, most notable the wild turkey (Meleagris gallopavo). Based on the archaeological literature, the turkey was an important food source during much of the prehistoric period of the Eastern United States. Several individuals have noted its importance during the Mississippian Period. Smith (1975:Table 30) indicates that the turkey was one of the more important food sources of Mississippian populations in the Middle Mississippi Valley. Turkey remains are reported from a number of Mississippian sites in the Southeast including: Etowah (van der Schalie and Parmalee 1960), and Little Egypt (Roth 1977) and from several sites on the Georgia coast (Caldwell and McCann 1941; Caldwell 1943).

Several of the coastal islands have small turkey populations most of which have been reintroduced (as is the case with the Ossabaw Island flock) after historical extermination of the bird (Johnson et al. 1974: 60). The islands apparently do not offer an ideal habitat for turkey and the populations have probably always been low. As has been suggested for the opossum and the squirrel, prehistoric hunting pressure may have exterminated the turkey from the islands, or, at least, kept the populations minimal.

Variability in Irene and Savannah Phase Subsistence

It has been shown that significant differences exist between the structure of the Savannah and Irene phase settlement systems on Ossabaw Island (Chapter III). We will now attempt to determine if differences also exist in the subsistence strategies of the two phases.

Several writers have argued that shifts in subsistence strategies occured during the prehistoric period on the Georgia coast and are recognizable in archaeological remains from the area (Martinez 1975; Milanich 1971; Wallace 1975). One difficulty with all of these studies is that their data bases have been inadequate for the sort of interpretations made. These studies have generally relied on limited excavation data which are unlikely to provide information on the range of variability in subsistence patterns at any one point in time much less provide a measure of subsistence changes through time. Additionally, these studies have dealt with a qualitative or, only partially, quantified subsistence data base.

An initial examination of Table 12 indicated that little difference exists between the two non-mulluscan faunal collections. The same three mammal species were exploited during each phase and of these the white-tailed deer was, by far, the most important mammal exploited. To further assess any possible differences in mammal exploitation by the two phaes a chi square test was run on the data. The null hypothesis was that there was no significant difference between the two phases in terms of mammal exploitation. The chi square data is given in Table 14. A chi square of 2.99 was obtained. At 2 df this value indicates that the null hypothesis cannot be rejected and that there is no significant difference between the two sets of data.

In terms of other species exploited, there again appears to be little difference between the two phases. The Savannah phase exhibits a wider variety of fish species but with the small sample available it is impossible to state this is due to actual differences in exploitative patterns. Neither the bird, fish, or reptile samples are large enough in themselves to warrant statistical comparisons, however, visual observation of Table 12 suggests no difference between the two phases in terms of species represented in the sample.

Intensity of Exploitation

While the faunal and statistical evidence suggests that the types and relative proportions of animal species in this sample were similarily exploited by Savannah and Irene phase populations, the intensity of exploitation of various species may have changed through time. Intensity refers to the relative reliance on non-molluscan faunal species in relation to other available food sources such that although the types and proportions of various animal species may have been similar an increase or decrease in total reliance may have changed through time. A shift in intensity could occur, for instance, if a greater reliance on agricultural crops developed during the Irene phase resulting in a

Phase	Edible Meat Yield (kg) deer	raccoon	rabbit	total
Savannah	188.1 (194.6)	39.2 (33.3)	4.6 (3.2)	231.9
Irene	205.2 (198.7)	28.0 (33.9)	1.8 (3.2)	235.0
Totals	393.3	67.2	6.4	466.9

df = 2

$X^2 = 3.7$

H_0 rejected

Table 14. Chi-square contingency table for mammal exploitation per phase.

lesser relaince on certain faunal species. Changes of this type have been proposed by Wallace (1975) and Martinez (1975) for late prehistoric populations on St. Simons Island.

Arguments about the importance of agriculture in coastal Mississippian populations are difficult to resolve because of a lack of good archaeological data. While it may not be possible to measure the relative importance of agriculture it is possible to partially examine the question of intensity of animal exploitation. One way to do this is to simply look at the amounts of faunal material recovered from each phase in relation to the amount of midden excavated. This can be expressed as a Concentration Index (CI) (Ziegler 1973:13). The CI is a measure of the number of bones recovered per unit excavated, normally measured in cubic meters (number of bones/area excavated m^3). The advantage of the use of concentration indices is that they allow the densities of various categories of faunal material (or any other material for that matter) to be expressed and compared in uniform terms (Ziegler 1973:33).

Concentration Index values were computed for all middens of all sites tested in order to assess the within site variability as well as the between site and between phase variability. Concentration Indices were computed for the three major food categories; mammals, fish, and turtle as well as for total bone. These values permit an examination of the variation in representation of each faunal category across sites and between phases and provides information useful in developing hypotheses concerning site (or midden) function and use.

Table 15 presents data concerning the intensity of exploitation of vertebrate fauna during the Savannah and Irene phases. There appears to be little difference in the total CI for the two phases. Savannah phase sites produce a CI of 142 and Irene phase sites a CI of 123. These figures are useful in indicating the general similarity of over-all intensity of faunal exploitation. Examination of the CI's for the three most important categories of fauna for the two phases indicates that there exists little difference in the total mammal bone concentration; each phase exploiting the same three mammals species at about the same intensity and as shown earlier (Table 14) in approximately the same proportions.

Some differences do occur in the CI's for the other two faunal categories (fish and reptiles). A higher CI for fish bone is shown for Irene phase sites than for Savannah phase sites. This difference is due to the high concentration of fish bone in one midden at site Ch 255. This large amount of fish bone supports the assumption that Ch 255, as a Class IV site, is a special activity site, in this case in part related to fishing. The high CI for fish is not considered indicative of an increase in the exploitation of fish during the Irene phase relative to the Savannah phase.

Variation in the CI for turtle bone is also indicated. Savannah phase sites have an average CI for turtle bone of 60 and Irene phase sites have an average CI of 23. This difference is again unlikely to be reflective of real variation in patterns of exploitation since the variability in turtle bone CI is as great within the two Savannah phase sites as it is between the two phases (Appendix III).

Sites	Area excavated m3	Mammal bone count	Mammal CI	Fish bone count	Fish CI	Turtle bone count	Turtle CI	Total bone count	Total CI
Savannah phase									
Ch158N	2.90	60	21	58	20	181	62	384	132
Ch266	.96	91	95	11	11	50	52	164	171
total Savannah phase	3.86	151	39	69	18	231	60	548	142
Irene phase									
Ch198	.45	9	20	5	11	16	36	48	107
Ch202	2.04	67	33	6	3	56	27	168	82
Ch255	1.16	52	45	121	104	13	11	233	201
total Irene phase	3.65	128	35	132	36	85	23	449	123

Table 15. Concentration Index (CI) data on number of elements (from screen sample).

The overall CI on bone elements indicates only slight differences in the intensity of exploitation between the two phases. In fact, CI variability can be as great or greater between middens at a single site than between sites or between phases. This indicates that differential deposition of faunal remains did occur at sites but it does not appear to reflect substantial differences in the intensity of exploitation between phases. This illustrates the major failing of those statements concerning shifting patterns of subsistence put forth by Martinez (1975), Milanich (1971), and Wallace (1975) for the coastal area of Georgia. These studies have based their proposals on the results of the analysis of a single or a few test excavations. It appears, based on the CI's, that as the faunal sample from each site and/or phase increases in size, the differences between the two phases lessens. This argues for the use of large and extensive samples before generalizations about the changes in the structure of coastal subsistence systems can be formulated.

Ziegler (1973) has shown that concentration indices may be used to graphically represent the trends in animal exploitation. A similar idea is presented here to visually demonstrate similarities or differences between sites based on their CI's. In this analysis the CI's for each major faunal class have been converted to percentages of the total CI for that class.

Figure 21 shows plots of each of the five sites analyzed across the four major faunal categories (mammal, fish, turtle, and other). Inspection of Fig. 21 clearly indicates the anamalous nature of site Ch 255 in relation to the other sites. The other four sites (Ch 158N,

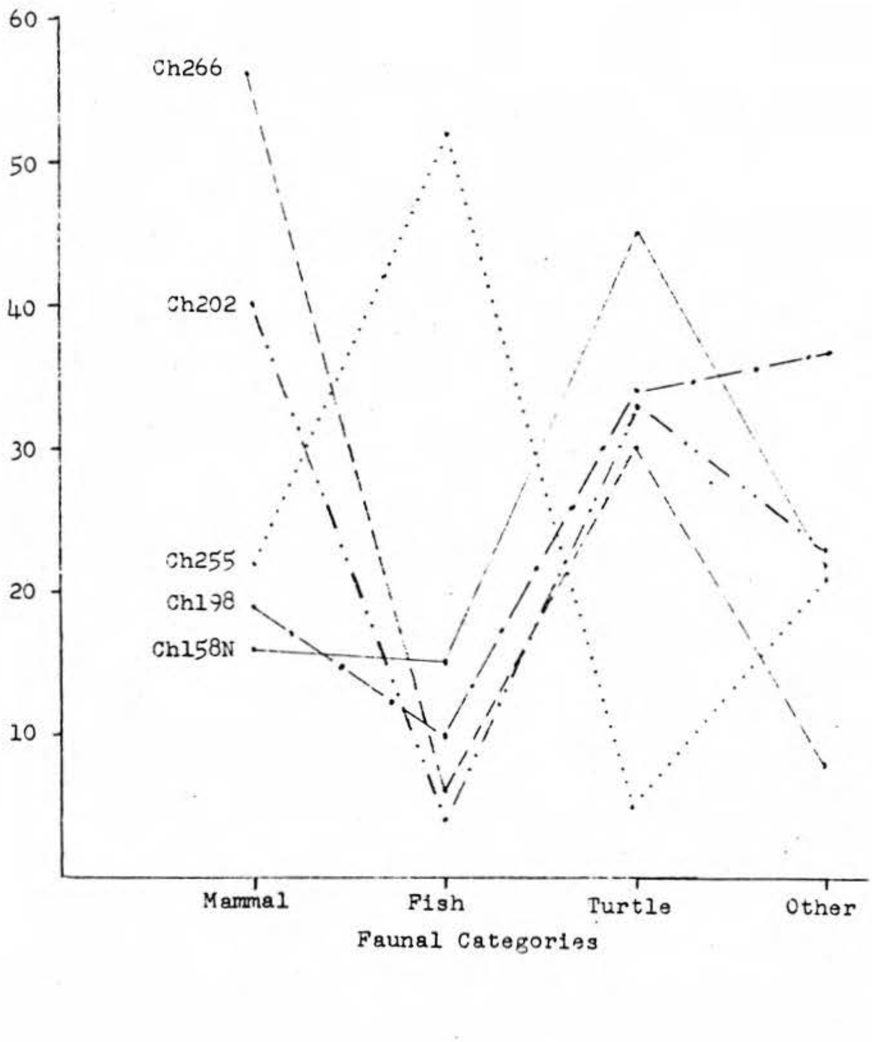

Figure 21. Graphs of proportional concentration indices based on number of elements (screen sample).

Ch 266, Ch 198, and Ch 202) show a moderate to high CI for mammal, a decrease in CI for fish, and an increase in CI for turtle. Ch 255, on the other hand, shows a moderate value for mammals, an increase for fish, and a dramatic drop for turtle. To some extent, Fig. 21 demonstrates the difference of site Ch 255, and is considered supportive of the assumption that it was a special activity site.

We can further examine variability in the faunal collection by using a Concentration Index based on potential meat yield rather than on number of elements. Although this approach is not often used in the literature it would seem to have potential in comparing sets of faunal data. Concentration Indices data on the potential meat yield for all sites are given in Table 16. This table reiterates the importance of mammals in the faunal collection. The overall CI for each phase is again similar. For the Savannah phase an estimate of 62.7 kg of meat per m^3 is derived and for the Irene phase an estimate of 65.9 kg of meat per m^3.

The CI's on total edible meat yield indicate a number of differences from that developed using number of elements (Table 15). The CI's on number of elements tended to obscure the great importance of mammals as a dietary item in the sample. The CI on potential meat yield demonstrates quite clearly the extreme importance of mammals in the overall diet. It also suggests that there is little difference among sites or between phases in the relative importance of the meat yield of the various faunal categories.

Utilizing the same technique given above fo converting CI's to percentage data allows for the graphical representation of meat yields

Sites	Area excavated m^3	Mammal edible meat yield	Mammal CI	Fish edible meat yield	Fish CI	Turtle edible meat yield	Turtle CI	Other edible meat yield	Other CI	Total edible meat yield	Total CI
Savannah phase											
Ch158N	2.90	131.5	45	7.4	3	1.0	-*	1.1	-	141.0	49
Ch266	.96	100.4	105	0.5	1	0.3	-	0.0	-	101.2	105
total Savannah phase	3.86	231.9	60	7.9	2	1.3	-	1.1	-	242.2	63
Irene phase											
Ch198	.45	39.8	89	0.0	-	0.3	1	0.0	-	40.1	89
Ch202	2.04	143.0	70	0.6	-	0.4	-	0.3	-	144.3	71
Ch255	1.16	52.2	45	3.3	3	0.2	-	0.5	-	56.2	49
total Irene phase	3.65	235.0	64	3.9	1	0.9	-	0.8	-	240.6	66

*CI less than 1.

Table 16. Concentration Index (CI) data on edible meat yield (from screen sample).

(Fig. 22). Figure 22 clearly demonstrates the extreme importance of mammals to overall meat yield and also obliterates the differences of site Ch 255 apparent in the graph of CI based on number of elements (Fig. 21).

The use of Concentration Indices as presented here suggests several facts about the data as well as about the use of such indices themselves. The CI on number of elements indicates that amount of bone varies considerably from midden to midden and suggests that statements on coastal subsistence patterns based on material from a single or a few tests are tenuous at best. Even so, the element CI indicates that, in general, there is little difference between the Savannah and Irene phases in terms of the density, and therefore presumed intensity of exploitation, of various categories of vertebrate faunal represented.

The CI's developed on potential meat yield presented here seem to be useful in the interpretation of faunal data. They would seem, in fact, to be more useful than the traditional CI based on number of skeletal elements. As presented, they suggest little difference between the intensity of exploitation of various animal species by Savannah and Irene phase populations and indicate the greater importance of mammals to the diet than was shown by the CI developed on number of elements.

Patterns of Selectivity

The above discussion has concerned certain aspects of the exploitation and relative importance of various animal species to Ossabaw Island's Mississippian Period population. This information does not,

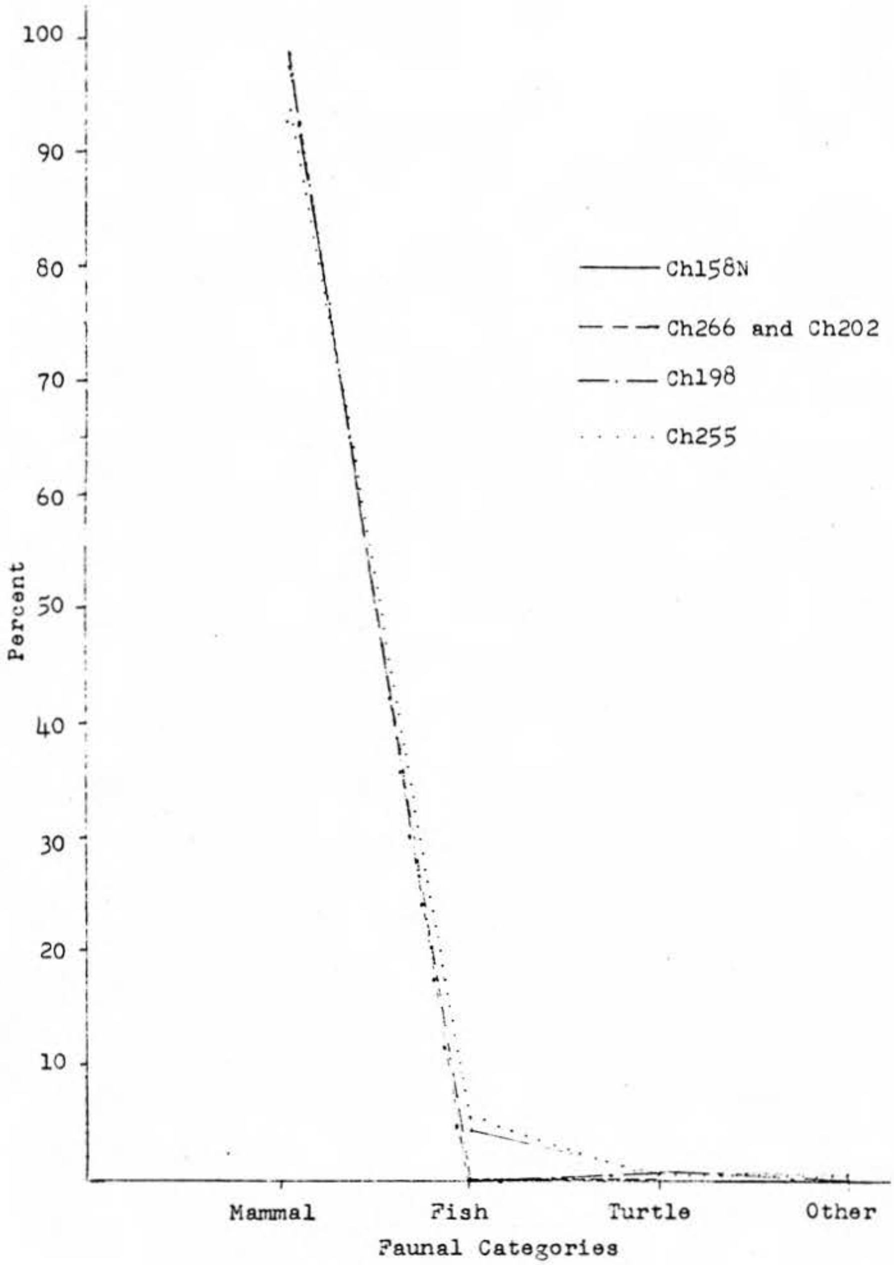

Figure 22. Graphs of proportional concentration indices based on estimated edible meat yield (screen sample).

however, tell us anything about the patterns of selectivity that may have existed in exploitation; i.e. were some animals selected for and others against? This question can be approached by comparing the proportional representation of various animal species in the archaeological sample with the projected representation of these species in the area. Bruce Smith has suggested that Middle Mississippian populations did selectively exploit a restricted segment of the biotic community and further that this selection "maximized their annual meat yield in relation to the energy necessary to exploit them" (Smith 1975:139).

Selectivity can first be examined by considering omissions of species from the faunal inventory which were potential prey species. As shown previously, important species missing from the Ossabaw Island data are the opossum, gray squirrel, black bear, and the wild turkey. All of these species are known from other coastal Mississippian Period faunal collections and can be considered to have been generally important to the diet of Mississippian populations in the area. The lack of exploitation of these species may have been occasioned by the unique conditions found on Ossabaw Island, in particular its small size and its relative isolation. Any intensive or long term prehistoric exploitation of these species, coupled with only remote chances of repopulation because of island isolation, could likely result in their extermination just as has happened historically to some species. Even if populations of these species did survive on Ossabaw, their numbers are likely to have been extremely low during the Mississippian Period and thus would rarely appear in the archaeological record.

The lack of the remains of any of these species in the faunal collection tends to suggest that little emphasis was placed on travel on the mainland to hunt these species, assuming that some skeletal parts of the animals would be brought back.

One requirement for assessing patterns of selectivity is an availability of good data on the density or the potential meat yield of the various animal species exploited. Unfortunately, usable data of this sort is available for relatively few species. For the coastal Georgia region, reliable estimates on biomass potential or density can be made for mammals only. Information is not available for the other species identified in the faunal sample from Ossabaw Island. The question of selectivity will be partially explored here by examining it in relation to mammal exploitation.

Since no single source provides adequate data for the area,a variety of sources are used in assessing biomass and density estimates for the three mammal species represented in the faunal collections. Biomass estimates incur a number of difficulties in their calculation and archaeologists have often used the idea of biomass incorrectly (Smith 1975).

Smith (1975) suggests that two aspects of animal population density can be utilized in assessing patterns of selectivity. One of these is species biomass. The biomass estimate of the population is simply a statement of its biomass level, that is the population density multiplied by the average weight of an individual. The other estimate is the potential meat yield of a species in a given area. The potential meat yield is that portion of the population which can be culled without causing a reduction in the breeding population. This figure is the product of the recruitment rate (i.e. number of young born each year) of a species, its density, and the average weight per individual. The recruitment rate for the three species are taken from Smith (1975).

Both biomass and potential meat yield estimates are computed for the three mammal species and compared against the relative abundance of these species in the faunal collection. This comparison will allow for estimating whether selectivity occured for any of the three species and also will give some indication of the intensity of hunting pressure being placed on a species.

Both potential meat yield and biomass estimates are converted into edible meat values using the appropriate conversions. The figures for biomass and potential meat yield are computed for an 18 square mile area, an area approximately the size of Ossabaw Island,to give some idea of the actual amounts of each species available on the island. Data on biomass, potential meat yield and relative importance of the three species in the faunal collection are presented in Table 17. Each of the three species is discussed below.

White-tailed Deer

There are few accurate estimates of deer densities available for the sea islands. Those studies that have addressed themselves to this question are discussed. Waring and Larson (1968:266) state that there were in excess of 300 white-tailed deer on Sapelo Island or approximately 15 to 20 deer per square mile. They suggest that this figure is in excess of the carrying capactiy of the island but provide no details or references as to how their determinations were made. Hillestad et al. (1975:124),in a more careful study, suggest deer population densities are usually much higher on the islands than on the adjacent mainland. They point out that Cumberland Island supports about 21 deer per square mile which is "much less" than the densities found on the other islands, including Ossabaw. An indication of the large numbers of deer that can survive on the islands is noted for Blackbeard Island (Hillestad et al. 1975:124). This island is relatively undisturbed but the deer population is hunted by archers every year. Approximately 25% of the population is harvested annually yet theisland sustains an extremely high pre-hunt density of approximately 1 deer per 7 acres (91 per square mile). This suggests that deer populations on the islands can be extremely large, especially when this figure is compared with Moore's (1967) estimate of 50 deer per square mile in the bottomland of the Savannah River, an area considered to be prime deer habitat. The islands do possess large numbers of nut bearing trees (especially live oak) and the additional habitat advantage of extensive areas of salt marsh grass, an area where deer are often seen feeding at low tide. This study will utilize a figure of 40 deer per square mile as an estimate of the density of deer on Ossabaw Island. This figure falls between the known densities of deer on the islands today and seems reasonable in light of available data.

As mentioned, the native deer on Ossabaw Island are assumed to have been the saml1 subspecies, O.v. nigribarbis. These deer average about 30 kg in weight. Using a figure provided by Hamilton (1947) that about 58% of deer weight is edible meat, there would have been an estimated potential edible meat yield for white-tailed deer of 348 kg per square mile and an edible biomass estimate of 696 kg per square mile.

Raccoon

Raccoon densities on the sea islands are very high, due mainly to the variety of habitats available for raccoon exploitation, i.e. the salt marshes, the beaches, and the island highland (Johnson et al. 1974:59). The resulting edge effect produced by the conjunction of these three zones increases the raccoon carrying capacity of Ossabaw Island as a whole.

Although no specific density figures for raccoon are available for coastal Georgia, sources are available that provide insight into the question. An average raccoon habitat in Virginia had a density of 44.8 animals per square mile (Sonenshine and Winslow 1972). Yeager and Rennels (1943) suggest an ideal raccoon habitat in the Middle Mississippi River area supports 53 raccoons per square mile. The Ossabaw Island density is high and possibly similar to these areas. A figure of 45 raccoons per square mile is considered reasonable based on this data and is used here.

Golley (1962:183) suggests an average weight of about 8 kg for an adult raccoon. Using a value of 70% of raccoon weight as edible meat (Smith 1975) it is estimated that potential edible raccoon meat yield for Ossabaw Island was 378 kg per square mile and the edible biomass would be 252 kg per square mile.

Rabbit

The rabbit found on Ossabaw Island, the marsh rabbit, occurs throughout the coastal plain of the state (Golley 1962:85). While no specific density figures are available for the marsh rabbit, Tomkins (1935, 1955) states that the densities on the coast are very high. Another rabbit species, the swamp rabbit (S. aquaticus) occurs in densities of approximately 35 individuals per square mile (Lowe 1958). In Missouri, the estimate of 142 swamp rabbits per square mile has been given (Toll et al. 1964). Based on Tomkins estimates this higher figure is probably more reasonable for Ossabaw Island and a figure of 145 rabbits per square mile is used in this study. Average marsh rabbit weight is given by Golley (1962:85) at 1.3 kg. Using a figure of 70% of rabbit weight as edible meat (Smith 1975) the estimated potential edible meat yield for rabbits is 1649 kg per square mile and the edible biomass is estimated at 132 kg per square mile.

Based upon the values used,these three species combined would have porvided an estimated potential edible meat yield of 2375 kg (5235 lbs) per square mile and would have constituted an edible biomass of 1080 kg (2380 lb) per square mile. Table 17 presents values and percentages of estimated potential edible meat yeild and edible biomass values for Ossabaw Island as a whole along with the weight and relative contribution of each of the three species to the total edible meat yield for each phase.

Examination of Table 17 indicates several facts about selectivity as well as providing some information about hunting pressure on the island. The white-tailed deer was very heavily selected for in terms

Species	Density (mile^2)	Breeding potential	Estimated* potential meat yield		Estimated* Biomass		Savannah phase edible meat yield		Irene phase edible meat yield	
			kg	%	kg	%	kg	%	kg	%
White-tailed deer	40	0.5	6264	15	12528	64	188.1	81	205.2	87
Raccoon	45	1.5	6804	16	4536	23	39.2	17	28.0	12
Marsh rabbit	145	12.5	29689	69	2375	12	4.6	2	1.8	1
totals			42757		19493		231.9		235.0	

*Calculated for an 18 mi^2 area.

Table 17. Data on mammal selectivity.

of its potential yield and less heavily exploited in relation to its biomass estimate. This indication of selection for deer is not surprising considering the importance of the deer to aboriginal populations. In addition to indicating selection for deer, Table 17 may suggest several possibilities about the exploitation of deer on Ossabaw Island. The large difference between the relative potential yield of deer and the relative importance of deer in both the Savannah and the Irene phase diets may suggest that deer were hunted over and above their breeding potential on the island. Though it is impossible to determine what portion of the deer population was killed yearly, there exists the possibility that the island's Mississippian Period population was over exploiting the deer population on the island. This is especially likely when it is considered that repopulation of the island by deer is somewhat limited by the island's relative isolation and the difficulties inherent in immigration of animals.

The high representation of deer in the collection may, on the other hand, indicate that mainland hunting was important in securing deer. A larger faunal collection would offer some unique opportunities to explore this question. Since island deer are assumed to be much smaller than the mainland variety, one would expect this variability to show up in deer skeletal material if mainland hunting was practiced.

Raccoons were exploited in percentages approximating their productive potential but in relative amounts lower than their estimated biomass. The difference in these figures are small but they may suggest a selection for raccoons. Considering the ease with which raccoons may be killed on the island, it is surprising that they are not more heavily represented in the faunal collections.

Exploitation of the rabbit was evidently very light. Its representation in the faunal remains of both phases is well below its biomass potential and does not even approach its potential productivity on the island. A similar lack of reliance was noted by Smith (1975) in the Mississippian groups he studied.

The figures relating to selectivity obtained from Ossabaw Island are very similar to those given by Bruce Smith (1975) concerning Mississippian exploitation in the Middle Mississippi River Valley. To some extent, this reflects similar patterns of reliance and possibly similar techniques of hunting for these widely dispersed Mississippian groups. Smith concluded that there is little "overall correlation between estimated biomass levels and the extent to which animal species were exploited by the Middle Mississippian groups being studied" (Smith 1975:135-136). The same can be said for deer and rabbit exploitation on Ossabaw Island, though the raccoon appears to have been exploited at levels approximating its potential yield.

The Column Sample

Column sampling is used here as a compliment to the screened sample already discussed for quantitatively assessing the types and relative importance of various food species to Ossabaw Island's Mississippian Period populations. Emphasis will be placed upon assessing the mollusc segment of the diet.

Column sampling has been extensively used in the analysis of prehistoric shell middens from throughout the United States. Much of the earlier, and better, work has been done in California (see especially Cook and Treganza 1947, 1950; Gifford 1916; Treganza and Cook 1948). The published material from the Eastern United States has dealt mainly with the Northeast (Brennan 1963, 1964; Salwen 1963, 1970), or with inland middens associated with fresh water shellfish (Parmalee and Klippel 1974). Very little published material is available concerning quantitative analysis of coastal shell middens in the Southeastern Atlantic region (See Marrinan 1975; Wallace 1975).

Much of our information on the usefulness and appropriatness of column sampling techniques derives from the California work. A single California midden was excavated by Treganza and Cook (1948) to assess the accuracy of various sampling sizes in estimating the composition of the complete midden. They, and later Greenwood (1961), demonstrated that samples of small size were generally adequate for obtaining accurate estimates of midden composition. One assumption which is necessary if small samples are to be used, is that midden composition is essentially homogeneous. It is unlikely, of course, that such an assumption is always true (Ambrose 1967). This assumption does seem legitimate for the Ossabaw Island middens analyzed. These middens are small and apparently represent a single or brief episode of accumulation which would limit internal variability (Pearson 1976). Additionally, the tests excavated in the middens did not reveal any stratigraphic discontinuities or features that would indicate internal variability. Excavation of an entire Irene phase shell midden on Skidaway Island reinforces the assumption of homogeneity (Goad 1975).

Within any midden, however, some variability inevitably does exist and must be considered when extrapolating from small samples. Cook and Treganza (1947) have shown that larger, scarcer items in middens tend to be underestimated in column sampling. This technique tends to be a more accurate measure of the numerous and widely dispersed items contained in the midden. Column samples, as used here, are rather accurate estimators of the mollusc composition of middens but items such as deer bone may be underrepresented resulting in an underestimation of the total animal bone (any by extension non-mollusc meat weight) for the midden as a whole. This question is addressed later in this chapter.

Because of the time involved in the quantified analysis of column samples, only three middens were used in analysis. One sample was taken from Trash Midden 1 at Ch 255, an Irene phase site, one from Trash Midden 3 at Ch 266, a presumably late Savannah phase site, and one from Trash Midden 1 at Ch 158N, a Savannah phase site. The temporal position of these middens is based upon their ceramic composition. Each of these middens also supplied data for the screened sample (Fig. 20).

Samples consisted of midden matrix of known volume and known weight (2 to 4 kg). All of the samples were air dried and then water floated to remove carbonized material which was retained for analysis. Samples were then washed through 1/16 in. window screen to remove sand, water soluble charcoal, etc. The remaining portion was then separated into categories, i.e. stone, ceramics, clam shell, oyster shell, etc. Much of the shell in this fraction was extremely fragmented and impossible to identify. Therefore, all shell was screened through a 4.5 mm screen and the saved fraction was separated by species, the portion which passed through the screen was lumped as unidentified shell.

Some assessment of this unidentified portion of the sample should be made here. Some very small bones, bone fragments, charcoal, etc. are likely to be included in this fraction, however, the great majority (probably over 95% by weight) is shell. Much of this unidentified shell consists of ribbed mussel (Modiolus demissus) fragments because this shell is highly fragmentary and disintegrates easily. Lesser quantities of oyster are expected to be included in the unidentified fraction and even smaller amounts of the hard and durable shells such as clam and whelk.

Each category of separated material was weighed giving the proportional representation of various types of material in the sample. The volumes of the middens tested were then calculated, allowing for an estimate of the total amount of each identified category in each midden. Estimated amounts of meat provided by each of the various vertebra and invertebrate categories were obtained and total estimated amount of edible meat was calculated for the middens as a whole.

The volume of middens was estimated using the formula for estimating a segment of a sphere: $1/6\ \pi h(h^2+3a^2)$ where:

h = altitude or maximum height
a = radius at the base

Estimated volume for Trash Midden 1 at Ch 255 is 10.516 m^3. Using the volume of the sample from this midden (0.005638 m^3) and the weight of the sample (6885 gm) we can estimate the weight of the total midden. Thus, this midden with a volume of 10.516 m^3 contains 1865.200 samples (total midden volume/total sample volume) of the size taken. Total midden weight is estimated at 12841.9 kg (the product of the estimated number of samples in the midden and the weight of each sample). These values allow for the estimation of the total amounts of each of the various classes of items there are in the entire midden by weight. Volumes and weights for the other two middens were computed in the same manner. Data on the samples and the total midden estimates are given in Table 18.

One figure of interest which is noted for all three samples is the relatively high proportion of the sample that was washed through the 1/16 in. screen. This fraction, noted as "soluble material", accounts for from 52% to 65% of the total weight of the samples. When excavating a typical coastal midden, the impression is that midden consistency is from 75% to 95% shell. It appears, however, that this is not so, at least by weight. The majority of the material which passes through the 1/16 in. screen is soil and charcoal, though some of it is disintegrated shell. A large quantity of the soils in these middens probably came from mud clinging to shellfish when they were deposited on the midden. Alternatively, some soil in the midden may have been purposefully placed on the midden to cover decaying shellfish and other refuse. In any event, over one half of the middens by weight consist of material which probably did not contribute to the diet.

Table 18 indicates that the oyster (_Crassostrea virginica_) is, by far, the dominant shellfish. Oyster makes up from 60% to 78% of the weight of all shell and from 21% to 37% of the total weight of the samples. Other less important shellfish include the ribbed mussel

Table 18. Subsistence data from the column samples for sites Ch158N, Ch266, and Ch255.

Ch158N, Trash Midden 1.
Estimated midden volume = 5.478m^3; estimated midden weight = 5103.436kg; sample weight = 3348gm.

Categories	Quantity in sample		Estimated amount in midden	Estimated edible meat yield in midden	
	gm	%	kg	kg	%
Total soluble material	2125.47	63.49			
Shellfish:					
Eastern oyster (*Crassostrea virginica*)	790.86	23.62	1205.519	241.104	50.3
Quahog clam (*Mercenaria mercenaria*)	43.59	1.30	66.440	15.707	3.3
Atlantic ribbed mussel (*Modiolus demissus*)	30.47	0.91	46.450	19.766	4.1
Stout tagelus (*Tagelus plebius*)	22.32	0.66	34.023	14.478	3.0
Periwinkle (*Littorina irrorata*)	2.35	0.07	3.582	0.448	0.1
Barnacle (*Balanus* sp.)	1.85	0.06	2.820		
Landsnail (*Triodopsis* sp.)	1.40	0.04	2.134		
Unidentified shell	322.78	9.64	492.021	164.007	34.2
TOTAL SHELLFISH	1215.62	36.31	1852.990	455.510	95.1

Table 18. Continued

Ch158N Categories	Quantity in sample gm	%	Estimated amount in midden kg	Estimated edible meat yield in midden kg	%
Non-shellfish:					
Turtle	0.38	0.01	0.579	3.862	0.81
Fish	0.89	0.03	1.357	9.051	1.89
Other reptile	0.07	-	0.107	0.714	0.15
Unidentified	0.91	0.03	1.387	9.251	1.93
Blue crab (Callinectus sapidus)	0.08	-	0.122	0.814	0.17
TOTAL NON-SHELLFISH	2.33	0.07	3.552	23.690	4.94
Other:					
Ceramics	2.67	0.08	4.070		
Carbonized material	2.00	0.06	3.049		
TOTALS	3348.00		5103.436	479.200	

Table 18. Continued

Ch266, Trash Midden 3
Estimated midden volume = 1.297m^3; estimated midden weight = 1623.915kg; sample weight = 3370gm

Categories	Quantity in sample		Estimated amount in midden	Estimated edible meat yield in midden	
	gm	%	kg	kg	%
Total soluble material	1749.00	51.90	842.797		
Shellfish:					
Eastern oyster (_Crassostrea virginica_)	1255.12	37.24	604.807	120.961	66.4
Quahog clam (_Mercenaria mercenaria_)	10.50	0.31	5.060	1.196	0.7
Stout tagelus (_Tagelus plebius_)	0.97	0.03	0.467	0.199	0.1
Atlantic ribbed mussel (_Modiolus demissus_)	55.59	1.65	26.785	11.398	6.3
Periwinkle (_Littorina irrorata_)	0.62	0.02	0.299	0.037	-
Barnacle (_Balanus_ sp.)	1.15	0.03	0.554		
Landsnail (_Triodopsis_ sp.)	3.11	0.10	1.499		
Unidentified shell	286.60	8.50	138.105	46.035	25.3
TOTAL SHELLFISH	1613.65	47.88	750.790	179.826	98.7
Non-shellfish:					
Fish	0.25	-	0.118	0.787	0.4
Reptile	0.04	-	0.019	0.126	0.1
Unidentified	0.44	0.01	0.210	0.401	0.8
TOTAL NON-SHELLFISH	0.72	0.01	0.347	2.314	1.3

Table 18. Continued

Ch266 Categories	Quantity in sample gm	 %	Estimated amount in midden kg	Estimated edible meat yield in midden kg	 %
Other:					
Ceramics	2.55	0.08	1.229		
Stone	0.04	-	0.019		
Carbonized material	4.04	0.12	1.947		
TOTALS	3370.00		1623.915	182.141	

Ch255, Trash Midden 1
Estimated midden volume = 10.516m^3; estimated midden weight = 12841.905; sample weight = 6886gm.

Categories	Quantity in sample gm	 %	Estimated amount in midden kg	Estimated edible meat yield in midden kg	 %
Total soluble material	4489.83	65.21	8373.430		
Shellfish:					
Eastern oyster (Crassostrea virginica)	1413.41	20.53	2636.292	527.258	39.1
Quahog clam (Mercenaria mercenaria)	41.30	0.60	77.032	18.203	1.4
Atlantic ribbed mussel (Modiolus demissus)	411.30	5.97	767.156	326.450	24.2
Stout tagelus (Tagelus plebius)	1.20	0.02	2.238	0.952	0.1
Knobbed whelk (Busycon carica)	41.46	0.60	77.331	9.666	0.7

Table 18. Continued

Ch255 Categories	Quantity in sample gm	Quantity in sample %	Estimated amount in midden kg	Estimated edible meat yield in midden kg	Estimated edible meat yield in midden %
Channeled whelk (*Busycon canaliculatum*)	1.31	0.02	2.443	0.305	-
Periwinkle (*Littorina irrorata*)		0.01	0.933	9.117	-
Ark (*Anadara* sp.)	0.90	0.01	1.679	0.397	-
Barnacle (*Balanus* sp.)	1.42	0.02	2.649		
Donax (*Donax* sp.)	0.10	-	0.187		
Moon shell (*Polinices duplicatus*)	2.67	0.04	4.980		
Landsnail (*Triodopsis* sp.)	0.10	-	0.187		
Unidentified shell	428.03	6.22	798.361	266.120	19.7
TOTAL SHELLFISH	2343.70	34.04	4371.459	1149.468	85.3
Non-shellfish:					
Mammal	1.30	0.02	2.425	14.974	1.1
Fish	14.29	0.21	26.654	177.782	13.2
Turtle	0.10	-	0.187	1.247	0.1
Blue crab (*Callinectus sapidus*)	0.23	-	0.429	2.861	0.2
Unidentified	0.16	-	0.298	1.988	0.1
TOTAL NON-SHELLFISH	16.08	0.23	29.992	198.852	14.7
Other:					
Ceramics	21.55	0.31	40.186		
Stone	0.61	0.01	1.138		
Carbonized material	13.24	0.19	24.695		
TOTALS	6885.00	12841.905	12841.905	1348.320	

(Modiolus demissa), the Quahog clam (Mercenaria mercenaria), the knobbed whelk (Busycon carica), stout tagalus (Tagelus plebeius), channeled whelk (B. canaliculatum), ark (Anadara sp.), and the marsh periwinkle (Littorina irrorata).

Several species of land snails (Triodopsis sp.) were recovered but probably do not represent a food resource. These snails feed on decaying matter and probably fed on materials in the midden. The barnacle (Balanus balanoides) also was recovered but was probably not eaten. Barnacles are often attached to oysters and probably found their way into the midden in this manner.

In no instances are there any dramatic differences between the three middens in terms of their estimated composition. In all three cases the soluble material makes up the majority of the midden by weight and shellfish form the second largest category by weight. Although less by weight than the soluble material, shellfish do form the majority of the bulk of the middens.

Oysters comprise the most important class of molluscs by weight. Other studies of shell middens along the Georgia coast tend to indicate that oysters are generally the major constituent of prehistoric shell middens. Wallace (1975:218) notes that oysters form 99% of the shell weight in his analysis of a midden on St. Simons Island. He utilized only material retained from a 1/4 in. screem and it is probably that other classes of shell, especially the easily fragmented ribbed mussel shell, passed through the screen.

Other sorts of molluscs occur in smaller, though variable, quantities. In all three instances, however, oyster, clam, and mussel form the three most important mollusc remains by weight. The amounts of both knobbed and channeled whelk found at Ch 255 are interesting. A large number of whelks of varying sizes were recovered in the test pit at this site, more than were recovered at any other site. The presence of unusually large numbers of whelks here appears to be a factor of the site's location. Whelks are more commonly found in tidal creeks that open into sounds or directly into the ocean than in those creeks located on the inland side of the island, possibly because of salinity factors. The creeks at the southern end of Ossabaw Island open directly into St. Catherines Sound and are expected to have higher concentrations of whelks than would be found in the tidal creeks on the western side of the island. The increased occurance of whelks at Ch 255, which was also noted on the surface at other sites along the southern end of the island, seems to reflect the greater abundance of whelks available in the creeks in this area.

The moon shells (Polinectus duplicatus) found at Ch 255 are unlikely to have been a source of food since many were found that had been killed by oyster drills (Urosalpinx sp.) indicating that they had been collected dead. The beach on Ossabaw is often littered with moonshells during the late summer and it is likely that some of these shells were collected there.

The vertebrate faunal remains from the column samples are identified only as to major categories, i.e. mammal, fish, turtle, etc. The amounts of vertebrate faunal remains recovered in these samples are extremely small when compared to the faunal remains from the screen sample. It appears that, as expected, small samples of this sort under-represent the less common elements in the midden, such as the remains of large mammals.

Potential Meat Yield Estimates of the Column Sample

A number of estimates of the average ratio of edible meat weight to dry bone weight have been made. Various estimates have been from 40:1 (Cook and Treganza 1950); through 20:1 (Meighan 1959); to 6.67:1 (Reed 1963). Despite the variability in these ratios, it is expected that bone weight is usable in obtaining a first estimate of potential meat weight. If we are to compare sets of data or attempt to quantify subsistence data some attempt must be made to estimate potential meat yield. Also, in this study, it is necessary to quantify meat yield from the column samples if we are going to use them in conjunction with the screened sample. For the purposes of the present analysis Reed's more conservative ratio of 6.67:1 is used in estimating meat yield from bone weight.

Ratios of shell weight to meat weight are available for a number of shellfish species. Those used here are: for oysters a ratio of 5:1 (Bailey 1975; Salwen 1970); for clams 4.23:1 (Salwen 1970); and for mussels a ratio of 2.35:1 (Cook and Treganza 1950).

Ratios for whelks are apparently unavailable though it would appear to be high since the shell is extremely heavy in relation to the small amount of edible meat available. An estimated ratio of 8:1 is used here. The same ratio is used for periwinkle. The ratio used for mussels (2.35:1) is also used for tagalus since both have rather lightly constructed shells in relation to the amount of meat available. For the ark, the same ratio is used as is used for the clam: 4.23:1.

A large portion of the shell fraction is unidentifiable shell, which is felt should be included in the assessment of estimated meat yield. It has already been noted that much of the unidentified portion consists of fragmented ribbed mussel shell, therefore, a low ratio, 3:1, is used here as a reasonable figure for estimating meat yield of the unidentified fraction.

Estimated edible meat yields for each of the samples are listed in Table 18. In all three middens, shellfish provide the majority of the estimated edible meat yield. In fact, in two cases (Ch 158N and Ch 266) non-shellfish sources of meat are practically insignificant based on their estimated contribution to the diet. At Ch 255, non-mollusca fauna provide 15% of the estimated meat yield, the majority (9%) of this coming from fish.

The results of the column sampling provide some general insights into patterns of exploitation of Savannah and Irene phase populations. Essentially there are few differences between the three middens analyzed. Ch 255 is the most different, but these differences are seen as reflective of differences in the kinds and intensity of specialized activities that may have occured at the site rather than reflecting broad structural differences or shifts in the overall subsistence systems of the two phases. This analysis demonstrates an extremely heavy reliance on molluscs, primarily upon oysters, with lesser reliance placed upon other species. This is generally inline with the availability of these mollusc species in the marsh-estuary area. Oysters are, by far, the most common and most widely distributed mollusc in the coastal area. They are found in most intertidal and subtidal situations where stratum and salinity are suitable. Mussels are less common and are generally associated with harder mud bottoms (Abbott 1968:198). Clams are distributed widely throughout the tidal creeks and rivers, though they do not occur in nearly the numbers or concentrations of oysters. These three species often occur in the same adjacent locality and can be gathered simultaneously.

The stout tagelus is less common than the three species mentioned and tends to occur in a slightly different environment. It tends to be found mainly in intertidal sandy mud and generally would require greater effort to gather than the other species.

A great deal has been written recently about the over-emphasis that has been placed on the importance of molluscs in certain prehistoric diets (Parmalee and Klippel 1974; Byrd 1976; Marrinan 1975; Wallace 1975). The argument is usually that the sheer bulk produced by shell has influenced archaeologists to assume it was a, or the, important portion of the diet when, in fact, the meat weight provided by the shellfish is small. This argument has been coupled with the argument that the nutritional value of molluscs is, in general, lower than that of mammal, bird, and fish.

These arguments must be considered in shell midden analysis, however, they seem to have gained an inertia of their own, such that the importance of molluscs are ignored or discounted upon little or no evidence (See Byrd 1976; Wallace 1975). The results of the column sample analysis presented here suggests an overwhelming importance of shellfish in terms of their contribution to the faunal segment of the diet of Ossabaw Island's Mississippian population. For the three samples used, shellfish contribute from 85% to 99% of the total estimated meat yield of the middens. Larger, less common elements in shell middens tend to be underrepresented in column sampling as mentioned. It is conceivable, therefore, that larger mammals are to some extent underrepresented in the sample. Considering the magnitude of difference between the estimated edible meat provided by shellfish and non-shellfish, it is unlikely that this difference is due only to this factor.

Comparison of the results of the column sample with the results of the screened sample is necessary in order to more fully understand the relative importance of molluscs and non-molluscan fauna in the diet of the two phases. As noted, the two tehcniques essentially gathered two types of information, one provides an assessment of non-molluscan faunal remains and the other mainly an assessment of mollusc remains. The use of concentration indices is seen as the best way to arrive at a comparison of the two sets of data and their results.

Average CI's for the screen sample have already been given (Table 16). These values, which are based on MNI, are 62.7 kg of edible meat per cubic meter of midden for the Savannah and 65.9 kg per cubic meter for the Irene phase. Using only shellfish, Concentration Indices in terms of edible meat yield per cubic meter of midden were obtained from the column sample data (Table 19). At Ch 158N shellfish provided an estimated 83.2 kg of edible meat per cubic meter, at Ch 266 shellfish provided an estimated 138.7 kg per cubic meter and at Ch 255 an estimated 109.3 kg per cubic meter.

Sites/middens	Midden volumn (m^3)	Shellfish meat yield kg	Shellfish CI	Nonshellfish meat yield kg	Nonshellfish CI
Ch158N Trash midden 1	5.478	455.510	83	23.690	4
Ch266 Trash midden 3	1.297	179.826	139	2.314	2
Ch255 Trash midden 1	10.516	1149.468	109	198.852	19

Table 19. Concentration Index (CI) data on edible meat yield from the column sample.

The Ci's for these sites vary somewhat in relation to the density of the middens tested. What is significant is that in these three middens, estimated yield of shellfish meat is almost twice that estimated for non-mollusca fauna obtained in the screen sample. It should also be noted that the CI values for the non-molluscan fauna given in Table 16 are based on MNI and it is likely that this produces a higher than acutal value.

Seasonality

The faunal collection used here provides little information on the seasonality of occupation of any one site or midden. Few species were recovered which can be used as explicit seasonal markers and the size and condition of the collection did not lend itself to age studies which could be used to estimate season of death. Some floral data was recovered which can be combined with the limited faunal data to, at least, help approach the question of seasonality. This data is presented in tabular form in Table 20.

A number of individuals have argued against the year-round occupation of the coastal islands of Georgia. Larson (1970) has suggested that the islands were not occupied during the winter and states that populations moved into the river valleys of the mainland to exploit the resources (especially deer and nuts) abundant there in the winter. Martinez (1975) and Wallace (1975) have both followed Larson in suggesting, at least, in part, an "inland" dispersion of the population during the winter. None of these discussions or suggestions about seasonality have, however, presented any substantial archaeological evidence relating to their hypotheses. Several lines of evidence do exist which argue against the abandonment of the islands and the seasonal movement of populations inland.

The argument against the inland movement by any substantial number of persons during the Irene phase is the extreme rareness of Irene phase sites in the inland area (Fish 1976; Hally, Zurel and Gresham 1975). As mentioned earlier, Irene phase sites are found almost exclusively in a narrow band along the coast. While this, of course, does not argue that island populations never visited the mainland, it suggests that substantial seasonal abandonment of the islands and movement inland any distance did not occur.

There is slightly more evidence of Savannah phase occupation back from the coast (F.C. Cook personal communication; Hally, Zurel and Gresham 1975) and the possibility exists that Savannah phase populations did move inland seasonally. However, the size of both Savannah and Irene phase sites on the islands and the presence of large and substantial burial mounds at many of these sites argues for permanent occupation.

The environmental data presented in Chapter II indicates that the resources on and around Ossabaw Island could have supported a year-round population. In fact, because of the abundance of marsh-estuary resources, especially in the form of shellfish, it would seem likely that the year round resources of the islands are equal to or greater than those found in the inland river bottom areas.

A few of the fish species identified in the faunal collection can be used as general seasonal indicators. The sea catfish (Arius felis) is apparently absent from the shallow estuary waters during the colder winter months and its presence in faunal collections would imply a spring, summer or fall occupation. Sea catfish are found in estuary waters from April through November (Mahood et al. 1974:25).

The channel bass (Sciaenops ocellata) occurs in estuary waters from July through January, and does not occur during the late winter and spring (Mahood et al. 1974:33). Mugil species, of which two are found on the Georgia coast (M. cephalus and M. curema), occur in the Ossabaw estuary area from May through December (Mahood et al 1974:36-37).

The blue crab (Callinectus sapidus) is not a specific indicator of seasonality, but its relative abundance can be used as an indicator of seasonality. Generally in the winter months crabs move to deep water to escape cold. Here they become more and more inactive as the water temperature drops (Palmer 1974:16). During the warmer months they become more active and move into shallow waters. Without special equipment crabs are easiest and most likely to be taken in the warmer months of the year when they are actively feeding in the shallow creeks and marshes.

The only mammal species in the collection which can be used as a seasonal indicator is the white-tailed deer. The presence or lack of deer antler can be used to estimate season of death in a broad manner. Deer antler begin growth in May. They are soft and in velvet until they become fully hardened in September. The antlers are dropped between the middle of January and the first week of February. The simple presence of antler fragments at a site will not provide information on seasonality. What is required is the skull section containing the antler attachment. Only one example is available from the Ossabaw Island faunal collection. This is a fragment of a skull from which the antler has dropped. This animal would have been killed sometime between January and May.

In addition to animal remains some floral material recovered can be used to assess seasonality. The species recovered which can be used as indicators are hickory nut fragments (all identified fragments are the pignut hickory, Carya glabra) and the berry of the cabbage palm (Sabal palmetto), both of which were found in abundance in some middens. Hickory nut and palm berry are both available for exploitation during the fall and early winter.

Table 20 presents data on those several species which are considered seasonal indicators and the middens and sites from which they come. The data in this table provides some information on seasonality, however, it is not as extensive nor as conclusive as one would hope. The presence of hickory nut fragments and cabbage palm berries, especially in large quantities, as at Ch 266, are considered solid indication for a fall to winter occupation of the site. More specifically, we should argue for a fall deposition of the particular middens containing the hickory nuts and plam berries since other middens at the site may have been deposited at other times.

At the other Savannah phase site, Ch 158N, no specific fall or winter indicators were recovered. The seasonal species recovered at this site suggest a range from early spring to early winter. When the

Table 20. Seasonality data for middens and sites.

Site/seasonality indicator and number of elements	J	F	M	A	M	J	J	A	S	O	N	D
Ch158N												
Trash midden 1												
Sea catfish (6)				—	—	—	—	—	—	—	—	
Channel bass (2)	—						—	—	—	—	—	—
Blue crab (1)			—	—	—	—	—	—	—	—	—	
Trash midden 9												
Sea catfish (2)				—	—	—	—	—	—	—	—	
Channel bass (2)	—						—	—	—	—	—	—
Blue crab (4)			—	—	—	—	—	—	—	—	—	
Trash midden 2												
Sea catfish (1)				—	—	—	—	—	—	—	—	
Trash midden 3												
Blue crab (25)			—	—	—	—	—	—	—	—	—	
Ch266												
Trash midden 1												
Hickory nut (1)									—	—		
Trash midden 3												
Hickory nut (156)									—	—		
Palm berry (11)									—	—	—	
Trash midden 7												
Mullet (6)			—	—	—	—	—	—	—	—	—	—
Hickory nut (4)									—	—		
Palm berry (3)									—	—	—	
Ch198												
Trash midden 2												
Blue crab (3)			—	—	—	—	—	—	—	—	—	
Ch202												
Trash midden 5												
White-tailed deer (skull with dropped antler) (1)	—	—	—	—	—							
Trash midden 10												
Blue crab (2)			—	—	—	—	—	—	—	—	—	
Trash midden 15												
Sea catfish (1)				—	—	—	—	—	—	—	—	

Table 20. Continued.

Site/seasonality indicator and number of elements	J	F	M	A	M	J	J	A	S	O	N	D
Ch255												
Trash midden 1												
Sea catfish (1)				—	—	—	—	—	—	—	—	
Blue crab (5)			—	—	—	—	—	—	—	—	—	
Trash midden 2												
Sea catfish (1)				—	—	—	—	—	—	—	—	
Blue crab (3)			—	—	—	—	—	—	—	—	—	
Trash midden 3												
Hickory nut (1)									—	—		

seasonal indicators are taken together we can narrow the expected period of occupation down to some extent for each midden tested. Trash midden 1 suggests a deposition of from June to December; Trash midden 9 indicators suggest a June to December period of deposition; Trash midden 2 suggests a period of deposition ranging from April to November; and Trash midden 3 a period of deposition from March to December.

For the two Savannah phase sites, then there are indications of occupation (or trash midden deposition) for all seasons except late winter. It is noted, however, that there are few specific indicators of a late winter period and negative evidence has little value in suggesting or eliminating season of occupation.

Seasonal data for Irene phase site occupation is also scanty (Table 20). The presence of one hickory nut fragment at one midden at site Ch 255 is a possible suggestion for at least a fall deposition of that midden. The other species recovered from the site are less specific and indicate seasons of deposition between April and November. The presence of the deer skull with a dropped antler suggests a winter to spring occupation for Ch 202. Other middens tested at this site indicate periods of deposition from March to November.

The few seasonal indicators available suggest that variability in period of occupation occurs between sites and most probably that variability in season of midden deposition occurs within sites, at least at the larger ones. A fall occupation of some sites is the best substantiated case of seasonality. It would appear however, that no season is totally excluded when we take into account all sites and all seasonal indicators.

Summary

The results of the subsistence analyses presented here provide information on several aspects of the subsistence strategies employed by the Mississippian populations of Ossabaw Island. In general, it is apparent that this subsistence strategy was in many respects different from that generally assigned to Mississippian groups. The subsistence activities of the Ossabaw Island, and presumably coastal populations in general, were largely influenced by the tremendous abundance of estuarine resources. Additionally, the general poorness of the area's soils in all probability precluded the heavy reliance on agriculture common for many interior Mississippian populations.

Shellfish, primarily oysters, seem to have been the basic dietary item supplemented by a variety of other marsh-estuary species. Those mammal species that were available were exploited. It is interesting to note that though the range of mammal species available of the island was narrow, the few species that were exploited are represented in the faunal collections in approximately the same proportions as they are found in collections from inland Mississippian sites. This may reflect similarities in hunting techniques across much of the Southeast during this time period.

While not explored fully in this study, Ossabaw Island because of its small size and geographical isolation, provides an ideal situation for examining the impact of prehistoric hunters on animal populations.

Lack of data has prevented a full assessment of the importance of vegetable foods in the diet. Abundant evidence of hickory and palm berry were found and it is assumed that these and other species were utilized when available.

The relative importance of agriculture has not been discussed in this study because of a lack of data. Two maize kernels have been recovered from Irene phase sites on Ossabaw Island (Pearson 1977) and maize, and possibly beans, have been reported from the Irene phase Pine Harbor site (Larson 1970). Historic accounts (Larson 1970) suggest that agriculture was wide spread on the coast and presumably of some importance during the early contact period. It is assumed that this is somewhat reflective of the Mississippian situation. As mentioned, however, the general poorness of the coastal soils coupled with the abundance of marsh-estuary resources would have limited the importance of agriculture in this area relative to the interior Southeast. An understanding of the position of agriculture in the coastal subsistence system will require extensive archaeological research.

Similarities in the subsistence patterns of the Savannah and Irene phase populations are striking. It would appear that the variety of species and the degree to which they were exploited changed little throughout the Mississippian Period. This similarity in the faunal samples of both phases is seen as reflecting a similarity in the choice of food resources, in the availability of species, and in the techniques used to secure them.

This similarity is in sharp contrast to the settlement systems of the two phases. It would appear that factors other than shifts in subsistence are the causes of the changes in settlement structure that occurred during the Mississippian Period on Ossabaw Island.

CHAPTER VII

SUMMARY AND CONCLUSIONS

This study has examined settlement and subsistence data from Ossabaw Island in an attempt to develop models of these systems as they existed during the Mississippian Period. Considering the observed patterns of subsistence and settlement as reflections of the Mississippian populations' interaction with their environment, these models are in broader perspective generalized statements about cultural adaptation during this period. Though considered to provide an initial framework for explaining and predicting variability in Mississippian settlement and subsistence, the models are essentially hypothetical. As such, they lend themselves to, and require further testing.

The available data relating to settlement suggests marked differences between the two phases. The Savannah phase is characterized by a nucleated settlement system while the Irene phase settlement structure can be defined as dispersed. These settlement structures are considered reflective of a wide variety of cultural phenomena. The dispersed pattern observed during the Irene phase is considered an expression of the permanent and seasonal population structure and of the political, social, economic, and religious hierarchy on the island. During the Savannah phase, the population is contained in a few settlements with authority and control of all sorts centralized at a single primate settlement.

The cultural factors behind the settlement shift are possibly related to pan-Mississippian phenomena since similar settlement shifts occur elsewhere. The specific causal factors are not discernable for Ossabaw Island at this time, though they are apparently not related to subsistence.

The Savannah and Irene phase settlement systems are seen as hierarchical in nature. This has been partially validated in the analyses conducted and, additionally, appears logical in light of assumptions about other Mississippian settlement systems. For example, Fowler (1974) has suggested a four level hierarchy of sites for the American Bottoms area with Cahokia occupying the highest level (the primate settlement). At Moundville, Peebles (1971, 1974) argues for a three level hierarchy.

These two Mississippian populations represent very complex and elaborate socio-cultural systems. The Ossabaw island populations, on the other hand, are seen as a marginal Mississippian group with a less sophisticated socio-cultural system. The Mississippian sites on Ossabaw Island, for example, contain no known platform mounds, a characteristic of the higher levels of the hierarchy at Cahokia and Moundville. For this reason the Ossabaw Island hierarchies are comparable only to the lower levels of these two settlement systems.

A situation more comparable to that of Ossabaw Island is seen in the Powers phase (A.D. 1275 - A.D. 1350) of southeastern Missouri. Price (1973) sees the Powers phase as being somewhat marginal to the main Middle Mississippian development but not, it appears, as marginal nor as different as the Mississippian development in coastal Georgia.

Price (1973:50) suggests a four level hierarchy of sites for the Powers phase. These are: 1. Civic Ceremonial Center - only one site, Powers Fort, is included in this category. This site contains four mounds, one of which is a large flat-topped temple mound. Powers Fort is considered to have been at the top of the hierarchy and to have exerted the greatest socio-political authority and influence. 2. Fortified Secondary Villages. 3. Hamlets. 4. Extractive sites.

Although Price does not explicitly describe the sorts of activities associated with each level of this herarchy it appears to share characteristics with both the Savannah and Irene phase settlement systems. With the possible exception of the primate Savannah phase site Ch 158N, Ossabaw Island itself may not contain a civic ceremonial center. Such sites may have existed on the mainland or on other islands. A close equivalent to a civic ceremonial center, especially during the Savannah phase, would seem to be the Irene Mound site which contained a Savannah phase temple mound and an Irene phase burial mound and mortuary building (Caldwell and McCann 1941).

It seems that the hierarchies of settlement on Ossabaw Island compare only to the lower levels of most other described Mississippian settlement hierarchies. This is not surprising considering the marginal position, relative isolation and rather distinctive subsistence base of the area. All of these factors have probably contributed to the lack of elaboration observed in coastal Mississippian cultural development.

The data presented suggests that Ossabaw Island's Mississippian populations operated as autonomous or semi-autonomous units in certain areas of cultural activity. For example, the subsistence data suggests that Savannah and Irene phase populations relied heavily on exploitation of marsh-estuary resources. In light of the abundance of easily exploited food resources in surrounding marshes and creeks, Ossabaw Island could have, and it is assumed did, operate as a self sufficient economic unit.

It is not assumed that the island operated as an autonomous unit at all levels. It is evident, for instance, that the Mississippian populations of Ossabaw Island had ties and relationships with the mainland and other islands. These affinities are most evident in terms of ceramic similarities. It is impossible to translate the available ceramic data into meaningful socio-cultural terms and all that can be said is that ceramic relationships existed.

Historical evidence is available which provides some information as to the position of the Issabaw Island population in relation to other populations in coastal Georgia at the time of European contact. This data holds for Irene phase populations but cannot be extended back to the Savannah phase with any assurance.

At historic contact the northern coast of Georgia was occupied by the Guale Indians (Lanning 1935; Swanton 1922). There is reasonable assurance that the area of Guale described in early historic accounts is equivalent to the archaeological manifestation, the Irene phase (Larson 1958a; Pearson 1977).

It is known that the inhabitants of Ossabaw Island were linguistically related to aboriginal populations in the rest of the north Georgia coastal area since Spanish accounts point out that in all of the area only one language, Guale, was spoken (Swanton 1922:15).

Early Spanish accounts describing Guale indicate that there were a number of villages in the area but only a few were considered important (Swanton 1922:81-83). These important villages were occupied by the most important chief, or cacique, in the immediate region. In 1566, the Governor of Florida, Pedro Menendez de Avila, stopped at several important villages in Guale. At each village a council was held at which the cacique of the village and chiefs from surrounding, and apparently subordinate, villages were present (Lanning 1935:12). It seems that some form of political hierarchy was operating in which a few towns were dominant over the rest.

By 1604 the Province of Guale was conceived of as three groups of towns, a northern, a central, and a southern group, each having one important town in which the most important cacique resided (Swanton 1922:81). The main town for the southern group was on St. Simons Island, for the central group on Sapelo Island, and for the northern group on St. Catherines Island.

Several towns on the mainland and the one town mentioned on Ossabaw Island (Asopo) were included in the northern group of towns. These were apparently subordinant to the main town on St. Catherines Island which was called Guale.

It appears that during the earliest period of European contact and presumably earlier, the Ossabaw Island population was part of a larger social sphere that included parts of the mainland and all of St. Catherines Island. Although the accounts imply that this interaction is at a political level we must assume relationships at other levels also.

The conclusions are that the Irene phase population on Ossabaw Island operated as a whole and discrete unit in terms of economics and some socio-cultural levels but that at higher socio-political and possibly religious levels acted as a portion of a larger network. It is suggested that a similar situation existed during the Savannah phase though the evidence is less strong. Because of this it is likely that certain sorts of settlements which should be associated with the highest level or levels of the total Mississippian Period settlement hierarchies are not to be found on Ossabaw Island. Platform mounds, such as that found at the Irene Mound site, are not found and possibly reflect the lack of highest order settlements on the island during the Savannah phase. The historic data suggests a similar lack of highest order settlements during the Irene phase.

The subsistence data suggests an orientation toward the exploitation of the abundant marsh-estuary resources of the region. Additionally, it would appear that there is little difference between the Savannah and Irene phases in terms of the types and the intensity with which food resources were exploited. Available data suggests that the reliance on marsh-estaury resources has existed on the Georgia coast since the Archaic Period (Marrinan 1975) and it is possible that few changes have occured in the basic subsistence patterns throughout the period of prehistoric occupation. Apparently, the addition of agriculture did not greatly affect the long standing basic pattern of subsistence in the area.

This study has approached the broad subject of cultural adaptation by dealing with aspects of only two cultural subsystems, those of settlement and subsistence. These systems have been analyzed in terms of their occurance during the Mississippian Period on Ossabaw Island, a unique, temporally, and spatially isolated unit. Within a bounded universe of this sort, settlement and subsistence data lend themselves to, at least, partial explanation.

The models developed are meant as explanatory mechanisms, as means of comparison, and as tools of analysis. As such, though they have their most specific value in the analysis of prehistoric adaptation on the Georgia coast, they are considered generally useful in a wide variety of situations.

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APPENDIX I

CERAMIC COLLECTIONS

Appendix I lists the sherd counts for each of the Ossabaw Island sites used in this study. The ceramics themselves have been discussed in the text.

The first column, labeled SN, is the site number as recorded in the Laboratory of Archaeology, University of Georgia, site files.

Columns labeled A through K are sherd counts for each of the various pottery types or styles in accordance with the following list.

A - Irene Complicated Stamped

B - Irene Incised

C - Plain Ware

D - Burnished Plain Ware

E - Savannah Check Stamped

F - Savannah Fine Cord-Marked

G - Savannah Complicated Stamped

H - Clay Tempered Wares

I - Deptford Wares

J - Fiber Tempered Wares

K - Unclassified

The last column, labeled SUM, lists the sum of the ceramic collection for each site.

SN	A	B	C	D	E	F	G	H	I	J	K	SUM
<u>Sav. Phase</u>												
Ch158N	41	1	85	67	31	234	30	110			207	806
Ch160			35	1	12	44		3			42	137
Ch155	22		6	2	3	5					11	49
Ch145	11		4	3	1	11		8				48
Ch438			1			2		1			1	5
Ch274	1					2						3
Ch266			3	38	48	65	80				140	380
Ch402						1						1
Ch400	3		1			4					1	9
Ch164	8		6	6	3							23
Ch147	83	3	1	3	10	21		7			46	174
Ch146	2	1	1		2	4					20	30
<u>Irene Phase</u>												
Ch158S	404	15	105	49	2	4		5			81	665
Ch155	22		6	2	3	5					11	49
Ch202	266		14	56		1		12	1		50	400
Ch150	40		6	6	1						49	102
Ch254	7			1							2	10
Ch191	3		2					5			4	14
Ch435	13		1	5							6	25
Ch199	315		7	59				12		1	17	411
Ch277	403	14	9	37				1			64	528
Ch176	179	2	16	10		5					34	246
Ch430	5										6	11
Ch253	37		1	2							8	48
Ch179	7		1								1	9
Ch195	107		19	13	1	1					26	167
Ch170	3			1							1	5
Ch145	11		4	4	1	11		8			9	48

SN	A	B	C	D	E	F	G	H	I	J	K	SUM
Ch436	14		2								5	21
Ch276	3											3
Ch198	167	7	12	40				3			16	245
Ch274	1					2						3
Ch185	1											1
Ch182	4		2					1			2	9
Ch153	1	1										2
Ch174	10		1								6	17
Ch395	1											1
Ch403	66	1	8	9							36	120
Ch248	3											3
Ch232	69	1	1	3							20	94
Ch151	150	11	8	32				8			13	222
Ch428	3		2	1							1	7
Ch247	68		1	9							5	83
Ch228	1		1									2
Ch259	11		1									12
Ch224	216	5	22	33							27	303
Ch275	1			2								3
Ch391	1											1
Ch429	1											1
Ch434	1											1
Ch255	136	6	4	16							35	198
Ch271	4		1									5
Ch400	3		1			4					1	9
Ch408	1		2							3		6
Ch385	2											2
Ch164	8		6	6	3							23
Ch147	83	3	1	3	10	21		7			46	174
Ch146	2	1	1		2	4					20	30
Ch236	51	1	8	8								68
Ch193	102		3	39				5			17	166

SN	A	B	C	D	E	F	G	H	I	J	K	SUM
Ch165	1											1
Ch258	1											1
Ch229	12											12
Ch225	4	1									1	6
Ch200	46			3							15	64
Ch244	1											1
Ch201	7	1	5									13
Ch143	2			5								7
Ch169	28		2	5							3	38
Ch192	153	4	3	18							14	192
Ch144	1											1
Ch235	2											2
Ch245	51							2			2	55

APPENDIX II

SITE ENVIRONMENTAL AND CULTURAL DATA

Appendix II presents various site unit and environmental data. Below is presented an explanation of the codes used in the listing. The categories discussed below have been fully explained in the text.

Column SN:

This column lists the site numbers as recorded in the files at the Laboratory of Archaeology, University of Georgia.

Column Size:

This column lists the sizes of all sites in m^2.

Column Class:

This column presents the Site Size Class into which each site is placed. 1 indicates Site Size Class I. 2 indicates Site Size Class II. 3 indicates Site Size Class III and 4 indicates Site Size Class IV.

Column MDS:

This column lists the number of burial mounds found at each site.

Column VEG:

This column presents the Forest Community in which the site is found. Discussion of these Forest Communities is presented in Chapter II. The codes are:

1 - Mixed Oak Hardwood Forest

2 - Oak Palmetto Forest

3 - Lowland Mixed Forest

4 - High Tidal Marsh

Column Soil:

This column lists soil types upon which sites are located. Discussion of these soil types is presented in Chapter II. The codes are:

1 - Lakeland Sand (Lp)

2 - Chipley Fine Sand (Cm)

3 - Olustee Fine Sand (Ol)

4 - Leon Fine Sand (Lr)

5 - Ellebelle Loamy Sand (El)

6 - Kirshaw-Osier Complex (Kic)

7 - Capers Soil (Ch)

Column Marsh:

This column presents site distances from the marsh in terms of 3 categories. These categories are discussed in Chapter II. The codes are:

1 - 0 - 100 meters

2 - 100 - 200 meters

3 - greater than 200 meters

Column Creek:

This column presents site distances from the nearest salt water creek. These categories are discussed in Chapter II. The codes are the same as those listed for Column Marsh.

Columns I,S,W,D, and F:

These columns present information on periods of prehistoric occupation at any site. A 1 in the columns indicates that evidence of a particular prehistoric occupation is present, a 0 indicates that there is no evidence. The prehistoric occupations are indicated by the column headings. The column headings are:

I - Irene Phase (A.D. 1350 - A.D. 1550)

S - Savannah Phase (A.D. 1150 - A.D. 1350)

W - Wilmington Phase (circa A.D. 700 - A.D. 1100)

D - Deptford Phase (circa 500 B.C. - A.D. 600)

F - Fiber Tempered or Late Archaic (circa 2000 B.C. - 1000 B.C.)

Savannah Phase

SN	Size	Class	Mds	Veg	Soil	Marsh	Creek	I	S	W	D	F
Ch158N	324000	1	2	1	1	1	1	1	1	1	0	0
Ch160	119520	2	1	1	1	1	1	0	1	1	0	0
Ch155	55740	2	0	1	1	1	1	1	1	1	1	0
Ch145	11148	3	0	2	4	1	1	1	1	1	0	0
Ch438	10440	3	0	1	1	1	3	0	1	0	0	0
Ch274	8871	3	0	2	3	1	3	1	1	0	0	0
Ch266	5562	3	0	1	1	3	3	0	1	0	0	0
Ch402	1800	3	0	1	2	3	3	0	1	0	0	0
Ch400	1560	3	0	2	4	3	3	1	1	0	0	0
Ch164	669	3	0	1	6	1	1	1	1	0	0	0
Ch147	557	3	0	1	1	1	1	1	1	1	0	0
Ch146	279	3	0	2	4	1	1	1	1	0	0	0

Irene Phase

SN	Size	Class	Mds	Veg	Soil	Marsh	Creek	I	S	W	D	F
Ch158S	140000	1	2	1	1	1	1	1	1	1	1	1
Ch155	55740	2	0	1	1	1	1	1	1	1	1	0
Ch202	55070	2	0	3	5	1	2	1	0	0	1	0
Ch150	37160	2	1	1	1	1	1	1	0	0	0	0
Ch254	33444	2	0	1	1	1	2	1	0	0	0	0
Ch191	29728	2	0	1	2	3	3	1	0	1	0	0
Ch435	27000	2	0	1	2	3	3	1	0	0	0	0
Ch199	26002	2	0	1	1	1	3	1	0	1	0	1
Ch277	17789	3	1	1	2	1	1	1	0	1	0	0
Ch176	16643	3	1	3	3	1	1	1	0	0	0	0
Ch430	15876	3	1	1	1	3	3	1	0	0	0	0
Ch253	15738	3	0	1	1	1	2	1	0	0	0	0
Ch179	14042	3	0	1	1	2	3	1	0	0	0	0
Ch195	14020	3	1	1	1	1	1	1	0	0	0	0
Ch170	11148	3	1	1	2	1	1	1	0	0	0	0

SN	Size	Class	Mds	Veg	Soil	Marsh	Creek	I S W D F
Ch145	11148	3	0	2	4	1	1	1 1 1 0 0
Ch436	10680	3	0	1	2	3	3	1 0 0 0 0
Ch276	10232	3	0	2	3	2	3	1 0 0 0 0
Ch198	9766	3	1	2	4	1	2	1 0 1 0 0
Ch274	8871	3	0	2	3	1	3	1 1 0 0 0
Ch396	7920	3	0	1	2	3	3	1 0 0 0 0
Ch182	7452	3	0	2	4	2	3	1 0 0 0 0
Ch153	7432	3	0	1	2	1	1	1 0 0 0 0
Ch174	7383	3	0	1	1	1	3	1 0 0 0 0
Ch395	6840	3	0	1	2	3	3	1 0 0 0 0
Ch403	6495	3	0	1	2	3	3	1 0 0 0 0
Ch248	6360	3	0	1	1	3	3	1 0 0 0 0
Ch232	4896	4	0	2	3	1	2	1 0 0 0 0
Ch151	4878	4	0	2	3	1	3	1 0 1 0 0
Ch428	3960	4	0	1	1	3	3	1 0 0 0 0
Ch247	3716	4	0	1	1	1	2	1 0 0 0 0
Ch228	2919	4	0	3	5	1	1	1 0 0 0 0
Ch259	2917	4	0	1	1	2	3	1 0 0 0 0
Ch224	2415	4	0	2	3	1	3	1 0 0 0 0
Ch275	2291	4	0	2	3	2	3	1 0 0 0 0
Ch391	2016	4	0	1	2	1	3	1 0 0 0 0
Ch429	1920	4	0	1	1	3	3	1 0 0 0 0
Ch434	1920	4	0	2	3	3	3	1 0 0 0 0
Ch255	1858	4	0	2	3	1	1	1 0 0 0 0
Ch271	1582	4	0	2	3	3	3	1 0 0 0 0
Ch400	1560	4	0	2	4	3	3	1 1 0 0 0
Ch408	1440	4	0	2	3	3	3	1 0 0 0 1
Ch385	1080	4	0	1	2	3	3	1 0 0 0 0
Ch164	669	4	0	1	6	1	1	1 1 0 0 0
Ch147	557	4	0	1	1	1	1	1 1 1 0 0
Ch146	279	4	0	2	4	1	1	1 1 0 0 0

SN	Size	Class	Mds	Veg	Soil	Marsh	Creek	I S W D F
Ch236	209	4	0	3	5	3	3	1 0 0 0 0
Ch193	186	4	0	1	1	1	3	1 0 1 0 0
Ch165	114	4	0	4	7	1	2	1 0 0 0 0
Ch258	60	4	0	4	7	1	1	1 0 0 0 0
Ch229	47	4	0	3	5	2	2	1 0 0 0 0
Ch225	47	4	0	1	2	3	3	1 0 0 0 0
Ch200	37	4	0	3	5	1	3	1 0 0 0 0
Ch244	37	4	0	1	1	1	2	1 0 0 0 0
Ch201	29	4	0	3	5	1	3	1 0 0 0 0
Ch143	28	4	0	2	4	1	1	1 0 0 0 0
Ch169	7	4	0	3	5	1	2	1 0 0 0 0
Ch192	6	4	0	1	1	1	3	1 0 0 0 0
Ch144	4	4	0	1	6	1	2	1 0 0 0 0
Ch235	1	4	0	1	6	1	1	1 0 0 0 0
Ch245	1581	4	0	1	2	2	3	1 0 1 0 0

APPENDIX III

SUBSISTENCE DATA FROM THE SCREENED SAMPLE

Appendix III presents subsistence data obtained from the screened sample by midden within each site. Molluscs were not quantified in this sample and are listed only by occurance. All middens investigated contained Eastern oyster (Crassostrea virginica), Atlantic ribbed mussel (Modialus demissus), Stout tagelus (Tagelus plebius), Barnacles (Balanus sp) and various species of land snails (primarily Triodopsis sp). Since these species occured in all middens, they are not included in the following tabulation.

The number of skeletal elements and the estimated Minimum Number of Individuals (MNI) are provided for other species. Those floral remains that were identified are included.

SAVANNAH PHASE

Ch158N

Trash Midden 1

Species	Number of elements	Estimated MNI
Mollusca:		
Mercenaria mercenaria		
Littorina irrorata		
Busycon carica		
Dinocardium robustum		
Mammalia:		
Procyon lotor	5	1
Sylvilagus palustris	7	1
Pisces:		
Lepisosteus osseus	1	1
Cynoscion nebulosus	1	1
Sciaenidae sp	1	1
Reptilia:		
Malaclemys terrapin centrata	1	1
Unidentified turtle	1	
Aves:		
Rallus longirostris	2	2
Unidentified bone:	8	

Ch158N

Trash Midden 2

Species	Number of elements	Estimated MNI
Mollusca:		
Mercenaria mercenaria		
Littorina irrorata		
Mammalia:		
Odocoileus virginianus nigribarbis	11	1
Procyon lotor	2	1
Pisces:		
Arius felis	1	1
Reptilia:		
Unidentified turtle	2	
Crotalus sp	1	1
Unidentified bone:	4	

Ch158N

Trash Midden 3

Species	Number of elements	Estimated MNI
Mollusca:		
Mercenaria mercenaria		
Polinices duplicatus		
Littorina irrorata		
Mammalia:		
Odocoileus virginianus nigribarbis	2	1
Crustacea:		
Callinectus sapidus	20	6

Species	Number of elements	Estimated MNI
Unidentified bone:	1	
<u>Ch158N</u>		
<u>Trash Midden 1/1977</u>		
Mollusca:		
Mercenaria mercenaria		
Busycon carica		
Littorina irrorata		
Mammalia:		
Odocoileus virginianus nigribarbis	4	1
Unidentified mammal	1	
Pisces:		
Arius felis	6	1
Sciaenops ocellata	2	1
Paralichthys sp	1	1
Unidentified fish	12	
Reptilia:		
Malaclemys terrapin centrata	34	1
Kinosternon subrubrum subrubrum	3	1
Unidentified turtle	32	
Crustacea:		
Callinectus sapidus	1	1
Unidentified bone:	22	

Ch158N

Trash Midden 9

Species	Number of elements	Estimated MNI
Mollusca:		
Mercenaria mercenaria		
Busycon carica		
Littorina irrorata		
Mammalia:		
Odocoileus virginianus nigribarbis	3	1
Procyon lotor	2	1
Unidentified mammal	3	
Pisces:		
Arius felis	2	1
Sciaenops ocellata	4	1
Unidentified fish	12	
Reptilia:		
Malaclemys terrapin centrata	15	1
Unidentified turtle	27	
Crustacea:		
Callinectus sapidus	4	1
Unidentified bone:	39	

Ch158N

Trash Midden 40

Mollusca:

Mercenaria mercenaria
Rangia cuneata
Busycon carica
Littorina irrorata

Species	Number of elements	Estimated MNI
Mammalia:		
Odocioleus virginianus nigribarbis	2	1
Reptilia:		
Malaclemys terrapin centrata	3	1
Unidentified turtle	4	
Aves:		
Unidentified bird	2	
Unidentified bone:	1	

<u>Ch158N</u>

<u>Trash Midden 60</u>

Species	Number of elements	Estimated MNI
Mollusca:		
Mercenaria mercenaria		
Busycon carica		
Urosalpinx sp		
Littorina irrorata		
Mammalia:		
Procyon lotor	1	1
Unidentified mammal	2	
Reptilia:		
Malaclemys terrapin centrata	18	1
Pseudemys sp	2	1
Kinosternon sp	4	1
Unidentified turtle	35	
Pisces:		
Unidentified fish	2	

Ch158N

Trash Midden 81

Species	Number of elements	Estimated MNI
Mollusca:		
Mercenaria mercenaria		
Littorina irrorata		
Busycon carica		
Urosalpinx sp		
Mammalia:		
Odocoileus virginianus nigribarbis	1	1
Procyon lotor	1	1
Unidentified mammal	11	
Pisces:		
Cynoscion nebulosus	12	1
Unidentified fish	1	
Reptilia:		
Unidentified reptile	1	

Ch266

Trash Midden 1

Mollusca:		
Mercenaria mercenaria		
Busycon canaliculatum		
Mammalia:		
Odocoileus virginianus nigribarbis	5	1

Species	Number of elements	Estimated MNI
Flora:		
Carya glabra (nut fragments)	1	
<u>Ch266</u>		
<u>Trash Midden 3</u>		
Mollusca:		
Mercenaria mercenaria		
Mammalia:		
Procyon lotor	1	1
Sylvilagus palustris	2	1
Unidentified bone:	6	
Flora:		
Carya glabra (nut fragments)	136	
Sabal palmetto (berry)	11	
<u>Ch266</u>		
<u>Trash Midden 5</u>		
Mollusca:		
Mercenaria mercenaria		
Busycon carica		
Mammalia:		
Odocoileus virginianus nigribarbis	9	1
Procyon lotor	9	1
Sylvilagus palustris	2	1
Unidentified mammal	3	

Species	Number of elements	Estimated MNI
Reptilia:		
Unidentified turtle	20	
Aves:		
Unidentified bird	1	
Unidentified bone:	5	

Ch266

Trash Midden 7

Species	Number of elements	Estimated MNI
Mollusca:		
Mercenaria mercenaria		
Busycon carica		
Dinocardium robustum		
Littorina irrorata		
Mammalia:		
Odocoileus virginianus nigribarbis	8	1
Unidentified mammal	34	
Pisces:		
Mugil sp	6	1
Unidentified fish	5	
Reptilia:		
Unidentified turtle	1	
Unidentified bone:	1	
Flora:		
Carya glabra (nut fragments)	4	
Sabal palmetto (berries)	3	

Ch266

Trash Midden 9

Species	Number of elements	Estimated MNI
Mollusca:		
Mercenaria mercenaria		
Rangia cuneata		
Dinocardium robustum		
Mammalia:		
Odocoileus virginianus nigribarbis	5	1
Sylvilagus palustris	5	2
Unidentified mammal	2	
Reptilia:		
Malaclemys terrapin centrata	4	1
Pseudemys scripta scripta	6	1
Unidentified turtle	14	
Unidentified bone:	3	

IRENE PHASE

Ch202

Trash Midden 5

Mollusca:		
Busycon carica		
Busycon canaliculatum		
Litterina irrorata		
Mammalia:		
Odocoileus virginianus nigribarbis	12	1

Species	Number of elements	Estimated MNI
Mammalia cont:		
Procyon lotor	1	1
Reptilia:		
Malaclemys terrapin centrata	10	1
Kinosternidae	2	
Unidentified turtle	13	
Aves:		
Unidentified bird	1	
Unidentified bone:	8	

<u>Ch202</u>

<u>Trash Midden 23</u>

Mollusca:		
Busycon carica		
Littorina irrorata		
Reptilia:		
Kinosternidae	1	1
Unidentified turtle	2	

<u>Ch202</u>

<u>Trash Midden 32</u>

Mammalia:		
Odocoileus virginianus nigribarbis	2	1

Species	Number of elements	Estimated MNI
Reptilia:		
Malaclemys terrapin centrata	2	1
Kinosternidae	7	1
Unidentified turtle	10	
Pisces:		
Unidentified fish	3	
Unidentified bone:	5	

Ch202

Trash Midden 8

Mollusca:		
Busycon carica		
Litterina irrorata		
Mammalia:		
Odocoileus virginianus nigribarbis	1	1
Reptilia:		
Unidentified turtle	2	
Unidentified bone:	5	

Ch202

Trash Midden 10

Mollusca:

Busycon carica

Species	Number of elements	Estimated MNI
Mammalia:		
Odocoileus virginianus nigribarbis	13	1
Procyon lotor	2	1
Unidentified mammal	1	
Crustacea:		
Callinectus sapidus	2	1
Unidentified bone:	8	

Ch202

Trash Midden 1

Mollusca:		
Littorina irrorata		
Busycon carica		
Busycon canaliculatum		
Mammalia:		
Odocoileus virginianus nigribarbis	7	1
Procyon lotor	3	1
Sylvilagus palustris	1	1
Unidentified mammal	6	
Reptilia:		
Unidentified turtle	4	
Colubus constrictor constrictor	3	1
Unidentified bone:	10	

Ch202

Trash Midden 15

Species	Number of elements	Estimated MNI
Mammalia:		
Odocoileus virginianus nigribarbis	2	1
Pisces:		
Arius felis	1	1
Unidentified fish	2	

Ch202

Trash Midden 24

Mollusca:		
Busycon carica		
Litterina irrorata		
Mammalia:		
Odocoileus vieginianus nigribarbis	13	1
Procyon lotor	2	1
Reptilia:		
Unidentified turtle	2	

Ch198

Trash Midden 2

Mollusca:

Litterina irrorata
Busycon carica
Mercenaria mercenaria

Species	Number of elements	Estimated MNI
Mammalia:		
Odocoileus virginianus nigribarbis	7	1
Procyon lotor	1	1
Reptilia:		
Malaclemys terrapin centrata	8	1
Unidentified turtle	6	
Unidentified bone:	7	

Ch198

Trash Midden 13

Mollusca:		
Busycon carica		
Mammalia:		
Odocoileus virginianus nigribarbis	1	1
Reptilia:		
Malaclemys terrapin centrata	2	1
Unidentified reptile	2	
Pisces:		
Unidentified fish	5	
Unidentified bone:	10	

Ch255

Trash Midden 1

Mollusca:		
Mercenaria mercenaria		

Species	Number of elements	Estimated MNI
Mollusca cont.		
Busycon carica		
Busycon canaliculatum		
Dinocardium robustum		
Polinices duplicatus		
Litterina irrorata		
Mammalia:		
Odocoileus virginianus nigribarbis	25	2
Reptilia:		
Malaclemys terrapin centrata	3	1
Kinosternon subrubrum subrubrum	1	1
Unidentified turtle	6	
Pisces:		
Arius felis	37	3
Menticirrhus americanus	2	1
Sciaenidae	1	1
Unidentified fish	78	
Crustacea:		
Callinectus sapidus	6	2
Unidentified bone:	3	

Ch255

Trash Midden 2

Species	Number of elements	Estimated MNI
Mollusca:		
Mercenaria mercenaria		
Busycon carica		
Polinices duplicatus		
Anadara brasiliana		

Species	Number of elements	Estimated MNI
Mammalia:		
Odocoileus virginianus nigribarbis	19	1
Sylvilagus palustris	5	1
Unidentified mammal	2	
Reptilia:		
Unidentified turtle	3	
Pisces:		
Arius felis	1	1
Unidentified fish	2	
Crustacea:		
Callinectus sapidus	4	2
Unidentified bone:	18	

Ch255

Trash Midden 3

Species	Number of elements	Estimated MNI
Mollusca:		
Mercenaria mercenaria		
Litterina irrorata		
Anadara brasiliana		
Mammalia:		
Unidentified mammal	1	
Reptilia:		
Unidentified turtle	1	
Unidentified reptile	1	
Aves:		
Aix sponsa	1	1
Unidentified bird	3	

Species	Number of elements	Estimated MNI
Unidentified bone:	2	
Flora:		
Carya glabra (nut fragments)	2	