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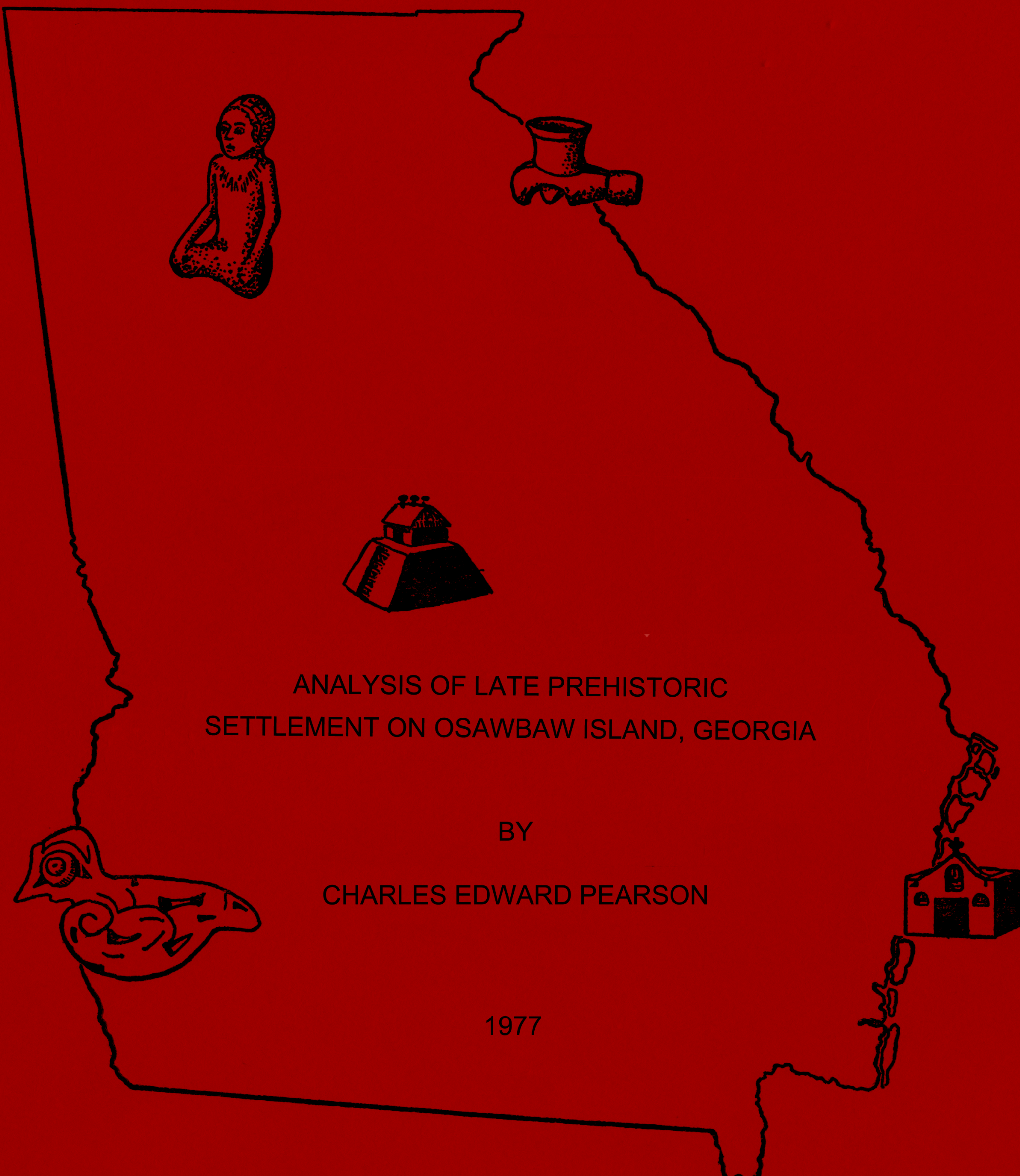

ANALYSIS OF LATE PREHISTORIC SETTLEMENT ON OSAWBAW ISLAND, GEORGIA

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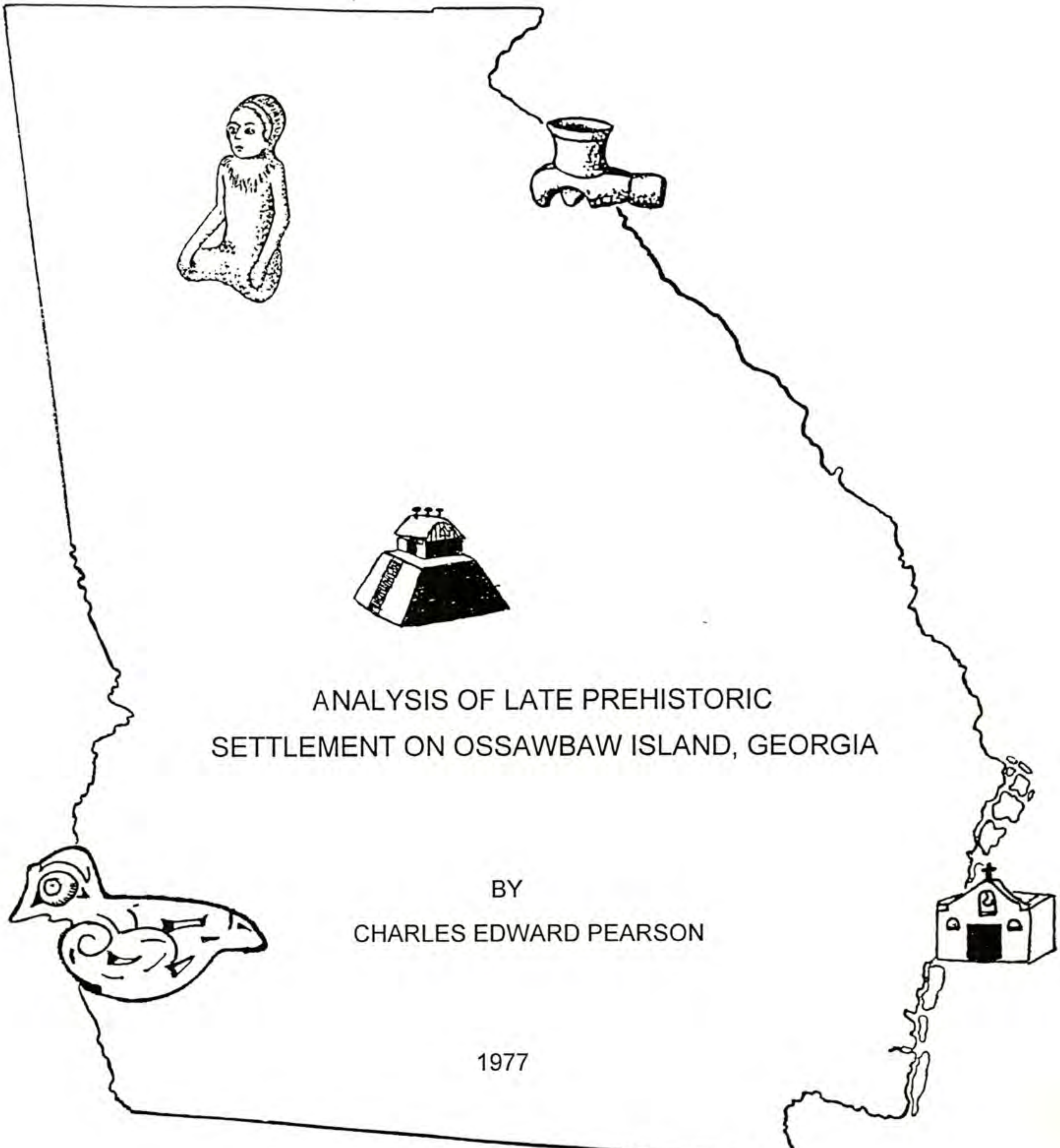

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CHARLES EDWARD PEARSON
DEPARTMENT OF ANTHROPOLOGY
UNIVERSITY OF GEORGIA

ATHENS
1977

PREFACE

This monograph constitutes a revision of my masters thesis which was written for the Department of Anthropology, University of Georgia I wish to acknowledge the assistance, and criticisms, of my thesis committee: Bruce D. Smith, Wilfred C. Bailey, Donald A. Graybill, and David J. Hally.

I wish to especially thank and acknowledge Mrs. Eleanor Torrey West of Ossabaw Island whose interest and encouragement have made this study possible. Several fellow graduate students have contributed to the quality of this work through their comments and suggestions. They include Sharon Goad, Chung Ho Lee, Ernest Seckinger, and Richard Zurel. Chester DePratter is especially thanked for the aid and helpful suggestions that he has provided throughout the course of this work. I also offer my thanks to those who provided aid and assistance during my stay on Ossabaw Island, especially, Margaret Thomas, Al Bradford, Larry Schroeder, and Ishmael Williams.

This paper is only a beginning effort and it is inevitable that it contains shortcomings or even errors. As an initial effort I would hope that it proves useful to some and that the criticisms of others be directed at improving its deficiencies.

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CHAPTER I

INTRODUCTION

The use of settlement data in interpreting and reconstructing prehistoric cultural activities has become an important and effective aspect of archaeological investigation. 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 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 socio-cultural environment. Utilizing such an approach, this study considers late prehistoric settlement data from Ossabaw Island, Georgia and proposes a general model of settlement and adaptation.

The late prehistoric cultural manifestation on the Georgia coast is known as the Irene phase and dates from A.D. 1350 to A.D. 1550 (Caldwell 1971:90). In order to approach the question of Irene phase settlement and 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 attempting 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 data with ecological data this study presents a view of Irene settlement patterning on Ossabaw Island and allows the formulation of accurate statements about the complex cultural systems that operated there. 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, Struever 1968, 1971, and Trigger 1968, 1971. These studies have, in turn, drawn heavily from the ideas of Julian Steward and Leslie White concerning cultural adaptation (Steward 1955, White 1949).

Settlement Pattern

The concept of settlement pattern was first put to substantial archaeological use by Gordon Willey in Settlement Patterns in the Viru Valley, Peru (1953). Willey has provided a broad and useful definition of settlement pattern which will be used herein. Settlement pattern is defined as

> "the way in which man disposed himself over the landscape on which he lived. It refers to dwellings, to their arrangement and to the nature and disposition of other buildings pertaining to community life. These settlements reflect the natural environment, the level of technology on which the builders operated and various institutions of social interaction and control which the culture maintained". (Willey 1953:1)

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 peoples 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.

Model

As used in this study the term "model" is considered a simplified theoretical diagram depicting adaptation to the natural and socio-cultural 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 they 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 model developed herein utilizes qualitative and quantitative measures of settlement 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 population being studied.

As with almost all other models based on archaeological data the model presented here must be considered hypothetical in nature. It is based on particular sets of collected data and seems reasonable in light of this data. As an hypothetical construct the model developed is seen as a comparative as well as explanatory device which provides a base line for further study. Changes and alterations in the model are conceivable and, in fact, expected with the collection of greater amounts of data.

An assumption inherent in this study is that Ossabaw's Irene 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 doubted 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 selecting those factors that express site function and differentiation. These factors will be discussed in detail in Chapter IV.

Settlement System

This study considers the Irene phase settlement system on Ossabaw Island as a subsystem of a larger, more complex cultural system 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. This 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 Irene settlements on Ossabaw Island. It is these relationships which are actually being sought in this study. Handling all possible relationships that existed within the 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 Irene phase (<u>circa</u> A.D. 1350 to A.D. 1550) which has been well defined and described, mainly on the basis of ceramics, by a number of workers (Caldwell 1952, 1971, Caldwell and McCann 1941, Willimas 1968).

The importance of interrelationships between the settlement system and other cultural subsystems is recognized. Of particular importance is the generally accepted assumption that subsistence strategy in particular is important in affecting site location as well as site variability. Understanding Irene phase subsistence strategy requires a knowledge of the specific resources being exploited out of the total resources available in the ecosystem. Therefore a rather detailed description of Ossabaw Island's natural environment is presented along with available data on Irene phase subsistence.

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 Irene phase settlement. 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 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.*,1975).

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

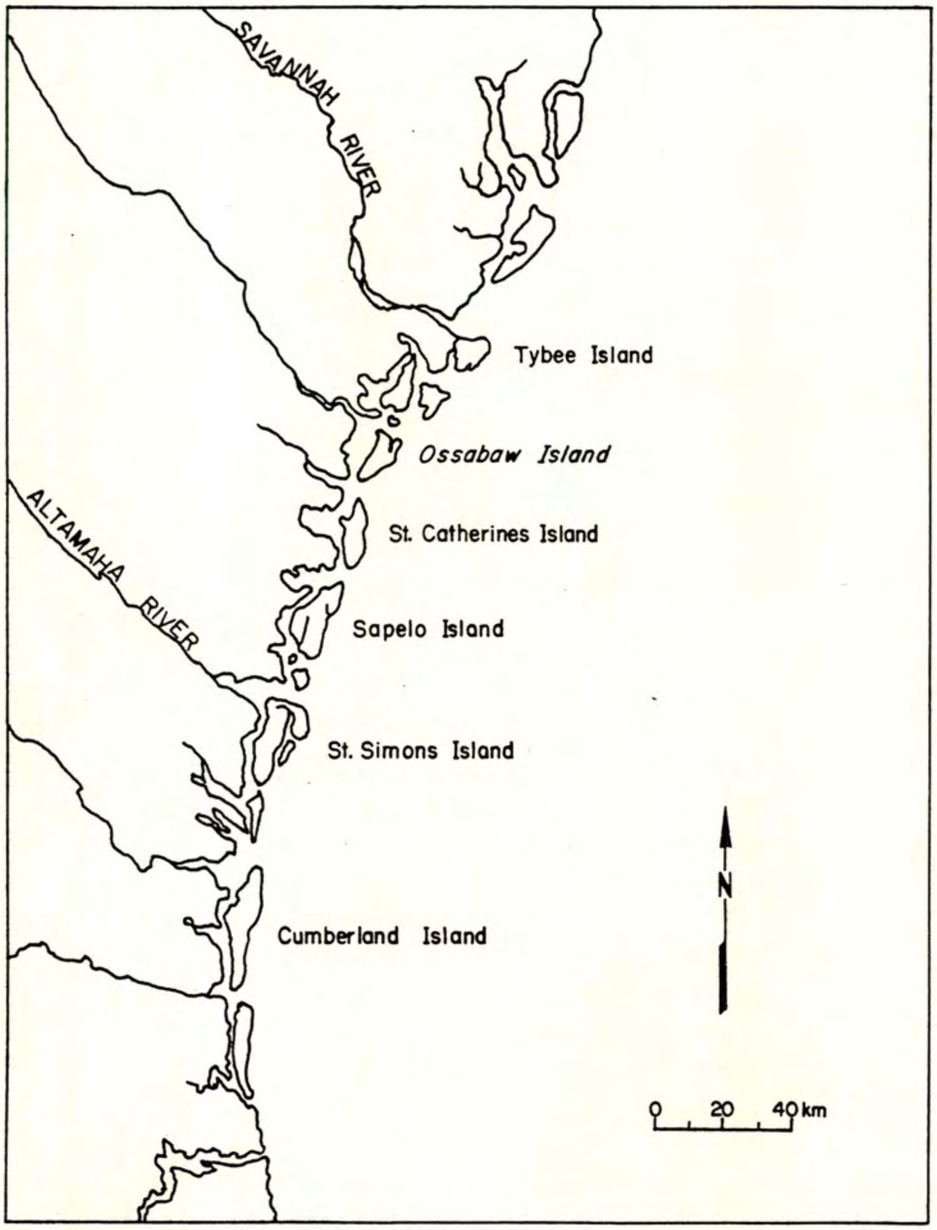


Figure 1. Map of coastal Georgia.

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 the result of Pleistocene and Post-Pleistocene 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 principle rivers 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., (1975) 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), opossum (Didelphis marsupialis) 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 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., 1975 and Larson 1970) provide pertinent information needed to reconstruct the biotic and abiotic communities of the island during the period of Irene phase occupation. While modern environmental studies may not be totally adequate in describing environmental conditions of five hundred years ago, Johnson et al., (1975:92) 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

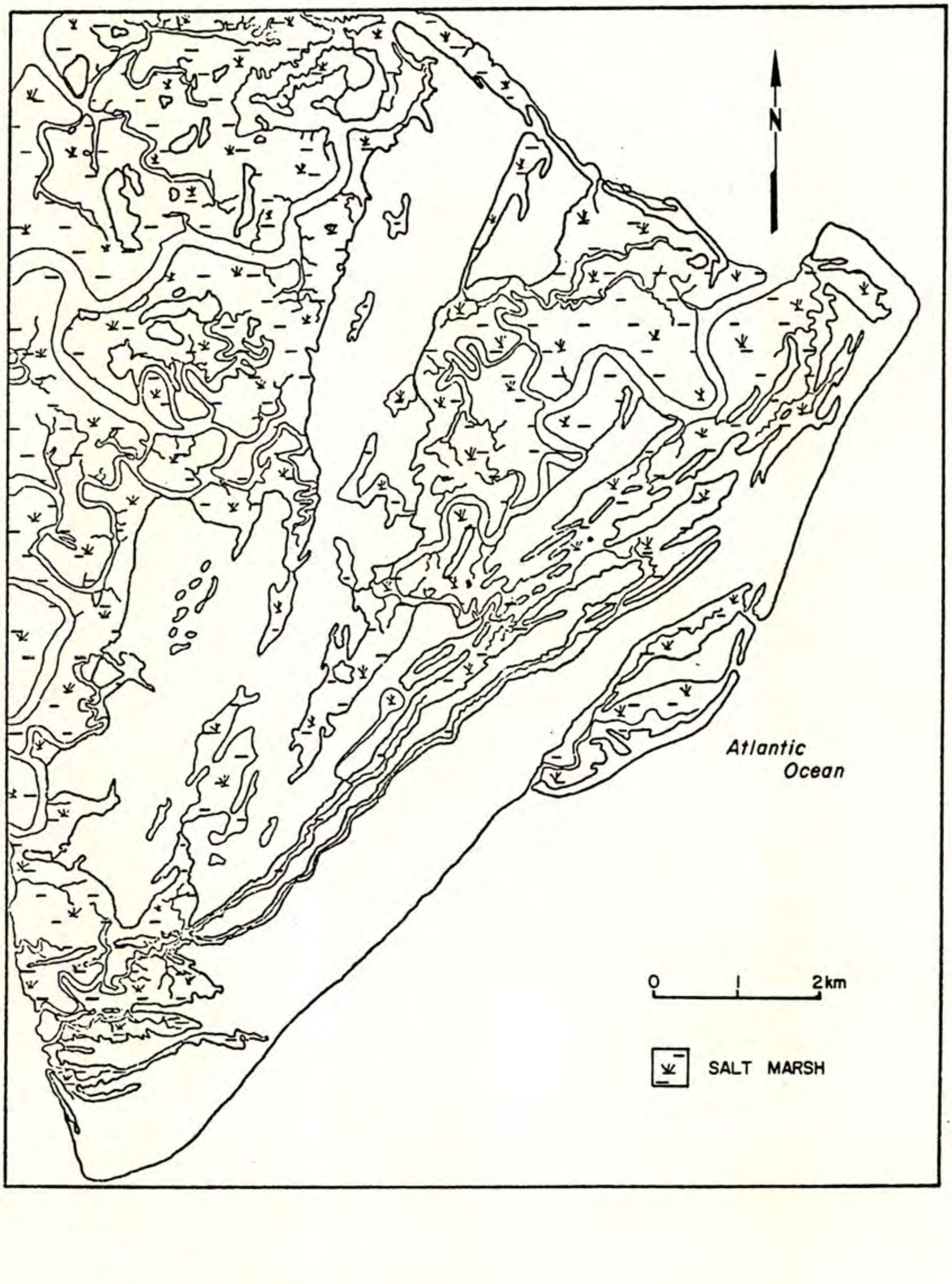


Figure 2. Ossabaw Island.

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 (United States Department of Agriculture, 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.

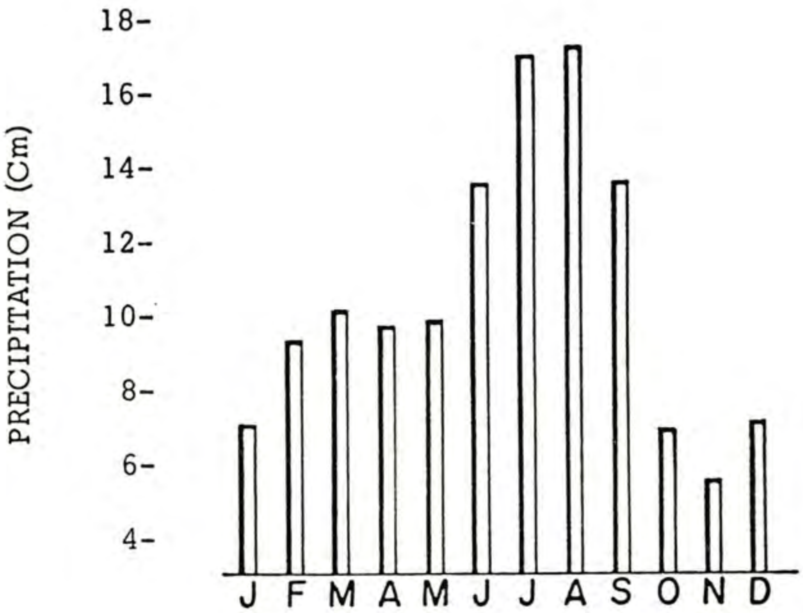
Heavy rainfall in the fall is most commonly associated with hurricane conditions. Hurricanes along the southeastern Atlantic Coast area tend to follow the warm lighter air of the Gulf Stream. Ossabaw Island is about 100 kilometers from the Gulf Stream and consequently has been less exposed to and affected by hurricanes than areas farther 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 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

Annual Mean Precip: 124.23 cm



Annual Mean Temp: 19.1° C
Frost Free Days: 275

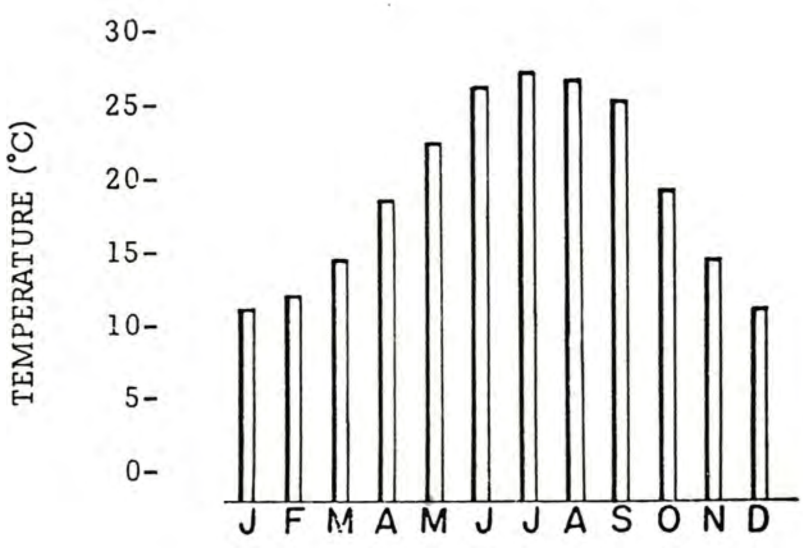


Figure 3. Climatic data for Ossabaw Island (after Carter 1974; data converted to metrics). Collecting station: Savannah Georgia. Period of Record: 1971-1960.

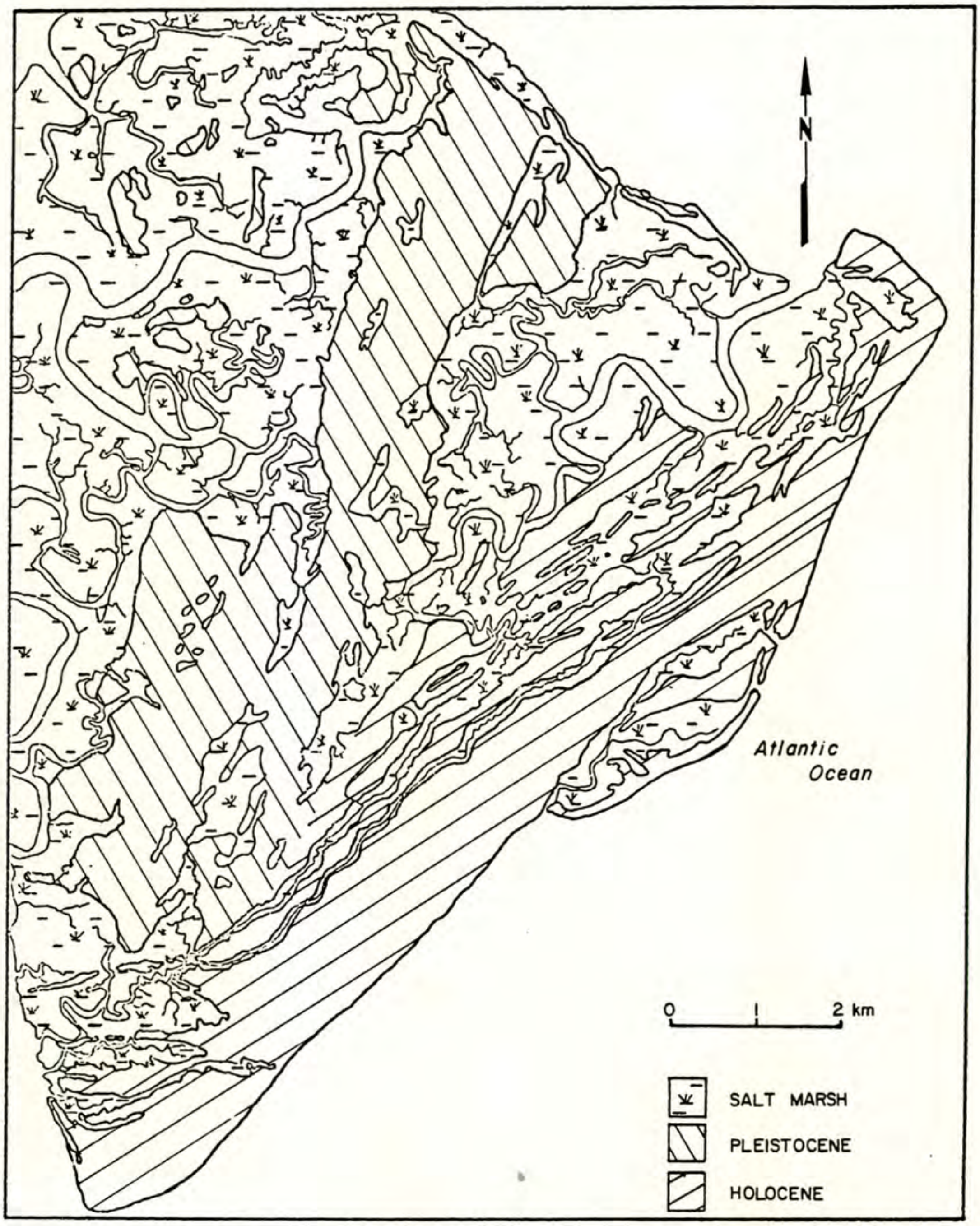


Figure 4. Geological zones of Ossabaw Island.

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 water marsh. The other barrier island formations are all the result of the same 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. Beginning about 18,000 years ago, sea level began to rise once again and the areas around and behind the old Silver Bluff Formation was flooded, isolating it from the mainland. With sea level stabilization about 6,000 years ago, river 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., 1975).

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 (1974) was used to determine the soil characteristics of Ossabaw Island. Soil types have been ranked in terms of their assumed value to Irene phase 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 Irene phase inhabitants of the island farmed these low wet areas.

The seven soil types present are listed below by rank and briefly described. Soil type 1 is considered the most desirable soil type for settlement and type 8 the least desirable.

1. Lakeland Sand (Lp)-Lakeland Sand is excessively 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.

Biotic Communities

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 Irene phase population conceived of 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 nilotica) (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 (Sylvilagus palustris).

The most important animal visiting the beach in terms of possible prehistoric exploitation is the sea turtle. 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.

The only species of sea turtle currently nesting on Ossabaw Island is the Atlantic loggerhead (Caretta caretta caretta), although one Atlantic Leatherback turtle (Dermochelys cariacea) was found dead on the beach in the summer of 1973 (Ishmael Williams, personal communication).

Recently a program has been undertaken on Ossabaw Island to collect information on laying turtles as well as to gather and artifically hatch their eggs (Williams 1974). Although I hesitate to make direct analogies between modern and prehistoric turtle populations, the modern data does give some indication of the possible exploitive value of nesting turtles.

During the summers of 1973 and 1974 a total of 78 turtles visited the beach. Only 55 actually layed. Their nests contained an average of about 120 eggs. Turtles began laying during the first week in May and continued laying through the last week of July. Although it has been previously assumed that turtles lay only during a full moon (Larson 1970:196) this was not found to be the case on Ossabaw Island. There seemed to be no relationship between the stage of the moon and laying habits. Turtles tended to come ashore at high tide, preferably when high tide occurred between 10 p.m. and midnight. When the high tide was later they rarely came ashore, probably because of the danger of being caught on the beach at dawn. Besides the tide, the major factor in preventing turtles from coming ashore was stormy weather.

The loggerhead turtles laying here generally weighed between 200 and 250 lbs. There are accounts, however, of loggerhead turtles weighing as much as 700 lbs (Carr 1952:383).

When turtles are on the beach they are slow moving and cumbersome, and since the nests are generally made in the dune area, often an hour or more is spent on the beach. During this time they are easily hunted and caught. My experience on the island during the summer of 1974 indicated that visibility on any clear night was sufficient to easily see turtles on the beach at a distance of several hundred feet.

Larson (1970:199) points out that between 40% and 80% of a turtle's weight is edible. Taking the lower figure of 40%, a 200 lb turtle would provide at least 80 lbs of edible meat. If 40 turtles were captured during the summer months, 3200 lbs of meat could have been acquired. Several thousand turtle eggs would have also been available.

While the density of the prehistoric turtle population is, of course, difficult to determine, the modern data suggests that sea turtles were likely to have been an important food source and certainly they were the most important potential food resource in the strand area. There is, however, a singular lack of sea turtle remains from coastal archaeological sites. None has been identified from the faunal remains recovered from sites on Ossabaw Island. The only sea turtle bones recorded from the Georgia coast were found in an Archaic context on Sapelo Island (Williams 1968:275). Turtles may have been butchered and consumed on the beach, leaving no remains in habitation sites.

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.*, 1975).

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.*, 1975:74). 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.*, 1975:82).

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*), 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 (United States Department of Agriculture, 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 Irene inhabitants. 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 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 on Ossabaw Island during the late prehistoric period. Today much of the area that was a mixed oak hardwood community in 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 oak (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 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 (*Salcornia 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.).

Based on the faunal samples recovered from Irene phase shell middens the white-tailed deer was the most heavily exploited land mammal. 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., 1975: 98). This subspecies, as found on Blackbeard Island, is smaller than the mainland variety, averaging about 60 lbs, with mature bucks weighing about 110 lbs (Johnson et al., 1975:99).

Smaller mammals found on Ossabaw Island include raccoon (Procyon lotor), 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. It has been stated that the opossum was extensively hunted for food and killed out during the historic period (Johnson et al., 1975:94). No opossum remains have yet been identified from prehistoric archaeological sites on the island.

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 only two turtles as being permanent residents on Sapelo Island, while Hillestad (Hillestad et al., 1975:135) list 4 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.*, 1975:130). 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 encountered in Irene phase trash middens it was extensively exploited.

Shellfish are extremely abundant in the marshes and seem to have been the most important food source for Irene as well as earlier 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 Irene 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 welk (Busycon canaliculatum), knobbed whelk (Busycon carica), lightning whelk (Busycon contrarium), and marsh periwinkle (Littorina irrorata). All of these molluscs are found in Irene phase middens on Ossabaw Island as well as in most other prehistoric sites reported on the Georgia coast.

Two crustaceans are commonly found in the estuary and were probably of some importance in Irene subsistence. The blue crab (Callinectes 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 (Galeichthys 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.

Although faunal remains from Irene phase sites on Ossabaw Island and elsewhere include large numbers of fish remains, few have been carefully identified. Catfish are most commonly mentioned but this is likely because of its characteristic and easily identified pectoral spines. Though rays and sharks may have been taken, there is little evidence for it. Sharks would have been most likely caught with hooks and there are only 4 fish hooks reported from Irene sites (Caldwell and McCann 1941:75, Pearson n.d.). The lack of fish hooks and other fishing gear in Irene phase sites seems to indicate a heavy reliance on the easily accessible and easily fished tidal creeks to the exclusion of the ocean or deep estuary sounds.

Seining conducted in the smaller tidal creeks and trawling carried out in the larger creeks and rivers provides rather complete information on the distribution, relative seasonal abundance, and size composition of the fauna found in the tidal waters adjacent to Ossabaw Island (Georgia Department of Natural Resources 1974a, 1974b). It is presumed that modern records are fairly representative of the prehistoric conditions.

Shrimp appear in abundance beginning in June in the upper creeks and marshes and remain there through September. These shrimp are the result of spawning which began in April and continues through August. Of the ten major species of fish that were taken in the small tidal creeks by seining most were young, since the upper creeks serve as "nursery" areas. It is interesting to note that the large majority of fish vertebra found in Irene phase middens on Ossabaw Island are from small fish, possibly indicating heavy exploitation of these smaller creeks. Trawling in the larger creeks and rivers produced essentially the same species as found in the small creeks, with the catch being generally of larger sized individuals. Table 1 lists the fish taken in the creeks and the rivers throughout a yearly cycle.

Species	J	F	M	A	M	J	J	A	S	O	N	D
Atlantic Croaker (*Micropogon undulatus*)	X	X	X	X	X	X	X	X	X	X	X	X
Star drum (*Stellifer lanceolatus*)	X	X	X	X	X	X	X	X	X	X	X	X
Fresh water catfish (*Ictalurus catus*)	X	X	X	X	X		X					
Summer trout (*Cynoscion regalis*)	X	X	X	X	X	X	X	X	X	X	X	X
Blackcheek tonguefish (*Symphurus plagiusa*)	X	X	X	X	X	X	X	X	X	X	X	X
Sea catfish (*Galeichthys felis*)				X	X	X	X	X	X	X	X	
Spot (*Leiostomus xanthurus*)	X	X	X	X	X	X	X	X	X	X	X	X
Southern Kingfish (*Menticirrhus americanus*)	X	X	X	X	X	X	X	X	X	X	X	X
Hake (*Urophycis* sp.)	X	X	X	X	X							
Winter flounder (*Paralichthys lethostigma*)	X	X	X	X	X	X	X	X	X	X	X	X
Yellowtail (*Bairdiella chrysura*)	X	X	X	X	X	X	X	X	X	X	X	X
White shrimp (*Penaeus setiferus*)	X	X	X	X	X	X	X	X	X	X	X	X
Blue crab (*Callinectes sapidus*)	X	X	X	X	X	X	X	X	X	X	X	X

Table 1. List of the most common estuarine faunal species and the months in which they occur in the salt water creeks and rivers of the estuary area. (After Georgia Department of Natural Resources 1974a)

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 Irene phase settlement.

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 Irene inhabitants. This reflects the fact that the sea islands occupy a transistion zone between three major biotic communites; 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 transistion 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 resources 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 Irene phase and attempts, through the examination of available subsistence data, to deliniate those environmental choices made by the human population that occupied the island during the Irene period.

CHAPTER III

THE IRENE PHASE IN CULTURAL PERSPECTIVE

This section presents an overview of our present knowledge of the archaeological phase known as Irene. In discussing previous research on this phase, emphasis will be placed on that data that will be useful in analyzing the overall settlement-subsistence system employed by this late prehistoric human population.

Previous Archaeological Research

The cultural manifestation known as Irene, though well represented in the literature, is known from only a limited amount of archaeological investigation. The earliest work that recognized the distinctive ceramic complex that came to be called Irene was that of C. B. Moore (1897). In excavating a large number of burial mounds on the Georgia coast, Moore noticed that certain pottery styles, now called Irene, tended to occur together. Irene mounds and ceramics were so numerous in the area that Moore often referred to this pottery as "that of the ordinary type" (Moore 1897).

Moore's excavations concentrated almost entirely on burial mounds, providing little or no information on other aspects of culture. His work still stands, however, as the most extensive, though narrowly focused, archaeological investigations on the Georgia coast. One of the most useful of Moore's contributions is in providing data on the overall distribution of these ceramics. His indication that they extended from the Altamaha River area north to, and possibly north of the Savannah River is still considered substantially correct.

In the late 1930's, as a result of Federal Government sponsored W.P.A. archaeological projects, J.R. Caldwell and Antonio Waring were able to divide 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 Irene the last complex in the sequence (Caldwell and Waring 1936b:7). The work at the Irene Mound site on the Savannah River during the years 1937-1940 supported the existence of the Irene ceramic complex and stratigraphically demonstrated this to be the latest prehistoric ceramic manifestation at the site (Caldwell and McCann 1941, Fewkes 1938). The dates assigned to it, range from A.D. 1350 to A.D. 1550 (Caldwell 1971:89-91). These dates are based upon the stratigraphic position of Irene phase ceramics at the Irene Mound site (Caldwell and McCann 1941) and upon several radiocarbon determinations from St. Catherines Island (Caldwell 1971, 1972).

The most intensive archaeological investigations of any site of this complex were carried out at the Irene Mound site. Excavations at this site produced a majority of our knowledge about Irene material culture. Since that time only a few minor excavations and tests have been conducted at Irene phase sites (Caldwell 1943, Cook 1966, 1971, Goad 1975, Larson 1958b, 1970, Pearson n.d.). Several extensive archaeological surveys in the area of coastal Georgia have provided valuable information on the overall distribution of these sites (Caldwell 1972, DePratter 1973, 1974b, 1975, Larson 1958a, Pearson and DePratter n.d., Hally, Zurel and Gresham 1975).

Previous archaeological research on Ossabaw Island has 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.

Clarence B. Moore (1897) undertook the most extensive excavations on the island. In 1896 he excavated nine burial mounds and tested several midden areas. Three of these mounds were at Bluff Field (9Ch 160) and 6 at Middle Settlement (9Ch 158). The descriptions given by Moore indicate that one of the mounds at Bluff Field and two of those at Middle Settlement were Irene phase mounds. In 1971 test excavations were conducted at a large archaic site (9Ch 35) on Ossabaw Island by University of Georgia students (Crusoe and DePratter n.d.).

An extensive archaeological survey of the island was undertaken by Shorter College of Rome, Georgia during the springs of 1972 and 1973. This survey work was continued by Chester DePratter in 1974. His report (1974a) provides the most complete record of prehistoric site distribution available for any of the sea islands, and was relied upon extensively in the present study.

Irene Phase Concept

Although variously called a Period, a Culture and a Focus (Caldwell 1943, Caldwell and McCann 1941, Larson 1958a), in accordance with Willey and Phillips (1958), I consider the most useful and plausable characterization of Irene to be as a phase:

> "An archaeological unit possessing traits sufficiently characteristic to distinguish it from all other units similarly conceived, whether of the same or other cultures or civilizations, spatially limited to the order of magnitude of a locality or region chronolog- limited to a relatively brief interval of time". (Willey and Phillips 1958:22)

The limited temporal span of the Irene phase,(approximately 200 years) as well as the limited geographical distribution of known Irene phase sites (to be discussed later) conforms to the temporal and spatial specifications attributed to a phase by Willey and Phillips.

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

The rareness of some of these traits would seem to indicate that Irene populations were somewhat isolated from the mainstream of Mississippian cultural development. The only rectangular platform mound which is known, for example, is at the Irene Mound site and there is a general lack of the cultural elaboration which is typical of Mississippian development in the interior southeast. Southern Cult items and motifs, which are common elements in some Late Mississippian cultural assembledges, rarely occur at Irene sites. If, as Waring and Holder (1945) have pointed out, Cult items are related to agricultural practices, then the rareness of Cult items at Irene sites may reflect lack of emphasis and/or reliance placed upon agriculture by Irene populations (Larson 1958b). The archaeological evidence that heavy reliance was placed upon marsh-estuary resources for subsistence (discussed below) would seem to support this contention.

Irene Ceramics

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. Since the distribution and variation of ceramics among Irene sites on Ossabaw Island is important in the present study, a rather detailed discussion of those ceramics follows.

Excavations at the Irene Mound site provide the most complete information on Irene phase ceramics (Caldwell and McCann 1941). A major concern of the investigators was ceramic typology and the use of ceramic change in the establishment of cultural chronologies. Three Irene pottery types were recognized; Irene Filfot Stamped, Irene Incised, and Irene Plain. Because of their stratigraphic occurrence at the Irene Mound site and their association in surface collections from other sites in the Savannah area these types were designated the Irene Ceramic Complex (Caldwell and McCann 1941:1-2). Subsequent investigations have followed this initial typological scheme with only minor variation.

The only significant variation has been that proposed by Larson (1958a, 1970) for the central Georgia coast. He has recognized one additional pottery type, McIntosh Incised (not noted at Irene), added it to the other Irene ceramic types, and designated this group of four types as the Pine Harbor Complex. This is considered to be characteristic of the Pine Harbor Period (Larson 1958a). Considering the rareness of McIntosh Incised (only a few dozen sherds are known) Larson's establishment of a "Pine Harbor Period" seems premature. Until further work is done, it seems best to consider McIntosh Incised as a variant of

Irene Incised and to consider the "Pine Harbor Period" as being part of the Irene phase.

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. The most "succint" characterization of Lamar has been offered by William Sears (1956:55):

> "As currently used, Lamar refers to ceramic complexes containing predominantly large grit tempered jars with rather varied rim treatment including notched base rim folds, added notched or filleted rim strips, encircling row of rim rosettes, or some other similar treatment. Usually a substantial portion of such pottery in a given collection is decorated with complicated stamps of a relatively simple design, heavily overstamped. . . Associated with this stamped ware, or a plain ware with the same rim treatment, incised pottery is often found with rather simple incised motifs applied above the shoulder of a bowl, often the sharp-shouldered cazuela type."

Based on minor differences in Lamar-like pottery throughout the southeast, Sears has identified at least 8 Lamar ceramic variants or sub-traditions (Sears 1956:55). This author recognizes that regional variation in "Lamar-like" pottery does exist but the current level of knowledge concerning Lamar ceramics does not permit ease in identifying the geographical distribution of these variants. No precise quantitative distinctions have yet been produced that allow easy identification and demarcation of the regional variants of Lamar. Until such distinctions are made 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 fil-fot cross design motif. Irene Complicated Stamped vessels tend to be more enlongated 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 contexts. There is also some slight variation in vessel shapes. Irene Complicated Stamped vessels tend to be more globular in shape while Pee Dee vessels are more conoidal (Caldwell 1952:319-320).

Geographical Distribution of the Irene Phase

As early as 1939, Caldwell and Waring (1939a, 1939b) demonstrated that the distribution of this 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 large amounts of Irene phase pottery in W.P.A. excavations. More recently an Irene phase burial mound has been excavated on the island (Cook 1966).

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 pottery to the north. Spanish accounts (see Lanning 1935 and Swanton 1922) 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 southern 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 the sites are not found in the pine barrens area is not fully known. Although most archaeologists (see Caldwell 1952 and Larson 1970) have considered the pine barrens to be a culturally sterile area, a recent archaeological survey of the area indicates rather extensive Archaic and Woodland occupation (Hally, Zurel and Gresham 1975). It is possible that very heavy reliance on marsh-estuary resources and/or a lack of good agricultural land in the pine barrens may have prevented Irene phase occupation of the area.

The northern archaeological boundary for the Irene phase has generally been considered to be the Savannah River. This has been considerably influenced by historical accounts. The Spanish considered the Savannah River a boundary between the Guale in Georgia and the Cusabo in South Carolina. Early accounts note very few cultural differences between the Guale and the Cusabo (Swanton 1922:81-85). These similarities tend to be borne out ceramically in that the late prehistoric pottery on the coast of South Carolina north of the Savannah River is similar to and often indistinguishable from the Irene phase ceramics from the Georgia coast.

Although Anderson (1974) has recently shown that Irene, or at least Irene-like ceramics, are found as far north as Charleston, South Carolina, the northern boundary of Irene phase ceramics seems to be less easily defined than either the western or southern boundary.

Irene Phase Subsistence

The few archaeological reports dealing with this phase have presented very little subsistence data. These are only in a generalized form. Since knowledge of subsistence activities is important in attempting any type of explanation of site location, the limited amount of subsistence information available from Irene phase sites on the Georgia coast is presented and discussed below to provide a partial picture of the overall subsistence pattern.

Data from available sources is presented in tabular form by site. Scientific names are given when they appear in the cited publications.

Irene Mound site (9Ch 1) (Caldwell and McCann 1941)

Flora: corn (*Zea mays*)
yellow pine; posts (*Pinus sp.*)
cane; used as matting

Fauna: White-tailed deer (*Odocoileus virginianus*)
Black bear (*Ursus americanus*)
Opossum (*Didelphis virginiana*)
Raccoon (*Procyon lotor*)
Gray squirrel (*Sciurus carolinensis*)
Rabbit (*Sylvilagus floridanus*)
Bobcat (*Lynx rufus*)
Beaver (*Castor sp*?)
Skunk (*Mephitis mephitis elongata*)
Dog (*Canis familiaris*)
Bison (*Bison bison*) questionable identification
Turkey (*Meleagris gallopavo*)
Wild goose
Mallard or Black duck (*Anas platyrhynchos* or *Anas rubripes*)
Teal
Alligator (*Alligator mississippiensis*)
Turtle
Tortoise
Shad (*Alosa sapidissima*)
Sturgeon (*Acipenser oxyrhynchus*)
Gar fish (probably *Lepisosteus osseus*)
Triggerfish

Houndfish
Drumfish

Invertebrates

Blue crab (Callinectes sapidus)
Eastern oyster (Crassostrea virginica)
Atlantic ribbed mussel (Modiolus demissus)
Quahog clam (Mercenaria mercenaria)
Ark (Arca campechiensis)
Atlantic cockle (Cardium robustum)
Venus shell (Venus mercenaria)
Stout tagelus (Tagelus plebius)
Razor clam (Ensis directus)
Green solen (Solen viridis)
Moon shell (Polinices duplicatus)
Eastern white slipper shell (Crepidula plana)
Periwinkle (Littorina irrorata)
Knobbed welk (Busycon carica)
Channeled welk (Busycon canaliculatum)
Lightning welk (Busycon contrarium)
Banded tulip (Fasciolaria distans)
Lettered Olive (Oliva sayana)
Freshwater mussels (Elliptio sp.)

Pine Harbor site (9 McI 64) (Larson 1970)

Flora:
Corn (Zea mays)
Beans-questionable identification
Hickory nuts (Carya sp.)
Acorns (Quercus sp.)
Persimmon, seed (Diospryos virginiana)
Pokeweed, seed (Phytolacca americana)
Chenopodium, seed (Chenopodium album)
Pine, wood fragments (Pinus sp.)
Hickory, wood fragments (Carya sp.)
Cherry, wood fragments (Prunus sp.)

Fauna:
White-tailed deer (Odocoileus virginianus)
Raccoon (Procyon lotor)
Bobcat (Lynx rufus)
Opossum (Didelphis virginiana)
Rabbit (Sylvilagus sp.)
Catfish
Unidentified bird remains

Invertebrates

Eastern oyster (Crassostrea virginica)
Stout tagelus (Tagelus plebeius)
Quahog clam (Merceneria merceneria)
Atlantic ribbed mussel (Modiolus demissus)
Periwinkle (Littorina irrorata)
Welks (Busycon sp.)
Blue crab (Callinectes sapidus)

Red Bird Creek site (9Bry 9) (Bates 1975, Pearson n.d.)

Flora:
Corn (Zea mays)
Sea oats, seed (Uniola sp.)
Pine, seed (Pinus sp.)
Grape, seed (Vitis sp.)
Elder, seed (Iva sp.)
Hackberry, seed (Celtis sp.)
Pine, house posts (Pinus sp.)
Cane, used in house construction (Arundinaria tecta)

Fauna:
White-tailed deer (Odocoileus virginianus)
Black bear (Ursus americanus).
Dog (Canis familiaris)
Raccoon (Procyon lotor)
Rabbit (Sylvilagus sp.)
Alligator (Alligator mississippiensis)
Sea catfish (Galeichthys felis)
Longnose gar (Lepisosteus osseus)
Unidentified bird remains

Invertebrates

Blue crab (Callinectes sapidus)
Eastern oyster (Crassostrea virginica)
Stout tagelus (Taelus plebeius)
Quahog clam (Mercenaria mercenaria)
Atlantic ribbed mussel (Modiolus demissus)
Periwinkle (Littorina irrorata)
Knobbed welk (Busycon carica)
Channeled welk (Busycon canaliculatum)
Atlantic cockle (Cardium robustum)

Budroe site (9Ch 9) (Caldwell 1943)

Fauna: White-tailed deer (*Odocoileus virginianus*)
Diamondback terrapin (*Malaclemys terrapin*)
Rabbit (*Sylvilagus sp.*)
Turkey (*Meleagris gallopavo*)

Invertebrates
Eastern oyster (*Crassostrea virginica*)

Skidaway Island (9Ch 112) (Goad 1975)

Flora: Hickory nuts (*Carya sp.*)

Fauna: White-tailed deer (*Odocoileus virginianus*)
Diamondback terrapin (*Malaclemys terrapin*)
Turkey (*Meleagris gallopavo*)

Invertebrates
Eastern oyster (*Crassostrea virginica*)
Quahog clam (*Mercenaria mercenaria*)
Atlantic ribbed mussel (*Modiolus demissus*)
Knobbed welk (*Busycon carica*)

Various Ossabaw Island sites

Flora: Corn (*Zea mays*)
Hickory nuts (*Carya sp.*)
Hackberry, seed (*Celtis sp.*)
Pine, wood fragments (*Pinus sp.*)

Fauna: White-tailed deer (*Odocoileus virginianus*)
Raccoon (*Procyon lotor*)
Rabbit (*Sylvilagus sp.*)
Diamondback terrapin (*Malaclemys terrapin*)
Eastern box turtle (*Terrapene carolina*)
Sea catfish (*Galeichthys felis*)
Black drum (*Pogonias cromis*)
Longnose gar (*Lepisosteus osseus*)
Several fish species of the Scienadae family
Mullet (*Mugil sp.*)
Unidentified bird remains

Invertebrates

Eastern oyster (Crassostrea virginica)
Quahog clam (Mercenaria mercenaria)
Stout tagelus (Tagelus pleveius)
Atlantic ribbed mussel (Modiolus demissus)
Periwinkle (Littorina irrorata)
Atlantic cockle (Cardium robustum)
Knobbed welk (Busycon carica)
Channeled welk (Busscon canaliculatum)
Blue crab (Callinectes sapidus)

Even with the limited amount of available data, some generalized statements can be made concerning subsistence. There is a heavy reliance on estuarine resources, especially shellfish. Shell, mainly oyster, constitutes the bulk of cultural debris at Irene sites, as well as at all other prehistoric coastal sites that I am familiar with. Sites on the Georgia coast are generally located and recognized by the presence of shell scatters or shell middens. The relative importance of shellfish in any of these subsistence patterns is at present unknown.

Exploitation of shellfish would require only the simplest of tools. Many shellfish beds can be reached by foot and shellfish can be picked up by hand with the only needed equipment being a carrying container and possibly a stick to pry apart the shells. Canoes would permit access to the majority of the shellfish beds which are located in the tidal creeks and marsh.

Fish remains indicate that most of those taken were small, possibly too small to have been taken by hook. Since fish hooks appear to be rare in Irene sites it is likely that many of the fish were taken with nets and/or weirs. The small size of the fish would seem to indicate that many were caught in the smaller tidal creeks, probably the easiest place to stretch nets or to set up weirs (see p. 42 above).

Tools involved with food processing and procurement are limited in both number and variety at Irene phase sites. Procurement of shellfish and fish probably required no specialized tools, or those tools that were utilized e.g., nets, have not been preserved.

Stone tools are generally rare at Irene phase sites, with only the Irene Mound site producing any appreciable quantity of them. This may be a factor related to its location on the Savannah River, an easy access route to inland sources of stone. The stone tools from the Irene Mound site consisted mainly of projectile points, flaked scrapers, "grooved net sinkers," hammer stones, and ground stone celts (Caldwell and McCann 1941:55-56). At both the Irene Mound and Red Bird Creek sites in situ house posts of pine were found. Stone celts were likely associated with heavy woodwork of this sort. Moore (1897) reports finding large numbers of small stone "chisels" in Irene period burial mounds. These chisels are usually thin, 8 to 10 centimeters long, and the bit is often angled only on one side. The chisels seem to imply finer woodworking, although there is no archaeological evidence for this. The "net sinkers," which are rough stone pebbles (usually quartzite) with a groove pecked around them, have been considered to have been used as weights for nets (Caldwell and McCann 1941:56). Many also appear to have been used as hammer stones.

Flaked stone tools, primarily scrapers and projectile points, are probably associated with hunting activities. It is noted that stone scrapers and scraper-like tools are rare on the coast and it is suggested that mollusc shell tools were used instead.

The only other type of tools commonly found in Irene phase sites are bone awls and welk "hoes". These shell hoes are also known from archaic sites and they are most likely not specifically associated with agriculture but rather served as generalized digging implements.

Agriculture

The presence of maize and possibly beans at Irene phase sites suggests but does not necessarily demonstrate the practice of agriculture. Larson's (1970:293-309) discussion of both the archaeological and historical evidence for late prehistoric agriculture in the coastal area of Georgia is followed here. Although maize is not found in quantities in Irene phase sites, the presence of species commonly found as old field types (e.g., pokeberry, chenopodium, and persimmon) lends support to the agriculture hypothesis. Early historic accounts from the coastal area give the impression that agriculture was practiced and was important. Writing of the Indians of Orista (coastal South Carolina), Father Juan Rogel in 1570 described the Indians planting maize and stated that the poor quality of the soil required both a dispersed and shifting form of settlement (in Larson 1970:294). Both the French and the Spanish demanded quantities of maize from the Indians, suggesting the availability of large amounts of agricultural goods among the Indians.

Writing from Guale (the Georgia coast) in March of 1570, Father Sedeno provides some information on agricultural practices. He says that the:

> ". . . few Indians that are there are so scattered because as they do not have that with which to clear the trees for their fields they go where they find a small amount of land without forest in order to plant their maize; and as the land is miserable they move with their households from time to time to seek other lands that they can bring to productivity". (Larson 1970:295)

It is likely that the cleared areas noted by Sedeno are old field plots allowed to go fallow. The account indicates the moving of settlements was required because of soil exhaustion. Shifts in settlement were likely 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 soil exists as small pockets (United States Department of Agriculture 1974).

It would seem as Larson has pointed out (1970:297), that 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".

These historic descriptions may be misleading in some ways. It seems odd, for example, that there is rarely any mention of shellfish exploitation, yet archaeological evidence indicates rather heavy use of shellfish resources during this early contact period. It is also possible that the great amount of movement indicated by the historic accounts is misleading. It seems likely that the pressures placed upon the native food supply, especially maize, by Europeans resulted in the need to move frequently in order to keep up production (or to get away from the Europeans) and the resulting settlement patterning was different from the pre-contact situation.

This section has reviewed the available archaeological and historic evidence concerning Irene phase subsistence and some of its implications on settlement patterning. It is obvious that this subsistence strategy was distinctly different from that generally assigned to Middle Mississippian groups (see Smith 1973). The tremendous abundance of estuarine resources coupled with the extreme sandy soils of the coastal area seem to have precluded the heavy reliance on agriculture (historic documents notwithstanding) common for interior late prehistoric groups (see Ward 1965:45).

CHAPTER IV

ARCHAEOLOGICAL INVESTIGATION AND ANALYSIS

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 primarily taken from two archaeological surveys conducted prior to the author's research. The first survey was conducted during the springs of 1972 and 1973 by Patrick Garrow and students from Shorter College, Rome, Georgia. During January of 1974 Chester DePratter continued the survey, locating a number of additional sites (DePratter 1974a). No report was produced by Garrow, however his maps, notes and collections were made available to DePratter and the present author. Site information from the Shorter College survey is included in DePratter's report (1974a). These two surveys included approximately two months of field work and located a total of 158 archaeological sites. Included in this number are several sites which had previously been located by Mrs. Eleanor West and other residents of Ossabaw Island. Two months of field work were conducted by the author during the summer of 1974. This work consisted of site mapping and testing with only a minimum amount of survey being conducted. Seven additional sites were found. Of the 165 archaeological sites located on Ossabaw Island, 47 have been identified, on the basis of ceramics, as having Irene phase components. These 47 sites are used in this study.

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. Each of the surveys is discussed in light of these factors.

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 (Ishmael Williams personal communication). The available maps indicate that most of the survey was confined at or near the marsh edge of the island. A total of 95 archaeological sites were recorded by these surveys. Most of the DePratter survey was conducted by a single individual. Some areas were covered by 2 individuals using the sweep and search technique spaced 5 to 20 meters apart. In addition to revisiting all of the sites recorded by the Shorter College survey DePratter recorded an additional 60 sites (DePratter 1974a:2). Again, as with the previous survey, most of the area covered by DePratter was confined to or near the marsh edge.

The present author conducted research on Ossabaw Island from June 10 to August 30, 1974. The majority of the work conducted during this period was directed towards surface collecting, mapping, and testing previously recorded sites. In walking to and from sites an attempt was made to locate additional sites. When two individuals were working they walked approximately 20 meters apart. When surveying alone a criss-cross sweep and search technique was employed to cover a 10 to 50 meter wide swath. The amount of area that could be seen using either of these methods 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. One interior section, approximately 1000 m^2, was surveyed in an attempt to locate sites. This area was covered by criss-crossing at approximately 50 meter intervals. Only 2 small sites were located in this interior section.

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. There are 3 plowed fields on the island making up less than 2% of the total area covered by the surveys. Sites were found in all of these fields.

Irene phase 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, not employed in any of the surveys on Ossabaw Island, would be required to locate these partially destroyed and hidden sites.

The similarity of the techniques employed by the surveys and the high visibility of exposed or undisturbed sites would seem to indicate the comparability of all of the surveys in their ability to locate sites. A major source of bias in all of these surveys, however, has been their concentration of effort along the marsh edge. This was done largely because the banks offer large exposed areas where sites are easily seen. Even though the majority of sites found are located adjacent to the marsh edge this does not appear to be totally a factor of survey bias or site exposure. Only a few sites were located in the interior of the island even in exposed or intensively surveyed areas. A systematic and intensive survey of a portion of Skidaway Island, just north of Ossabaw Island, supports the finding that Irene phase sites are concentrated along the marsh edge (DePratter 1975). Other surveys on the Georgia coast also indicate that Irene phase sites are generally located near salt water marsh (Hally, Zurel and Gresham 1975, Pearson and DePratter n.d.).

Approximately 25% to 30% 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 many Irene phase sites remain to be found. The majority of large sites, because of their

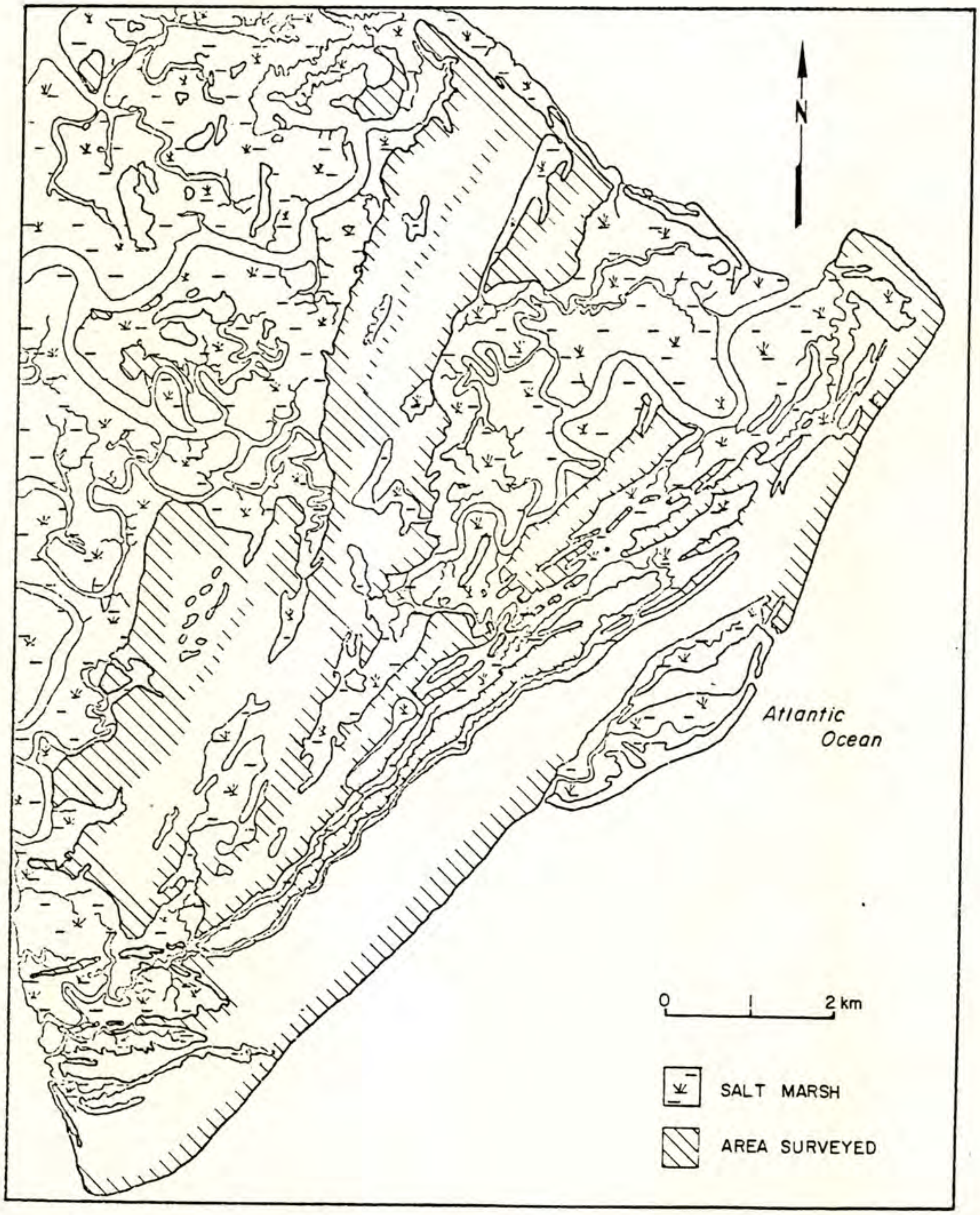


Figure 5. Areas surveyed.

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, are assumed to 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 Irene phase site population represented by the 47 known sites. But, as mentioned above, it is assumed that these 47 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 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 m 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 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 mapped and tested although size measurements are available for all sites.

Even with the testing program, several of the small sites produced only single sherds and collections from several of the larger sites are small. Since this study is an attempt to look at the overall Irene phase settlement system even those sites that produced very little pottery are included in the following analyses. The majority of analyses conducted with the site data deals with groups or classes of sites rather than with individual sites. Adequate and usable pottery counts are available for each group of sites. Ceramic data for all sites is presented in Appendix I.

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.

The Irene phase sites found on Ossabaw Island generally consist of linear shell middens stretched along the marsh edge and/or as clusters of individual shell middens. These individual 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.

Site Size Analysis

The major analytical unit used in the following analysis is that of site size, or more specifically, classes of site size. Size is one of the only measurable variables common to all sites and is considered to be one of the most adequate reflections of cultural response to environmental variation now available. Settlement size is assumed to be a useful indicator of the number, as well as the types, of activities carried out at any particular site (Haggett 1971:115-116). Within a settlement system, variation in site sizes may, at a minimum, be a general indicator of variation in site function and is considered to be a useful starting point for the analysis of settlement systems. Considering site size as reflective of variation in site function it is assumed that sites of equivalent size will display similar socio-cultural traits.

Since it is impossible to deal with time segments smaller than the two hundred year span postulated for the Irene phase, the size of any site as well as the total number of sites are possibly the result of accumulation over that time span. Although site distribution and variation at any one point in time is considered to reflect the socio-cultural adaptation of a particular human group, the patterns of settlement viewed over a brief period of time likely emphasize those environmental variables that were critical to settlement throughout the time period.

Actual population figures for sites would be a more desirable measure than site size. Although site size is related to population, neither archaeological nor ethnographic data is available that would allow reliable population estimates for Irene phase sites.

In order to produce analytical units for settlement analysis some means of grouping sites into meaningful and usable size classes is necessary. Cluster analysis provides an objective means of achieving this grouping.

Cluster Analysis

The general technique used for producing size classes is cluster analysis. The computational method used is Ward's Method from HCLUS, a computer program developed by J. Wood and modified by D. Graybill (Graybill 1974, Wood 1974). For a more complete discussion of the use of cluster analysis in an archaeological settlement pattern study the reader is referred to Graybill's study of prehistoric settlement in the Mimbres Region of New Mexico (Graybill 1973). The present study has drawn upon his usage of cluster analysis.

All cluster analyses attempt to group units or variables into clusters so that the elements within a cluster have a high degree of "natural association" among themselves while the clusters are at the same time relatively distinct from one another (Anderberg 1973:xi). Ward's Method is an hierarchical agglomerative clustering technique in which clustering proceeds by progressive fusion beginning with the individual case (in this instance sites) and ending with the total population. This error sum of squares objective function, attempts to find at each stage of fusion those two clusters whose merger gives the minimum increase in the total within group error sum of squares (Anderberg 1973:142-145).

The variable used in the cluster analysis is the total surface area of each site in m^2. Area estimates were obtained by measuring the total distribution of cultural debris at a site. This is our only reasonable means of estimating site size from surface indications.

Discussion of the results of the cluster analysis is assisted by Figs. 6 and 7.

Two sites, Ch 158 and Ch 160, are so much larger than any of the other sites that they were omitted from the cluster analysis and placed in a size class by themselves.

Figure 6 is a dendrogram of the clusters produced for the remaining 45 sites. The 45 nodes along the bottom represent the individual sites. The cluster merge levels, a measure of inter-cluster distance, are scaled along the vertical axis.

There are no universally agreed upon means of assessing the optimum cluster solution to accept from most clustering techniques. One means of aiding in the choice of a "best solution" concerns the amount of "information" that is gained or lost at any particular step in the cluster

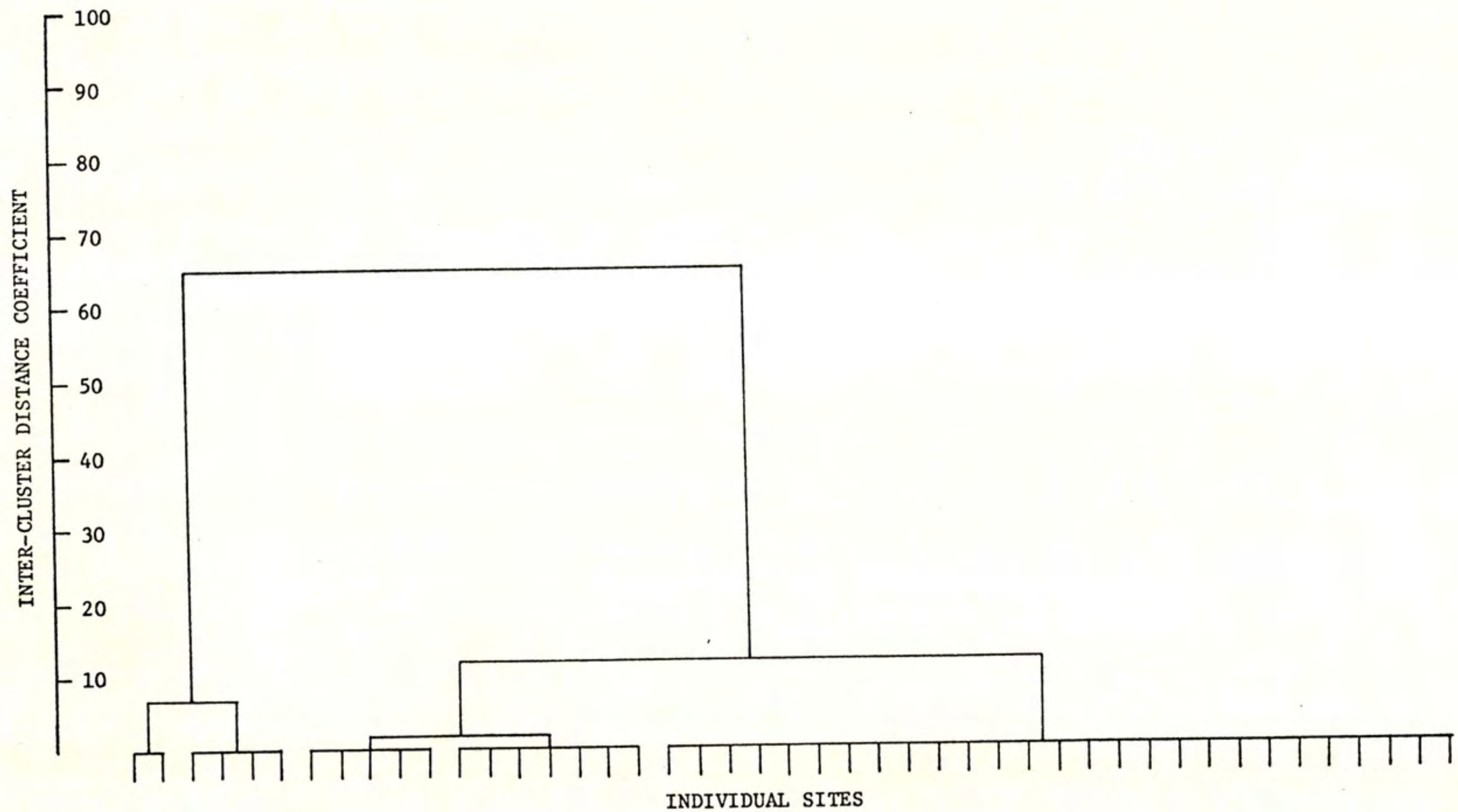


Figure 6. Dendrogram of complete linkages.

analysis. Fig. 7 is a graph of percent of change in information in relation to the number of clusters produced. This graph is best viewed in terms of "information" versus "resolution" such that the greater number of clusters one uses the more information is available per cluster but the less resolution or inter-cluster difference there is. An attempt must be made to pick a cluster solution that falls at a point intermediate between the extremes of information and resolution. As can be seen, Fig. 7 demonstrates that a reasonable cluster solution, based on the criteria of information and resolution is at three clusters. This point on the graph falls at a point of major transition of both information and resolution. It is emphasized that the criteria of information and resolution are simply aids in selecting a solution and that the solution chosen must ultimately satisfy conditions of the problem at hand. In this instance the three cluster solution is considered reasonable and usable in light of the hierarchical arrangement expected to be operating within a settlement system (Haggett 1971:114-142).

Fig. 8 presents a dendrogram of the hierarchical relationship of the clusters in the three cluster solution. Using these three clusters and considering the two very large sites as a single cluster, a hierarchy of 4 size classes is produced. This 4 class hierarchy will be used throughout the subsequent analyses.

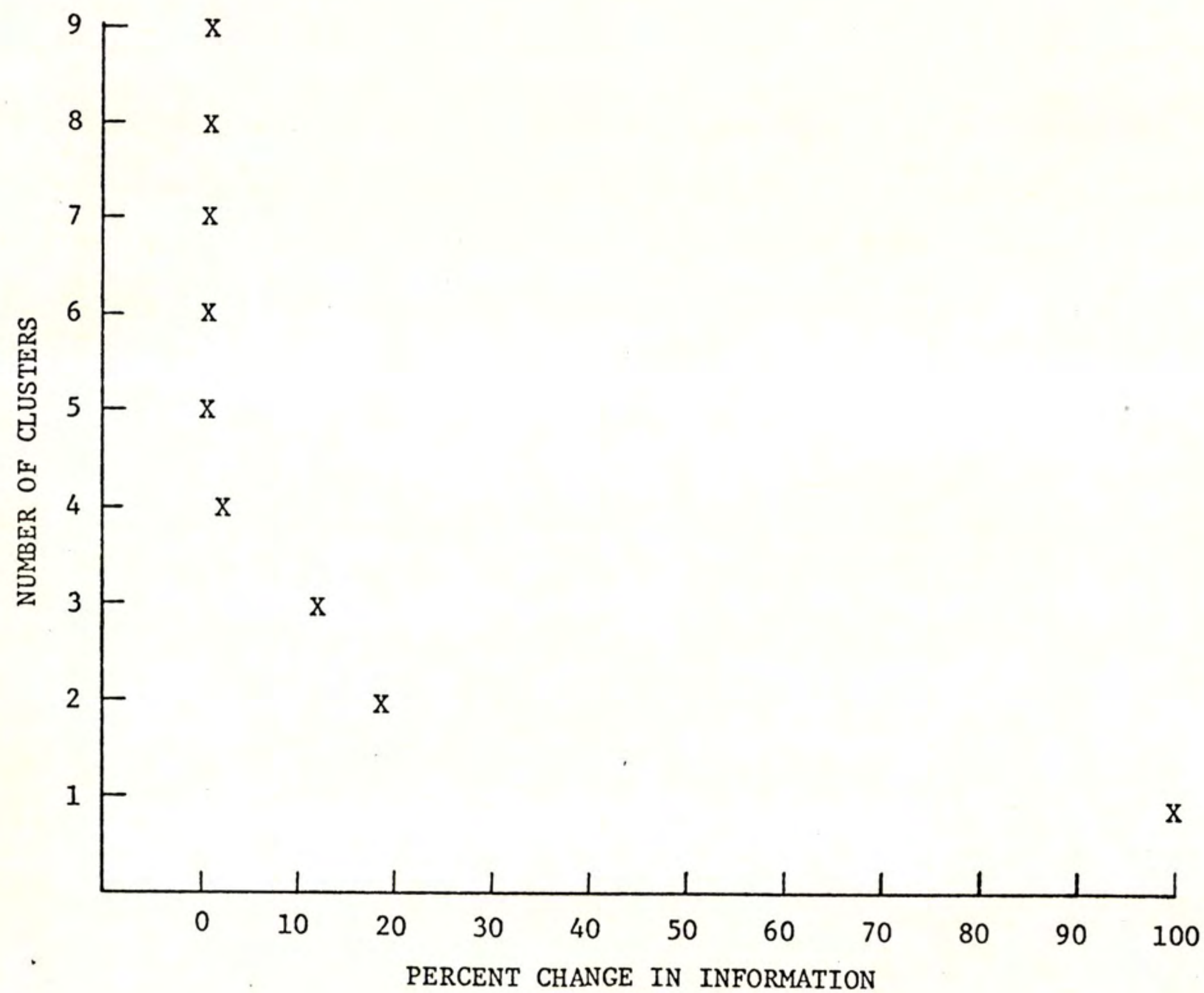


Figure 7. Interpretive data from cluster analysis.

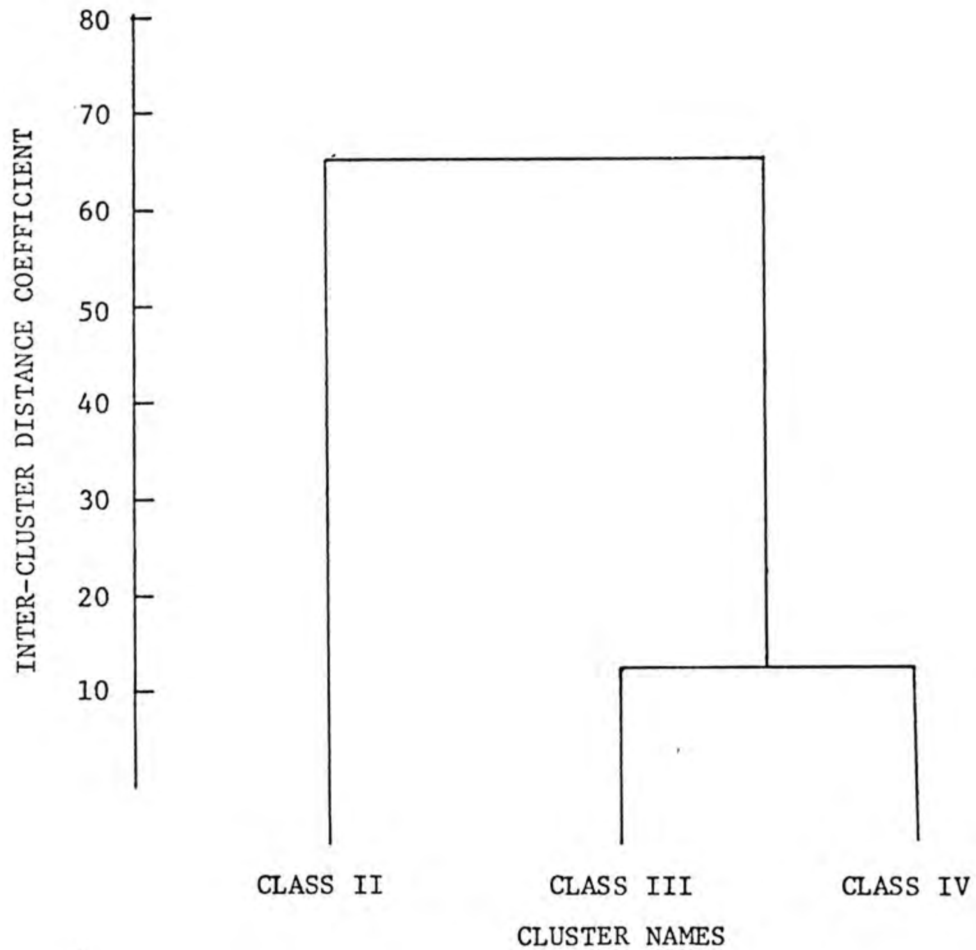


Figure 8. Dendrogram of three cluster solution.

Pattern of Site Size Distribution

Certain regularities in settlement size distributions have been observed by geographers and economists and theoretical explanations for these distributions have been developed (Berry 1961, Berry and Garrison 1958, Vapnarsky 1969, and Zipf 1941). The sort of settlement size distributions expected within completely or accurately sampled settlement systems are of primary interest here. The pattern of size distribution of the 47 Irene phase sites is compared against the type of distributions displayed by accurately sampled settlement systems.

Figure 9 is a histogram of site frequency per size class. Across the horizontal axis are the size classes numbered I through IV. Class I consists of the 2 largest sites. Class II contains the 6 next largest sites, while Class III contains the 12 third largest sites. Class IV is composed of the 27 smallest sites. The distribution shown in this Figure, of a large number of small sites and a few large sites is the typical and expected pattern. Geographers have shown that the curve produced by the histogram in Fig. 9 (the J-shaped curve) corresponds to that which is theoretically expected in the size distribution of settlements operating within a system (Berry and Garrison 1958, Haggett 1971).

In addition, the number of sites within each size class conforms to the theoretically expected distribution of settlement sizes within a system. Simon (1955), utilizing stochastic processes and probability concepts, derived equations that accurately describe the frequency

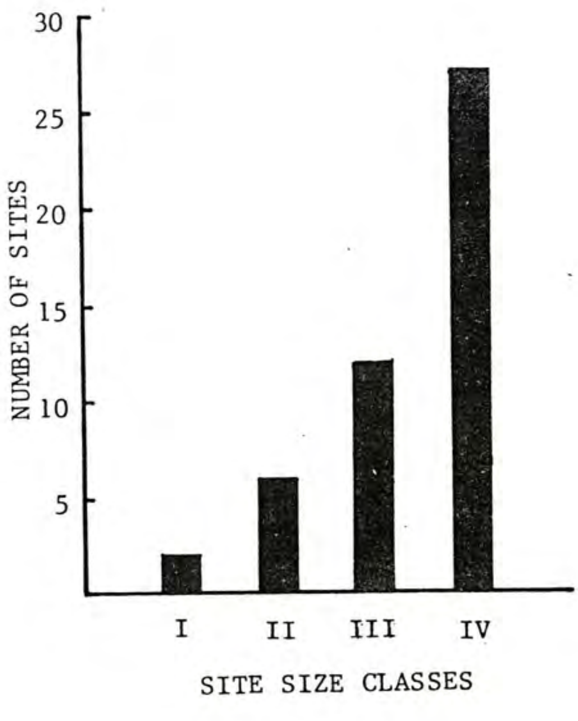


Figure 9. Frequency distribution of sites by size class.

distribution of settlements. Berry and Garrison (1958) have modified Simon's model slightly and shown its applicability to geographic data. Following Berry and Garrison, modified versions of Simon's equations were applied to the Ossabaw data to determine if the number of sites within each size class was significantly different from the number expected within a discrete settlement system. The results are presented in Table 2. These results indicate that the number of sites in each size class is not significantly different from the number expected using Simon's equations. It is argued that the representativeness of the sample of 47 sites used in this study is strongly supported by the pattern of distribution of site sizes displayed.

Although the spatial relationships of sites are not considered in this study, they are an important aspect in the analysis of settlement. Figure 10 shows the distribution of sites by size classes.

Site Size Hierarchy

The site size classes produced by the cluster analysis are discussed below in terms of their hypothesized position in the Ossabaw Island settlement hierarchy. These hypotheses are based on *a priori* assumptions about settlement hierarchies as well as specific knowledge about Irene phase settlement on Ossabaw Island. Later the variability proposed to exist among the size classes is viewed in light of size class relationships to various environmental and cultural data. The

Site Size Class	Observed Number	Observed Cumulative percent	Expected Number	Expected Cumulative percent
I	2	.04	2	.05
II	6	.17	4	.16
III	12	.43	8	.38
IV	27	1.00	24	1.00

H_o: 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: D=.05 There is no significant difference between the observed and theoretical distributions at p=.01 level of significance.

Expected values obtained by using the following formulas:

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. (after Berry and Garrison 1958)

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

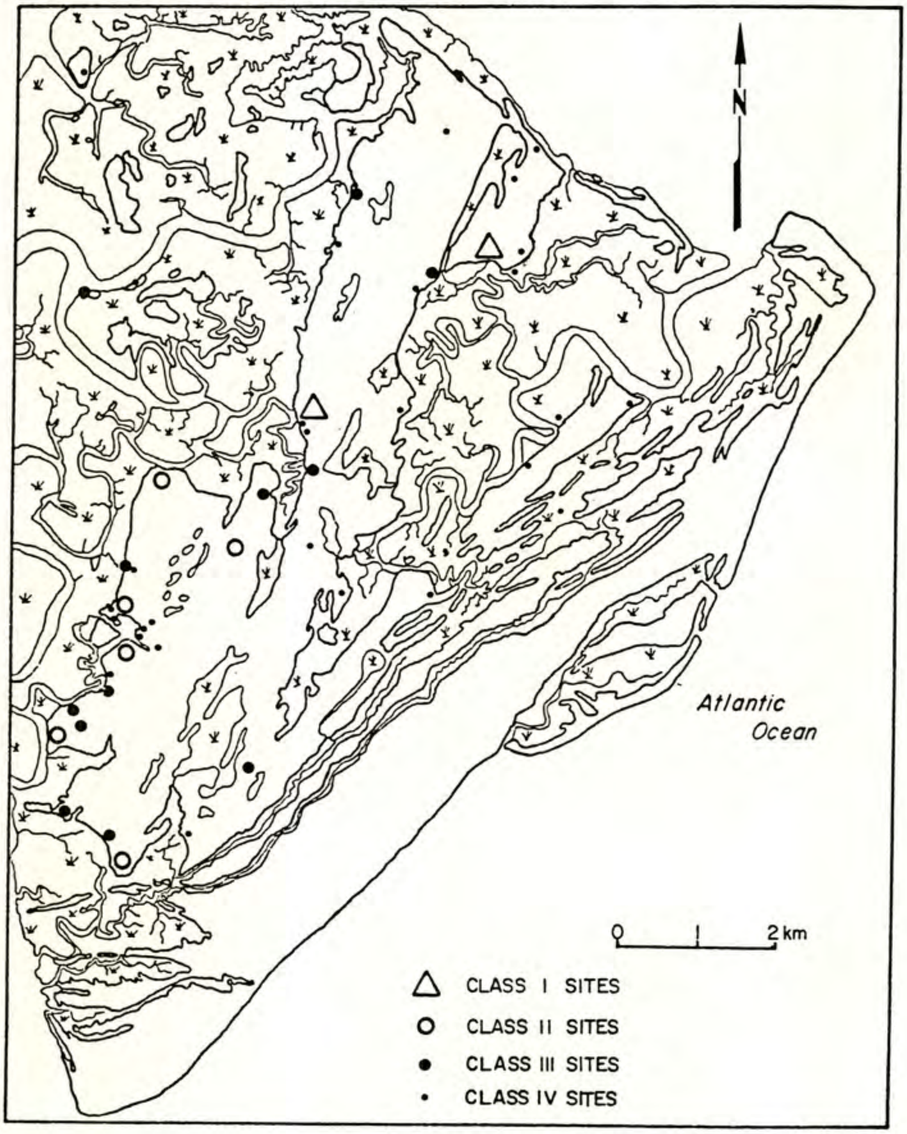


Figure 10. Site distribution on Ossabaw Island.

sorts of data used in this study permit only generalized hypotheses concerning the probable "functional" position or role of each site size class in the hierarchy as well as about interrelationships among the size classes. These assumptions about the "function" of sites, are, however, considered logical and essential for the development of an hypothetical model of settlement. More importantly, the hypothesized roles of site size classes presented are testable. The analyses which follow are mainly directed at testing the hypothesized variability that exists between size classes. Hypotheses about socio-cultural variability among size classes are derived from these analyses. These hypotheses are, of necessity, very generalized and more definite statements about the settlement system would require extensive archaeological investigations beyond the scope of this study.

Appendix II presents some of the site data discussed in this section.

Site Size Classes - Description and Discussion

Class I. This class consists of the two largest sites on Ossabaw Island, Ch 158 and Ch 160. Ch 158 is the largest site on the island (412,476 m^2) and is larger than Ch 160 (118,912 m^2). It should be emphasized that although site sizes are not considered to be exact indicators of population they do reflect the intensity of occupation at a site. They provide a relative measure of population throughout the Irene phase. The Class I sites, comprising 57% of the total area of the

47 Irene phase sites can be seen to have been intensively occupied and presumably important population centers. These sites are distinguished from the other sites by factors besides size. Both have multiple burial mounds as well as evidence of extensive pre-Irene phase occupations. Ch 158 has 5 burial mounds, two of which are Irene phase. Ch 160 has three burial mounds, one of which is Irene phase. All of these mounds were excavated by C.B. Moore in 1895 and their phase identification has been based on his report (Moore 1897). The descriptions given by Moore indicate that the burial mounds at these two sites were the largest on the island. He indicates that they ranged from 3 to 5 meters in height and from 11 to 25 meters in diameter (Moore 1897:90-134). Only at these two sites have more than one burial mound been found.

The size, presence of extensive pre-Irene phase occupations, and the number and size of burial mounds all differentiate these sites from others on Ossabaw Island and would seem to indicate their greater importance. Based on this data, Class I sites are hypothesized to have been the major centers of population and associated socio-cultural activities. As the most important settlements these two sites are likely to have been the foci of some, if not all, social, political and religious activities. If, as is postulated, the local population existed as a discrete social unit at some levels of socio-cultural organization then it is possible that one or both of these sites acted as island centers for particular socio-cultural systems. They are assumed to have been permanent, year-round settlements.

Class II. This class contains the group of second largest sites. Six sites are included in this class. Two of these sites, Ch 150 and Ch 155, have been extensively disturbed by modern agriculture and portions of the others have been slightly disturbed by the digging of shell for road construction. It is interesting to note that a burial mound has been found at only one of these sites, (Ch 150). This mound is approximately one meter high and 15 meters in diameter. Three of the Class II sites have indications of pre-Irene phase occupations.

The general lack of burial mounds at these sites, although they are rather large in size (ranging from 26,002 m^2 to 55, 740 m^2), may indicate an important socio-cultural difference between Class II and Class I sites. It is difficult to place functional titles on these sites, but in general they are hypothesized to have made up the second level of the settlement hierarchy on Ossabaw Island. The total size of these sites (237,144 m^2) indicates that although considered less "important" than the Class I sites, they contained a substantial amount of the total area (25%) included in Irene phase settlement on Ossabaw Island.

Class III. This class consists of 12 sites. Six of these have burial mounds. These mounds are much smaller than those found in the

Class I sites and the single mound found in the Class II sites. The mounds average 0.75 meters in height and from 10 to 20 meters in diameter. Whether the 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 since none have been excavated.

Only one of the Class III sites has extensive pre-Irene phase occupation. This site (Ch 145) is located on one of the small hammocks in the marsh west of the main island. This hammock would have provided an ideal base from which to exploit marsh resources. It may be that this site was occupied during a long period of prehistory only for this reason and as such was different from other Class III sites.

Class III sites are hypothesized to have been small communities consisting of one or a few families. Some of these sites are assumed to have been occupied seasonally for the exploitation of a limited range of resources.

Class IV. Class IV consists of 27 sites. Although the size range is considerable, 1 m^2 to 4,896 m^2, all of the sites are considered to be functionally similar. They are hypothesized to have been single function occupations, or to have encompassed only a narrow range of cultural activities. These sites were probably not permanent settlements. Many of them are small, consisting of only a single shell midden or scatter, and are interpreted as briefly occupied shell gathering stations. The Class IV sites comprise only 3% of the total area of Irene phase occupation on Ossabaw Island. This is seen as indicative of both brief and sparse occupation.

Only one Class IV site (Ch 179) has a burial mound. This site is somewhat anomalous for this class. It is one of the larger of the Class IV sites and is located in the interior portion of the island relatively far from the marsh edge. Most other Class IV sites are located immediately adjacent to the marsh. It is probable that this one site is functionally more similar to Class III sites than others of Class IV.

Only 4 of the 27 sites in this class have pre-Irene phase occupations. One of these, Ch 146, is located on a small hammock in the marsh. It seems likely that its use was similar to that of Ch 145 described above.

Site Size Classes and Environmental Variability

This section looks at site location in relation to several quantified environmental variables that are considered critical to site location. The variability proposed to exist between the 4 levels of the settlement hierarchy is expected to be reflected by variation in site size class relationships to environmental variables.

Tables 3 and 4 present frequency distribution of sites in each size class across forest community and soil types. These environmental variables and their assumed value to Irene phase settlement are discussed in Chapter II.

As can be seen from Table 3 the location of the larger site classes corresponds to Mixed Oak Hardwood Forest, while there is more variation with respect to vegetation type for the two smaller size classes. The food value of the Mixed Oak Hardwood Forest may have been important for supporting long-term occupations or larger populations. The variation evident in the distribution of sites may also indicate that the subsistence value of the Mixed Oak Hardwood Forest was not as important in determining the location of the smaller sites. Other factors, perhaps accessibility to marsh resources, entered into the choice of location for the smaller sites.

That soil conditions are, at least, as important and possibly more important to site location as vegetation community is demonstrated by Table 4. This table shows site location with respect to soil type. These soil types, listed from left to right, are ranked from those assumed most valued to those considered least valued for settlement. The rankings are based primarily on drainage characteristics such that the most "valued" soil type, Lakeland Fine Sand, listed Lp on the table, is the best drained soil. As one moves to the right across the table drainage becomes progressively worse. Soil ranking is discussed in Chapter II.

Table 4 demonstrates that the larger sites tend to be located on the better drained soils. The advantages of living on well drained soils,

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

Size Classes	Forest Communities 1 (Mixed Oak-Hardwood)	2 (Oak-Palmetto)	3 (Lowland Mixed)	4 (High Marsh)
Class I	2			
Class II	5		1	
Class III	8	3	1	
Class IV	11	8	6	2
Total	26	11	8	2

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

Size Classes	Soil Types 1 Lp	2 Cm	3 Ol	4 Lr	5 El	6 Kic	7 Ch
Class I	2						
Class II	4	1	1				
Class III	4	4	1	2	1		
Class IV	7	1	6	2	6	3	2
Total	17	6	8	4	7	3	2

especially in terms of the potential which they offer for year-round settlement and agriculture, are considered to have been instrumental in the choice of location of these large sites. The smaller sites are not concentrated on any single soil type. This lends support to the previously mentioned assumption that factors other than soil type were important in determining the location of smaller sites.

A difficulty in interpreting the relative importance of forest community and soil type as factors of site location lies in the fact that the two are interrelated. For example, since the most valued forest community, Mixed Oak Hardwood Forest, is associated with the most valued soil type, Lakeland Fine Sand, it is difficult to assess which was more important in influencing site location. It would seem that soil type may be more important for the actual location of a settlement since the resources of the Mixed Oak Hardwood Forest would be easily accessible from any part of the island. The combined value of these two is, of course, apparent and it must be assumed that some sites, especially the larger ones, were strategically located to take advantage of this.

As mentioned earlier, archaeological evidence indicates that extensive exploitation of marsh-estuary resources was undertaken by Irene phase populations. An attempt was therefore made to relate site location to marsh resources. Since it is not possible to accurately quantify the actual variation in availability of food resources in the marsh area, site distance from the marsh is used as a plausible measure of its importance to site location.

Tables 5 and 6 present data on site distance from both the marsh edge and from salt water creeks.

Table 5 presents data on site distances from the salt marsh edge. Distance category 1 indicates that a site is within 100 meters of the marsh, category 2 from 100 to 200 meters, and category 3 more than 200 meters from the marsh. It can be seen that the majority of sites fall within category 1. This may be indicative of the importance of marsh resources to all Irene phase populations, regardless of site size.

Table 6 presents data on site distances from salt water creeks. This measure is deemed important since creeks allow access into the marsh, thus increasing the exploitable area available to a site. Creeks are also important in producing a means of movement on and off the island. The distance categories are the same as those used in Table 5.

Tables 5 and 6 illustrate that there is greater variation in site distance from creeks than in site distance from the marsh. Seventy-seven percent of all sites are located adjacent to the marsh edge while 38% of all sites are located near creeks. In general a site's distance from a creek or the marsh is related to its size. This is most dramatically expressed by the differences between the largest and the smallest classes of sites. All of the Class I sites are located adjacent to saltwater creeks and thus next to the marsh. On the other hand, while 74% of

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)
Class I	2		
Class II	5		1
Class III	9	2	1
Class IV	20	3	4
Total	36	5	6

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

Size Classes	Distance Categories 1 (0-100m)	2 (100-200m)	3 (over 200m)
Class I	2		
Class II	2	2	2
Class III	6	2	4
Class IV	8	7	12
Total	18	11	18

the smallest (Class IV) sites are located adjacent to the marsh, only 30% are located next to creeks. It appears that while proximity to the marsh was important for most sites, access into the marsh or off the island was not an important consideration in the location of small sites.

No attempt is made to relate site location to fresh water sources since, as mentioned in Chapter II, fresh water is available at almost any point on the island.

In general, the data indicates that variability does exist between sites of different size classes in regard to their relationship to certain environmental variables. The larger sites are associated with more "valued" environmental variables than are smaller sites. The two largest and presumably the most important sites on the island are in every instance associated with optimum environmental conditions. It appears that these two sites are strategically located to permit ease in exploitation of several resource zones. This may indicate that a wide range of cultural activities may have been sustained at these locations. The larger of these two sites (Ch 158) is located on the salt water creek that provides the most direct access to the mainland. Interaction with the mainland was likely funneled through this site, thus adding to its importance.

As site size decreases there is a general lessening of overall environmental quality associated with sites. Class IV sites demonstrate the greatest variability in relation to the environmental variables. Many are located on seasonally wet or flooded soils which indicates short term or seasonal occupation. Few are located near creeks that would provide access into the marsh or away from the island. Most, however, are located next to the marsh. The environmental data is supportive of the proposed functional role of this class of sites, i.e., that they were transitory and specialized sites occupied primarily for shellfish gathering.

Overall Environmental Rank

It appears that the size classes do demonstrate patterned differences in relation to certain environmental variables and, as has been suggested, this variation is reflective of the site's role or function in the total settlement system. It seems, however, 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 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, Class I contains 2 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 site 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 Class I 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.

Size Class	Number of Sites in Class (N)	Sum of All Environmental Ranks for Class (SE)	Overall Environmental Rank (SE/N)
I	2	8	4.0
II	6	37	6.2
III	12	83	6.9
IV	27	246	9.1

Table 7. Overall Environmental Rank

Not surprisingly, the mean for Class I sites was the lowest with an overall environmental rank of 4.0. Class II sites had a rank of 6.2, Class III a rank of 6.9, and Class IV a rank of 9.1.

The overall environmental rank for each class supports the general assumptions made above. 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 site size decreases with a corresponding decrease in a site's functional variability.

Site Size Classes and Ceramic 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 (ceramics) are used in analyzing site size class variability. The assumption underlying this discussion is that observed differences in ceramics between site classes are reflections of socio-cultural differences.

Two types or levels of ceramic analysis were conducted. The first examines the differences in ceramic compositon between size classes using established Irene phase pottery types. The second is a more fine-scaled analysis that looks at variations in rim sherds and their distribution among site size classes.

Surface collections were made at all 47 sites. Only the Irene phase ceramics from the surface collections are used in the following analyses. Although an attempt was made to collect as many sherds as possible, many sites produced very little surface ceramics. An attempt was made to gather more ceramic material by excavating 1 x 1 meter test pits in randomly selected Irene phase middens at 18 sites. Even so, several sites produced only small ceramic collections. Seven of the Class IV sites produced only 1 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 use in analysis. The problem of inaccurate and insufficient samples from any one site is recognized. The second largest site (Ch 160), for example, produced only 15 Irene phase sherds. The reasons for the small collection are that the site has been extensively disturbed and much of the site is in pasture making collecting difficult. Time did not permit testing at this site which would have resulted in a larger collection. Difficulties such as this (in obtaining surface collections) were encountered on other sites. This small sample problem is somewhat alleviated by dealing with groups of sites (size classes) rather than with individual sites. The lumping of the ceramics from sites in each class provides reasonable sample sizes for analysis.

Combining surface collections with excavated samples could conceivably introduce error. There seemed to be no other way to obtain collections large enough for analysis. It is also to be noted that in no instance was any great difference observed between a site's Irene phase surface collections and its excavated sample.

The sources of error possible in the ceramic data are not seen as prohibitive in terms of the sorts of limited generalizations that are developed here. Questions which go beyond simply looking at ceramic variability across site size classes would require more rigorous procedures than have been undertaken in this study.

Ceramics and Ceramic Variability

The ceramic analysis that follows utilizes the typologies established through earlier research (Caldwell and Waring 1939a, Caldwell and McCann 1941, Williams 1968). Considering Irene phase pottery types as reflective of cultural activity, ceramics are anlayzed in light of their variability across the 4 site size classes. If, as proposed, the size classes differ in the types of cultural activities they sustain then this should be expressed by differences in their pottery type composition.

Before looking at pottery type variation across size classes a brief discussion is given of the total ceramic collection and note is made when the material varies from the established typologies. Table 8 presents the range of variability in the ceramic collections.

The most common pottery type is Irene Complicated Stamped. This type makes up 69.77% of the total collection. Collections from other Irene phase sites also demonstrate the preponderance of this type. At the Budreau site (Ch 9), east of Savannah, Irene Complicated Stamped comprised 81.73% of the ceramics found (Caldwell 1943:25). A small Irene phase site on Skidaway Island (Ch 112) produced 65.17% Irene Complicated Stamped (Goad 1975) and at the Redbird Creek site (Bry 9) in Bryan County, it comprised 71.18% of the collection (Pearson n.d.).

Pottery Type	Total Count	Range Count	Total %
Irene Complicated Stamped	2258	1-338	69.77
Irene Burnished Plain	330	0-59	10.19
Irene Plain	236	0-110	7.29
Irene Incised	49	0-13	1.51
Savannah Check Stamped	3	0-1	.09
Savannah Fine Cordmarked	35	0-19	1.08
Clay tempered wares	48	0-12	1.48
Irene Complicated Stamped with Incising	2	0-1	.06
Irene Complicated Stamped with limestone tempering	1	0-1	.03
Unclassified	274	0-50	8.46
Totals	3236	1-556	

Table 8. Total Irene Phase Ceramic Variation.

As found on Ossabaw Island, Irene Complicated Stamped is indistinguishable from the published type descriptions (Caldwell and Waring 1939a). The only recognizable stamped design element is the filfot cross or some variation of it. The execution of the stamping is variable. Sometimes the unit design is clearly depicted, at other times it is obliterated by overstamping.

Irene Complicated Stamped decoration is generally found on globular shaped jars with flared rims and rarely occurs on bowl shaped vessels. Two of the 146 Complicated Stamped rim sherds recovered are from bowls while the remainder are from flared rim jars. Incidental rim decoration in the form of nodes, reed punctations, applique rim strips etc., are commonly found on Complicated Stamped vessels. Only 12 of the 146 Complicated Stamped rim sherds lacked incidental rim decoration.

Plain wares are the second most common pottery type. In this study plain pottery that has been burnished or polished is distinguished from non-burnished wares, even though the original type descriptions group both treatments under Irene Plain. The types used here, Irene Plain and Irene Burnished Plain, occur on similar vessel forms. Most commonly this is the hemispherical or sharp-shouldered "cazuela" bowl. In some cases 4 to 5 widely spaced nodes are found below the rim of Burnished Plain Bowls. Rarely does Plain or Burnished Plain occur in the globular jar form, when it does it normally has incidental rim decoration like that found on Complicated Stamped ware.

It was often difficult to distinguish between the Plain and Burnished Plain wares because of surface erosion of the sherds. Most of these sherds would have been classified as unidentifiable although some Burnished Plain may have been classified as Irene Plain.

Irene Incised is found almost exclusively in the form of burnished bowls with the incising just below the rim. In the rare instances that incising occurred on jar-shaped vessels it occurred on the shoulder below the vessel's neck. Although incising is normally found on burnished non-stamped vessels, 2 sherds were found from bowls which are incised near the rim and stamped below. Moore (1897) found several vessels like this in burial mounds on Ossabaw Island, although Caldwell (Caldwell and McCann 1941:48) says that this juxtaposition of incising and stamping is rare at the Irene Mound site.

The 4 pottery types mentioned, Irene Complicated Stamped, Irene Plain, Irene Burnished Plain and Irene Incised, comprise the majority of the ceramics. Minor wares do occur in some Irene phase contexts. Those types definitely assigned to an Irene phase context based upon the test excavations were check stamped and cord marked wares. They are similar to, and identified as, the earlier types Savannah Check Stamped and Savannah Fine Cord-Marked (Caldwell and McCann 1941:44). The presence of these two types within an Irene phase context has been noted at other sites (Caldwell 1943, Pearson n.d.) and it is proposed that they constitute minor wares of the Irene phase complex. Caldwell and McCann (1941) have proposed that Irene phase ceramics are a development from Savannah ceramics and it may be that check stamping and cord-marking are holdovers from the Savannah phase (A.D. 1150 to A.D. 1350). Although the possibility exists that these two types are indicative of early Irene phase, this cannot be ascertained with the current data.

Several clay tempered sherds were found in the test pits excavated in the Irene phase shell middens. Only one clay tempered sherd displayed typical Irene phase surface treatment (Complicated Stamped) and this identification is in doubt. All other clay tempered sherds are cord-marked or plain. Clay tempering and cord-marking are characteristic of the earlier Wilmington and St. Catherines phases (A.D. 700 to A.D. 1100). Due to the rareness of these types it is assumed that they occur in Irene phase contexts only by chance. For the present these sherds are not considered Irene phase wares and are simply grouped together as clay tempered types.

One Complicated Stamped sherd was found that appears to be limestone tempered. Limestone tempering is generally characteristic of Woodland ceramics in the north Georgia-east Tennessee area. The presence of this one sherd is unexplained.

The rather large number of unclassified sherds shown in Table 8 is due to the eroded surfaces on many sherds. It was often difficult to distinguish between Irene Plain and Irene Burnished Plain and at times difficult to determine whether or not stamping occurred. All questionable sherds were placed in the unclassified category.

Site Size and Ceramic Variability

Table 9 presents data on ceramic variability by site size class. Discussion of the ceramic variability displayed in the table is presented below.

Table 9 indicates that the Class I sites have a greater percentage of Irene Plain and a smaller percentage of Irene Complicated Stamped than the other size classes. As mentioned earlier, both of the Class I sites have extensive pre-Irene phase occupations. One of these earlier occupations, the Savannah phase, is partially characterized by the use of plain and burnished plain pottery. It is likely that some Savannah Plain ceramics have been inadvertently included in the ceramic counts. The high percentage of Savannah Fine Cord-Marked may be due to the same reason although Fine Cord-Marked pottery does occur in Irene phase contexts as indicated by test excavations. The lack of Irene Incised in Class II sites is not explainable at this time.

Perceiving differences between ceramic compositions of site size classes is not readily accomplished through visual interpretation of

Pottery Types	Class I			Class II			Class III			Class IV		
	Total Count	Range Count	%	Total Count	Range Count	%	Total Count	Range Count	%	Total Count	Range Count	%
Irene Complicated Stamped	343	5-338	60.07	631	3-315	69.64	832	1-334	73.69	452	1-150	71.74
Irene Burnished Plain	46	0-46	8.05	122	0-59	13.46	95	0-40	8.41	67	0-32	10.63
Irene Plain	119	9-110	20.84	23	0-14	2.53	42	0-16	3.27	52	0-15	8.25
Irene Incised	9	0-9	1.57	0			23	0-13	2.03	17	0-11	2.69
Savannah Check-Stamped	1	0-1	0.17	1	0-1	0.11	0			1	0-1	0.15
Savannah Fine Cordmarked	19	0-19	3.32	6	0-3	0.66	10	0-5	0.88	0		
Clay tempered Wares	3	0-3	0.52	29	0-12	3.20	8	0-8	0.70	8	0-8	1.26
Irene Complicated Stamped with Incising	0			0			2	0-2	0.17	0		
Irene Complicated Stamped with Limestone temper	0			0			1	0-1	0.08	0		
Unclassified	31	1-30	5.42	94	0-50	10.37	116	0-34	10.27	33	0-20	5.23
Totals	571	15-556		906	8-410		1129	1-417		630	1-222	

Table 9. Ceramic Variation by Site Size Class.

Table 9. To determine if there is a significant ceramic type difference between site classes the total count of pottery for each class is compared with that from other classes using the chi square statistic for goodness-of-fit.

Chi-Square Analysis

The non-parametric chi-square statistic is used to test "whether the observed sample differences signify differences among populations or whether they are merely the chance variation that are to be expected among random samples from the same population" (Siegel 1956:174).

The analysis is conducted at two levels. First, all size classes are compared together to obtain an overall chi-square value. This test is used to determine the significance of the differences among all four of the size classes. This provides information on the overall ceramic variability. Analysis of the differences between each of the size classes is achieved by computing chi-square values for each possible pair of site size classes.

The procedure and rationale used in this analysis follows that presented by Siegel (1956:104-111, 174-179). The null hypothesis (H_O) to be tested is: The ceramic composition of site classes are not significantly different from one another and can be considered to have come from the same population.

Table 10 presents a contigency table of the data for the computation of the overall chi-square. Tables 11 through 16 present contigency tables containing data for the computation of chi-squares for all possible pairs of size classes. In each table expected values are in parentheses and are listed beneath the observed values. Only the four major pottery types, Irene Complicated Stamped, Irene Burnished Plain, Irene Plain and Irene Incised are used in the analysis. This was done since these four are definitely Irene phase types while the others are questionably allocated to that phase.

The results of the chi-square tests indicate that there is a significant statistical difference in the ceramic composition of the four size classes. Although it may be considered that this ceramic variation reflects and supports the general contention that size classes are functionally different, the chi-square results can not be considered without some caution. Some of the cell values are O and the possibility exists that sampling error is producing spurious results. There seems to be no way to aleviate this sampling error and the chi-square results are only considered to be strong indications of ceramic variation among size classes.

Rim Sherd Analysis

An additional attempt to examine variability between site size classes involves analysis of rim sherd distribution. No previous

Pottery Types	Site Size Classes I	II	III	IV	Totals
Irene Complicated Stamped	343 (399.3)	631 (599.4)	832 (766.3)	452 (454.2)	2258
Irene Burnished Plain	46 (58.3)	122 (87.6)	95 (112.0)	67 (66.3)	330
Irene Incised	9 (8.6)	0 (13.0)	23 (16.6)	17 (9.8)	49
Irene Plain	119 (41.7)	23 (62.6)	42 (80.1)	52 (47.4)	236
Totals	517	776	992	588	2923

df=9
X^2=241.437
H_o rejected: $P<.001$ level of significance

Table 10. Chi-square contingency table for all site size classes.

	Pottery Types				
Size Classes	Irene Comp Stpd	Irene Burn Plain	Irene Incised	Irene Plain	Total
I	343 (389.4)	46 (67.2)	9 (3.6)	119 (56.8)	517
II	631 (584.6)	122 (100.8)	0 (5.4)	23 (85.2)	776
Totals	974	168	9	142	1293

df=3
X^2=147.4
H_o rejected: P<.001 level of significance

Table 11. Chi-square contigency table for Class I and Class II.

	Pottery Types				
Size Classes	Irene Comp Stpd	Irene Burn Plain	Irene Incised	Irene Plain	Total
I	343 (402.6)	46 (48.3)	9 (11.0)	119 (55.2)	517
III	832 (772.4)	95 (92.7)	23 (21.0)	42 (105.8)	992
Totals	1175	141	32	161	1509

df=3
X^2=126.3
H_o rejected: P<.001 level of significance

Table 12. Chi-square contigency table for Class I and Class III

	Pottery Types				
Size Classes	Irene Comp Stpd	Irene Burn Plain	Irene Incised	Irene Plain	Total
II	631 (642.0)	122 (95.2)	0 (10.1)	23 (28.5)	776
III	832 (820.9)	95 (121.8)	23 (12.9)	42 (36.5)	992
Totals	1463	217	23	65	1768

df=3
X^2=26.4
H_o rejected: P<.001 level of significance

Table 13. Chi-square contigency table for Class II and Class III.

	Pottery Types				
Size Classes	Irene Comp Stpd	Irene Burn Plain	Irene Incised	Irene Plain	Total
II	631 (616.1)	122 (107.5)	0 (9.7)	23 (42.7)	776
IV	452 (466.9)	67 (81.5)	17 (7.3)	52 (32.3)	588
Totals	1083	189	17	75	1364

df=3
X^2=49.14
H_o rejected: P<.001 level of significance

Table 14. Chi-square contigency table for Class II and Class IV.

Size Classes	Pottery Types Irene Comp Stpd	Irene Burn Plain	Irene Incised	Irene Plain	Total
III	832 (806.2)	95 (101.7)	23 (25.1)	42 (59.0)	992
IV	452 (477.8)	67 (60.3)	17 (14.9)	52 (35.0)	588
Totals	1284	162	40	94	1580

df=3
X^2=17.04
H_o rejected: $P<.001$ level of significance

Table 15. Chi-square contigency table for Class III and Class IV.

Size Classes	Pottery Types Irene Comp Stpd	Irene Burn Plain	Irene Incised	Irene Plain	Total
I	343 (372.0)	46 (52.9)	9 (12.2)	119 (80.0)	517
IV	452 (423.0)	67 (60.1)	17 (13.8)	52 (91.0)	588
Totals	795	113	26	171	1105

df=3
X^2=43.19
H_o rejected: $P<.001$ level of significance

Table 16. Chi-square contigency table for Class I and Class IV.

investigators have attempted to analyze Irene phase ceramic rim sherds in any systematic manner, yet due to the marked elaboration and variability of rim decoration it offers the possibilities of fine-scale distributional analysis. The major assumption of this analysis is that objectively defined rim types will display patterned variability across site size classes. It is also hypothesized that the smaller and assumed more specialized sites will display less variability in rim type than the larger and more heterogeneous sites. To achieve objective and precise rim typology a statistical method is used to establish a rim type classification. The technique used is a monothetic subdivisive classification developed by Robert Whallon (1971, 1972). A computer program, also developed by Whallon (1971), is used to analyze the rim sherd data.

The Whallon method is borrowed from plant ecology and is generally called "association analysis." The analysis is based on the use of qualitative (presence/absence) attributes and proceeds by the division of an original data set into smaller and smaller subgroups on the basis of the presence or absence of a single "best" attribute.

Association analysis, in general, uses the chi-square statistic to test for association. The Whallon program uses the simple sum of chi-squares such that at any point division in the hierarchy occurs on that attribute having the largest number of significant chi-squares. The ultimate goal of the procedure is to produce a group of items or "types" each of which is "uniquely defined by a specific combination of presence and absences of attributes and in which the maximum degree of homogeneity within subgroups and heterogeneity between subgroups is concurrently maintained" (Whallon 1971:9). The usefulness of this method of classifying ceramics has been demonstrated by Whallon (1972:21-24). A more detailed explanation of this method can be found in Whallon's "A Computer Program for Monothetic Subdivisive Classification in Archaeology" (1971).

The program requires the selection of attributes that are considered most important and a code of the presence or absence of the attributes for each rim sherd. The program allows a maximum of 15 subdivisive steps. Stopping rules can be used that place restrictions on the division. The stopping rules used here allow the smallest acceptable cell value for calculation to be 3 and places the minimum acceptable significant chi-square at 2.71.

The list of the 26 attributes used is presented in Table 17. This list is considered adequate and sufficient for the ceramic sample used. The possibility exists that future adjustments in the attribute list may be necessary to include Irene phase ceramics from other locations.

Figure 11 presents a classificatory tree of the statistically derived rim types. Discussion of the results is presented below.

The major division in the analysis occurs on variable 14, complicated stamped decoration. Although not evident in Figure 11, this division can to some extent also be considered a division on vessel shape.

ATTRIBUTE LIST

Rim form

1. straight
2. flared
3. incurved

Rim decoration

4. rim strip: segmented
5. rim strip: segmented and punctated
6. rim strip: plain
7. rim strip: reed punctated
8. no rim strip: plain
9. no rim strip: punctated
10. no rim strip: nodes
11. no rim strip: punctated nodes

Exterior decoration below rim

12. cord-marked
13. check stamped
14. complicated stamped
15. straight line incised
16. rectilinear incised
17. curvilinear incised
18. burnished
19. non-burnished (plain)

Interior treatment

20. burnished
21. plain
22. scraped

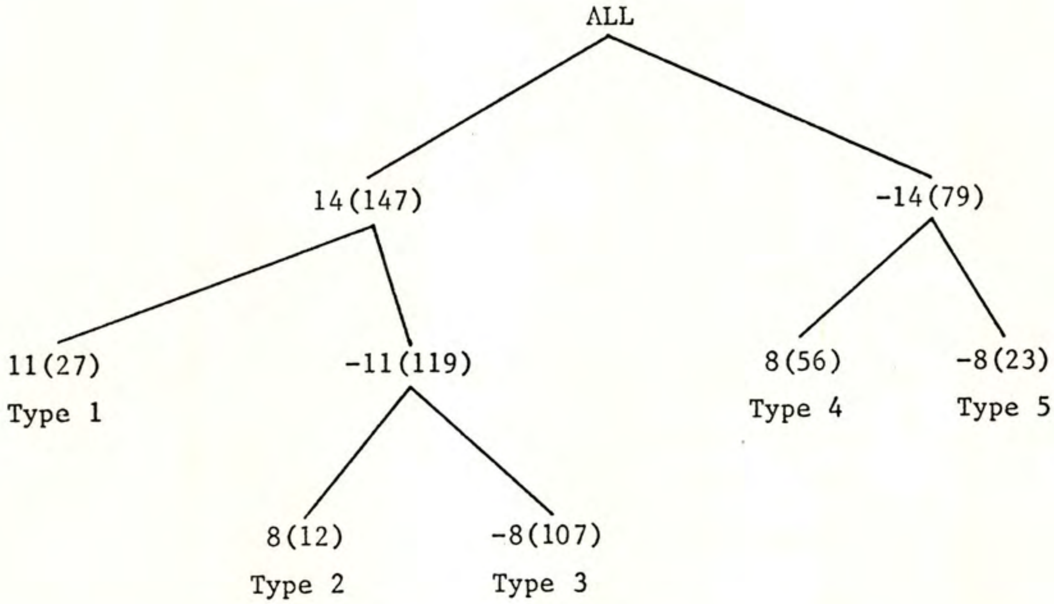
Lip treatment

23. stamped
24. plain

Temper

25. grit
26. clay

Table 17. Attribute list.



Attributes upon which division occurred:

8--No rim strip: plain
11--No rim strip: punctated nodes
14--Complicated stamped

Figure 11. Classificatory tree for all rim sherds. Based on sum of Chi-square with a minimum expected cell value of 3.

All except 2 complicated stamped sherds are from jar shaped vessels.

There is greater variation in vessel form among non-complicated stamped wares (-14). Included in this group are both bowl and jar shapes which are Irene Plain, Irene Burnished Plain and Irene Incised. This group also contains four sherds of Savannah Fine Cord-marked.

Division in this non-complicated stamped group occurred on variable 8. Although this is mainly a division between plain vessels with some sort of incidental rim decoration (Type 5) and vessels with no rim decoration (Type 4) there is some variability within each group. Type 4 consists mainly of Irene Plain and Burnished Plain bowl-shaped vessels but includes 1 Irene Incised and 4 cord-marked sherds. Type 5 consists of bowl and jar shaped Irene Burnished Plain vessels with incidental rim decoration.

Division among the complicated stamped rims occurred on variables 11 and 8. Type 1 consists of Irene Complicated Stamped jar-shaped vessels with punctated nodes at the rim. No rim strip occurs on this type. Type 2 consists of complicated stamped vessels with no rim decoration. Type 3 consists of Irene Complicated Stamped vessels with decorated rim strips.

No division occurred on incising although 2 incised sherds are included in the analysis.

Division did occur on attributes dealing with incidental rim decoration, suggesting that the use of rim decoration is potentially useful in fine-scale Irene phase pottery typology. It would seem that a larger sample is needed to obtain finer divisions within those types having incidental rim decoration.

Data on the distribution of the statistically derived rim types is presented in Table 18. Visual observation of the table does not reveal any obvious distributional differences. Using a statistical test such as chi-square, to analyze the differences between size classes is deemed meaningless because of the small sample size and small expected cell values (Siegel 1956:178).

It was expected that variation in site size would be expressed by patterned variability in rim sherds such that the greatest variety of rim sherds would be associated with the largest sites. This is not expressed by the data at hand. It is expected that rim sherd analysis of the sort used here is potentially useful in indicating site variability but that a larger sample of rims is needed for a more meaningful analysis.

Discussion

The ceramic data is not as useful an indicator of site variability as the environmental variability surrounding site locations. Although some ceramic variation across size classes is indicated, the sociocultural correlates of this variability are not yet discernible.

	Site Size Classes				
Rim Type	I	II	III	IV	Totals
1	2	14	3	8	27
2		7	2	3	12
3	21	38	30	19	107
4	8	21	21	6	56
5	1	12	5	5	23
Totals	31	92	61	41	225

Table 18. Distribution of rim types by site size classes.

The limited usefulness of the ceramics in this analysis of site variability may be due to sampling error in the ceramic collection procedures. More rigorous collection procedures are required to determine the range of ceramic variability and the implications this may have for socio-cultural variability that exists among site classes.

CHAPTER V

SUMMARY AND DISCUSSION

This study has been directed at developing a model of Irene phase settlement on Ossabaw Island. Considering the observed settlement variability as reflective of the local population's interaction with their environment, this model is in broader perspective a generalized statement on Irene phase cultural adaptation. Those factors which are considered to be essential factors of settlement have been isolated and analyzed to determine how they may relate to settlement variability.

The model, consisting of sets of hypotheses, is based upon the assumptions, data, and analyses utilized in this study. It provides a simplified construct of the complex structure of the Irene phase settlement system by using only what are considered the most important "factors" of settlement. Though considered to provide an initial framework for explaining and predicting variability in Irene phase settlement the model is essentially hypothetical. As such it lends itself to and requires further testing.

A brief summary of the model of Irene phase settlement and adaptation can best be achieved by first looking at the variability in the hierarchy of sites and secondly by viewing some of the overall trends evident in the settlement data.

The four level site hierarchy developed in this study is reasonable in light of the available archaeological data. The data permits only generalized statements to be made concerning the sorts of cultural activities associated with each of the levels of the hierarchy.

Based on the environmental and archaeological factors discussed, the largest sites (Class I) are seen as centers of economic, social and religious importance for the island. One, or both, of these sites occupied the apex of the settlement hierarchy and may have been foci for the more complex socio-political activities on the island.

That the Class I sites were centers of population seems beyond doubt since the total size of the Class I sites (531,388 m^2) is greater than the size of all of the other sites together (418,662 m^2), comprising 57% of the total area of Irene phase occupation.

The exact configuration of population dispersal over Ossabaw Island is not known. The archaeological data does indicate the likelihood of seasonally dispersed settlement. It is hypothesized that most of the island's population lived in the largest sites during part of the year and, in order to exploit specific resources (agricultural land, marsh resources, etc.), small groups (possible families or groups of families) moved and established small semi-permanent seasonal settlements (Class II and III sites) at appropriate locations around the island.

Some portion of the population probably remained in the larger sites year round.

This type of settlement system conforms to the type of settlement described by the early historic accounts for the area of coastal Georgia (see pp. 68 above and Swanton 1922) as well as to the archaeological data.

Several aspects of the pattern of site size distribution supports this hypothesized pattern of settlement. The two largest sites may display evidence of permanent occupation in their size, their extensive pre-Irene phase occupations and in their large and multiple burial mounds. On the other hand, the majority of the smaller sites (78% of the Class II and III sites) have only Irene phase components. Although population growth may be expected to have accounted for some of these single component sites, many are interpreted as being the result of the seasonally dispersed settlement pattern described.

The question of permanency of settlement in coastal Georgia has long been debated, but never resolved. Most (J. R. Caldwell, personal communication, Larson 1970, Milanich 1971) have assumed that all sites on the coast were only seasonally occupied. Though not explicitly demonstrated, the present author suggests that the largest sites, based on their size, long period of occupation, burial mounds, and their optimum location in respect to environmental variables were permanent year round settlements even though part of the population moved away seasonally. Other sites may also have served as permanent settlements, but the majority were probably seasonal or short term occupations.

The functional position of the Class II sites within the hierarchy is the most difficult to discern. The fact that only one site has a burial mound and that only three have pre-Irene phase occupations places them in contrast with the Class I sites. The site with the burial mound also has pre-Irene phase occupation and it may have provided socio-cultural functions similar to Class I sites. The sites with no pre-Irene phase occupations were probably semipermanent, seasonal occupations, and are the result of the seasonally dispersed settlement. The total area of Class II sites (237,144 m^2) constitutes 25% of the total area of Irene phase occupation indicating the importance of Class II sites in terms of relative population during the Irene phase.

Class III sites are best described as permanent or semipermanent small settlements, some of which though economically self-sufficient, were likely dependent upon or closely related to other (larger) sites in socio-political spheres.

Only one of the Class III sites has an extensive pre-Irene phase occupation and this site is somewhat anomalous in that it is located on a small hammock in the marsh (see pp. 91 above for a discussion of this site). Six of the Class III sites have burial mounds. As mentioned earlier, these mounds are relatively small when compared with the mounds found in the Class I sites. It is argued that burial mounds are, to some extent, indicators of permanency of settlement and socio-religious autonomy. Therefore some of the Class III sites are considered permanent settlements containing socially distinct units. The small burial mounds likely served only the inhabitants of that particular settlement. It seems logical that this group of Class III sites are the result of actual population expansion during the Irene phase. The other sites are, again, assumed to be the result of seasonal dispersal or movement of population over the island.

In several recent studies of Mississippian settlement patterns, sites of this general type are considered to be small agricultural settlements (Brandt 1972, Peebles 1971, 1974, Price 1973). The seemingly limited importance of agriculture in Irene phase subsistence suggests that these sites may not have been solely agricultural hamlets but, even so, some were likely economically self-contained.

Class IV sites are considered to have been transistional, limited activity sites. Most are extractive sites associated mainly with exploitation of shellfish and other marsh resources. The very smallest of these sites probably represent only a single day's occupation while some of the larger ones were occupied for considerable lengths of time. The one Class IV site with a burial mound probably was more similar to the Class III sites.

The pattern of site size distributions in this settlement hierarchy provides pertinent information concerning the overall settlement system.

Vapnarsky (1969) has attempted to explain settlement size distributions within an ecological framework by using two measures that reflect a given region's relative isolation. Though based on modern economic situations, his approach seems useful for limited application to prehistoric data. One characteristic is internal interdependence. This is a measure of the amount of interaction within a given settlement system. Closure, on the other hand, is a measure of the amount of interaction going in and out of a system.

Four possible combinations of closure and interdependence are derived, each indicating aspects of a systems relative isolation. The four combinations are: 1. high closure/low interdependence, 2. low closure/low interdependence, 3. low closure/high interdependence, and 4. high closure/high interdependence. Each of these situations is theoretically associated with different settlement size distributions. These distributions are reflected as specified curves when the size of a class of settlements is plotted against the rank of classes on log normal probability paper.

Figure 12 is a plot of the Ossabaw Island sites using Vapnarsky's specifications. The size of each site size class is the midpoint of the sizes within that class. The curve produced is that which is to be expected in a low closure/high interdependence situation. Such a situation is to be expected in a relatively small, homogeneous, somewhat isolated region in which a great deal of interaction occurs among

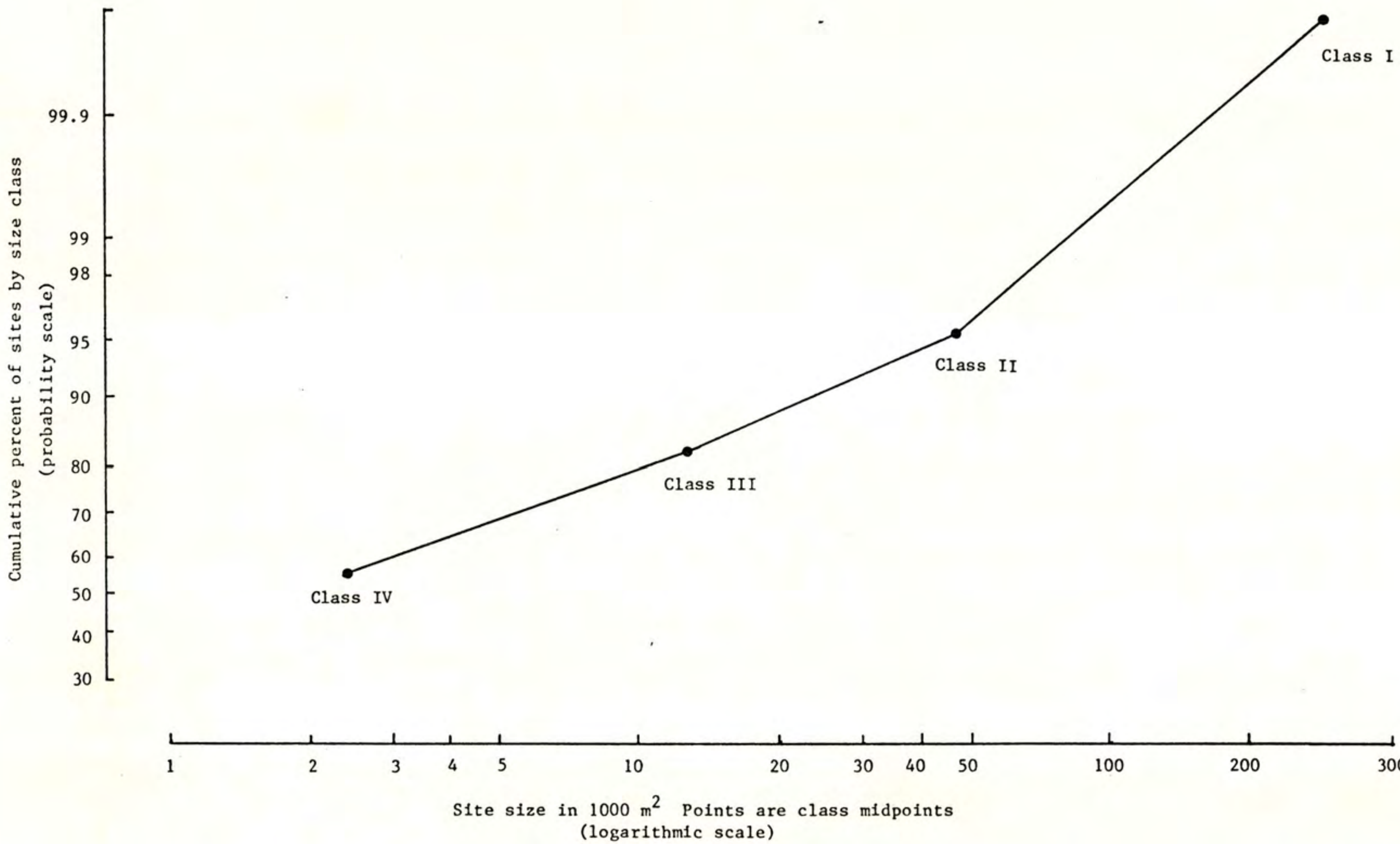


Figure 12. Graph of site size by class versus cumulative percent of sites by class.

settlements within the region and with only a few settlements handling interaction outside of the region (Vapnarsky 1969:585).

Berry (1961) points out that this particular curve reflects a "primate" settlement situation in which one or a few settlements are much more important in socio-economic terms than are the remainder of the settlements. He implies (1961:584) that the primate situation occurs in societies having a "simple" socio-economic system.

The Irene phase settlement system on Ossabaw Island is seen as a logical reflection of Vapnarsky's situation of low closure/high interdependence and Berry's primate settlement hierarchy. It is argued then that the curve shown in Fig. 12 is useful as an indicator of some broader aspects of the Irene phase settlement system on Ossabaw Island. It also appears that though Vapnarsky's and Berry's models are based on modern data they do have comparative and explanatory applicability to prehistoric data.

The settlement model presented suggests that Ossabaw Island's Irene phase population operated as an autonomous or semi-autonomous unit in certain areas of cultural activity. It is not assumed that the island operated as such at all social levels. Discussion of Irene phase adaptation requires some knowledge of the extent and the level of Ossabaw's interaction with other Irene phase populations. Both archaeological and historical data is used to examine these relationships.

The evidence, in terms of site location and archaeologically recovered food remains indicates that Irene phase peoples relied heavily on marsh-estuary exploitation. In light of the abundance of easily exploitable 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 evident that the Irene phase population on Ossabaw Island had ties and relationships with the mainland and other sea islands. Affinities are most obvious in terms of similarities in material culture. This is most evident in 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 exist.

Historical evidence provides more information as to the position of the Ossabaw Island population in relation to the rest of the Irene phase cultural manifestation. As mentioned earlier, there is reasonable assurance that the area of Guale described in early historic accounts is equivalent to the archaeological manifestation known as the Irene phase.

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 Menendex 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. Because of this it is likely that certain sorts of settlements which would be associated with highest level or levels of the total Irene phase settlement hierarchy are not to be found on Ossabaw Island. Platform mounds, such as that found at the Irene Mound site, are not found and probably reflect the lack of highest order settlements on the island.

Comparisons

The few studies that have dealt with Mississippian settlement have generally concentrated on what can be considered the most elaborate and sophisticated settlement systems of the Mississippian period. Two major examples are the work at Moundville by Peebles (1971 and 1974) and by work done around the site of Cahokia in the American Bottoms of Illinois (Brandt 1972, Fowler 1972, 1974). Even the Class I sites on Ossabaw Island fit in only at the lower levels of the settlement hierarchy established for these two areas.

Fowler (1974) has established a four level hierarchy of sites for the American Bottoms area. This hierarchy is: 1. First Line Communities. Only one site, Cahokia, is included in this level and it is considered the most important site in the system. 2. Second Line

Communities. Included in this level are sites with several platform mounds and a plaza. 3. Third Line Communities. These include sites having only one platform mound. 4. Fourth Line Communities. This level includes all moundless sites, villages and farmsteads.

It would appear that most, if not all, of the sites on Ossabaw Island would fall into Fowler's Fourth Line Community level.

For Moundville, Peebles (1971, 1974) presents a three level hierarchy of sites. These are: 1. Regional Center- Only one site, Moundville, is included in this level. It is considered to have been the most important site in the system. 2. Secondary Ceremonial Centers- Included in this group are sites which have one or a few platform mounds. 3. Villages or local communities. This group contains sites that have no mounds.

As with Cahokia, the Ossabaw Island sites fall somewhere along the lowest levels, mostly in the group of villages and local communities.

A situation more nearly comparable to that of Ossabaw Island is seen in the Powers phase (A.D. 1275 to 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 Irene phase developments.

A four level hierarchy of sites is established for the Powers phase (Price 1973:50). These are: 1. Civic Ceremonial Center- Only one site, Powers Fort, is included in this category. This site contains 4 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 going on at all levels of his hierarchy it does not appear to be dramatically different from that established in this study for Ossabaw Island. Ossabaw Island itself does not contain a civic ceremonial center but such sites may have existed on the mainland or on other islands. A close equivalent to a civic ceremonial center would seem to be the Irene Mound site which contained a temple mound, a burial mound and a mortuary building (Caldwell and McCann 1941).

The Class I sites, though there is no evidence they were fortified, are somewhat similar to Price's Fortified Secondary Villages. The remaining sites on Ossabaw Island conform to the hamlet and extractive sites given by Price.

It seems that the hierarchy of settlement on Ossabaw Island compares only to the lower levels of most other described Mississippian settlement hierarchies. This is not surprising considering the marginal position, relative isolation and the rather distinctive subsistence base of Irene phase developments (especially the lack of intensive agriculture). All of these factors have probably contributed to the lack of elaboration observed in Irene phase cultural development. With the exception that Irene phase settlement hierarchy most resembles another somewhat marginal cultural manifestation (Powers phase), this comparison seems to offer little in the way of meaningful results.

It seems likely that profitable and interesting comparisons could be made between settlement systems if more explicit approaches were used in establishing site hierarchies. The two site size distribution curves discussed in this study would, for example, permit meaningful comparisons of settlement systems. It does not appear that the data necessary to make such comparisons is being collected.

Conclusions

The approach to settlement analysis used in this study is somewhat different from that which has previously been used in most prehistoric settlement pattern studies. Ossabaw Island was approached as a unique, spatially isolated, geographic unit and settlement phenomena within this unit was analyzed. Most settlement studies, in particular those dealing with Mississippian in the eastern United States, have used similarities in cultural data, mainly ceramics, to delineate their settlement universe and then have analyzed settlement within this "ceramic" universe (Peebles 1974, Price 1973). Few attempts have been made to use physiographic boundaries to delineate areas and when done the bounded areas are rarely distinct or discrete (see Fowler 1972). The result has been a difficulty in identifying the social correlates of the material similarities used to define the area and thus a difficulty in even demonstrating that a given group of sites actually operated in a "settlement system".

For the archaeologist, geographical models of settlement distribution seem to offer the best means of interpreting, identifying and even approaching prehistoric settlement. Geographical models, have been developed using explicitly defined regions or areas, be the boundaries of the areas political, economic or physiographic ones (see Haggett 1971). Unless archaeologists can establish meaningful boundaries on their areas of investigation the use of geographic models is haphazard, to say the least. Ossabaw Island has provided a rather fortuitous situation in being a distinct and rather obviously bounded physiographic area and the settlement data lends itself to, at least, partial explanation, through the use of established geographic models.

The approach presented here in developing a site hierarchy based on explicit size distinctions seems to have general applicability in most analyses of prehistoric settlement. The model of Irene phase settlement developed here, as a generalized hypothetical construct, requires further use and testing. More cultural data needs to be collected to enable refined statements about site size class socio-cultural position in the overall hierarchy. The model is meant as an explanatory mechanism, a means of comparison and a tool of analysis. As such, though it has its most specific value in the analysis of prehistoric settlement on the

Georgia coast, it is considered generally useful in a wide variety of situations.

Future Research

This study presents a number of problem areas that require and should lead to further research. Most of these problems are seen to stem from the general paucity of artifactual material available for analysis. The most important questions to be approached are those relating to seasonality and site variability. The model developed in this study relies heavily on the assumption that Ossabaw Island as a whole and certain sites in particular had permanent Irene phase occupations. This assumption is, however, only tentative. An important hypothesis of this study is that site variability will be expressed by patterned variability in material culture, especially ceramics. This variability, if in fact it exists, has not been satisfactorily demonstrated. The rim sherd analysis as presented in this study provided no conclusive evidence of site variability. With larger sample sizes, however, this approach is seen as useful in examining both between and within site variability.

Intensive and systematic test excavations conducted at a few sites of each level of the proposed settlement hierarchy is suggested as the most direct and efficient means of acquiring data to use in examining the questions of seasonality and site variability. Recent research by the author (Pearson 1976) has shown that seasonality can be easily and accurately estimated through the analysis of the shells of Quahog clams (Mercenaria mercenaria), which are commonly found in Irene phase shell middens.

A systematic and complete survey of the island is needed, though it is not considered as important in testing the proposed model as are the test excavations. It is assumed that a survey will locate more Irene phase sites but it is doubtful if their inclusion will alter the proposed settlement hierarchy to any degree.

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 L are sherd counts for each of the various pottery types or styles in accordance with the following list:

A - Irene Complicated Stamped

B - Irene Burnished Plain

C - Irene Incised

D - Irene Plain

E - complicated stamped and incised

F - limestone tempered

G - Savannah Check Stamped

H - Savannah Cord-Marked

I - clay tempered wares

J - Deptford wares

K - Fiber Tempered wares

L - 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	L	SUM
CH158	338	46	9	110	0	0	1	19	3	0	0	30	556
CH160	5	0	0	9	0	0	0	0	0	0	0	1	15
CH202	266	56	0	14	0	0	0	1	12	1	0	50	400
CH155	13	1	0	0	0	0	1	3	0	0	0	0	18
CH150	29	5	0	0	0	0	0	0	0	0	0	21	55
CH254	5	1	0	0	0	0	0	0	0	0	0	2	8
CH191	3	0	0	2	0	0	0	2	5	0	0	4	16
CH199	315	59	0	7	0	0	0	0	12	0	1	17	411
CH195	91	10	0	8	0	0	0	0	0	0	0	18	127
CH277	334	32	13	4	0	0	0	0	0	0	0	34	417
CH175	178	10	2	16	1	0	0	5	0	3	0	34	249
CH253	37	2	0	1	0	1	0	0	0	0	0	7	48
CH179	2	0	0	0	0	0	0	0	0	0	0	1	3
CH170	2	1	0	0	0	0	0	3	0	0	0	1	7
CH145	7	0	0	0	0	0	0	0	0	0	0	0	7
CH276	2	0	0	0	0	0	0	2	0	0	0	0	4
CH198	167	40	7	12	1	0	0	0	3	0	0	15	245
CH274	1	0	0	0	0	0	0	0	0	0	0	0	1
CH153	1	0	1	0	0	0	0	0	0	0	0	0	2
CH174	10	0	0	1	0	0	0	0	0	0	0	6	17
CH232	69	3	1	1	0	0	0	0	0	0	0	20	94
CH151	150	32	11	8	0	0	0	0	8	0	0	13	222
CH247	1	0	0	1	0	0	0	0	0	0	0	0	2
CH228	0	0	0	1	0	0	0	0	0	0	0	0	1
CH259	11	0	0	1	0	0	0	0	0	0	0	0	12
CH224	64	13	0	15	0	0	0	0	0	0	0	0	92
CH275	1	2	0	0	0	0	0	0	0	0	0	0	3
CH255	0	0	0	1	0	0	0	0	0	0	0	0	1
CH271	4	0	0	1	0	0	0	0	0	0	0	0	5
CH266	2	0	0	1	0	0	0	0	0	0	0	0	3
CH164	2	1	0	6	0	0	1	0	0	0	0	0	10
CH147	44	3	1	0	0	0	0	0	0	0	0	0	48
CH146	2	0	1	1	0	0	0	0	0	0	0	0	4
CH236	51	8	1	8	0	0	0	0	0	0	0	0	68
CH193	12	0	0	2	0	0	0	0	0	0	0	0	14
CH165	1	0	0	0	0	0	0	0	0	0	0	0	1
CH258	1	0	0	0	0	0	0	0	0	0	0	0	1
CH229	12	0	0	0	0	0	0	0	0	0	0	0	12
CH225	3	0	1	0	0	0	0	0	0	0	0	0	4
CH200	1	0	0	0	0	0	0	0	0	0	0	0	1
CH244	1	0	0	0	0	0	0	0	0	0	0	0	1
CH201	7	0	1	5	0	0	0	0	0	0	0	0	13
CH143	2	5	0	0	0	0	0	0	0	0	0	0	7
CH169	1	0	0	0	0	0	0	0	0	0	0	0	1
CH192	7	0	0	0	0	0	0	0	0	0	0	0	7
CH144	1	0	0	0	0	0	0	0	0	0	0	0	1
CH235	2	0	0	0	0	0	0	0	0	0	0	0	2

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 what each site is included. 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 site is found. Discussion of these Forest Communities is presented in Chapter II. The codes are:

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 are 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 categroies 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.)

SN	SIZE	CLASS	MDS	VEG	SOIL	MARSH	CREEK	I	S	W	D	F
CH158	412476	1	2	1	1	1	1	1	1	1	1	0
CH160	118912	1	1	1	1	1	1	1	1	1	0	0
CH155	55740	2	0	1	1	1	1	1	1	1	1	0
CH202	55070	2	0	3	5	1	2	1	0	0	0	0
CH150	37160	2	1	1	1	1	1	1	1	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	1	0
CH199	26002	2	0	1	1	1	3	1	0	0	0	0
CH195	20798	3	1	1	1	1	1	1	0	0	0	0
CH277	17789	3	1	1	2	1	1	1	0	0	0	0
CH176	16643	3	1	3	5	1	1	1	0	1	0	0
CH253	15738	3	0	1	1	1	2	1	0	0	0	0
CH179	14042	3	1	1	1	2	3	1	0	0	0	0
CH170	11148	3	0	1	2	1	1	1	1	0	0	0
CH145	11148	3	0	2	4	1	1	1	1	1	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	0	0	0
CH274	8871	3	0	1	2	3	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
CH232	4896	4	0	2	3	1	2	1	0	0	0	0
CH151	4878	4	0	2	3	1	3	1	0	0	0	0
CH247	3716	4	0	1	1	1	2	1	0	0	0	0
CH288	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
CH244	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
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
CH266	743	4	1	1	1	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	1	1
CH146	279	4	0	2	4	1	1	1	1	0	1	1
CH236	209	4	0	3	5	3	3	1	0	0	0	0
CH193	186	4	0	1	1	1	3	1	0	0	0	0
CH165	114	4	0	4	6	1	2	1	0	0	0	0
CH258	60	4	0	4	6	1	1	1	0	0	0	0
CH229	47	4	0	3	5	2	2	1	0	0	1	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

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