THE ARCHAEOLOGY OF MISSION SANTA CATALINA DE GUALE: 1. SEARCH AND DISCOVERY

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ABSTRACT

Nearly a decade ago, the American Museum of Natural History began to search systematically for the archaeological site of the 16th/17th century Spanish mission Santa Catalina de Guale (9 Li 274), thought to exist on St. Catherines Island, Georgia. This monograph initiates a new series entitled *The Archaeology of Mission Santa Catalina de Guale.* We describe how available historical evidence and geophysical technology led to discovery of the mission buildings in 1981. Since then, six years of intensive field investigations have been completed, specifically into the interaction between the indigenous Guale Indians and the Franciscan missionaries in 16th and 17th century Spanish Florida.

Throughout most of the 17th century, St. Catherines Island represented the northernmost extension of effective Spanish control in eastern North America. When Santa Catalina was overrun by British forces in 1680, the Spaniards and the Guale began their inexorable retreat southward. The fall of Santa Catalina marked the beginning of the end for Spanish control of the Eastern Seaboard.

The Guale were among the first indigenous peoples encountered by Europeans exploring north of Mexico, and they are among the best known of the 16th and 17th century Muskhogean peoples. Nevertheless, even basic issues of subsistence, settlement pattern, and social structure remain the subject of controversy today. A primary objective underlying the search for Santa Catalina was to shed light on these issues by addressing questions of ecological potential, economic change (particularly the relative importance of horticulture), degree of transhumance, relationship of health to social status, and changes in population size among the protohistoric Guale.

Another research direction was more methodological. Several remote sensing techniques were employed at Santa Catalina to locate the mission complex, to define the configuration of unexcavated subsurface structures, and to build a baseline library of geophysical signatures to be projected against concrete archaeological evidence.

Preliminary proton magnetometer research disclosed the presence of a Spanish period barrel well and two well-preserved ruins of wattle-and-daub buildings—the church (*iglesia*) and the presumed kitchen (*cocina*). Low-altitude aerial photography defined a shell-covered forecourt (*atrio*) fronting the mission church.

Soil resistivity studies turned up a third wattle-and-daub mission building—apparently the Franciscan friary (*convento*)—plus a series of contemporary aboriginal Guale structures (the Guale *pueblo*). Subsequent ground-penetrating radar survey and low-level aerial photography confirmed the presence of a western bastion and palisade trenches surrounding the central mission complex.

The excavations also encountered an extensive Guale Indian cemetery beneath the church floor; roughly 400–450 Christian burials have been exhumed to date. By employing both generalized stress indicators and specific trace-element and carbon-isotope technology, we hope to monitor dietary changes (especially the dietary importance of maize) and determine the nature of demographic shifts among Native Americans in Spanish Florida. The skeletal sample also provides information regarding pathology, bone size modification, and the relationship of social status to resource access.

The present monograph, the first in a series, describes why we decided to seek Santa Catalina and how we conducted the search. This volume provides the methodological baseline for more substantive contributions to follow.

INTRODUCTION

This is the first monograph in a new series entitled *The Archaeology of Mission Santa Catalina de Guale.* Although the American Museum of Natural History (AMNH) has been exploring the archaeology of St. Catherines Island since 1974, research objectives have evolved markedly over this period. For reasons detailed in this volume, we embarked upon a long-term program in historic period archaeology, focusing initially on the discovery and subsequently on the excavation of the Spanish mission Santa Catalina de Guale. Nine years of field investigations have now been completed, and in this monograph we begin presenting our findings.

By way of background, in 1972 the AMNH entered into an agreement with the Edward John Noble Foundation to encourage and facilitate scientific research on St. Catherines, a barrier island off the coast of Georgia. The resulting program has enabled hundreds of scientists and advanced students to carry out research on various aspects of the natural and cultural history of the island.

Since 1974, field crews from the AMNH have conducted intensive and extensive archaeological investigations as part of this overall research program. The results of these inquiries have been reported in several monographs grouped within the general rubric *The Anthropology of St. Catherines Island*; each appeared as an *Anthropological Paper of the American Museum of Natural History*. The first volume in this series (Thomas et al., 1978) provides an overview of the natural and cultural history of St. Catherines Island, and should be viewed as a backdrop for this monograph as well.

The early objective of the St. Catherines Island Anthropological Project was decidedly biocultural in emphasis, initially focusing on the Refuge and Deptford complex, dating from about 1500 B.C. through A.D. 600 (Thomas and Larsen, 1979). Crews from the AMNH excavated nine such burial mounds between November 1974 and May 1977. The investigations clarified the temporal affiliations of these subtle, inconspicuous sand mounds and also provided the first real data regarding religious and ritual practices during these early periods.

As a direct outgrowth of these excavations, Larsen (1982) conducted a detailed examination of prehistoric biocultural adaptations on St. Catherines Island. Drawing upon a skeletal sample of more than 600 individuals, Larsen found that the shift to agriculture-based subsistence coincided with a general rise in infectious disease, a modification he attributed primarily to increasing population density and a diet high in carbohydrates (see also Larsen, 1981, 1984).

The program in mortuary archaeology continued in 1977 and 1978, when two St. Catherines period burial sites—Marys Mound and Johns Mound—were excavated and analyzed (Larsen and Thomas, 1982). Ceramic and radiocarbon evidence suggests that both mounds were constructed during the late 12th or early 13th centuries A.D.

More recently, we have reported the results of archaeological excavations of two additional prehistoric burial mounds on St. Catherines Island (Larsen and Thomas, 1986). South End Mound I, an Irene period mortuary site (ca. A.D. 1300–A.D. 1600), had been initially excavated by C. B. Moore during the winter of 1896–1897. South End Mound II, a previously unrecorded St. Catherines/Savannah period burial mound, was discovered not far from Moore's excavations. Related mortuary excavations on St. Catherines Island are reported elsewhere (Thomas et al., 1977).

In addition to the biocultural research, American Museum crews initiated an examination of regional cultural ecology. The first step was to conduct a 20 percent systematic randomized sample of St. Catherines Island, disclosing and testing about 135 archaeological sites. These data are currently being analyzed and will be published in *The Anthropology of St. Catherines Island* series. Further contributions to this series are anticipated at irregular intervals.

For the past nine years, our primary research objective has been the search for and excavation of 16th/17th century Franciscan mission Santa Catalina de Guale (9 Li 274). Although a few accounts of this research have appeared in popular publications (Thomas, 1983a, 1985; see also Wilford, 1982; Toner, 1985; Kiell, 1986; Schwartzman, 1986), only one technical article has been published to date (Garrison et al., 1985; see also Thomas, in press). This monograph will describe our motivation for seeking Santa Catalina and explain how we did it. This volume likewise defines a methodological baseline for more substantive contributions to follow.

Acknowledgments

I begin with my sincere thanks to the Trustees of the St. Catherines Island and Edward John Noble Foundations, for providing the opportunity and the support to conduct the archaeological research described here. We are particularly grateful to Mr. and Mrs. Frank Y. Larkin for their truly extraordinary level of interest and benefaction. Few research projects have enjoyed the intellectual freedom and enthusiastic approbation provided by the Larkins in support of our efforts on St. Catherines Island.

Additional funding for excavations and analysis came from the Richard K. Lounsbery Foundation, the National Science Foundation, the Georgia Endowment for the Humanities, Mr. Donald McClane, the James

Ruel Smith Fund, the Ogden Mills Fund, and Earthwatch.

I thank those who assisted in administrating archaeological research on St. Catherines Island. Mr. Royce Hayes, superintendent of St. Catherines Island, made our work both effective and pleasurable. We also thank the staff of St. Catherines Island for always being willing to lend a hand: Mr. Thomas Fanning, Mr. Mike Harper, Mr. Stephen Holley, Mr. John Robbins, and Mr. Jack Waters. Each assisted throughout the project, especially helping to keep the machinery running and clearing vegetation from the site. Mr. John Toby Woods, the previous superintendent, contributed significantly to the early success of our Santa Catalina research.

Moreover, had it not been for the basic research orientation and specific support of the American Museum of Natural History, the search for Santa Catalina could never have been undertaken. Long-range institutional commitment was critical throughout our research, and I specifically thank those at the AMNH who helped out: Dr. Thomas D. Nicholson, Dr. Jerome G. Rozen, Jr., Ms. Diane Menditto, and Ms. Joan Buttner.

We wish to publicly acknowledge the contributions of Dr. Kathleen Deagan (University of Florida) and Mr. Stanley South (University of South Carolina), both of whom visited Santa Catalina in the early stages of excavation. They shared valuable insights from their own experiences in Spanish Florida, and contributed a number of constructive suggestions about how best to proceed in our excavations.

We also gratefully acknowledge those who helped out with various remote sensing studies at Santa Catalina. Dr. Ervan Garrison and Mr. James Tribble (both then of Texas A&M University) conducted the initial magnetometer surveys. Subsequent computer graphics were supplied by Mr. James Baker (also of Texas A&M University). We thank Colonel Tilford C. Creel (Army Corps of Engineers) and Mr. Richard K. Anuskiewicz (University of Tennessee) who graciously lent us the first survey magnetometer.

The soil resistivity survey was conducted by Dr. Gary Shapiro (Florida Bureau of Archaeological Research/LAMAR Institute) and Dr. Mark Williams (LAMAR Institute/University of Georgia). Had it not been for their sound advice and willingness to share expertise, this productive study would never have taken place.

We also thank the personnel of Red R, the consulting firm that conducted the ground-penetrating radar survey. Mr. Steve Persons was particularly helpful in interpreting the results of this valuable study.

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We also toast the members of the Coastal Georgia Archaeological Society, who visited

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We especially thank the Most Reverend Raymond Lessard, bishop of the Savannah Diocese for his cooperation in resolving the reinterment issue, and for supervising the "Reblessing the Ground and Re-burial of Remains" services held in the cemetery at Santa Catalina on May 25, 1984. We are likewise grateful to other members of the Historical Commission in the Cause of the Georgia Martyrs for their support and participation: Reverend Alexander Wyse, O.F.M., Reverend Francisco Morales, O.F.M., Dr. F. Lamar Pearson (Valdosta College), and Dr. Edward Cashin (Augusta College). Sister Mary Laurent Duggan and Mrs. Gillian Brown of the Chancery, Diocese of Savannah, assisted in the reconsecration ceremony.

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CHAPTER 1. WHY SEEK SANTA CATALINA?

> If some unwitting hands have not pulled them down, if they were not built entirely of wood, if the weather has not beaten too fiercely through the centuries, or if the streams have not innundated them, some fortunate hunter may yet stumble upon the mission remains of Santa Catalina de Guale .... Although at the time of the coming of the English, Santa Catalina was the most important of the Guale missions, the fierceness of the struggle in this region may have led the Yamasees and the English to treat it as the Romans did Carthage. (Lanning, 1935, p. 7)

Historian John Tate Lanning was right fifty years ago. Santa Catalina de Guale did indeed one day surface.[1] But we "fortunate hunters" hardly stumbled upon the mission remains. It took us five years of planning and searching and in these pages we discuss how that investigation was conducted.

But first a word about why we bothered. The search for Santa Catalina evolved naturally from long-term investigations on St. Catherines Island. Some years ago, we quite deliberately set out to generate a relatively unbiased overview of the archaeological record on this barrier island. This done, we wished to focus on a single, more restricted time frame. We began our search with a systematic regional survey, and, after three years, we had a sample of 135 archaeological sites—roughly 20 percent of those we suspect exist on St. Catherines Island. Ceramic and ecological data from this diachronic sample provide a first-order approximation of cultural dynamics spanning four millennia and eight cultural periods. The long-range game plan then called for us to narrow the scope to a single cultural period and explore more specific issues constrained in time and space.

In truth, the search for Santa Catalina evolved as something of a backup strategy. My first inclination was to explore the subsistence-settlement system of the Late Archaic period. Like most American archaeologists, I was impressed and puzzled by the apparent antiquity of ceramics along the Georgia coast. And, as a relative newcomer to Southeastern archaeology, I was curious about the meaning of the characteristic three to four millennia-old Late Archaic shell rings (one of which was discovered and tested as part of the 20% systematic survey).

For weeks, we planned to research the Late Archaic on St. Catherines Island through a series of intensive, interdisciplinary excavations conducted at target sites known from the systematic regional sample; this research was envisioned as a direct parallel to our long-term program of archaeological survey and related excavations in Monitor Valley, Nevada (Thomas, 1983b, 1983c).

Fortunately for us, the operational flaws in this strategy surfaced early. Our regional survey disclosed that most Late Archaic sites clustered along the northeastern margin of St. Catherines Island. This area of relatively high ground has been subjected to extreme seaward erosion—our sample of Late Archaic components was a rapidly diminishing remnant of what had been there only recently. In fact, since 1974, some of our best Late Archaic components have literally washed away.

Given these locational and microgeographic factors, we realized, to our chagrin, that the St. Catherines Island sample of Late Archaic archaeology was decidedly second-rate. Although several potentially significant fiber-tempered ceramic sites survive here, the truth is that several areas in coastal and riverine Georgia hold vastly more potential for understanding this early adaptation. Reluctantly, we shifted attention away from the early end of the archaeological sequence.

The 20 percent systematic survey also identified dozens of late prehistoric and early historic Guale Indian sites. Because of the randomization, these sites ranged from isolated, single-task extractive loci to full-blown Guale villages. Some areas showed evidence of structural remains, and most sites were intact and unthreatened by either development or erosion. We then realized that the

[1] *Guale* is pronounced "wallie" (Swanton, 1922, p. 80).

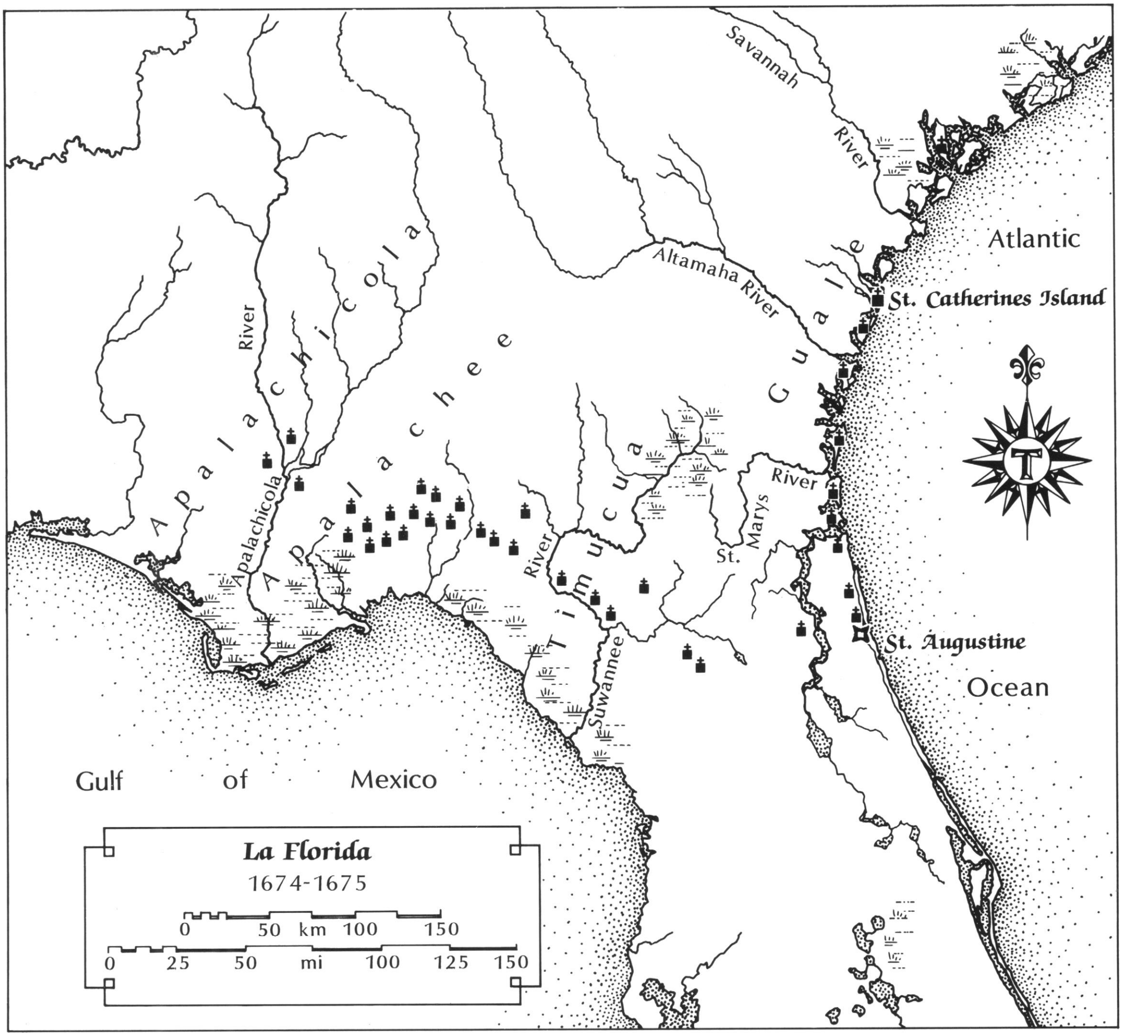

Fig. 1. The provinces and missions of *La Florida* at the time of Bishop Calderón's visitation, 1674–1675 (after Gannon, 1965, p. 64, facing). Each mission is indicated by a cruciform symbol (and individually identified on fig. 9).

greatest potential for anthropological archaeology on St. Catherines Island centered on these Guale sites.

ETHNOHISTORICAL OVERVIEW

The Guale were among the first indigenous peoples met by Europeans exploring north of Mexico (Swanton, 1922, p. 81; 1946, p. 603; Sturtevant, 1962; Larson, 1978; Jones, 1978a; fig. 1). After brief contact with the Spanish in 1526, this Muskhogean-speaking group later encountered the French in 1562–1563. Then, beginning in 1566, the Guale were exposed to a long and intensive period of Spanish colonization. By 1684, the gradual withdrawal of the Spanish to the south and the correlative expansion of the Carolina colony southward fostered relocation and reorganization of the vastly reduced Guale population.

St. Catherines Island may not have been an important settlement during the earliest phase of European contact—we simply are not certain. But we do know that an important Guale town existed there by at least 1576 (Jones, 1978a, p. 203). The year 1584 found only four Franciscan friars stationed in all of *La Florida,* and they spent their time attending to Spanish needs at the sister cities of St. Augustine and Santa Elena, with little time for missionizing the Guale and Timucua (Sturtevant, 1962, p. 58; fig. 1, this volume).[2]

Indian hostilities soon forced final abandonment of Santa Elena, and Spanish headquarters were shifted to Santa Catalina. In 1587 the island became the principal northern Spanish outpost on the Atlantic coast and remained so until the 1680s. In this strategic position, St. Catherines Island became a key element in both the history of Spanish Florida and the ultimate fate of the Guale Indians. By 1597, 14 friars were stationed in *La Florida,* several of whom served in Guale (Geiger, 1940). That year, the Indians of Guale staged a major revolt, part of which was played out on St. Catherines Island (see also Larson, 1978, p. 133; Deagan, 1978, p. 113; Wallace, 1975, p. 200)—an uprising with distinctly nativistic overtones (Sturtevant, 1962, p. 58).

The Spanish named the Guale Indians for the chiefdom centered at the principal towns on this island; the associated Franciscan mission eventually became known as *Santa Catalina de Guale.* For most of the 17th century, Mission Santa Catalina represented the northernmost extension of effective Spanish cultural influence along the western Atlantic. But during this relatively late phase of conquest, the spirit of rebellion among neighboring coastal groups, as well as those who resided on the island, lived on until a final uprising on the eve of removal (Barcia, 1951).

[2] The term *La Florida* was coined by Juan Ponce de León when he first sighted "the island" at Easter time of 1513. Because the land was heavy with fragrant flowers, he termed the new territory *Pasqua florida,* Easter of the Flowers. The term has occasionally been expanded to include all Spanish territory in America (Gannon, 1965, p. 1); but in this volume, we restrict the term "*La Florida*" to the "First Spanish Period" of St. Augustine, dating from 1566 to 1763, when the Spanish left St. Augustine under terms spelled out in the first Treaty of Paris (Waterbury, 1983; Deagan, 1983, pp. 22–27). So employed, *La Florida* encompasses parts of the modern states of Georgia and South Carolina, in addition to most of Florida.

Guale resistance, in fact, remained alive among the mixed population of interior Yamassees for nearly four more decades (Jones, 1978a).

Spanish hegemony remained relatively unchallenged here until 1670, when the English settled at Charles Town, South Carolina. The territory from there south to St. Augustine became a region of conflict and contention between England and Spain until 1763—the so-called "debatable land" (Bolton and Ross, 1925).

Spanish missions on the barrier islands of coastal Georgia were the first victims of this basically European conflict. In 1670 the English and Spanish agreed, through the Treaty of Madrid, that Britain might forever hold the areas in America and the West Indies that were already regarded to be in her possession. Conflicting interpretations resulted, and the Spanish intended to settle the problem by sending an expedition to attack and destroy Charles Town, the southernmost British settlement. Although the expedition destroyed Port Royal, it was disrupted by storms and forced to retreat before even threatening Charles Town. The only tangible consequence of this episode was the establishment of a Spanish garrison on St. Catherines Island in 1673 and the beginning of a stone fort at St. Augustine.

The year 1680 was a turning point as the English began a steady push down the coast and across the interior toward the Mississippi. "For a decade the English cloud hovered over Santa Catalina, guardian of the Guale border . . . . The Guale missions were a menace, and their neophytes would make good slaves on Carolina plantations" (Bolton and Ross, 1925, p. 35).

That year, a force of 300 British-led Yamassee Indians appeared at Santa Catalina and killed Christian Guale guards. The surviving sentries spread the alarm through the small fortified mission settlement. Captain Francisco Fuentes was apparently housed in the friary (*convento*) with the rest of the Spanish garrison of five men. His hastily organized defense force—five Spaniards and fewer than four dozen Guale—took refuge in the fortified mission church, where they withstood the siege for more than a day (Bolton and Ross, 1925, p. 36).

The defense of Santa Catalina seems to have been well planned and its execution determined, Fuentes taking the almost unprecedented risk of placing firearms into the hands of 16 Guale Indians (Lanning, 1935, pp. 215–216). When Governor Salazar heard of this attack, he dispatched reinforcements from St. Augustine, but this force arrived after Santa Catalina had been abandoned.

The Guale of Santa Catalina had successfully held off the invaders, but they were horrified by the attack and abandoned Santa Catalina immediately and completely. Retreating toward the relative safety of St. Augustine, they stopped first at Sapelo Island. Then, in 1686, they withdrew to the mouth of the St. Mary's River. Although no formal war had been declared between England and Spain, the English had cleared the Georgia coast of Spanish missions, military bases, and influence.

With the fall of Santa Catalina, the Spaniards and the Guale began their inexorable retreat to the south; the fall of Santa Catalina became, in a real sense, the beginning of the end for the Spanish along the Eastern Seaboard (Spalding, 1977, p. 13).

Earlier, the conquest of Santa Elena exposed Spain's inability to hold by colonization the middle North American coast against the incursions of other nations (Lyon, 1984, p. 16). A century later, the fall of Santa Catalina underscored the inability of Spain to retain this same coast through missionization.

> In every sense of the word these missionaries were the advance guard of Spain in North America .... When the long arm of English colonization, extending rapidly southward during the first half of the seventeenth century, at length came into direct conflict with the Spaniards, it was the Franciscan missions which bore the brunt of the attack, until, overpowered by the English fur trader and English gold, rum, and firearms, they at length capitulated. (Chatelain, 1941, p. 26)

The mission on St. Catherines Island was abandoned in the early 1680s, when the Guale coast was largely depopulated (Sturtevant, 1962, pp. 68–69).

The ruins of Santa Catalina were described in 1687 by a Captain Dunlop of South Carolina:

> we came about noon to the North east of St. Catharina where resting a while we came to the ffurther point of that Isle [probably Persimmon Point] where the great Setlement was we see the ruins of severall houses which we were informed the Spaniards had deserted for ffear of the English about 3 years agoe; the Setlement was great, much clear ground in our view for 7 or 8 miles together. (Dunlop, 1929, p. 131; fig. 2, this volume)

In May 1736, Saltzburger Philip Georg Friedrich von Reck landed on the northwestern part of St. Catherines Island "to take on some fresh water there. The island is 12 English miles long. There is much good land on it, especially on the shore of the river [probably at Wamassee Creek], where more than 100 acres had previously been cleared and cultivated by the planters but it had been ruined by the Indian wars, and now lie deserted" (Hvidt, 1980, p. 39).

THE GUALE PROBLEM

These are the so-called historical facts—and some remain in dispute. But even if one could get all these "facts" straight, the ethnographic and ethnohistorical meaning attributed to such "facts" is anything but clear. The Guale may be the best known of the Muskhogean groups during the 16th and 17th centuries, but even the basic ethnographic picture remains today in dispute. "The 'ethnohistoriographic' problems inherent in a study of the Guale are immense" (Jones, 1978b, p. 242).

Transcending Swanton's (1922) all-encompassing synthesis, the first detailed reconstruction of Guale ecology was framed by Lewis Larson. In his pioneering analysis of environment and subsistence technology on the Georgia coast, Larson found the productivity for Guale agriculture was low, based upon swidden technology (Larson, 1969, 1980a). This horticultural base was heavily supplemented by hunting and collecting, resulting in a highly dispersed, seasonally mobile population (see also Crook, 1986).

Contrasting the Guale with considerably more sedentary groups of Apalachee Florida, Larson argued that Guale agriculturalists

> [shifted] their cultivation as it became necessary to fallow a field. Because the soils suitable to

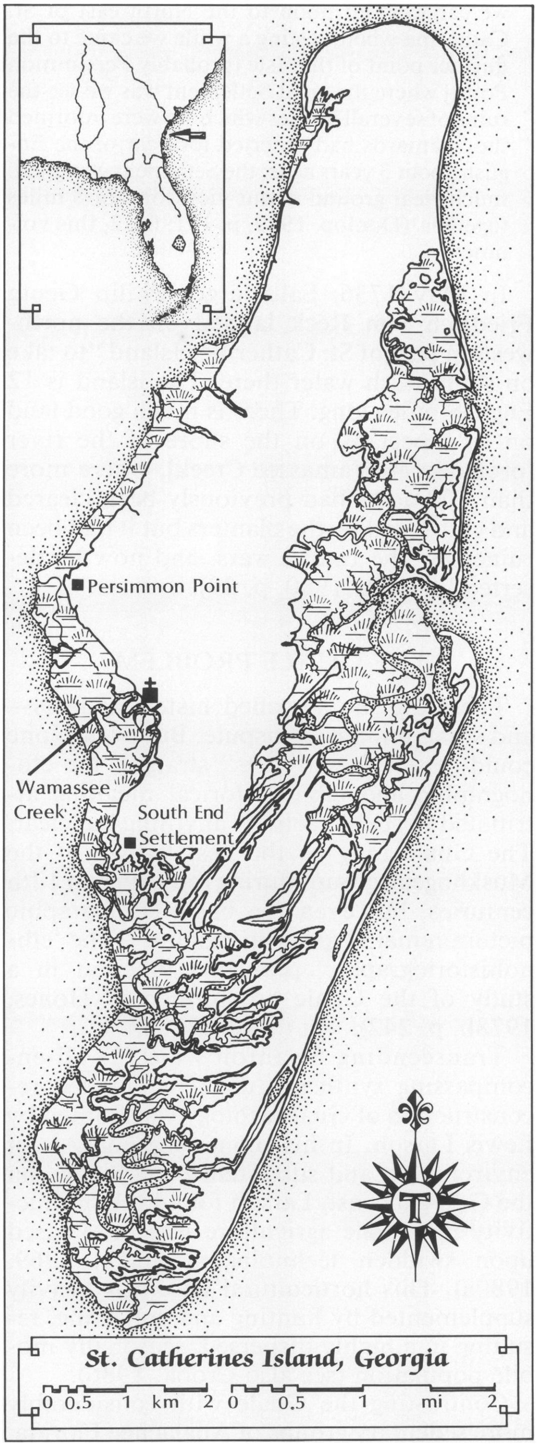

Fig. 2. St. Catherines Island, Georgia.

> agriculture occurred in small and widely scattered patches, it was necessary for them to shift their residences each time a new field was opened to cultivation and an old field allowed to lie fallow. (1980a, p. 221)

Larson (1978, pp. 122, 127, 137; see also Crook, 1984, p. 260; 1986, pp. 18–20) felt that whereas agriculture was indeed practiced in late prehistoric times, "its importance seems to have been slight .... The Guale were a coastal people whose economy was centered on the tidal waters where they derived a subsistence from fishing. Agriculture and hunting were of relatively minor importance" (1978, pp. 122, 137).

This interpretation relied heavily on then-available ethnohistoric and archaeological evidence. Particularly important was Father Rogel's 1570 account of Guale settlement pattern:

> The Indians were so reluctant to receive the Catholic religion that no admonitions would curb their barbarity—a barbarity based on liberty unrestrained by the yoke of reason, and made worse because they had not been taught to live in villages. They were scattered about the country for nine of the twelve months of the year, so that to influence them at all, one missionary was needed for each Indian. (*in* Barcia, 1951, p. 152)

The Rogel account goes on to rationalize the failure of the Jesuit efforts after his return from 11 months in Guale. According to Rogel, the problem was due first to the missionaries' inability to concentrate the Indians in permanent settlements because the soil of the region would not allow intensive agriculture, and secondarily to the disturbances caused by the Spanish garrisons' dependence on the Indians for food.

Another relevant source, a letter written from Guale on March 6, 1570, by Father Sedeño, described coastal Georgia and its landscape:

> It is full of huge pines and barren forests; and this is the reason as I have written at other times to your excellency, 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 so miserable they move

> with their households from time to time to seek other lands that they can bring to productivity. (cited in Larson, 1980a, p. 208)

Taking this evidence at face value, Larson continues:

> The first missionaries in the Guale area complained bitterly about the fact that the Indians neglected agriculture in favor of hunting and fishing, which meant that permanent settlements were not the rule, for long seasonal junkets in pursuit of game mitigated against a settled populace. (Larson 1978, p. 122; see also 1969, pp. 293–297; 1980a, pp. 206–209)

This view has, to some degree, become conventional wisdom regarding Guale subsistence and settlement (e.g., Wallace, 1975, pp. 265–271; Pearson, 1977a, pp. 62–63; Crook, 1978b, pp. 48–49 and 280, 1984, 1986; Reitz and Scarry, 1985, p. 46).

An alternative model of late prehistoric ecology on the Georgia coast has evolved during the past decade, initiated by the ethnohistorical research of Grant Jones (1978a, 1978b), and strongly reinforced by the demographic evidence assembled by Henry Dobyns (1983; see also Fairbanks, 1985).

In the Apalachee area, explorer Soto ran into a clearly chiefdom level organization in 1540. But later Franciscan missionaries found little evidence of organization above the village level (Fairbanks, 1985, pp. 133–134). Although some ritual patterns were retained, mound building and use had stopped by the arrival of missionaries; Southern cult paraphernalia are also totally lacking from these mission sites. The Indians' inability to maintain the elaborate ritual necessary for the smooth function of that polity is reflected by the cessation of mound building.

Dobyns (1983) and Fairbanks (1985) have argued that the Spanish *entrada* into Apalachee and elsewhere resulted in a massive reorganization of the culture and major population reduction. Dobyns (1983, p. 292) estimates that levels of Timucuan-speaking populations dropped from more than 700,000 to less than 175,000 people during the 15 years following 1515—and there is no reason to believe that such precipitous declines were restricted to the Timucuan-speakers.

Scattered villages encountered in Apalachee during the subsequent mission period apparently held migrants from the west and the north, probably refugees from similar depopulations. Combined with the loss of redistributive chiefdomship organization during the mid-16th and early 17th centuries, this change shattered traditional lifeways throughout the Southeast. In fact, Fairbanks attributes the failure of Spanish Florida to an underestimation of how depopulated the Southeast had become due to the excesses of the Soto expedition (1985, p. 139). Historians, anthropologists, and archaeologists seem also to have underestimated the full impact of the early Spanish *entrada*. Rethinking the earliest European contact in the Southeast has only just begun.

Specifically with respect to the Guale Coast, ethnohistorian Grant Jones (1978a) has proposed a "tentative and exploratory" model this way: "on the empirical level I believe that [the conventional wisdom, outlined above] has led to an overstatement of the isolation of the Guale from the interior, the unproductivity of Guale horticulture, and the scattered quality of Guale settlements" (Jones, 1978a, p. 189).

Reinterpreting the Jesuit accounts cited above, Jones argues:

> Guale horticulture, I suggest, was sufficiently productive, in combination with other subsistence and productive activities, to account for the presence of permanent towns, a chiefdom level of social organization, temporary federations of chiefdoms under centralized leadership, and long distance trade networks. The chiefdoms were characterized by dual features of political organization and an emphasis on matrilineal succession . . . . I strongly suspect that the Guale inhabitants were scattering in order to avoid contact with the missionaries, whom they refused to listen to or accept. Significant factors in their resistance would have been the practice of forced tribute payment in maize to the Santa Elena garrison and the epidemic of 1569–1570, which was blamed on the priests. Sedeño's letter read as if they were intentionally exaggerating the "misery" of the land and the recalcitrance of the pagans, perhaps in order to procure a transfer. Rogel's letter is clearly an apology for his abandonment of the mission, placing the blame for his failure on the intransigent natives and the policies of the secular authorities . . . . The Jesuit portrait of a highly mobile, dispersed population with insufficient maize to last the

> year and a weakly developed political system does not conform with the earlier French reports or with subsequent documentation .... The Jesuit reports were exaggerated and misleading. (Jones, 1978a, pp. 179, 191)[3]

Jones' reinterpretation suggests another way of viewing Guale subsistence, settlement pattern, and sociopolitical organization. Basic differences exist between the two interpretations; these differences cannot be dismissed as merely temporal or acculturative (e.g., Crook, 1986, p. 73).[4]

We thus have a "Guale problem" that addresses the basic nature of coastal subsistence prior to European contact:

Do coastal environments—in and of themselves—constrain potential for cultural and social development?
Was Guale population density low at contact, or did they suffer massive depopulation during the early 16th century?
Were the Guale part-time farmers, or were they sedentary horticulturalists?
Did they engage in a seasonal economic/settlement system, or did they live in permanent towns?
To what extent did Spanish missionization reorient the prehistoric Guale subsistence and settlement systems?
Did the Guale achieve a chiefdom level of social organization, forming temporary federations with other chiefdoms under centralized leadership?

These and related questions derive primarily from ecological, ethnographic, and historical concerns and, to date, the archaeological record has been only peripherally involved.

The "Guale problem" is fortunately quite visible in the archaeological record. Lewis Larson conducted the primary research on the late prehistoric/protohistoric period of the

[3] A related problem may have been linguistic, since the priests (having learned the futility of using interpreters while in South Florida) insisted on preaching in the local language. According to Sturtevant "their religious bias caused them to select the name of an important local supernatural creature as the name of the devil" (1962, p. 57). Is this why the Guale, at first receptive to the Jesuit friars' message, refused to stick around mission compounds?

[4] Since this was written, Dr. Larson has communicated with me at some length to clarify his position; he has graciously permitted me to cite appropriate portions of that letter:

> I have argued that Guale agricultural productivity was low; that Guale agricultural technology was swidden technology; that Guale subsistence depended not only on agriculture but also on hunting and gathering ....
>
> On the Georgia coast extensive areas of soil suitable for agriculture did not exist. The area is broken into small pockets of different kinds of soil, some are too poorly drained, some are too permeable, all are characterized by acidity and poor moisture retention. My understanding of the suitability of the Georgia coast area for swidden cultivation bears out the Jesuit commentary on Guale agriculture. Without techniques to renew soil fertility I do not believe the Guale could cultivate a given acreage for many seasons, perhaps no more than one, without fallowing for a long period, at least 10 years or longer. The small areas of drained (but not too permeable) land made it difficult to cultivate and fallow fields in sequence around a fixed house site let alone a sedentary village.
>
> The priests in the post-Jesuit, Franciscan period seem to have brought about a marked change in Guale subsistence by introducing new cultigens and probably new techniques of manuring that allowed long term cultivation of fields. Perhaps more extensive areas could also be cultivated .... Pre-Franciscan Guale cultivation required other subsistence activity which in turn required that group to disperse at certain times of the year (e.g., in the fall to harvest mast) ....
>
> I would no longer characterize the Guale in the same manner as I did in the 1978 paper .... That paper was written almost 25 years before it was published and apparently circulated in a manuscript form for a number of years .... I would no longer make the statement that "permanent settlements were not the rule" (1978, p. 122), and I now feel that the Guale had large permanent towns but that swidden agriculture was the rule and that the populace did seasonally leave the towns to cultivate and to exploit other resources (e.g., acorns). I did not characterize the Guale as a chiefdom in the 1978 paper because that terminology was not applied by Sahlins and Service until about 1958 or 1959 after Kirchoff's paper was finally published in 1955 and its significance began to be recognized. I did not use the term chiefdom in the dissertation or in the 1980 published version because I did not discuss Guale social organization. However in my own defense I would point out that the 1978 paper certainly discusses the Guale political structure in terms of titles, ranks, territorial jurisdiction, central leadership, etc. (Lewis Larson, personal commun.)

Georgia coast; his doctoral dissertation is well ahead of its time in its decidedly ecological focus (1969; see also 1978, 1980a). Nevertheless, that record—as now perceived—has not contributed significantly toward resolving the "Guale problem." To accomplish this, we must address the past with these specific problems in mind, employing the most appropriate methods and theoretical insights available from contemporary archaeology.

The relevant archaeological complexes can be recognized in the ground. Material associated with protohistoric and early contact sites on the Georgia coast are termed the *Irene phase* on the north coast (DePratter, 1979) and *Pine Harbor phase* to the south (Larson, 1978, 1980a).

Some Irene/Pine Harbor sites contain paraphernalia diagnostic of the so-called Southern Cult (or Southeastern Ceremonial Complex). Larson (1955), for instance, reports that figurines from the Pine Harbor site have "eagle warrior" motifs comparable to those on the Etowah copper plates (Moorehead, 1932, figs. 12–15) and on shell gorgets from Tennessee. Other Southern Cult items in Irene/Pine Harbor sites include engraved shell gorgets, stone and copper ceremonial celts, clay pipes with cult symbols, incised pottery vessels with cult motifs, and conch shell bowls (Larson, 1955, 1958b; Cook and Snow, 1983).

But as Larson (1978, p. 127) notes, only a selected subset of Southern cult paraphernalia was picked up by the prehistoric Guale. Significantly, other elements such as the platform mound and many specific items of cult paraphernalia, appear to be wholly absent on the Georgia coast. Larson (1978) offers an ingenious explanation for this selectivity, heavily grounded in his view of coastal Georgia ecology. Assuming the Southern Cult to be primarily associated with certain, or even all, aspects of the busk (after Waring, 1968), he suggests that the cult is only partly manifested on the Georgia coast because ". . . agriculture did not play an important role in the pre-Spanish Guale economy; therefore, it could only have assumed a proportionate role in the religious activity. If the cult was primarily a maize fertility ceremony, then one would not expect the Guale to have taken over this ritual in its entirety . . . . The Guale, when confronted with the cult, adopted those nonagricultural aspects of it and modified them to fit their own cultural situation" (Larson, 1978, pp. 127–128).

The mission period *Altamaha* complex followed Irene on the north Georgia coast, while the *Sutherland Bluff* complex succeeded the Pine Harbor to the south. Altamaha and San Marcos series ceramics (respectively) occur on such sites, with limited numbers of Spanish artifacts (chap. 2). Several investigators have emphasized the similarities between Altamaha pottery and San Marcos ceramics, found along the northern Florida coast (e.g., Otto and Lewis, 1974, p. 97; Kelso, 1968, p. 14; Crook, 1984, p. 259). A number of Spanish ceramic traits were also incorporated on aboriginal forms during Altamaha/Sutherland Bluff times, including plate forms with foot rings (Goggin, 1952, p. 61) and the addition of red film (cf. Smith, 1956, pp. 60, 110–111; Deagan and Hemmings, 1973, p. 16).

Construction of burial mounds ceased during Altamaha/Sutherland Bluff times, and Southern Cult paraphernalia are to date unreported from historic period Guale sites (Larson, 1978, p. 127; see also Sturtevant, 1962, p. 65; Smith and Gottlob, 1978, pp. 12–15).

The "Guale problem" turns on the relative importance of maize agriculture on the prehistoric Georgia coast, a decidedly archaeological issue. Although nobody seems prepared to argue that the Guale were sedentary, full-time horticulturalists, it does seem clear that the Guale did conduct maize agriculture to one degree or another in prehistoric times.

Having said this, the truth is that very little maize has actually been recovered, and this from only a handful of sites (see Larsen, 1981, p. 490). Corn was found, for instance, at Irene period midden sites on Ossabaw Island (Pearson, 1979), at Pine Harbor (Larson, 1969), and at the Irene Mound proper (Caldwell and McCann, 1941; see also Larsen, 1982, pp. 165–166). It was found in association with a burnt Irene period habitation structure at Red Bird Creek (Pearson, 1984, 1985), and a cache of Irene period corn cobs was recovered at Seven Mile Bend (Cook, 1971). At the Kent Mound on St. Simons

Island, Cook (1976, 1978) reports finding domesticates (maize and mustard) in a premound, Savannah-age midden. Maize is also currently on display at Fort King George and has been attributed to the Irene/Pine Harbor period.

But given the relatively large number of Irene/Pine Harbor sites tested over the years, maize remains relatively rare. Perhaps the scarcity is due to inadequate recovery procedures. Or it may be that maize was actually a relatively unimportant item in the prehistoric diet. We presently lack adequate evidence to distinguish between the two.

Larson (1978, p. 133) also musters archaeological settlement pattern evidence to argue that the mission period Guale "became settled farmers, turning from their former dependence upon the surrounding tidal waters." This shift is seen as accounting for the general decrease in shell quantity in mission period (Sutherland Bluff) sites, and the more uniform distribution of midden deposits across the sites. According to this interpretation, shell heaps ceased being deposited not long after the Spanish arrived and introduced their agricultural system.

> . . . Not that shell was no longer present in the middens, rather the low moundlike heaps were not now built . . . . One also has the feeling that, quantitatively, the amount of shell on the sites is much smaller than that on Pine Harbor sites. This was the result of the Spanish policy of forcing the natives into a sedentary agricultural economy. (Larson, 1978, p. 132)

There is little question that such a strategy was commonly employed by Spanish missionaries. Keep people in place to promote Christianity, make allies, and generate stable supply lines (Milanich, 1978, p. 82): convert, civilize, and exploit (Bolton, 1917).

Such nucleation may have been so successful that it changed primary economic patterns (Larson, 1978, p. 132). But if such modifications occurred, they stand in marked contrast to patterns to the south, where Deagan (1978, pp. 89, 113) found a remarkable continuity in Timucuan subsistence and settlement patterns—despite the Spanish who encouraged horticulture by introducing new techniques and European technology. It might also be that such shifts in Guale subsistence and settlement patterns, if real, are indicative of the radical depopulation along Florida and Georgia coasts during the early historic period, as suggested above. If the decimation of Guale populations was in any way comparable to that suggested for Timucuan-speakers (Dobyns, 1983), the early historic period settlement pattern could have changed so radically that, four decades later, Father Rogel observed small Guale groups simply "scattered about the country."

The so-called "Guale problem" can be resolved by recourse to archaeological data. Given appropriate and deliberate sampling strategies, the archaeological record of coastal Georgia can, without doubt, speak effectively to questions of ecological potential, economic change (particularly the relative importance of horticulture), degree of annual mobility, relative health and status, and changes in population size. But investigators will not arrive spontaneously at such answers after digging a couple of test pits or mapping some shell scatters.

Such inquiry is more complex than archaeologists once believed. Archaeological data—on the Georgia coast as elsewhere—decidedly do not speak for themselves. In the recent past, too many behavioral interpretations in archaeology approached such "facts" through simple pattern recognition and ad hoc reasoning. Although such exercises can sometimes generate interesting data, most achievements remain symbolic tours de force, crippled by mid-range codes yet to be cracked (Thomas, 1986).

Research such as this characterized much of the 1960s and 1970s in American archaeology. Many of the tacit assumptions that guided ecological archaeology during this period were simplistic or downright wrong (Thomas, 1986; see also Binford, 1981, pp. 13–20; Dunnell, 1982, pp. 510–511, 525–528; Grayson, 1982, pp. xix, 171, 179).

Contemporary archaeology is now taking a hard look at the behavioral meaning of botanical, faunal, lithic, and ceramic assemblages. Although most regional studies in archaeology require that residential areas be operationally distinguished from places used logistically, our success at systematically separating such areas varies considerably. While site structural evidence can sometimes be used to identify procurement areas, assemblage-level signatures remain ill-defined, and the available base camp diagnostics are notoriously difficult to apply (e.g., Thomas, 1983b, pp. 78–79).

Nevertheless, American archaeologists have not hesitated from making such seemingly routine behavioral assignments: whereas small, homogeneous assemblages have commonly been interpreted as task specific assemblages, the larger, more diverse accumulations are too often attributed to residential utilization. Although rarely spelled out, an assumption equating absolute assemblage diversity with discrete settlement types still underlies too many behavioral interpretations of the archaeological record of coastal Georgia.

Unfortunately for us all, in many (if not most) archaeological assemblages, diversity is a direct function of sample size (Thomas, 1983c, chap. 20). While assemblage diversity is hardly unrelated to site function, the exact nature of that relationship can be appreciated only by focusing on relative (not absolute) diversity. Not a remote "methodological" concern, sample size bias impacts the everyday business of archaeology.

We can also learn much from contemporary paleopathological research, which has derived several indices to monitor dietary change (especially the relative dietary contribution of maize) and measure the intensity of demographic shifts. Employing both generalized stress indicators—such as Harris lines and enamel hypoplasias—and specific trace-element and carbon-isotope analysis of dietary composition (e.g., Buikstra and Cook, 1980; Larsen, 1987), physical anthropologists have been engaged in mid-range theory building. This research has begun to translate such formerly elusive concepts as "stress" and "social status" into operational, archaeologically observable criteria (Thomas, 1986).

Available mortuary samples from coastal Georgia strongly suggest that prehistoric populations adopted a mixed economy, based at least in part on maize agriculture. The evidence currently available likewise indicates that a maize diet exacts a physical toll (summarized in Larsen, 1981, 1982, 1983, 1984; Cohen and Armelagos, 1984; Ruff et al., 1984).

The impact of agriculture is marked. Skeletal infections increased dramatically. People—especially women—became shorter. Both deciduous and permanent teeth became smaller. Bones became more fragile (capable of withstanding less bending and torsional stress). Teeth—especially those of women—started to decay. About the only benefit occurred at the joints; people suffered less degeneration of the elbow and knee, and of the upper and lower back.

To what degree these dramatic changes can be attributed to maize horticulture on the Georgia Coast remains unclear. But there is convincing evidence that such changes have occurred in other hunter-gatherer populations in the process of adopting an agricultural economy (e.g., Cohen and Armelagos, 1984, p. 594).

The mission period Guale Indians were, without question, subjected to biological stress, including (but not limited to) epidemics, food shortages, and military action by Spanish, British, and aboriginal forces. Some degree of increased sedentism and demographic nucleation, coupled with intensification of horticulture undoubtedly resulted in related disease and nutritional stress. But the critical issue relative to the "Guale problem" is to determine how such stress was caused by the conditions immediately prior to European contact.

From previous research on St. Catherines Island (and elsewhere), we already had a large and well-studied prehistoric population from the Georgia coast. But properly excavated, well-documented skeletal collections from the historic period were scarce when we began looking for Santa Catalina. Should such a population be located—and systematically explored with these goals in mind—one could investigate the impact and significance of such stress by analyzing demography, pathology, bone size modification, and the relationship of social status to resource access.

To be taken seriously, future attempts to relate the archaeological record of coastal Georgia to the "Guale problem" must employ contemporary advances in archaeological method and theory. This is precisely why we launched our archaeological investigation of the late prehistoric/protohistoric period on St. Catherines Island, and finding Mission

Santa Catalina was the obvious first step in that inquiry.

HARNESSING THE TECHNOLOGY OF DISCOVERY

We began with a largely substantive agenda, attempting to shed some light on the "Guale problem" using up-to-date archaeological method and theory. Another arena of interest, more distinctly methodological, arose somewhat later.

Generations of archaeologists have longed for some mystical technique to peer beneath the earth's surface, a way of learning from archaeological sites without actually digging them: "Ideally, we should have an X-ray machine which would allow us to locate and formally evaluate the range of variation manifest in cultural features" (Binford, 1964, p. 155). Failing to secure such magical machinery, archaeologists over the past two decades have concentrated on developing both theoretical and practical techniques of surface and subsurface sampling (e.g., Mueller, 1975; Berry, 1984).

But many (myself included) have come to realize that probability sampling and randomization alone cannot adequately address variability in archaeological site location and site structure (e.g., Jelks, 1975; Cowgill, 1986, pp. 379–381). Growing dissatisfaction with rote sampling methodology has led some to look again at nondestructive technology. Recently, Binford's elusive X-ray machine has been reincarnated in a series of increasingly sophisticated remote sensing devices. This technology, when appropriately integrated with solid archaeological objectives, can indeed tell us, prior to excavation, where sites are and how they are structured.

The term *remote sensing* is, in its strictest usage, limited to various applications of photogrammetry (e.g., Avery and Lyons, 1981; Ebert, 1984). But in current archaeological circles, "remote sensing" has come to embrace the variety of techniques employed in geophysical observation (e.g., Parrington, 1983; Dunnell, 1982, p. 85; 1984, p. 495; Lyons and Avery, 1984): not only visual and infrared aerial sensing, but also a broad range of chemical and geophysical techniques—especially magnetometry, resistivity, ground-penetrating radar, and, most recently, differential heat analysis (Benner and Brodkey, 1984). These techniques were designed initially to measure geophysical features on the scale of several meters or kilometers. Yet to be most effective in archaeology, such methods must be scaled down to the order of centimeters or meters (Weymouth, 1986, p. 313).

Geophysical technology has, to date, been used mostly for defining intrasite structure, being considered too costly and/or time consuming to help in the site discovery process (e.g., McManamon, 1984, p. 234; Weymouth, 1986, p. 312). Today, thoughtful (a priori) design of archaeological research can probably render geophysical prospection useful for site discovery as well.

The promise of remote sensing is awesome. But its full potential will be realized only when we transcend the seductive gadgetry to integrate this technology into the mainstream of archaeological theory.

We thought the research framework on St. Catherines Island lent itself to a long-term evaluation of how to do this. Specific remote sensing efforts at Santa Catalina centered about three objectives:

1. to locate and define the mission complex,
2. to define size and configuration of archaeological features and structures *before excavation,*
3. to generate a baseline library of geophysical signatures to be projected against concrete archaeological evidence.

Initial Objective: Locating and Defining the Mission Complex

The first goal was simply to narrow the zone of potential excavation, to derive progressively higher levels of probability for locating mission structures prior to excavation. We used three remote sensing techniques—proton magnetometer research, soil resistivity survey, and ground-penetrating radar reconnaissance—and each more than proved its worth. While critical site landmarks could doubtless have been located by extensive test trenching, a remote sensing approach proved to be considerably more cost effective and less destructive.

Intermediate Objective: Defining the Configuration of Unexcavated Structures and Features

Once the mission complex was located, we hoped that subsequent excavation could be guided by a priori knowledge garnered from geophysical prospection. Magnetometer survey provided accurate indications of daub wall segments, but we found that soil resistivity could define the shape, orientation, and extent of unexcavated buildings. Assessment of cross-cutting radar profiles let us further define the palisade and bastion complex encircling the central buildings and plaza prior to any excavation in this area.

Such prior information not only guided excavation strategy, but it also provided us a degree of knowledge about those structures and features deliberately left unexcavated. At Santa Catalina these untouched areas insure that significant parts of the archaeological record remain intact for future archaeologists who assuredly will pose sharper questions and employ more refined techniques than we even dream about today.

Ultimate Goal: Employing Remote Sensing as a Tool for Mid-range Theory Building

Remote sensing technology potentially provides archaeologists with cost-effective means of generating noninvasive, nondestructive assessments of the archaeological record (Weymouth, 1986, p. 311). In this early developmental stage, emphasis has necessarily been on technology; but for the technology to really pay off in archaeology, we must now integrate the hardware into the theoretical fabric of working archaeology. We see an unfortunate tendency to extoll the virtues of remote sensing studies simply as "cheaper and more efficient surrogates for traditional kinds of evidence" (Dunnell, 1985, p. 594). Newer developments in technology and field technique cannot be viewed merely as refined ways of generating traditional data.

At a more general level, we also intended to employ Santa Catalina as a bridge between the empirical record of geophysical technology and the more specific requirements of theory-building in archaeology. It should be possible to establish a baseline library of geophysical signatures for Santa Catalina:

What is the diagnostic resistivity signature for a daub pit?
Do palisade walls show up on magnetometer survey?
What does a cemetery look like on a radar profile?

We think it important not only to compare results between geophysical survey and actual excavation, but also to examine the efficacy of the various geophysical media. If successful, this exercise could insure that in future excavations at places like Santa Catalina, destructive exploratory groping—such as randomized test pitting—can be avoided. The subsurface research design should be guided instead by a sequence of unambiguous, nondestructive geophysical signatures.

Constructing a cross-cutting compilation of remote sensing signatures should be viewed as an exercise in mid-range theory building in archaeology—another way of assigning meaning to our empirical observations (Schiffer, 1976; Binford, 1977, pp. 2–10; R. B. Thomas et al., 1979; Hayden and Cannon, 1984; Thomas, 1986, p. 238). Mid-range theory dictates how we perceive the past. This body of theory is quite different from how we attempt to explain that past (Binford, 1981, p. 29; Thomas, 1983b, p. 17).

Theory at the mid-range requires that we operationally define the precise relationships between *concepts and an appropriate class of empirically observable phenomena* (Thomas, 1970, 1972; Binford, 1977). Such theory building has been an extremely important activity in both past and contemporary American archaeology (Grayson, 1986; Thomas, 1986, p. 238); but to date, little effort has been directed at building mid-range theory from the data of remote sensing.

We are attempting to do just this, using Santa Catalina as a referent. *Concepts,* in this case, are the typically abstract categories employed by archaeologists exploring 16th/17th century contexts in Spanish Florida: wattle-and-daub building, daub processing pit, grave feature, palisade, bastion, and so forth. Effective mid-range theory relates these concepts to an unambiguously defined *class of empirically observable phenomena*—in this case the battery of signals and signatures that derive from nondestructive geophysical prospection.

We depart here from traditional archaeology. "Empirical observation" in archaeology has in the past been conducted almost exclusively by "tactile sensing"—you-know-what-something-*is*-after-you've-dug-it-up-and-can-hold-it. This is archaeology by capture, in which objects comprise the "hard data." While archaeologists working this way will soon fill their yawning museum cases, they unfortunately confuse just what *data* really are:

> Data are not people, objects, or things; data are counts, measurements and observations *made on* people, objects, and things .... There are no data until an anthropologist observes them. Data do not passively exist. Data must be generated. (Thomas, 1976, p. 7)

"Remote sensing" is simply one more way of generating archaeological data—but in this case, archaeologists appeal to unexcavated objects and features. That these things remain buried beneath the ground is irrelevant in an epistemological sense. Much confusion exists on this point.

We find a parallel between remote sensing in today's archaeology and the birth of settlement pattern studies two decades ago. Programmatic regional research in the late 1960s and early 1970s began precisely this way, by attempting to build a repertory of field techniques—in effect devising new ways of physically encountering the archaeological objects within regions (e.g., Binford, 1964; Thomas, 1969, 1973; Cowgill, 1970; Gumerman, 1971; Judge, 1973).

The objects remained the same. What distinguished regional archaeology was the attempt to redefine the scale of observation. Rather than excavating 10 cm levels inside 1 m squares, the regional perspective encouraged a shift in scale and we began to perceive pattern in terms of kilometers and hectares. Quadrat and transect survey, sampling fractions, and stratified random samples became the tools of the trade in regional archaeology (e.g., Thomas, 1975; Plog et al., 1978).

But it became clear by the mid-1970s that regional research *as a field tool* was in danger of evolving into rote behavior. Fortunately, some archaeologists working at the regional scale began to construct a conceptual base specifically designed to keep theory apace with field technique.

One problem was the site concept. For years, the "site" remained unchallenged as an existential entity. *Sites* had always been archaeology's "proper" unit of observation. But elevation to the regional scale led some to question seriously the site concept as a necessary abstraction (Thomas, 1975; Foley, 1981; Tainter, 1983; Dunnell and Dancey, 1983; Dunnell, 1984, p. 495). Today, there is no question that regional archaeology proceeds best when unfettered by the often unnecessary and inappropriate concept of site. Parallel conceptual retooling will undoubtedly be required with the increased utilization of remote sensing technology in substantive archaeological applications.

Regional archaeology also radically modified the way we view surface remains. Although the archaeological record was being sampled at an increasing rate, surface-derived archaeological data were too often viewed as merely another way of "predicting" subsurface distributions. Gradually, archaeologists came to realize that surfaces can indeed provide a critical source of ancillary data *important in its own right* (Talmage et al., 1977; Dunnell, 1981, p. 441; 1983, p. 527). Simultaneously, archaeologists have recognized that plowzones contain significant spatial information, even after repeated plowing (O'Brien and Lewarch, 1981; Lewarch and O'Brien, 1981). As Lewarch and O'Brien (1981, p. 332) accurately predicted, it is "likely that surface assemblages will have to be accepted as basic rather than ancillary sources of information."

Archaeological data generated from surface and plowzone assemblages can (and do) provide systematic, quantifiable information at the local and regional level: beyond predicting subsurface phenomena (features, site boundaries, and so forth), they point to intrasite growth patterning, identify functionally distinct activity areas, distinguish residential from nonresidential areas, and define settlement function. "The full potential of these developments will not be realized until their results are treated as independent bodies of information, some of which may duplicate traditional objects and features, but many of which are new kinds of archaeological information" (Dunnell, 1985, p. 594). Combined with excavation-derived data, "surface" materials can contribute by defining diachronic land use patterns, dating components across entire regions, and determining intersite relationships (see also Lewarch and O'Brien, 1981, p. 319).

The same is happening today with remote-sensing data in archaeology, as vividly illustrated by recent developments within Mayan archaeology. After years of debate about the foggy relationship between urbanism and Classic Maya subsistence, investigators tried using airborn synthetic aperture radar to penetrate the forest cover. Adams et al. (1981) mapped and spot verified the extensive systems of previously unknown canals that drained truly impressive segments of the lowlands. An entirely new avenue of inquiry was opened, and, although the issues of Classic Maya subsistence were hardly settled by remote sensing, such technology without question generated an entirely new approach to a traditional problem, literally creating data inherently different from that obtained through more conventional techniques of excavation and terrestrial survey (see Dunnell, 1982, p. 516).

Remote sensing may ultimately provide a new way of defining traditional concepts in archaeology provided that we work out unambiguous relationships between things still buried and how we know they are there. Doing this requires definition of Grayson's (1982) "if and only if" statements linking the more traditional archaeological concepts (walls, structures, and features) to the way they are perceived ("remotely") by the sensors of geophysical machinery.

Defining such linkages became the ultimate methodological objective of the archaeological research at Santa Catalina.

LA FLORIDA: QUO VADIS?

Our decision to seek Santa Catalina thus arose from an interest in specific anthropological issues and the desire to improve current archaeological methodology.

But I must admit a more personal motivation as well. Growing up in California, as I did, one can hardly escape mission mania. On one San Diego street alone, Mission Transmission shares a warehouse with Mission Valley Pool and Spas next door to the Old Mission Deli. The Padre Trail Inn, at the corner of Mission and Friars Roads, borders the Friars Mission subdivision. A professional baseball team—the San Diego Padres—plays not far away.

But California's crass mission message should not be allowed to obscure the vastly more important one that—at one level or another—the Franciscan mission effort remains today a significant part of the cultural fabric of western America. The first archaeological site I visited was Mission *Santa Clara de Asís.* Two centuries of epidemics, earthquakes, floods, secularization, and a disastrous fire—allegedly begun when bat guano ate through electrical insulation—could not erase Mission Santa Clara from the Alta California landscape. Each November, one can still hear an original mission bell ring in All Souls' Day—as it has every year without interruption since 1799.

Reared against this background, I was astonished to learn, a dozen years ago, that a Franciscan mission had once flourished on St. Catherines Island. I had never heard of *Santa Catalina de Guale.* I was totally unaware of the extensive mission efforts once directed at Native Americans living in Spanish Florida.

And yet, the demographic records make it clear that the little-known missions of 16th/17th century Spanish Florida were quite comparable to the mission complexes of the American West. In the mid-17th century, *La Florida* was home to perhaps 70 Franciscans serving approximately 25,000 Indians in 38 missions (Bolton, 1917, p. 50; Chatelain, 1941, p. 26; Gannon, 1965, p. 57; cf. Matter, 1972, vii). At the same time, 50 or so missions in the American Southwest operated under the direction of 26 friars (Kubler, 1940, p. 7). In Alta California, a 650 mile-long chain of 21 Franciscan outposts functioned with an estimated 60 friars who, immediately prior to secularization in 1830, preached to 18,000 Indians (Cook, 1976, p. 261).

Despite such numerical and strategic importance, the missions of Spanish Florida

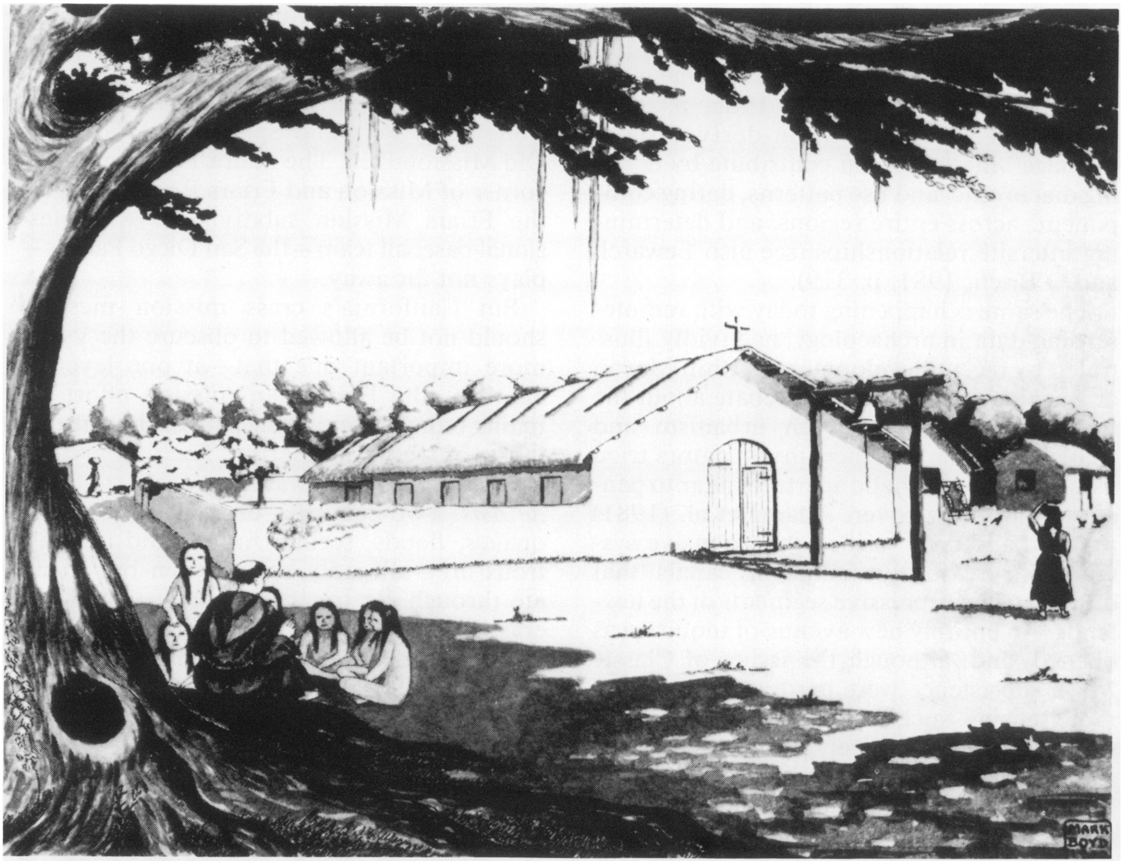

Fig. 3. Mark F. Boyd's idealized reconstruction of a typical mission chapel in *La Florida* (after Boyd et al., 1951, frontispiece; reproduced with permission of the University of Florida Press).

have been overlooked in America's perception of its own origins, for reasons both complex and varied.

Herbert Bolton—titular "father" of Spanish Borderlands studies—attempted to demonstrate that American history consisted of more than merely the establishment and expansion of English settlements along the Eastern Seaboard of North America. Recognizing that United States history "is written almost solely from the standpoint of the East and of the English colonies," Bolton argued that "the importance of the Spanish period in American history has not yet been duly recognized" (Bannon, 1978, p. 25; see also Scardaville, 1985, p. 185).

Historian Wilcomb Washburn (1985) suggests that Southern culture is commonly portrayed as somehow "deviant," far removed from mainstream American colonial history. Southeastern institutions have never loomed large in the American consciousness, partly because that history has been written somewhere else. The New England colonies achieved a significant head start by publishing their colonial histories early in the game, encouraged by the colonial period colleges and historic societies of the Northeast—an area which long produced the leading thinkers and writers in American history.

> As a New Englander, I am acutely aware of the intense concern with history shown by other New Englanders, from the moment William Bradford stepped off the *Mayflower* to the latest Ph.D. dissertation at Harvard. Writing history, or keeping a diary, was almost implicit in the Puritan religious outlook and philosophical traditions that derived from it. (Washburn, 1985, p. 143–144)

By contrast, the written historical record of the South has been dominated by antebellum, bellum, and postbellum accounts, with relatively little said about the colonial period. Washburn argues that Southern alienation from the rest of the nation as a result of the Civil War led not only to physical disruption, but also an "... excessive concern with the lost war, lost values, lost opportunities, and lost wealth—in short, the Lost Cause" (1985, p. 147; see also Spalding, 1985).

An anti-Southern bias seems to have spilled over to Native Americans as well. Charles Hudson notes that whereas Southeastern Indians possessed the richest culture of any native group north of Mexico, they became

> victims of a virtual amnesia in our historical consciousness .... The average American has some notion of the Powhatan Indians of Virginia and of the role they played in our early colonial history; he has a clear but stereotyped concept of the Indians who lived on the Great Plains; he may know something about the Navajo and Pueblo Indians of the Southwest; but he knows little or nothing about the Southeastern Indians. (Hudson, 1976, p. 3)

This ignorance can be attributed primarily to the severe and rapid dislocation suffered by Indians living in the Southeast: "many of them were killed, their societies disrupted, and their cultures greatly changed before the day when educated people thought the Indian cultures were worth studying" (Hudson, 1976, p. 4; see also Washburn, 1985, p. 149).

Part of the blame must also be ascribed to the persistent "Black Legend" that has, for nearly four centuries, systematically overlooked and belittled Spanish achievements in general (Maltby, 1971; Scardaville, 1985, p. 188). Spanish colonization of the United States has traditionally been viewed as an insignificant background to the later British developments: "St. Augustine is often the disreputable foil to the English colonies in Virginia and Massachusetts. The language, religion, law, and customs of the Spaniards are contrasted, always unfavorably, with those of the English" (Patrick, 1964, p. xi; McAlister, 1964; Hoffman, 1980, pp. 1–2; Washburn, 1985; Scardaville, 1985, p. 184; Fitzhugh, 1985).[5] As Sturtevant (1962, pp. 42–43) warns: "... most of us in the United States start with an anti-Spanish bias compounded of our inheritance from ancient English religious and geopolitical antagonisms,

Fig. 4. Willis Physioc's romantic reconstruction of the mission well at Tolomato (after Lanning, 1935, frontispiece); note that the superstructure was incorrectly depicted as made of oystershell tabby. (See also fig. 6, this volume. Reproduced with permission of the University of North Carolina Press.)

[5] The linguistic problems involved in the study of colonial *La Florida* are compounded by difficulties of paleography, the science of reading older scripts. Whereas reading 16th century Spanish script may not be intrinsically difficult—at least superficially—this skill must be mastered in order to extract meaning from the recorded materials (see also Deagan and Scardaville, 1985, pp. 33–34).

the Black Legend, the Mexican War, the Spanish-American War, and probably other sources."

Some degree of anti-Spanish sentiment is still evident throughout the English-speaking world, but the "Black Legend" hangs particularly heavily over Spanish Florida—at least in part a stigma attached to the founder of St. Augustine for his well publicized murder of Jean Ribault and his shipwrecked soldiers at Matanzas Inlet (Solís de Merás, 1922, pp. 115–122; Lyon, 1976, pp. 121–124). American history had viewed Pedro Menéndez de Avilés primarily as "the avenging arm of the Spanish Counter Reformation," the villian who expelled innocent French colonists from North American lands. This too commonly held view ignores the longer-range, more comprehensive plans harbored by Menéndez and his predecessors for the exploitation, conversion, and settlement of an entire continent (Lyon, 1985, p. 156). Fifteen years before the founding of St. Augustine, Spaniards had launched their *entrada* seeking gold and slaves; but more was involved, including the prospect of farms to breed horses, cattle, and mules, and to provide a way to produce food not only for immediate consumption, but also for export.

Some suggest that the nature of early Spanish Borderlands scholarship also helped perpetuate the anti-Spanish feelings: "... emphasis on the early years in the Borderlands denigrates the Spaniards, who often are charged with cruelty, absence of morality, and indolence and basely contrasted with the thrifty, moral, and hard-working English colonists" (Scardaville, 1985, p. 188). By glorifying the high adventure and romance, older Borderlands histories tend to leave an impression that the Spanish came to America only for quick profits.

For a variety of geopolitical reasons, Spanish Florida lacks the obvious historical continuities of the American West; Hispanicized Native Americans disappeared long ago from *La Florida*. By the late 1750s, only two small villages of christianized Indians remained on the periphery of St. Augustine. When the Spaniards turned over rule to the British in 1763, the 83 surviving Native American converts—Guale, Timucuan, and whoever else was left—fled from Florida as well (Siebert, 1940; Deagan, 1983, p. 32).

On the other hand, not only do substantial populations of Native Americans live in the American West today, but many are still Spanish-speaking and nominally Catholic. In fact, the first Native American bishop of the Catholic Church was appointed in New Mexico just this year, underscoring a direct-line religious and cultural continuity going back to the earliest Franciscan efforts. Analogous remnants of tradition are lacking east of the Mississippi.

The archaeological record itself further exacerbates the contrast between the relatively high profile of America's western missions (and the virtual invisibility of comparable events in Spanish Florida). Early Spanish mission sites dot the Southwestern landscape, attracting thousands of tourists annually to mission ruins at the National Monuments at Pecos, Quarai, Abo, Gran Quivira, and Tumacacori. Still operating mission churches remain conspicuous components at the contemporary Taos, Zuni, Laguna, and Acoma pueblos. "The Mission Trail" connects the Alamo (itself a former Spanish mission) to three other 18th century missions within the city limits of San Antonio (and another just over the city line).

Each of the 21 California missions can today be visited: 14 are now parish churches, 3 have become museums, one houses a seminary, another is a university chapel, and 2 are State Historical Parks. In all but two, one can still attend religious services.

By stark contrast, all hard evidence of Spanish missionization has virtually disappeared from Georgia and Florida. To be sure, the mission buildings of the Southeast never were as architecturally picturesque as those of the American West (Floyd, 1937; Spalding, 1977, p. 11). The modest Floridian missions were single story structures of simple mud and stick construction (fig. 3, this volume); those better built may have been patterned after "flimsy board and thatch" counterparts of 17th century St. Augustine (Manucy, 1978, pp. 17, 62; 1983, p. 52; see also fig. 5, this volume).

These simple structures did not, understandably, survive. One eyewitness, viewing

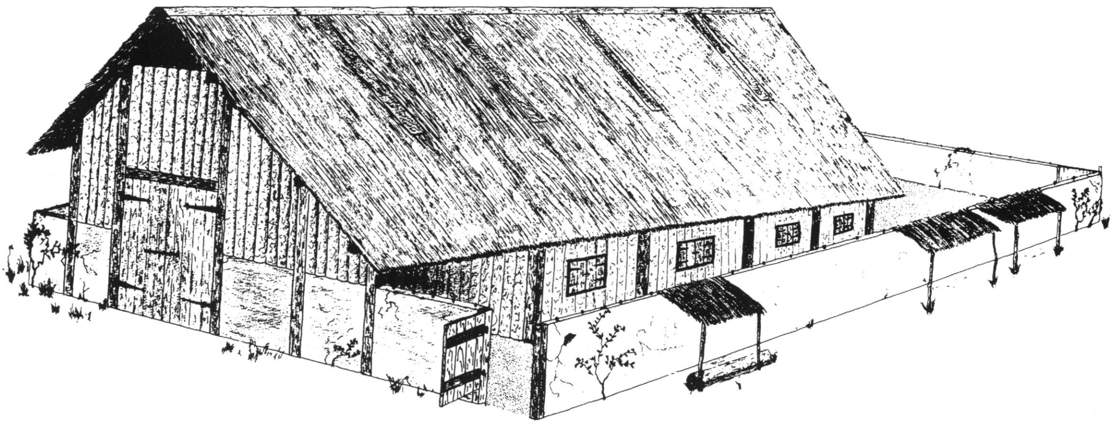

Fig. 5. Conjectural reconstruction of a church in *La Florida,* based on archaeological excavations at San Juan de Aspalaga. (After Morrell and Jones, 1970, fig. 4; reproduced with permission of the authors and the Florida Division of Historical Resources.)

St. Augustine in the 1620s, remarked that the fort walls were so dry that firing one gun would have set them aflame (Bushnell, 1983, p. 47). St. Augustine was indeed fired several times, most notably by Sir Francis Drake in 1586 and by Carolinian Governor James Moore in 1702. Not a single mission structure in Guale survived the Juanillo Rebellion of 1597, and Moore's 1702–1704 attacks leveled mission churches across Apalachee and Timucua (Boyd et al., 1951, pp. 11–13).

La Florida experienced both fire and flood. In 1599, while some Spanish troops were setting the torch to Native American towns in Guale (as retribution for the rebellion two years earlier), a fire swept St. Augustine, burning the Franciscan friary and some surrounding buildings; the seas, whipped to hurricane frenzy, then rose to carry away several houses (Bushnell, 1983, p. 39). Hurricanes also leveled parts of the city in 1638, 1655, 1674, 1685, 1822, 1894, and again during the 1940s (Waterbury, 1983, p. 255).

A combination of "flimsy" initial construction, periodic fires and hurricanes, and British military superiority effectively erased 16th/17th century *La Florida* from the landscape (Manucy, 1983, p. 51). Except for parts of the sturdy coquina walls at Castillo de San Marcos, *not a single building—mission or secular—survives from 16th and 17th century Spanish Florida.* Lacking such visible archaeological reminders, *La Florida* has escaped the mainstream of America's historical consciousness.

In the West, mission buildings not only still stand, but their physical presence has inspired a variety of architectural "revivals"—which further the visibility of western missionization. The architectural legacy of the eastern United States is decidedly non-Spanish, and for good reason.

When the late 19th century expanding middle class drifted away from Victorian excess to embrace more properly "American" architecture, many looked toward the homes of early American colonists (Gowans, 1986). Countless 17th and 18th century (British- and Dutch-derived) houses stood along the Eastern Seaboard to provide architectural roots, ultimately stimulating the Dutch and Colonial Revival styles so common here today.

But post-Victorian architecture evolved along a very different course in California, where colonial precedents were largely Spanish. Although the 18th century missions had fallen into disrepair, by the 1880s public-spirited citizens clamored for their restoration; by the dawn of the 20th century, the missions of Alta California had already become objects of romantic pilgrimages.

Simultaneously, a distinctive *Mission Revival* architectural style—legitimized by the California pavillion at the 1893 Columbian Exposition—swept across the American West. House fronts began to look like church fa-

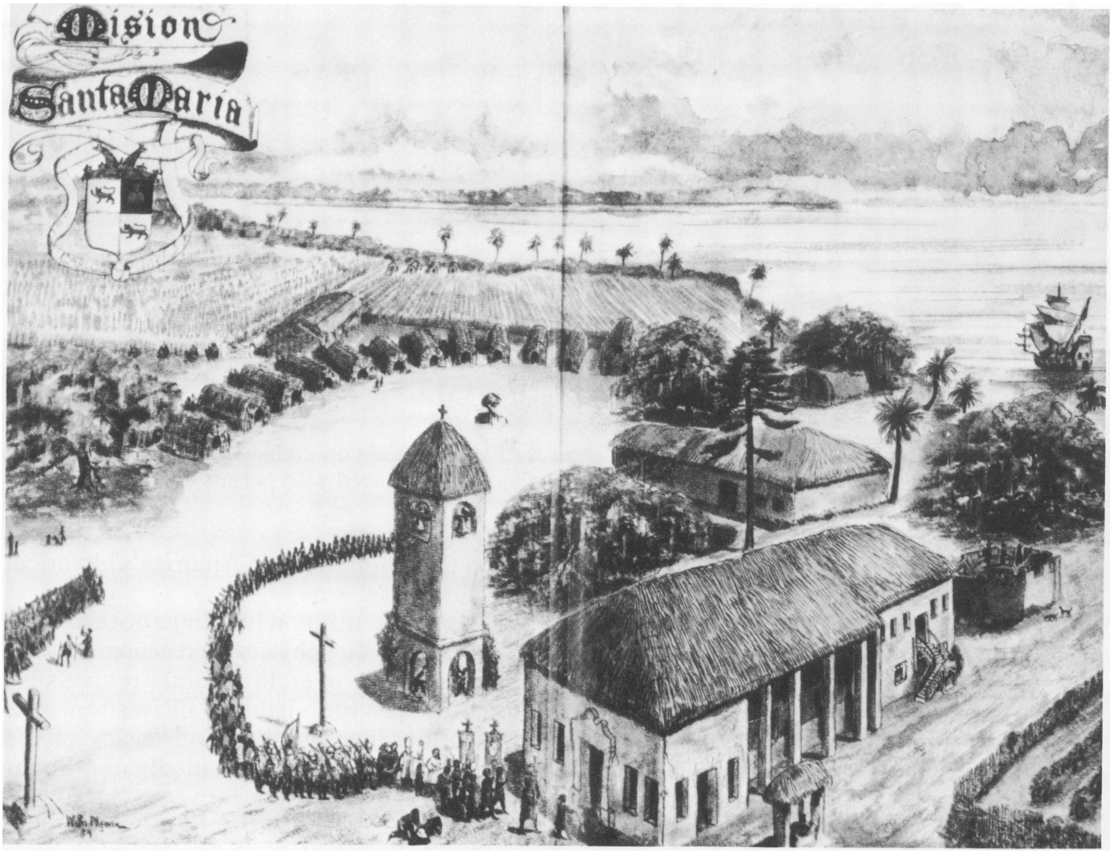

Fig. 6. A highly speculative reconstruction of Mission Santa María by the artist Willis Physioc (after Lanning, 1935, endpapers): ". . . a permanent tabby edifice . . . probably not begun until about 1615 or 1616 . . . . The best preserved mission-type ruins in Georgia, the square detached columns, and the perfectly preserved two-story wall . . . now stand at their full height in Camden County, near St. Marys, Georgia" (Lanning, 1935, p. 6; see also Ross, 1926, pp. 196–198). Shortly after this drawing was published, Floyd (1937) established that this tabby ruin (and the others discussed by Lanning) could not possibly date from the Spanish mission period. The tabbies are, beyond all doubt, remains of 19th century antebellum structures—not Spanish missions. (Reproduced with permission of the University of North Carolina Press.)

cades, complete with prominently scalloped outlines, reddish-brown tiled roofs, round-headed window openings, and clearly recognizable parapets. Ceilings started to resemble the open timberwork ceilings still visible in Californian mission ruins. Arcades began to define entryways and side porches, and bell-towers sprouted from public buildings—not only in schools, libraries, and courthouses, but also on Santa Fe railroad stations, city halls, movie theaters, and throughout the newly constructed showcase campus of Stanford University.

Evolution of Mission Revival architecture and the restoration of Franciscan mission prototypes proceeded hand-in-hand; resurrecting the bygone Spanish mission period has become an enduring Californian tradition.

In the American Southwest, where earlier structural elements were more Native American than strictly Spanish, post-Victorian architecture followed parallel lines. Since Native Americans supplied most of the material and labor, the Spaniards had adopted a distinctive Pueblo building style more from necessity than by choice. Although surely Spanish to some degree, the low silhouette, massive pillars, and overall proportions of Southwestern buildings derived largely from limitations in aboriginal adobe technology. As in California, this distinctive architectural style—deeply rooted in Native American and Spanish lore—insured the survival of mission traditions.

Unlike their Californian and Southwestern contemporaries, Florida architects searched in vain for suitable prototypes: not only was traditional English-style housing rare, but legitimate Spanish mission architecture had already vanished.[6] At one point, the historic void was seemingly filled when tabby ruins were erroneously confused with the lost Spanish missions of *La Florida.* "This myth, promoted by realtors, seized the fancy of the public and influenced some professional historians . . ." (Floyd, 1937, p. 5; see also fig. 6, this volume). But once the tabby walls were correctly identified with 19th century plantation ruins, the Southeast was again left without a suitable, homegrown antecedent on which to base a "Revival" style.

St. Augustine failed to assume a significant place in American historical consciousness. "In part, American ignorance of the Deep South reflects the false values of an earlier period, when Florida was held to be a worthless tract of sand and swamps, Southern agricultural lowlands were malarial and pest ridden, and the Southern interior was bereft of great cities and great universities" (Washburn, 1985, p. 144).

Floridians ultimately borrowed domestic architectural elements directly from Spain and Italy, at times even incorporating details from Islamic North Africa. Florida spawned a so-called *Venetian Revival* style, a term derived primarily to publicize Miami and Coral Gables, where developers simulated the canals and lagoons of Venice, providing bridges, islands, and other exotics.

In a real sense, the archaeological and architectural records themselves partially obscured the historic importance of Spanish Florida in America's historic self-image.

Our search for Santa Catalina was thus inspired, in some intangible degree, by a personal interest in *the mission* as an element of frontier culture contact. Early missionization of Alta California, Texas, New Mexico, and Arizona remains a highly visible enterprise; it is neither coincidental that hundreds of volumes have outlined America's western mission history, nor that dozens of such archaeological sites have been excavated, restored, and turned into tourist attractions. Understanding the past is heavily conditioned by attitudes toward the present; one simply does not overlook the "mission heritage" of America's West. If the missions themselves were not enough, the countless "Revival" replicas keep the architectural flame alive.

No such reminders exist in *La Florida.* Spanish Florida lacks both visibility and continuity. We have only the barest outline of how the extensive Spanish mission system operated in the American Southeast. Few mission sites have been excavated and even fewer books have been written.

> Traditional archival research alone cannot provide the data to study the nature of Hispanic society in the Borderlands adequately. What is needed most is a multidisciplinary approach to examining the frontier, relying particularly on historical archaeology. Historians must admit the limitations of their sources and realize that historical archaeology is essential where documentation is weak or absent. (Scardaville, 1985, p. 195; see also Deagan and Scardaville, 1985)

Archival research still holds great promise, but it becomes increasingly clear that much of this history can be written only from evidence preserved in the heretofore invisible archaeological record.

This is the other reason we set out to find Santa Catalina.

[6] The distinctive 18th century "St. Augustine Look" was rejected as merely "quaint" (Manucy, 1978, p. 7), with little appeal beyond the outskirts of "The Oldest City."

CHAPTER 2. WHAT *SHOULD* THE MISSIONS OF *LA FLORIDA* LOOK LIKE? A HISTORICAL PERSPECTIVE

> The Spanish missions of Florida did not conform to the romantic notion of cloistered lush gardens, tolling mission bells, handsome, striking churches set in peaceful, idyllic villages surrounded by bountiful fields and orchards and contentedly grazing livestock .... The chief impression gained from the few available documents ... is one of stark realism, revealing crude buildings and few tools, poverty as well as plenty, war, discord, martyrdom, and toil by a handful of Spanish Franciscans, their Indian converts, and a few soldiers in a primitive wilderness. (Matter, 1972, pp. 123–124)

While this is undoubtedly true, one must not forget the degree to which Spanish efforts throughout the New World were structured by formal policies "designed both to apply Christian principles to the governance of a new state and to help realize the economic potentials of the colonies and meet the needs of the crown" (Deagan, 1985, p. 282). We begin this exposition by looking at these general aims, then move on to examine how these overall objectives were ultimately modified to suit the harsh realities of Spanish Florida (see also Fitzhugh, 1985).

THE ORDINANCES OF THE INDIES

Zéndegui (1977) has argued that no world power since the fall of the Roman Empire had been faced with so great a need to conquer, populate, and hold a vast new territory under its dominion—until the discovery of America.

> To conquer and to found—that was the twofold task of the captains-general and their lieutenants. The first is an act of force .... [But] to found ... occurs only when the plans for a new town are drawn up, a new church is built, a new town council is installed .... This is true even though the church might be a shack, the council a symbol, and the entire city nothing more than a hamlet. (Zéndegui, 1977, p. S-1)

In 1573, Philip II issued a comprehensive compilation of 148 ordinances dealing with all aspects of site selection, city planning, and political organization (Bushnell, 1981, p. 43). Several specific ordinances are of special interest (as translated by Crouch et al., 1982, pp. 13–16):

> 110. ... On arriving at the place where the new settlement is to be founded—which according to our will and disposition shall be one that is vacant and that can be occupied without doing harm to the Indians and natives or with their free consent—a plan for the site is to be made, dividing it into squares, streets, and building lots, using cord and ruler, beginning with the main square from which streets are to run to the gates and principal roads ....
>
> 112. The main plaza is to be the starting point for the town; if the town is situated on the sea coast, it should be placed at the landing place of the port, but inland it should be at the center of the town. The plaza should be square or rectangular, in which case it should have at least one and a half its width for length inasmuch as this shape is best for fiestas ....
>
> 113. The size of the plaza shall be proportioned to the number of inhabitants, taking into consideration the fact that in Indian towns, inasmuch as they are new, the intention is that they will increase, and thus the plaza should be decided upon taking into consideration the growth the town may experience. [The plaza] shall be not less than two hundred feet wide and three hundred feet long, nor larger than eight hundred feet long and five hundred and thirty-two feet wide. A good proportion is six hundred feet long and four hundred feet wide.
>
> 114. From the plaza shall begin four principal streets; ... the streets running from the plaza will not be exposed to the four principal winds ....
>
> 118. Here and there in the town, smaller plazas of good proportion shall be laid out, where the temples associated with the principal church, the parish churches, and the monasteries can be built, [in] such [manner] that everything may be distributed in a good proportion for the instruction of religion.
>
> 120. The temple of the cathedral [principal

> church] where the town is situated on the coast shall be built in part so that it may be seen on going out to sea and in a place where its buildings may serve as a means of defense for the port itself.
> 128. Having made the plan of the town and having distributed building lots, each of the settlers shall set up his tent on his plot if he should have one. . . . Everyone as soon as possible shall make a palisade or ditch encircling the plaza so that they may not be harmed by Indians or natives.

These royal ordinances removed site selection from the hands of military captains. Devised to be applied across an entire continent, these decrees defined an urban tradition and spatial configuration that repeated itself throughout the era of Spanish colonization. The Laws of the Indies also provide a priori expectations for the archaeological record of Spanish Florida.

In urban St. Augustine, we now know that much of the initial town planning conformed to these ordinances. The 16th century layout followed the standardized grid plan, the town lots corresponding almost precisely to the Spanish *pie* dimension (13.4 × 26.8 m)—just as stipulated in the ordinances.

This preferred Hispanic plan was a direct attempt to transplant a "civilized" lifeway upon a Florida wilderness highly "frontier" in character. As Deagan (1982, p. 191) points out, the nature and necessity of modification in this setting must be understood in terms of the *Frontier model* proposed by Lewis (1977, p. 153): "the outer edge of an expanding society [that] adapts to the conditions of attenuated contact with the homeland and the physical conditions of the new environment."

The geographic and ecological variability encountered in such "frontier" situations quite naturally fostered countless on-the-ground compromises between expectations embodied in the 1573 ordinances and on-the-ground reality.

As expected, there is variability in the degree to which a priori rules were actually translated into architectural reality. Deagan's (1982, pp. 185–191) recent archaeological investigations at St. Augustine have demonstrated that a central plaza—hallmark of Spanish urban planning and a mainstay of the ordinances—may not have been constructed (cf. Bushnell, 1981, p. 46). Moreover, the first church appears to have been built at the north end of 16th century St. Augustine, in direct contradiction to the ordinance stipulating that the main church be located on the coast.

The founders of St. Augustine apparently gridded their town plat to follow local patterns of drainage and microtopography. The rigid urban plans set out in Philip II's decrees would have led to constructing a centralized plaza, usurping the highest, residentially most desirable land. Public buildings of St. Augustine were similarly grouped at the northern end of the town, not downtown. Once again, local conditions favored higher, better drained ridges as preferred settlement sites in 16th century St. Augustine.

THE SPANISH MISSION FRONTIER

Throughout New Spain, the mission outpost was the single most important biethnic frontier institution, deliberately modifying Native American culture to suit Spanish ethnocentric values (Bolton, 1917, pp. 43, 55–61; Habig, 1976, pp. 17–23). Father Pareja, stationed for years in La Florida, boasted that "we are the ones who are bearing the burden and the heat and we are the ones who are conquering and subduing the land" (quoted in Sturtevant, 1962, p. 63). Franciscan friars became, in the words of one 1633 document, the "soldiers of the gospel" (Montgomery et al., 1949, p. 9).

The Laws of the Indies theoretically applied only to permanent civic settlements—not temporary missions or military encampments—but in practice there was little distinction between the two types of settlement in North America. The familiar ordinances were applied equally to urban centers and mission outposts (Crouch et al., 1982, p. 28; see also Bolton, 1917, p. 44).

In the strict sense, a *mission* encompasses an entire settlement—not just the religious edifices—a place where tribal economies were reorganized, new crops and European methods of cultivation were introduced, scattered native American groups were nucleated ("reduced") into new settlements, where instruction included music, reading, and writing (Kubler, 1940, pp. 6–7).

Sturtevant has sketched the basics of mission life in Spanish Florida:

> Each missionary lived in the *doctrina* (the central Indian town of his district), and periodically went to his *visitas* [nonresidential satellite mission stations] in the outlying villages and hamlets. His responsibility often covered some ten villages with a population of a thousand or so. A soldier or two was stationed at the *doctrina* to assist the missionary, or was available from a small detachment in a nearby post. However, more than a few soldiers were to be found only at the main *presidios* [forts], such as Santa Catalina, St. Augustine, Pensacola, St. Marks, or San Luis (the present Tallahassee). It was only at or near these latter *presidios* that any Spanish civilians lived, and the total of these was very low; all were government officials or the families of soldiers, and evidently had little direct contact with the Indians. (1962, pp. 62–63; see also Poltzer, 1976)

The Laws of the Indies mandated that church structures be placed on a plaza, in *newly formed* Indian communities (Montgomery et al., 1949, p. 113). Each mission settlement town was to be laid out in regularized, gridded *barrios,* with each Indian living on assigned land.

THE APPEARANCE OF SANTA CATALINA DE GUALE

Although some correlative evidence is available from archaeological excavations at specific mission sites in Florida (see chap. 3), we know remarkably little about the appearance or site structure of such settlements in Spanish Florida (see also Floyd, 1937, Spalding, 1977, p. 11; Jones, 1980, pp. 163–165; Marrinan, 1985, p. 246). The best clues about the appearance of 16th/17th century missions are still gleaned from contemporary Spanish accounts.

Specifically searching for Mission Santa Catalina, we found relevant details to be particularly sparse and sketchy. But certain benchmarks are clear. In November 1597, Governor Canzo traveled to St. Catherines Island to investigate the two-month-old Guale rebellion. Canzo could "not find one Indian," but he located the church and the friary, both burnt to the ground. Canzo torched the council house (*buhío grande*) and house of the chief (*cassa del casique*) and everything else that he found to burn (Quinn, 1979, p. 84; see also Geiger, 1937, pp. 103–104). This important account suggests that 16th century Santa Catalina consisted of only a church and a friary. The council house and house of the cacique were apparently prominent features of the associated Guale *pueblo*.

We can also infer something about the appearance of 17th century Mission Santa Catalina. Through the courtesy of Jerald Milanich, we obtained a copy of a rare contemporary map of a 17th century mission in Spanish Florida (fig. 7; see also Boyd et al., 1951, plate I). Although not a map of the St. Catherines Island mission, this plan view apparently depicts the fortified mission compound built on Amelia Island—then called Santa María—by refugees who had fled St. Catherines a decade before.

The caption to figure 7 reads as follows:

> Stockade (*estacada*) made on the Island of Santa María and [at?] the site (*lugar*) of Santa Catalina (*Cathalina*) in the Province of Guale, being three varas high, with loopholes (*troneras*) for firing (*jugar*) the weapons, with their small bastions flattened [like a terreplein] in the middle, with its moat (*foso*); and within, the church (*iglesia*), lodging (*convento*) for the priest (*doctrinero*), barracks (*alojamiento*) for the infantry, and a small house (*casilla*) for cooking [the kitchen, *la cocina*); as in the plan, it [the group of buildings] appears with its scale (*pitipie*) in varas. (Richard Ahlborn translation)

The Amelia Island mission may have been, to some degree, planned as a "replica" of the mission on St. Catherines Island.

Although the projected mission compound at Santa María may never have been executed, at a minimum the map provides a model of such settlements. The Santa María map is scaled in *varas,* thought to be about 84 cm (32.9 in.) in St. Augustine (Boyd et al., 1951, plate II; Manucy, 1978, p. 165). Assuming that the mission outliers of St. Augustine were constructed using the same units of measurement, figure 7 suggests that the following dimensions for structures might be expected in the archaeological record on St. Catherines Island (rounded to the nearest 0.5 m):

the church (*iglesia*): 26 × 13.5 m
the friary (*convento*): 13.5 × 7.5 m
the kitchen (*cocina*): 12 × 7 m
the garrison (*alojamiento de la Infanteria*): 25 × 15 m
central plaza: 15 × 17 m
palisaded area (outside dimension): 59 m on a side

To the extent that the St. Marys mission mirrored the compound abandoned on St. Catherines Island a decade earlier, we have some general expectations for the community of Santa Catalina, and some specific dimensions for the structures involved (fig. 8).

Beyond this general configuration, it was also possible to posit a few additional characteristics of the Santa Catalina de Guale settlement. Missions throughout the New World were generally constructed of aboriginal materials, even when more suitable Spanish style materials were locally available (Kubler, 1940, p. 25). Gannon has described the generalized appearance of the missions of *La Florida*:

> The mission buildings themselves were of simple, even primitive, construction. Pine-tree trunks held up the roofs and walls, and between these rough-hewn pillars small posts were interwoven with horizontal wattles, tied with leather thongs. Clay was then daubed on the latticework and, when dry, it was whitewashed on the interior. Palmetto thatching served as roofing, and wide eaves provided outside shade from the sun. Because of the scarcity of stone, and the unrelieved poverty of the colony, this wattle-and-daub type of construction would characterize the Florida mission compounds throughout their entire history. (1965, pp. 39–40)

Although wattle-and-daub buildings were most commonly used in Spanish Florida (Ross, 1923, pp. 268–269; 1926, p. 193; Floyd, 1937, p. 11; Lyon, 1977, p. 154; Bushnell, 1983, p. 33; Marrinan, 1985; see also chap. 3, this volume), some structures seem to have been made of plain planking (Floyd, 1937, p. 14, 177; Lyon, 1977, p. 22).

The best analogues for building construction at Santa Catalina come from Apalachee, where several specific structures have been identified (see chap. 3). The "typical" mission church in Apalachee was about 10 m wide and slightly over 20 m long. According to Jones (1980, p. 164), the *convento,* usually situated on the south side of the church, was about 6 m wide, ranging in length from 6 m to 9 m.

Most such missions were probably not truly fortified, with separate external walls for defense; some churches seem to have been directly built into the fortification walls. A council house (*buhío*) and village plaza are also believed to have formed part of the *doctrina* complex (Morrell and Jones, 1970, p. 26).

Church buildings were invariably associated with one or more cemeteries. As noted earlier, several of these have been found in Florida (chap. 3). Mission cemeteries tend to be located along one side of the church (Jones, 1980, p. 164). The cemetery at Nuestra Señora de la Soledad (Koch, 1980, p. 232), in St. Augustine proper, included burials beneath the church floor, behind the church, and on the north side of the building.

Tradition dictates that the sanctuary define the eastern end of the church. But in Mexico proper, only the Franciscans observed this rule during 15th century; after 1600, churches faced in all directions depending upon factors of site and local preference. In New Mexico, the facade usually looks east, and the sanctuary faces west (Kubler, 1940, p. 23).

The limited evidence available from excavations in *La Florida* suggests that mission sites in Apalachee were commonly oriented 45° west of north, e.g., San Juan de Aspalaga, San Luis, and San Pedro y San Pablo de Patale (Morrell and Jones, 1970, p. 41; Shapiro and Marrinan, 1986). The only known exception in Spanish Florida is La Concepción de Ayabali (Boyd et al., 1951, pp. 118–121), which is oriented in a roughly north-south direction.

The *convento* (variously translated as monastery, convent, or friary) was one or more subsidiary buildings in which friars and lay brothers lived cloistered lives according to the rules of their order (Kubler, 1940, p. 72). Such structures commonly had a simple plan, merely a single row of rooms, sometimes constituting the sides of a quadrangle which contained the sacred garden. Inside the *convento* were the refectory, the cells or suites of the friars, and perhaps some specialized rooms, such as a kitchen, offices, workshops, and

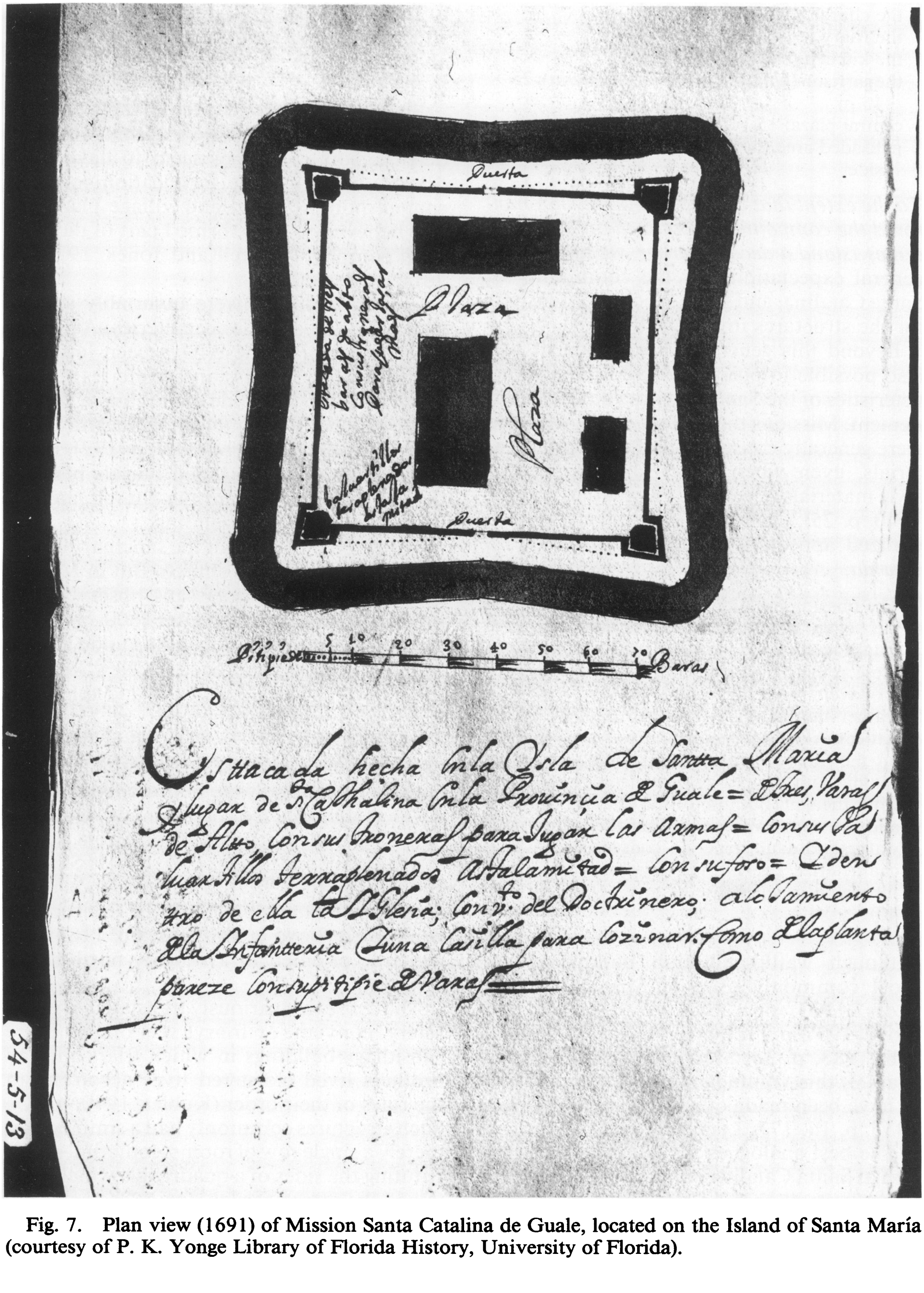

Fig. 7. Plan view (1691) of Mission Santa Catalina de Guale, located on the Island of Santa María (courtesy of P. K. Yonge Library of Florida History, University of Florida).

granary (Bolton, 1917, p. 59; Montgomery et al., 1949, pp. 14, 48). Visitations by superiors and other friars were extremely important, and, for this reason, we might expect a friary to be built to serve needs far beyond those of one or two lonely friars.

Mission Santa Catalina may at times have assumed a somewhat military character. On May 15, 1670, British subject Maurice Mathews landed on St. Catherines Island to collect wood and water. After a brief altercation with resident Guale, they "heard a drume, and presently saw 4 Spaniards armed with muskets and swords" (Salley, 1911, pp. 114–115). Conflicts such as these soon prompted Governor Manuel de Cendoya, in 1671, to station 25 soldiers at Santa Catalina to defend it against the newly established British settlement at Charles Town (Matter, 1972, p. 192).

Lanning (1935, p. 215) suggests that two years later, the Spaniards sent a garrison to St. Catherines Island to begin construction of a stone fortress for which Indian labor was drawn from Timucua, Guale, and Apalachee. When Bishop Calderón visited the island in 1675, he reported the presence of "an officer with a good garrison of infantry" (Wenhold, 1936, p. 10).

In December 1677, the cacique of Santa Catalina complained to General Captain Antonio de Arguelles that his people were required to support the Spanish infantry stationed in their town, despite a previous agreement by all chiefs in the area that all towns would share that task. Although the Guale suggested that the infantry be withdrawn, Arguelles prevailed, promising that all towns in the area would soon receive troops as well (Matter, 1972, p. 196).

We also know that in 1680, a force of British-led Yamassee Indians attacked Santa Catalina. The governor wrote later:

> There were forty-five Spaniards from this Garrison and about a hundred Natives. They took refuge in the convent of the Friar, who teaches the Gospel in that Province. Captain Francisco Fuentes, whom I sent two years ago to take charge of that place, defended himself and army with great valor and distinction from daylight until four o'clock in the afternoon against these Indians, who were *armed with firearms*. (Salazar to Crown, May 14, 1680, Mary Ross translation)

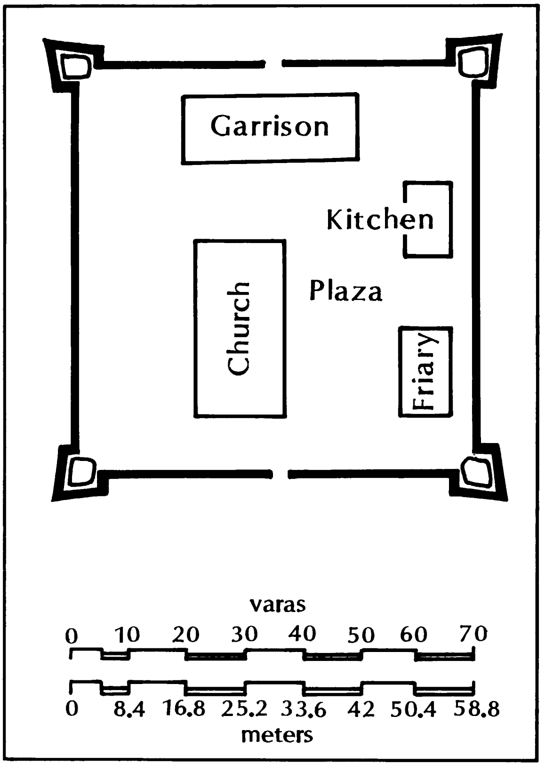

Fig. 8. Metric abstraction of the Santa María Mission map.

Because bickering was common between officials of church and state, military garrisons were often constructed some distance from mission complexes (see foldout map in Lanning, 1935). Civil authorities were ordered by certain regulations to provide extensive protection and support to clergy who were in many ways, both in theory and in fact, their rivals (e.g., Montgomery et al., 1949, pp. 13–14). Although many North American missions maintained a defensive character (Kubler, 1940, p. 18), it seems possible that a separate military garrison was constructed sometime during the occupation of Santa Catalina.

Available historic records also suggest that a sizable Guale *pueblo* was associated with Mission Santa Catalina. During his visitation in 1606, Bishop Cabezas Altamirano reported the May Day confirmation of 286 "happy children" at Santa Catalina (Ross, 1926, p. 195). In 1655, Santa Catalina is listed as "the principal *doctrina* in the Province of Guale" (Geiger, 1940, p. 125).

In 1670, Maurice Mathews reported that "Severall of our people had been just at theire houses and told us of brave plantations with a 100 working Indians and that they want nothing in the world . . ." (Salley, 1911, p. 114; see also Swanton, 1946, p. 136). That same year, William Owen informed Lord Ashley that

> Our next neighbour is he of Wallie weh ye Spaniard calls St. Katarina who hath about 300 Indians att his devoir with him joyne ye rest of ye Brotherhood and cann muster upp from 700 hundred Indians besides those of ye main whom they vpon any urgent occasions shall call to their assistance. (Cited in South Carolina Historical Society, 1897, pp. 196–197)

In 1675, Governor Salazar listed the population at Santa Catalina at 150 persons (Geiger, 1940, p. 129). By this time, the population of Satuache, a town 10 leagues north of St. Catherines Island, had been relocated at Mission Santa Catalina (references in Jones, 1978a, p. 185). A deposition from Spanish Captain Echavaray later notes that 60 families lived at Santa Catalina in 1679. An aboriginal settlement of this proportion should surely leave a substantial archaeological record.

Contemporary accounts further suggest that the archaeological record at Mission Santa Catalina should reflect its destruction in the late 16th century, rebuilding in the early 17th century, and abandonment sometime shortly after 1680. The earliest recorded burning occurred on September 19, 1597, as a direct result of the Juanillo Rebellion (Gannon, 1965, p. 40; Jones, 1978a, pp. 183–184). The 1597 Canzo account, cited above, suggests that the church, friary, council house, and house of the cacique were fired, "and everything else that he found to burn."

On November 24, 1604, Governor Ybarra visited Santa Catalina, together with a company of infantry and Father Ruíz (who was subsequently stationed at Santa Catalina). They were billeted in several palm thatch structures, apparently built specifically for their visit. Two days later, the entire party from St. Augustine attended Mass with several chiefs from Guale. Some sort of serviceable church stood at Santa Catalina at this point (but the account does not specify whether it had been constructed on the same site as the previous mission complex).

In one form or another, Mission Santa Catalina continued to function until Spanish abandonment eight decades later. It is unclear how badly Santa Catalina was damaged in the siege of 1680, or the degree to which the Spanish destroyed the mission when they abandoned St. Catherines Island. When Captain Dunlop visited the site in 1687, he reported seeing "the ruins of severall houses which we were informed the Spaniards had deserted for ffear of the English about 3 years agoe" (Dunlop, 1929, p. 131).

These expectations, derived from extant historical documents, conditioned the strategies of our geophysical prospection and archaeological excavations. But in no case did the historic literature provide a satisfying substitute for actual field exploration at Santa Catalina. Additional primary historical research on Mission Santa Catalina is sorely needed, and we sincerely hope that the success of ongoing excavations will foster such investigations among our historical colleagues.

CHAPTER 3. WHAT *DO* THE MISSIONS OF *LA FLORIDA* LOOK LIKE? AN ARCHAEOLOGICAL PERSPECTIVE

DAVID HURST THOMAS AND LORANN S. A. PENDLETON

> If there were twenty-one missions in California, there were as many in Texas, more in Florida, and twice as many in New Mexico. At one time the California missions had over thirty thousand Indians under instruction; but a century and a half earlier, the missions of Florida and New Mexico each had an equal number. (Bolton, 1917, p. 45)

Bolton had a point, but the truth is that—compared with current research in California and the American Southwest—we know almost nothing about the archaeology of the fifty or so mission sites in *La Florida*. Only two decades ago, archaeologists working in the Apalachee Province were able, literally, to more than double the number of known mission sites within a few months of fieldwork and directed archaeological reconnaissance (Jones, 1970a). Yet fewer than half of the historically known missions in *La Florida* can be identified with archaeological sites—and several of these correlations remain tenuous.

When we began looking for Mission Santa Catalina, we were part of only a small handful of archaeologists even interested in the archaeology of *La Florida*. Fortunately, a new wave of interest in mission archaeology is sweeping the American Southeast, and the past few years have ushered in dramatic increases in our knowledge of both the subject matter, and the way to ask pertinent questions of the archaeological record.

In this section, we recapitulate what is known about the archaeology of missions throughout most of Spanish Florida. This presentation follows, where possible, the sequence of Bishop Calderón's visitation of 1674–1675 (Wenhold, 1936; see also fig. 9, this volume). We attempt not only to define an empirical baseline for our own reconnaissance at Santa Catalina, but also to encourage archaeologists working in related fields to become conversant with recent advances in the mission archaeology of Spanish Florida.

THE PROVINCE OF APALACHEE

Bishop Calderón's 1675 account recorded the following missions operating in Apalachee:

> . . . the mission of San Lorenzo de Hibitachuco, first village of this province. From this mission to that of La Concepción de Ayubali it is 1 league, and another to that of San Francisco de Oconi, another to that of San Juan de Aspalaga, 2 to that of San Joseph de Ocuya, 4 to that of San Pedro de Patali, 2 to that of San Antonio de Bacuqua, 2 to that of San Damian de Cupahica, called also Escambi, one to that of San Luis de Talimali which is the largest of all, another to that of La Purificación de Tama, called Yamases, another to that of San Martín de Tomoli, 2 to that of Santa Cruz de Capoli, called also Chuntafu, and 4 from Tomoli to Assumpción del Puerto, . . . both of which were heathen [villages] . . . . In the mission of San Luis, which is the principal one of the province, resides a military officer in a country house defended by pieces of ordinance and a garrison of infantry. (Wenhold, 1936, pp. 8–9)

This account has proved valuable for interpreting the archaeological record of Apalachee (see also fig. 9, this volume); most mission archaeology conducted to date in *La Florida* has taken place here (Boyd, 1939; Boyd et al., 1951; Jones, 1970a, 1970b, 1971, 1972, 1980; Marrinan, 1985; Shapiro and Poe, 1984; Shapiro, 1985).

Especially important has been research conducted by the Florida Division of History (previously called the Division of Archives, History, and Records Management), which initiated fieldwork on Florida missions in

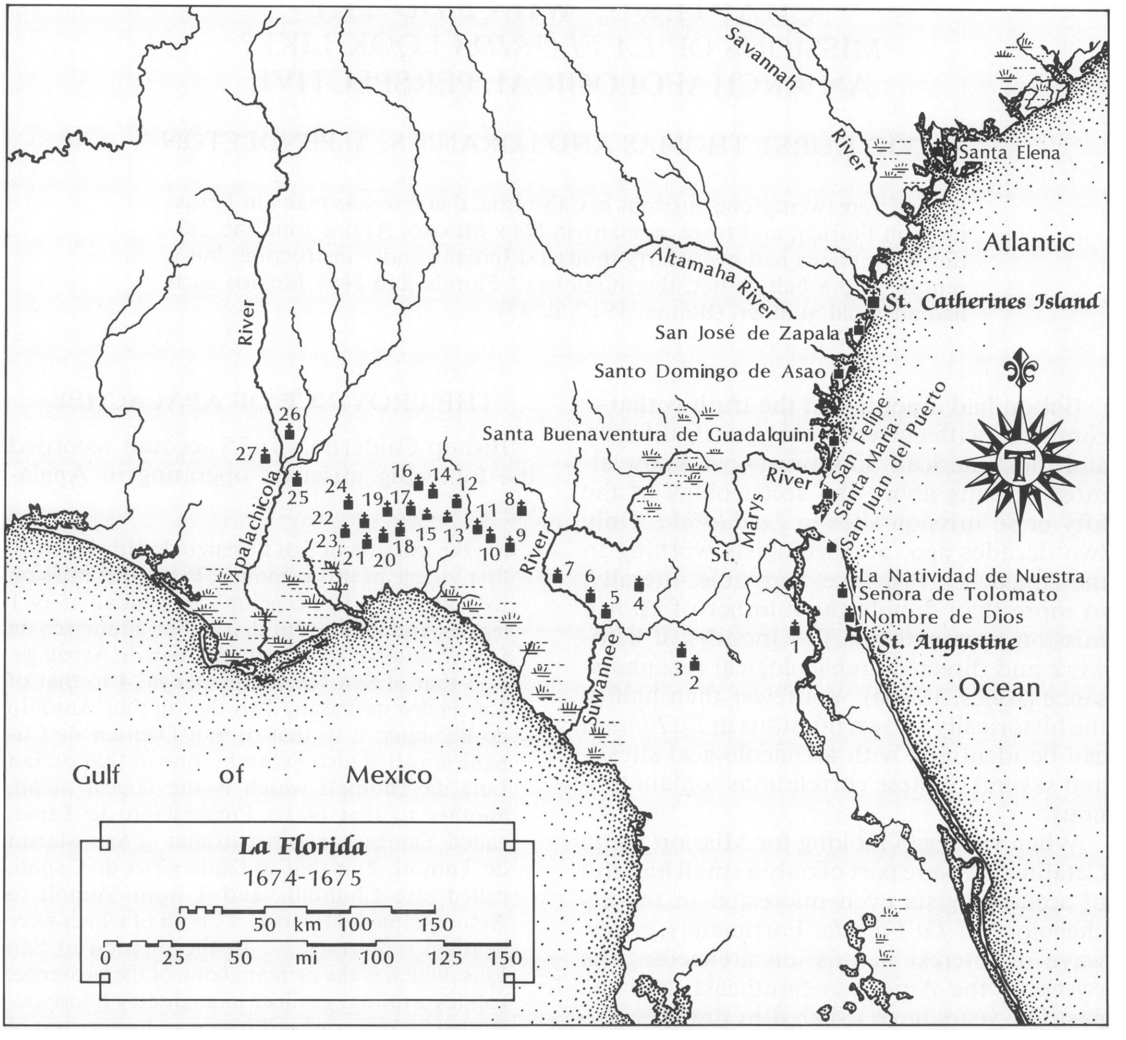

Fig. 9. The mission system throughout *La Florida* at the time of Bishop Calderón's visitation, 1674–1675 (after Gannon, 1965, p. 64, facing). **1.** San Diego de Salamototo; **2.** San Francisco de Potano; **3.** Santa Fé de Toloca; **4.** Santa Catalina de Afuerica; **5.** Santa Cruz de Ajohica; **6.** Santa Cruz de Tarihica; **7.** San Juan Guacara; **8.** Santa Elena de Machaba; **9.** San Pedro de Potohiriba; **10.** San Mateo; **11.** San Miguel de Asile; **12.** San Lorenzo de Ivitachuco; **13.** La Concepción de Ayubale; **14.** San Francisco de Oconi; **15.** San Juan de Aspalaga; **16.** San José de Ocuya; **17.** San Pedro de Patali; **18.** San Antonio de Bacuqua; **19.** San Damian de Cupahica (also called Escambi); **20.** San Luis de Talimali; **21.** San Martín de Tomoli; **22.** La Purificación de Tama; **23.** Santa Cruz de Capoli; **24.** Asunción del Puerto; **25.** La Encarnación a la Santa Cruz de Sábacola; **26.** San Carlos; **27.** San Nicolás.

1968 (Jones, 1970a). Before that time, only four Apalachee mission site locations were known, but during the survey by L. Ross Morrell and B. Calvin Jones, a number of additional mission sites were discovered in this area: San Lorenzo de Ivitachuco, San José de Ocuya, San Pedro de Patali, and San Damian de Escambi (also called Cupahica). Two mission sites were also located in the western Timucuan area: San Miguel de Asile and San Pedro y San Pablo de Potohiriba (discussed briefly in Jones, 1970a, pp. 1, 3).

The success of this survey can be attributed largely to the settlement pattern approach followed (Morrell and Jones, 1970). Jones (1980, p. 163) combined ethnohistoric evidence with archaeological data to provide a generalized model of 17th century mission structures for north Florida (see also Marrinan, 1985, p. 246). Most such missions occur in terrain above 30 m in elevation, near two water sources, either a spring or a stream, and a sinkhole or two.

Marrinan (1985) provides an excellent overview of the current state of knowledge regarding mission archaeology in Apalachee. In the account below, we concentrate upon the architectural details most relevant to our own work at Santa Catalina.

San Lorenzo de Ivitachuco

This site (8 Je 100) was discovered by Morrell and Jones in the 1968 mission site survey (Jones, 1970a, p. 3). Excavations at San Lorenzo de Ivitachuco disclosed ruins of a burnt *convento* structure, measuring 6.2 × 4.3 m (Jones, 1972, p. 2).

La Concepción de Ayubale

On the basis of topography and the location of other mission sites, Smith previously identified the Scott Miller site (8 Je 2) as San Francisco de Oconi (Boyd et al., 1951, p. 112). However, more recently this site has been correlated with Mission La Concepción de Ayubale (Morrell and Jones, 1970, p. 26).

Regardless, excavations at this heavily plowed site yielded the first floor plan of a Spanish mission building in Florida (fig. 10). One wattle-and-daub structure had a partially baked clay floor, varying in thickness from 2 to 7 cm. This building measured (from the centers of the corner posts) 6.0 × 5.0 m (Boyd et al., 1951, p. 119). The flooring extended beyond the walls as much as 3.7 m (although the excavators believed this extension was due to outwash rather than the construction of a deliberate exterior walkway). Vertical posts supporting roof and walls varied from 15 to 20 cm in diameter; some were split whereas others were used whole. The distance between uprights varied extensively, from 0.66 to 2.88 m.

Although Smith suggested that "the walls of this building were low, not over 2 feet in height . . . because of the very small amount of wall rubble on the surface and at floor level" (Boyd et al., 1951, p. 119), it is more likely, following Loucks (1979, p. 130), that: "This is either a typographical error or the structure was not a living area for priests." The orientation was north northwest by south southeast. A larger building—of both wattle-and-daub and plank construction—was oriented on a north-south axis, measuring 17.8 by 12.0 m (fig. 11). A number of interior wall partitions were excavated, but the exact configuration is uncertain. A small U-shaped "altar-like area" was found in the most southerly room, equidistant from the lateral walls. Interior wall faces had been plastered (Boyd et al., 1951, p. 120).

A relatively large number of hand-wrought nails were found at both structures; they had been used to secure beams, rafters, and apparently gabled roofs. Smith (1956, p. 56–59) discusses additional artifacts from the Scott Miller site in some detail. An impressive array of metal artifacts was found, including an iron lance head, chain mail, and a spring lock. Ceramics included majolica, five olive jars, and a variety of aboriginal wares.

San Juan de Aspalaga

Research at the Pine Tuft site (8 Je 1), 25 km east of Tallahassee, was begun by Hale Smith in the early 1950s (Boyd et al., pp. 62–63). Then, in 1968, Morrell and Jones (1970) returned for more extensive excavations at San Juan de Asapalaga, but only two structures were excavated. Accompanied by Dr. Gary Shapiro, we visited the site in May 1985; future work is clearly warranted at this important site.

The smaller building, designated the *convento,* measures approximately 5 by 6 m. Two outer walls and a possible interior partition were constructed of wattle and daub; the other two walls were perhaps vertical planks. In the center were paired rectangular posts (15 × 20 cm), spaced 120 cm apart; they probably supported a thatched gabled roof, oriented on a northeast-southwest axis. The only door threshold occurred on the southwestern wall (Morrell and Jones, 1970, p. 33).

This structure may have had either two equally proportioned rooms or, more likely, one large room, with adjacent smaller rooms

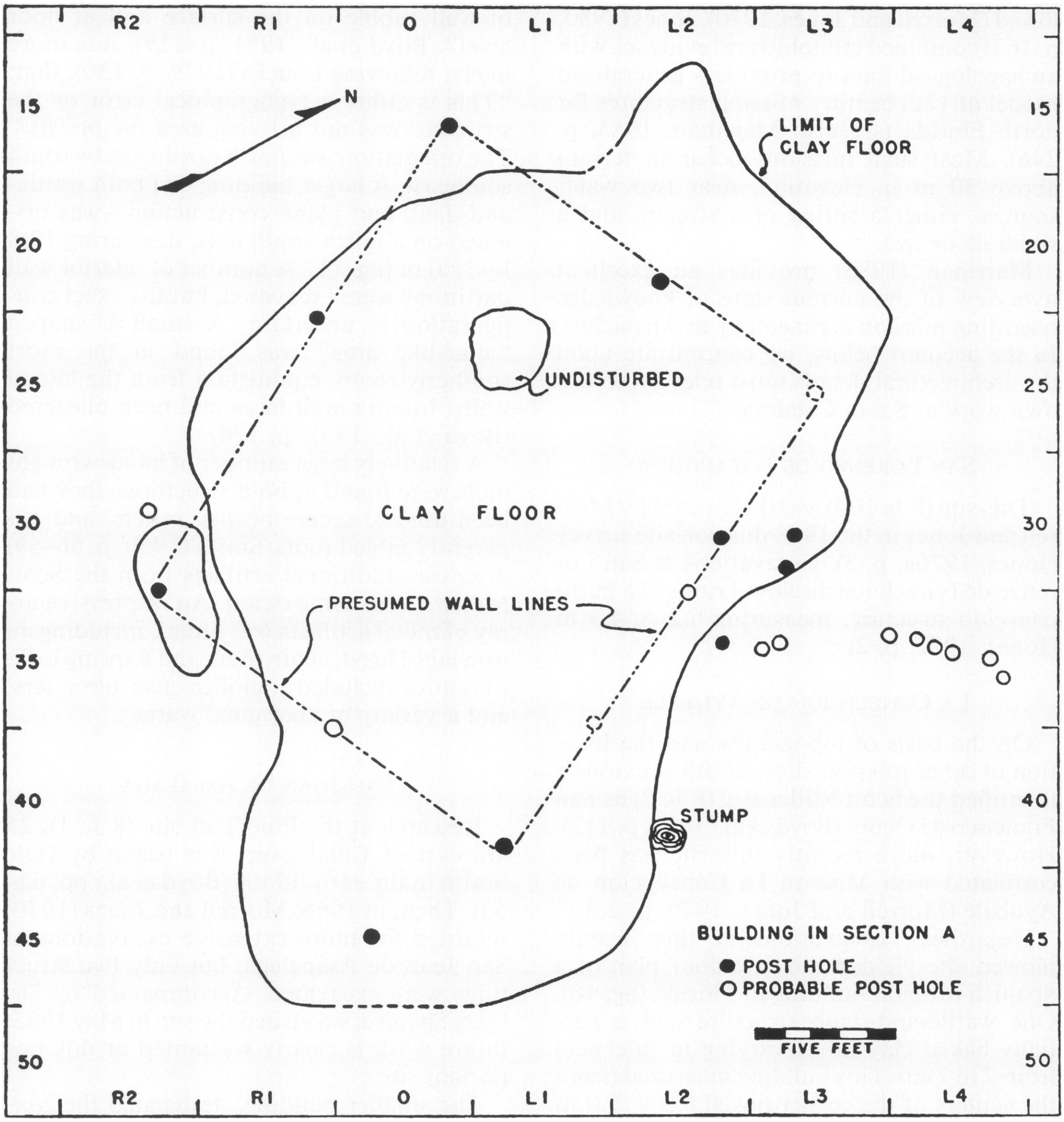

Fig. 10. Plan view of the smaller building (Section A) excavated at the Scott Miller site, probably Mission La Concepción de Ayubali (after Boyd et al., 1951, fig. 3; reproduced with permission of the University of Florida Press).

separated by a wattle-and-daub partition. Within the major room (on the southwestern side) was a curious linear depression, connected to a deeper oval basin-shaped feature. The excavators did not speculate about this singular feature (Morrell and Jones, 1970, p. 33).

The "church" at Aspalaga, oriented on a northwest-southeast axis, was perpendicular to the "convento." Those walls made of wattle and daub were constructed on uprights 4 cm in diameter, spaced at intervals of about 15 cm (fig. 12; see also fig. 5, this volume). Horizontal elements were apparently hard-

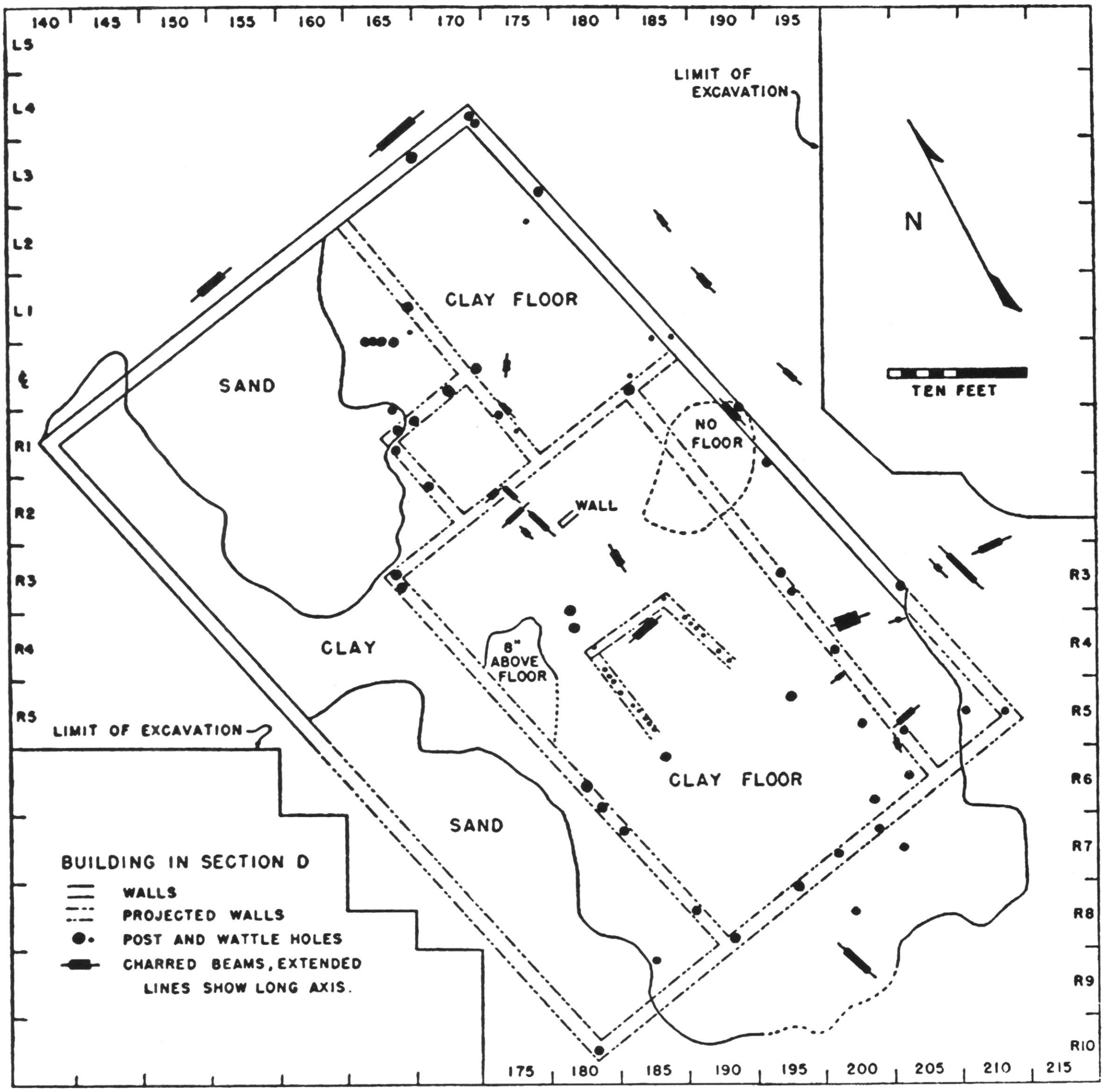

Fig. 11. The larger mission building (Section D) at the Scott Miller site, probably La Concepción de Ayubali (after Boyd et al., 1951, fig. 4; reproduced with permission of the University of Florida Press).

wood twigs or vines, and the walls averaged about 15 cm thick. In part of the wall, plank impressions suggest that the daub may have been set against plank forms. Stucco with a whitewash was applied only to exterior surfaces. The plank walls were made of 20 cm wide boards, nailed to a horizontal footing. The bases of some planking were buried 1 or 2 cm.

The church shared a northwestern wall with the entire compound. The remaining three walls were independent structural units. Smith (1956, pp. 62–63) commented that in the mid-1940s, a low wall that enclosed the entire complex, an area of nearly 1 ha, could still be seen.

San José de Ocuya

This site (8 Je 72) was discovered by Morrell and Jones in the 1968 mission site survey (Jones, 1970a, p. 3). At San José de Ocuya,

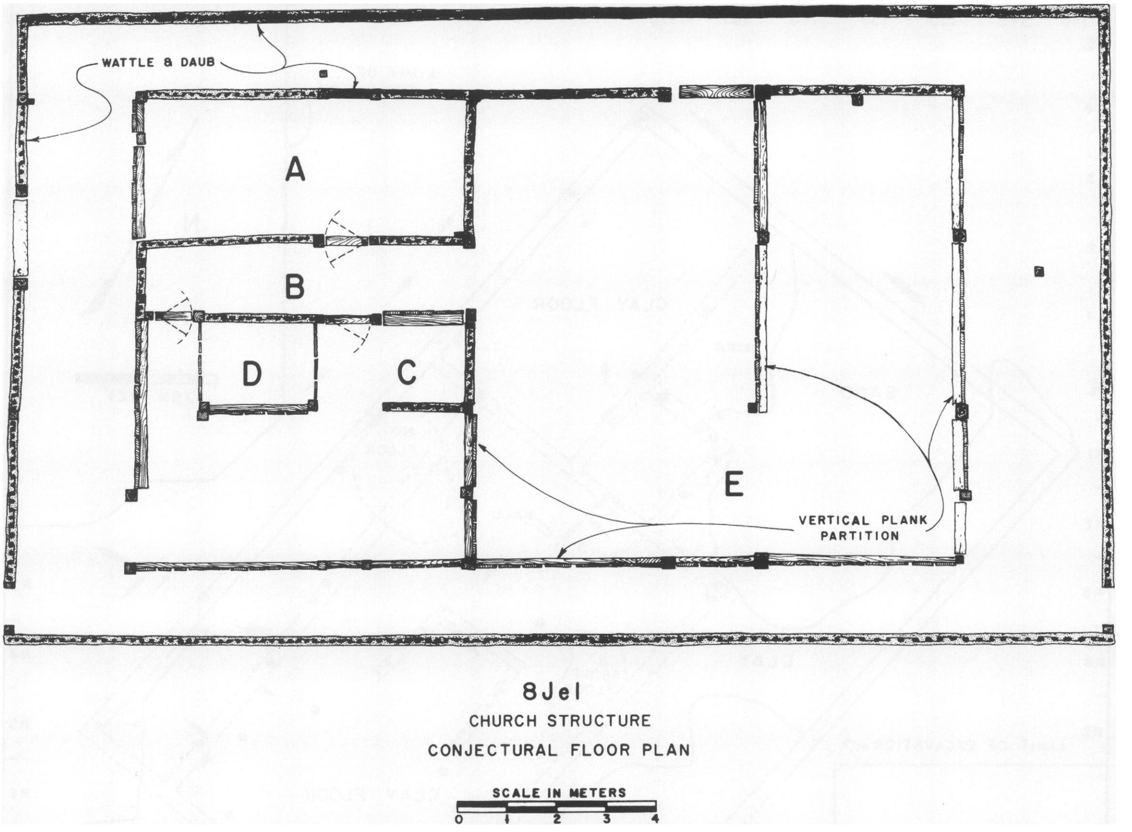

Fig. 12. Conjectural floor plan of the church building excavated at San Juan de Aspalaga (after Morrell and Jones, 1970, fig. 4; reproduced with permission of the authors and the Florida Division of Historical Resources).

surface reconnaissance showed three distinct artifact concentrations. Jones describes a *convento* measuring 10.4 by 9.4 m, built of wood plastered with red clay. The cemetery was located to the southeast, and 15 of its estimated 300 graves were excavated. Individuals had been placed in extended position, without grave goods (Jones, 1972, p. 2). Jones (1970a, p. 3; 1973, p. 6) also describes a highly unusual semisubterranean structure and a partial palisade trench.

San Pedro y San Pablo de Patale

The site of San Pedro y San Pablo de Patale (8 Le 152) was initially discovered by Jones, whose 1971 excavations revealed remains of two churches, a cemetery, and the probable locations of a *convento* and a *cocina* (Jones, 1970a, 1971, 1972). The floor of the earlier church was found within the area enclosed by the cemetery; Jones (1972, p. 2) suggests that the church was burned in 1647, the ground leveled, and graves dug through the floor of the burnt church (see also Jones et al., in press).

The cemetery, 61 m northeast of the *convento,* was confined within a 25 × 18 m area, and was either fenced or covered (Jones, 1972, p. 2). The 64 burials excavated were extended and primary, with hands commonly placed over the chest; all but two were oriented with heads toward the southeast. Thirteen graves contained artifacts of personal adornment, consisting of multifaceted glass trade beads, cigarette-sized rolled brass beads, brass finger rings, dumbbell-shaped shell pendants, a shell gorget, shell beads, a brass crucifix, and a broken hawk bell (Jones, 1972, p. 2).

Since 1984, Florida State University Museum has conducted detailed mapping and systematic subsurface tests at 10 m intervals at Patale (Byrne and Marrinan, 1984; Marrinan, 1985; Shapiro and Marrinan, 1986). Auger tests show a roughly rectangular ceramic distribution about 45° west of north. The nearby Turkey Roost site (8 Le 157) is probably the post-1647 Patale.

San Damian de Escambi (Also Called Cupahica)

Excavations conducted at this site (8 Le 120) in 1969 exposed parts of a burnt wooden building (perhaps the church) and a wide variety of iron and brass tools; Jones (1970a, p. 2) illustrates a portion of a brass bell recovered in these excavations.

A cemetery (ca. 10 × 30 m) was also found about 30 m from the suspected church. Most burials were individual interments, extended (often with hands crossed on the chest or clasped) with head toward the southeast: "individual graves formed tight rows with groups of burials being separated by an 8-foot square grid pattern of post holes extending over the western three quarters of the cemetery .... They may indicate family burial plots or supporting posts for a cemetery cover" (Jones, 1970b, p. 1). Grave goods "consisted of items of personal adornment and were associated primarily with children. For the most part, these included multicolored European glass trade beads, rolled sheet brass beads, and grooved dumbbell shaped shell pendants. One remarkably well preserved piece of heavy woven cloth was recovered" (Jones, 1970b, p. 2).

Jones suspected that two adults and one child might be Spanish because they had been placed in wooden coffins, fastened with wrought iron nails.

San Luis de Talimali

San Luis (8 Le 4) functioned as administrative center for the Apalachee Province during the second half of the 17th century. Located amidst a dense Indian population and in an area of fertile soils, San Luis has been called the "breadbasket for St. Augustine" (Shapiro and Poe, 1984, p. 4). The location of the fort and blockhouse were well known from 19th century accounts, and considerable archaeology has been conducted since at this important complex (see Boyd et al., 1951; Smith, 1956; Shapiro, 1985).

Yet relatively little was known about the mission complex per se until recently, when a comprehensive program of auger testing, soil resistivity survey, and exploratory excavations revealed the probable location of the church, *convento,* and cemetery complex (Shapiro and Poe, 1984; Shapiro and Marrinan, 1986). There is evidence that the town plaza, the *presidio,* the village area to the northeast, and perhaps the mission complex were oriented 45° west of north (see Shapiro, in press). Most recently, Shapiro (1985) has been excavating the circular Apalachee council house, projected to be 36 m in diameter (and confirmed by excavations in the spring of 1986).

The following Apalachee missions have not yet been firmly associated with archaeological remains: *San Antonio de Bacuqua, San Francisco de Oconi, La Purificación de Tama, San Martín de Tomoli, Santa Cruz de Capoli,* and *Asunción del Puerto.*

THE PROVINCE OF APALACHICOLA

Bishop Calderón continued westward, recording the following missions:

> At 2 leagues from the afore-mentioned village of San Luís, on the northern frontier, is the river Agna which divides the provinces of Apalache and Apalachocoli, and at a distance of 12, on the bank of another large and copious river which takes its name from that province and runs through it from north to south, is a heathen village called formerly Santa Cruz de Sabacola el Menor, now La Encarnación a la Santa Cruz de Sabacola .... Nine leagues [farther] ... is another [village] named San Nicolás, of about 30 inhabitants, and 3 leagues further on is another, San Carlos, of something like 100 inhabitants. (Wenhold, 1936, p. 9)

The National Park Service commissioned the Florida Historical Society to document historical sites that would be flooded by the Jim Woodruff Reservoir. Boyd's (1958) research documents the whereabouts of each site mentioned in Calderón's account.

The "heathen village" of Santa Cruz de Sábacola was located above the fork of the Apalachicola River, immediately north of Chattahoochee (Boyd, 1958, map 8 and fig. 10). Archaeological reconnaissance by A. R. Kelly and Joseph Caldwell revealed historic sites in this area, although no Spanish artifacts were recovered.

Boyd (1958, p. 215) notes that considerable confusion exists about precise site locations, in part because the two villages were both known as "Sábacola," and also because Calderón's usage of "Santa Cruz" implies that a chapel already existed in this "heathen" community. Boyd (1958, p. 213) feels this identification is "presumptive" and reports the site condition as "obliterated."

John Hann (personal commun.) further notes that the Sabacola site on the west bank of the Apalachicola River was established at least as early as 1674 and occupied as late as September of 1677 when the Apalachee expeditionary force going to attack a Chisca village in West Florida (probably on the Choctawatchee) stopped there. Fear of Chisca reprisal probably led to its abandonment soon thereafter. It was at some later date that the Chacato appropriated the site. In 1675, at the time of the revolt, the Chacato were still at the two missions of San Carlos de los Chacatos and San Nicolás in the Marianna area.

Calderón's village of San Carlos has been identified from Spanish and aboriginal sherds recovered atop a bluff on the west side of the Apalachicola River in Jackson County, Florida (Boyd, 1958, p. 258; previously designated as Nos. 1 and 3 in Bullen, 1950). It is unclear whether a skeleton in Spanish armor, recovered in the river nearby (Lanman, 1856, p. 147), is contemporary.

Although the site of San Carlos is adjacent to Woodruff Reservoir (and apparently not flooded), part of it was occupied by the Apalachee Correctional Institution. Boyd (1958, p. 258) notes that "most of the site has been materially altered or obliterated in the course of the last few years."

Boyd (1958, p. 260) notes further that San Nicolás was probably near Rock Arch Cave, in the vicinity of Marianna, but its exact position is unknown.

THE PROVINCE OF TIMUCUA

The Timucuan Province encompassed the northeastern corner of the Florida peninsula (fig. 1). Bishop Calderón provided the following accounting, as of 1675 (at an earlier period there had been a far larger number of Timucuan missions):

> Ten leagues from the city of Saint Augustine, on the bank of the river Corrientes [the St. Johns], is the village and mission of San Diego de Salamototo .... From there to the village and mission of Santa Fe there are some 20 uninhabited leagues. Santa Fe is the principal mission of this province. Off to the side toward the southern border, at a distance of 3 leagues, is the deserted mission and village of San Francisco. Twelve leagues from Santa Fe is the mission of Santa Catalina, with Ajohica 3 leagues away and Santa Cruz de Tarihica 2. Seven leagues away, on the bank of the large river Guacara, is the mission of San Juan of the same name. Ten [further on] is that of San Pedro de Potohiriba, 2, that of Santa Helena de Machaba, 4, that of San Matheo, 2, that of San Miguel de Asyle, last in this Timuquan, or Ustacanian, province. (Wenhold, 1936, p. 8; see also fig. 9, this volume)

Missions in this area were more scattered than in Apalachee—making them more difficult to locate—and the archaeology is correspondingly less complete.

San Diego de Salamototo

The Rollestown site may have been the mission at Salamototo (Goggin, 1953, p. 5), a mission that did not appear in documents until 1675 (Wenhold, 1936, p. 8) and was probably a mission for relocated Guale. John Bartram visited here in 1765, and reported a small Spanish entrenchment 20 paces square and 1.5 m high (reported in Smith, 1956, p. 46). Deagan (1978, p. 106) also suggests that Rollestown might be an earlier Timucua village.

San Francisco de Potano

The Fox Pond site is presumed to be 17th century Mission San Francisco de Potano (Symes and Stephens, 1965, p. 65). Although four apparent house sites were encountered, no mission structural remains were discovered. Milanich (cited in Loucks, 1979) suggests that the main early village was located to the southwest. Goggin (1960) reports on the majolica found here.

Santa Catalina de Afuerica

Although no architectural remains have been encountered, documentary evidence suggests that Fig Springs, located on the Ichtucknee River, may be the site of Santa Catalina de Afuerica (Deagan, 1972, p. 23; see also Smith, 1956, pp. 49–50; Loucks, 1979). This is the type site for both Fig Springs Polychrome and the Ichtucknee majolica types. Several chunks of red clay daub with wattle impressions were recovered, as were nails, lime mortar, a glass bottle, trade beads, peach pits, charred corncobs, and cow bones.

San Agustín de Urica

The archaeological site named Baptizing Spring has been tentatively associated by Loucks (1979) with 17th century Mission San Agustín de Urica, not mentioned in Spanish accounts after 1655 (and hence not shown on fig. 9). She thought it possible that the Timucuans from San Agustín de Urica might have been subsequently removed to San Juan de Guacara, the nearest mission site. Jerald Milanich (personal commun.) thinks it more likely that Baptizing Spring is a ca. 1587–1611 *visita.*

Loucks (1979) reports two structures at Baptizing Spring. The larger of these (Structure B), tentatively identified as the church, consisted of a packed clay floor, some charred wood and posts, and sections of two wall trenches, enclosing a structure roughly 10 m EW by 8 m NS. One associated daub processing feature was encountered. The badly disturbed Structure A is estimated to be about 7 by 7.5 m, but no architectural or construction features could be identified. A centrally located hearth was excavated, as well as two aboriginal Timucuan structures.

San Pedro de Potohiriba

Loucks (1979) suggests that the site excavated by Jones (1972) and identified with San Pedro y San Pablo de Patali may actually be San Pedro y San Pablo de Potohiriba.

San Miguel de Asile

This site was discovered by Morrell and Jones in the 1968 mission site survey (Jones, 1970a, p. 3). At San Miguel de Asile, Jones (1972, p. 2) encountered a cemetery located 15.2 m north of the church. Ten primary, extended burials were partially excavated.

Additional Mission-Related Sites in the Timucuan Province

Milanich (1972a, p. 36) has described excavations at the Richardson site, an early postcontact village site near Evinston, and possibly the *visita* of Apalo. A series of circular posthole patterns were excavated, associated with charcoal-filled fire and refuse pits, but no unequivocally identified mission architecture was discovered.

The Zetrouer site (A-67), was apparently a late 17th-century Spanish-Indian cattle ranch, established in Potano territory to supply beef to St. Augustine (Boyd et al., 1951, p. 68). Milanich (1972a, p. 36; 1978, pp. 63, 79; see also Seaberg, 1955) suggests that deposits at Zetrouer probably date A.D. 1660–1700. Smith (1956, pp. 47–48) enumerates the artifact inventory for this site, which included mirrors, olive jar sherds, majolica, glass, beads, sheet silver, a lead bead, and tools of iron.

Jerald Milanich (personal commun.) notes that extensive aboriginal remains can be correlated with Mission Santa Fe de Toloca, although the mission buildings have not been located. Milanich also informs us that missions San Juan Guacara and Santa Elena de Machaba were located by Calvin Jones (and that more detailed locational information is available in the Florida State site files).

The following mission sites in the Timucuan Province have apparently not been correlated with archaeological remains: *Santa Cruz de Ajohica, Santa Cruz de Tarihica,* and *San Mateo.*

THE NORTHERN FRONTIER

Bishop Calderón continued his 1675 mission inventory by traveling north from St. Augustine, ultimately arriving at the Province of Guale:

> Going out of the city [St. Augustine], at half a league to the north there is a small village of scarcely more than 30 Indian inhabitants, called Nombre de Dios, the mission of which is served from the convent .... At 2 leagues from the city [St. Augustine] is the village and mission of La Natividad de Nuestra Señora de Tolmato; at 10, the village and mission of San Juan del Puerto at the bar of which disembogues the great

> river Corientes . . . , at 6, the mission and village of Santa María; at 3, San Phelipe; at 9, Santa Buenaventura de Guadalquini; at 6, Santo Domingo de Asahó; at 6, San Joseph de Zapala; at 2, Santa Catalina. All are settlements of Christian [Indians], and in the last named Your Majesty has an officer with a good garrison of infantry. (Wenhold, 1936, pp. 8, 10)

As we follow the route of Calderón (fig. 9), north into Guale, the quality of archaeological evidence becomes less satisfactory. We must accordingly modify the level of resolution beyond architectural detail to include ceramic evidence as well.

Nombre de Dios

The first Christian mission to the North American Indian (Gannon, 1965, p. 27), Nombre de Dios was established on the outskirts of St. Augustine; archaeological research at this important site spans four decades. The Fountain of Youth Park is a Timucuan village thought to be Seloy—the aboriginal settlement first encountered by Menéndez de Avilés in 1565. This site probably began as a *visita* rather than a mission proper. The park contains shell middens, a village area, and a cemetery. More than 100 burials were excavated by J. R. Dickson in 1934 (Seaberg, 1951, p. 1). Later the same year, M. W. Stirling of the Smithsonian Institution, examined six of the burials.

The cemetery was near the edge of the salt marsh north of St. Augustine. Most burials were primary, with feet toward the east, arms crossed over the chest. The sparse grave goods included hundreds of glass beads, two amber beads, 77 shell beads, a number of seed beads, 5 metal cone-shaped tinklers, and an amber pendant (Seaberg, 1951; see also Geiger, 1940, p. 23; Goggin, 1952, p. 54, 1968; Merritt, 1977; Larson, 1978, p. 120).

Recent excavations by the Florida State Museum promise to add considerably to our knowledge of 16th century mission archaeology at Nombre de Dios (Kathleen Deagan and Michael Gannon, personal commun.).

La Natividad de Nuestra Señora Guadalupe de Tolomato (post-1658)

In 1658, this Guale town was relocated from McIntosh County, Georgia (discussed below) to approximately 2 leagues (8 km) from St. Augustine. Deagan (1978, p. 106) believes that Wrights Landing (SJ-3), known only from surface collections (Goggin, 1953, p. 6), corresponds to the transplanted Tolomato, one of the last Guale missions to be recorded in Spanish documents (Larson, 1978, p. 136; see also Goggin, 1960).

San Juan del Puerto

Mission San Juan del Puerto was established in 1587 at the mouth of the St. Johns River on Fort George Island (Geiger, 1937, p. 55). Fray Francisco Pareja arrived there in 1595, and he reports, in 1602, that 500 Christian Indians were under his care at the *doctrina* of San Juan, with nine nearby *visitas* (McMurray, 1973, p. 15). The church at San Juan is described as being quite ornate, with a bell tower (Milanich and Sturtevant, 1972, p. 10).

In 1674, Governor Salazar reported that San Juan was 3 leagues from Santa María, with 30 persons in residence (Geiger, 1940, pp. 35, 129). Archaeological evidence suggests that at least some Tacatacuru (a Timucuan-speaking group) from Cumberland Island were relocated between 1660 and 1675 at San Juan del Puerto mission. Calderón documented San Juan 12 leagues north of St. Augustine (Wenhold, 1936, p. 10); Jonathan Dickinson spent two days there in 1697 (Andrews and Andrews, 1975). Although the mission was destroyed by the army of Governor Moore in 1702, an attempt may have been made to revive this mission in 1715 (Gannon, 1965; see also Dickinson and Wayne, 1985, pp. 2-5–2-7).

Initial archaeological research was conducted here by John Griffin in 1951, and intermittent research has taken place up to the present time (Dickinson and Wayne, ibid.). Traces of a palisaded village were found, plus numerous Spanish period artifacts, including San Luis Blue-on-White and Abo Polychrome sherds, two wrought iron door keys, an olive jar sherd worked into a gaming piece, a handmade ceramic and metal religious medallion, a handmade lead corpus, and a carved wooden club (illustrated in Milanich and Sturtevant, 1972, pp. 11–12; see also (MacMurray, 1973; Deagan, 1978, pp. 104, 106). But only inconclusive structural remains were encountered at San Juan (McMurray, 1973; see also Milanich and Sturtevant, 1972, pp. 10–12; Milanich, 1972b).

Dickinson and Wayne (1985) report on recent research at San Juan del Puerto. In 1985, after conducting 165 shovel tests on a 25 m grid across the mission site, they excavated three 1 × 2 m units in areas of highest artifact concentration. A comprehensive soil resistivity survey was also carried out across the part of the site having the greatest density of Spanish period materials (Williams, 1985).

Ceramic and shell distributions suggest that the mission was oriented on an angle of 45° from north. Locations of the structures, central courtyard, and palisade ditch are indicated by the resistivity survey. Human remains were recovered in the excavations, deriving from either a mass interment or from the plowed mission cemetery.

Santa María

Mission Santa María was initially established on the mainland, as a focal point for mainland Timucuans from the village of Tlathlothlaguphta (Lanning, 1935, p. 6), on the banks of the St. Marys River. Menéndez de Avilés reportedly had built a chapel there in 1566. Withdrawal of the Spanish from Cumberland Island after the rebellion of 1597 left mainland Santa María unprotected, and the site was soon in ruins. It was rebuilt by Governor Canzo. When Fray Juan Baptista Capilla was assigned to Cumberland Island, he probably established a *visita* on the mainland at Santa María.

Mission Santa Catalina de Guale de Santa María

Located on the Harrison Plantation (ca. 1770) at the southern end of Amelia Island, on a small bluff overlooking the Amelia River, this site has been renamed the Dorion site (Hardin, 1986, p. 75). It had been Mission Santa María, established in 1680, and was also the Spanish military headquarters for the area. The mission was viable until 1702 when it was abandoned after an unsuccessful British attack on St. Augustine (Hardin, 1986, p. 76; Bullen and Griffin, 1952, p. 59; see also fig. 13, this volume).

On-going excavation of the site has revealed the presence of 80–90 mission period burial pits, most containing single burials and oriented on an east-west axis. A large ossuary of perhaps another 50–60 burials has also been excavated (Clark Spencer Larsen, personal commun.; see also Hardin, 1986). This cemetery is apparently some distance away from the mission buildings. At this writing, grave goods are extremely limited: a bone pin or projectile point (Hardin, 1986, p. 77), a small crucifix, an oval-shaped glass pendant (or mirror), and about a dozen trade beads.

Majolica and 34 Spanish olive jar fragments were found in an area north of the cemetery which may have been the *convento* (Hardin, 1986, p. 78). The cemetery and nearby daub concentrations are being excavated (Clark Spencer Larsen and Jerald Milanich, personal commun.).

Additional Sites on Amelia Island

The Harrison Homestead Village (N-41) is the probable Indian site associated with Mission Santa María. The site is on the landward edge of the island, along the salt marsh and Harrison Creek. The mission itself (1675–1702) was thought to be slightly north of the Indian settlement, but we now know that the aboriginal middens also extend to the north (Jerald Milanich, personal commun.). The Hemmings and Deagan (1973, p. 4) survey located olive jar sherds on the surface, a blue-on-white sherd in a refuse pit (1973, p. 9), a great deal of San Marcos ware, two majolica sherds, and 14 olive jar sherds (1973, pp. 12–13), in addition to the 10 olive jar sherds recovered earlier by Bullen and Griffin (1952, p. 59). Two iron nails were also recovered, but from disturbed contexts, as was an iron knife blade found in a refuse pit (Hemmings and Deagan, 1973, p. 20). The site is mentioned by Jonathan Dickinson (Andrews and Andrews, 1975).

Fernandina Cemetery is a midden site on Amelia Island, known to contain San Marcos Simple Stamped ceramics, a type of Mission red filmed pottery (Bullen and Griffin, 1952, p. 40; Smith, 1956, p. 134). Fernandina was built during the second Spanish Period (1815).

Fig. 13. The Spanish mission system of coastal Georgia, as interpreted by John Tate Lanning (after Lanning, 1935, foldout. Reproduced with permission of the University of North Carolina Press.)

Oldtown (N-9), which may be the same as the cemetery, contained Mission red filmed and olive jar sherds.

Bullen and Griffin (1952, pp. 55, 60) indicate that Spanish ceramics were found at the Jackson Creek (N-37) site, but do not elaborate. The site was called Ocotoque by the Spanish, and Sappataw by Jonathan Dickinson; both claimed it was a Spanish-Indian town.

Santa Buenaventura de Guadalquini

Mission Guadalquini is located on Jekyll Island, north of San Pedro. In 1675, 40 persons in addition to the missionary Fray Pedro de Luna lived at this site (Geiger, 1940, p. 129).

San Pedro de Mocamo

According to Lowery (1905, p. 289), a small garrison was established on Cumberland Island in 1569. From 1587 until at least 1689, Cumberland was the site of one or more Franciscan missions (Deagan, 1978, p. 101). The first, Mission San Pedro de Mocamo, was established by Fray Balthazar Lopez (Geiger, 1937, p. 55) at Tacatacuru village on the southwestern coast of Cumberland Island (Swanton, 1946, p. 187). Also known as the Dungeness Wharf site, Ca 14 (Walker, 1985, p. 67), this is apparently the same location as the subsequent Mission San Felipe. Lanning (1935, p. 8) notes that the mission of San Pedro de Mocamo was rebuilt in 1603 between Old Tower and Abraham Point. It survived there during the entire Spanish period in Georgia, although its first church had been destroyed in the Juanillo Revolt of 1597. The rebuilt structure was ready for mass by March 10, 1603 (Geiger, 1937, pp. 160–162). The Franciscan effort met such great success here that Lanning (1935, p. 239) lists 18 aboriginal villages under the control of San Pedro by 1600; Deagan (1978, p. 102) notes that 300 Christian Indians lived here by 1605. Mission San Pedro continued to be listed in Spanish records until 1659 (Deagan, 1978, p. 101), when the Tacatacuru moved south to San Juan del Puerto and St. Augustine.

Larson (1958a, p. 16) located an olive jar fragment on his surface survey of the site. Milanich (1971, 1972b) has also conducted surface reconnaissance at the presumed site of Tacatacuru village and San Pedro de Mocamo Mission. The town grid plan was apparently an elongated rectangle, with small, circular shell middens reflecting individual dwellings. To support his contention that this spot is indeed the site of a mission, he notes that it is near a serviceable waterway and remarks on the absence of Spanish deposits elsewhere on the island (Milanich, 1972b, pp. 289–290).

San Felipe de Athuluteca

This mission site has the same number (Ca 14) as Mission San Pedro (Walker, 1985, p. 67). Deagan (1978, p. 101) suggests that between 1650 and 1675, the Timucuan population of Cumberland Island had been relocated to the south, due to pressure from the Guale and Yamassee to the north. By 1675, a mission called San Felipe de Athuluteca was established on Cumberland Island (Swanton, 1922), probably to accommodate the relocated Timucua population returning to Cumberland Island from the south. The old mission has also been listed as San Pedro de Athuluteca, suggesting that San Pedro and San Felipe are one and the same (Milanich, 1972b, pp. 289, 291). This mission was probably active between 1675 and 1689, when it was last recorded by Compostela (Walker, 1985, pp. 68–69; Deagan, 1978, p. 102).

By 1695, San Felipe Mission was on Amelia Island, a mile or so from Santa María de los Yamasee (John Hann, personal commun.), whereas at its first mention on the 1655 mission list it was 54 leagues from St. Augustine, four leagues farther away than the Santa Catalina Mission. The 1965 Hita Salazar list places it farther south, six leagues south from Guadalquini (Jekyl Island) and below the Bars of Guadalquini and Ballenas, and three leagues north of the Isle of Macama (Cumberland Island). In 1678, San Felipe was sandwiched between missions on Guadalquini and Santa María (then on Cumberland Island) in 1675.

San Pedro y San Pablo de Puturibato

The mission site (Ca 7) was also known as the Brickiln Bluff Site (Walker, 1985, p. 67).

Fray Pedro Fernandez de Chozas had a chapel at the village of Puturibato on Cumberland Island in 1585. The site was eventually named Mission San Pedro y San Pablo de Puturibato, a *doctrina* (Lanning, 1935, pp. 70–71, 80).

Fort San Pedro

This fort was established by Menéndez de Avilés in 1566 to assure control of the Guale Coast (Smith and Gottlob, 1978, p. 6). A Spanish garrison established on Cumberland Island was abandoned in 1670 (Lowery, 1905, p. 355).

Additional Historic Sites from Cumberland Island

The Kings Bay locality is on the mainland across the channel from Cumberland Island. Several historic aboriginal sites have been discovered there which contain Spanish trade goods. None of these sites has been firmly correlated with a mission (see map of entire locality in Adams, 1985, pp. 2–3, 68). In fact, no missions have been reported from the mainland across from Cumberland, although a number of *visitas* have been mentioned (Deagan, 1978, p. 97).

In the bluff portion of the Kings Bay site (Ca 171A), a total of 161 olive jar sherds and 28 majolica sherds were distributed across the north and south blocks. In addition, 27 San Marcos red filmed sherds were recovered. A variety of aboriginal ceramics was present, but the Swift Creek type comprised more than 50 percent of the total (Saunders et al., 1985, pp. 243–246). Fig Springs Polychrome composed about 80 percent of the majolica sample. In addition, five San Luis Blue on White, and two Santo Domingo Blue on White sherds were recovered from this locality. One San Luis Polychrome, 10 Ichtucknee Blue on White, and 12 Fig Springs fragments have been reported from the Kings Bay site proper (Saunders et al., 1985, p. 248). In addition to the ceramics, the Kings Bay site also yielded Spanish artifacts in the form of two glass seed beads, and nine small yellow-green glass fragments (Saunders et al., 1985, p. 250). Numerous red filmed ware sherds were also recovered in the artesian well portion of the same site.

In the marsh area of the Devils Walkingstick site (Ca 177D) were found 10 olive jar sherds, plus a sherd from an Orange Micaceous ware vessel (DesJean et al., 1985, pp. 96–97).

THE PROVINCE OF GUALE

One can hardly say that the archaeological record of Apalachee and Timucuan missions is well known. But the picture darkens considerably in the northern province of Guale. For that reason, we must look more deeply into Guale archaeology than we have done above. We follow the traditional boundaries of the Guale coast, from the St. Andrews Sound to the St. Catherines Sound (Swanton, 1922, p. 81; Larson, 1978, p. 120; cf. Jones, 1978a, p. 178, fig. 17; see also fig. 13, this volume).

Santo Domingo de Asao

Historical Evidence: Sometime late in the mission period, the Guale towns of Asao and Talaxe were merged into a single *pueblo* on St. Simons Island, associated with a *doctrina* known both as Santo Domingo de Talaxe and Santo Domingo de Asao. The earlier villages of Asao and Talaxe must have been ("there is no doubt") on the lower Altamaha or one of its branches (Jones, 1978a, p. 206; see also García, 1902, pp. 189–193; Lanning, 1935, p. 154). The date of their consolidation is uncertain.

Mission Santo Domingo was built just prior to Governor Ybarra's visit in late 1604 (Lanning, 1935, p. 4). The convent of St. Dominic (Talaxe) existed in 1610 (Geiger, 1937, p. 234), but it is unclear whether it was on St. Simons Island. Santo Domingo de Talaxe was mentioned in documents by 1659, and by 1675 it was definitely located on St. Simons Island (Jones, 1978a, p. 207; see also fig. 13, this volume).

Archaeological Evidence: The archaeological picture is complicated by the relatively frequent mission moves throughout this area. As Larson (1980b, pp. 37–38) has noted, "Undoubtedly, there was more than one mission in the McIntosh County area during most of the Spanish Period; in addition to the mission on Sapelo there must have been a mainland mission. The most logical site for

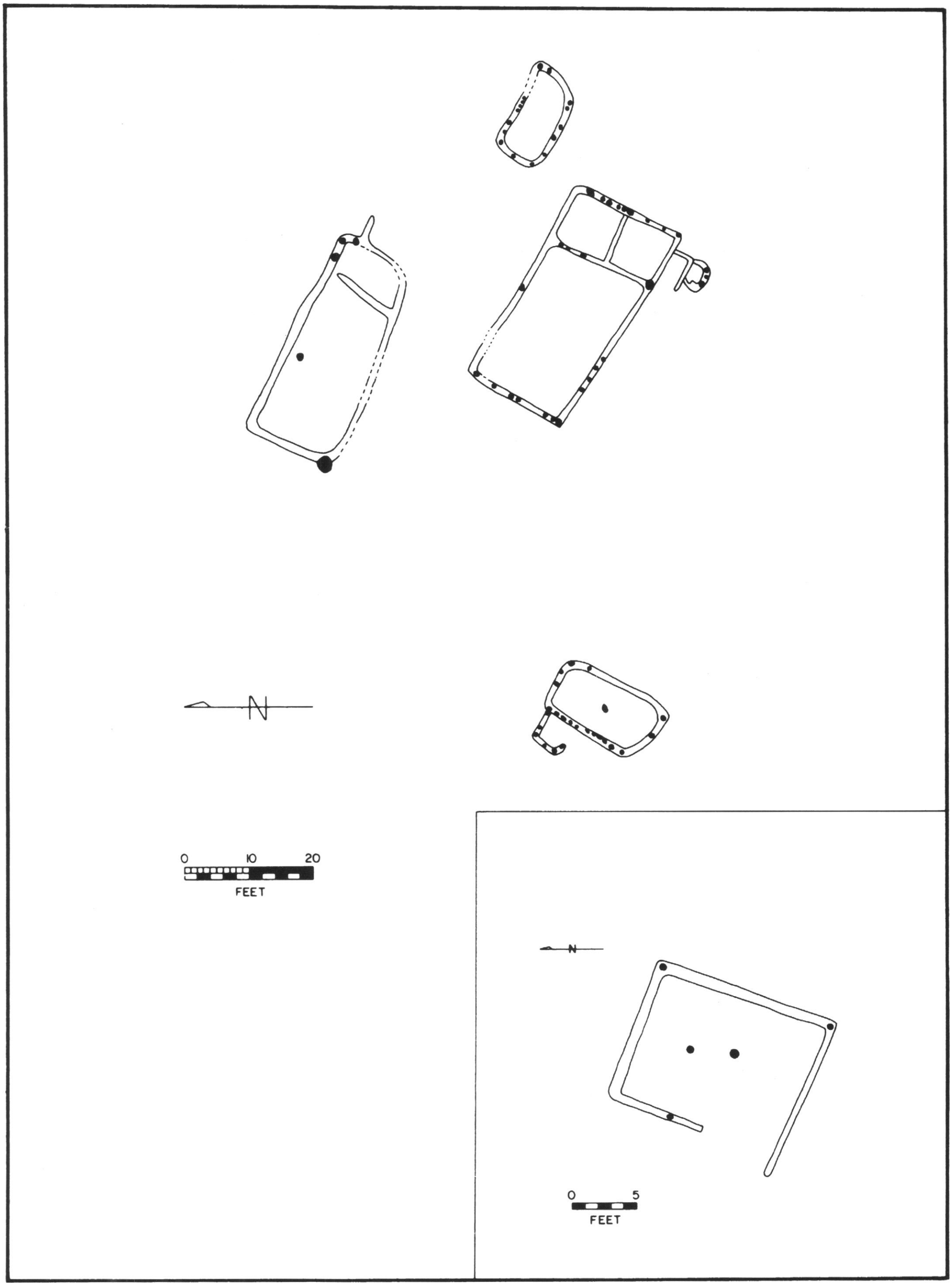

Fig. 14. Wall trench outlines of Spanish period aboriginal domestic structures at Fort King George (after Larson, 1980b, fig. 3). Drawing is based upon incomplete tracing of a map by Sheila Caldwell, and scale may not be correct. The structure in the box was excavated by Lewis Larson in 1966 (reproduced with the permission of West Georgia College).

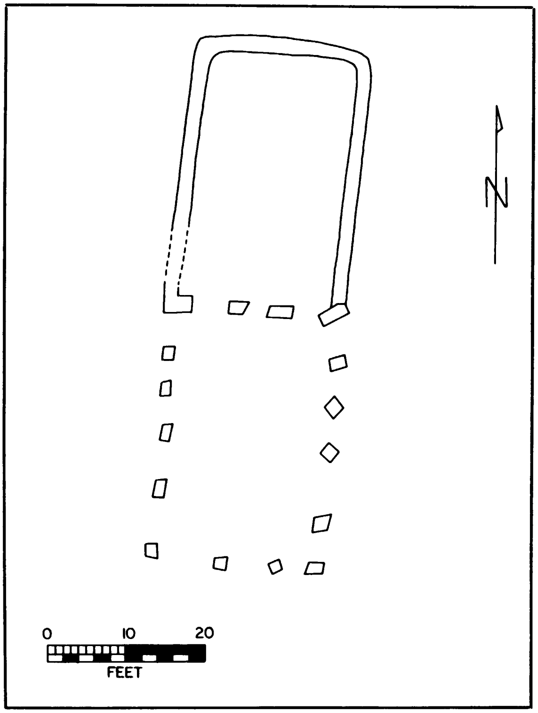

Fig. 15. Partial plan of presumed Spanish structure at Fort King George (after Larson, 1980b, fig. 5). As in figure 14, this drawing is based upon an incomplete tracing of a field map by Sheila Caldwell. Not all of the excavated features are shown, and scale may be inaccurate (reproduced with the permission of West Georgia College).

the mainland mission would have been on the [Darien] bluff at the place that was to be occupied by Fort King George."

Excavations have been conducted in this vicinity for nearly 50 years. The Darien Bluff site (McI 10) is at the confluence of Lower Bluff Creek and Black Island Creek at the mouth of the Altamaha River. In his M.A. thesis, Joseph Caldwell reports the discovery of coffins and remains of 14 white men and historic Indians. One hundred olive jar sherds were also recovered. Structural remains were all attributed to aboriginal buildings (Caldwell, 1943, p. 27).

Caldwell (1943, p. 30) states that, although the fort was not located, they did recover ". . . notable . . . quantities of fallen fired wall (plaster from mud daub structures which had been burned) . . . ." He believes the daub was from Guale structures, but admits they could also have been Spanish or later; figure 12 shows an unbroken clay floor adjacent to the fired wall. The wall had been tempered with Spanish moss. Late style olive jar sherds (Goggin, 1960, p. 21) occurred with aboriginal ceramics in the upper surface of the floor and in the layer of wall plaster above it (Caldwell, 1943, p. 35).

Sheila Caldwell continued excavations at Darien Bluff in 1952. She found two kinds of houses (Caldwell, 1953, p. 31; 1954, pp. 13–16; see also figs. 14 and 15, this volume). Shallow wall trenches and small round postholes marked the positions of 15 houses. The earliest were interpreted as aboriginal mud daub constructions, without trace of European influence. The later houses were "more neatly laid out, the shape and distribution of roof supports indicating the use of ridge poles in roof construction." Some of the post holes formed "a large frame building, 35 feet wide by 70 feet long, enclosed by a wall to which were attached two smaller buildings. Behind the central building and within the enclosure was a small Indian type house." Beside both kinds of houses were shallow pits in the ground "perhaps not dug especially for the storage of refuse, but filled with trash through the passage of time" (Caldwell, 1954, pp. 15–16).

Figures 14 and 15 depict apparently Spanish period houses excavated by Sheila Caldwell and Lewis Larson (after Larson, 1980b, figs. 3, 5). Larson offers the following comments about these structures (and those excavated at the north end of Harris Neck; see below):

> [these] are surely domestic structures, in all likelihood houses, from the seventeenth century. These Indian Buildings are not large and all provide unquestioned association of aboriginal sherds and Spanish sherds with the construction features . . . . The floor plans are characterized by walls that divide the interior space into rooms. Some of these walls partition off corners of the house into separate rooms, others cut across the center of the house creating two equal sized rooms. Entries were apparently located where short walls jut out from the exterior wall line of the house in order to form a covered passage. There do not appear to be any structures that contained interior hearths. (Larson, 1980b, p. 40)

The postholes and associated features contained only aboriginal and Spanish artifacts: red filmed bowls, cups, pitchers, and plates, 200 fragments of majolica that appear to date to the middle of the 17th century, several hundred olive jar sherds, and two whole olive jars.

Parts of the 18th century British cemetery at Fort King George were also excavated, as some of the graves intruded into the Spanish period building. No aboriginal burials were encountered.

S. K. Caldwell (1954, pp. 14–15) believes that the Spanish component at Fort King George represents the mission site of Santo Domingo de Talaxe. She attributes the total absence of religious paraphernalia, valuables, and personal ornaments to an "orderly evacuation"; there was no sign of burning.

Kelso (1968, p. 14) reports on additional excavations and survey at the Ft. King George site, including the foundation of another building, a "temporary" structure which contained olive jar sherds, a Spanish iron knife, and the buttplate of a heavy Spanish musket. Kelso (1968, p. 6) suggests that the Caldwell (1954) excavation unearthed a "Spanish Mission building and several Indian structures" in the southwestern section of the site.

Some of the Spanish materials recovered from this site are presently (May 1986) on exhibit at the Fort King George Museum: two dozen majolica sherds, two nearly complete olive jars, a sword hilt and blade fragment, a silver jingle, ten large glass beads, and a Spanish coin. In one case, Spanish ceramics and a human skull (catalog no. FKG121) were labeled: "Artifacts evident of Spanish occupation include a Spanish olive jar and skull of whom many believe to be Father Pedro de Corpa, massacred at the Tolomato Mission by the Guale in September, 1597."

The following is a catalog card entry in the files of the Fort King George Museum:

> FKG.52-54.1.121—human skull received 1952–54, donor, Mrs. Sheila K. Caldwell, archaeologist . . . human skull found on the bank of the river in what may have been the Guale Indian trash pile. The skull is believed to be that of the Franciscan priest, Father Corpa. Father Corpa was beheaded by the Indians in the 1590s. His head was placed on a stake in a trash pile and the rest of his body was fed to the dogs . . . Mediterranean type. Condition stable.

We have been unable to find additional confirmation relating to this potentially important find (see also Wyse, 1985).

To date, no mission sites are known on St. Simons Island or the adjacent mainland, although Larson (1980b, p. 38, fig. 1) reports Spanish period sites near the St. Simons lighthouse and at Cannon's Point. Additionally, there is a mortuary complex on the island which was in use during the earliest period of Spanish contact with the Guale.

At Couper Field (on St. Simons Island), an apparent charnel house from the "Savannah" period (in this dating, A.D. 1250 to A.D. 1540) contained a dog burial with a musket ball between its ribs (Wallace, 1975, p. 106). Milanich (1977, p. 140) attributes the burial to the early 16th century (cf. Crook, 1986, p. 71). The Couper Field association is also an important link extending Savannah period ceramics into the historic period (see also Crook, 1984; cf. DePratter, 1979; Pearson, 1977b, p. 76).

The Taylor Mound (GN 55), located at the northern end of St. Simons Island, has also been assigned to the early historic period, between about A.D. 1500 and 1600 (Wallace, 1975; Milanich, 1977, p. 140; Pearson, 1977b, pp. 74–83). Thirteen burials were recovered in this late Savannah period mound; three intrusive burials were associated with an interesting array of historic artifacts. Associated with Burial 2 were 10 perforated pearls, 22 shell beads, 6 tubular glass beads (3 Nueva Cadiz Plain, 3 Nueva Cadiz Twisted; see also Smith and Good, 1982, p. 47). Burial 10 contained burial shroud stain, nine copper *maravades* coins (dating to the 16th century) placed around the skull and spaced with *Olivella* beads, shell beads and perforated pearls around the wrist, an iron axe (celt form), a rectangular iron axe, an iron awl or punch, and an iron knife. Two iron spikes were found nearby, unassociated with the burial. Subsequent excavations at the Taylor Mound (Wallace, 1975, pp. 58–59) turned up a brass spike, a round ship's spike, two nails, and another spike, all found in a cache with Irene and San Marcos ceramics (see also Fairbanks, 1985, pp. 130–131).

The Kent Mound, on the south end of St. Simons Island (Pearson, 1977b, p. 81), contained a chevron bead and an iron knife associated with San Marcos (protohistoric) vessels; Smith and Good (1982, p. 47) also mention beads. Cook and Snow (1983, p. 9) believe that the Latin cross element in the Southeastern Ceremonial complex, observed on a Kent Mound Irene period vessel, was inspired by European culture.

Milanich (1977, p. 140) suggests that a Sutherland Bluff period (A.D. 1625–1680) village site on St. Simons Island was abandoned when the mission villages were being consolidated and, presumably, moved to the south end of the island.

San José de Zápala

Historical Evidence: Mission San José de Zápala was initially established by Fray Diego Delgado as a *visita* in 1605 (Lanning, 1935, p. 5). Fray Oré visited Sapelo Island in December 1616, ". . . we descended by a larger river than the Tagus, in canoes, to the people of the land of Guale. We visited the towns and the six priests in the convent of San José de Zapala where [the Indians] had martyred one of our five martyrs" (Geiger, 1936, p. 130; see also Larson, 1980b, p. 36). This river was almost certainly the Altamaha. Larson (1980b, p. 36) notes that several *visitas* must have been established nearby, and that Oré's statement "offers a strong argument" that Sapelo was the site of a mission at the time of the rebellion of 1597. By 1675, the mission had about 50 persons (Larson, 1980b, p. 37). In the 1680s, after abandoning Santa Catalina de Guale to the north, Francisco Fuentes and his men retired to Zápala.

Archaeological Evidence: Larson (1952, p. 2) chooses High Point on Sapelo Island as a "good candidate" for the location of Mission San José de Zápala, but evidence of Spanish period architecture is lacking; only ceramics are available to document the Spanish settlement here. Elsewhere (Larson, 1953, pp. 7, 26) he notes the presence at High Point of glazed bricks or tiles, coated with a thick green glaze. Larson speculates that the tiles and associated sherds are of Spanish origin and suggests that "Sapelo Island is perhaps the most promising area for the investigation of Spanish occupation on the Georgia coast" (Larson, 1980b, p. 45).

The West Georgia College survey of 1974–1979 found some limited concentrations of Spanish pottery, including olive jar sherds and very little majolica at Kenan Field, Bourbon Field, north of the Shell Ring, and at High Point. The location of these sites coincides with the structural remains noted on the DeBrahm map of Sapelo dated 1760. He speculates that these were British settlements and that they were placed in areas that had been cleared earlier or were former Spanish fields (Larson, 1980b, p. 38); as noted below, a similar correspondence exists on the DeBrahm map of St. Catherines Island. DeBrahm also mapped an " 'oranges and limes garden' at the extreme northeastern corner of the [Sapelo] island at a point overlooking the marsh separating Sapelo from Blackbeard Island" (Larson, 1980b, p. 44).

At Kenan Field, massive architectural elements have been found, but they are associated with Savannah period ceramics and, although apparently constructed during the early Spanish period, do not seem attributable to Spanish activities (Morgan R. Crook, personal commun.; Larson, 1980b, p. 40). Crook (1980, p. 94) describes these earthworks, with their rectangular post holes, and suggests that they may be Spanish, but found no direct evidence.

At Shell Ring no. II, Simpkins (1980, p. 68) notes tin and lead glazed European ceramics, nails, and lead shot (?). The upper levels of the disturbed ring midden had a historic component consisting of tabby, nails, and olive jar and Irene sherds.

Nuestra Señora Guadalupe de Tolomato (1595–1658)

Historical Evidence: Pedro Ruíz established the Tolomato mission in 1595. The Juanillo Rebellion began at Tolomato, where Friar Pedro de Corpa was stationed, then spread to Tupiqui, where Fray Blás Rodriguez lived. Both missions were destroyed in the rebellion, and only Tolomato was rebuilt, by Fray Diego Delgado, 10 years later (Lanning, 1935, p. 3). The 17th century Tolomato mission at Espogache served both villages:

"As to the location of Espogache there can be no doubt. It overlooks the Bar of Espogue, now Doboy Sound" (Lanning, 1935, p. 4).

Swanton (1922, p. 82) notes that in one account, Tolomato is two leagues from Guale and in another on the mainland near the bar of Sapelo. Jones (1978a, p. 207) places the two principal Guale towns of Espogache and Tupiqui along the North or South Newport rivers.

Lanning places old Tupiqui Mission in northeastern McIntosh County, directly inland from Oldnor Island and Cedar Hammock (1935, p. 7). Jones (1978a, p. 205) sites Tolomato on the Sapelo River, an undetermined distance upstream (see also Ross, 1926, p. 178, fn. 12); he goes on to suggest that "Floyd's analysis of these locations (1937, pp. 37–38) and others is not a dependable guide" (Jones, 1978a, p. 205, fn. 88).

ARCHAEOLOGICAL EVIDENCE: Relevant archaeological evidence comes from three major areas: Sutherland Bluff, Pine Harbor, and Harris Neck.

The Sutherland Bluff site, located on the bank of the Sapelo River between the White Chimney River and the Bororo River—about 3 mi due south of Shellman Bluff settlement—is the type site for the *Sutherland Bluff Complex,* the archaeological manifestation of the mission period Guale (Larson, 1978, p. 121).

Although part of the Sutherland Bluff site had eroded into the channel, Larson found numerous postholes underlying the cultural layer (Larson, 1953, p. 11) containing charcoal, animal bone, lithics, numerous aboriginal sherds and several Spanish sherds. An olive jar sherd was resting atop an Altamaha sherd in a posthole (Larson, 1953, p. 12). A Fig Spring Polychrome sherd was also reported. Larson (1953, pp. 30–31) thinks that Sutherland Bluff was probably a *visita* but "as to the mission which was located there, it was impossible even to hazard a guess."

Larson (1978, p. 122) defined his *Pine Harbor Complex* based on evidence from Pine Harbor, a site that covers more than a mile of the high ground along the marshes bordering the northern bank of the Sapelo River near Pine Harbor. Since then, Cook (1980, pp. 38–40) reported intrusive burials in a log tomb associated with glass beads, nails, and several brass finger rings from the site; the beads are thought to date to the late 16th or early 17th centuries.

To the north, a variety of archaeological sites at Harris Neck have produced a wealth of Spanish period remains. Larson (1953, 1958a) reported on excavations at the Thomas Landing site (originally recorded as McI 52, then as McI 42 by Fryman et al. [1979, p. 91] and Braley et al. [1986, p. 18]). The Thomas Landing site, on the northeastern corner of Harris Neck is a huge site overlooking the South Newport River, but the Mississippian and contact period occupations are rather meager: "I wouldn't characterize the site as a village during either phase. At most the southeast portion of McI 42 functioned as a small hamlet during the Sutherland Bluff period. The Thomas Landing site is situated nearly a mile to the north" (Chad Braley, personal commun.). Here, Larson (1958a, p. 14) recovered Fig Springs Polychrome, Ichtucknee Blue on White (or possibly Blue on Blue), Columbia Plain, and olive jar sherds (see also Goggin, 1968).

Larson's excavations at the Thomas Landing site revealed outlines of at least six aboriginal structures of the Sutherland Bluff period (fig. 16). These rectangular structures are aligned on a grid system approximately 10° west of north (Larson, 1980b, p. 39; see also Fryman et al., 1979, p. 91). Braley et al. (1986, p. 18) compute a Mean Ceramic Date of 1614.8 for the small ceramic assemblage, suggesting that Thomas Landing may have been a key settlement in the Espogache-Tupiqui chiefdom, which Jones (1978a, fig. 17) thinks centered around the estuaries of the South Newport River.

C. B. Moore (1897) partially excavated two small mounds on the north end of Harris Neck, but precise location of his excavations is unknown. Braley et al. (1986, p. 16), think that Moore's mounds might have been part of the Thomas Landing site (see also Fryman et al., 1979, p. 41).

The Harris Neck Airfield site (originally reported by Larson [1953] as McI 51, subsequently changed to McI 41; see Fryman et al., 1979, p. 41) contains an 88 ha scatter of oyster shell, aboriginal ceramics (Irene and Altamaha), plus Spanish pottery including olive jar sherds. (Fryman et al., 1979, p. 89).

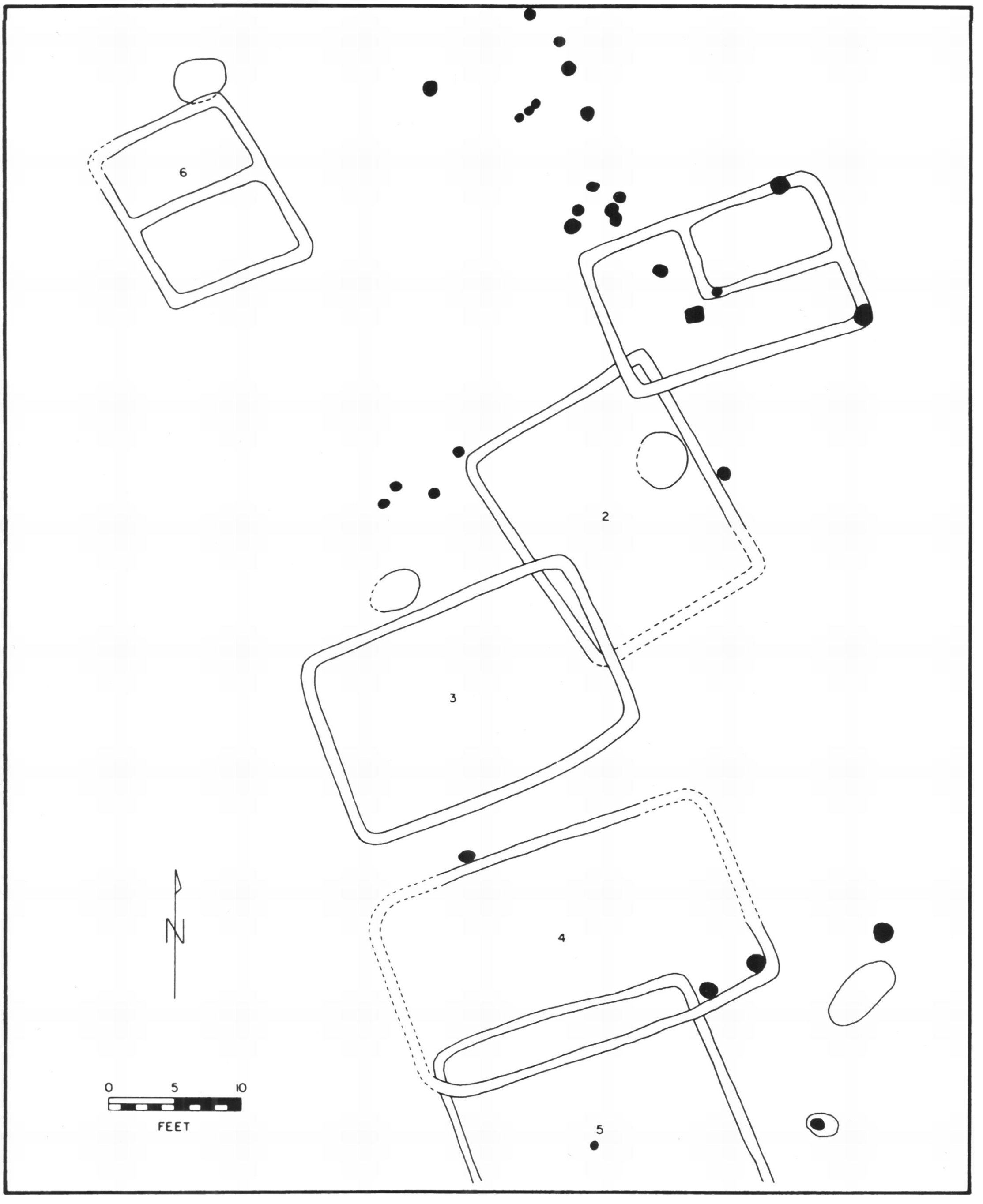

Fig. 16. Wall trench outlines of Spanish period aboriginal domestic structures found on the north end of Harris Neck (after Larson, 1980b, fig. 2). The black dots represent post holes (reproduced with the permission of West Georgia College).

Braley et al. (1986) also report the presence of Columbia Plain majolica, "honey colored ware," a Spanish spike, and a light blue glass bead. The overall extent of this site is somewhat misleading, since it combines one portion on the east side of the wildlife refuge fence, and includes the west portion as part of McI 41: "I would estimate the very diffuse Sutherland Bluff occupation covered an area of no more than 5 ha" (Chad Braley, personal commun.).

McI 53 is a site slightly to the south of McI 52, between the marsh and the air strip on the eastern side of the northern end of Harris Neck; eight olive jar sherds were found here (Larson, 1953, p. 5).

At the Lebanon Plantation, 3 mi west of Harris Neck Airport on the South Newport River, is McI 83, a largely prehistoric site, but one Columbia Plain sherd was found there (Larson, 1953, p. 9).

The nearby Gould Landing site was first recorded by Larson (1953, pp. 5–6) as McI 56, renumbered as McI 46, then grouped with McI 41 by Fryman et al. (1979, p. 92). Presumably this designation also includes the excavations at McI 41 described by Braley et al. (1986, pp. 18–20). Drucker (1982) tested part of the protohistoric component of McI 41, recovering daub fragments, olive jar sherds, and an assortment of aboriginal materials. An uncorrected radiocarbon date of 230 ± 50 B.P.: A.D. 1720 was obtained from shell recovered from a feature containing an olive jar sherd (cited in Braley et al., 1986, fig. 47).

Cobb (1984) conducted further excavations here, directly leading to investigations by Braley et al. (1986), who reported three additional radiocarbon dates for McI 41. A date of 550 ± 70 B.P.: A.D. 1400 (Beta-10842) was obtained on wood charcoal associated with Irene/Pine Harbor ceramics. Another charcoal sample from a large midden-filled pit dated to 520 ± 60 B.P.: A.D. 1430 (Beta-10841). Of particular interest is a date of 300 ± 70 B.P.: A.D. 1650 (Beta-10840), obtained on charred corn recovered from an ovoid midden pit.

A 1979 survey of McI 46, on the southern tip of McI 41, recovered three additional olive jar fragments (Fryman et al., 1979, p. 89).

Site McI 43 (labeled McI 53 in the Georgia State files) is located on the eastern side of the tip of Belleville Point and contains a number of thick glazed sherds in association with Altamaha Complicated Stamped ware (Fryman et al., 1979, pp. 89, 92). Fryman et al. (1979, p. 89) list eight green glazed Spanish sherds and a single olive jar sherd from this site. Braley (personal commun.) thinks this site contains the most intensive Guale occupation on the north end of Harris Neck.

McI 59, on the northeastern part of Belleville Point, produced three Spanish olive jar sherds (Larson, 1953, p. 6); a burial mound roughly 10 m in diameter was in the immediate vicinity of the midden.

Southward, on the north end of Creighton Island is McI 81, originally excavated and described by Moore (1897, pp. 28–43). Although two associated mounds contained no historic period materials, village middens contained a San Luis Blue on White sherd (Goggin, 1968, pp. 77–78; see also Larson, 1980b). Larson (1953, p. 17–21) also lists Altamaha Complicated Stamped ware, red filmed Check Stamped sherds, undecorated red film ceramics, and Spanish pottery including Fig Springs Polychrome and olive jar sherds from this site.

Larson (1953, p. 10; 1980b, p. 38, fig. 1) reports a Spanish period site on Wahoo Island, where three olive jar fragments were recovered.

To summarize these somewhat confusing data, it may be, as suggested by Jones (1978a, p. 205, fn. 88), that the Sutherland Bluff site (McI 55) correlates with Mission Tolomato; but no structural evidence of such a mission settlement has been noted so far, and at least today, the midden scatter is extremely thin, with many of the artifacts deriving from the 18th century British colonial occupation (Braley, personal commun.).

Larson (1952) suggests that another, as yet unidentified, mission was located on Harris Neck. If so, then the rectangular structures at Thomas Landing may be associated with the Mission *pueblo*. Alternatively, the Harris

Neck complex may comprise one of the principal aboriginal towns of the Espogache-Tupiqui chiefdom, which Jones (1978a, p. 207, fig. 17) has placed nearby. On the other hand, it may be that the site on Creighton Island was a main town of the Tolomato-Guale chiefdom, which Jones (1978a, fig. 17) had ascribed to the Sapelo Sound area (see also Braley et al., 1986, p. 18).

Yoa

Historical Evidence: The northernmost Guale *visita* was located at Yoa, which Lanning (1935, p. 13; see fig. 13, this volume) plots on the mainland, about two leagues up the Medway River, across from St. Catherines Sound.

Archaeological Evidence: The Medway River today defines the boundary between Bryan and Liberty counties. Setting aside the St. Catherines Island finds, subject of this monograph, two other occurrences of early Spanish materials are known from Liberty County, both of them on Colonel's Island. At Maxwelton Plantation (Li 9; previously recorded as Lb 1 and Lb 2), Larson (1952, 1953, p. 10) recovered 11 majolica sherds. On the southeastern side of the same island, he found majolica in a shell concentration, designated as Li 391 (previously recorded as Lb 3).

No 16th/17th century Spanish materials have been reported from Bryan County.

Ossabaw Island

Historical Evidence: Lanning (1935) thought that the Guale village of Asopo was situated toward the south end of Ossabaw Island, but he does not list a *visita* on this island. Reinterpreting the same evidence, Jones (1978a, p. 203), however, suggests that the principal town of Guale, visited by Menéndez de Avilés in 1566, may have been located somewhere along the Bear River (on the western shore of Ossabaw Island). Jones believes that the town of Guale was then moved south to St. Catherines sometime within the following two decades.

Archaeological Evidence: No evidence of Spanish period architecture is known from Ossabaw Island; only ceramic evidence is available to document Spanish period settlement here.

DePratter (1974) summarized the available materials, noting that "since a mission once existed on Ossabaw, a large Spanish period site should be present somewhere on the island." But to date, only a single Altamaha period site (Oss 6) has been found. Oss 6, located on a hammock adjacent to the junction of Burchead Creek and Cane Patch Creek, is a dense shell midden up to 0.5 m thick, covering the entire western third of the hammock. A collection belonging to Mrs. West contains a single Spanish olive jar sherd, plus ceramics spanning the Altamaha, Irene, and Wilmington periods.

Oss 19 is located in the South End Field adjacent to Newell Creek. This large site occupies a constantly eroding bluff, along which postholes and pits are visible. Limited testing unearthed early 19th century materials, as well as a Spanish olive jar and a variety of early prehistoric pottery.

Santa Catalina de Guale

Historic Evidence: In his review of early French and Spanish sources, John Swanton concluded (1922, pp. 50–55) that the principal town of Guale and its associated mission was initially established on St. Catherines Island by Menéndez de Avilés in the spring of 1566.

But in a recent assessment of the same evidence, Jones (1978a, p. 203) argues that prior to 1575, the town of Guale was *not* on St. Catherines Island, but rather to the north, either near Skidway Island or on Ossabaw. There is no question, however, that by 1587, both the Guale chiefdom and the associated Franciscan mission existed somewhere on St. Catherines Island (e.g., Bolton and Ross, 1925; Ross, 1926; Gannon, 1965, p. 39; Lyon, 1976, p. 154; Jones, 1978a, p. 204).

Historian John Tate Lanning tried to pin down the location of Santa Catalina de Guale more precisely, based largely upon an account by Pedro de Ybarra, who visited Guale in 1604:

> The Señor General and Father Fray Pedro Ruíz whom he had in his company came ashore and the said head of Guale and other chiefs and vassals of his came to the landing place to receive the Señor General and they saluted him as was their custom and kissed the hand of said

> Father Fray Pedro Ruíz. Then the Señor General marched with the infantry in order to the town of Guale which was a little more than half a league from the landing place and on arriving at the town, many Chiefs, Indian vassals of the said head, Don Bartolome came to salute the Señor General and all of them kissed the hand of Father Fray Pedro. (translation from the notes of Mary Ross; see also Lanning, 1935, pp. 143–144)

Assuming that Ybarra and Ruíz marched one-half league *inland,* Lanning speculated that Santa Catalina lay "half a mile inland, opposite Oldnor Island near the first stream of any size that breaks the island as one goes north from Sapelo Sound" (Lanning, 1935, pp. 7, 143–144). Lanning therefore plotted the mission site near the extreme southern tip of St. Catherines Island (fig. 13).

A copy of the 1604 Ybarra account is also preserved in the Mary Letitia Ross Papers at the Georgia Department of Archives and History (from which the above translation was taken; see also Mendelson, 1979). In the margin (at an unknown date), Mary Ross had written: "was landing at oyster footing factory? Is it ½ l. to main big house?" She was obviously referring to the dock and oyster boiler near South End Settlement (see Thomas et al., 1978, p. 211; see also fig. 2, this volume). Assuming 1 league to be 2.5 mi. (4.0 km) in length (e.g., Boyd et al., 1951, p. 11), the distance from this south end landing to the (now known) site of Santa Catalina is exactly 0.5 leagues.

That is, Mary Ross assumed (correctly, we now think), that the Ybarra account implied that the landing spot was near the oyster footing and that the 1604 expedition marched one-half league along the shore (rather than inland, as Lanning had assumed).[1]

Marmaduke Floyd reached a similar conclusion in 1937, based on different evidence. Relying heavily on the Dunlop account (cited previously), Floyd argued that

> on St. Catherines Island the "great settlement" mentioned by William Dunlop, who saw the abandoned place in 1687, was located upon that part of the island now known as Persimmon Point. Upon many other parts of the island there are evidences of large village sites and land much used by the Indians, but the most extensive signs of Indian occupation are on Persimmon point and vicinity .... The great Indian old fields on St. Catherines which were viewed by Dunlop in 1687 had probably been cultivated and kept open by the Indians for ages before; and the forest growth in the Indian old fields on this and the other islands and the adjacent mainland on the coast can be readily distinguished from the primeval forest .... St. Catherines Island is mentioned here because of its use by the Spaniards as the capital of Guale for a long time, but no claims appear to have been made that ruins of Spanish missions are to be seen there. (Floyd, 1937, p. 46)

Finally, the DeBrahm map of St. Catherines Island, dated 1760 (fig. 17), shows a structure (a "hous") near Wamassee Creek. Although it seems likely that these buildings were erected after Oglethorpe's founding of the Georgia colony, the positioning is precisely where we later found the ruins of Mission Santa Catalina de Guale.

A similar problem seems to exist on Sapelo Island. Larson (1980b, p. 37) notes that structures on the DeBrahm map of Sapelo Island "are largely coincident" with the large sites known to contain Spanish ceramics. Larson suggests that post-1733 buildings might have been erected in areas of clearing or old fields.

ARCHAEOLOGICAL EVIDENCE: In 1952, as part of the Georgia Historical Commission search for 16th/17th Spanish missions sites along the Georgia Coast, Lewis Larson visited St. Catherines Island. Among the "good candidates for the location of a mission," Larson (1952, p. 2; see also 1953, pp. 11, 31) lists "Wamassee Head on St. Catharines as the location of Santa Catherina de Guale," but he cautions that "no final and conclusive identification of a mission site can be made until adequate excavation ... has been undertaken." He also notes that its location, near Persimmon Point, agrees with Floyd's earlier (1937) suggestions about Santa Catalina.

Site form Li 13 (formerly Lb 8), prepared by Larson on August 12, 1952, reports "a series of shell mounds [that] ranged along the marsh edge [of Wamassee Head]. They are

[1] There is another possibility, also consistent with the 1604 Ybarra account. The primary Spanish landing could have been to the north, at Persimmon Point (fig. 2). The distance from a Persimmon Point landing spot to the site of Santa Catalina is also exactly 0.5 league.

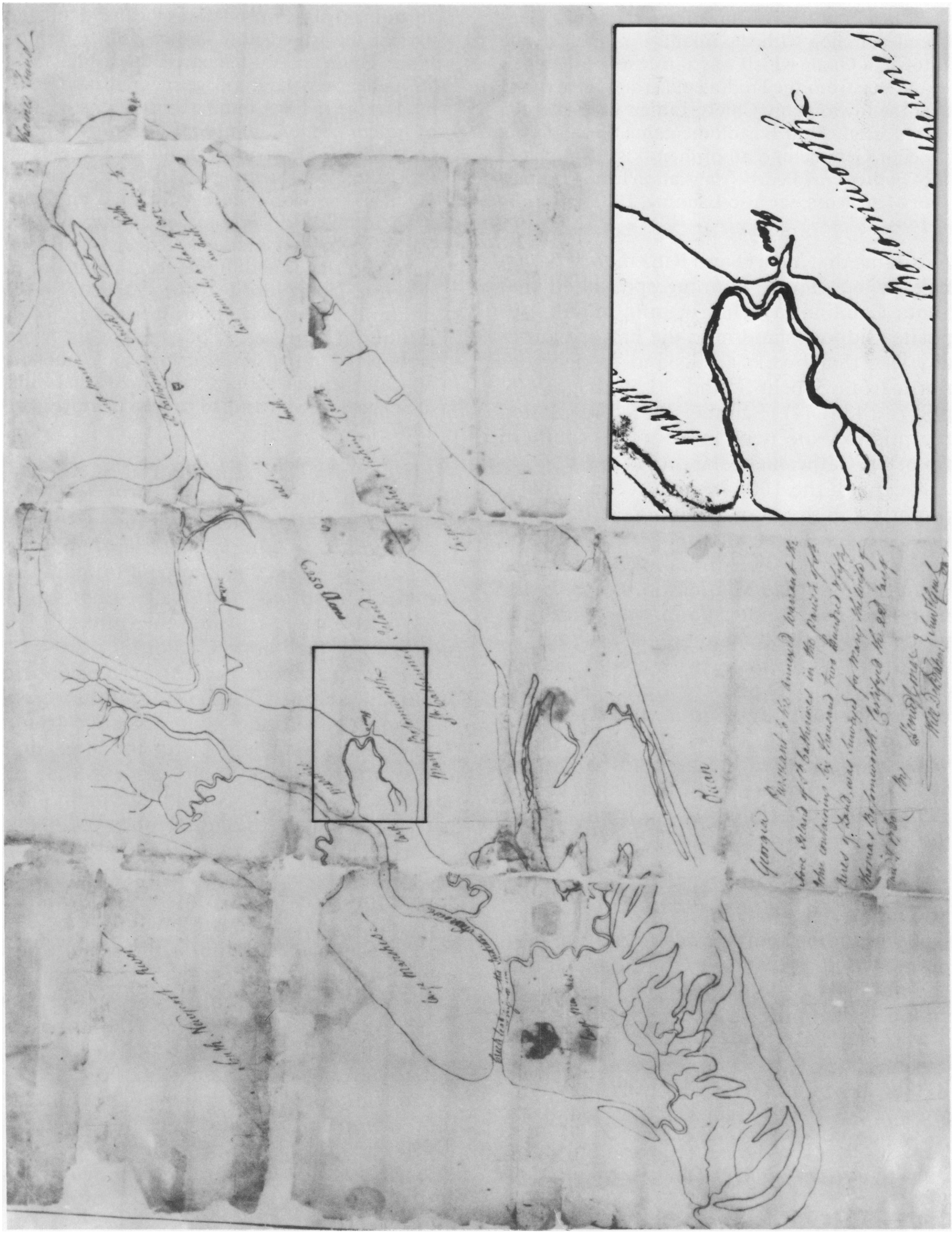

Fig. 17. The 1760 DeBrahm map of St. Catherines Island; note the *hous* apparently standing at the site of Santa Catalina de Guale (courtesy Georgia Department of Archives and History).

approximately 3′ high and 50′ in diameter." Larson notes recovery of Spanish and aboriginal sherds. To our knowledge, this is the first time geographic and historic conjecture was subjected to hands-on archaeological investigation.

Three years later, this site was "rediscovered" by Mr. John W. Bonner, Jr. and Ms. Carroll Hart, who had been retained in 1955 by Mr. Edward John Noble to prepare a historical overview of the island (Hart and Bonner, 1956). Apparently unaware of Larson's research, Hart and Bonner became curious whether any signs of the mission could be found. Relying heavily on the 1687 Dunlop account, Bonner and Gaffney Blalock explored the coast southward from Persimmon Point. Although observing several archaeological sites in the area, they were particularly impressed with the quantity of historic period sherds washing out of the Wamassee Creek cut (John Bonner and Gaffney Blalock, personal commun.); they photographed and collected several olive jar and majolica fragments from the creek bed, correctly pinpointing Wamassee Creek as the general location of Santa Catalina de Guale.

Larson returned in 1959 to Wamassee Creek to conduct the first archaeological investigations in the vicinity of Mission Santa Catalina (fig. 18). The excavated sample contained evidence of a wide range of aboriginal occupations, but most of the sherds were aboriginal ceramics dating to the Spanish period. Larson also recovered sherds of the characteristic types of Spanish majolica ware that had been found on known Spanish mission sites in Florida; large fragments of Spanish olive jars were the most common evidence of Spanish occupation. Although iron was not common, he found several hand wrought nails identical to the types found on the excavated sites of San Luis de Apalachee and La Concepción de Ayubali in Florida (cf. Griffin, 1951; Morrell and Jones, 1970). No structural evidence of Santa Catalina emerged in these limited tests.[2]

[2] Dr. Larson has generously allowed us to examine the materials recovered in the 1959 test excavations; these data will be reported in a subsequent volume of this series, in conjunction with more recent AMNH excavations in the immediate area.

Not long thereafter, in April 1965, at the request of Mr. Alger B. Chapman (Executor of the estate of Edward John Noble), John W. Griffin (then Staff Archaeologist, National Park Service) visited St. Catherines Island. Griffin had examined the artifacts and fieldnotes resulting from Larson's excavations at Wamassee Head, and the primary purpose of his visit was to gather information regarding the eligibility of the site of Santa Catalina Mission as a Registered National Historic Landmark. Griffin ultimately prepared two unpublished reports: a general overview of the potential for archaeological investigations on St. Catherines Island (Griffin, 1965a), and a consideration of the specific whereabouts of Mission Santa Catalina (Griffin, 1965b):

> St. Catherines Island is richly endowed with archaeological resources .... The first need is for a detailed and systematic archeological survey which would pin-point all locations of human activity, test them to determine their depth and extent and cultural affiliation, and analyze the materials from surface collections and tests to establish a program of investigation of the most significant remains .... Further work on the site of Santa Catalina mission is in some respects of the highest priority .... (Griffin, 1965a, pp. 10–11)
>
> It is not known at this time whether all of the mission settlements of the Spanish period were in the same location on the island. There is a possibility that the earlier, 16th century, location was toward the north end of the island, but this is not an established fact.
>
> The location of Santa Catalina mission in the 17th century and at the time of its abandonment may, however, be fixed with assurance. The description of Captain Dunlop ... [cited above] is readily interpreted. The "ffurther point of that Isle" is Persimmon Point [see fig. 2] .... From that point southward along the inner side of the island for over a mile, to the area known as Wamassee Head, abundant shell midden refuse is found, dominated by Indian potsherds of the correct time period for the mission settlement ....
>
> Dunlop's description indicates an extensive settlement matching the present widespread midden deposits [near Wamassee Creek]. Given this condition and the perishable nature of the structures themselves—they were of poles and thatch, not masonry—it can readily be seen that

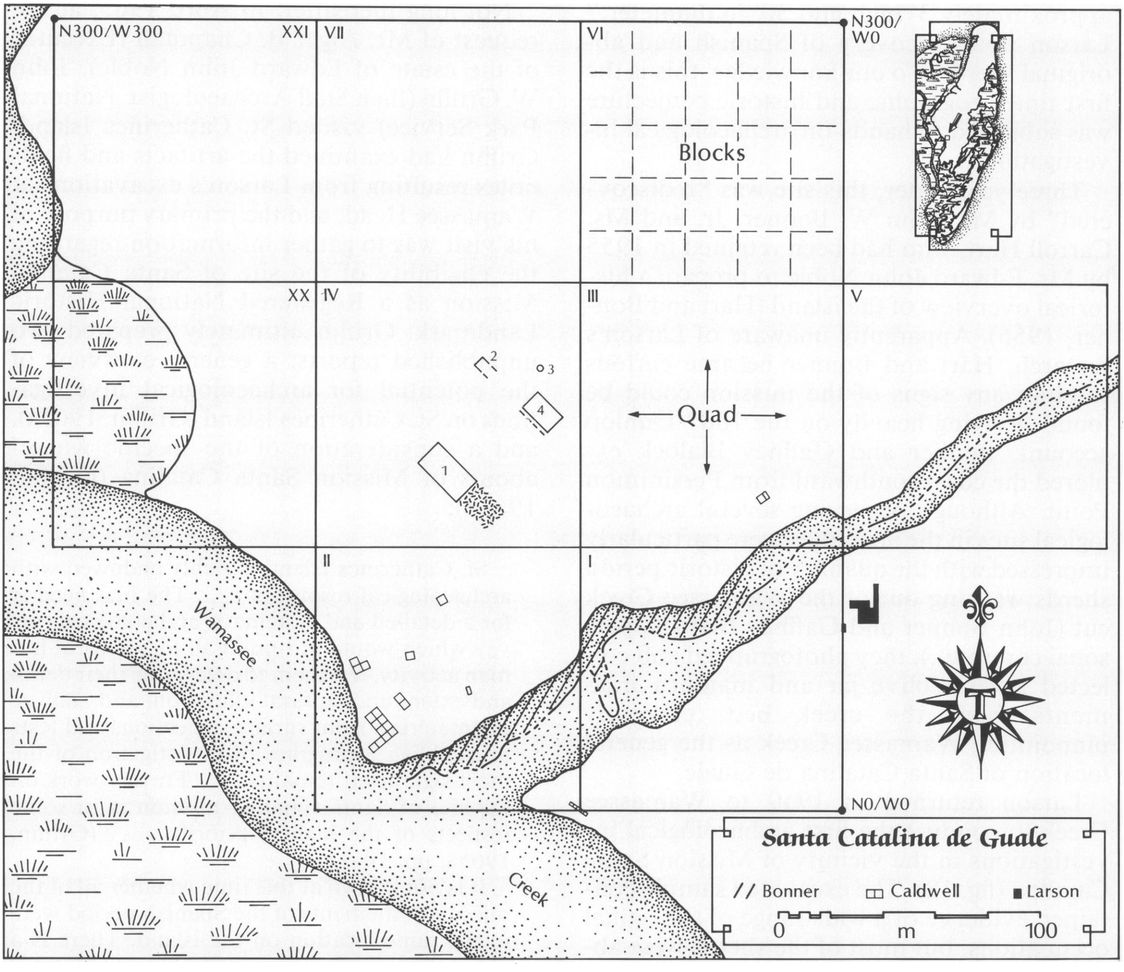

Fig. 18. Previous archaeological reconnaissance and excavation at Wamassee Point prior to AMNH involvement. Configuration of now-known mission structures added for reference. The 1 ha reconnaissance "quads" are denoted by Roman numerals (see chap. 6 for a discussion of the quad system).

extensive archeological work would be needed to pinpoint individual buildings of the settlement.

The location of the settlement is further indicated by negative evidence from elsewhere on the island. While many shell midden deposits from Indian times are known on the island, only those in the area mentioned contain the concentration of Indian pottery of the correct time period for the mission. (Griffin, 1965b, pp. 5–7)

Largely as a result of Griffin's report to the Noble Foundation, Joseph Caldwell and his students from the University of Georgia were permitted to conduct three seasons of archaeological fieldwork on St. Catherines Island. Although concentrating their efforts on mound excavations elsewhere on the island (as described in Larsen and Thomas, 1982), Caldwell sank several test pits in the Wamassee Creek area (fig. 19). These limited soundings turned up, among other things, three Altamaha Line Block Stamped bell-shaped pots (fig. 20), plus olive jar, majolica, and Spanish iron fragments; water screening in the creek bed also recovered several dozen glass trade beads. In unpublished fieldnotes, Caldwell speculated:

Surface collections made by Mr. John Tobey [sic] Woods and various students and test excavations made by the University of Georgia party show the following sequence of materials at Wamassee.

1. A small appositely beveled flint knife found on the surface by Mr. Smith of a type which is generally older than 2500 B.C. in the Southeast. If more of these can be found we will have a *terminus ante quem* for such a Sea Island as St. Catherines.
2. On the north side of the site test excavations A, B, D, and E all yielded Deptford III Period pottery in the lower levels. A radiocarbon determination for Deptford III from Excavation B was 490 A.D. ± 90 years (UGA 116) and fits nicely in our Coastal sequence.
3. On the south side of the site the lower levels of the Fallen Tree shell midden showed a distinctive protohistoric pottery complex which we have named Fallen Tree.
4. Blanketing the entire site and extending far beyond the area shown on the preceding map are pottery and artifacts of the Spanish Mission Period.

Fig. 20. Spanish period vessels exposed in 1969 by University of Georgia field crew, probably in shell middens immediately south of Santa Catalina de Guale (plotted on fig. 18; photograph courtesy of the University of Georgia).

There is no reason to believe, at present, that this is not the site of the mission of Santa Catalina. So far, however, our excavations have yielded little structural detail. (J. Caldwell, n.d.)

Fig. 19. Test pit excavated in 1969 by University of Georgia field crew, probably in shell middens immediately south of Santa Catalina de Guale (photograph courtesy of the University of Georgia).

A second radiocarbon date was processed on a shell sample from Excavation A at Wamassee: 270 B.P.: A.D. 1680 ± 65 (UGA 120). This date, and the Wamassee excavations in general, were briefly discussed in Caldwell (1971, p. 92).[3]

Such was the state of knowledge regarding the location of Mission Santa Catalina when the American Museum of Natural History began long-term fieldwork on St. Catherines Island in 1974.

[3] The University of Georgia has generously returned all Caldwell materials to St. Catherines Island. The University of Georgia test excavations at Wamassee will be described in a subsequent volume of this series.

CHAPTER 4. PROSPECTING FOR SITE LOCATION

The 16th/17th century documents available to us in the late 1970s were of little help in locating the archaeological site of Santa Catalina de Guale. One major problem was that Franciscan missions along the northern Guale coast had been subjected to intense pressures from both non-Christian Guale and British colonists; as a result, the individual missions moved from place to place through the years.[1]

A HISTORICAL APPROACH

We began our quest for Santa Catalina in 1977 with an archival search. Grant D. Jones, project ethnohistorian, conducted an intensive search for relevant historical documentation in the P. K. Yonge Library of Florida History, University of Florida (see Jones, 1978a, 1978b). Unfortunately, no new detailed maps or geographically specific references to the whereabouts of Mission Santa Catalina were forthcoming. A subsequent period of research in the Archivo General de las Indias in Seville, Spain was similarly unproductive (Jones, personal commun.).

Despite this geographic inconclusiveness, Jones assisted our effort by deriving a relative chronology for Guale and its attendant mission by dividing the Spanish era on the Georgia coast into three periods: Period I (1526–1586), the years from Aylln's colony to the abandonment of Santa Elena by the Spanish; Period II (1587–1606), the interval leading up to and following the 1597 rebellion (including the establishment of the Franciscan mission); and Period III (1607–1684), the creation of island-based missions and the gradual depopulation of the Guale coast (Jones, 1978a, pp. 178–209).

Jones concluded that prior to 1575, Guale may not have been on St. Catherines Island at all. The principal town of Guale was "either along the inland waterway of Skidaway Island (the French descriptions favor this location) or on Ossabaw Island along the Bear River (favored by the Spanish descriptions)" (Jones, 1978a, p. 203); Jones thinks that Guale might have been moved to St. Catherines Island proper by 1575. This view contrasts with the opinions of Swanton (1922, pp. 50–51), Bolton and Ross (1925, pp. 8–9), Lanning (1935, p. 39), Zubillaga (1941, p. 353), Sturtevant (1962, p. 57), and Lyon (1976, p. 154), all of whom place the town of Guale on the south end of St. Catherines Island in 1566.

During Period II (1587–1606) Jones argues

> The Guale-Tolomato chiefdom, by then definitely centered on St. Catherines Island and the Sapelo Sound area, was to remain the principal northern outpost of Spanish interests for nearly a century . . . . The exact location of the town of Guale, which was definitely on St. Catherines Island during this period, cannot be established given the documents of which I am aware. I suspect . . . it was along the inland waterway . . . , but later references are ambiguous. The later mission of Santa Catalina de Guale was apparently on the southern tip of the island, but this was probably not the location of the original town. (Jones, 1978a, pp. 204–205; see also fig. 21, this volume)

Data from Period III (1607–1684) are "especially poorly understood" and no further geographic clues emerged from the Jones analysis.

In other words, the combined French, English, and Spanish historic documentation available to us in the late 1970s supplied little more than general geographic clues. At the time, we knew only that—*if* remains of the mission structures survived at all—they were likely to be buried somewhere along the southwestern marsh margin of St. Catherines Island.

A RANDOMIZED REGIONAL APPROACH

Our archaeological quest for Santa Catalina began in 1977 with intensive reconnaissance and site evaluation of the whole of St.

[1] In fact, Mission Santa Catalina de Guale was actually *at least three* different 17th century missions. Before the 1680s, Santa Catalina de Guale had been firmly planted on St. Catherines Island; during that decade, the *doctrina* of Santa Catalina de Guale was moved to the Island of Santa María (Amelia Island, Florida; see fig. 7, this volume); at a time prior to 1728, Mission Santa Catalina de Guale was relocated at Nombre de Dios, in the vicinity of St. Augustine (Geiger, 1940, p. 23; Deagan, 1978, p. 82; Larson, 1978, p. 120).

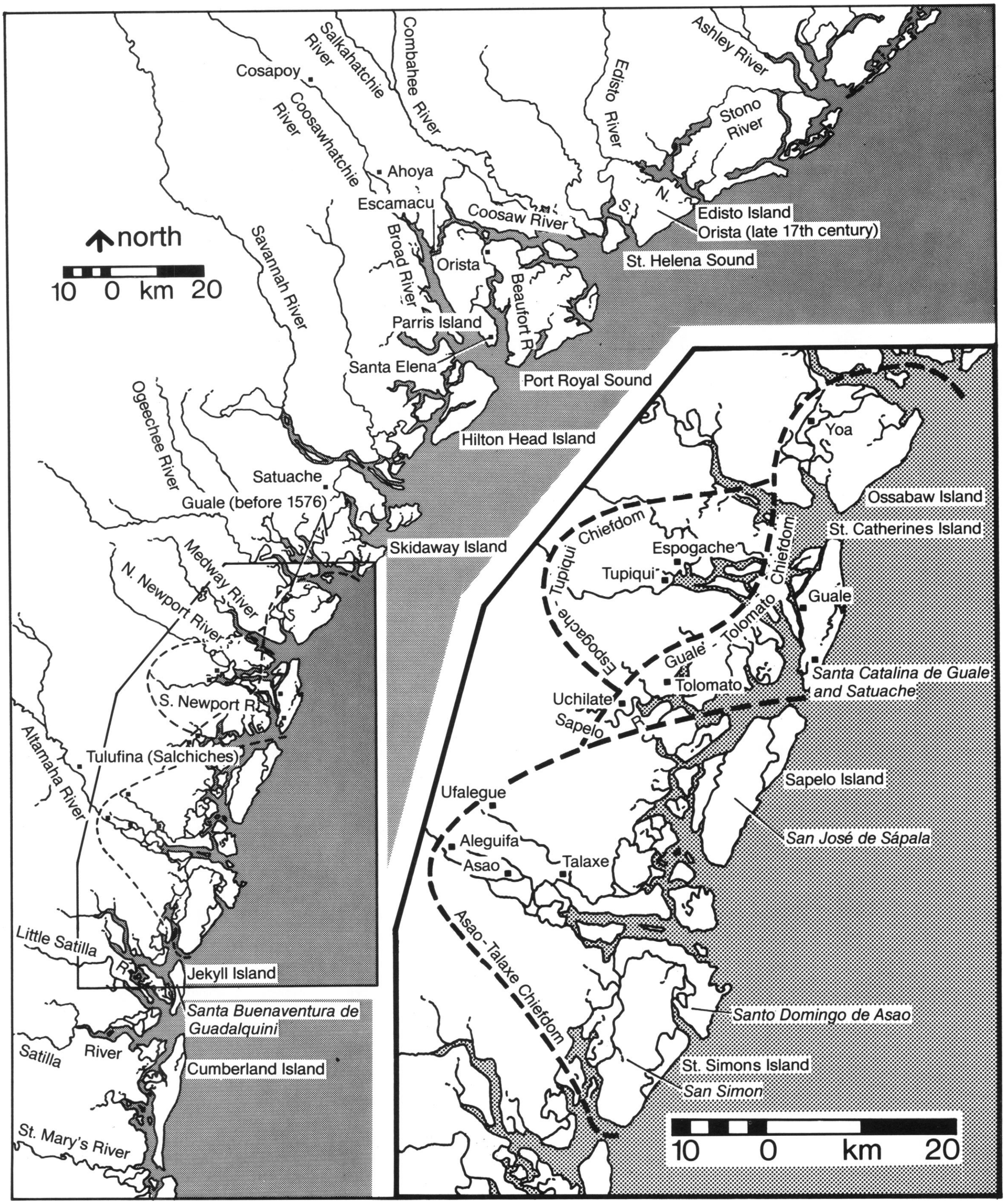

Fig. 21. Approximate locations of Spanish period towns and settlements along the Guale Coast. Dashed line denotes approximate boundaries of southern chiefdoms (after Jones, 1978a, fig. 17).

Catherines Island. The survey technique was relatively simple, the research design patterned after our earlier work at Pleistocene Lake Tonopah, Nevada (described in Thomas, 1979, pp. 292–299). This survey began with a 10 percent transect sample; but to in-

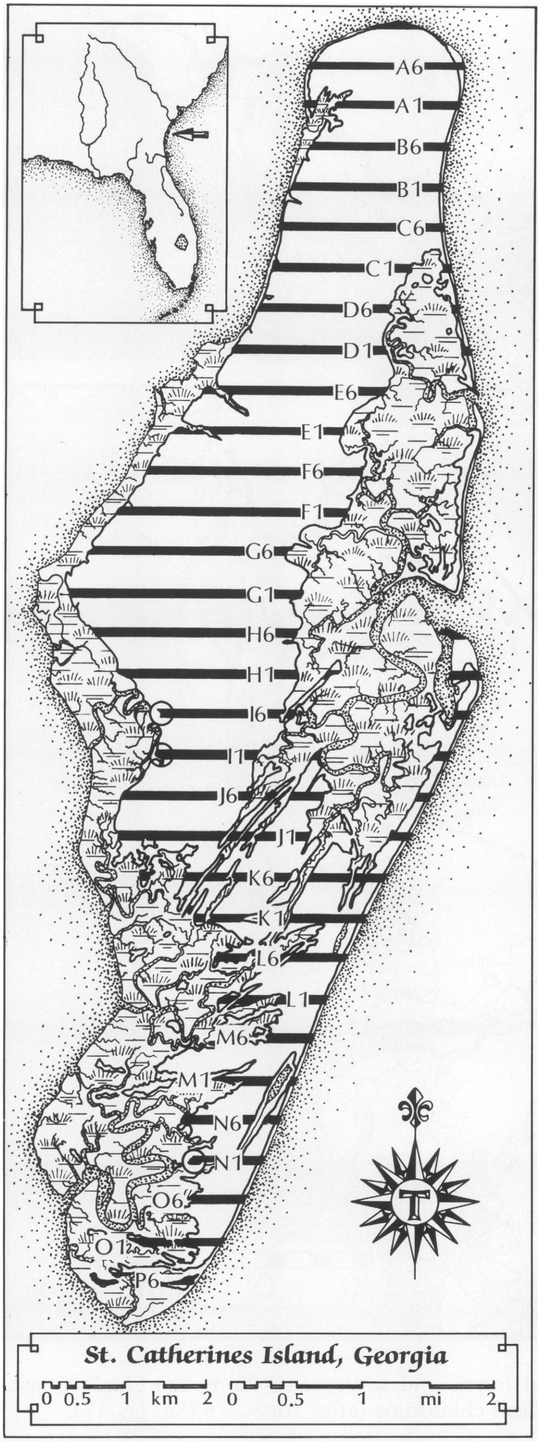

Fig. 22. Systematic transect design employed in regional sampling of St. Catherines Island; occurrences of 16th/17th century Spanish ceramics have been circled.

Fig. 23. Survey crew, spaced at 10 m intervals, heading toward "slave tree" in antebellum field at South End Settlement, St. Catherines Island.

sure more complete coverage, it was soon expanded to a 20 percent sample, obtained in a series of 31 east-west transects, each 100 m wide (fig. 22).

The survey team—11 archaeologists spaced at 10 m intervals—progressed at a constant rate across the island until an archaeological "site" was encountered (fig. 23). In the first survey phase, "site" was defined by the presence of oyster and/or clam shell. Although surface shell was readily observed, subsurface shell deposits could be detected only by systematic probing. To do this, each surveyor carried at 2 ft steel probe and checked for subsurface shell at every third step. This initial survey disclosed the presence of approximately 135 archaeological sites, ranging from massive shell heaps to small, isolated shell scatters. Each "site" was then explored with two or more 1 m square test units; more than 400 such test pits were dug in this phase of excavation (fig. 24). This initial survey approach assumes, of course, a one-to-one isomorphism between shell deposits and archaeological sites.

What about those sites that are *unassociated* with marine shell? We know, for instance, that many sites in early coastal Georgia, particularly during the Refuge phase, appear in predominantly nonshell contexts (DePratter, 1977; see also Thomas and Larsen, 1979, chap. 7). Therefore, a second stage of regional sampling was necessary to control for sites not associated with shell deposits. To do this, in 1979 we began a series of systematic shovel tests on St. Catherines Island. Each shovel test was 50 cm in diameter and 1 m in depth, spaced at 50 m intervals along

Fig. 24. Crew members excavating one of the 400+ test pits in the regional randomized survey of St. Catherines Island.

the southern margin of each 10 percent systematic transect.

More than 600 shovel tests were conducted, and, as expected, most of them proved sterile. But about 10 percent of the units contained evidence of human activity. By and large, subsurface concentrations of potsherds and artifacts could be linked with shell-associated archaeological sites previously located in the systematic survey. But nonshell sites were also discovered, and the shovel testing program proved to be a useful adjunct to transect sampling.

The results of the 1000 test excavations on St. Catherines Island are currently being ana-

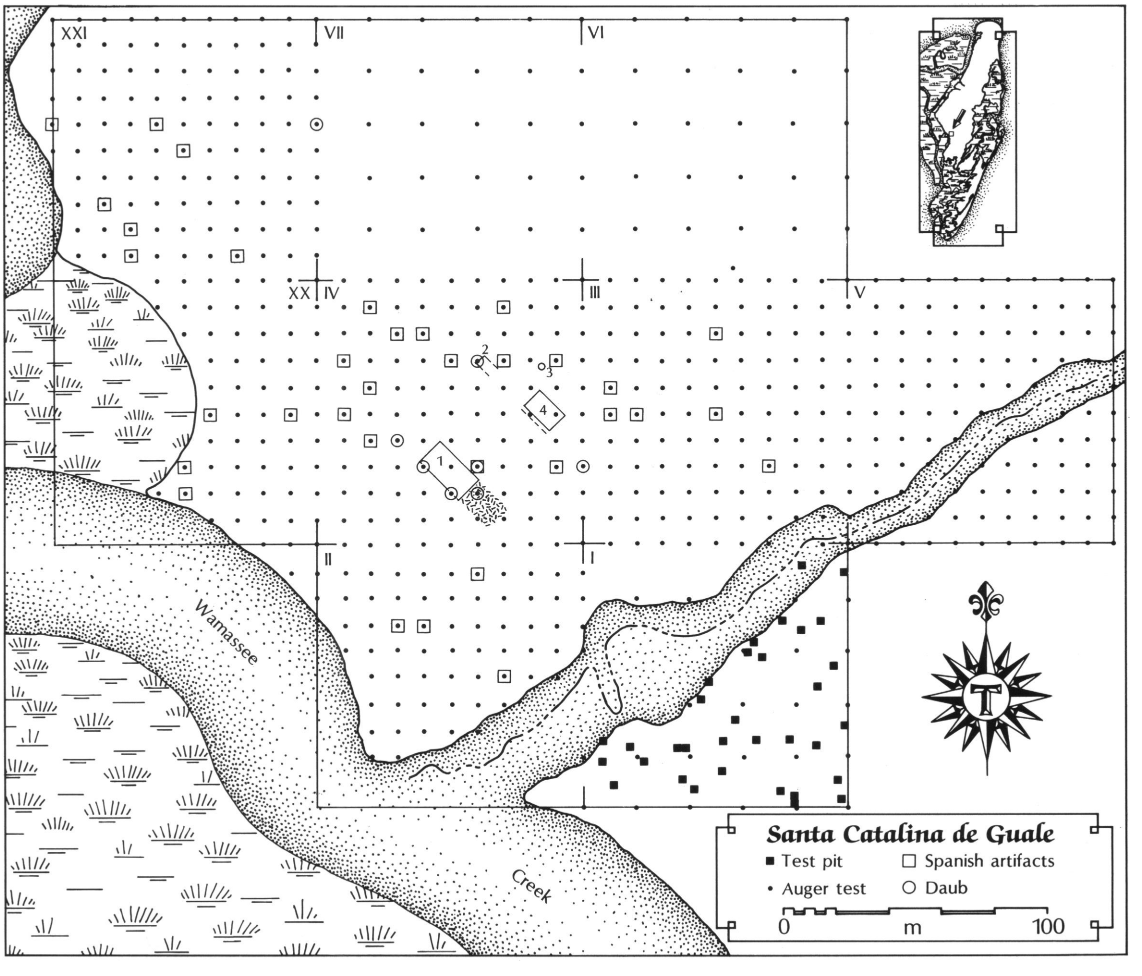

Fig. 25. Randomized test pits and power auger holes at Santa Catalina; distribution of 16th/17th century Spanish ceramics and metal has been emphasized.

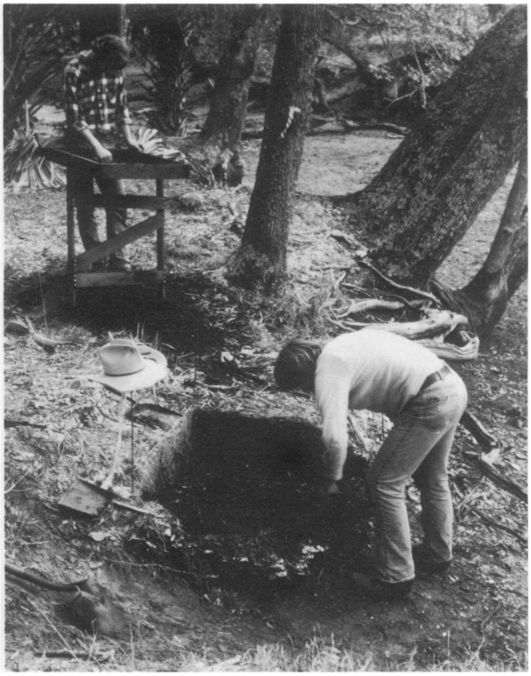

Fig. 26. Field crew excavating one of the exploratory 1 m square test pits on the southern margin of Santa Catalina de Guale.

lyzed. Excavated ceramic samples can be used for defining the various components within the sites, and an intensive program of seasonal dating of *Mercenaria* shells provides an estimate of seasonality for each site. These findings will be published subsequently.

But in addition to providing a glimpse into overall regional patterning, the survey sampling gave us a way to assess the distribution of Hispanic period artifacts across St. Catherines Island. We found 16th/17th century Spanish period ceramics at five archaeological sites identified in the systematic survey. All olive jar and majolica sherd fragments occurred at archaeological sites located within the extreme western portions of transects I-1 and I-6 (fig. 22), both of which intersect the Wamassee Creek drainage.[2]

In other words, the regional survey confirmed, complemented, and extended the earlier archaeological investigations of Larson, Bonner, Griffin, and Caldwell: the site of Mission Santa Catalina almost certainly was in a 10 ha area, not far from Wamassee Creek. But the nature of that archaeological deposit was almost totally unknown. Did Santa Catalina consist merely of 16th/17th century garbage middens, or was structural evidence buried somewhere in the Wamassee Creek area?

A RANDOMIZED TEST PIT APPROACH

In 1980, our research focus thus shifted from systematic regional sampling to intrasite sampling: Where in these 10 ha should we begin digging?

As explained in chapter 6, we divided this area into 1 ha "quads," each designated by a Roman numeral. We decided to randomize the early period of test excavation, starting with a sampling fraction of 0.05 percent in Quad I (fig. 25), for a number of reasons. The ground cover in this area was relatively open and clear, allowing for more experimentation with field technique. More important, however, was the availability of prior knowledge. Our 100 m regional transect passed through the north part of Quad I, and both Larson and Caldwell had excavated in this area. By 1980, we had access to Caldwell's fieldnotes and artifacts, and his preliminary results showed a Spanish period presence in Quad I (see fig. 18). Later, in 1983, we caught up with Larson's materials, which also showed ample evidence of Spanish occupation in this area.

We figured that, if present at all, mission structural remains—as opposed to mission period midden scatter—should probably be buried *north* of Wamassee Creek (outside the Quad I test zone). We also noted a large trench parallel to the north side of the creek; at the time, we thought this might be a surface indication of fortification features. Furthermore, sketchy University of Georgia fieldnotes noted the presence of a "possible wall trench" in one of their excavations. This evidence suggested that the mission compound might lie to the north of the creek, the aboriginal settlement to the south. We decided to hone our techniques in the south end and move progressively northward as our familiarity with the site increased.

[2] The only 16th/17th century Spanish period ceramics elsewhere on St. Catherines Island occurred at site AMNH 342 (transect N-1; see fig. 22), in which seven El Morro earthenware sherds were found in Test Pit IV. This occurrence has not yet been explored in detail.

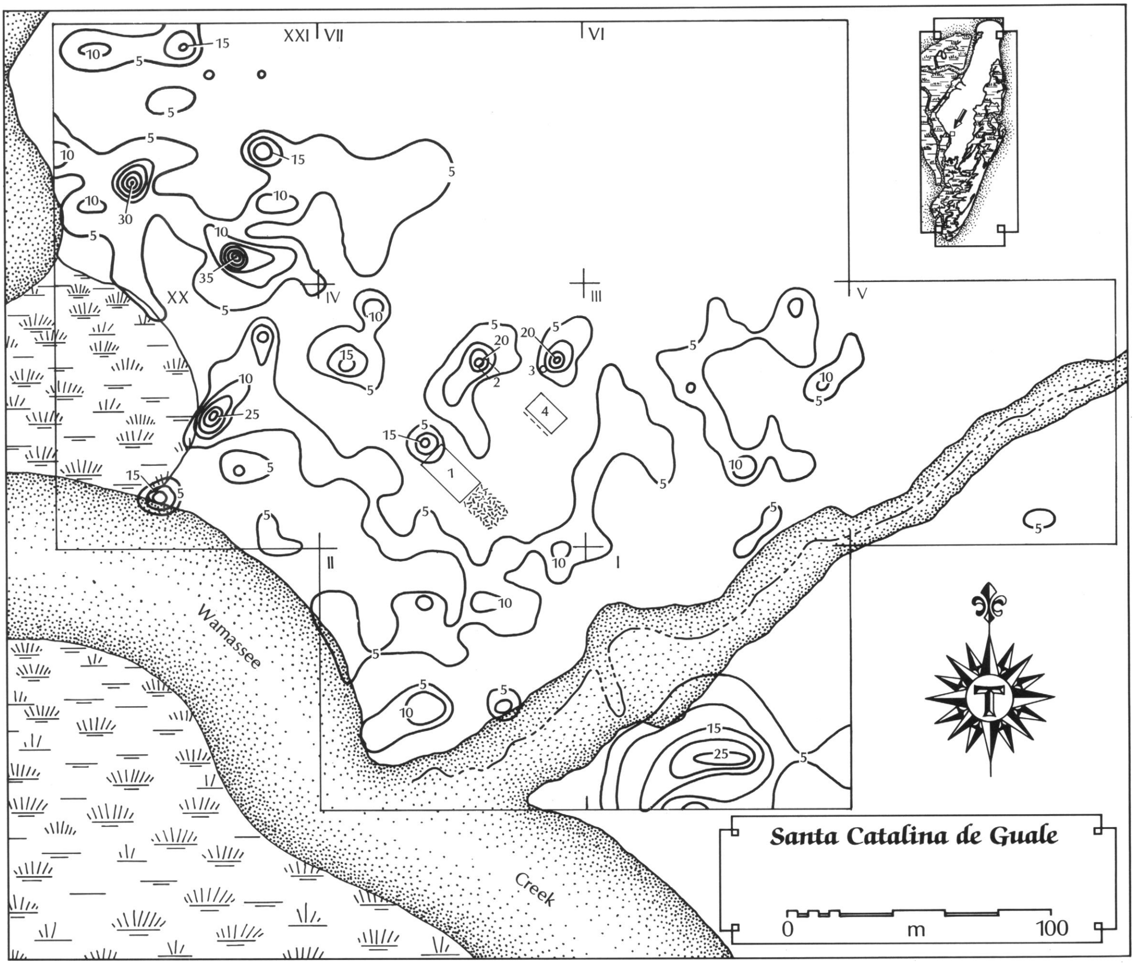

Fig. 27. Distribution of grit tempered ceramics at Santa Catalina (based on data from power auger survey). Contour interval scale in five-sherd increments.

Our excavation strategy is discussed in some detail elsewhere (chap. 6). We began by excavating randomized 1 m test pits (fig. 25), selecting coordinates for the southeastern corner of each sample square from a table of random numbers. Although the units of measurement and the sampling fractions differ somewhat, this procedure is remarkably similar to the independently derived methods used by Stanley South roughly eight months before in his successful search for, and exploration of, 16th century Santa Elena on Parris Island, South Carolina (South, 1979, 1984; fig. 1, this volume).

Randomized test pitting at Santa Catalina was slow, tedious, and rather unproductive (fig. 26). During March, May, and November (1980), 32 such 1 m units were excavated to an average depth of 50 cm. Although ample cultural materials were recovered—much from the Spanish period—feature recognition was low due to the relatively small "window" provided by each 1 m test pit. Roughly 200 person-days were invested in the randomized test pit procedures at Santa Catalina, but a much larger sampling fraction would have been required to facilitate feature recognition; without considerably greater investment of time and effort, any pattern recognition from test pitting alone would necessarily be restricted to the artifact level. At Santa Catalina, randomized test pitting told

Fig. 28. Ervan Garrison and Deborah Mayer O'Brien using a GeoMetrics Proton Magnetometer (Model 806A) in the initial remote sensing survey at Santa Catalina de Guale in May 1981.

us little more than how, when, and where not to dig for structural evidence.

A POWER AUGER APPROACH

The time had come to narrow the focus and change the methods, and we began looking around for better ways to find that hidden needle in the haystack. Fortunately, by this time, we had learned of Kathleen Deagan's successful search for 16th century St. Augustine. Following her example, we decided to employ a systematic auger test survey on the high probability area at Wamassee Creek (Deagan, 1981; see also Percy, 1976; South and Widmer, 1977; McManamon, 1984); similar techniques have been used recently with great success at other mission sites in Spanish Florida (Shapiro and Poe, 1984; Shapiro and Marrinan, 1986).

The augering procedure began in November 1980. We started in Quad I so that the test units dug previously could be compared. Sherds were compared simultaneously to provide a control for the auger holes. One auger test was excavated in the southeast corner of each 20 by 20 m block (slightly to the northwest of the stake). The first auger hole was excavated on November 9, 1980, to test the equipment. A 20 cm bit was used, reaching to a depth of about 88 cm. Sherds, bone, and shell were recovered when the donut of spoil dirt was screened. The units were completely backfilled. We then shifted to a larger bit, one that produced a hole ca. 32 cm in diameter, to the same depth. This larger diameter was used throughout the rest of the survey.

These revised procedures were then applied to the study area north of the creek. Beginning in Quad III, the sampling interval was changed from 20 m to 10 m. This technique quadrupled the available sample and provided more adequate spatial control on artifact distributions.

We had dug 615 auger pits by March 1981 (fig. 25). Once the grid had been transit plotted, a crew of two could dig approximately 12 auger holes per hour. Two screeners, working behind the auger crew, could screen the fill from approximately four holes per hour. The auger survey consumed roughly 150 person-days, but a significant proportion of this time was spent clearing vegetation and laying in grid locations for the auger holes.

Auger testing generated important data at three distinct levels. Once field testing was complete, we identified all elements recovered (raw data are supplied in the Appendix to this volume) and plotted their distributions in a series of simple dot density maps. Sherd density varied considerably across the 9 ha sampled. The central and western Quads (I, II, III, IV, XX, and XXI) were found to contain extremely high densities of Altamaha and grit tempered sherds (Appendix, table 1; fig. 27). We noted significantly lower ceramic densities in peripheral Quads V, VI, and VII.

Moreover, figure 27 suggests that Mission Santa Catalina may have been divided into districts (or *barrios*). Note particularly the distribution of sherds surrounding the central mission buildings; the interior compound—the "mission" proper—seems to have been contained within a rectangular walled enclosure. A second, much larger walled area appears to the northwest, probably part of the Guale *pueblo*. In both cases, refuse appears to have accumulated along 45° angles, apparently confined by a series of walls or fences.

These general impressions were further sharpened when we focused strictly on Hispanic ceramics. More than one-third (12 of 31) of the olive jar and majolica sherds came from Quad IV (table 1). If the conventional assumption that Hispanic/aboriginal sherd

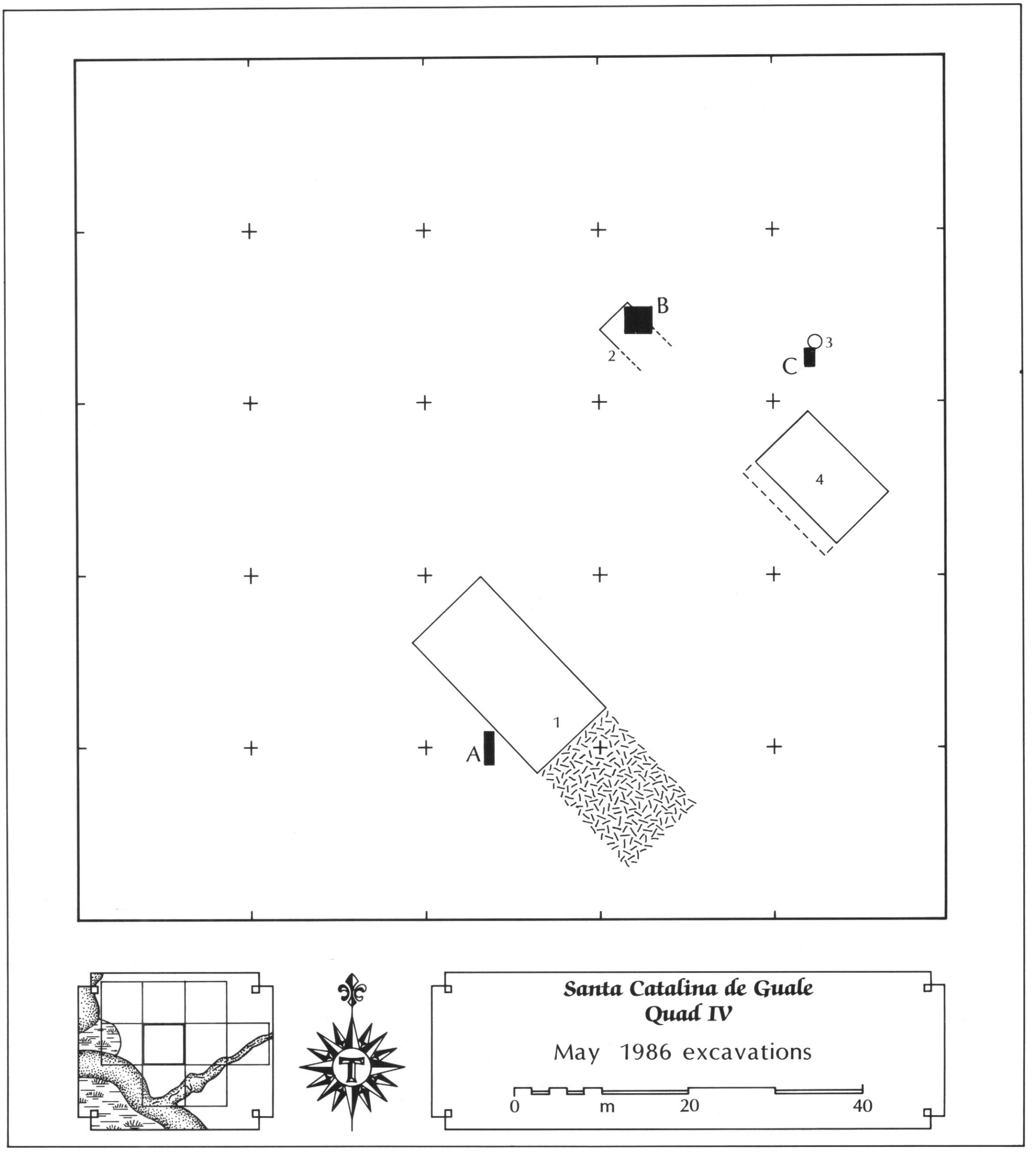

Fig. 29. Locations of three major magnetic anomalies and associated test pits at Santa Catalina. The locations of now-known Spanish period structures have been added for reference.

ratios reflect relative social status (cf. South, 1977, pp. 172–175; Loucks, 1979; Deagan, 1983, pp. 114–116; 1985, p. 300) holds for a mission context, then Quad IV once again would seem the most likely location for the central mission complex.

Based strictly on this evidence, we decided to focus all further yield evaluation on a single 100 by 100 m square in the overall sampling grid for St. Catherines Island: Quad IV, a totally unremarkable piece of real estate, covered by the same scrub palmetto/live oak

Fig. 30. The initial exacavations (Test Pit B) in Structure 2 at Santa Catalina, now thought to be the Spanish *cocina.*

forest typical of the western margin of St. Catherines. The only evidence of any human occupation was a little-used field road for island research vehicles. Although shell midden scatters were evident here and there, Quad IV contained absolutely no additional surface evidence distinguishing it from its surroundings. In effect, the simple and expedient auger testing procedures allowed us to narrow the focus from 10 ha to 1 ha.

A PRELIMINARY REMOTE SENSING APPROACH

The first instrument prospection at Santa Catalina was a proton magnetometer survey, conducted May 14–18, 1981, by Ervan G. Garrison and James Tribble (both then associated with Texas A&M University). The instrument was a GeoMetrics Proton Magnetometer, Model 806A, modified for terrestrial survey. This proved to be a rather cumbersome procedure, since none of the surrounding vegetation had been cleared from Quad IV (fig. 28). We employed one cycle/sec sampling, with a sensor height of 1.2 m. Readings were taken at 2 m intervals throughout Quad IV. All field data were hand transcribed, then input to the AMDAHL V6/V7 computer at Texas A&M. A series of preliminary CONREC maps were produced to array the initial magnetometer findings; subsequently, more satisfactory graphic representations were obtained based on later magnetometer research (see below).

But the remote sensing research paid off handsomely, even before the computer plots were available. The raw instrument readings showed three major subsurface magnetic anomalies, patterning so strong that we decided to begin testing right away. As the Texas A&M team left to work up the data, they told us simply, "If we were y'all, we'd dig in three places: right here, over yonder, and especially right here."

We explored these three magnetic anomalies during the few days remaining in the May 1981 field season (fig. 29). The "over yonder" anomaly occurred near an auger hole which had previously produced burnt daub. A single 4 × 1 m excavation unit (Test Pit A) was positioned to straddle the magnetic anomaly. We encountered a dense burnt daub concentration in the northern portion of the trench, at a depth of 20–25 cm below the contemporary ground surface. An unfired clay floor appeared in the southern half of the unit, at about 30 cm below surface. Charcoal, a single nail, and Altamaha ceramics were found associated. We designated this area Structure 1, and postponed further excavation to the next field season. We now know that Structure 1 is the remarkably well-preserved Franciscan church (*iglesia*), which

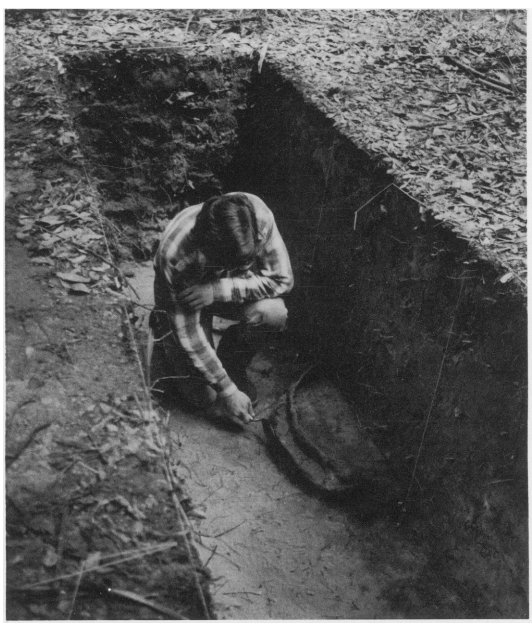

Fig. 31. Initial test pit at the Spanish well, Santa Catalina de Guale. Ring A is partially exposed, surrounded by the well construction pit; six such rings lay below (May 1981).

contained 400–450 Christian Guale Indian burials.

The magnetic anomaly pointed out "right here" was a small mound, thought at the time to be perhaps a grave or tomb. We positioned Test Pit B (3 × 3 m) to straddle the 30 cm rise (fig. 30). A dense concentration of daub was encountered about 25 cm below the ground surface, associated with deer bones, two iron spikes, and fragments of olive jar, majolica, and Altamaha ceramics. Artifacts were left in place, and three additional test pits were laid out, defining a 5 × 5 m test area. When the daub wall and artifact concentration were found to extend throughout this area, we designated it Structure 2, and stopped excavation. We now think that Structure 2 is the mission kitchen (*cocina*), on which archaeological exploration continues as of this writing (June 1986).

The third magnetic anomaly—"especially right here" (Test Pit C)—turned out to be a Hispanic period barrel well, entirely excavated in May 1981 (fig. 31). We found seven decomposing iron rings above the well-preserved remains of an oak casing, and olive jar and majolica sherds within the construction pit of the well.

Thus, even without benefit of computer enhancement and graphics, the magnetometer data were sufficiently powerful to indicate the presence of significant Hispanic period structural features at Santa Catalina.

CHAPTER 5. GEOPHYSICAL PROSPECTION FOR SITE STRUCTURE

We have already described the initial proton magnetometer survey at Santa Catalina. Even at this preliminary stage, the geophysical prospection had paid off by pinpointing three major subsurface features, two Spanish period wattle-and-daub structures, and the mission well. This was the last step in the site discovery process at Santa Catalina, which proceeded as a progressive narrowing of probabilities. With structural evidence at Santa Catalina positively identified (in May 1981), our research objectives shifted from a question of site location to more compelling issues of site structure.

A PROTON MAGNETOMETER APPROACH

Magnetic prospection is one of the more commonly applied remote sensing techniques in archaeology. Weymouth (1986, pp. 351–369) provides an up-to-date history and methodological overview of such research in the New World (see also Scollar, 1969; Steponaitis and Brain, 1976; von Frese and Noble, 1984).

Elsewhere, we describe some of the specifics of how this magnetic survey was conducted at Santa Catalina (Garrison et al., 1985); this section highlights relevant portions of that discussion and integrates the magnetometer research into the overall research design employed on St. Catherines Island.

From the outset, we thought that the cultural and geomorphic contexts at Wamassee Creek boded well for magnetic survey. The preliminary archaeological survey had demonstrated, for instance, that the Wamassee Creek area generally lacked modern surface iron debris. We also knew that subsurface deposits of lithic materials were virtually absent on St. Catherines Island. Had they been present, surface iron and buried rocks could have seriously hampered magnetometer survey.

Other than the scattered shell deposits, soil in this area consisted primarily of Holocene and Pleistocene sand, interfingered with more clastic sediments. Such low humic sandy soils and overlying fluvially deposited sediments are typically low in magnetic susceptibility when compared to iron-rich sediments and soils of igneous origin (Aitken, 1974, pp. 220–225; Weymouth, 1986, pp. 345–346). Given this generally low magnetic susceptibility, we hoped that magnetometer prospection could detect subsurface anomalies of very low magnetic contrast and intensity, in the range of 2–5 gammas (Garrison et al., 1985, pp. 303–304).

The first magnetic survey was conducted using a Geometrics G-806 proton magnetometer, equipped with a portable console, powerpack, and sensor (fig. 28). Sensor height was standardized at 1.2 m, using a standard collapsible aluminum staff; sensor orientation was maintained on compass north. Readings were taken at 2 m intervals along the grid and recorded in notebooks. As only one instrument was being used, diurnal variation of the earth's field could only be sampled at intervals. Generally these readings were made on the south edge of Quad IV in a magnetically ambient spot predetermined by a random walkover with the survey instrument.

The initial results on Quad IV were so promising that we decided to expand the scope to encompass the 9 ha research frame (fig. 25). Subsequent surveys of other quadrangles were carried out with a Geometrics G-816 portable proton magnetometer; the earlier Quad IV results were replaced with readings from the new magnetometer. The basic difference in the two instruments is the manual sampling mode necessary with the latter instrument. Both magnetometers had ± 1 gamma sensitivity and were deployed in like configurations in the field, e.g., sensor height, console-sensor separation distance, and so forth.

Data Reduction and Graphic Imagery

Managing the St. Catherines survey data presented a number of challenges. At completion of the magnetometer work, an area 300 × 300 m had been surveyed (with the exception of a few small swampy sections). The entire survey consisted of nine 100 × 100 m quadrangles. Each full quadrangle contained 2601 magnetometer readings (e.g., fig. 32), and the final matrix of all nine quadrangles contained 22,801 values, including unsurveyed areas of the marsh, Wamassee Creek, and the area south of Wamassee Creek.

Magnetometer readings were subsequently entered into magnetic disk files on the Texas A&M Amdahl computer (as described in detail by Garrison et al., 1985). That a single magnetometer had been employed complicated the data reduction because we could only approximate the normal daily changes in magnetic intensity, called *diurnal variations*. Periodic readings, taken at control points to track the diurnal variation, provided the values for ambient magnetism. These were correlated with the survey values recorded at 2 m intervals. Monitored every 15 to 20 minutes, this ambient magnetism was subtracted from the contemporaneous survey readings to provide corrected readings reflecting magnetic variability in the archaeological record per se.

The lack of a control magnetometer reduced the reliability of small variations in magnetism (Breiner, 1973); some degree of microscale variability was sacrificed by this procedure (e.g., Weymouth and Huggins, 1985; Weymouth, 1986). Use of a single magnetometer also created a series of linear features on the accompanying graphics (a problem discussed by Weymouth, 1986, p. 346). To filter the raw magnetometer counts, values from +2 to −2 gammas were set equal to zero. Contour maps thus reflect only those anomalies with a strength greater than ±3 gammas.

After experimenting with the imagery, we decided to display the magnetic variability at Santa Catalina in three different formats: conventional contour maps, three-dimensional graphics, and alphanumeric grey-tone contour maps (see Garrison et al., 1985, pp. 304–309). All plotting was initially achieved on VERSATEC 11-inch and 36-inch electrostatic plotters, but a XEROX 9700 laser printer produced the smaller versions included here.

Magnetic survey data from Santa Catalina were rendered in five different mapping formats:

1. Figure 32 is the baseline magnetic contour map from the resurvey of Quad IV (after excavations had begun), with positive anomalies imaged as solid lines and negative anomalies imaged as broken lines. For each of the nine quadrangles, a separate 10 × 10 in. contour map was produced for field use. A similar map was generated from the initial magnetometer survey of Quad IV; but in the interests of consistency, the entire area was resurveyed by AMNH staff. In this case, bold contour lines were placed at 10 gamma intervals with an additional dark line placed at the 5 gamma contour. We plotted readings between +3 and +19 and between −3 to −19 gammas at two-gamma intervals; beyond ±20 gammas, we placed lines only every 10 gammas. No values between +2 and −2 were plotted. Asterisks or plus signs symbolized data voids caused by marsh, Wamassee Creek, or archaeological excavations.

2. For each quadrangle, SAS/GRAPH generated a pair of three-dimensional plots, displaying all magnetometer readings except those between +4 and −4 gammas. These pairs proved useful for comparing relative intensities of various anomalies. The first 3-D plot showed positive magnetic readings as peaks, with negative values rendered as depressions. The second, a mirror image of the first, indicated negative values as peaks and positive values as depressions. In figure 33, Quad IV is shown with the Z-axis having positive gamma values imaged as peaks. All three-dimensional images have an artificial spike inserted at the northeast corner to serve as a scale. The spike has a value of +100 gammas or −100 gammas, depending on whether the negative or positive values are being graphed as peaks on the image.

3. James Baker then used FORTRAN software to synthesize data from all 22,801 data points into a large contour map, including all nine target quadrangles. Figure 34 shows a much reduced version of the original 30 × 30 in. map.

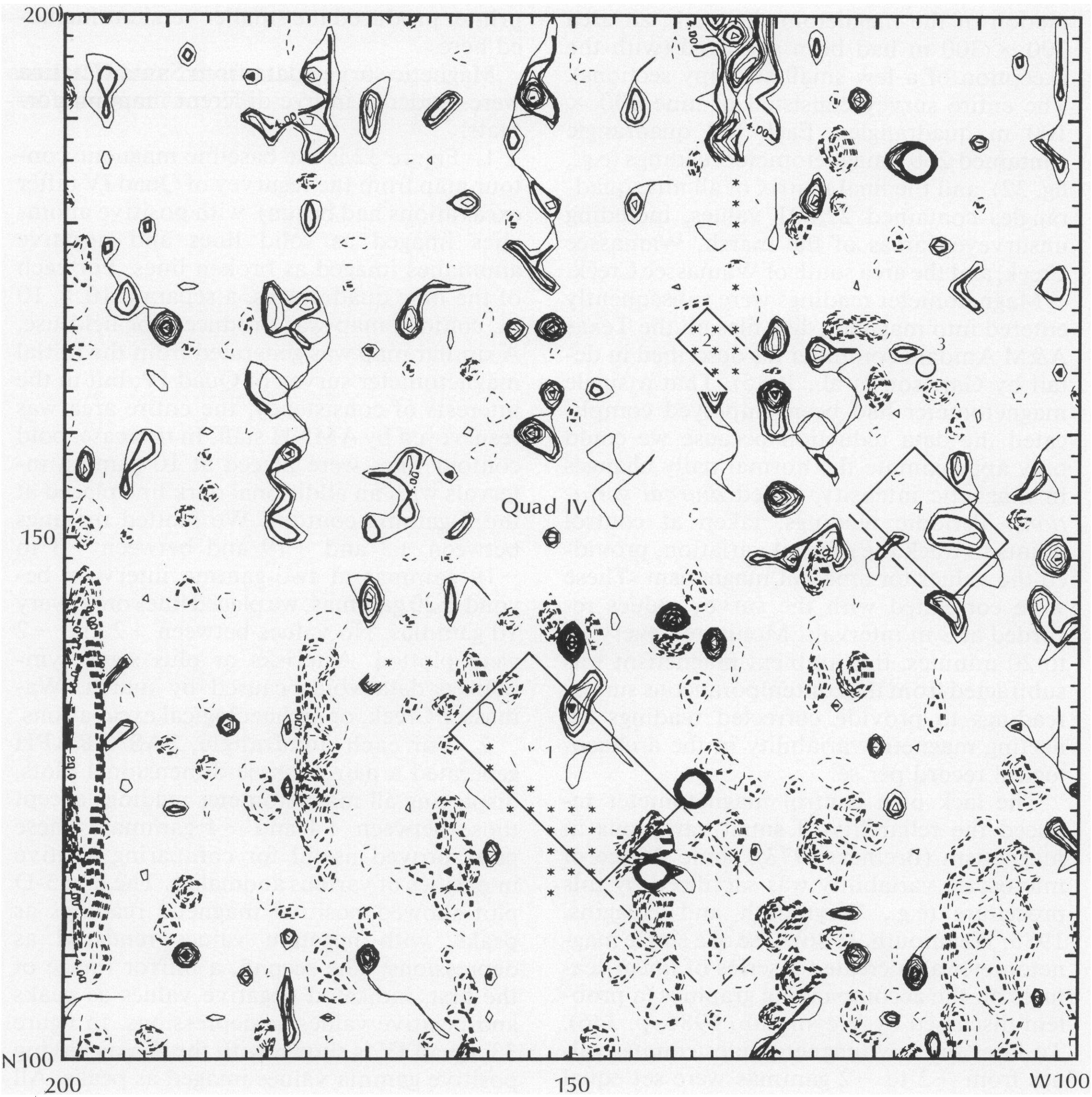

Fig. 32. Magnetic contour map of Quad IV at Santa Catalina; scale in meters (after Garrison et al., 1985, fig. 5). Locations of the three known mission structures and the Spanish well are plotted and numbered.

4. Two three-dimensional graphics served as counterparts to the contour map in figure 34. We reversed the negative and positive ends of the Z-axis on the two different plots to allow study of both negative and positive anomalies and to allow comparison of their relative intensities. Figure 35, plotted on the XEROX 9700, represents a diminutive version of the original 3 ft square format, plotted on a 36 in. VERSATEC plotter; this figure shows positive anomalies imaged as peaks on the Z-axis.

5. The Quad IV SYMAP represents 2601 data points (fig. 36), showing areas of mag-

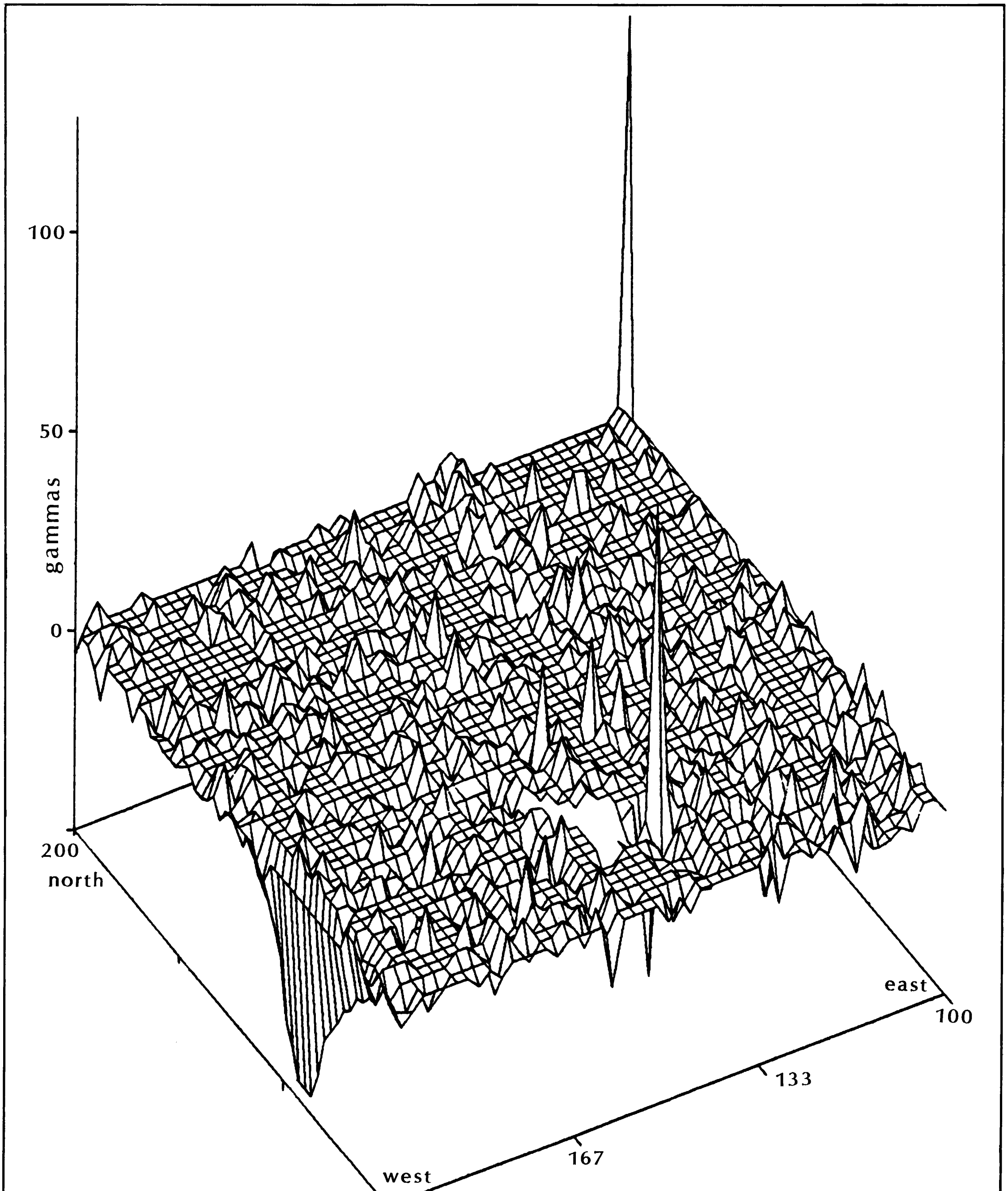

Fig. 33. Three-dimensional ("birds-eye") magnetic map of Quad IV at Santa Catalina. Grid interval equal to 2 m; values within ±4 gammas plotted equal to zero (after Garrison et al., 1985, fig. 6).

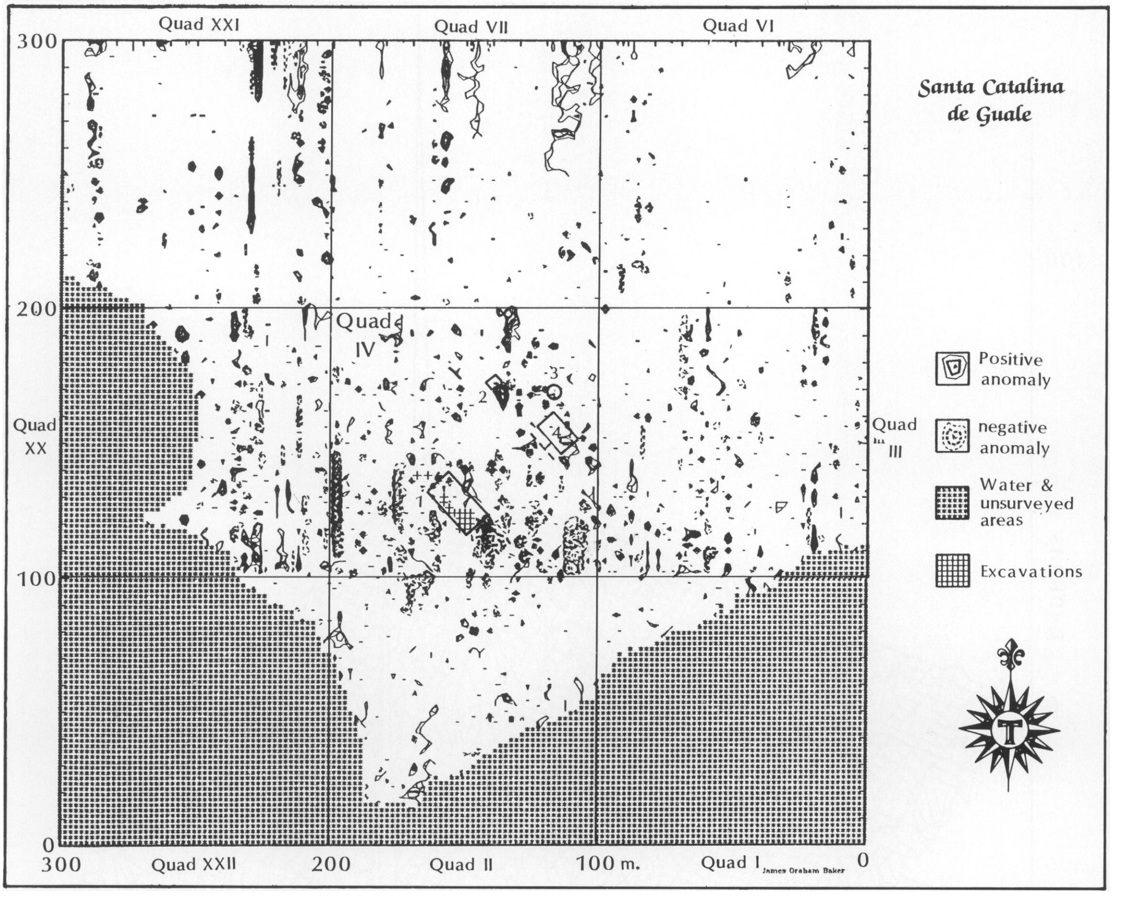

Fig. 34. Geomagnetic contour map of Quads I–IV, VI–VII, and XX–XXII at Santa Catalina de Guale (after Garrison et al., 1985, fig. 7). Locations of the known mission structures are plotted and numbered as in figure 32.

netism as broad structural features. Because highly anomalous readings do not obstruct the surrounding patterns of magnetism, features such as buildings and shell middens tend to show up better. Each alphanumeric symbol on the map corresponds to a reading taken during survey. Because the character type font which comprises the image contains more characters per inch than lines per inch, the graphic appears rectangular rather than square, which the quadrangle is in reality. Contour levels can be varied in the SYMAP program to optimize contrast and to make magnetic features more distinct. In figure 36, the areas of negative or less than ambient magnetism show as a lighter shade of grey with areas of positive magnetism being emphasized by a darker pattern.

General Projections Based on Magnetic Survey

Archaeological excavations in Quad IV provide a phenomenological tool for evaluating the large-scale topographic imaging discussed here. In turn, data generated from proton magnetometer survey provide a series of expectations for the archaeological record at Santa Catalina de Guale. We can eventually compare these projections with our excavation results to determine how well the magnetometer performed, but such a study cannot be attempted until excavations and laboratory analysis of the material culture are complete.

But even at this relatively early stage, we can make some general observations about

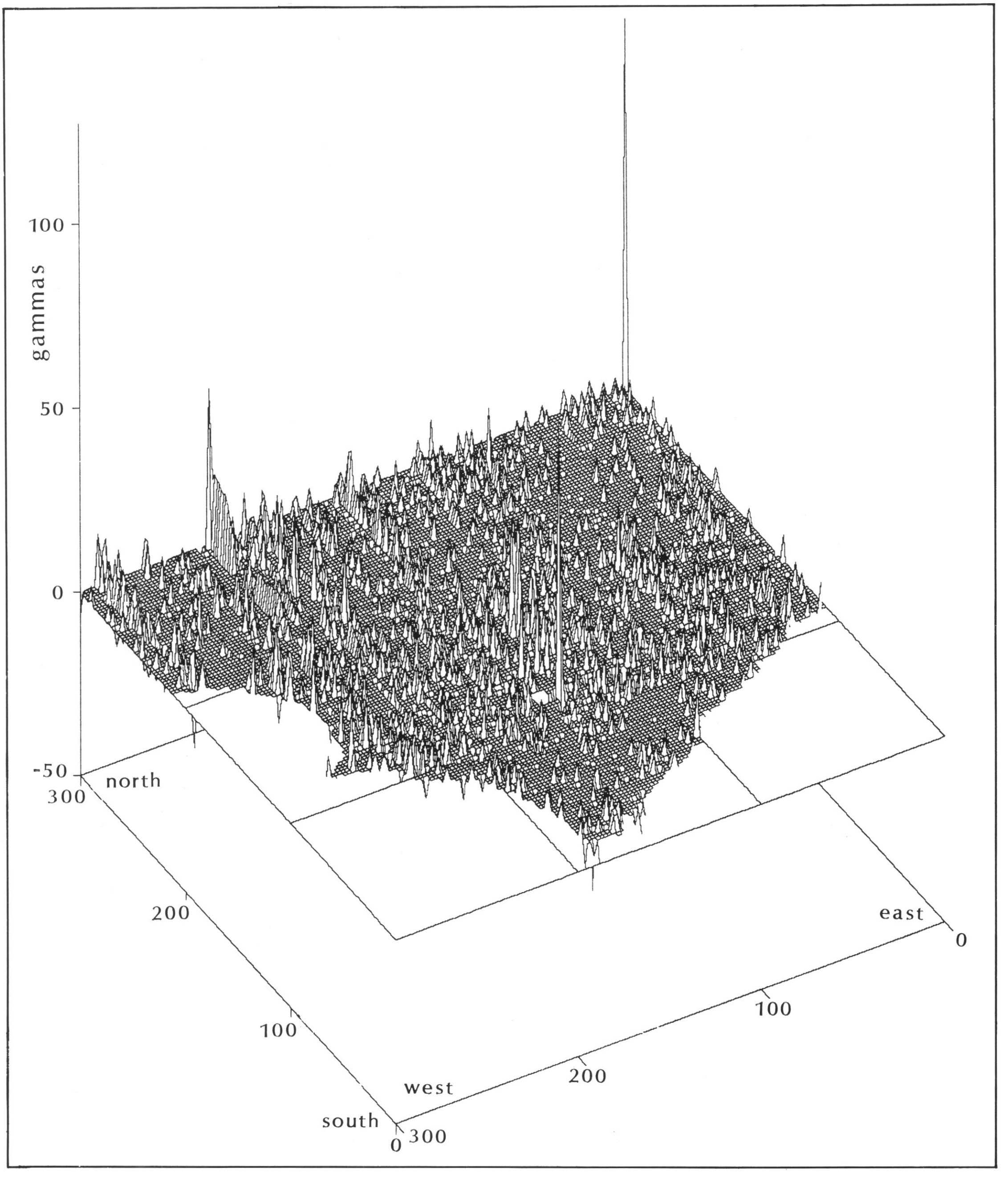

Fig. 35. Three-dimensional magnetic map of nine quads at Santa Catalina; grid interval and values as in figure 33 (after Garrison et al., 1985, fig. 8).

the accuracy of magnetic projection at Santa Catalina.

1. Point sources, with a uniform distribution of dipoles, behave as a dipolar anomaly yielding a larger-amplitude positive reading and a lesser-amplitude negative reflection

Fig. 36. SYMAP rendering of magnetic profile of Quad IV at Santa Catalina. Lighter tones indicate negative values (after Garrison et al., 1985, fig. 9).

of the maximum (as defined by Weymouth and Huggins, 1985). This is due to a relatively normal orientation of the earth's field at St. Catherines Island. To date, archaeological excavation has verified few such point anomalies.

2. Broad-scale structural features tend to appear as monopolar, positive anomalies with maximum deflections centered over the feature. This high correlation of the location of maximum deflection and actual location is expected, given the earth's field at this latitude. That is, Spanish period structural remains tend to correspond to large areas of relative positive magnetism. Finding these structures by magnetic prospection proved to be the signal success of the survey. Burnt wattle-and-daub buildings appeared as low-level (8–19 gammas), relatively large orthogonal features. The signatures of a house floor, walls, and hearths were positive, but even the strongest deflections did not exceed 50 gammas. Typically, most positive features were of the 10–20 gamma range.

3. Depositional or fill features tend to appear as monopolar, negative anomalies of low intensity (1–6 gammas). This is also due to interaction of the earth's field with the anomalies' local field and to the decreased magnetic susceptibility of the fill or depositional material as compared to the siliceous soil matrix on St. Catherines Island. The Spanish well, for instance, appeared as a sharply delineated negative (−35 gamma) anomaly restricted to a 3–4 m area. Buried shell middens and deliberately shell-enhanced architectural features commonly show up as areas of negative relative magnetism.

4. The mission grid system is well reflected on our magnetic contour maps (e.g., figs. 32, 34). Preliminary excavations disclosed that the entire mission complex at Santa Catalina de Guale was oriented 45° west of magnetic north. Fortunately, the magnetic survey transects were run magnetic north-south, so it is a simple matter to distinguish the linear patterns of diurnal magnetic variability from magnetic anomalies due to 17th century Spanish occupation of the area. That is, every time we see a 45° angle on the magnetic contour maps, we strongly suspect the presence of Spanish period structural remains.

Site Structure as Projected by Magnetic Survey

As with all magnetic anomaly characterizations, these interpretations will contain errors, particularly at the microscale of smaller magnetic features. This is due to the interaction between individual anomalies and the burial matrix. At St. Catherines the major extraneous factor appears to be widespread shell deposition in many quadrangles. The broad-scale negative behavior of the shell middens will mask smaller point sources and features of negative signatures.

These cautions notwithstanding, a number of hypotheses were offered about the settlement structure of Santa Catalina de Guale (after Garrison et al., 1985, pp. 312–313).

1. Within Quad IV, two clear-cut activity zones are apparent, based strictly upon subsurface magnetic structure. Positive magnetic features to the north and east of Structure 1 (the church) are closely tied to the Spanish grid alignment; shell midden deposition, on the other hand, resulting in lessening magnetism, is evident to the south and east of Structure 1. While it is possible that the shell deposits precede the mission occupation, it is more likely that Quad IV is the central district of the *doctrina* of Santa Catalina de Guale.

2. Quads III and XX are clearly laid out according to the mission grid system defined in Quad IV. This patterning probably corresponds to the Guale Indian *pueblo* at Santa Catalina.

3. The Spanish grid system remains in evidence even in peripheral areas (parts of Quad VI, all of Quad VII, and the majority of Quad XXI). Although the nature of this intermediate settlement remains to be defined, these quads may also be part of the *pueblo*.

4. Little evidence of a Spanish grid plan occurs in Quads I, II, VI, and XXII. These areas probably contain fields and small, outlier settlements.

The 16th/17th century settlement at Santa Catalina trends southeast to northwest, its structures concentrated near the Wamassee inlet but not approaching its immediate shore. This, coupled with the clear delineation of the Spanish grid system (especially running

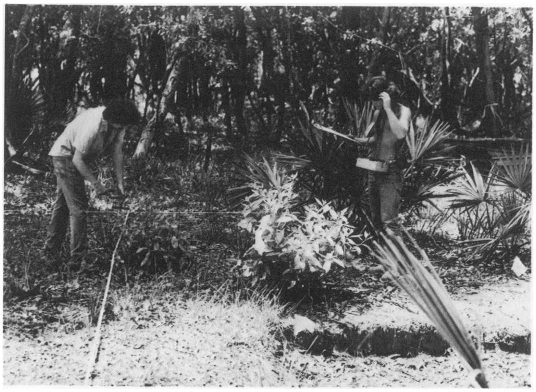

Fig. 37. Mark Williams and Gary Shapiro conducting soil resistivity survey near Structure 2, Santa Catalina de Guale (May 1982).

through Quads XX, IV, III, and stopping at Quads XXII, II, I), suggests the demarcation of the settlement.

A SOIL RESISTIVITY APPROACH

Soil resistivity is an "active" method of site prospection (sensu Weymouth, 1986, p. 314), monitoring the electrical resistance of soils in a restricted volume near the surface. Perhaps due to its relatively low cost, soil resistivity has been a popular technique of geophysical prospection over the past three decades (esp. Carr, 1982, pp. 5–8; see also Carr, 1977; Parrington, 1983, pp. 113–115; Bevan, 1983; Weymouth, 1986, pp. 331–340).

Degree of soil resistance depends on many factors, the most important of which is often the amount of water in the soil (inversely related to its resistivity). Thus, buried features can be detected by their differential retention of groundwater: Compaction, such as occurs in house floors, paths, and roads, reduces pore sizes and potential to retain water, thereby registering as high resistance (Weymouth and Huggins, 1985).

Aggregation of fill in pits, ditches, and middens, will alter resistivity. Foundations or walls, particularly those in historic period sites, generally increase resistivity over that of the surrounding soil; generation of humus due to occupation activity increases ion content in the soil, thereby reducing resistivity (Weymouth, 1986, p. 321; see also Shapiro, 1984).

Preliminary Soil Resistivity Survey

In the spring of 1982, we briefly discussed with Gary Shapiro the possibility of conducting a soil resistivity assessment of Santa Catalina. Proton magnetometer research had already been completed by that time, and excavations had begun at Structures 1 and 2. After examining soil resistivity research conducted by Shapiro and Mark Williams at Fort Michilimackinac (subsequently published by Williams and Shapiro, 1982), we contracted for a pilot study to determine the potential and feasibility of large-scale resistivity prospection at Santa Catalina. Shapiro and Mark Williams conducted this initial survey in May 1982 (fig. 37).

This pilot study was directed at three areas inside Quad IV. All resistivity readings were taken on the Williams Model 103 Resistivity Meter, designed and built by Mark and Marshall Williams. The device, specifically designed for archaeological application, incorporates a number of technical advantages over most commercially available resistivity devices (see Williams, 1984).

The following standardized procedures were used in the Santa Catalina survey (see also Shapiro, 1984; Williams and Shapiro, 1982). Soil resistance was measured by four probes set in a line at 1 m intervals; probe insertion depth was 20 cm. Readings were taken using the "double-dipole" probe configuration. In this arrangement, current is passed through the first two probes, while the second two are passive (potential) electrodes. A numeric value (in units roughly equivalent to ohms) indicates electrical resistance of the soil between the two center probes.

Readings were consistently taken on east–west grid lines at 1 m intervals. Each 20 m east–west line resulted in 21 readings. The line was then advanced 1 m to the north (or south) and another 21 readings taken. This procedure resulted in a gridded array of resistance values which were recorded on graph paper at a scale of 1:100. These data, stored on magnetic diskettes, were used to produce dot-density maps. Locations of trees, backdirt piles, roads, and other features that might have affected earth resistance were recorded directly on the graph paper.

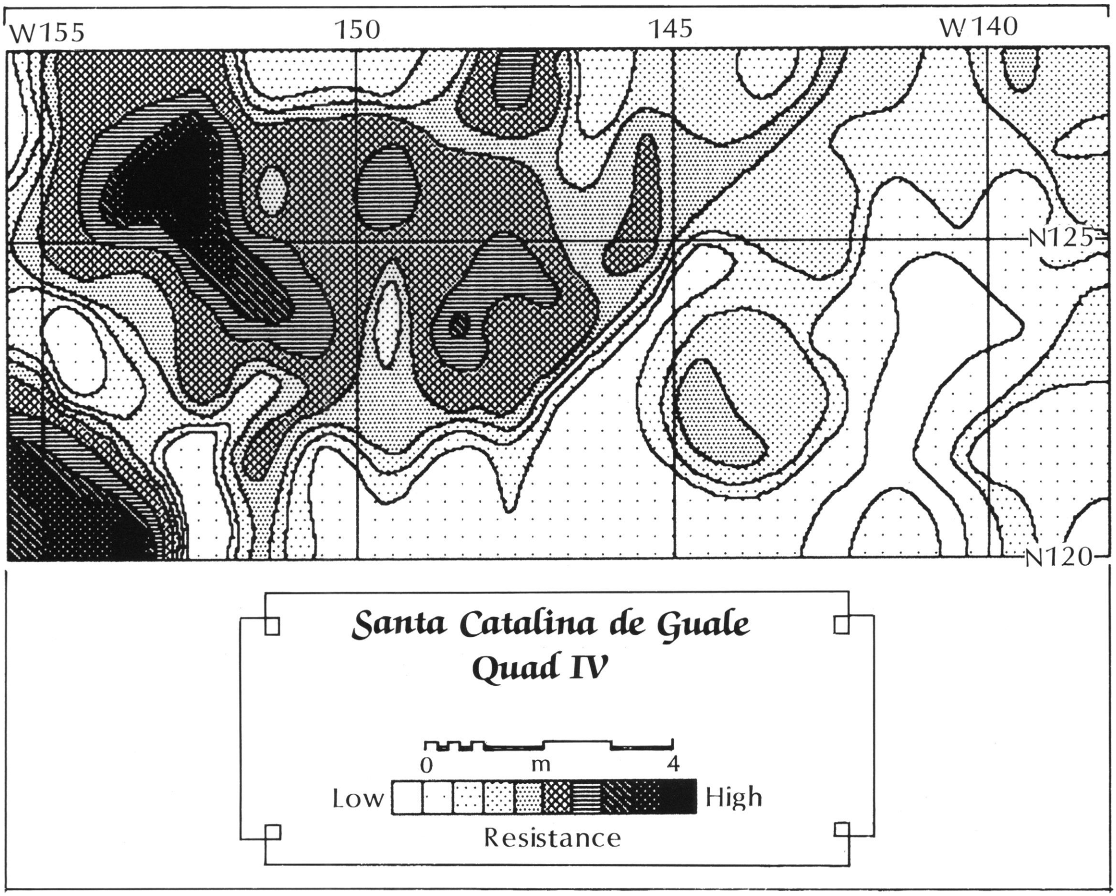

Fig. 38. Soil resistivity contour map of Structure 1 (*iglesia*) at Santa Catalina.

Three hand-contoured, color-coded maps were produced, reproduced as black-and-white renderings in figures 38 and 39. Although additional excavation and detailed feature-by-feature comparison will be necessary to evaluate fully the information in these resistivity maps, the outcome of directed test excavations is sufficiently clear to allow preliminary interpretation. The results are striking.

Resistivity testing at Santa Catalina was first attempted in an 18 × 8 m test area near the presumed (unexcavated) southeastern margin of the church (Structure 1). In figure 38, plotted at a scale of five resistance units (roughly equivalent to ohms), one can recognize several aspects characteristic of all resistivity research at Santa Catalina. The most obvious is the distinctive 45° orientation (evident in all three resistivity maps)—the same alignment first noted in the magnetometer contour maps presented in the previous section. Consistent with the 1573 Laws of the Indies (Crouch et al., 1982), Mission Santa Catalina was constructed according to a rigid town plan, in this case, oriented 45° west of north.

Test excavations have permitted us to identify some of the structural elements involved. As it turned out, resistivity test area A straddled the front wall of the church at Santa Catalina; the church facade itself appears as the well-defined diagonal across the center of figure 38.

The round feature at coordinate N122W144 has not yet been tested, but the extremely low area of soil resistance in the southeastern quadrant is now known to be a

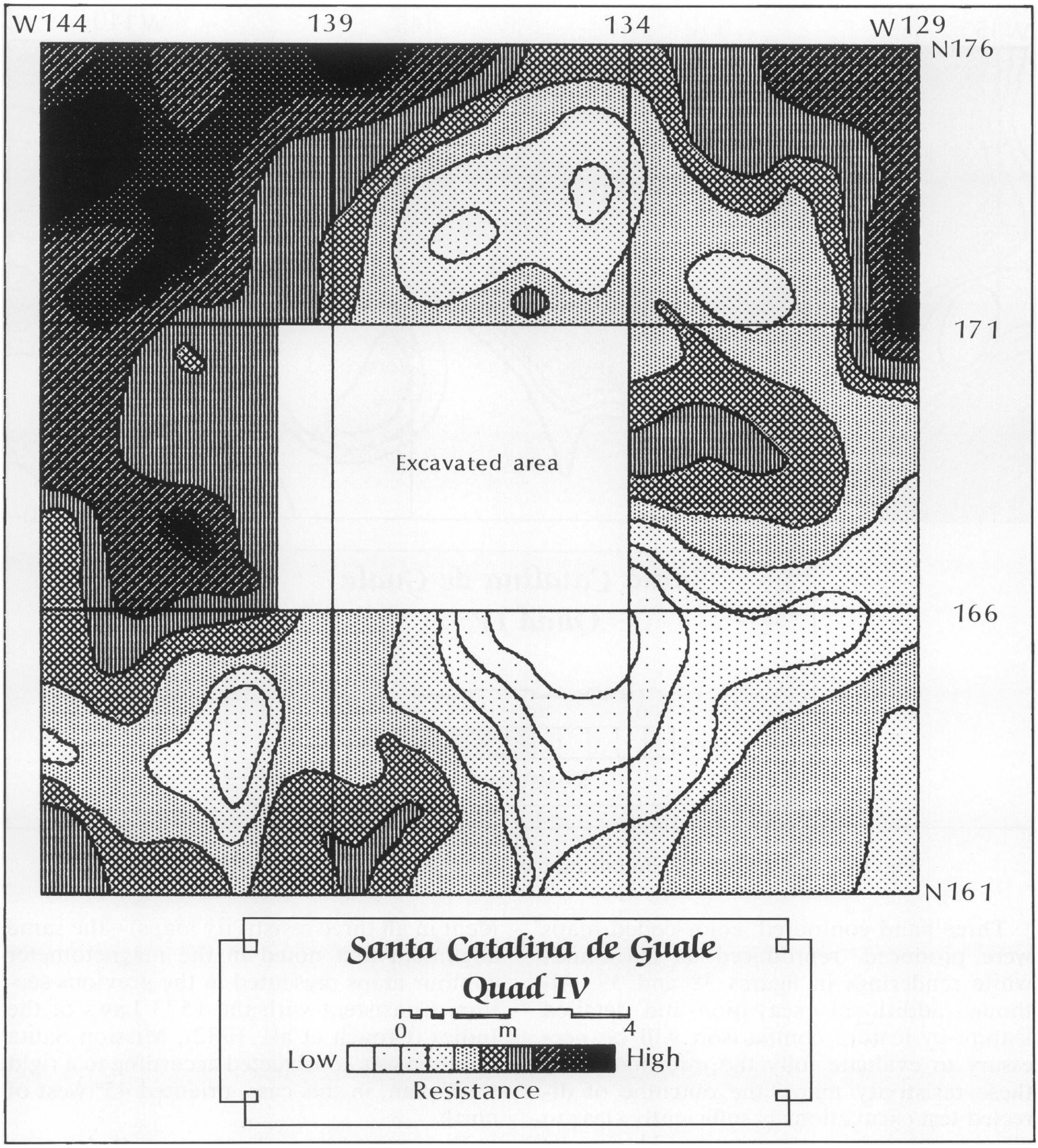

Fig. 39. Soil resistivity contour map of Structure 2 (*cocina*) at Santa Catalina.

large, buried, shell-covered rectangular plaza. Constructed of water-rolled marine shell, this feature is probably an *atrio,* a walled courtyard facing the church facade. This ubiquitous element of New World religious architecture provided not only a decorous entryway into churches like that at Santa Catalina, but also could function variously as an outdoor chapel, an area to contain overflow congregations, and even as a cemetery (Kubler, 1940, pp. 73–75).

A second test was a 15 × 15 m square located along the western margin of the central plaza (approximately 10 m to the east of

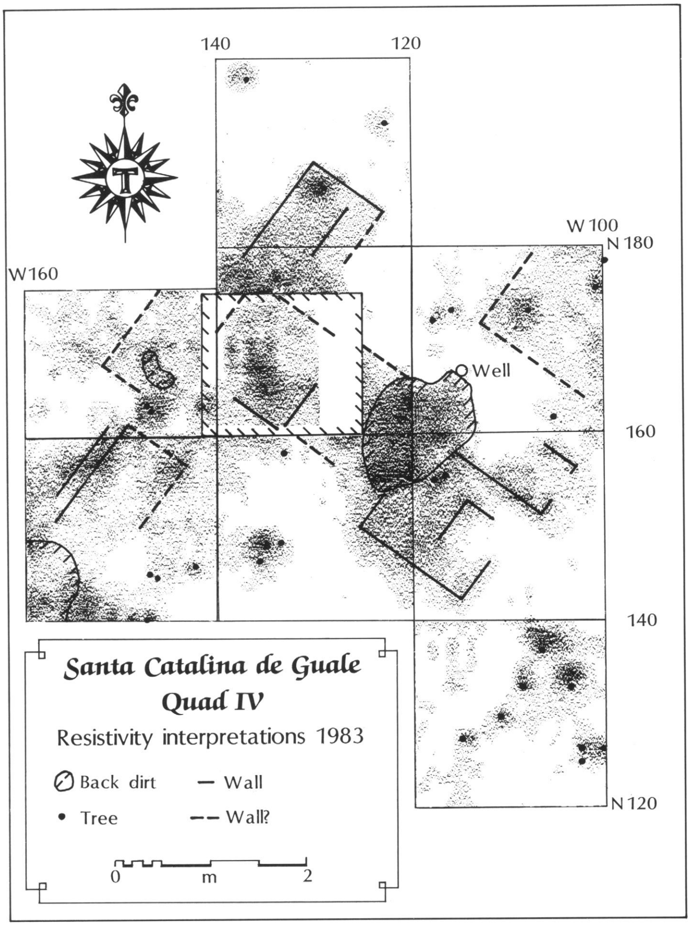

Fig. 40. Raw dot density map of soil resistivity data for a portion of Quad IV at Santa Catalina. Trees and backdirt piles are plotted as nonarchaeological disturbances that might have affected soil resistance.

the church). But because of a large oak tree in this area, it is unclear whether an apparent 45° alignment should be attributed to deliberate planning or to happenstance. No structural elements have yet been identified in this area.

The last preliminary resistivity survey was conducted within a 15 × 15 m square straddling the previous 5 × 5 m test unit in Structure 2 (fig. 39). Humus and topsoil had been removed in this area, but excavations had not progressed to the depth at which the features appear. Accurate readings could not be taken 1 m west of the test square because this area had been covered with black plastic (to protect the sidewalls of the test excavation).

We think that figure 39 (plotted at a scale of 10 resistance units) shows very clearly the margins of this unexcavated building, and early test soundings confirmed the accuracy of the soil resistivity diagram. But the architectural details and activity areas remain to be revealed archaeologically.

The Quad IV Resistivity Survey

On the strength of these preliminary surveys, we contracted to conduct a close-interval survey of the entire Quad IV area. This survey was completed by Shapiro and Williams in fall/winter, 1983, and the following account is based upon their final report (Shapiro and Williams, 1984), submitted in April 1984.

Two major areas in Quad IV could not be surveyed (fig. 40) due to significant backdirt accumulations near the *iglesia* excavation and also in the northeastern corner, where large live oak stumps and logs had been piled during the clearing of Quad IV. Approximately 7500 resistance values were recorded (by the techniques described above).

Shapiro and Williams produced three interpretive maps based on their soil resistivity survey at Santa Catalina. The first (fig. 40) is the dot-density raw representation of the Quad IV resistivity pattern which plotted known nonarchaeological disturbances (trees, roads, backdirt piles) that might have affected soil resistance (see also Scollar and Krückeberg, 1966). The software, prepared by Williams, indicates areas of lowest resistance as the darkest shaded areas. Due to the mechanical structure of dot-matrix printers, the vertical scale is about 2 percent shorter than the horizontal scale; this distortion is minor and produced no interpretive difficulties.

Site Structure as Projected by Soil Resistivity

Soil resistivity data were then synthesized into an interpretive dot-density map (fig. 41). Shapiro and Williams (1984) also prepared two "hypothetical mission plans" which designated 17 areas of potential archaeological interest; numbers 1–4 refer to structures already tested archaeologically and 5–17 designate large anomalies of either high or low resistance. Figure 42 shows the irregular outlines as observed in the field (and with trees plotted as black dots). Figure 43 is idealized by squaring off the corners of anomalies that appear to align with the Spanish mission grid. Shapiro and Williams (1982, pp. 5–9) offered several observations based on figures 42 and 43:

Area 5 [(N140W100)]: a rectangular anomaly associated with the southeast corner of Structure 4 (the daub *convento* structure had been partially exposed between episodes of resistivity survey).

Area 6 (eastern half of Block N160W100): a zone of lower resistance with alignment close to the known Spanish mission grid. Area 6 may be a structure, but note that the corner of this anomaly is occupied by a large live oak tree, which is partly responsible for the configuration of the anomaly.

Area 7 (west half of Block N100W100): an amorphous anomaly of low resistance; no interpretations offered on the basis of resistivity.

Area 8 (square N140W120): a somewhat rectangular area of higher resistance; probably contains little organic refuse or collapsed daub construction and may be interpreted as a courtyard or small plaza.

Area 9 (extends NE to SW beginning in Block N180W120): Although the southern extension of this anomaly is unclear, it is possible that Area 9 represents a wall that once divided the mission compound itself from the Guale *pueblo* to the northwest, where several patches of shell midden could readily be detected as the probes were inserted in the ground. Area 9 contained no indications of shell midden.

Area 10 (Block N100W180): an anomaly of lower resistance, composed at least in part of shell midden. The shape and alignment suggest that this may be a structure approximately the same distance to the southwest of Structure 1 as are Structures 2 and 4 to the northeast (daub Structures 1, 2, and 4 having already been exposed at the time of this survey).

Area 11 (Block N120W180): a somewhat amorphous anomaly of lower resistance. Even given disturbance by two roads and a pile of bulldozed earth, it is possible that Area 11 represents a shell midden feature aligned with the mission grid.

Area 12 (Blocks N140W180, N140W160, N160W160, and N160W140): rectangular area of higher than average resistance; surrounded by shell midden on northwest and southwest borders and by Area 9 to the southeast. Area 12 appears to be a courtyard surrounded by domestic refuse.

Area 13 (extends NE from north half of Block N140W180; turns northwest in Block N180W160): an arc of low resistance, clearly aligned with Spanish mission grid.

Areas 14, 15, and 16 (primarily located in Blocks N160W180 and N180W160): areas of even lower resistance within Area 13.

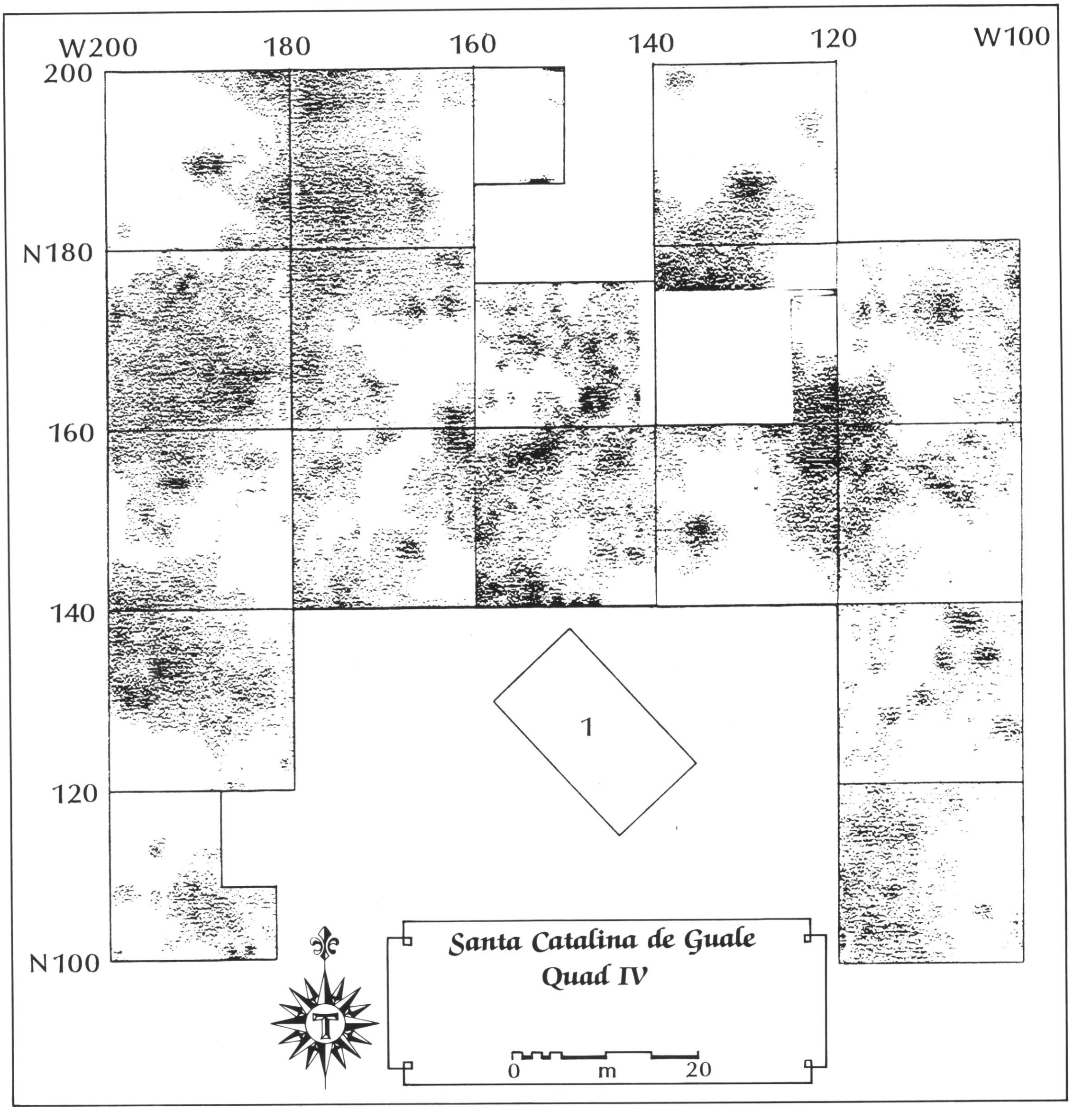

Fig. 41. Interpretive dot-density map of soil resistivity data for Quad IV at Santa Catalina.

While these areas might simply represent concentrations of shell midden, Area 14 is distinctly rectangular and may represent a collapsed structure aligned with the mission grid. Area 16 might be similarly rectangular, but only a small part of this anomaly is included in the Quad IV survey area.

Area 17 (N180W180): a third area of higher than average resistance. Like Area 12, this zone is rectangular and surrounded by midden deposits. Area 17 is aligned with the mission grid and may represent a courtyard surrounded by domestic structures.

Based on this resistivity patterning, and examination of previously excavated Structures 1 and 2, Shapiro and Williams (1984) made some additional suggestions about the general structure of Santa Catalina.

Areas 10 and 14 (the most rectangular of

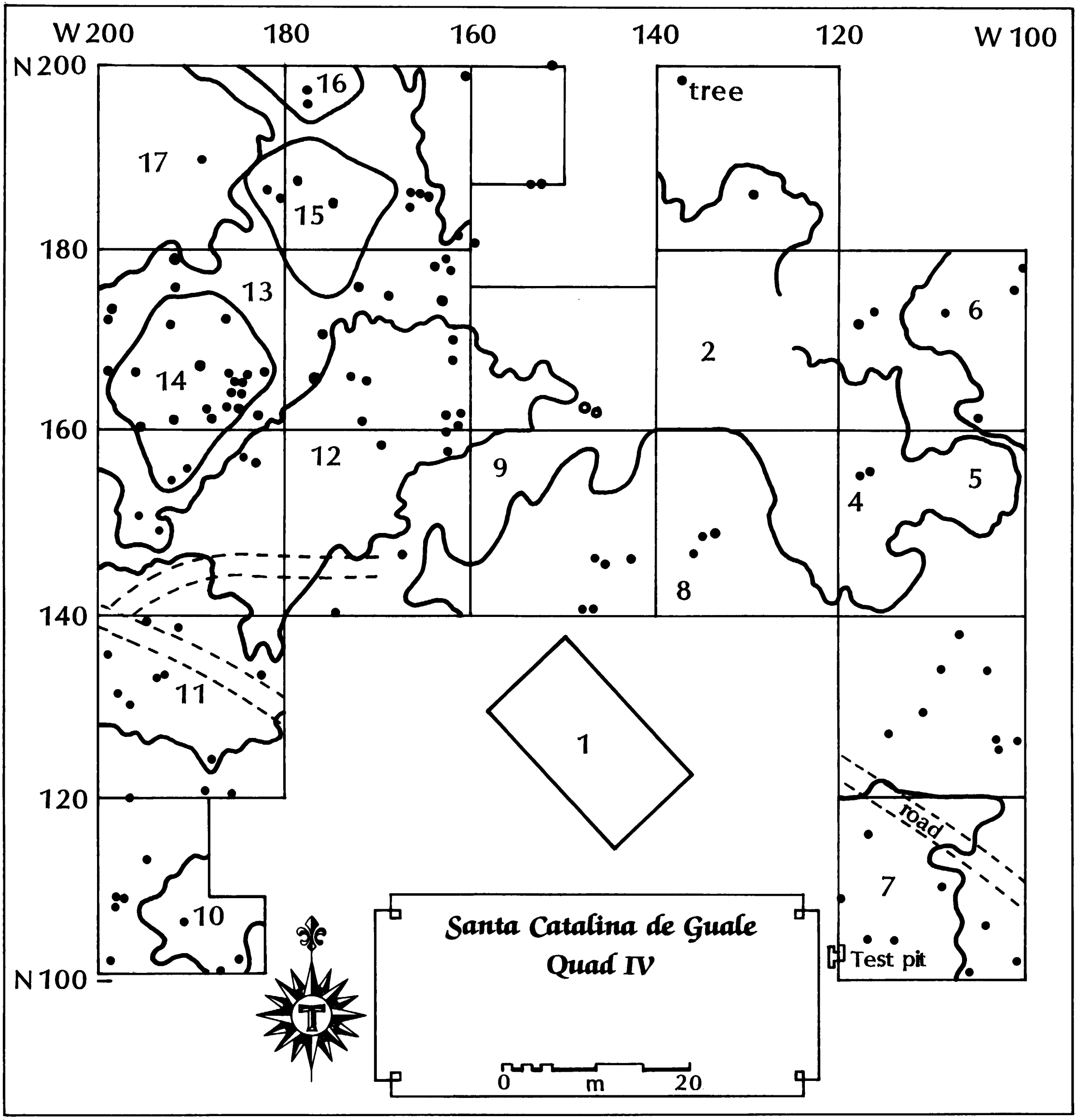

Fig. 42. Suggested plan view of Mission Santa Catalina, based on soil resistivity profiles of Quad IV; trees have been plotted as black dots. Several areas of potential archaeological interest have been outlined. Numbers 1, 2, and 4 refer to structures already tested archaeologically; 5–17 designate large anomalies of either high or low resistance. The Spanish period well (anomaly number 3) has not been plotted.

the untested low-resistance anomalies) most likely represent structures; but unlike structures exposed at the time of the survey, these anomalies consist mostly of shell midden.

Areas 11 and 13 circumscribe a roughly rectangular area of lower resistance to the southeast and another to the northwest. Areas 8, 12, and 17 all appear to be rectangular areas of higher than average resistance aligned with the mission grid; they may represent a series of courtyards. Alternatively, Areas 12 and 17 might be locations of structures, with

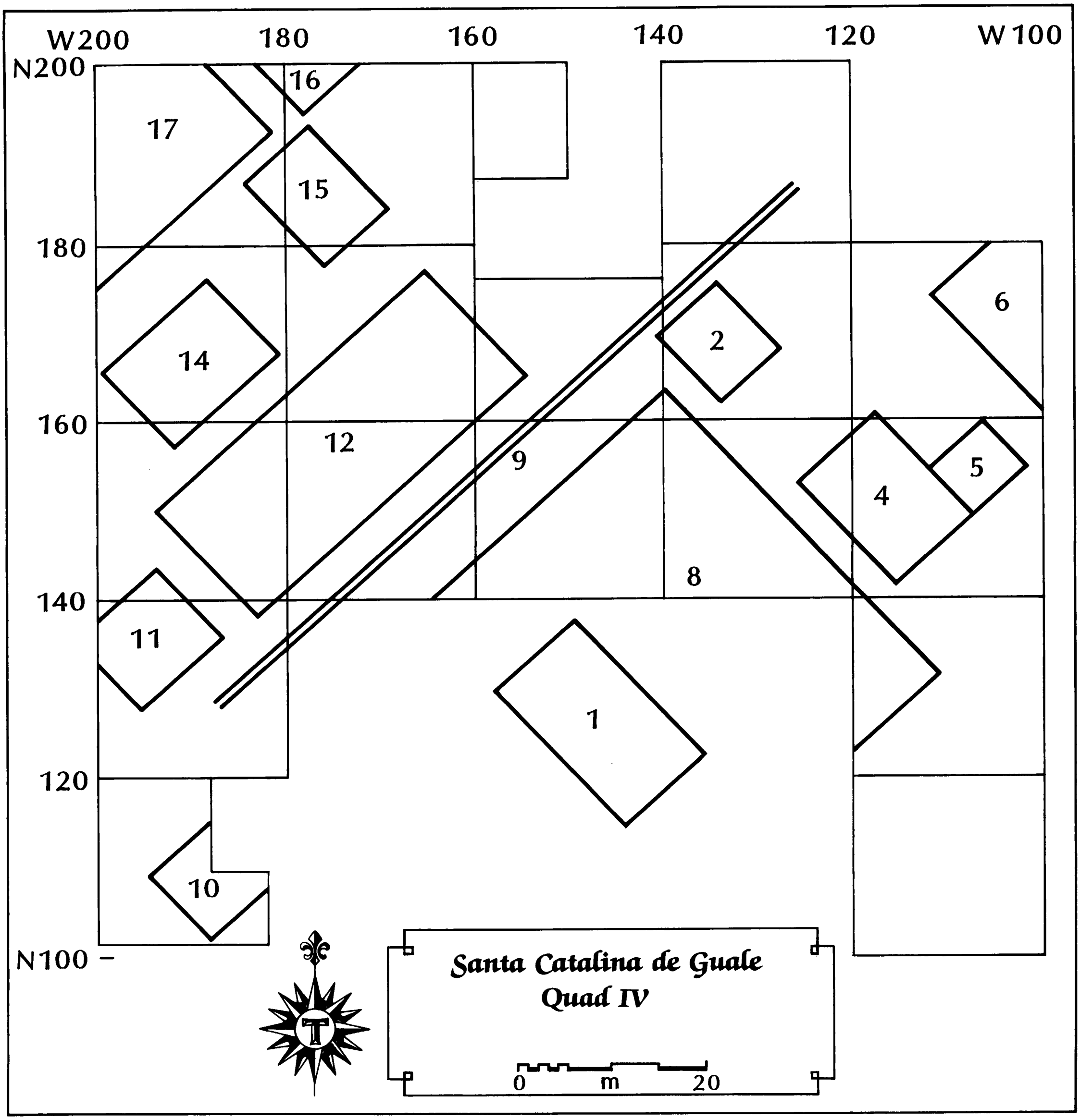

Fig. 43. Idealized plan view of Mission Santa Catalina, based on soil resistivity profiles of Quad IV. Areas of potential archaeological interest are outlined: numbers 1, 2, and 4 denote known mission structures; 5–17 designate large anomalies of either high or low resistance. The Spanish period well is not plotted.

accumulations around the outside of each; this interpretation was considered unlikely because of the large size of Areas 12 and 17, and because burnt or rotten structures should appear as areas of lower resistance (as in excavated Structures 1, 2, and 4).

Finally, the fact that shell midden was detected only in the northwest half of Quad IV lends support to the interpretation of low-resistance Area 9 as a wall separating the mission complex itself (in the southeast) from an aboriginal habitation area to the northwest and possibly surrounding the mission complex.

This was a useful early-stage inquiry, directly leading to the discovery of Structure 4. The main shortcoming in resistivity survey lies not with the technique, but with the timing of its application. Because we did not initiate resistivity studies until well after the excavations had begun, a couple of potential areas of survey had been covered with backdirt. Even if removed, the presence of this spoil would seriously modify patterns of resistance; we could not obtain useful results in these areas. Ideally, this type of survey should be conducted before any excavation has modified the local patterns of resistivity.

Nevertheless, the soil resistivity survey was unquestionably a success at Santa Catalina. Not only did it provide a general projection of site structure across Quad IV, but the results provided structure-by-structure detail that guided subsequent excavations. Moreover, these projections can be tested against independent data generated from ground-penetrating radar studies, discussed below.

A GROUND-PENETRATING RADAR APPROACH

A third—and in some ways most promising—geophysical exploration at Santa Catalina was an intensive ground-penetrating radar survey of Quad IV and the surrounding area. Another "active" method of geophysical prospection, ground-penetrating radar is a rather expensive technique, but the cost is offset to some degree by the speed with which it can proceed (at least under ideal circumstances). But neither radar equipment nor interpretation are simple (Bevan and Kenyon, 1975; Weymouth, 1986, p. 315). Because applying ground-penetrating radar technology is a relatively new enterprise in archaeology, a word of background seems appropriate.

Initial work in ground-penetrating radar can be traced back to 1910, but a significant peak in relevant articles coincides with the Apollo 17 Lunar sounding experiment in the early 1970s. Today, ground-penetrating radar techniques are commonly employed by environmental engineering firms to aid in route selection for proposed rights-of-way, finding buried rock or deep swamp deposits, foundation investigations, mineral studies, searches for peat, lignite, and coal, siltation studies, location and identification of caverns in limestone, groundwater studies, and ground pollutant investigations.

To date, comprehensive, substantive archaeological applications remain limited (see, e.g., Johnson, 1961; Kenyon, 1977; Parrington, 1983, pp. 115–119). But it is clear that ground-penetrating radar has extraordinary potential for archaeological remote sensing. Bevan and Kenyon (1975) provide a detailed discussion for archaeologists, outlining the theory behind ground-penetrating radar surveys (see also Bevan et al., 1984; Weymouth, 1986); a more technical discussion can be found in Ulriksen (1983).

In brief, impulse radar operates as an echo sounding device, transmitting energy over a frequency band (in contrast to pulse radar which operates at a single frequency that is turned on and off). Radar pulses directed into the ground reflect back to the surface when they strike targets or interfaces within the ground (such as a change of stratum, interface between soil and rock, presence of ground water or buried objects, and void areas). As these pulses are reflected, their speed to the target and nature of their return is measured. The reflection time of the signal can provide useful information about the depth and three-dimensional shape of buried features (Bevan et al., 1984, p. 64).

By employing transducers (transmitters/receivers) of various dimensions, it is possible to direct the greatest degree of resolution to the depth of specific interest. A pulsating electric current is passed through the bow-tie-shaped antenna, inducing electromagnetic waves which radiate toward the target and return in a fraction of a microsecond to be recorded. The dimensions of this transducer influence the depth and detail which may be expected.

As the antenna is dragged across the ground surface, a continuous profile of subsurface electromagnetic conditions is printed on the graphic recorder (fig. 44). The location and depth of subsurface targets can be inferred from, and tested against, this graphic record.

The groundwater table can pose a problem in such studies because it changes the relative permeability of most soils by a factor of from five to six. Soils are good reflectors when they are associated with steep changes in the soil water content, as occurs in coarse materials. In unsorted soils such as moraine deposits, there will be a broad and varying capillary zone and thus no clear reflection. It is often possible to employ radar survey to project the groundwater table in coarse sand, but not in finer materials.

Ground-penetrating radar is generally ineffective over salt water, in penetrating some clays, and at depths in excess of about 30 m below the surface. Maximum depth of penetration is dependent on the conductivity of the overlying deposit. Deep profiling by ground-penetrating radar requires more expensive equipment and more highly trained personnel than other geophysical prospecting technology currently applied in archaeology (Weymouth, 1986, p. 381).

The method seems to work best when soil resistivity is high, as in well-drained soils and those of low clay content. Radar has produced good results when subsurface features have a sharp dielectric contrast from surrounding soil. Subsurface walls, foundations, cellars, voids, cavities, and well-defined, compacted prehistoric house floors are known to provide clear radar echoes (Bevan et al., 1984, pp. 71–73).

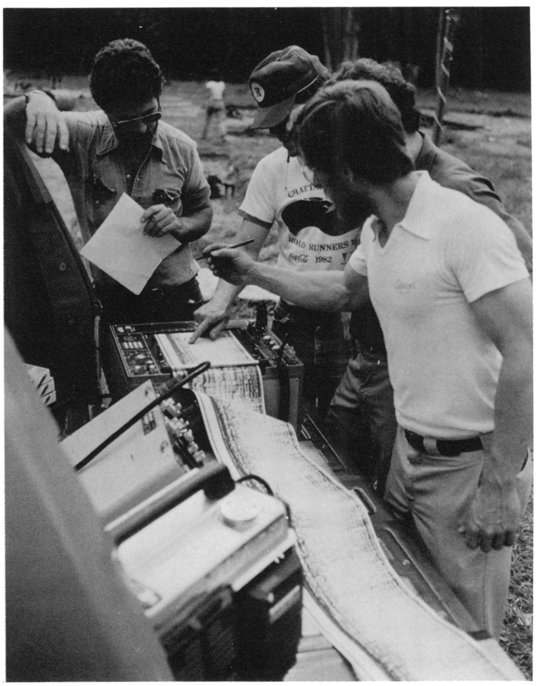

Fig. 44. The ground-penetrating radar survey at Santa Catalina.

Fig. 45. Ground-penetrating radar antenna employed in the survey of Santa Catalina.

Research Objectives at Santa Catalina

The ground-penetrating radar study at Santa Catalina was conducted in April and May 1984 by personnel from Red-R Services of Atlanta (fig. 45). By this time, we had completed the magnetometer and soil resistivity surveys, and intensive excavations were being conducted at the church (Structure 1), kitchen area (Structure 2), and friary (Structure 4). We were also employing large-scale test trenching to determine the extent and configuration of the associated Guale Indian *pueblo* area.

Extant historical documents suggest that Santa Catalina had been fortified as a precaution against British attack (e.g., Bolton and Ross, 1925, p. 36; Lanning, 1935, p. 215; see also previous discussion). The Santa María map, employed as a model for late 17th century constructions at Santa Catalina (fig. 7), suggests that a stockade and moat complex may have been constructed to protect the buildings immediately adjacent to the central plaza. Yet, despite three years of prospection and excavation, we had failed to locate any trace of defensive fortification surrounding the central plaza at Santa Catalina. Thus, in addition to providing baseline geophysical

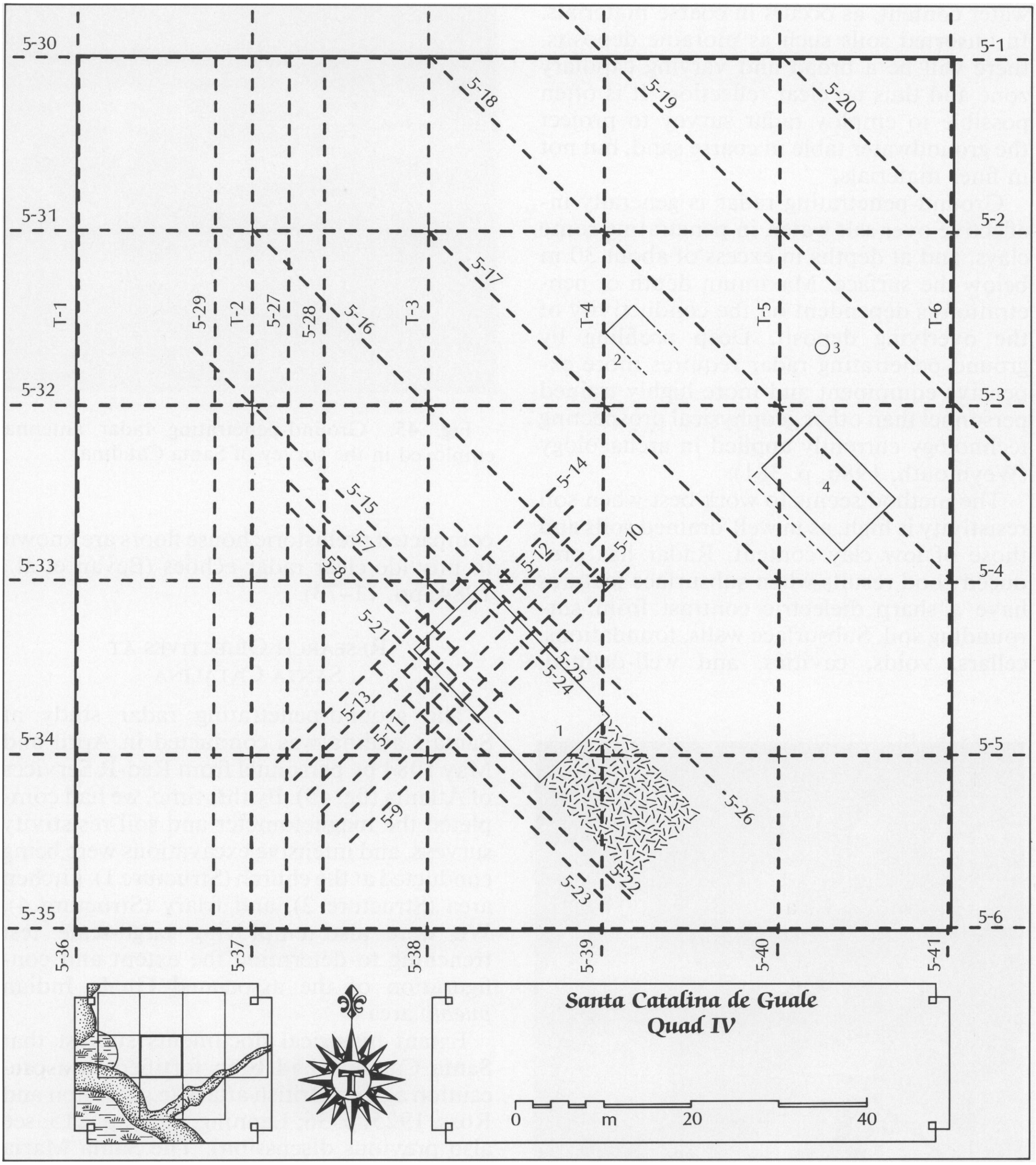

Fig. 46. Plan view of ground-penetrating radar transects conducted across Quad IV at Santa Catalina.

data, our immediate objective for the ground-penetrating radar survey at Santa Catalina was a search for defensive fortifications, such as palisades, bastions, or moats encircling the central mission zone.

We took Quad IV as a 1 ha control area, to be saturated by diverse methods of remote sensing, then extensively excavated to compare the efficacy and results of each method against in-the-ground archaeological evidence. In this sense, a complete ground-penetrating radar survey of Quad IV was mandatory to stockpile information about the subsurface structure of unexcavated Santa

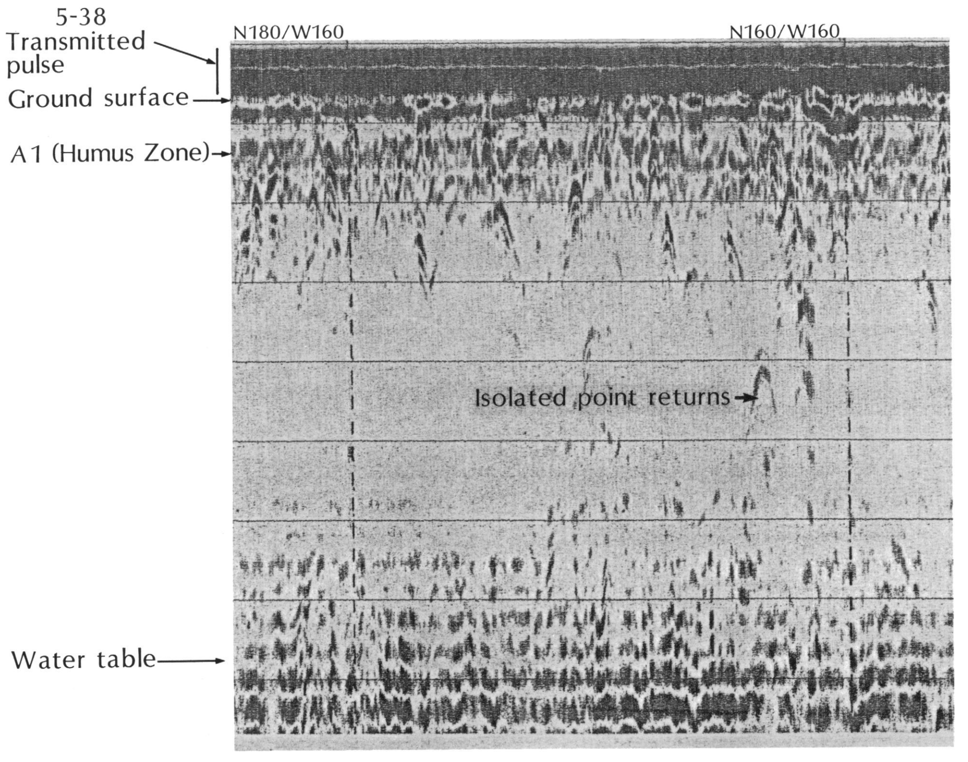

Fig. 47. Printout of a noncultural ground-penetrating radar transect at Santa Catalina.

Catalina de Guale. Once our excavations are finished, we will be in a position to compare magnetometer, resistivity, and ground-penetrating radar surveys against the facts encountered during excavation.

One further concern guided our radar survey. By 1984, we had become great believers in, and advocates of, remote sensing technology, and we worried about extending our excavations into areas not first surveyed with geophysical equipment. Remote sensing is not very effective in partly excavated areas, and we were troubled about potential information lost when subsurface features are excavated without benefit of geophysical survey. It may be that remote sensing will one day be required as baseline documentation prior to the destruction of sites through excavation.

Methods

Ground-penetrating radar equipment is relatively portable, and it may be transported on a handcart as the transmitter/receiver is dragged across the earth's surface; this was the method employed at Santa Catalina (see fig. 45). The equipment may also be housed in an all-terrain vehicle as it tows the transmitter/receiver resting on a sled; this method was employed in our survey of the Fallen Tree site, to the south of Wamassee Creek.

At Santa Catalina, we employed an SIR System 8, manufactured by Geophysical Survey Systems, Inc., with a 500 megahertz antenna, an analog control unit, and a grey scale printer/recorder. This equipment produced an average penetration of roughly 2 m below the present ground surface; this estimate was confirmed by an auger test on the margin of Quad IV.

We used the existing grid system at Santa Catalina, having cleared transect lines of brush and palmetto prior to survey. Initially, a number of systematic north-south transects were run at 20 m intervals, followed by a series of east-west transects (fig. 46). Obvious anomalies were hand-plotted on the basis of the grey scale output, and then additional

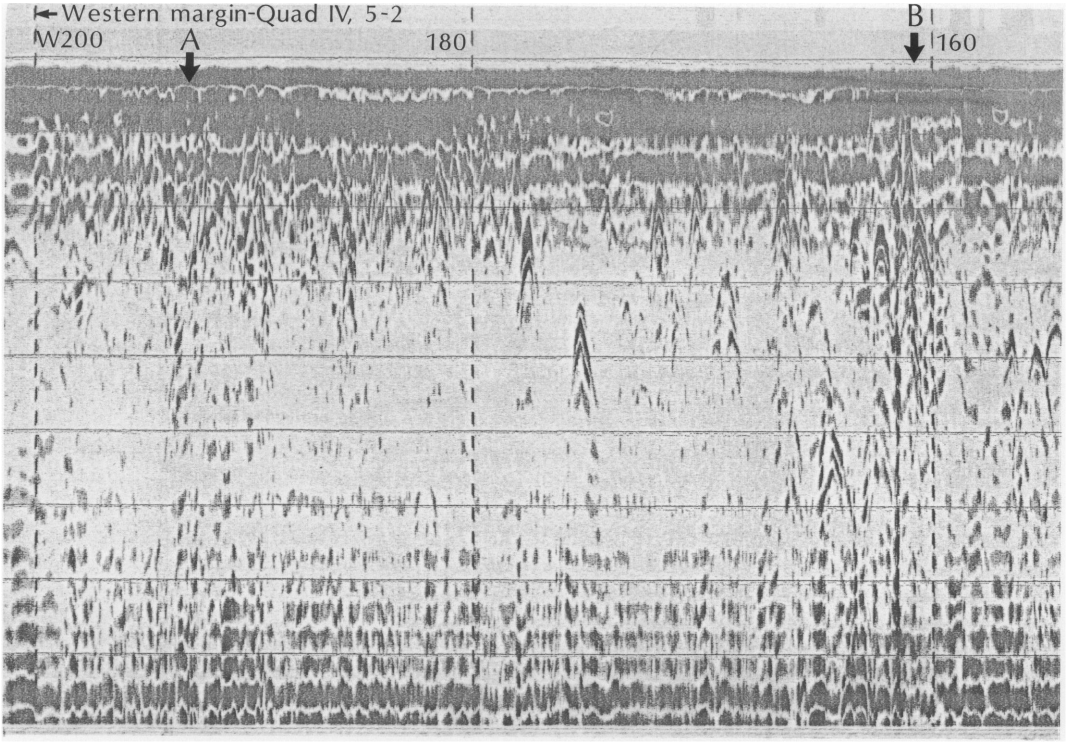

Fig. 48. Printout of ground-penetrating radar transect 5-2 at Santa Catalina; see figure 46 for placement within Quad IV.

transects were run across these target areas; the trajectories of significant anomalies were plotted on the ground by means of pin flags. We then ran a series of transects at a 45° angle, to intercept buried anomalies in a perpendicular fashion.

Site Structure as Projected by Ground-Penetrating Radar: Preliminary Results

Figure 47 shows a typical radar profile from Santa Catalina, monitored at an off-site control zone. It should be read as a stratigraphic profile, with the ground surface at the top, water table at the bottom. In this characteristically transmitted and received pulse train, horizontal distance is indicated by dashed lines. These were manually induced by the antenna operator to denote each 20 m stake; corner coordinates were simultaneously recorded by hand on the grey scale printout. The horizontal distance in figure 47 is about 35 m. The solid horizontal lines cannot be precisely calibrated to correspond with depth; they are for reference only. The vertical distance in figure 47 is approximately 2 m, as determined by hand excavation to the water table.

The two dark bands at the top of the profile represent the transmitted radar pulse leaking into the receiver (Bevan et al., 1984, p. 65). All patterning below these lines represents echoes reflected from subsurface characteristics.

The dark, irregular bands (denoted as A1 on fig. 47) represent the radar signals reflected from the near-surface humic A1 soil horizon. This horizon is where most living organisms are active, and it is characterized by extensive buildup of organic matter. In the Wamassee area, the A1 soil horizon ranges in depth from 10 to 20 cm. The hyperbolic echoes evident in this area result from radar contact with

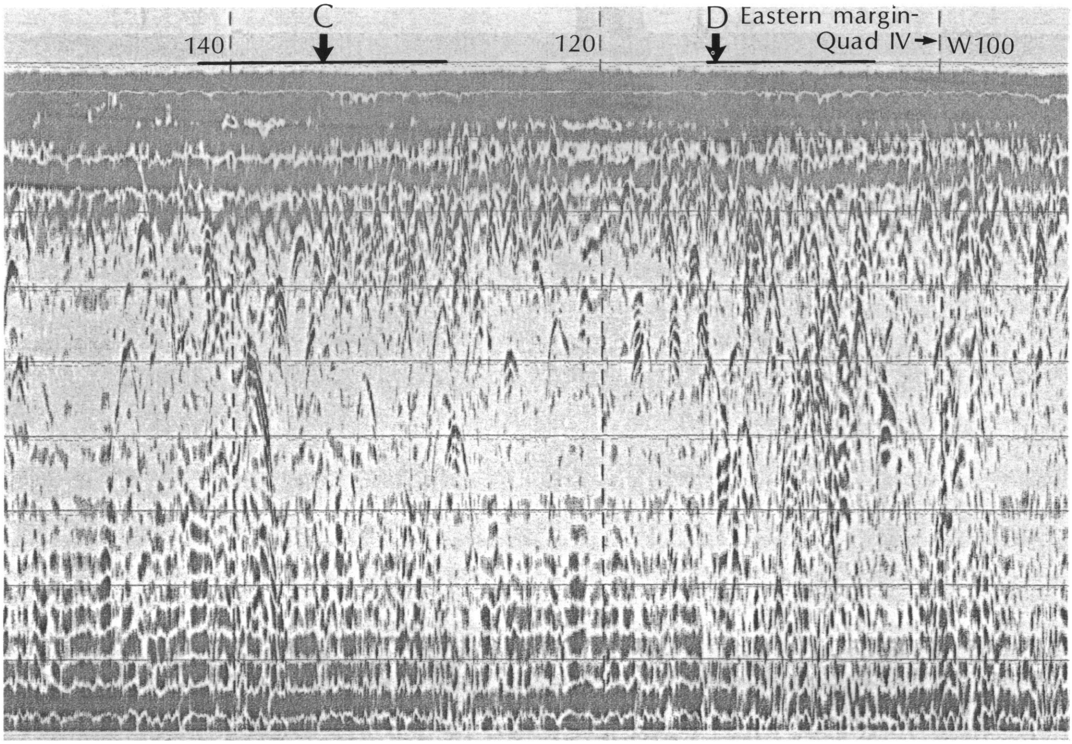

Fig. 48—(*Extended.*)

relatively small objects buried beneath the line of traverse (Bevan and Kenyon, 1975, p. 4).

Below the irregular A1 horizon is the loose, sandy weathered C horizon, represented on figure 47 by a paucity of radar echoes. In this culturally sterile control zone, the haphazardly dispersed parabolic returns probably result from small roots and naturally occurring iron concretions.

The variegated, regular banding at the base of figure 47 represents returns reflected by the water table, at a depth of roughly 2 m.

The profile in figure 47 is fairly typical of noncultural deposits in the Wamassee Creek area, and the immediate objective in our radar survey at Santa Catalina was to locate systematic deviations from this pattern.

Figure 48 is the printout from one Quad IV transect (labeled *5-2*), beginning at N180W200 and ending at N180W100; in other words, figure 48 is a 100 m E–W radar transect running 20 m from the northern margin of Quad IV (for location, see fig. 46). Although detailed interpretation must await further excavation and analysis, four sets of distinctive radar echos are apparent even at this early stage. We note particularly the close correlation between such radar transects and the independent geophysical data generated by magnetometer and resistivity surveys, discussed above.

Radar anomaly *A* occurs between 193W and 188W. Although this subsurface anomaly has not yet been tested, it clearly corresponds with the southeastern margin of an area of higher than average soil resistance, with the margins aligned along the 16th/17th century mission grid (figs. 42 and 43). The radar profile shows a distinctive anomaly corresponding to a surface midden, that borders the high-resistance rectangular anomaly. A strong 45° magnetic anomaly likewise appears along the southern margin of radar echo

A (fig. 35); this rectangular zone is encircled by surface midden deposits, perhaps representing a courtyard surrounded by domestic structures.

The well-defined planar echo *B* occurs between 168W and 157W, apparently reflecting subsurface shell midden scattered along the northern margin of resistance anomaly 12, a rectangular zone of higher than average resistance (figs. 41, 42). Significantly, the magnetic survey showed a distinctive 45° "corner" in this area (fig. 32). As in Area *A*, the combined geophysical results suggest that *B* may be a courtyard surrounded by domestic structures and refuse.

A third radar echo (*C*) appears at about 135W–147W, and an indistinct anomalous zone extends to about 128W. This placement correlates with soil resistance zone 9, a 45° anomaly extending nearly 100 m along a SW–NE direction (fig. 42). Based strictly on resistivity results, we thought perhaps that Area 9 represents a wall dividing the mission compound itself from aboriginal *pueblo* areas to the northwest, where several patches of shell midden could readily be detected by subsurface probing. Area 9 lacks shell, and the radar profile perhaps reflects the presence of an indistinct backfilled wall trench.

Finally, a sharp radar echo (*D*) occurs between 112W and 105W. The magnetic contour map in figure 32 shows another distinctive 45° corner about 4 m to the south. Radar anomaly *D* also corresponds to a zone of lower resistance (Area 6), with alignment close to the known Spanish mission grid. Although Area 6 was thought to be a structure, the resistivity results were unclear because at the corner of this anomaly is a large live oak, at least partially responsible for the low resistance recorded. Independent results of radar and magnetic survey reinforce the suggestion of a structure in this area.

The results from transect *5-2* remain preliminary and speculative, but they satisfactorily point up the potential of ground-penetrating radar at Santa Catalina. We conducted 12 such radar transects, spaced 20 m apart across Quad IV. Six 100 m long transects (like that on fig. 48) ran east–west, and 10 ran in a magnetic north–south direction. The output from these systematic radar surveys—representing 1.2 km of linear profiles—provides the primary reference library documenting the subsurface radar characteristics of Santa Catalina. These data remain largely unanalyzed, awaiting detailed comparison with output from other geophysical sensing technology, and the results of archaeological excavations in Quad IV.

We also expanded the radar survey beyond the 1 ha Quad IV by surveying a series of N–S and E–W transects into adjacent Quad XX (due west of Quad IV) and Quad I (due south of Quad IV). These surveys provide an additional 2 km of subsurface radar profiles within the Guale *pueblo* that once bordered Mission Santa Catalina.

We experimented with several special-purpose radar surveys at Santa Catalina. In some cases, we were able to map buried linear anomalies directly on the ground. When a significant anomaly was detected in the above-mentioned systematic survey, we completed the transect, then returned to the "hot" area to conduct a zigzag pattern across the anomaly. The anomalous area was then marked on the ground with pin flags, which served as guides for future test excavations.

By this time, we knew that the Mission Santa Catalina complex had been constructed according to a grid system oriented about 45° west of magnetic north. This meant that these initial 20 m transects would commonly intersect subsurface anomalies at a 45° angle. While this procedure is satisfactory for some purposes, it is known that linear subsurface structures are best located when the antenna crosses in a perpendicular direction (Bevan et al., 1984, p. 65).

Accordingly, we ran an ancillary series of radar transects parallel to the mission orientation (that is, at an angle of 45° west of north). Such transects were designed to encounter known structures and unknown anomalies at Santa Catalina at an easier-to-interpret perpendicular angle.

Ten radar transects were, for instance, run across the northern end of Structure 1 (the church) at Santa Catalina. The horizontal distance of each transect was about 25 m; and depth of radar penetration was 2 m. Preliminary analysis of these transects shows a series of pulses that seem to correspond to the post pits encountered in our excavations. A series of point echoes are also apparent on transects throughout the then-unexcavated church interior. This area has since been completely excavated, and we now know that radar transects passed directly over several dozen extended, supine human burials. It is tempting to correlate the point radar returns from this area with individual burial pits. But establishing such isomorphism will require more detailed analysis of burial records and the results of all available radar transects. Similar preexcavation radar data are likewise available for the other Spanish period structures presently being excavated at Santa Catalina.

To summarize, the general objective of the ground-penetrating research at Santa Catalina was to establish a baseline library of radar signatures for Quad IV. We now have a comprehensive set of such profiles, suitable for comparison both with the results of excavation, and with projections obtained from other means of geophysical survey.

We also accomplished our specific objective. Test excavations, guided by radar profiles, led directly to the discovery, in 1984, of the palisade and bastion complex encircling the central buildings and plaza at Santa Catalina. Excavations proceed on these features. While this defensive network could surely have been located by extensive test trenching, the radar approach proved to be considerably more cost effective and less destructive than conventional archaeological exploration by excavation.

CHAPTER 6. EXCAVATION STRATEGIES AT SANTA CATALINA

Initial AMNH excavations at Santa Catalina were undertaken as part of the regional randomized transect sample. Transect I-6 passed directly through the mission site, and two archaeological sites (AMNH-208 and AMNH-441) were tested in the vicinity of Santa Catalina. Five 1 m square test pits were dug in middens at each site, employing sequential 10 cm arbitrary levels. This preliminary testing took place in March 1978.

Once the general location of the site had been verified, we began a program of randomized test pitting at Santa Catalina. These excavations were anchored to a master grid system extended across the area known to contain concentrations of Hispanic period ceramics. A master datum point, labeled "N0, W0," was established to the south of Wamassee Creek, at a point southeast of known sherd concentrations (and assumed to be southeast of the actual mission location). A baseline was then surveyed 1600 m north to Persimmon Point, an area considered to be well north of the actual mission settlement (fig. 49). A series of 1 ha *quads* (100 m on a side) was laid in, relative to this baseline (fig. 50). A *block* was defined as a square 20 m on a side, and each block was assigned a letter designation. Test units were then designated serially within each block (e.g., IB2 designates the second test unit excavated in Block B of Quad I). All units were excavated in arbitrary 10 cm levels, and fill was screened with ¼ in. screens.

It was not long until we realized that the archaeological record at Santa Catalina de Guale was extraordinarily intact and well preserved. We lack a "plow zone" at Santa Catalina, and our earliest test excavations demonstrated that the site contained remains of several structures—both mission buildings proper and an assortment of peripheral Guale Indian constructions. Although considerable effort has been expended excavating these buildings, we have attempted to transcend the building-specific excavation strategy by adjusting our long-range excavation plan to embrace a range of subsurface testing aimed at defining site structure on a broad scale.

The first step in the large-scale testing program at Santa Catalina was to clear-cut all timber from Quad IV. This was itself a difficult decision. Although two dozen antebellum fields are today visible on St. Catherines Island, no evidence of plantation agriculture is apparent in the Wamassee Creek/Santa Catalina target area. In his 1687 account, Dunlop (1929, p. 131) described this area as containing "much clear ground in our view for 7 or 8 miles together." We suspect that the extensive mission-related agricultural complex so severely depleted the soils that colonial period planters deliberately avoided this previously cultivated area. While not exactly "virgin forest," the vegetation growing on 16th and 17th century Santa Catalina appeared as undisrupted climax forest that had begun maturing upon the abandonment of Mission Santa Catalina, ca. A.D. 1680. This exceptionally well-dated seral stage will undoubtedly be of importance for investigations into the growth rate and composition of coastal terrestrial ecosystems.

The decision to cut 10,000 sq m of the 300-year-old forest was not taken lightly—despite the fact that thousands of hectares of this forest remain undisturbed on St. Catherines Island. Although sensitive to the conservation and esthetic considerations, we decided that the unique archaeological potential of Santa Catalina warranted the step. All overstory vegetation was cut and removed from Quad IV between 1982 and 1984.

This done, we proceeded with large-scale exploration at Santa Catalina. Without the encumbering vegetative cover, all terrestrial remote sensing—particularly resistivity and ground penetrating radar studies—proceeded at an accelerated pace. We also initiated a program of periodic site recording by aerial photography from a helicopter hovering roughly 150 m above the surface.

After viewing the first few such low-level aerial photographs, we realized that certain aspects of site structure were evident even without excavation. To take full advantage of this unusual circumstance, we decided to remove *all* vegetation from Quad IV. With

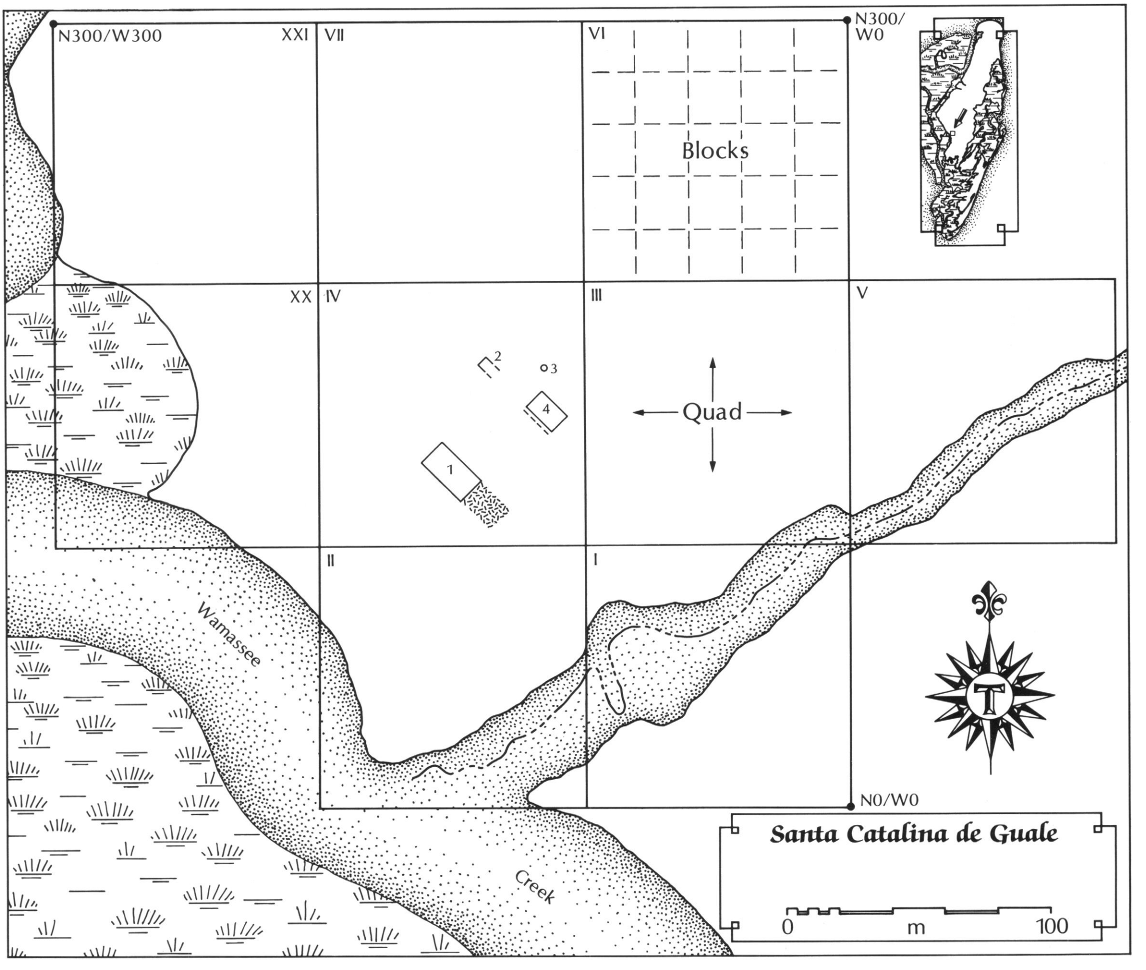

Fig. 49. Grid system imposed on the Wamassee Creek area, with the buildings of Mission Santa Catalina plotted.

the cheerful cooperation of the Coastal Georgia Archaeological Society, we cleaned the entire 1 ha target area in May 1984 using garden rakes and pitchforks. The resulting aerial photograph provides a baseline document for all subsequent remote sensing studies.

LARGE-SCALE TESTING STRATEGY

We then opened a series of large-scale exploratory surface trenches across Quad IV (evident in fig. 51). These 4 × 100 m "test pits" were hand-excavated to the 17th century Spanish period surface, generally at a depth of 25 cm below the contemporary ground surface. All deposit was screened through ¼ in. power screens (fig. 52).

To augment the shallow excavation strategy, we dug a series of 1 m wide trenches into the Spanish period deposits (to a depth of roughly 50 cm below ground surface); all deposit was screened through ¼ in. power screens.

The objective of this large-scale testing was twofold: (1) to *expose but not excavate* Spanish period site structure; (2) then to investigate the nature of Spanish period features encountered. These important large-scale aspects of site structure were documented by

Fig. 50. Field crew beginning to map the archaeological site of Santa Catalina de Guale.

low-altitude aerial photography (fig. 51), using both conventional and false color infrared imagery.

The program of extensive testing paid off in several ways. Perhaps most important, we isolated critical areas to be explored by more intensive block excavations. This strategy both generated data to verify the a priori remote sensing results, and also disclosed some important aspects of previously unknown site structure at Santa Catalina. We likewise derived a systematic body of "negative evidence," defining the "empty" interstices between major architectural elements. In short, although digging 4 × 100 m "test pits" departs from conventional archaeological procedure, the results clearly justify this step.

STRUCTURAL EXCAVATIONS

Despite the considerable time and energy spent defining intra-site variability at Santa Catalina, most of the actual digging proceeded as intensive excavation of specific structures. Preliminary proton magnetometer research in May 1981 had disclosed the presence of a Spanish period barrel well and two well-preserved wattle-and-daub buildings—the church (*iglesia*) and presumed kitchen (*cocina*). Low-altitude aerial photography defined the shell-covered plaza fronting the mission church. Subsequent soil resistivity studies in the fall and winter of 1983 turned up not only a third wattle-and-daub mission building—apparently the Franciscan friary (*convento*)—but also a series of contemporary aboriginal Guale structures (the *pueblo*). Ground-penetrating radar research and subsequent aerial photography in the spring of 1984 confirmed the presence of the western bastion and palisade trenches surrounding the central mission complex at Santa Catalina.

Since then, each area has been intensively excavated. Although precise field methods necessarily vary from structure to structure, we employed a series of relatively standardized field tactics throughout the project. Subsequent volumes will describe these methods on a structure-by-structure basis, but at present, we think it useful to provide a generalized overview of our excavation strategy.

Research at Santa Catalina was not conducted in a vacuum, and we benefited greatly from the experience of others involved in similar inquiry. We were lucky that innovative excavations were on-going at St. Augustine (Florida) and Santa Elena (South Carolina), the 16th century sister cities of Spanish Florida. At the outset, we publicly and gratefully acknowledge our profound methodological debt to Kathleen Deagan and Stanley South. Each visited Santa Catalina in the early stages of excavation, providing us with useful insights regarding their field tactics, and contributing constructive suggestions about how best to proceed in our own work at Santa Catalina.

One important goal at Santa Catalina was to insure that our data was comparable to that from these important sites. In this way, whatever was unique about Santa Catalina could be attributed to behavioral differences, rather than methodological differences among excavators. In particular, the structural excavation strategy at Santa Catalina (described below) was deliberately adapted from the system employed at Santa Elena (South, personal commun.; see also South, 1980, 1981).

A-ZONE EXCAVATION STRATEGY: Because Santa Catalina lacks a "plow zone," it became necessary to impose somewhat arbitrary designations until subsurface Spanish features were sufficiently exposed to guide excavators. The so-called *A-zone* consists of an 18th–20th century, post-Spanish zone of deposition at Santa Catalina, known to contain abundant Hispanic and aboriginal material

Fig. 51. Low-level aerial photograph showing the Quad IV excavations (as of May 1984). The top of the photograph is north, and white tic marks are spaced at 20 m intervals. The light colored, vertical strips are 4 m-wide shallow test trenches. Individual mission structures are clearly evident in the center of the 1 ha clearing.

culture in secondary context; features are almost completely absent.[1]

A-zone excavations at Santa Catalina proceeded within a metric grid system tied into a master datum. Excavation units are 2 m on a side, and orientation is magnetic north–south. Vertical control is maintained by a builder's level positioned at one of several concrete subdatum points located throughout Quad IV. A-zone deposit was removed by shovel scraping and screened through a mechanical sifter (fig. 52). A ¼ in. mesh was employed for the uppermost humus and root zone (ca. 5 cm thick); all remaining deposit was screened through ⅛ in. screens. We shifted to water-screening whenever the soil became too moist to pass freely through the power screen. No particular effort was expended to locate A-zone artifacts in situ, although artifacts so encountered were piece-plotted whenever possible.

This upper zone at Santa Catalina varied from 15 to 25 cm in thickness. The A-zone strategy was terminated whenever features or in situ artifact concentrations ("living surfaces") were encountered. Most structures at Santa Catalina were built (at least in part) of wattle and daub. These walls had been sub-

[1] The terms *A-zone, B-zone,* and so forth are employed sensu South (1980, p. 6; 1981, p. 12), and must not be confused with the pedogenic A *horizon,* B *horizon,* etc. designations commonly employed by archaeologists and soil scientists.

Fig. 52. Dennis O'Brien screening with a ⅛ in. mesh power sifter at Santa Catalina.

jected to fire and were generally preserved as discrete episodes of wall-fall. In our A-zone strategy, we attempted only to expose the upper surface of these walls, leaving the daub concentrations in situ, to be recorded by aerial photography. Similarly, A-zone excavation was terminated whenever wall posts, daub pits, shell concentrations, burn features, refuse pits, and so forth were encountered. These features were only superficially cleaned; actual "excavation" was postponed until the B phase of excavation.

Because the Santa Catalina deposits were relatively undisturbed, we usually attempted to expose entire Spanish period structures using an A-zone strategy. Our objective in A-zone excavation was to *expose, but not destroy* the Spanish period surface. In selected cases, we left A-zone structural excavations at Santa Catalina exposed for years. In this way, we were able to determine overall configurations before individual construction details were destroyed by excavation. In some cases the building configuration was sometimes enhanced by short-term soil weathering processes.

B-ZONE EXCAVATION STRATEGY: The *B-zone* at Santa Catalina is equated with the 16th/17th century Spanish ground surface. This abandonment surface apparently extends across the entire site, represented in places by crumbled structural remains, elsewhere by flat-lying artifact and debris scatters.

The Franciscan mission and Guale *pueblo* complex were constructed according to a rigid grid pattern, oriented approximately 45° from magnetic north. It was clearly desirable that actual *excavation* of the Spanish period structures be conducted within the 16th/17th century framework. Accordingly, we employed two distinct grid systems in the Santa Catalina excavations. Whereas the initial, A-zone exposures were laid out according to an arbitrary north-south alignment, B-zone excavation units were oriented at an angle of 45° west of magnetic north.

All excavation, regardless of grid system, was conducted by hand, and, depending upon the exact contexts, deposit were either troweled or shovel-skimmed. Every attempt was made to plot B-zone artifacts in situ, and all deposit was sifted through ⅛ in. mesh screen. In some cases, graduated geological sieves were used to recover tiny beads and faunal samples. Hundreds of samples were processed as flotation separation, and bulk soil samples were collected for future research.

Spanish period features were explored as part of the B-zone excavation strategy. Fired daub walls, daub processing pits, unfired daub concentrations, floor surfaces, and so forth, superficially exposed in the A-zone operation, were fully exposed and defined. Such features were pedestaled in most cases, with excavation proceeding in the nonfeature areas approximately 5–10 cm below the Spanish ground surface. Excavation of individual features ceased temporarily at this point to allow for simultaneous exposure of the rest of the structure. In this way, a single low-level aerial photograph could be prepared of an entire building, demonstrating the positioning of individual features and documenting building stage sequences (if present). This pause in excavation also allowed us to compare previous remote sensing projections and actual, in-ground archaeological remains.

C-ZONE EXCAVATION STRATEGY: The remaining archaeological deposits were grouped into an arbitrary *C-zone*. All deposit was sifted through ⅛ in. mesh screen, and samples for flotation were extracted. In most cases, actual excavation proceeded within Spanish-defined units such as burial pits, intact walls, pit features, midden deposits, wall posts, post molds, and so forth; these were sectioned, photographed, recorded, and removed in this final phase of excavation.

In the early stages of excavation, we realized that an extensive Guale Indian cemetery lay beneath the floor of the church; roughly 400–450 individuals have since been excavated at Santa Catalina de Guale. The C-zone excavation strategy at Santa Catalina thus included a significant biocultural component; Clark Spencer Larsen (Northern Illinois University) assumed responsibility for excavating and analyzing the mortuary sample.

Reburial of Historic Period Human Remains

Throughout our 12 years of research on St. Catherines Island, we have maintained a policy that all human remains from historic period contexts be reburied once requisite analysis has been completed.

This situation arose twice previously. In 1975, we excavated and analyzed two late 18th century slave burials, unexpectedly encountered as intrusions into the 3000-year-old Cunningham Mound D (Thomas et al., 1977, pp. 398–412; Thomas and Larsen, 1979, pp. 65–74). When the mortuary investigations were complete, the remains were reburied near the original graves. We also excavated the grave of W. J. L. Harris, son of a wealthy plantation owner buried on nearby Colonel's Island in 1859 (Thomas et al., 1977, pp. 412–417). These remains were reinterred in the restored tomb once analysis had been completed.

When we first discovered the Guale cemetery at Santa Catalina, we recognized the opportunity to generate a valuable source of biocultural information. But before proceeding, we wished to ensure that the projected investigation be carried out with dignity and respect. Because of the large number of individuals thought to be buried there, we felt it necessary at the start to determine the ultimate disposition of the remains. We therefore suspended excavations in the cemetery pending resolution of both matters. The appropriate first step was to contact individuals of demonstrable biological, cultural, and/or religious affinity to the human beings interred there.

Tracking down the biological descendants of the Santa Catalina Guale proved fruitless. After the fall of St. Catherines Island in the 1680s, many Native Americans were removed closer to St. Augustine (Swanton, 1922, p. 136; Lanning, 1935, p. 218; Barcía, 1951, p. 312). Other Guale remained in the area, aligning with the British and being absorbed by the Yamassee. By the early 18th century, Guale had become the dominant Indian element in St. Augustine (Deagan, 1973); the latest reference to the Guale as a group was in 1735, when Fray Tomas de Aguilar was reappointed professor of the Guale language at Mission Santa Catalina de Guale, then located at Nombre de Dios, on the outskirts of St. Augustine (Geiger, 1940, p. 23; Larson, 1978, p. 120). By the late 1750s only two small Indian villages remained near St. Augustine, and when the Spaniards departed from the area in 1763, all 83 surviving Indians left Florida with the Spaniards (Siebert, 1940; Deagan, 1983, p. 32).

Because there was no possibility of contacting demonstrable *biological* descendants of the Guale, we focused efforts on determining which individuals or groups might have the closest *cultural and/or religious affinity* to the Guale at Santa Catalina.

This proved to be a relatively easy task, since our initial test excavations indicated a mortuary pattern clearly mandated by 16th/17th Catholic custom. The Guale Indians buried at Mission Santa Catalina—or at least their immediate families living nearby—had without question opted for Christian burial at the time of death. We view this decision, made three to four centuries ago, as an unequivocal statement of religious preference. On this basis, the contemporary Catholic Church became the most appropriate organization with which to discuss the ultimate disposition of the human remains.

Accordingly, in September 1982, I contacted Father Raymond Lessard, Bishop of Savannah. My first question dealt with the process of excavating: Is there any feeling within the church that unearthing these remains would constitute a kind of desecration? Bishop Lessard assured me that the Catholic Church had no objections to our excavating the cemetery at Santa Catalina:

> In fact, I would say on the contrary, because it

Fig. 53. Bishop Raymond Lessard and Fathers Adams, Wyse, and Morales conducting a service dedicated to "reblessing the ground and re-burial of remains" at Santa Catalina de Guale (May 1984).

> is part of an experience of human discovery . . . a cultural exploration, as long as the whole thing is done properly and with respect . . . . For us as a religious community, it has an added significance. It tells us something about our roots, our spiritual roots as well as human or cultural roots, and that we are part of a community not only in space but also in time, with links to the past. Accumulating all this becomes what we will pass on to the future. (Bishop Lessard, personal commun.)

Moreover, in his view, the burial ground ceased to be consecrated when the missionaries and neophytes abandoned the site in the 1680s.

The Church thus expressed a profound historical interest in the results of our excavations. As it turned out, the Franciscan Order had been simultaneously (and independently) investigating beatification for the five Franciscans killed in the Juanillo Rebellion. Significantly, two of these missionaries—Fr. Miguel de Añon and Br. Antonio de Badajoz—had been martyred on September 17, 1597 at this very site.

Although the formal canonization procedures, entitled "The Cause of the Georgia Martyrs," actually began in the 1950s (see Wyse, 1985), it was not until late 1982 that Bishop Lessard—in whose territory the martyrdoms had occurred—was granted permission to proceed. He appointed a Historical Commission to prepare the necessary documentation, for ultimate submission to the Pope.

When Bishop Lessard, accompanied by two members of the Historical Commission, visited St. Catherines Island on May 16, 1983, he enthusiastically encouraged us to proceed with the cemetery excavations. Not only would such information generally enhance our knowledge of the 16th/17th century Georgia coast, but the excavation could provide a major new source of information relative to the Cause of the Georgia Martyrs.

I also questioned Bishop Lessard about the Church's position on ultimate disposition of remains. After some discussion, we agreed on two points: (1) the most appropriate action was reburial after suitable analysis, and (2) the most appropriate venue for reinterment was the original cemetery itself.

Acting on behalf of the St. Catherines Island Foundation, I agreed to this plan and, on May 25, 1984, Bishop Lessard returned to Santa Catalina to conduct a service dedicated to "Reblessing the Ground and Reburial of Remains" (fig. 53). As part of the ceremony, he supervised reinterment of three Guale Indians in an excavated portion of the cemetery. The congregation of 120 people included members of the Historical Commission, three Franciscan friars, several representatives of the Savannah Diocese, the Boards of the St. Catherines Island and Edward John Noble foundations, two dozen participating archaeologists, several historians of the period, plus numerous prominent citizens of Liberty County.

We feel that this solution represents the most satisfactory course of action for all concerned. Other remains will be reinterred as the biocultural analysis is completed.

This overview has described our initial objectives and detailed how historical evidence and geophysical technology were combined to discover the 16th/17th century site of Spanish Mission Santa Catalina de Guale. Six years of intensive field investigations have now been completed since that discovery, and the results of this excavation will be presented in future numbers of this new series entitled *The Archaeology of Mission Santa Catalina de Guale.*

APPENDIX. INVENTORY OF AUGER SURVEY

TABLE 1
Ceramic Frequencies, Power Auger Survey

Auger Tests per Quad	I 20	II 65	III 92	IV 100	V 101	VI 30	VII 30	XX 58	XXI 114	Total 610
Majolica										
Sevilla Blue on Blue	—	—	1	—	—	—	—	—	—	1
San Luis Blue on White	—	—	1	—	—	—	—	—	—	1
Fig Springs Polychrome	—	—	—	1	—	—	—	—	—	1
Olive jar										
Plain	—	1	4	11	—	—	—	2	6	24
Green glaze	—	—	—	—	—	—	—	4	—	4
Additional Historic Period Sherds										
Pearlware	—	—	1	—	—	—	—	—	—	1
Stoneware (white glazed)	—	1	—	—	—	—	—	—	—	1
Aboriginal Ceramics										
Altamaha Line Block Stamped	11	102	152	154	24	5	29	122	283	882
Altamaha Red Filmed	—	3	—	2	—	—	—	1	3	9
Altamaha Check Stamped	—	—	—	2	—	—	1	—	—	3
Altamaha Incised	—	—	—	1	—	—	—	—	—	1
Altamaha Punctated and Incised	—	—	—	5	—	—	—	—	1	6
Irene Complicated Stamped	1	3	—	7	5	1	—	—	—	17
Grit tempered, plain	—	36	6	14	13	8	4	21	37	139
Grit tempered, incised	6	6	6	13	4	—	2	4	23	64
Grit tempered, punctated	1	6	3	11	3	—	5	10	12	51
Grit tempered, incised and punctated	—	4	2	—	—	—	3	1	—	10
Grit tempered, stamped	—	37	25	46	17	1	13	26	86	251
Grit tempered, burnished incised	—	1	—	3	—	—	—	1	—	5
Grit tempered, burnished plain	—	11	—	11	1	—	—	3	20	46
Grit tempered, check stamped	—	1	—	—	—	—	—	—	1	2
Grit tempered, cob impressed	—	—	—	—	—	—	—	—	1	1
Grit tempered, misc.	119	27	110	106	26	9	8	44	81	530
Savannah Check Stamped	—	—	—	1	—	—	—	—	—	1
Savannah Incised	—	—	—	1	—	—	—	—	—	1
Savannah Burnished Plain	—	—	—	—	—	—	—	1	—	1
Savannah Plain	—	2	—	—	2	—	—	1	—	5
Savannah stamped	—	—	—	—	—	—	1	—	—	1
Savannah, misc.	—	—	—	—	—	1	—	—	—	1
Sand tempered, plain	—	4	1	—	—	—	1	—	1	7
Sand tempered, burnished plain	—	—	—	1	—	—	—	—	1	2
Sand tempered, red burnished interior	—	—	—	—	—	—	—	1	—	1
Sand tempered, incised	—	1	6	—	—	—	—	—	—	7
Sand tempered, stamped	—	2	2	—	—	—	—	—	1	5
Sand tempered, misc.	8	2	8	4	—	—	—	1	6	29
St. Catherines Burnished Plain	—	—	—	1	—	—	—	—	—	1
St. Catherines, shell scraped	—	—	—	—	—	—	—	2	—	2
Clay tempered, cord marked	—	1	—	1	1	1	—	—	3	7
Clay tempered, plain	—	2	—	—	—	—	1	2	2	7
Clay tempered, burnished plain	—	—	—	—	—	—	—	—	1	1
Clay tempered, misc.	3	4	1	2	2	1	—	5	4	22
Clay/grit tempered, stamped	—	1	—	—	—	—	—	—	1	2
Clay/grit tempered	—	—	—	1	—	—	—	—	—	1

TABLE 1—(*Continued*)

Auger Tests per Quad	I 20	II 65	III 92	IV 100	V 101	VI 30	VII 30	XX 58	XXI 114	Total 610
Clay/sand tempered	—	1	—	—	—	—	—	3	2	6
Clay/sand/grit tempered	—	2	—	—	—	—	—	—	—	2
Wilmington Heavy Cord Marked	—	—	—	—	—	1	—	1	1	3
Wilmington Plain	—	1	—	—	—	—	—	1	—	2
Wilmington, misc.	—	1	1	—	—	—	—	1	—	3
Deptford Check Stamped	4	4	5	—	5	—	—	6	2	26
Deptford, misc.	—	—	8	—	2	—	—	—	2	12
Refuge Simple Stamped	—	1	2	—	—	1	—	4	3	11
Refuge Plain	—	2	—	—	—	—	—	3	1	6
Refuge, misc.	—	—	—	—	—	1	—	8	—	9
Sand/grit tempered, plain	—	12	8	—	1	—	—	—	4	25
Sand/grit tempered, stamped	—	1	—	—	1	—	—	—	—	2
Sand/grit tempered, incised	—	—	1	—	—	—	—	—	—	1
Sand/grit tempered, misc.	—	5	6	—	—	—	—	13	3	27
St. Simons Plain	—	1	—	—	—	5	—	6	—	12
St. Simons, misc.	—	1	—	—	—	—	—	—	1	2
Fiber tempered	1	—	2	1	—	—	1	—	1	6
Fiber/grit tempered	—	—	1	—	—	—	—	—	—	1
Fiber/sand tempered	—	—	1	—	—	—	—	—	—	1
Fiber/clay tempered	—	—	2	—	—	—	—	—	—	2
Misc. ceramic fragments	3	42	9	77	4	2	7	50	83	277
Ceramic gaming piece	—	—	—	—	—	—	—	—	1	1
Totals	157	332	375	477	111	37	76	348	678	2591

TABLE 2
Nonceramic Artifact Frequencies, Power Auger Survey

Auger Tests per Quad	I 20	II 65	III 92	IV 100	V 101	VI 30	VII 30	XX 58	XXI 114	Total 610
Whelk shell[a]	—	1	1	2	—	—	—	—	1	5
Metal fragment	—	—	—	2	—	—	—	—	1	3
Nail	—	—	1	2	—	—	—	—	1	4
Iron tie-rod wrench[b]	—	—	—	—	—	—	—	—	1	1
Polished granite fragment[a]	—	—	—	1	—	—	—	—	—	1
Smoothed stone[a]	—	—	—	1	—	—	—	—	—	1
Flake[a]	—	—	1	—	—	—	—	—	—	1
Fired daub[c]	—	—	—	7	—	—	—	—	1	8
Natural concretion[c]	—	—	—	—	—	—	1	4	3	8
Fired daub/natural concretion[c]	—	—	—	17	—	—	—	—	—	17
Unfired daub[c]	—	—	—	1	1	—	—	—	2	4
Bone[c]	5	12	6	9	3	—	1	12	15	63
Misc. shell[c]	14	11	31	26	22	5	8	29	35	181
Charcoal[c]	8	9	11	11	5	6	3	5	19	77

[a] Number of fragments per auger test.
[b] Probably used in tabby construction.
[c] Number of auger pits.

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