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Dwellers by the Sea: Native American Adaptations along the Southern Coasts of Eastern North America

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Abstract This comparative synthesis examines archaeological and ethnohistoric data pertaining to Native American coastal adaptations along the southern coasts of the eastern United States. We consider the totality of experiences of people living along coasts, examining such issues as technological innovation, environmental variability and change as it relates to site visibility, the built environment, the use of coastal food resources, the nature of complex coastal Calusa and Guale polities, and European contact. We link our topical discussions to broader issues in anthropology, arguing that the archaeology of southern coasts has much to contribute to our understanding of worldwide adaptations to coastal environments and broad-scale shifts in the trajectories of human societies.

Keywords Archaeology · Ethnohistory · Coastal · Southeastern U.S.

Introduction

"Dwellers by the sea cannot fail to be impressed by the sight of its ceaseless ebb and flow, and are apt…to trace a subtle relation, a secret harmony, between its tides and the life of man, of animals, of plants" (Frazer 1922, p. 39).

At the beginning of any regional comparative synthesis, it is necessary to define the parameters of the discussion. We use coastal adaptation to refer to the totality of experiences and history of people who live on islands and along coasts, not simply

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how people obtain food from the ocean and estuaries. Although food production and consumption is an integral part of our discussion, we argue that simply living in coastal environments impacts trajectories of history, ideology, ritual, ideas of time, political organization, kinship, resistance and resilience, colonization, and travel and transport.

We do not attempt a comprehensive review of all the literature pertaining to coastal adaptations in eastern North America. Rather our focus is on a few key issues and emerging research agendas that have broader implications for other coastal areas, as well as more general anthropological questions. We focus on the southern coasts—the Gulf and south Atlantic. We do not consider all areas of these coasts equally within each topical section (Fig. 1) but are guided by the most salient and/or most recent studies. Although our focus is on southeastern North America, we incorporate information from northern regions when appropriate. Our focus is on the last 5000 years, when the most archaeologically visible settlement of the coasts occurred. All date ranges are reported in radiocarbon years unless otherwise noted.

Why are coastal adaptations in southeastern North America important? A recent article by Erlandson and Fitzpatrick (2006) highlights many of the important issues that island and coastal archaeologists are addressing around the world. Specifically, the emergence of early monuments is rising as a central theme (e.g., Russo 1994a, 2004; Sassaman 2004a; Saunders et al. 2005; Thompson 2007, in press). Research on the emergence of nonagricultural and mixed economy complex polities (i.e.,

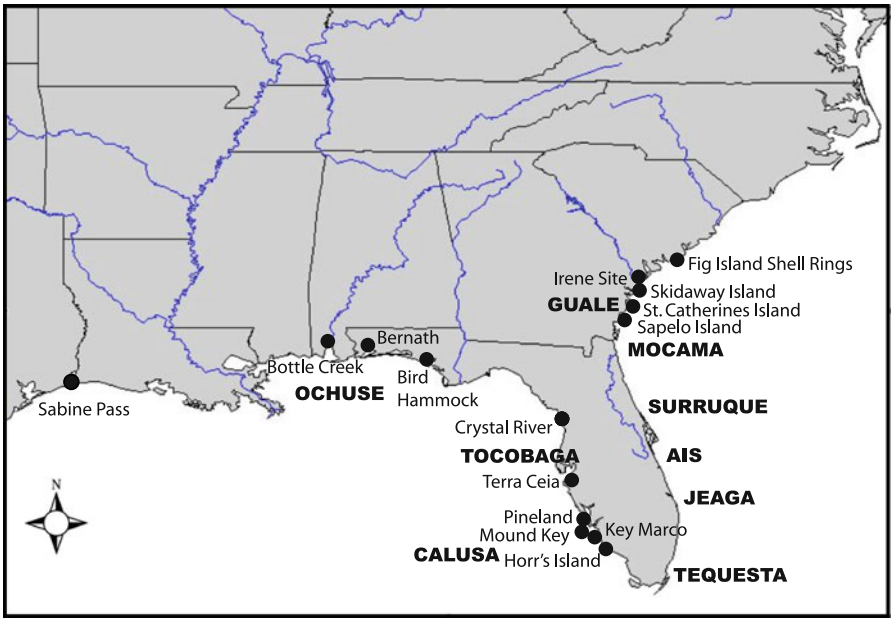

Fig. 1 Location of selected sites, islands, and groups discussed in the article. Name designations in all caps are ethnohistoric groups. Name designations in title caps are archaeological sites and important islands with multiple sites discussed in the article

chiefdoms) also has the potential to inform our understanding of how such sociopolitical entities form in coastal environments and how they follow different histories than interior agricultural societies (e.g., Marquardt 1988; Thomas 2008e; Widmer 1988). Coastal areas can be areas of technological innovations; for example, they were the locus for the emergence of pottery production in North America (see Sassaman 1993, 2000, 2004b). Finally, these coastal areas served as entry points and staging areas for many early colonization and mission endeavors north of Mexico (e.g., Hann 1991, 1996; Hudson 1998; Milanich 1999a; Milanich and Hudson 1993; Worth 2007).

We believe that research on the southern coasts is primed to address many key anthropological questions and should be of interest to researchers grappling with similar issues outside the region. We begin by presenting a review of environmental variability and change as it relates to site visibility, technological innovations, the built environment, and the use of coastal food resources. We then provide examples of two complex cultures, the Guale and Calusa, to illustrate the variability between these two groups and point to possible reasons why these groups differ from each other and other coastal peoples in the region. Finally, we discuss the role of European colonialism and reflect on the role of coastal adaptations in the social history of southeastern North America.

Sea levels, site visibility, and coastal resources

The greatest impact on the archaeology of the coasts of eastern North America, apart from modern human influences, is sea level rise. Underwater archaeology and research conducted in the intertidal environment on wet sites contributes to our understanding of coastal adaptations as well as environmental change. However, research in these areas is still in its nascent stages. Several important underwater archaeology projects document early Paleoindian and Early Archaic sites offshore (e.g., Dunbar et al. 1992; Faught 1988, 2002, 2004); however, we do not deal with the implications of these sites here. During the time of their occupation they were inland sites and not coastal adaptations as we define them. Yet underwater archaeology has the potential to contribute to the study of coastal adaptations, as there are sites on the continental shelf that would have been located near shore environments during the Pleistocene. Understanding where and when occupation of these areas occurred would significantly increase our knowledge of the first colonization and use of these environments.

The common understanding is that sea levels became relatively stable with the establishment of the modern coastline beginning around 6000 years ago, yet sea level fluctuations continue to the present (Fig. 2). Despite this recognition and the different proxies used to evaluate sea level change (e.g., diatoms, corals, peat, and archaeological sites), exactly when these fluctuations occurred and their amplitude is a subject of continuing debate (e.g., Balsillie and Donoghue 2004; Blum et al. 2001, 2002; Colquhoun and Brooks 1986; DePratter and Howard 1981; Donoghue et al. 1998; Gayes et al. 1992; Otvos 1995; Tanner 1991, 1993; Walker et al. 1994, 1995). Although the contentious atmosphere of sea level research and numerous

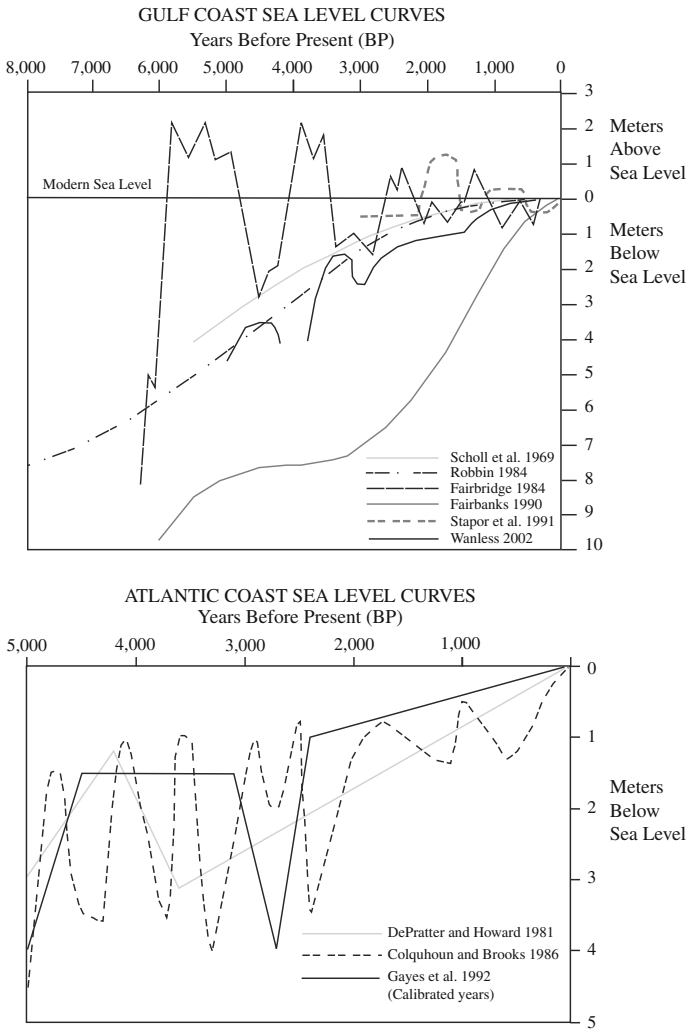

Fig. 2 Examples of sea level curves from both the Atlantic and Gulf Coasts (adapted from Thompson and Turck 2009; Widmer 2005)

curves for both the Gulf and Atlantic Coasts prohibit a complete discussion, there are points of agreement between curves, which we include in our discussion below.

There is evidence of early coastal sites on the Gulf Coast (Goodyear et al. 1993; Mikell and Saunders 2007; Pearson et al. 1986; Russo 1996a; Stright 1990, 1995). Submerged sites include the Sabine Pass shell midden near the Texas coast (Pearson et al. 1986; Stright 1995, p. 135), which dates to around 8055 ± 90 rcbp (Pearson et al. 1986). Another early shell midden site is Turtlecrawl Point (c. 7000–4000 B.P.). Early northern sites along the Atlantic include Hammonassett Beach (c. 6000–4000 B.P.) in New York (Goodyear et al. 1993; Stright 1995, p. 135) and other contemporaneous sites in the Chesapeake Bay area (Blanton 1996). These,

as well as other terrestrial sites such as the Dogan Point shell midden in New York (c. 7000 B.P., see Claassen 1998, p. 2) and several early sites along the Texas and Florida coasts (Cox 1994, p. 223; Mikell and Saunders 2007; Russo 1996a, p. 180), provide the best picture to date of the earliest coastal adaptations in the eastern United States. Despite increased attention by archaeologists in recent years, mid-Holocene coastal adaptations remain a largely unknown phenomenon, largely due to the lack of site visibility and accessibility resulting from general eustatic sea level rise rather than an inability of humans to exploit the coasts at that time (Anderson et al. 2007, p. 457; Russo 1996a, pp. 177–178).

There is sporadic evidence for archaeological coastal sites prior to 4500 B.P., whereas after that time their frequency increased dramatically (see Russo 1996a). The sites also were much larger and spatially complex, with some taking on a circular or arc shape (Russo 1994a, b, 1996a, b). Many of the earliest sites are in Florida, with other coastal regions, in Georgia and South Carolina, not having appreciable site densities until after 4200 B.P. (Anderson et al. 2007, p. 475). This site distribution correlates with general trends in sea level rise and its connection to estuarine resources (DePratter and Howard 1980; Widmer 1988), specifically the increased availability of shellfish. Initially, researchers thought that conditions prior to 4200 B.P. were turbulent, producing high salinity and instability of the substrate upon which shellfish affix themselves (DePratter 1979, p. 7; Galtsoff 1964). Such conditions would have prohibited the development of productive shellfish beds (e.g., oyster, *Crassostrea virginica*) (DePratter 1979, p. 7; Galtsoff 1964). As Russo (1996a, pp. 177–178; see also Elliott and Sassaman 1995) notes, however, there is growing evidence for coastal sites prior to that time, which suggests that coastal resources were in place and exploitable. Despite this realization, we do not understand the degree to which Native Americans adapted to these environments or the availability and distribution of resources along the coasts.

After 4200 B.P. there was widespread occupation of both the Atlantic and Gulf Coasts (Anderson et al. 2007, pp. 474–475; Blanton 1996; Russo 1996a; Widmer 2005), when sea levels were lower than they are today (DePratter and Howard 1980; Widmer 2005). Shell rings and shell arcs proliferated along both coasts, many located along the margins of barrier islands (DePratter 1979; Russo 1996b; Russo and Heide 2001; Saunders 2004a; Thompson 2007, in press; Thompson et al. 2004; Trinkley 1985). In some cases, parts of these rings are submerged, and at some sites entire ring complexes (i.e., the Fig Island Ring complex in South Carolina) are in tidal marsh environments (Saunders 2002). Leigh (2002) suggests, based on soils analysis, that the area around the Fig Island shell rings was inundated during the site's occupation; however, the conventional view is that sites like Fig Island were located on areas of dry land that were exposed by lower sea levels. Regardless, we should be able to locate many more of these sites and general shell middens in areas that are now presently marshland. The lower gradient along the Gulf Coast resulted in higher rates of submergence and erosion affecting most sites except those located in areas well above the rising sea (Anderson et al. 2007, p. 475; see also Widmer 2005).

Late Holocene sites, such as the shell rings along the Atlantic Coast, began to be abandoned by c. 3800 B.P., and formation of these sites ceased by c. 3200 B.P. (e.g.,

Elliott and Sassaman 1995; Russo 1996a; Thomas 2008a; Thompson in press; Thompson and Turck 2009). Thompson and Turck (2009) use site distributional data for the entire Georgia coast to suggest that not only had shell ring formation ceased by that time, but that there was a dramatic settlement shift along with the abandonment of some barrier islands along the South Atlantic Coast. Incidentally, this settlement shift corresponds with a significant drop in sea level along the Georgia and South Carolina coasts (Colquhoun and Brooks 1986; DePratter and Howard 1981; Gayes et al. 1992; Howard and Frey 1980). Similar data indicating major fluctuations in sea level between 3400 and 2400 B.P. are noted for the Gulf Coast as well (Gelsanliter and Wanless 1995; Pielou 1991; Widmer 2005, p. 78). On both the Atlantic and Gulf Coasts, it appears that there were concomitant changes in tool technology and the exploitation of resources. On the Atlantic Coast, for example, at least some sites evidence a shift toward a terrestrial base with greater emphasis on hunting than collecting estuarine resources (DePratter 1976, pp. 8–9; Thompson and Turck 2009). Additionally, no large shell middens date to c. 3800–3200 B.P. (DePratter 1977, p. 11; Reitz 1988, p. 147). Similarly, on the Gulf, Widmer (2005, p. 83) reports evidence for sedentary occupation and the disappearance of monumental constructions during times of sea level regression. Yet the lack of sites dating to this timeframe is not solely a result of shifting cultural adaptations. Sites dating to this period are found in submerged contexts in the marsh on the Atlantic Coast, but published reports are few (DePratter 1977, p. 8; DePratter and Howard 1981; Thompson and Turck 2009).

By around 2400 B.P. on the Atlantic Coast, researchers postulate a high stand (high sea level) that was near what it had been before 3800 B.P. (cf. Colquhoun and Brooks 1986; DePratter and Howard 1981; Gayes et al. 1992). At that time, groups occupied the same areas of the coast that they had during the Late Archaic period (Thompson and Turck 2009). While there is general agreement that there was a high stand at the beginning of the Late Archaic, lower sea levels during the Early Woodland period, and a return to a high stand after that point, there is considerable disagreement as to the exact nature of later South Atlantic Coast sea levels. For example, while Gayes et al. (1992) and DePratter and Howard (1981) show a smooth rise since 2500 B.P., Colquhoun and Brooks (1986) propose at least seven small-scale fluctuations over the past 5000 years, three of which occurred after the Early Woodland low stand. Clearly, additional research is necessary to tease out the various inconsistencies in our current understanding of sea levels along the South Atlantic Coast.

The final 3000-year sea level record for the Gulf Coast parallels to some degree the patterns along the Atlantic. Recent archaeological work in southwestern Florida provides support for several independent determinations of sea level fluctuations and concurrent climate change during this period (e.g., Marquardt and Walker in press; Tanner 1991, 1992; Walker and Marquardt n.d; Walker et al. 1994, 1995; Widmer 2002, 2005). Based on a range of stratigraphic and other proxy data excavated from the coastal sites of Pineland, Wightman, Solana, and Cash Mound in southwestern Florida and Paradise Point in northwestern Florida, a series of transgressive and regressive sea level episodes have been proposed for the Florida Gulf Coast (Marquardt and Walker in press), including high stands between 100

B.C. to A.D. 500 (Wulfert High) and A.D. 850–1200 (La Costa High), and low stands between A.D. 500–850 (Buck Key Low) and A.D. 1200–1850 (Sanibel II High). Although the scale of these fluctuations and their impact on coastal populations are still being evaluated, they correspond to globally recognized climatic episodes such as the Roman Optimum and Medieval Optimum (and the intervening Vandal Minimum and subsequent Little Ice Age).

Evaluating the missing record

To understand settlement systems and resource use in coastal environments in a diachronic perspective, archaeologists studying the first settlement of the coasts as well as the later Holocene must understand how global and local sea level fluctuations affected the record. We recognize that there is disagreement over sea level curves and suggest that the archaeological record may be one of the best proxies by which to evaluate sea level fluctuations. Yet we do caution that such endeavors must pay close attention to formation processes of archaeological deposits as this will directly affect sea level curve interpretations.

Underwater archaeology will be of central importance in locating sites submerged by sea level rise. We also suggest that another, and perhaps more profitable, area to search is the intertidal zone. Such research has met with success in other areas of the world, such as Scotland (e.g., Hale 2000). DePratter's (1978; DePratter and Howard 1981) work in the marshlands off the coast of Georgia illustrates the high potential for such research along the southern coasts. Further, these areas and adjacent wetlands may preserve perishable artifacts (e.g., Purdy 1991), lending insight into aspects of material culture not usually recovered from terrestrial sites.

As sea level change is a global concern, comparing and contrasting how societies reacted to such large-scale environmental changes is a key question for coastal archaeologists around the world (Bailey and Milner 2002). Research along the southern coasts, with its extended continental shelf, provides a case study that can be contrasted with other areas around the world where the shelf dives quickly in a subduction zone, such as off the coasts of Peru and Chile. The timing and degree of coastal settlement is another key question in world archaeology. At present, the southern coasts closely parallel other regions of the world, such as northern Europe, in that there is little evidence of coastal exploitation prior to 6000 B.P. As archaeologists conduct more underwater and wet-site projects and find more sites dating prior to 6000 B.P. in the Southeast and other areas of the world (e.g., Bailey and Craighead 2003), a more comprehensive pattern of both human preference for these environments and environmental conditions relating to their exploitation will emerge.

Material culture, middens, and mobility

Although there are a number of different site types/site features in the coastal environment (e.g., shell works, burial mounds, etc.), we focus on "shell middens"

as the residuum of resource consumption as opposed to intentionally constructed monuments. Our overarching context for this discussion is mobility, a central problem related to the use and exploitation of resources.

Lithic and ceramic technologies

Stone tool technologies usually represent a minority of the cultural materials found at coastal sites. Along the northeastern coast, stone tool technologies are much more diverse and include chipped, ground, pecked, and polished stone tools (e.g., Bourque 1995). These assemblages closely resemble their interior riverine shell midden counterparts (e.g., Jefferies et al. 2007). The paucity of stone tool technologies on the southern coasts reflects the lack of lithic raw material sources (Austin n.d.; Bense 1994; Elliott and Sassaman 1995; Sassaman and Anderson 1995). As a result, most of the lithics in these areas are imported finished tools or tool maintenance debitage (e.g., Jefferies and Moore 2009; Thompson 2006). When present, these remains are evidence of either long-distance trade or forays to procure lithic materials. We know of no intensive study of coastal stone tool technologies, which remains one of the largely understudied topics of the region.

Ceramics are ubiquitous at sites on both coasts postdating the Middle Archaic. The earliest coastal shell midden sites predate the inception of pottery; however, these sites do contain ceramic artifacts referred to as baked clay objects and less often as Poverty Point objects, named after the Poverty Point site, an interior Archaic mound center in northern Louisiana (Russo 1996b; Sassaman 1993). Baked clay objects are small, spherical—or amorphous—fired clay objects; more elaborate and varied forms are found at Poverty Point. They are made by hand molding lumps of clay, and many still bear finger impressions (Sassaman 1993, p. 69). The reference to Poverty Point implies some connection to that site, where they are found in the thousands (Gibson 2001). Indeed, archaeologists working along the Gulf Coast take the presence of these artifacts, in part, as evidence of participation in the Poverty Point exchange network (e.g., Thomas and Campbell 1991). Reviewing the literature on these artifacts (e.g., Sassaman 1993), we opt for the term "baked clay object." Although some sites in northwestern Florida do evidence connections with Poverty Point, based on a small amount of nonlocal Poverty Point network materials (Thomas and Campbell 1993), we see no reason to associate sites to the network solely on the presence of baked clay objects.

Baked clay objects predate pottery yet continued to be made at sites on the coast after pottery production became prevalent. Baked clay objects are present at a number of sites across the southeastern United States, from Louisiana to the Georgia coast (Lazarus 1958; Marrinan 1975; Russo 1996a, b; Sassaman 1993; Waring and Larson 1968). Most of these sites date to the Late Archaic period (c. 6000–3000 B.P.). Interestingly, baked clay objects predate pottery production in Louisiana and Florida (Milanich 1994, pp. 97–98; Russo 1996b). In addition, production of baked clay objects occurred with Archaic fiber-tempered pottery at many sites on the Georgia coast; however, production seems to have diminished and/or ceased at some point before 3700 B.P. (Sassaman 1993, pp. 69, 133; see also Marrinan 1975, Appendix 1; Waring and Larson 1968). Regardless of whether these artifacts

functioned as pit roasting stones or stone boiling, they were part of the cooking technology (see DePratter 1979; Sassaman 1993). This technology existed in places (e.g., Florida) before the advent of pottery, but pottery persisted long after the decline of baked clay objects. Thus these two media functioned as components of two distinct cooking technologies. It is possible that the use of pottery and baked clay objects occurred in conjunction with each other; however, the use of one did not require the other.

Although several different Late Archaic (c. 4200–3000 B.P.) pottery types have been identified in coastal contexts, including Thom's Creek in South Carolina, Stallings/St. Simons in Georgia and South Carolina, and Orange and Norwood in Florida, Alabama, Louisiana, and Mississippi, there are broad similarities among them (Elliot and Sassaman 1995; Sassaman 1993; Saunders and Hays 2004; Williams and Thompson 1999). Most are fiber tempered, although minor amounts of grit and sand-tempered variants occur as well (Sassaman 1993; Williams and Thompson 1999). Unlike the others, Thom's Creek ceramics have very little fiber tempering and contain mostly sand or heavy grit temper (Trinkley 1980). Most of the early pottery vessels were basins and bowls that were used in a variety of thermal contexts (e.g., indirect and direct heat cooking) (Beck et al. 2002; Sassaman 1993; Saunders 2004b). The thermal performance characteristics of these forms differ, including the rate of heating the contents and the rate of heat loss (Sassaman 1993, p. 141; Waggoner 2006). Basin forms are associated with indirect heating, whereas bowls were used for direct heat cooking (Sassaman 1993, p. 146). Use alteration supports this distinction (i.e., no soot was observed on basin forms) (Sassaman 1993, p. 147).

Sassaman's (1993, 1995, 2000, 2004b; see also Saunders and Hays 2004) ceramic studies still guide much of our thinking regarding the emergence and changing use of early pottery in eastern North America. Although the earliest secure dates for fiber-tempered pottery occur inland along the Savannah River near Augusta, Georgia (4465 ± 95 [Stoltman 1966]), Sassaman (2004b, p. 29) tentatively proposes that the actual origin for the emergence of pottery is the central to southern Georgia coast. His rationale is a series of early dates for pottery that rival those found along the central Savannah River. Many of the dates are in excess of 4000 B.P. and occur at various sites along the coast (Marrinan 1975; Sassaman 2004b; Thompson 2007, in press; Thompson et al. 2008). If this model is correct, then the emergence of this technology is closely tied to the exploitation of coastal resources; the initial adoption may have been for culinary reasons (Sassaman 2004b, p. 39) or larger systemic changes in mobility.

Although ecological factors may have been the initial drivers for the invention of pottery, Sassaman (1993, 2000, 2004b) argues for social reasons for its adoption and changing use context. He argues that the first use of pottery occurred along the coast and spread inland to the Middle Savannah. Most of this early pottery was used in indirect heat cooking; earlier flat bottom forms were no more than portable pits. Both Middle Savannah and coastal pottery-producing people were involved in soapstone acquisition and used soapstone as part of an indirect cooking technology. However, shortly after the introduction of flat-bottomed vessels, coastal groups began experimenting with vessel forms that could be used for direct heat cooking.

The expensive social alliances required to maintain access to soapstone cooking stones then declined along the coast.

Several other studies look at differential production techniques from the perspective of ceramic compositional analysis. Cordell's (2004) petrographic study of ceramics focuses on peninsular Florida, whereas Thompson et al. (2008), using both petrography and chemical analysis, focus on the Georgia and South Carolina coasts. In both studies the authors note regional differences in ceramics, which point to possible interaction and exchange between different social groups and/or greater group mobility.

Although Sassaman and others (e.g., Russo and Heide 2004; Saunders 2004b) have paid considerable attention to early pottery in the southern coastal regions, there is still much to learn, particularly regarding interaction and the exchange of ceramics. Studies of later Woodland and Late Prehistoric pottery tend to focus on chronology building and little else. Saunders' (2000, 2004c; see also Braley 1990) work with Guale pottery from the Georgia coast and Cordell's (1992, n.d.) detailed compositional analyses of Caloosahatchee ceramics in southwestern Florida are notable exceptions, as is a recently published volume edited by Deagan and Thomas (2009) that focuses, in part, on ceramics and ethnicity along the Atlantic Coast during the historic period. While these works are important (e.g., DePratter 1991), they also point to a considerable gap in our understanding of the social context of pottery production and use for much of the region. Such studies could help elucidate patterns of interaction, exchange, and mobility similar to the early studies discussed here.

Shell, bone, wood, and fiber technologies

Notable objects of coastal material culture were made of shell, bone, wood, and fiber. Such items are sometimes specifically and uniquely adapted to the coastal environment, but shell middens and wet sites in coastal zones provide favorable preservation conditions. Marine shell from Gulf and Atlantic sources has long been recognized as a significant component of long-distance prehistoric trade networks across southeastern North America; chemical sourcing of archaeological specimens has demonstrated both Gulf and Atlantic Coast sources for interior specimens from Archaic through Mississippian times (Brown et al. 1990; Claassen and Sigmann 1993). Particularly during the Mississippi period, shell was a favored raw material for beads, engraved gorgets, dippers, and other special-function exotica, some of which may have been used to consume another common coastal trade item—*Ilex vomitoria*, or yaupon holly—used to make the famed Black Drink across much of the interior (e.g., Hudson 1979; Phillips and Brown 1978). Beyond its role in long-distance trade, shell also was used extensively by the inhabitants of coastal zones to manufacture a wide range of utilitarian implements ranging from axes and hammers to knives and net mesh gauges (Claassen 1998). Shell tool technology was particularly well developed in southern Florida, which was largely devoid of lithic resources.

The earliest Archaic shell tools in the region were manufactured from marine gastropods such as the lightning whelk (*Busycon sinistrum*) and to a lesser extent the

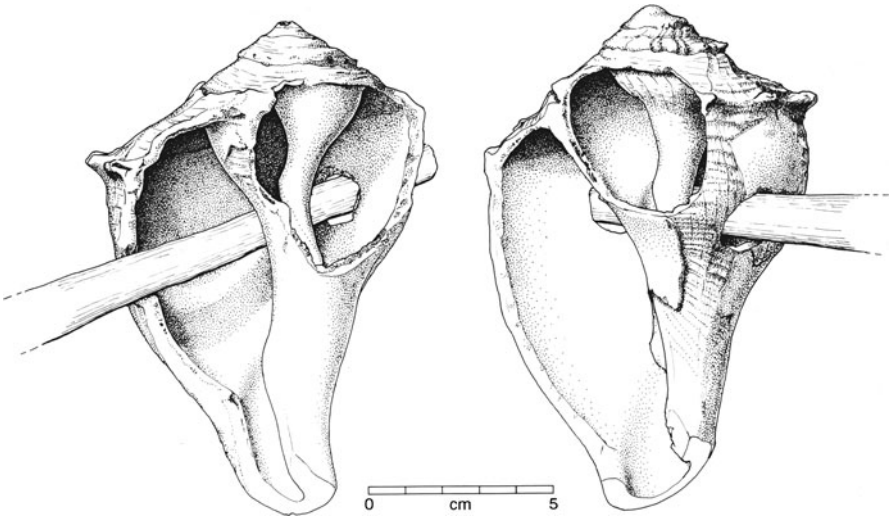

Fig. 3 Example of hafted *Busycon* shell tool (adapted from Marquardt 1992a, p. 197)

horse conch (*Pleuroploca gigantea*). These artifacts include columella hammers and cutting tools, as well as shouldered adzes, celts, dippers, and spoons made from the outer whorls of the shells (Marquardt 1992b; Simpkins 1975; Torrence 1992, 1999) (Fig. 3). Later tools of the Caloosahatchee period were made of whole shells. These implements are distinguished by the position of hafting holes and the extent to which the outer whorl and working edge was removed or worn down either as a part of manufacture or use life-stages (Luer et al. 1986; Marquardt 1992b). A wide range of species also were utilized, including quahog clam anvils (*Mercenaria campechiensis*), sunray venus clam knives (*Macrocallista nimbosa*), perforated ark clam net weights (*Noetia ponderosa*), and tools made from the lightning whelk, such as rectangular net mesh gauges, dippers, cups, saucers, scoops, gorgets, and beads (Marquardt 1992b; Walker 2000a). The typology developed for southern Florida has recently been used in classifying a more limited range of shell tools found on St. Catherines Island on the Atlantic Coast of Georgia, including knobbed whelk (*Busycon carica*) and channeled whelk (*Busycon canaliculatum*) (Licate 2008).

Bone implements are common at coastal sites and include objects fashioned from avian long bones, turtle shell, shark teeth, and stingray spines. Despite the clear dominance of aquatic faunal resources for coastal populations, particularly in southern Florida, bone points and bone pins were most commonly made from metapodial bones of whitetail deer (*Odocoileus virginianus*). Although single- and double-pointed bone tools have often been interpreted as projectile points, recent analysis suggests they were used as throat gorges for fishing or were elements of composite fishhooks (Walker 1992, 2000a). Shark teeth, often drilled, filed, or abraded, were used as utilitarian cutting or engraving implements or also as part of compound weapons such as the "shark tooth sabres" discovered at Key Marco (Cushing 2000; Gilliland 1989; Kozuch 1993).

Well-preserved implements crafted from wood and fiber have been identified at several coastal wet sites. The most notable are Key Marco and Pineland (Cushing 2000; Gilliland 1975, 1989; Kolianos and Weisman 2005; Marquardt and Walker 2001; Walker and Marquardt n.d.). The range and diversity of items recovered at Key Marco represents one of the richest samples of prehistoric wood and fiber implements from prehistoric coastal contexts in the entire world. Not only does the assemblage include a variety of utilitarian implements ranging from twisted cabbage palm fiber nets to wooden canoe paddles and handles for hafted tools, it also includes an astounding array of carved and painted wooden objects. Many of these items, including wooden masks and objects with zoomorphic images, have ceremonial and ritual significance. Many of the expressed themes and images are features of Spanish-era Calusa rituals and religious practices (e.g., Hann 1991, 2003, pp. 187–199). Moreover, these coastal cultures made extensive use of wooden dugout canoes, sometimes described in firsthand accounts to have included multiple hulls, awnings, and shielding (e.g., Herrera 1601; Solís de Merás 1893). Though few coastal canoes have been identified archaeologically (e.g., Wheeler et al. 2003), wood debitage from Pineland has been interpreted as a by-product of canoe manufacture (Marquardt and Walker 2001).

The archaeological record of shell, bone, wood, and fiber technology in coastal zones is remarkably rich. On the one hand, many elements of coastal material culture represent specific adaptations to the coastal environment and form a distinguishing feature of coastal peoples. On the other hand, as a result of unusually favorable preservation (particularly wet sites), the archaeological record of normally perishable items is comparatively richer for some coastal zones than for contemporaneous sites in the interior, providing an important opportunity to "fill in" some elements of the missing record at inland sites.

Seasons of collection, seasons of occupation

Excellent summaries of shell middens and shellfish exploitation by Claassen (1991, 1998) and Waselkov (1987) present the methodological problems surrounding the analysis of shell midden materials and the ethnographic context of shellfish collection. Here we focus on key themes related to mobility—season of collection (particularly of shellfish), season of occupation, exploitation of resources, and human impacts on fisheries and island fauna.

Shellfish constitute the bulk of what is visible at archaeological sites in coastal middens (Larson 1980, p. 69). Once thought to be a food turned to as a result of increasing population pressure and concomitant reductions in food choices and territories, many now view these species as a core resource (Larson 1980, p. 66; Thomas 2008b, p. 74). The primary shellfish species found in coastal middens along much of the Atlantic and Gulf Coasts are bivalves such as *Mercenaria* spp. (hard clam), *Rangia cuneata* (brackish water clam), *Donax variabilis* (coquina), and *Crassostrea virginica* (eastern oyster), and gastropods such as *Busycon* spp. (whelk), *Fasciolaria* spp. (tulip), and *Melongena corona* (crown conch). Improved archaeological recovery techniques have allowed a more complete representation of the contribution of bony fish to the diet of coastal populations. in southwestern

Florida, for example, Walker (1992) has demonstrated that bony fish contributed considerably more in terms of edible meat weight to the diet than did shellfish. Moreover, though hardhead catfish (*Arius felis*) was frequently dominant in this region, smaller fish such as pinfish (*Lagodon rhomboides*) and pigfish (*Orthopristis chrysoptera*) also were exploited (e.g., Marquardt 2004, p. 206). As a general rule, the clear volumetric predominance of shell in coastal shell midden sites cannot be taken as demonstration that shellfish dominated bony fish as the primary source of meat in coastal diets; the reverse was true for southwestern Florida.

Numerous studies using a wide range of techniques, including growth band, size class, and geochemical analyses, have examined mostly oysters and clams to infer the season of shellfish collection (e.g., Andrus and Crowe 2000, 2008; Claassen 1986a, b, 1998; Clark 1979; Keene 2004; O'Brien and Thomas 2008; Quitmyer 1985, 1992; Quitmyer et al. 1985, 1997; Russo 1991a, b, 1998; Russo and Saunders 2008; Surge et al. 2001; Thompson and Andrus in press). Growth band analysis, of hard clams specifically, is the most widely applied technique (see Quitmyer et al. 1985). Briefly, shell incremental growth structure analysis involves measuring the light and dark incremental growth bands that correspond to seasonal changes in temperature. Theoretically, by examining and comparing the terminal stage of growth with the previous stages, one can gain a measure of what the environment was like (e.g., warmer or colder weather) when the animal died and thus what season the site was occupied (Quitmyer et al. 1985; Russo 1998). In addition, ongoing geochemical research focuses on the use of the quahog clam (*Mercenaria campechienses*) and otoliths from hardhead catfish (*Arius felis*) to reconstruct past environmental conditions based on archaeological specimens from southwestern Florida (Surge and Walker 2005, 2006; Walker 2000b; Walker and Surge 2006).

Claassen's analysis and synthesis of shellfish exploitation in the southeastern United States, largely derived from growth band studies, deals with information from Late Archaic to historic sites on both coasts. As she states, "in spite of methodological differences, disparate geographic locales, disparate cultures and the use of numerous different species and sample sizes, the results of southeastern shellfish seasonality studies are in remarkable agreement" (Claassen 1986a, p. 29; 1986b). Broadly, we suggest that for the Gulf Coast, shellfish collection occurred during the spring to fall months (Claassen 1986a, p. 30). Along the Atlantic, the predominant collection time was fall to spring, with minor collection during the summer months (Claassen 1986a, p. 30).

Research during the following two decades supports, to some extent, Claassen's original conclusions. However, the inclusion of new techniques such as stable isotope analysis to determine season of capture have considerably refined our view of these resources, showing more variability than previously recognized. In general, populations along both coasts pursued this activity throughout the year. Russo (1998; Russo and Quitmyer 1996) and Thompson and Andrus (in press) argue that at least some Late Archaic populations collected these resources year-round, sometimes alternating collection of various species during different times of the year. Additional research by Quitmyer and others (Keene 2004; O'Brien and Thomas 2008; Quitmyer and Massaro 1999; Quitmyer et al. 1985, 1997; Russo and Quitmyer 1996) suggest a similar pattern for later times on both coasts.

A key interrelated question that continues to be debated is whether sites along the coast were occupied year-round. Archaeologists working on Late Archaic shell rings on both the Gulf and Atlantic Coasts have directly addressed this issue through faunal proxies. Russo's (1998) work on the Horr's Island shell ring in southwestern Florida is the most encompassing in terms of the diversity of species; his findings suggest that at least some of the population occupied the site throughout the year (Russo 1998, p. 159). This is a departure from previously held notions which maintained that Archaic coastal shell midden sites were seasonally occupied (Russo 1998, p. 143).

Thompson and Andrus (in press) also argue for year-round occupation of shell rings based on isotopic analysis of clams and oysters. Briefly, this technique measures the relative amount of ^{18}O to ^{16}O throughout the life history of a given animal's shell. The relative amount of oxygen isotopes in the shell varies as a function of temperature during the period of growth (see Andrus and Crowe 2000, 2008). By sampling a series across shell growth bands to its last growth increment, one can determine the relative temperature and, by proxy, the season the individual died. Data from the Sapelo Shell Ring complex indicate, like Horr's Island, that some portion of the population occupied the site throughout the year.

In contrast, others argue that these sites represent seasonally occupied macroband aggregation spots for ritually prescribed feasts (Saunders 2004a, b). Although the few empirical studies described here seem to counter this notion, more studies are required to explore the variability in mobility strategies and ultimately the function of these sites.

Season-of-occupation studies of sites from the Woodland period on the Atlantic and Gulf Coasts exist but are less prominent in the literature. At least a few suggest multiseason use if not year-round settlement (Orr 2007; Quitmyer n.d.; Quitmyer and Massaro 1999; Reitz and Quitmyer 1988). Still, there is little consensus in the timing of the occupation of Woodland sites. Some sites can be characterized as large shell midden rings similar to Late Archaic rings, with some key differences in terms of the amount of shellfish (Russo et al. 2006). Interpreted as villages, some of these sites have large-scale mounds of shell and earth as well as formal burial areas (e.g., Bense 1998; Milanich 2002; Stephenson et al. 2002; Widmer 2002). Presumably, these sites are sedentary occupations; however, models that emphasize mobility, particularly between the coast and inland, still hold sway for many timeframes, such as the Weeden Island period (Milanich 1994, 2002; Thomas and Campbell 1993).

Issues and debates over the mobility of coastal groups continue into the late colonial era. In southern Florida, there is little doubt that groups like the Calusa were large sedentary, politically stratified polities (e.g., Marquardt 1988, p. 161; Widmer 1988), a viewpoint well supported by ethnohistoric observations (e.g., Goggin and Sturtevant 1964; Hann 2003; Worth 2006, 2008) and archaeological season of captures studies (e.g., Quitmyer n.d.). In other areas, particularly on the Atlantic Coast from A.D. 1000 on, there is less consensus.

The Guale exemplify arguments regarding coastal mobility during the late prehistoric period. Dubbed the "Guale problem" (Crook 1986; Thomas 1987, pp. 57–64, 2008c, p. 1095; see also Jones 1978; Keene 2002, 2004; Reitz 1988; Steinen 1984), the debate centers on whether the ancestors of the ethnohistorically known

Guale (A.D. 1000 to c. 1500) were semisedentary farmer-fisher-gatherers or if populations were much larger, with agriculture and fishing supporting large year-round sedentary villages. Keene (2004) provides a cogent summary of both sides of this argument. Based largely on ethnohistoric evidence, Larson (1980; see also Crook 1986, n.d.; Steinen 1984) argues that coastal people moved throughout the year. Others suggest a more sedentary existence (DePratter 1978; Jones 1978; Keene 2002, 2004; Pearson 1977, 1978).

Most of these arguments are based on settlement location and the nature of estuarine resources. Though important, they must be backed by studies using proxies of season of occupation, of which there are few. Two of the best examples are Keene's (2004) work on Skidaway Island, Georgia, and Weinand et al.'s (2000) study of the earlier Savannah period St. Simons North End site (see also Quitmyer et al. 1985, 1997).

Of the season-of-occupation studies, Keene's work on Skidaway is the most comprehensive. Using paleobotanical, faunal, and oxygen isotope analysis of oysters, Keene (2004, p. 686) concludes that Native populations inhabited the Grove's Creek site year-round. We find the isotopic results for summer, spring, and winter represented one of the most convincing aspects of the study. Additional isotopic studies by Andrus and Crowe (2008) on shellfish collected from late prehistoric sites on St. Catherine's Island suggest that populations resided on the larger islands throughout the year. These data coupled with Keene's study suggest that populations may have been more sedentary than allowed for in the mobile models of Guale settlement (e.g., Crook 1986; Larson 1980). Our ideas of Guale settlement, however, may be an oversimplification of the mobility issue (see Kelly 1995, 1998 for a discussion of archaeological models of mobility). Both Crook (n.d.) and Thomas (2008a) discuss this exact issue in recent publications. Until researchers conduct more empirically grounded studies using such techniques as isotopic ratios on a wider variety of sites, such models will fail to capture exactly how much variability there actually was in Guale mobility.

Human impacts on fisheries and terrestrial fauna

A topic related to mobility is the exploitation and impact of humans on coastal resources. Human impact is a recently burgeoning area of archaeological inquiry (e.g., Redman 1999; Redman et al. 2004). Past human impacts on marine environments is the theme of a recent book (Rick and Erlandson 2008). Reitz et al. (1996, p. 11) outlines human impacts as a key study area for environmental archaeologists. Unfortunately, research designs that focus on an ecological perspective, particularly using zooarchaeological data, are still few in the southeastern U.S.; of those, most have been in coastal regions (Reitz 1993). The methods by which we access these issues through the archaeological record are becoming increasingly sophisticated.

Studies of shell middens on the coasts of the eastern U.S. and elsewhere have led the way in human-environmental interaction issues. Most of these early studies focused on human impacts on shellfish populations as evidenced by decreasing size grades and species proportions through time in the middens (Claassen 1998, p. 45).

Such studies have occurred on both coasts for multiple time periods, yet there is still much to be done to quantify shellfish exploitation and its impact on the environment. More studies are needed to distinguish between environmental change and human predation as the principal driver of mean species size and composition in the middens. Although we have long recognized that shell middens alter soil chemistry and affect plant distributions (e.g., Dorroh 1971), we do not understand the scale and effect that these large deposits of shellfish have on past and modern ecosystems.

Other key studies focus on vertebrate estuarine and terrestrial fauna (e.g., Orr 2007; Quitmyer and Reitz 2006; Reitz 1982a, b, 1988; Reitz and Quitmyer 1988). Purdue and Reitz (1993) have documented the reduction in island deer body size through time, possibly due to human predation. Another study shows the shifting emphasis on estuarine resources over time as they relate to trophic level exploitation (Quitmyer and Reitz 2006). Yet we still do not fully understand the relationship between human (over)exploitation and environmental changes associated with the various size and compositional variation of coastal middens.

Work directed toward understanding human impacts will aid our understanding of mobility strategies and resource use along the coast. How long can people exploit resource patches before having to seek others? Long-term research that incorporates resource exploitation studies and human behavioral ecology, such as the work by Thomas (2008a) and colleagues, will be integral to understanding these issues.

Evaluating foraging and mobility in coastal environments

There is still a need to address key questions regarding mobility, the role of farming in coastal communities, and human impact and reliance on coastal resources. One of the main contributions to understanding these issues will be settlement pattern studies. Although such research exists for coastal areas (Patton 2001; Pearson 1977; Thomas 2008a), larger-scale projects are needed to contextualize the site-based research in the region. At the site level, archaeologists must incorporate paleoethnobotanical and zooarchaeological analysis into the research design of their projects before excavation takes places if we are to evaluate research questions critically. We should then be able to address the question of when a forager farms and when a farmer forages.

Our thoughts regarding mobility fall on the side of less mobile communities for the coastal sector. There is considerable evidence for year-round occupation of sites dating back to the Archaic period. However, we do suggest that mobility in the coastal environment fluctuated (e.g., Thompson and Turck 2009) and was far more complex than simple dichotomies of mobile and sedentary (*sensu* Kelly 1998). This issue lies at the core of anthropological inquiry for coastal peoples and articulates with the other questions we address here.

The study of human mobility is key to understanding a host of interrelated social and cultural phenomena (see Kelly 1992, 1995). Interestingly, the available data for the Southeast suggest that a reduction in mobility occurred relatively early in coastal areas. As many researchers suggest (e.g., Kelly 1983; Pálsson 1988; Renouf 1991; Yesner 1980) for other areas of the world, particularly in colder climates, a

dependence on aquatic resources in areas of abundant biomass is highly correlated with decreased mobility. Less well known both archaeologically and ethnohistorically are hunter-gatherers who occupied high biomass temperate climate coasts such as found in the Southeast. Data from the Southeast coupled with data from other regions have the potential to shed light on the ultimate cause(s) of reduced mobility (see Kelly 1992 for a discussion).

Monumental architecture and Native American coastal populations

Shell middens are the most common features at sites along the coasts of eastern North America. Other archaeological features include platform mounds, burial mounds, canals, houses, and public buildings, some of which were constructed of shellfish remains. The high frequency of shell middens coupled with the use of shell in other constructions has engendered considerable debate among coastal archaeologists, especially concerning the earliest proposed monuments in the eastern U.S.

Shellworks

Recent research in eastern North America reveals a history of monument construction dating back to the Middle Archaic in the lower Mississippi River Valley (Saunders et al. 2005). This research is not only changing the way we view the Archaic period (see Sassaman 2008) but also leading the academic community to question assumptions about the nature of hunter-gatherer societies. These early monuments include structures composed of shell (e.g., Claassen 1998; Russo 2004; Russo et al. 2006; Sassaman 2004a; Saunders 2004a, b; Thompson 2007, in press). There is a current debate, however, about the degree that such features constitute monumental constructions (see DePratter 1979; Russo 1994a, b, 2004; Saunders 2004a; Thompson 2007; Thompson and Andrus in press; Trinkley 1980, 1985). Debate is not limited to early shell-bearing sites created during the Late Archaic. Like the issue of mobility, these discussions transcend temporal periods. In southern Florida, debate occurs over the nature of Calusa mound construction (e.g., Marquardt 2008; Torrence 1999), paralleling dialogues regarding hypothesized monumental piles of shell in interior river valleys, along the Tennessee River, the Green River in Kentucky, and the St. Johns in Florida (Claassen 1991, 1998; Milner and Jefferies 1998; Randall 2008; Sassaman 2008).

The views regarding the existence of shellworks can be situated in two broad camps—cultural "minimalists" (Anderson et al. 2007, p. 462) and "maximalists." Minimalists view large-scale shell deposits simply as substantial midden accumulations resulting from long-term occupation in one location, whereas maximalists interpret such structures as intentionally constructed monumental shellworks. Admittedly, these are generalizations and many researchers straddle various positions within the debate; however, these distinctions help frame current research and provide a departure point to deconstruct both arguments.

Clearly there are shell deposits on the coast that are the accumulated remains of quotidian activities. There also are examples of shellworks that were purposefully

constructed by Native Americans for ceremonial and political reasons. So, why exactly do these debates continue in the literature? In brief, a maximalist view of the minimalist perspective would argue that researchers in that camp overemphasize the everyday activities that result in the creation of the shell deposits. In so doing, minimalists undervalue social meanings (particularly with regard to social inequality) and actions and deny agency to the Native Americans who created the monuments (e.g., Sassaman 2008). In contrast, the extreme minimalist perspective would point out that to assign a monumental function based simply on the quantity of shell in a deposit is specious and overemphasizes the social aspects of those sites when they quite simply may represent repeated occupations over extended time periods. Further, a minimalist perspective would argue that maximalists are too quick to view all shell middens and shellworks as evidence of sociopolitical inequality. Minimalists are quick to point out that even highly egalitarian societies construct monuments (e.g., White 2004).

In reality, both camps realize that variation exists; however, both encounter the problem of equifinality when interpreting large-scale shell deposits. The key issues are how fast the deposits accumulated, whether the growth was episodic or continuous, and the extent to which shell deposits can be considered primary or secondary (Russo and Heide 2003; Schober and Torrence 2002; Thompson 2006, 2007, in press; Thompson and Andrus, in press; Torrence 1999). It is a question of how we know what we know about these deposits (Marquardt 2008).

Shell rings are the key early coastal sites that inform our understanding of Archaic period monumentality. The majority of research on shell rings focuses on their formation, function, and concomitant social relations (e.g., DePratter 1979; Russo 2004; Sassaman 2004a; Sassaman and Heckenberger 2004a, b; Saunders 2004a, b; Thompson 2006, 2007, in press; Trinkley 1985). As the name implies, shell rings are large piles of shell in circular, arcuate, U-shape, or C-shape forms that vary in size from 50 to over 300 m in diameter. Today, there are over 50 known shell-ring sites on both coasts from northern South Carolina to southern Florida and the northwestern Gulf Coast (Russo and Heide 2001; Russo et al. 2006).

There are various models of shell-ring formation and function. The key issue is whether these sites represent the mounded remains of ceremonial feasts (Cable 1997; Saunders 2004a, b) or if they represent villages (sedentary or otherwise) and are a product of everyday refuse accumulation (DePratter 1979; Trinkley 1985). Others suggest that these behaviors co-occurred (Russo 2004; Thompson 2006, 2007, in press) or that the dominant function or behaviors that create such deposits may have shifted over time (Thompson 2006, 2007, in press).

Recently, Marquardt (2008) called for an empirical evaluation of shell-bearing deposits. Recognizing that mounding of shell occurs, he suggests that before we assume that such deposits are imbued with ritual meaning, we should know something about how they formed. We agree with his stance. Many archaeologists assume that because a deposit consists of "clean" shell remains it is the result of ceremonial feasting or mounding. Clean in this context refers to shell deposits that lack soil development and have relatively low artifact densities (see Russo 2004, p. 43). The reality, however, is that although clean shell deposits may have

developed more rapidly, we still do not have a sense of how quickly the deposits accumulated (Russo and Heide 2003, p. 43).

Archaeologists have used radiocarbon dates and stable isotope analyses of shellfish to address the temporal nature of shell accumulation (Saunders 2004a; Thompson 2006; Thompson and Andrus in press). There are issues with both methods. First, they require large samples. Saunders (2004a, p. 261) argues for ceremonial feasting based on radiocarbon dates that separate the top and bottom of the core of the ring by 50 to 100 years. It is certainly possible that these deposits represent feasting events, yet it does not rule out the possibility that they are the result of village midden accumulation—especially when archaeological data on late prehistoric villages, such as the King site in northern Georgia, suggest that such entities last no longer than 50 years (Hally 2008, p. 314). More studies are needed with the type and quantity of dates suggested by Stein et al. (2002) to use these data effectively to evaluate the nature of ring accumulation.

Isotopic studies by Thompson and Andrus (in press; see also Thompson 2006) used season of collection to evaluate the nature of shell accumulation at the Sapelo Shell Ring complex. They find that some deposits form rapidly (i.e., one season) while other deposits accumulated over multiple seasons. They use these data to argue for the changing function of the site and that the ring, as a whole, is a result of multiple behavioral processes. The problem with this is that even if a deposit accumulated over one season, we have no way of evaluating if the shellfish collected during the winter season represent the same year of collection. Shellfish could accumulate over multiple years during the same season and appear to be a more rapid feasting event. That said, the radiocarbon and isotopic methods are, at present, the best ways to evaluate the nature of such deposits. Future studies should use these techniques in tandem.

Rings of shell are present in the Woodland period; however, they do not reach the scale of shellfish debris present at Late Archaic sites (Russo et al. 2006). Bense (1998) also documents the existence of burials in the center of one circular shell midden site (Bernath) on the northwestern Florida Gulf Coast. As very few excavators explore the center of such sites, we are uncertain if this pattern is replicated in other areas. The compositions of these rings appear to contain more soil development (Bense 1998; Russo et al. 2006; Stephenson et al. 2002), and archaeologists rarely discuss them as intentional monuments. This is not to say, however, that large shellworks were absent during this period.

Recent work at the Crystal River site by Pluckhahn and colleagues (2009; see also Milanich 1999b; Thompson and Pluckhahn 2010; Weisman 1995) reveals that large dense shell layers occur in some of the Middle Woodland flat-top pyramidal mounds at the site. Other coastal sites appear at least superficially to include shellworks as well, such as the Bird Hammock site near Panama City, Florida (Bense 1969; Milanich 1994). Clearly, these sites to some degree incorporate shellfish remains as a construction material. It is uncertain, however, if the remains are from feasts, mined previous middens, or something else. A key point is that they resemble in architectural design and layout other Woodland period sites of the interior coastal plain (e.g., the McKeithen site in north-central Florida [Milanich et al. 1997]). Studies of the later monuments may serve as a methodological guide to

interpreting other shellworks (e.g., shell rings) whose forms do not have immediate analogues in earthen form.

In the late prehistoric period, the Calusa areas of southwestern Florida have the densest concentration of shellworks on the eastern coasts (see Marquardt 1988; Milanich 1994). Yet not all agree to the scale and nature of the formation of these deposits. At least some of these structures are clearly intentional monuments, including the largest mounds at Mound Key, Pineland, and Big Mound Key (Torrence 1999, n.d.; Walker and Marquardt n.d.) (Fig. 4). In the Calusa heartland, the main shellwork at Mound Key is nearly 10 m tall and, according to ethnohistoric documents, had a substantial communal structure on its summit (e.g., Hann 1991, 2003). Platforms of shell are not the only shellworks in the area. Sites such as Mound Key and the now-devastated Key Marco site also evidence house mounds,

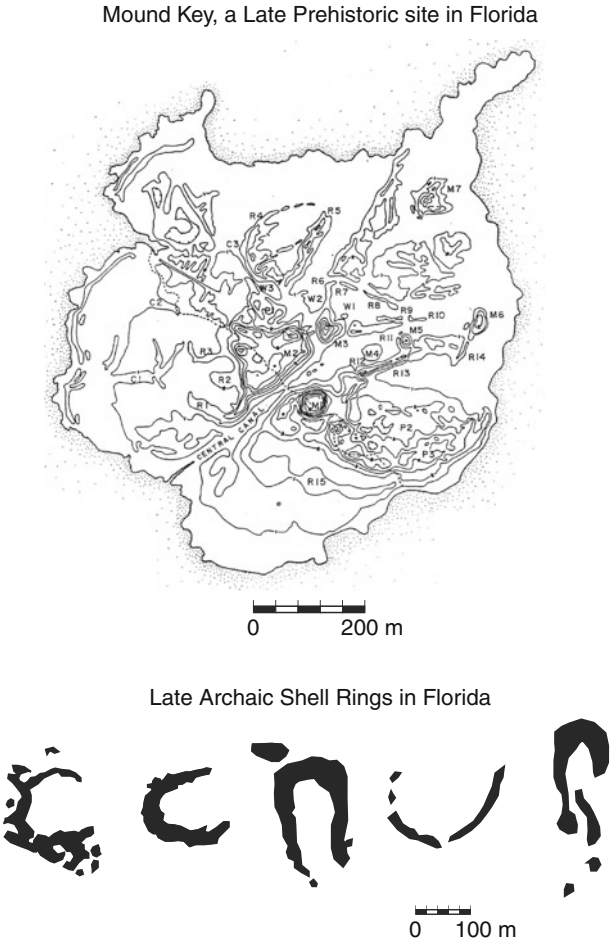

Fig. 4 Plan view examples of Archaic period shell rings in Florida and Mound Key, a late prehistoric site in southwestern Florida (adapted from Russo and Heide 2001, p. 492; Torrence et al. 1994, p. 14)

terraces, ridges, water courts, and canals (Cushing 2000; Torrence et al. 1994; Torrence et al. 1999). Some of the canals extended well beyond the coastal sites in which they originated, most notably the Pine Island canal, which stretched 4 km between two large habitation sites on either side of Pine Island, a remarkable feat of human engineering and labor investment (e.g., Luer 1989a, b; Luer and Wheeler 1997; Marquardt and Walker in press).

Other areas of shellwork construction, or where shell forms a significant portion of the construction material, include the Safety Harbor area of Tampa, Florida, and the surrounding region, as well as the St. Johns area of northeastern Florida. Safety Harbor is probably an extension of the traditions established during earlier periods at sites like Crystal River. Mounds in the area are large, such as the Madira Bickel Mound at the Terra Ceia site, which is over 6 m tall (Milanich 1994, p. 397). The mound is composed of both shell and soil, similar to the large mound at Crystal River. Most shellworks in the latter region are actually composed of freshwater shellfish and are not true coastal adaptations as we define them. Yet for all practical proposes, shell-bearing sites in the area conform to many of the patterns we have discussed. These traditions point to a history of shell used as a construction material that extends back to the Archaic period.

Earthworks and other structures

The line between earthwork and shellwork blurs to some degree (see Pluckhahn et al. 2009, in press; Thompson and Pluckhahn 2010). That said, there are many types of mounds in the coastal sector that are more properly labeled earthen monuments, including small-scale burial mounds that appeared during the Late Archaic-Early Woodland and continued to the contact period (Caldwell and McCann 1941; Luer 2002; Luer and Almy 1982; Russo 1991a, 1994b; Thomas and Larsen 1979; Widmer 1988; Willey 1949). Exclusively earthen platform pyramidal mounds of later prehistory are less frequent on the coasts; however, there are areas where this tradition persists.

The earliest known coastal burial mound is Mound B at the Horr's Island site (Russo 1991a, b). This mound is associated with the Late Archaic shell ring at the site and has an associated radiocarbon date from a burial that places it squarely in this timeframe. While much more is known of interior burial mounds for this early period, few have been identified or investigated on the coasts. During the Middle and Late Woodland periods, a tradition of burial mound construction proliferated on both coasts of eastern North America (e.g., Milanich 1994; Thomas and Larsen 1979; Willey 1949). Although these structures overlap in size and complexity with some burial mounds that are associated with more northern interior peoples (e.g., Adena and Hopewell), mounds in the largest size classes are not as frequent on the coasts. However, this proposition must be quantitatively evaluated.

Archaeologists pose several possible scenarios regarding the social relations represented by Woodland burial mounds. One of the most important studies is Thomas and Larsen's (1979) work on the burial mounds of the Georgia coast, which incorporates cultural contexts and an empirical bioarchaeological study of the skeletal populations. Based on the frequency of females buried in the mounds, they

suggest that the kinship system was matrilineal (Thomas 2008c; Thomas and Larsen 1979).

Widmer (2004) also suggests that the development of mounds is related to a shift in kinship systems. If we assume that mounds are a lineal claim to power and resources, then such traditions may have emerged during the Late Archaic in coastal areas (see Widmer 2004). The burial mound tradition was even more elaborate in the following Middle Woodland period, with some sites evidencing nonlocal (Hopewell) trade goods (Greenman 1938; Pluckhahn et al. 2009). While such connections have long been recognized (e.g., Greenman 1938), research agendas explicitly designed to address Florida's role and connection to the Middle Woodland macroregional systems are few. Further, we know little about when such ceremonialism flourished on the coasts.

Flat-top earthen mounds emerged relatively early on the coasts, though apparently not in the southern portion of the Florida peninsula. Like other areas of the Southeast, Native Americans began constructing this type of architecture during the Middle and Late Woodland periods (e.g., Jefferies 1994; Pluckhahn 2003). The Crystal River site is the largest of these early platform mound sites on the central Florida coast (Pluckhahn et al. 2009). Unfortunately, we have no definitive evidence on summit top activities. Knight (2001) argues that Woodland period platform mounds served a distinctly different function than their later Mississippian counterparts, suggesting that ritual feasts and ceremonies were performed on their summits. Knight's argument derives from his study of contemporaneous sites in the interior. Thus it is uncertain if parallel activities occurred at coastal platform mounds. Elsewhere in southwestern Florida, Widmer (2002, p. 389) asserts that monumental shellworks appeared by A.D. 500 and by 800 they occurred frequently at large villages. He suggests that these structures are equivalent to the temple mounds of more northerly cultures. Yet they are markedly different from contemporaneous earthen platform mounds located farther north and generally contain only thin summit layers of earth amidst more substantial shell construction layers (e.g., Schober and Torrence 2002, pp. 155–159). Although this may in part result from regional differences in soil and sediment characteristics in comparison to shell as a substructure building material, other cultural differences also may be responsible for the lack of earthen platform mounds on the coasts of southern Florida. This question clearly deserves further study.

At the very least, the presence of burial mounds on the coasts, along with platform mounds in some of these areas during the Woodland period, suggests that individuals or groups were able to mobilize enough labor to construct these edifices. Still largely egalitarian, at least certain groups show evidence of emerging status differences as indicated by burials interred with nonlocal goods (Milanich 1994; see also Milanich et al. 1997). Thus the Woodland period of the coasts evidenced an elaboration of cultural traditions (e.g., mound construction) that were rooted in the Archaic. Key among these is the emergence of elaborate segmentary political organizations that were supported by a hunter-gatherer-fisher economy (see Anderson 2002, 2004). Perhaps the most interesting aspect is the relatively low incidence of warfare before A.D. 800 in central and southern Florida (Hutchinson 2004, p. 155). Hutchinson (2004, pp. 155–156) suggests from skeletal evidence that

conflict prior to that time consisted of raiding and skirmishes and that injury was a more common outcome than death. Such behavior is not consistent with people who are resource stressed (Hutchinson 2004, p. 156).

The flat-top mound tradition continued in central Florida at Safety Harbor sites until the contact era (Milanich 1994, 2002). Another area on the coast that evidenced flat-top mound construction is the Fort Walton-Pensacola area of northwestern Florida, where archaeologists identified several sites with temple mounds (Fairbanks 1965; Lazarus and Fornaro 1975; Payne 1991; Willey 1949). To date only the Fort Walton Temple Mound site has been investigated (Milanich 1994, p. 385). Other sites such as the Bottle Creek site (Brown 2003) on Mound Island in the upper reaches of Mobile Bay also have large platform mounds, although these also may reflect connections with riverine populations farther inland. Interestingly, the areas between these two centers of mound construction exhibit a lower frequency of burial and platform mounds, leading some archaeologists to emphasize the differences in material culture between Fort Walton and Pensacola (Milanich 1994, p. 381; see also Harris n.d; Knight 1984; Scarry 1981). Exactly what this pattern represents in terms of the specific type of architecture and coastal adaptations is uncertain. Clearly, there is a significant gap in our understanding of this area, as well as our ability to compare the northwestern coast with traditions practiced in peninsular Florida.

Platform mound construction was a much shorter-lived tradition on the Atlantic Coast. There are Woodland period platform mounds in interior Georgia, whereas the coast lacks such structures. During the Mississippian period Native Americans constructed platform mounds; however, a regional analysis of the coast revealed only two sites with platform mounds (Pluckhahn and McKivergan 2002). One of these sites is located on a barrier island (Kenan Field on Sapelo Island [Crook 1986]). At the other, the famous Irene site (Caldwell and McCann 1941), which is located slightly more interior, large deposits of shellfish were used as construction material in the mound.

After the Middle Mississippian period, Native Americans no longer constructed platform mounds along the Atlantic Coast (Anderson 1994; Pluckhahn and McKivergan 2002). Yet we know that groups in the region were organized into complex polities with centralized leadership (i.e., chiefdoms) at European contact (Worth 2004a, 2007) and that they constructed other forms of substantial architecture such as the 36-m-diameter great council house at Irene (Caldwell and McCann 1941; Crook 1986; Thompson 2009), a type of structure that strongly resembles Spanish-era descriptions of council houses in the same region (e.g., Hann 1996, pp. 89–92; Worth 2004a, pp. 241–242). We explore some of these issues further in our examples of complex polities in the coastal zone later in the article.

Evaluating monumentality in coastal environments

The issue of monument construction is a hotly debated topic in coastal archaeology of the southeastern U.S. Particularly relevant are shell-bearing sites and whether deposits at these sites represent monumental constructions. Archaeologists from both perspectives do not deny that shell deposits may have represented both

middens and monumental works. The debate is methodological and centers on establishing how rapidly the deposits form, representing either feasting or monumental constructions. Although several techniques are used to address this specific problem, they need further testing and independent confirmation. Refinement of such approaches will aid our interpretation of such sites for most periods along the coast.

Another interesting issue is the cessation of platform monument construction in coastal areas coincident with demographic shifts. Whereas burial mound construction continued into the late Mississippian period on the Atlantic Coast, platform mound construction ceased. Archaeologists hypothesize that populations were at their peak at least on some islands (Thomas 2008d) if not the entire coast during this late period. Drawing on findings from the Irene site, some suggest that this change in the use and construction of architecture was tied to shifts is political complexity (e.g., Anderson 1994, Saunders 2000; Thompson 2009). Anderson (1994) discusses this shift in terms of interior chiefdoms, yet no one has linked this to larger regional-level political dynamics on the coast, even though relatively detailed ethnohistorical information from the Spanish era is available (e.g., Worth 2004a, 2007).

A final point considers the nature of conflict and cooperation in peninsular Florida, specifically as it relates to monument construction. Following Anderson (2002, 2004), segmentary societies (i.e., tribes) emerged during the Late Archaic along the southern coasts. This argument is largely based on the establishment of monumental architecture, a tradition that continued throughout the Woodland period and presumably supported a similar political organization. Low-level conflict is characteristic of tribal societies (Marcus 2008) and is documented in the Southeast for such societies (Dye 2009, pp. 167–168). Hutchinson's (2004, p. 155) excellent bioarchaeological study of central and southern Florida populations suggests that they may have experienced lower levels of conflict than the greater Southeast. Additional skeletal collections research is needed to develop this emerging picture more fully (see Hutchinson 2004 for possible explanations).

The Southeast is one of the few areas of the world, along with Peru and Japan, where coastal hunter-gatherers constructed large-scale earth and shell monuments. Shell rings, shell and earth mounds, and other structures all formed a complex suite of architecture that characterized the coasts of the Southeast beginning 4500 years ago. The Southeast has one of the highest densities of monuments constructed by hunter-gatherers with varying degrees of mobility. Unlike other areas where complex hunter-gatherers became reliant on domesticates or created the necessary preconditions for domestication (e.g., Bar-Yosef and Meadow 1995; Habu 2004), many on the southeastern coasts continued to follow a hunter-gatherer lifeway. Some groups, such as the Calusa, became as elaborate in terms of political complexity as their contemporaries who were reliant on maize agriculture in the interior river valleys of eastern North America. Other groups, such as the Guale, integrated maize into an economy that was already heavily dependent on estuarine resources. This economic variability and long-term tradition of monument construction makes the Southeast an important comparative case study for anthropologists dealing with similar and divergent traditions elsewhere in the

world. We now turn to two examples of complex polities that emerged along the coast of the southeastern U.S.

The development of complex polities in the coastal zone: Two examples

Many complex polities developed specifically in the context of the coastal zone of the southeastern U.S., at differing spatial and demographic scales and with widely divergent subsistence strategies and socioeconomic systems. Nevertheless, two polities stand out in the literature: the Calusa of southwestern Florida and the Guale of southeastern Georgia. The Calusa have been described as "a complex chiefdom or a weak tribute-based state" (Marquardt 2004, p. 210; see also Marquardt 1987, pp. 99–100). During the historic period, this coastal polity controlled or influenced a vast region of the southern Florida peninsula, extending across 150–200 km of coastal and inland terrain and encompassing over 20,000 people distributed in 50 to 60 communities (Worth 2008; see also Goggin and Sturtevant 1964; Widmer 1988, pp. 255–260). The Guale have been described for the same period as a complex chiefdom on a considerably smaller scale, with perhaps 3,000 people distributed in 30 to 40 communities in a narrower coastal zone extending only 70 km (Worth 2004a, pp. 238–240, 244). Due in part to the rich documentary data available for both societies, as a result of relatively well-described Spanish contact during the 16th century, considerable archaeological research has been carried out in both regions, much of it designed to investigate the relationship between subsistence economy and complex political organization. A great deal of effort has been expended on explaining how the Calusa polity emerged in the clear absence of agriculture. For the Guale the primary research question revolves around the extent to which the Guale were characterized by a sedentary agricultural lifestyle prior to Spanish contact. For most of the coastal plain there is limited evidence for premaize domestic plant use (Gremillion 2002); for the Guale area, specifically, there is much debate about the extent of prehistoric reliance on maize, although bone isotope and skeletal analysis has done much to at least provide a departure point for future studies (e.g., Hutchinson et al. 1998; Larsen 1982; Thomas 2008a, b).

In neither case is the fact of political complexity debated, though there is no consensus on its precise nature and configuration in each area. What is principally at stake is the extent to which political complexity can and did emerge in coastal environments that are commonly considered marginal for agriculture and even sedentism. These two groups provide key cross-cultural examples for related research in areas such as California (e.g., Arnold 2001), the Northwest Coast (e.g., Ames and Maschner 1999), and Japan (e.g., Aikens and Dumond 1986; Habu 2004). A related question that is not commonly articulated, however, is whether complexity in coastal zones differs in any fundamental way from that of interior regions and if so, why.

Several authors address the anomaly of Calusa complexity, and the topic remains an active research concern for archaeologists and ethnohistorians (e.g., Goggin and Sturtevant 1964; Marquardt 1986, 1987, 1988, 1992a, 2001, 2004; Patton 2001; Widmer 1978, 1983, 1988; Worth 2008). That the Calusa were characterized by a

remarkable degree of sociopolitical complexity during the Spanish colonial era is unquestioned based on documentary sources, though a thorough and detailed characterization of their sociopolitical organization at the time of Spanish contact and thereafter remains somewhat ambiguous (see also Hann 1991, 2003; Lewis 1978; Worth 2006). Also, it is well documented that the Calusa were hunter-gatherers as indicated ethnohistorically and confirmed by extensive zooarchaeological and archaeobotanical analyses (e.g., Newsom and Scarry n.d.; Scarry and Newsom 1992; Walker 1992, 2000a). Even though Newsom and Scarry (n.d.) have recently argued for the presence of tropical home gardens of mostly nondomesticated species, no archaeological work in the Calusa region has produced any evidence of the maize agriculture. The general characterization of the Calusa as a nonagricultural chiefdom is unquestioned; the question is when and why this complexity emerged.

Though from divergent theoretical schools, all researchers acknowledge the important role of the highly productive coastal and estuarine environment of southwestern Florida in the emergence of Calusa complexity. The Charlotte Harbor estuarine system in particular comprises broad expanses of shallow seagrass beds interspersed with numerous mangrove-fringed islands, supporting a rich diversity of fish and shellfish that evidently formed the basis of the Calusa subsistence economy for centuries (e.g., MacMahon and Marquardt 2004, pp. 8–59; Widmer 1988, pp. 98–137). Archaeological sites associated with the historic Calusa or their predecessors are numerous and widespread; they include a diversity of sizes and configurations, ranging from low-density shell scatters and small shell middens and ridges to vast midden islands with immense shell mounds arranged in complex configurations with artificially constructed canals, water courts, and ridges (Torrence 1999; Walker and Marquardt n.d.; Widmer 1988, pp. 189–260). While the precise relationship between the spatial and chronological distribution of this vast constellation of sites remains poorly understood (but see Patton 2001), it is nonetheless evident that human populations were densest adjacent to the rich estuaries and their resources.

Widmer (1978, 1983, 1988) provides a comprehensive model for the development of Calusa complexity, postulating that the ancestral Calusa lifestyle became fully entrenched only after a broad stabilization of sea levels around 2700 B.P. After a period of population growth and group fissioning accompanied by a ramage-type chiefly social organization, the coastal estuaries of southwestern Florida reached critical carrying capacity around A.D. 800. After that point in time, the Calusa polity shifted to a unilineal chiefly system and began to incorporate surrounding regions in the interior, ultimately forming a prehistoric paramountcy that was later witnessed and described by Spanish explorers and missionaries in the 16th and 17th centuries (Widmer 1988, pp. 272–273, 279).

In contrast, Marquardt (1986, 1987, 1988, 2001, 2004), though acknowledging the emergence of a simple chiefdom by A.D. 800 (Marquardt 2004, p. 210), has critiqued Widmer's model as "a highly-orthodox cultural materialistic model in which internal socio-historical processes play few or no causative role" (Marquardt 1988, p. 186). Approaching the problem from a dialectical perspective, Marquardt (1992c) hypothesizes that the hypercomplexity witnessed by Spanish chroniclers

may have emerged only during the first decades after European contact as a multiregional response to the external Spanish threat. Prior to that time, Calusa complexity may have manifested itself on a smaller scale, with a more complex and extensive chiefly polity emerging during the 16th century (Marquardt 1987, pp. 104–112). Though Marquardt's hypothesis clearly lends greater importance to sociohistorical factors in the rise of complexity described by Spanish chroniclers, purely archaeological measures of such factors have yet to be explored and elaborated for the centuries-long span of the late prehistoric era. Therefore, it is difficult to judge the extent to which Widmer's model might need adjustment or revision to account for sociohistorical factors of the type discussed by Marquardt.

This debate illustrates the importance of timing in the rise of complexity. Were the Calusa characterized by the hypercomplexity described in Spanish accounts only after European contact? Alternatively, was this level of complexity centuries old by that time? Unfortunately, differences in the types of data available for each period make it extremely difficult to gauge the timing of Calusa complexity. At present, precontact data on the Calusa are exclusively archaeological and postcontact data are almost entirely documentary (see discussion below); thus it is difficult to assess the extent to which historic-era Spanish accounts of the Calusa are mirrored in prehistory. Since models for the emergence of Calusa complexity depend largely on arguments regarding population growth, environmental circumscription, sea-level change, and intra- and interregional sociohistorical conditions, the question of *why* Calusa complexity emerged is predicated on an answer to the question of *when* complexity emerged. Until the postcontact political complexity of the Calusa is clearly defined from an archaeological standpoint, it will be difficult to push our interpretations regarding the emergence of documented Calusa complexity into the precontact era, except in general terms.

Like the Calusa, Guale complexity is largely unchallenged, though once again the precise nature of that complexity, its relationship to Guale subsistence and settlement systems, and the timing of its onset have been debated for decades (e.g., Jones 1978; Larson 1969, 1978, 1980; Thomas 1987, 1993, 2008d; Worth 2004a, 2007). Models accounting for complexity among the Guale also have been based, until recently, on Spanish documentary sources, although not without substantial differences in interpretation. Detailed ethnohistoric accounts penned by several Jesuit missionaries who lived for several months among the Guale and their northern neighbors, the Orista, between 1568 and 1570 (Zubillaga 1946) directly imply that the contact-era Guale were only minimally sedentary and relied only sporadically on maize agriculture. Larson (1969, 1980) and others (Crook 1984, 1986) have used these accounts to develop a detailed model that emphasizes residential mobility in the coastal zone and only minimal reliance on maize agriculture. These models emphasize the contribution of hunting and gathering of aquatic and terrestrial resources in both coastal and inland habitats and view sedentary agricultural lifestyles as a largely postcontact phenomenon that emerged because of Spanish missionary activity among the Guale (e.g., Larson 1978, p. 133).

This model of Guale society contrasts with later Spanish-era accounts of sedentism and agricultural productivity (e.g., Jones 1978; Worth 2007); it also contradicts other archaeological evidence for year-round occupations and site-size

hierarchies (e.g., Keene 2004; Pearson 1977, 1984; Thomas 2008c). Recent attempts to explain and resolve the "Guale problem" include a reevaluation of the earliest documentary accounts in broader historical and climatological context (Worth 1999) and an extensive and detailed archaeological reevaluation of prehistoric Guale settlement systems, subsistence strategies, and social organization (Thomas 2008c).

On the one hand, the Jesuit accounts so fundamental to Larson's model of residential mobility and minimal agricultural development among the Guale may reflect nothing more than culturally conditioned responses to the effect of a prolonged drought and repeated appropriation of surplus foods by French and Spanish explorers (e.g., Thomas 2008c, pp. 1110–1113). It may therefore be possible to confirm the applicability of later mission-era accounts of sedentism and agricultural production as relevant for understanding prehistoric Guale complexity, irrespective of the intervening Jesuit accounts that describe Guale behavior during periods of stress. More importantly, however, Thomas' (2008a) archaeological study of St. Catherines Island provides substantial data and interpretations relative to the advent of sociopolitical complexity and maize agriculture among the ancestral Guale, making it possible for the first time to reconstruct a timeline regarding the appearance of both. Importantly, Thomas (2008a, d) found, based on mortuary data, that ascribed social status first appeared on the coast around A.D. 800, centuries before maize agriculture (c. A.D. 1300). Archaeological data indicate that the inhabitants of St. Catherines Island developed "a ranked, despotic system of inherited asymmetry in leadership and social status" by A.D. 800 (Thomas 2008e, p. 1078). Thus political complexity in the Guale area likely emerged long before maize agriculture, which was not a necessary prerequisite or corequisite of political complexity.

This finding is important for understanding the emergence of Guale complexity and Calusa complexity, which have long challenged anthropologists as notable examples of nonagricultural chiefly social organization. When compared with Widmer's (1988) interpretations of prehistoric Calusa complexity, Thomas' evidence for the Guale reveals that political complexity in both regions may have emerged at about the same time—c. A.D. 800—and both in the absence of maize agriculture. For at least five centuries, the ancestral Calusa and ancestral Guale may have existed as nonagricultural coastal chiefdoms, or at least as coastal polities with ranked social organization (complex foragers). In contrast, interior groups eventually adopted maize agriculture and chiefly political organization as a component of the geographically extensive Mississippian culture spreading across eastern North America. The appearance of maize agriculture among the Guale may actually coincide with the collapse of interior riverine agricultural chiefdoms along the Savannah River (see Anderson 1994) and a possible reorganization of the political and demographic landscape (Thomas 2008c, pp. 1103–1105). Thus the adoption of agriculture may have been more a result of external sociohistorical factors than a natural outcome of internal environmental and ecological processes. Given his conclusion that maize cultivation on St. Catherines Island was actually less energetically efficient than coastal foraging, Thomas suggests that maize agriculture may have been adopted only as part of a strategy of "costly signaling" in

which "sociopolitical…considerations could have outweighed net energetic returns" (Thomas 2008c, pp. 1105, 1107–1110). Both interpretations are in line with Marquardt's (1986) critique regarding the processes involved in the rise of Calusa complexity, since they incorporate sociohistorical factors as significant components in the shift to maize agriculture.

Ultimately, a comparison between the historic Guale and Calusa reveals that complex polities can and did emerge in coastal zones in the complete absence of agriculture and that complex coastal foraging represented a successful adaptation that lasted some 500 years for the ancestral Guale and more than 900 years for the ancestral Calusa. Whether maize agriculture was possible or advantageous for coastal polities now appears to be a secondary question; it was more a supplement than a prerequisite for Guale complexity and never played any role among the Calusa. We argue that political complexity in the coastal zone needs to be studied as a specifically coastal phenomenon, one that emerged out of, and not in spite of, the resource base already available to coastal residents. Such an understanding will contribute not only to the larger literature on so-called "complex" hunter-gatherers but also to the broader research on political economies (e.g., Earle 2002; Feinman and Nicholas 2004). Only then can we begin to examine the relationship between the political economies of complex foragers and complex farmers.

Two points should now be clear. First, although the hunter-gatherers of the southern coasts exhibit considerable variability in mobility and political complexity, for most of their history these groups are clearly not the highly mobile, small groups of family bands discussed in *Man the Hunter* (Lee and DeVore 1968). The southeastern coasts add yet another case, like the Northwest Coast, that relates to the coastal paradox or what Erlandson (2001, pp. 289–292) has termed the "Gates of Hell" and "Garden of Eden" models. This debate centers on the relative productivity of aquatic environments, population density, and the role of aquatic resources. Some archaeologists view such environments as marginal, where groups were barely able to provide for daily needs and resorted to low-ranked species of shellfish; others suggest a seemingly endless supply of food (see Erlandson 1994, 2001). Few southeastern archaeologists have addressed this debate explicitly, yet it is clear that the southern coasts have much to offer on the role of coastal ecosystems in the varying trajectories of human societies.

European contact and Native American coastal populations

The southeastern coastal zone was the first part of North America to experience direct contact with European explorers and colonists during the 16th century. As colonial settlements were established along the Atlantic and Gulf Coasts from the late 16th through the 18th centuries, the coastal zone quickly became "ground zero" for subsequent European penetration of the interior by missionaries, soldiers, traders, and settlers. These ports were direct links with an increasingly global network of maritime transportation of people and goods. For these reasons, indigenous residents of the coastal zone commonly experienced the earliest and most substantial impact from European colonization.

The earliest documented European expeditions to the Atlantic and Gulf Coasts include an assortment of coastal explorations between 1513 and 1565 (e.g., Hoffman 2002; Milanich 1999a; Weddle 1985). After first contact on the Florida peninsula, two primary regions of early maritime exploration and attempted settlement emerged. One was the lower Gulf Coast of the Florida peninsula, roughly extending from Charlotte Harbor on the south to Tampa Bay on the north, marked by deeper near-shore waters than elsewhere, long barrier islands, and extensive bay and estuary systems. The second region was the middle of the Georgia Bight, extending from the St. Johns River mouth on the south to Port Royal on the north, characterized by well-developed barrier island and estuary systems alongside deeper Atlantic waters. Another locale of early exploration was Pensacola Bay on the northern Gulf Coast, marked by a notably deep bay with adjacent barrier island and estuarine systems.

Spanish imperial strategy in the mid-16th century ultimately focused on fortifying the lower Atlantic coastline of North America against anticipated French intrusion, and in particular on the Port Royal estuary (called Santa Elena). However, because of the failure of Tristan de Luna's 1559 attempt to establish an overland route from Pensacola Bay on the northern Gulf Coast to Santa Elena on the Atlantic (e.g., Priestley 1928), ultimately the Georgia Bight region became the hub of Spanish colonial efforts in greater Florida. Between 1565 and 1570, Pedro Menéndez de Avilés established the twin coastal ports of St. Augustine and Santa Elena. He also attempted to maintain a string of additional coastal forts extending from Port Royal all the way south to the Florida Keys and around the tip of Florida north to Tampa Bay (e.g., Hudson 1990; Lyon 1976; Milanich 1999a). All but St. Augustine and Santa Elena had been overrun or withdrawn by 1570; with the withdrawal of Santa Elena in 1587, St. Augustine remained the primary point of European colonial expansion for much of the Southeast throughout the next century (e.g., Hann 1996; Worth 1998).

Because of these early colonial endeavors, Europeans initially contacted most, if not all, major indigenous coastal groups across during the 16th century. Yet only a small number of these populations experienced intensive and long-term colonial interaction. As a result, coastal populations along the entire northern and eastern Gulf coastline and the lower Atlantic coastal regions of both southern Florida and the Carolinas remained autonomous throughout much of the colonial era. Only the Guale and Mocama of the Atlantic Coast north of St. Augustine were fully assimilated into the colonial system of Spanish Florida; most other groups experienced only limited maritime contact after the 16th century. This pattern changed only with the establishment of new European colonies during the 17th and 18th centuries, including the English at Charleston after 1670, the Spanish at Pensacola after 1698, and the French at Biloxi, Mobile, New Orleans, and other nearby locations after 1699.

Given the above, we recognize two broad trajectories of colonial change for indigenous coastal populations, both of which have implications for archaeological research. The first trajectory is characterized by intensive European interaction leading to full-scale colonial assimilation; the second is characterized by only sporadic and limited European maritime contact with fully autonomous coastal

groups. Only the Guale and Mocama fall into the first category, whereas the second category includes the Calusa and many other Florida groups (Surruque, Ais, Jeaga, Tequesta, Tocobaga, Pojoy, etc.), and the Escamazu and various other groups now classified as Cusabo on the Carolina coast (e.g., Hann 1991, 1996, 2003; Milanich 1999a; Waddell 2004; Wheeler and Pepe 2002; Worth 2003, 2004c, 2007). This second category also includes populations living along the northern Gulf coastline, though late 17th-century Spanish accounts imply that the Pensacola Bay region at least may have been repopulated by entirely new groups in the aftermath of severe depopulation affecting the 16th-century residents, although the precise relationship between these groups has yet to be clarified empirically (Harris 2003).

Although ethnohistorical information is available for most coastal groups during the colonial era, archaeological data specifically associated with this crucial period are still largely absent, with the exception of the Guale and to a lesser extent the Mocama (e.g., Braley et al. 1986; Caldwell 1954; Deagan 2004; Deagan and Thomas 2009; Dickinson and Wayne 1985; Gorman 2007; Jefferies and Moore 2009; Milanich 1971; Rock 2006; Saunders 1993, 2000; Thomas 1987, 1993, 2008b; Thunen and Whitehurst 2005; Waters 2005). In large part due to the florescence of mission archaeology along the Atlantic Coast north of St. Augustine, we know a great deal about the nature of cultural transformations. Nevertheless, despite extensive recent archaeological work among prehistoric Calusa of the lower Florida Gulf Coast, for example, virtually no detailed archaeological data exist regarding colonial-era Calusa life beyond Spanish grave goods recovered from burial mounds at coastal sites (e.g., Wheeler 2000; Worth n.d.).

Available archaeological and ethnohistorical data combine to provide an increasingly detailed portrait of the nature of culture change among the Guale and Mocama. Though much remains to be learned, demography, settlement systems, subsistence strategies and diet, material culture, belief systems, sociopolitical organization, and many other facets of life were all affected to some extent in the context of missionization. The exact nature and pace of these changes, however, has proven far more complex than a simple acculturative model might have predicted. For example, the overall reduction in the number of archaeological sites associated with satellite communities within local chiefly jurisdictions clearly mirrors documented evidence for population loss in the context of increased mortality, nutritional stress, and workload, along with decreased birthrate and overall community health (Larsen 1990, 2001). Yet there is convincing ethnohistorical evidence of a persistence of traditional chiefly social organization even in the context of population aggregation and relocation (e.g., Worth 2007). Despite an increased reliance on maize agriculture and the addition of new European cultigens and livestock to the coastal diet, there is also clear evidence for continuing reliance on aquatic and wild terrestrial foodstuffs that formed key components in prehistoric diets (Hutchinson et al. 1998; Reitz 1993; Ruhl 1990, 1993). The Guale and Mocama adopted many items of European material culture such as iron tools and glass beads, as well as a wide range of cloth, clothing, and other items known only from documentary records. Despite their increased reliance on European material culture, they simultaneously maintained a robust indigenous ceramic tradition, which supplied not only their own needs but also the supplementary needs of

resident Spanish missionaries and soldiers (e.g., Deagan and Thomas 2009; Saunders 2000). In this context, archaeological and documentary data sets clearly complement each other in providing a more nuanced portrait of the processes of transformation.

Far from being passive victims of European colonialism, the missionized chiefdoms of Georgia and Florida clearly played an active part in adapting to their role in the evolving colonial system of greater Spanish Florida. Perhaps nowhere is this more evident than in the extent to which St. Augustine came to rely on both the labor and staple foods produced in Guale. Labor and goods from this area became fundamental components of its broader economic infrastructure during the mid-17th century, and the mission communities of Mocama became important links in the northern corridor of travel and transport between Guale and St. Augustine (Worth 1998, 2007). Though marked by both cultural continuity and cultural change, the coastal Guale and Mocama displayed a flexibility and adaptability that was strongly countered only by their dwindling numbers. In the end, the coastal homeland of the missionized Guale and Mocama was abandoned between 1661 and 1702 as a result of mainland slave raids, maritime piracy, and outright assault by English Carolina; as refugees their descendants survived to emigrate to Cuba with the Spanish in 1763 (Worth 2007).

The details of culture change among the unmissionized coastal groups are poorly known from an archaeological standpoint but comparatively well known ethnohistorically. Documentary sources clearly indicate that many coastal groups persisted well into the colonial era and that many aspects of their culture remained largely unchanged well into the 18th century. This is evident among the Calusa, whose indigenous belief systems, sociopolitical structure, settlement patterns, and subsistence practices at the end of the 17th century appear to have been remarkably similar to that documented more than a century before (e.g., Hann 1991, 2003). Nevertheless, surviving unmissionized coastal groups were not completely disengaged from surrounding European colonial activities. Coastal groups along Florida's lower Atlantic Coast were routinely contacted by passing Spanish ships traveling between St. Augustine and Havana, stopping for water, intelligence gathering, or engaging in illicit trade for ambergris. Toward the end of the 17th century, Cuban fishermen increasingly plied the waters of the Florida Keys and the rich estuaries of Charlotte Harbor and Tampa Bay, interacting with dwindling coastal populations in the search of commercial fish resources (Worth 2003, 2004c). Even after slave raids had pushed surviving southern Florida groups to the Florida Keys, many still worked as wage laborers on Cuban fishing vessels returning to the former Calusa homeland. Coastal groups north and west of Florida's mission provinces, such as Escamazu, routinely exchanged goods and information with missionized groups; by the end of the 17th century they interacted increasingly with newly arrived English and French settlers (e.g., Waddell 2004; Worth 2007). To one extent or another, even these unassimilated autonomous coastal groups must have experienced some degree of cultural adaptation to the new and evolving colonial world, though at present there is virtually no archaeological data in this regard.

While beyond the scope of this article, several entirely new coastal adaptations emerged among Native American refugees and immigrants originally from the

interior Southeast but who settled in sparsely populated or vacant coastal zones during the colonial era. The most notable examples for which ethnohistorical and archaeological work has been undertaken are the Yamasee, who lived at various locations on the Atlantic Coast between Spanish St. Augustine and English Charleston for a full century between the 1660s and 1763 (Green and DePratter 2000; Southerlin et al. 2001; Worth 2004b), and a later group known as the "Spanish Indians," who eventually intermarried with Cuban fishermen along Florida's lower Gulf Coast between the 1760s and the 1830s (e.g., Almy 2001; Covington 1959; Palov 1999; Schober and Torrence 2002; Worth 2004c). Both groups originated among Muskogee-speaking populations in the interior, representing good examples of colonial ethnogenesis in the coastal zone.

Evaluating European contact

Historic-era Native American groups continued to occupy substantial portions of the coastal zone of southeastern North America throughout much of the European colonial period after 1513. After the withdrawal of the Spanish from Florida in 1763, however, not a single group originally indigenous to the coast remained on the entire Gulf and Atlantic coastlines of greater Spanish Florida. Only small proportions of the Creek immigrants to Florida lived on the coast (i.e., the Spanish Indians), with the remainder concentrated in the interior (the Seminoles).

Despite the nearly wholesale abandonment of the coastal zone during the first two centuries after European contact, much can be learned about Native American coastal populations during this crucial period when documentary evidence is available to supplement the archaeological record. Not only should it be possible to examine the nature of coastal societies as they responded to the rapid and sometimes traumatic changes of the colonial era, but the ability to link ethnohistorical and archaeological data for specific archaeological sites and contexts provides an unparalleled opportunity to expand and enrich our understanding of precontact cultures as well. Unfortunately, apart from relatively extensive (though still incomplete) archaeological investigations among the Atlantic coastal mission chiefdoms of Guale and Mocama, surprisingly little archaeological work has been implemented for sites and contexts that have specifically colonial-era dates (post-1513). While this is undoubtedly in part a result of the difficulty of distinguishing material cultures from pre- and postcontact occupations in the absence of datable European diagnostics (see discussion in Worth n.d.), more attention should be directed toward identifying and exploring such contexts to take full advantage of the multifaceted evidentiary base of the historic period.

Given the varied endeavors of European powers and their interactions with Native coastal peoples, the archaeology and ethnohistory of the southern coasts has much to contribute to the study of colonialism. Such interactions are apparent in the various accounts of rebellions, new economic endeavors, and the emergence of multiethnic groups and identities that occurred in these regions. Further, the archaeological record of these areas can speak to the materiality of these experiences and provide a methodological testing ground for ideas regarding

hybridity and how individuals and groups, whose histories were not recorded, experienced daily life (see Loren 2008 for a discussion).

Reflection and prospect: The archaeology of the southern coasts

What are the roles of coasts and islands in the social history of Native Americans in eastern North America? Why is there variation in space and time in the way Native Americans adapted to coastal areas? These are the two central questions that archaeologists working on the coasts must consider. Until recently few scholars gave serious attention to the coasts. In two syntheses of archaeology in the region and North America in general (Bense 1994; Neusius and Gross 2007), the Calusa are given a passing mention. Arguably one of the most important examples of complex hunter-gatherers in the world, the short attention given to the Calusa is not due to negligence on the authors' part but rather the lack of research attention the coasts have received. Fortunately this is changing.

The development of archaeology in eastern North America has largely been dependent on the study of monumental earthworks. The platform mounds of the Mississippian have done much to shape anthropological thinking of eastern North America. While the coasts, following King and Meyers (2002), may be rightly thought of as the edge of the Mississippian world, they *are not* the edges, peripheries, or backwaters of technological innovation, monument construction, social history, or cultural complexity. In fact, the coasts are the centers of development and the interior the edge.

Key studies on the regional development of pottery, the emergence of monuments, the development of complex hunter-gatherers, and colonization and mission attempts are changing the way we view these areas within the greater history of the region. With that said, there is tremendous variability in terms of the societies that inhabited the south Atlantic and Gulf Coasts of eastern North America. These differences are heavily due to environmental factors, as the coasts are not homogeneous in terms of available resources, and deep time historical factors that played a major role in shaping the structure of these societies.

To refine some of the gross observations we provide in this review, scholars must fill some of the key gaps in our knowledge of coastal groups. To this end, we highlight key research agendas that should lead to more substantive findings regarding the variability of coastal groups and their contribution to the greater history of the Southeast. Submerged sites, not just underwater sites but those located in intertidal environments, should be investigated. Because coastal resources are tied to major climatic phenomena such as sea level fluctuations and ENSO, additional research on climatic change and human systems is needed. Early work along the Atlantic and current work along the Gulf focuses on these issues; however, this research continues to be in a nascent stage of development. Such work will be relevant in terms of our understanding of the past and also provide insight into how coastal people deal with such changes in the environment. Such work should also include how humans have altered the coastal environment.

Research should investigate domestic architecture and associated features. Few houses have been excavated (cf. Keene 2004; Russo 1991a; Worth 2007), and an understanding of domestic organization in all time periods will be key to tracking demographic shifts. Research also should focus on timeframes between the Late Archaic and Late Prehistoric/Contact. We know more about these two periods than the others. We do not know if this disproportionate research is biasing our interpretations of the intervening timeframes.

Methodological techniques to discern rapid and/or slow shellfish accumulation should be developed. Such techniques will be key in resolving ongoing debates on the nature of monumentality along the coasts. Although research on subsistence and mobility has been a major research agenda, we are just beginning to understand these patterns for the Late Archaic and Late Prehistoric/Contact periods. More research is needed to see how patterns of subsistence and mobility change over time, specifically within these intervening timeframes.

Research that frames colonialism in terms of coastal adaptations has largely been implicit in previous work. We lack a more explicit understanding of how colonialism impacted such cultural events and interactions. Research on the development of complex ranked polities in the absence of agriculture should be carried out in the context of broader anthropological questions and debate. And finally, we need more archaeological research on historic-era populations. Until the archaeological "signature" of the better-documented coastal groups is clearly distinguished and identified, comparisons with prehistoric archaeological data will remain tenuous and general.

We make two final points regarding research along the southeastern coasts. First, we believe that coastal research has the potential to make key contributions to world archaeology, particularly in the realm of political economies and monument construction in the absence of agriculture and the nature of colonialism in these contexts. We see the Guale and Calusa as unparalleled comparative case studies for other areas where coastal complex hunter-gatherers emerged. We have attempted to point out where research in the Southeast speaks to broader anthropological issues. We also encourage southeastern coastal archaeologists to frame their research within broader anthropological questions and make their research accessible to the larger archaeological community. Although many researchers do this already, parochialism, even sometimes in our own work, continues to be pervasive in much of the research along the southeastern coasts.

Finally, several issues loom on the horizon for coastal archaeology everywhere. As Erlandson (2008, p. 167) points out, sea levels are projected by many scholars to rise between 20 and 200 cm by the end of this century. Along the Gulf and Atlantic Coasts, most of the archaeological resources are directly adjacent to the modern shoreline, with many currently inundated and suffering erosion from increased boat traffic and natural processes. In the eastern United States more and more people are moving to the coast, and coastal tourism, housing, and commercial development are on the rise. One need only look at the coastline of Florida on Google Earth to get a sense of the scale of development. We echo Erlandson's (2008, p. 169) call to race not only the rising tide of the sea but also of development.

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