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Climate change, resilience, and the Native American Fisher-hunter-gatherers of the late Holocene on the Georgia coast, USA

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ABSTRACT

The Georgia Coast of the eastern United States boasts some of the largest and spatially complex Late Archaic sites in North America, with the most famous of these being shell rings. The shell ring village phenomenon and its larger ceremonial landscapes did not, however, last throughout the Late Archaic. Climate shifts that led to local relative sea level change in the area at around 3800 cal. BP appears to have resulted in conditions that suppressed shellfish productivity and ultimately led to the uneven abandonment of shell ring sites. Our understanding of these changes along the Georgia Coast is limited by the fact that much of the research focuses exclusively on large shell midden sites. Investigations at several large terminal Late Archaic sites demonstrate continuity in the size of these occupations compared to earlier Late Archaic sites (i.e., shell rings), demonstrating a socio-ecological resiliency in these small-scale societies. We argue that, contrary to narratives of collapsing socio-ecological systems, the terminal Late Archaic was a time when displaced communities coalesced and forged new community bonds in the wake of a shifting resource base.

1. Introduction

The Georgia Coast of the eastern United States boasts some of the largest and spatially complex Late Archaic (5000–3000 cal. BP) sites in North America, with the most famous of these being shell rings (Saunders and Russo, 2011; Thomas, 2008a; Thompson and Worth, 2011). Shell rings, which are arcuate and circular shell midden sites, have been the focus of archaeologists since the beginning of archaeological research in the region (e.g., Moore, 1897; Waring and Larson, 1968). In addition to their status as the largest sites of their time in the region, they also evince some of the earliest pottery in North America, a fibre-tempered variety referred to locally as St. Simons wares (Sassaman, 2004; Thompson et al., 2008). Shell rings are the material remains of the earliest villages on the coast, and indeed, in the whole of the Eastern Woodlands of the United States. Recent research, based on isotopic and faunal analyses, indicates that Native Americans of the area occupied these villages across multiple seasons, and often year-round (Colaninno and Compton, 2019; Russo, 1998; Sanger et al., 2019; Thompson, 2018; Thompson and Andrus, 2011). These village communities were comprised of cooperating households that likely hosted larger-scale gatherings for feasts, ceremonies, and trade (Russo, 2004; Sanger, 2015; Thompson, 2018; Thompson and Worth, 2011). Thompson (2018) recently argues that Late Archaic shell ring villages represent high levels of group cooperation and collective action, particularly with regards to the extraction of estuarine resources for both subsistence and ceremonial feasting.

The shell ring village phenomenon and its larger ceremonial landscapes did not remain unchanged throughout the Late Archaic. Starting at around 3800 cal. BP, along the coastal margins of the southeastern United States, these communities began abandoning the shell rings. Sanger (2010) examined the abandonment of shell rings in terms of relative sea level change (RSLC) and found that this cessation of occupation was uneven for the Atlantic coast. Local-scale sea level curves suggest that initial Late Archaic settlement coincided with the establishment of marsh ecosystems when sea level reached approximately 1.2 m below present (mbp) by around 4200 cal. BP (Gayes et al., 1992;

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Turck and Alexander, 2013). By 3800 cal. BP, sea levels had dropped to 2.5 mbp, and 3.5 mbp by 3100 cal. BP.

For the Georgia Coast specifically, Thompson and Turck (2009) found that the frequency of sites, from the Late Archaic to the Early Woodland, dropped during this later period, with more sites persisting in deltaic areas of the coast (cf. Thompson and Turck, 2010). It may be that climate shifts beginning around 3800 cal. BP affected RSLC in the area, ultimately resulting in an alteration in environmental conditions (e.g., salinity gradients, temperatures) that suppressed shellfish productivity (Lulewicz et al., 2017). Turck and Thompson (2016) conducted a multi-scalar analysis of site types and environmental information coupled with a Bayesian analysis of radiocarbon dates. They found that intensive shell-fishing started earlier and lasted longer in deltaic regions (*5000 to* 3500 cal. *BP*) than in non-deltaic areas (*4500 to* 3800 cal. *BP*). Turck and Thompson (2016) found that intensive occupations persisted in both ecological zones and concluded that evident settlement and subsistence continuity following the 3800 cal. BP abandonment of shell rings indicated the presence of a resilient socio-ecological regional system. More recent research suggests that this resiliency was, in part, supported by the use of, and access to, localized shell-fish resources (Thompson et al., 2020).

Before Turck and Thompson s (2016) analysis, there had been no specific consideration of terminal Late Archaic (3800 3000 cal. BP) social-ecological landscapes of the Georgia Coast. Most research in the region has focused exclusively on large shell midden sites and their immediate surroundings. Even when studies considered smaller sites (i.e., sites with smaller shell midden deposits), those sites were often viewed through the lens of the larger, more visually impressive shell rings (e.g., Saunders, 2004).

1.1. Questioning the terminal Late Archaic

The decreased amount of associated shell deposits that accompany sites with terminal Late Archaic components, as compared to earlier Late Archaic ones, proves to be the primary challenge in examining the terminal Late Archaic period on the Georgia Coast. Archaeologists often assume, in the absence of radiocarbon dates, that non-shell bearing sites, as well as small shell-bearing sites, with Late Archaic ceramics, are contemporaneous with larger Late Archaic shell rings (e.g., Saunders, 2004). It is only through analysis of radiocarbon dates that archaeologists can clarify the relationship between different site types and their components (Turck and Thompson, 2016). Turck and Thompson (2016) observe that radiocarbon data suggest that non-shell bearing sites exhibiting Late Archaic ceramics most often occur between 3800 and 3100 cal. BP. Prior to Turck and Thompson (2016), many archaeologists working in the region assumed that the diversity of Late Archaic site types reflected some kind of settlement hierarchy. Waring (1968:253; see also Calms, 1967; Michie, 1979; DePratter, 1979) divides coastal Archaic sites into three basic categories: shell rings, shell middens, and surface scatters. Non-ring shell middens, interpreted as fishing stations, were the location of fish weirs and processing stations for oysters for transport back to residences. In contrast, shell rings, located mainly on the barrier islands, were thought to be communal centres.

The research presented here details our recent investigations of the early-through-terminal Late Archaic occupations at multi component sites. These assemblages have implications for understanding what happened as Late Archaic peoples abandoned shell ring villages. Following Thompson (2018) we explore how changing sea levels impacted and altered cooperation and collective action. Specifically, we suggest, following Turck and Thompson (2016), that the terminal Late Archaic was a time when communities coalesced at certain places along the coast to forge new community bonds in the wake of a shifting resource base. Our new data, presented below, provides further support for these interpretations and contributes to an emerging picture that suggests complex behavioural shifts and continuity in traditions during this period. Further, these data lend insight into how hunter-gatherers coped socially and economically with more considerable climate changes that impacted subsistence resources (i.e., shell beds). This research broadly demonstrates that climatic changes affected even relatively small-scale societies, precipitating shifts in cultural choices, traditions, and lifeways over time.

We defined three major research domains to explore how these sites, exhibiting few to no shell deposits, articulate with the overarching cultural trajectories along the Georgia Coast. These domains in the form of questions are as follows:

1. To what extent do terminal Late Archaic sites demonstrate large scale occupations?
2. Is there evidence at terminal Late Archaic sites of similar types of feasting activities that took place at shell rings?
3. To what extent does the terminal Late Archaic use of space and the landscape diverge from earlier Late Archaic practices?

To address these three research questions, we compile data from the past 11 years of research on the northern Georgia Coast. These data consist of large-scale systematic surveys of multiple sites, excavation of features, radiocarbon dating, and analysis of faunal assemblages, along with ongoing paleoclimate reconstructions. This multi-sited and mixed method approach provides us with a base to examine both local and regional shifts across the Late Archaic to terminal Late Archaic transition.

2. Research domain and methods

2.1. Site descriptions

Six archaeological sites make up our sample (Fig. 1). These are Ring II of the Sapelo Island Shell Ring complex, South End Field, Buckhead Field, Kenan Field, Patterson Island, and Little Sapelo Island. These sites are all multi component sites, but we focus on the Late Archaic occupations here.

Sapelo Shell Ring II. The Sapelo Island Shell Ring complex is located on Sapelo Island, GA. The complex is made up of three shell rings, with Ring II being the second largest, covering an area of approximately 8100 m^2. The primary occupation of the rings was between ca. 4200 and 3800 cal. BP. Evidence suggests that these ringed villages were occupied throughout the year, rather than seasonally (Andrus and Thompson, 2012; Thompson and Andrus, 2011). The results from the systematic shovel test survey of this site conducted by Jefferies and Moore (2013), serves as our comparative case for early Late Archaic settlement intensity.

South End Field. The South End Field site is located on the southwestern edge of Ossabaw Island, GA. Research and management at South End has had a dual focus. In part, ongoing work has been conducted in partnership between the University of Georgia, the Georgia Department of Natural Resources, and the Muscogee (Creek) Nation to salvage the rapidly eroding western bank and the Late Mississippian Native American component concentrated there (Ritchison, 2015; Ritchison et al., 2018). The site contains a Late Archaic period component that is most likely associated with the terminal Late Archaic due to the absence of associations between the site s Late Archaic ceramics and its shell deposits.

Buckhead Field. Buckhead Field, like South End, is a former plantation tract located on Ossabaw Island, GA. Similar in size and character to South End, Buckhead Field exhibits multiple Native American occupations and has been the target of investigations by archaeologists from UGA, focusing on its Late Archaic, Mississippian, and Plantation period components. The Late Archaic component at Buckhead are associated with the terminal Late Archaic based on radiocarbon dates reported here for the first time.

Kenan Field. Kenan Field is the largest known archaeological site on Sapelo Island (ca. 60 ha), exhibiting occupations from the Archaic

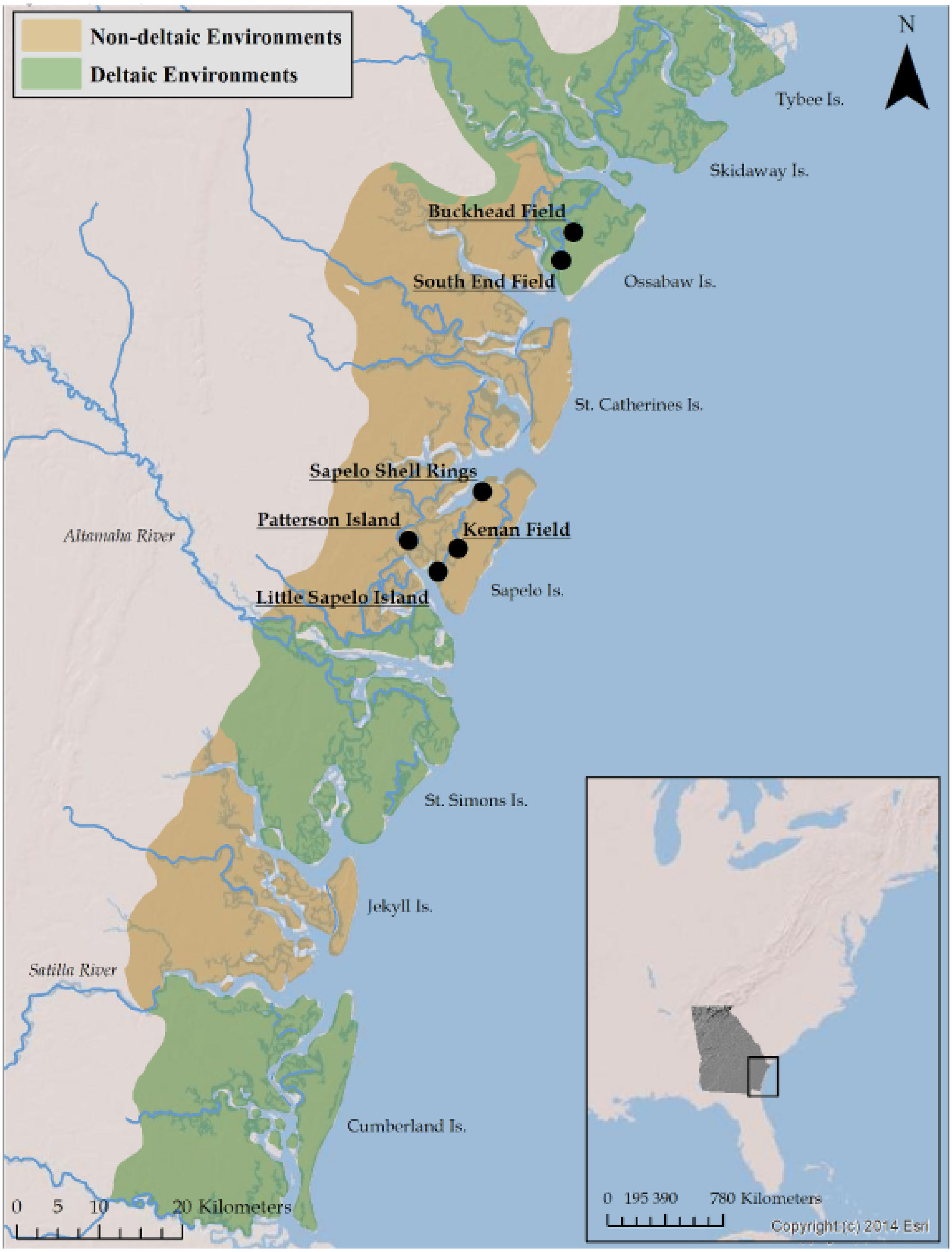

Fig. 1. Locations of archaeological sites included in the density analysis showing their associations with deltaic or non-deltaic environments (reproduced from Turck and Thompson, 2016).

period up to the Historic Euroamerican period. The site is a rectangular peninsula on the western edge of Sapelo Island. It is surrounded on three sides by the estuary, a situation on the landscape that likely contributed to its long-term history of consistent occupation. For the Archaic period, radiocarbon dates suggest the site was occupied during and after the shell ring phenomena, although the site does not exhibit a shell ring village (Ritchison, 2019).

Patterson and Little Sapelo Islands. Numerous marsh islands occupy the estuary between the larger barrier islands of the Georgia Coast and the mainland. These landforms are surrounded by tidal marsh, tidal creeks, and/or open water. Patterson and Little Sapelo Islands are examples of these "back-barrier" islands that are situated between mainland Georgia and Sapelo Island. These islands were surveyed by Thompson and Turck (2010) to understand how Native Americans occupied these smaller islands as well as how their economic importance varied over the long-term history of human occupation in the region. Patterson Island exhibits multiple Native American occupations, although occupation was punctuated. Patterson Island also exhibited the least association of Late Archaic sherds and shell refuse of any site in Thompson and Turck's survey (Thompson and Turck, 2010; Turck and

Thompson, 2016), which is characteristic of terminal Late Archaic occupations.

2.2. Survey

At our study sites, shovel tests were placed at either 10 or 20 m intervals. This disparity is due to the various proximate research or site management goals that drove investigations at each site. However, both intervals are smaller than typically used in Georgia (i.e., 30 m), allowing us to use a distributional approach to understand histories of site occupation (Dunnell, 1992; Ebert, 1992). This approach interprets of artefact densities across the entire landform rather than estimating site densities or simply delineating occupational boundaries. Each shovel test was placed at known UTM NAD83 (Zone 17) coordinates using either a Real Time Kinesmatic GPS unit, a Total Station, or a handheld high-accuracy (i.e., ~1 m) GPS unit; most commonly, a combination of these geo-locating tools was used. Twenty-meter intervals were used at all sites except for Sapelo Shell Ring II, where Jefferies and Moore (2013) conducted tests at 10 m intervals.

Each shovel test, save for those conducted at Sapelo Shell Ring II, was excavated as a 50 cm wide test in arbitrary 20 cm levels. The first 20 cm level of these tests regularly captures the entirety of the plough zone (i.e., approximately 22 cm in depth from the surface). Shovel tests conducted at Sapelo Shell Ring II were excavated as 30 cm diameter excavations and at 10 m intervals. These tests were also not excavated in distinct levels. This work was conducted earlier than the rest of the surveys presented here and the strategy of the Sapelo Shell Ring II survey at that time was meant to identify the presence of Spanish Mission period materials at a high spatial resolution. Excavated matrix was screened through quarter-inch mesh.

All materials excavated were removed from the field for analysis and curation except for dense shell midden deposits. If a shovel test penetrated one of these features, the excavated midden shell was weighed, recorded, and replaced following the completion of excavation. Shovel tests were excavated to sterile depths (usually through 20 cm of sterile subsoil); on the two occasions where cultural deposits extended below depths of 1 m, excavating further became prohibitively difficult and excavation ceased. Shovel tests that were not excavated to sterile represent a small fraction of the sample (1%). Thus, we do not believe that these outliers impact our analysis.

2.3. Excavations

Excavations occurred at three of the sites in our sample: Buckhead, South End, and Kenan Field. All units were excavated in 10 cm levels and screened through quarter-inch mesh. Sediment samples were retained from select features. During excavation, all cultural materials recovered were bagged by level. All materials excavated were removed from the field for analysis and curation again except for dense shell midden deposits. For these features, excavated shell was weighed, recorded, and replaced during back-filling, and a sample of each included shell species was bagged along with the recovered artefacts. When features were encountered, depending on their size, either a sample or the entirety of the feature fill was excavated and bagged for processing and analysis in the laboratory. Units were excavated to sterile subsoil. No ancestral Native American burials were disturbed during these excavations.

Temporally diagnostic ceramic sherds were analysed to determine the periods of use of each site. Native American ceramics were analysed based on surface treatment/decoration, temper, rim form, count, and weight using the sequence DePratter (1991) developed for the northern coast of Georgia. All cultural material, shovel test forms, and field notes are curated at the Laboratory of Archaeology, Department of Anthropology, University of Georgia, Athens, GA.

2.4. Ceramic density analysis

Ceramics collected during the surveys were placed into typological categories. The analysis described here deals exclusively with Late Archaic fibre-tempered ceramics, locally known as St. Simons wares. Fibre-tempered ceramics first appear on the Georgia coast between approximately 5000 and 4500 cal. BP and were in production until at least approximately 3000 cal. BP (DePratter, 1991; Ritchison, 2018:13; Thomas, 2008a). Early St. Simons ceramics are commonly plain; while surface treatments (i.e., incising and punctations) on St. Simons ceramics tend to occur more frequently in later Late Archaic assemblages, a lack of these treatments in a given context does not preclude a late date. Undecorated pottery was produced throughout the Late Archaic period. We used Natural Neighbour interpolation to identify distributional patterns at the study sites. This method employed the weight (in grams) of recovered ceramics per shovel test as the spatial variable (following Turck, 2011:44).

Georgia s archaeological standards define archaeological components as being at least 30m away from any other deposits. Although there are gaps in the distribution of Late Archaic materials at each of our individual study sites that are 30 m or greater, these gaps are filled with other archaeological materials such that we do not consider these gaps to be separations between distinct sites. We decided to instead visually define distinct concentrations in interpolated ceramic density results for Late Archaic materials. In that way, we could create an internally comparable dataset to evaluate differences in density and organization within our sample of sites. For our six study sites, we identify ten Late Archaic concentrations at our six sites, with each concentration being at minimum 30 m apart based on the observed distributions of Late Archaic ceramics (Table 1).

The total weight of Late Archaic ceramics from each site (including plough zone deposits), and each included concentration, was used to calculate a measure of ceramic density (i.e., weight in grams per

Table 1
Results of the systematic shovel test surveys of six sites on the Georgia Coast. Testing took place between 2013 and 2018.

Component	Shovel Test Interval (m)	Shovel Test Type	Sherd Weight (g)	Area (m^2 to the nearest 100 m)	Density (g/ha)
Shell Ring II Total	10	Round	680.80	8100	840.49
Shell Ring II	10	Round	674.20	6500	1037.23
Buckhead Total	**20**	**Square**	**461.40**	**39000**	**118.31**
Buckhead South	20	Square	171.50	5100	336.27
Buckhead Central	20	Square	127.50	8100	157.41
South End Total	**10&20**	**Square**	**223.67**	**41600**	**53.77**
South End S Central	10&20	Square	116.79	1800	648.83
South End Central	10&20	Square	43.98	2300	191.22
Kenan Field Total	**20**	**Square**	**1393.09**	**338500**	**41.15**
KF West	20	Square	424.32	7400	573.41
KF South	20	Square	354.59	10500	337.70
KF Central	20	Square	304.64	34600	88.05
Patterson Island Total	**20**	**Round**	**605.80**	**182200**	**33.25**
Patterson Central	20	Round	348.10	19000	183.21
Little Sapelo Island Total	**20**	**Round**	**98.30**	**448600**	**2.19**
Little Sapelo SE	20	Round	59.40	3500	169.71

systematically tested hectare of site area). Areas were rounded to the nearest 100 m^2 using the site identification policies of the state of Georgia mentioned previously. Weights, in grams, of Late Archaic ceramics were also used to calculate a measure of weight per excavated area. These measures are used to compare the relative intensity of Late Archaic occupations at shell ring sites to those at non-shell-bearing terminal Late Archaic sites.

We recognize that ceramic densities reflect a combination of factors, both geologic and behavioural, not the least impactful of which is the amount of time a location was occupied or in use. While later historic occupants ploughed these sites resulting in a mixing of the deposits, the Late Archaic components are the least affected as they are the deepest at these sites. Many of the artefacts associated with this period are found beneath the plough zone. Furthermore, all of these sites have a similar geographic context, all sites are marsh adjacent and were subject to similar geomorphological processes (e.g., windblown sediments, etc.). Given these similarities, we argue that sites are readily comparable and that given the large size of the survey of each, minor localized differences in site formation processes are minimized. Our radiocarbon data, reported below, supports this approach, but future radiocarbon dating will be able to test this supposition and better contextualize these reported ceramic depositional patterns.

2.5. Radiocarbon dating

The radiocarbon dating program reported here provides a chronological framework to contextualize the temporality of occupation of each of the Late Archaic components at these distinct site-types. Samples, usually charred botanical remains, from the excavation of Late Archaic features were selected from either the base of deposits or within the Late Archaic deposits or features. In total, six radiocarbon assays are reported here. Samples for these assays targeted specific features and artefacts (e.g., a Late Archaic midden, Late Archaic ceramics, and a feature with an as-of-then unknown temporal association).

3. Results

The following sections report the findings of the ceramic density analysis from five terminal Late Archaic sites and the early Late Archaic Sapelo Shell Ring II site (Table 1) as well as the results of excavations of terminal Late Archaic features at two of our study sites, Buckhead Field on Ossabaw Island, GA and Kenan Field on Sapelo Island, GA (Fig. 1).

3.1. Survey data (Ceramic density)

Sapelo Shell Ring II (9MC23). The survey of Sapelo Shell Ring II conducted by Jefferies and Moore (2013) yielded a total of 680.8g of Late Archaic ceramics (Table 1). The focused shovel testing of Shell Ring II demonstrated that the entirety of the survey area was effectively a single concentration. The primary Sapelo Shell Ring II component yielded a ceramic density of 1037.23g per ha, while the site in its entirety had a density of 840.49g per ha. This situates Shell Ring II as the densest Late Archaic occupation of our sample of sites.

Patterson and Little Sapelo Islands (9MC351 and 9MC493). Two of the four back-barrier islands surveyed by Turck and Thompson (2016) in the vicinity of Sapelo Island exhibited evidence of Late Archaic settlement: Patterson Island and Little Sapelo Island. Each of these islands contained a single primary occupational concentration with outlying isolated finds (Table 1). The primary Little Sapelo Island Late Archaic concentration contained 59.4g of ceramics, while the island exhibited 98.3g in totality, resulting in a density of 169.71g per ha for the primary component and a smaller density at 2.19g per ha for the island.

Patterson Island also exhibited a single primary occupational concentration surrounded by isolated finds of varying density. The primary concentration contained 348.1g of Late Archaic ceramics, with the island exhibiting 605.8g in total. These amounts resulted in a density value of 183.21g per ha for the primary concentration and a value of 33.25g for the entire island.

Kenan Field (9MC67). Kenan Field, the largest site in our sample, contained three distinct concentrations and isolated finds (Table 1; Fig. 2). These three concentrations were designated Kenan Field (KF) West, Kenan Field Central, and Kenan Field South. KF West exhibited 424.32g of Late Archaic ceramics at a density of 573.41g per ha. KF Central exhibited a lower incidence of Late Archaic ceramics than KF West and KF South with a total of 304.64 g at a density of 88.05g per ha. KF South contained 354.59g of Late Archaic ceramics at a density of 337.7g per ha. For the site as a whole, Kenan Field exhibited 1393.09g of Late Archaic ceramics at a density of 41.15g per ha.

South End (9CH150). The South End site contained two distinct concentrations, which we have labelled South End (SE) South-Central and South End Central (Table 1). SE South-Central contained 116.79g of Late Archaic ceramics and SE Central contained 43.98 g at densities of 648.83g per ha and 191.22g per ha, respectively. The high density of SE South-Central should probably be taken as an outlier as these materials were recovered from a cluster of only 3 artefact-rich shovel tests. As a single site, South End exhibited 223.67g of Late Archaic ceramics at a density of 53.77g per ha.

Buckhead (9CH155). The Buckhead site contained two concentrations, labelled Buckhead Central and Buckhead South (Table 1). Buckhead Central exhibited 127.5g of Late Archaic ceramics at a density of 157.41g per ha while Buckhead South exhibited 171.5g of Late Archaic ceramics as a density of 336.27g per ha. Combined, the Buckhead site contained 461.4g of Late Archaic ceramics at a density of 118.31g per ha, the highest site-level density besides Sapelo Shell Ring II.

3.2. Excavation data

Kenan Field. Although the excavation strategy at Kenan Field was comprised primarily of systematically placed shovel tests, features from various periods of occupation were encountered with some regularity. One notable Late Archaic feature was investigated during the excavation of Shovel Test 112, located at the core of the Kenan Field South concentration (Ritchison, 2019). The feature was a large pit (i.e., approximately 1 m in diameter and 40 cm in depth) that was entirely devoid of shell refuse but contained approximately 60g of Late Archaic St. Simons series ceramics. Also included in the feature were several (n 6; 10.69g) pieces of worked petrified wood. Radiocarbon dates from a Late Archaic sherd recovered from this feature place a Late Archaic occupation at Kenan Field during the terminal Late Archaic (UGAMS-15933/15933in.). Dates for this sherd were recovered from carbonized soot deposits on the exterior of the sherd and from a charcoal fragment within the paste (Table 2).

Buckhead. Except for the Sapelo Shell Ring complex, Buckhead is the most intensively occupied site in our sample with regards to its early Late Archaic through terminal Late Archaic occupations. The largest of the Buckhead features is a massive earth oven/roasting pit that was extensively reused (Fig. 3). This feature measured 1.8 m in length with a depth of at least 0.9 m, with a small portion of the feature s base remaining unexcavated. Due to its large size, only half of the feature was excavated with the other half preserved for future research. The stratigraphy of the feature showed successive use of the pit with bands of different coloured sediments and varying degrees of artefacts and faunal materials mixed throughout these sediments. A series of outlying chamber-like features along the edge of the main feature are interpreted as areas dug out for sediments to cover the pit while in use. While this feature contained some oyster as well as other molluscs, including marsh periwinkles and stout tagalus, from the surrounding estuaries, the quantity is much lower than we see at other early Late Archaic sites. This pit also contains two distinct layers of slaked shell, which is produced through instances of particularly hot fires (see Fig. 3).

We recovered Late Archaic ceramic sherds throughout the pit feature. In addition, we collected and analysed vertebrate faunal

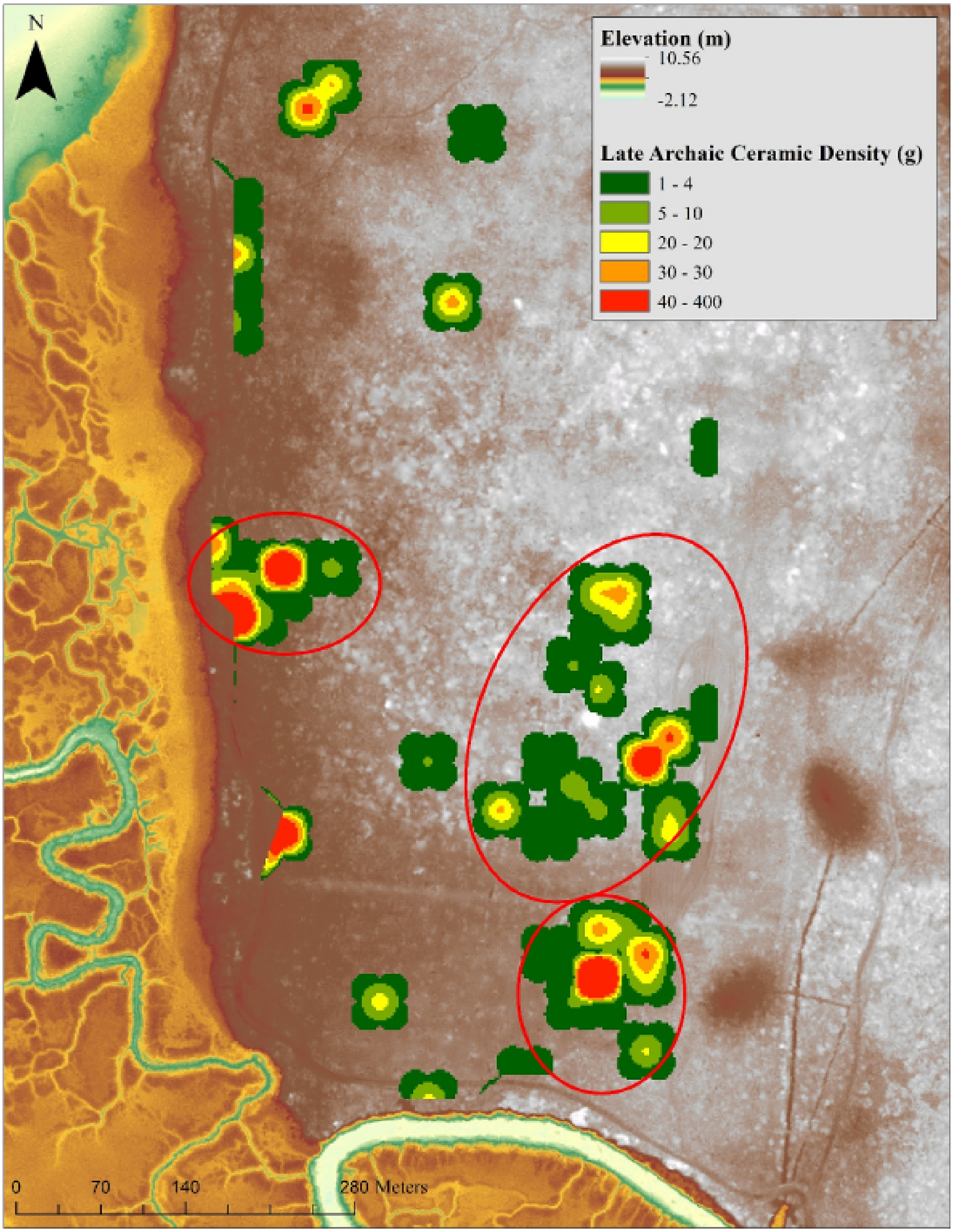

Fig. 2. Late Archaic interpolated ceramic density distributions at Kenan Field with identified concentrations denoted by red ellipses. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

remains encountered during the excavation following standard zooarchaeological methodologies (Table 3). The mixed temporal context, as described below makes interpreting the exact function of this pit difficult. Despite this the limited vertebrate faunal identify in the pit fill appears to indicate exploitation of locally available terrestrial and aquatic species. These species are commonly observed in shell ring faunal assemblages as well, albeit in much greater quantities (see Colaninno and Compton, 2019).

What is perhaps most interesting about the pit feature is that radiocarbon dates for the feature returned two dates on carbonized wood from the same level in the pit as being hundreds of years apart (UGAMS-21669/21670; Table 2). Both of these dates fall into the primary occupational span of shell ring villages. The presence of these two distinct dates suggests that the pit fill was not the product of a single event and that older midden materials were being used to fill in the pit, perhaps being used as earth mantels for covering during roasting events. Other features at the site include what look like post moulds that could possibly be part of a large structure. Radiocarbon dates for one of these

Table 2
Radiocarbon Dates. Dates reported here include those presented in the text or those associated with the span of the terminal Archaic period at our study sites.

Site	Unit	Level	UGAMS#	^{14}C Age (BP)	±	Material Type	$\delta^{13}C$	2σ Calibrated Range (Years BP at 95% CI)
Kenan Field	ST50	1	15933in.	3170	35	Charcoal in sherd paste	−20.30	3465–3270
Kenan Field	ST50	1	15933	3270	30	Sooted sherd	−24.70	3575–3410
Patterson Island	ST	1–2	4501	3330	50	Sooted sherd	−23.8	3695–3655 (5.9%); 3650–3450 (89.5%)
Buckhead Field	A-1	4	21667	3510	25	charcoal	−26.8	3855–3700
Buckhead Field	G-2	3	21669	3670	25	charcoal	−26.4	4090–3915
Buckhead Field	G-1/2	E. Wall	21670	3880	25	charcoal	−25.6	4415–4235

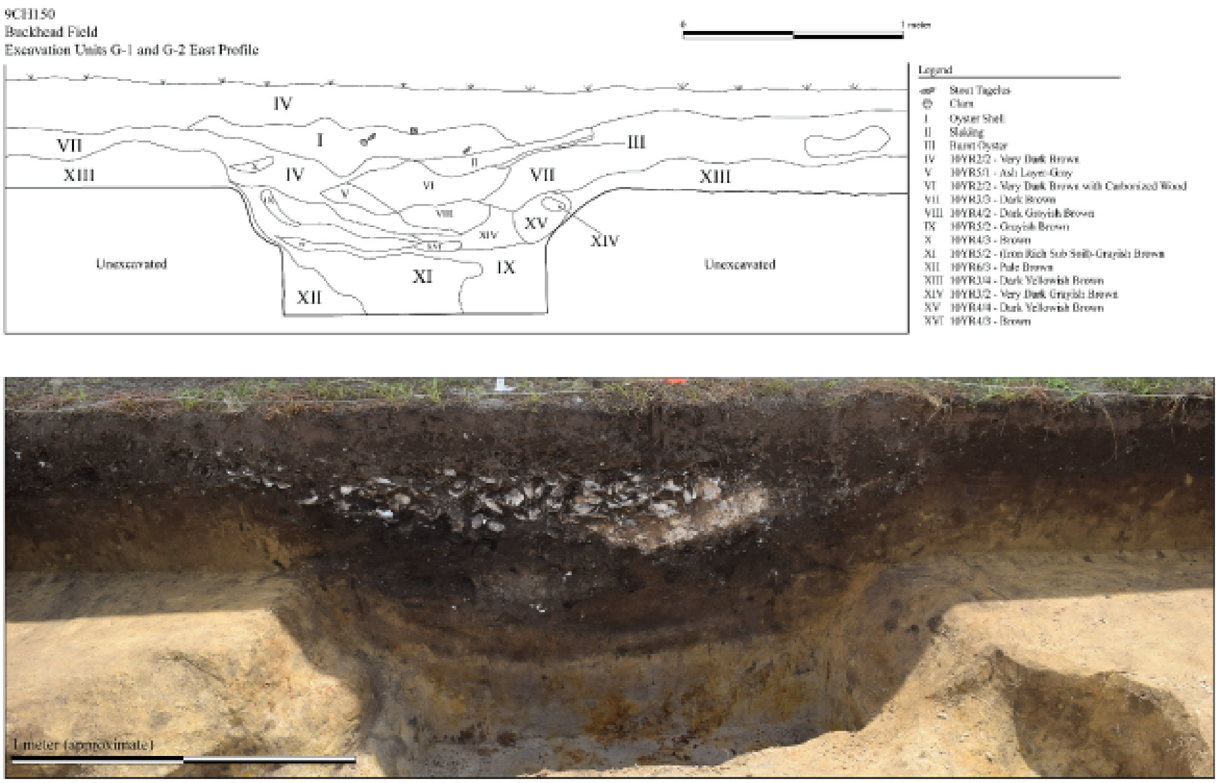

Fig. 3. Profile and photograph of the Buckhead Field Late Archaic pit feature. All sediment descriptions describe fine sand.

Table 3
Buckhead excavation unit g-1/2 species list.

Taxa		NISP	MNI	%	Weight (g)
Actinopterygii	Indeterminate bony fishes	2	–	–	0.81
Lepisosteus osseus	Longnose gar	1	1	12.50	0.59
Ariidae	Sea catfishes	1	–	–	3.00
Bagre marinus	Gafftopsail catfish	2	1	12.50	0.35
Testudines	Indeterminate turtle	1	–	–	0.13
Deirochelys reticularia	Chicken turtle	1	1	12.50	0.60
Nerodia erythrogaster	Water snake	1	1	12.50	1.15
Aves	Indeterminate birds	3	–	–	1.56
Rallidae	Coots, rails, and moorhens	2	2	25.00	0.78
Gallinula spp.	Moorhens	2	1	12.50	1.00
Mammalia	Indeterminate mammals	18	–	–	24.58
Odocoileus virginianus	White-tailed deer	5	1	12.50	20.35
Vertebrata	Indeterminate vertebrates	–	–	–	13.25
Total		34	8	100%	68.15

features (UGAMS-21667) returned a calibrated date of 3855–3700 cal. BP (at the 95% CI), falling within the terminal Late Archaic (Table 2).

4. Discussion

4.1. Comparison of findings

Returning to our primary research questions, we propose several answers based on the results of our investigations at the six discussed sites.

To what extent do terminal Late Archaic sites evidence large scale occupations? We argue that terminal Late Archaic settlements remained similar, at least in terms of spatial extent, to earlier settlements. However, it is unknown if these sites were occupied throughout the year similar to shell rings. The variance in our sample does suggest the presence of a potentially distinct terminal Late Archaic settlement system, but the actual patterns of occupation on the landscape are only mildly divergent and are likely more reflective of changes in population density and distribution than of major cultural transformations. While many terminal Late Archaic occupations in our sample are not as intensively occupied as the shell ring village, we argue that the differences in artefact density are not substantial enough to support a conclusion of a fundamentally distinct set of settlement practices. Consequently, we argue that people occupied terminal Archaic settlements likely throughout the year, like their earlier Late Archaic predecessors. Future work should verify if this pattern holds through season of occupation studies of botanical remains.

While we do argue for a certain degree of continuity, as none of our sampled sites evince artefact densities greater than or equal to those of our shell ring control, we suggest reduced settlement intensity during the terminal Late Archaic. Attributing this reduced density to either decreased populations or to an increase in mobility is currently impossible. However, we find it most likely that a combination of these two outcomes was probable during the terminal Late Archaic.

Is there evidence at terminal Late Archaic sites of similar types of feasting activities that took place at shell rings? Turck and Thompson (2016) argue that feasting activities at shell ring sites facilitated cooperation and collective governance in a context of increasing regional populations and distinct, potentially contested authorities over fishing rights in particular places. Based on isotope geochemistry showing that some shellfish recovered from the Sapelo Shell Ring complex may have been initially collected from up to 20 km away (Andrus and Thompson, 2012), it is clear that residents at various shell ring sites along the coast would have been in regular contact with one another and that feasting, associated ceremonies, and trading events would have been a means to ameliorate tensions that could have arisen from abutting or overlapping foraging radii.

As reported for the Archaic pit feature at Buckhead Field, we also have found evidence that suggests that communal cooking activities may have continued to take place among early Late Archaic and terminal Late Archaic peoples on the Georgia Coast who did not reside at shell rings. It is difficult to interpret these findings as the dating of this large feature suggests a mixed assemblage and possible use over time of the feature. The pit features identified at both Buckhead and Kenan Field together suggest that communal activities, including but not limited to small-scale feasting, occurred at non-shell ring sites both throughout, and following, the era of villages. Also, the later Archaic date at Buckhead Field indicates that the occupation of this site continued into the terminal Late Archaic. This date also falls at the tail end of occupation at the largest Archaic shell midden mound and ring sites for Ossabaw Island and might indicate that the start of the terminal Late Archaic was a time when groups were actively altering their community patterns and settlement decisions, as the landscape and the broader ecosystem was changing. This pattern, however, will need to be explored in the future.

To what extent does the terminal Late Archaic use of space and the landscape diverge from earlier Late Archaic practices? Our results document a variety of evidence for both continuity and change in terminal Late Archaic spatial practices. Primarily, our excavations confirm the analysis of Turck and Thompson (2016), showing that different coastal environments exhibit distinct pathways of developments. At Kenan Field, Patterson Island, and Little Sapelo Island Late Archaic ceramics are rarely, if ever, found in the same contexts as oyster shell (Ritchison, 2019; Turck and Thompson, 2016). However, shellfish are associated with terminal Late Archaic contexts on Ossabaw Island in slightly greater amounts than in other areas in this period (Ritchison et al., 2018). At the regional scale, this supports the pattern that populations occupying deltaic and non-deltaic areas may have experienced different degrees of change in settlement and subsistence (Thompson and Turck, 2009; Turck and Thompson, 2016).

The spatial organization of terminal Late Archaic settlements is distinct from the clearly defined arcuate and circular shell ring villages. Terminal Late Archaic occupations at Kenan Field, Buckhead Field, and South End Field, are amorphous clusters of two to three components that could have been occupied sequentially or simultaneously. It has been argued that the arcuate form of the shell rings materialized a generally egalitarian social organization, although others note that uneven distributions of refuse may hint at burgeoning social inequities (Russo, 2004; Saunders, 2002; Waring and Larson, 1968). Central plazas generally kept clear of refuse have been identified as another repeated characteristic of Native American villages and have been regularly observed at sites ranging from Late Archaic shell rings to Mississippian, historic, and contemporary ceremonial square grounds. (Flannery, 1972, 2002; Rodning, 2009; Sanger and Ogden, 2018; Sassaman and Anderson, 1996).

Thompson (2018:26 27) has argued that the circular form of shell ring villages served to suppress tendencies for aggrandizers in the context of socially proscribed inequities relating to the control and management of common pool resources. Circular layouts, and the resultant panopticon, may have discouraged individualizing behaviours as community members could have easily observed the production and consumption of neighbouring households (Sanger, 2015). The irregular forms of the terminal Late Archaic concentrations discussed here show that this levelling mechanism was absent following the dissolution of ringed villages after 3800 cal. BP. While cleared plazas are not apparent at our surveyed sites, the large, centrally located pit feature containing lithic material at the core of the KF South component might suggest that similar social practices might have continued in the terminal Late Archaic. It may be that the absence of anticipated surpluses from commonly held resources (e.g., mass small fish capture or oyster aquaculture [Colaninno, 2010; Thomas, 2008a; Thompson et al., 2020]) relaxed, to some degree, the need for attendant cooperative and managerial social institutions (Thompson and Moore, 2015). Given our findings that settlement scale was only slightly reduced in the terminal Late Archaic, we expect that the continuation of other levelling practices, such as redistribution through small-scale feasting, would have been sufficient to maintain egalitarian social relations. We suggest that the reason for this was, in part, due to the availability of fewer highly localized resources (i.e., oyster beds) as sea levels lowered and beds because unproductive (Thompson and Turck, 2009; Turck and Thompson, 2016). Regardless of the ultimate extent of change, daily social interactions, as mediated by the organization of space at settlements, were altered during the terminal Late Archaic.

4.1. The fallacy of site types the non-shell site as insignificant

The apparent reduction in a formal spatial organization may be an artefact of our own practices as archaeologists. The plazas at shell ring sites do not require substantial archaeological effort to observe, yet at non-shell bearing sites, especially those dating to the Archaic period which commonly occur at or below 20 cm below the modern ground surface, extensive excavations are required to even recognize the presence of sites, let alone characterize intra-settlement patterns of deposition. Most archaeological sites recorded for the Georgia Coast were initially discovered via pedestrian survey or through explicit testing for shell deposits or as shoreline surveys (DePratter, 1974; Thomas, 2008a, Thomas, 2008b). This history of investigation in the region has led to the common use of three categories for Late Archaic sites: shell rings, shell middens, and non-shell sites. The difficulty in identifying buried non-shell bearing sites has likely contributed in subtle, yet substantial, ways to our current understanding of the Archaic period and the transition to the following Woodland period.

The non-shell bearing components discussed here were all identified through the use of systematic testing strategies and likely would not have been identified as distinct components otherwise, if they had been observed at all. As DesJean et al., 1985 note, non-shell bearing sites are probably heavily underrepresented in current archaeological datasets. Five of the nine non-shell ring sites systematically surveyed by the authors contained non-shell bearing components. Extrapolating this out to the larger region, we surmise that non-shell sites may make up an immense proportion of the archaeological record. In light of these results, we suggest a re-evaluation of the relationship between settlement, mobility, and social organization for the Archaic and Woodland periods on the coast.

For example, DePratter (1979; see also DePratter and Howard, 1980) argued that the smaller and more dispersed Late Archaic sites with little-to-no shell midden deposits represented limited use campsites in “marginal (i.e., non-estuary) environments. Our findings show that non-shell sites also occur as denser occupations at central places on the landscape that were subject to regular reoccupation. Simply put, our study, along with Turck and Thompson (2016) indicates that the tri-partite classification used previously is significantly biased toward certain kinds of Late Archaic deposits namely those with large shell deposits. Thus, we must re-evaluate our classification schemes and our assumptions regarding the function(s) of sites that have been subject to only limited sub-surface testing.

4.3. Fluctuating environments and the nature of mobility

Environmental changes related to a lowering of sea-level circa 3800 cal. BP would have had some predictable outcomes. As non-deltaic estuary environments became increasingly starved of external nutrient inputs, human-accessible resources that had been used throughout previous centuries, such as oysters, would have become less uniformly distributed across the coastal landscape (see Turck and Thompson, 2016). As shown by Turck and Thompson (2016), terminal Late Archaic shell-fishing appears to persist in deltaic environments for longer, where productive ecotones would have persisted to a greater degree than in the non-deltaic environments that likely transformed into broad swaths of uplands lacking inputs of organic and inorganic sediments (Turck, 2011).

As demonstrated by Thomas, 2008c, the archaeological record of St. Catherines Island matches the expectations of a central place foraging model. Throughout the Native American archaeological sequence on that island, primary settlements occur along the boundaries between the most productive eco-zones, the marsh and the terrestrial uplands. We note, however, that this survey was specifically designed to find archaeological sites via the presence of shell identified through probing. Thus, this strategy may have failed to identify non-shell occupations if they did not spatially overlap with other shell-bearing components.

The St. Catherines survey demonstrated that Late Archaic, and subsequent Early Woodland period, sites tend to occur along the edges of the marsh, where populations were able to maximize their foraging returns in both the estuary and in the terrestrial forest. This apparent continuity in settlement choice appears to suggest that, although we have identified a relatively significant environmental perturbation, populations did not significantly alter their subsistence strategies over the long term, even as the subsistence base s composition changed along with the coastal environment. Instead, it appears that settlement and mobility strategies were altered to maintain similar foraging practices in the conditions of dramatically reduced shellfish populations (Turck and Thompson, 2016).

As the estuarine landscape disappeared concomitant with the lowering of sea levels, these ideal settlement locations would have become rarer and more concentrated in deltaic environments. This decrease in favourable ecological patchiness meant that Late Archaic populations would have had to either increase their movement throughout the landscape to access a similar set of resources as they had previously, or that they would have had to facilitate mutually beneficial relationships between groups for access or exchange to these resources. We feel that a combination of these approaches was the most likely outcome of this environmental transformation. We see a minor reduction in occupational intensity at our non-shell bearing sites, but not at a scale that would suggest massive reductions in regional populations. Rather, this may represent a trend towards shorter periods of occupation. Additionally, it is likely that a continuation of inter-community integrative activities, such as is suggested by the roasting pit feature at Buckhead, would have both ensured continued access for localized communities to a diversity of resources and reduced social tensions related to the unequal access to deltaic resources as the systems of rights and access to estuary resources that appears to have existed within the shell ring villages came into conflict with new ecological and social realities (Turck and Thompson, 2016). As communities likely relocated more frequently across the expanded upland landscape due to reduced environmental productivity, feasting activities, like those observed in our excavations at Buckhead Field, could have served to ameliorate the tensions that resulted from the continuation of social practices that had emerged prior to the transformation of environmental conditions during the terminal Lat Archaic. Thus, settlement mobility in the terminal Late Archaic was probably an unevenly distributed transformation. Where Turck and Thompson (2016) saw this as a difference in environment (deltaic vs. non-deltaic occupations), we now surmise other factors were involved, related to localized socio-historical contexts leading up to the transformations of the terminal Late Archaic period. However, we know that the transformations were only temporary, as populations quickly returned to the same locations and to the same subsistence activities that had defined the Late Archaic period once sea levels rebounded.

The evidence presented here points to the existence of a socio-ecological system unique to terminal Archaic populations that developed out of earlier shell ring village phenomena. As new research has documented the existence of a long-term, stable system structuring the utilization of oyster beds, a highly localized, common-pool resource that began during the Late Archaic and bridging the estuarine collapse of the terminal Late Archaic (Thompson et al., 2020), we must consider the nature and form of the social institution(s) that enacted and reproduced the cultural norms responsible (sensu Carballo, 2012:111 112). We argue that conceptions of territoriality, buttressed by small-scale redistributive feasting, may be the primary means by which Archaic communities continued to reproduce themselves, even as their originating socio-ecological conditions were transformed. It seems that Late Archaic populations adjusted to the reduction in estuary productivity by abandoning shell rings and collector foraging strategies and altering their settlement and foraging strategies to suit new environmental conditions, while likely continuing to participate in socially mediated inter-group resource sharing (Turck and Thompson, 2016). This is observed in the somewhat reduced settlement density at our terminal Archaic study sites, when compared to the density observed for the Sapelo Island Shell Ring village and the observation that Archaic period communal activities, as seen in our excavated pit features, were not exclusively carried out within village settings.

Yet, many questions remain. First, is our sample of sites representative of terminal Late Archaic practices? If terminal Late Archaic estuaries transformed into uplands, which are once again located underwater or under marsh sediments at modern sea levels, then we certainly are missing significant segments of the terminal Late Archaic material record. Second, it is unclear whether our preliminary evidence for changing mobility represents seasonal patterns, a reduction in the length of time that any given year-round settlement was occupied, or a combination of both, and this remains to be tested. However, as ^{18}O measurements from shellfish is one of our best seasonal proxies (Andrus and Thompson, 2012; Quitmyer et al., 1997; Sanger et al., 2019), understanding seasonality of settlement in the terminal Late Archaic may prove to be difficult when the apparent reduced use of shellfish will mean relying on less precise methods using other, likely botanical and faunal, data. However, our increasing recognition of these alterations in many Late Archaic practices presents an opportunity for future investigations. Future research will let us understand how coastal residents patterns of movement through the coastal landscape structured their intra- and inter-regional interactions in such a way that while the shell ring phenomenon both emerged and then ended, deeper social structures remained resilient throughout.

5. Concluding thoughts

Too often we view coastal landscapes, especially those that abound in large shell middens, through a lens largely biased towards these highly visible archaeological sites. Indeed, shell midden sites are crucial to understanding the past and provide a wealth of information; however, we must be careful not to lose sight of their larger context. This myopia is part methodological and part theoretical. For archaeology, where time and funds are often major constraints, it is understandable that research focuses on sites, such as shell middens, where the recovery of archaeologically relevant information is assured. In our Georgia Coast example, finding, evaluating, and excavating non-shell sites took considerable effort, time, and funding. In fact, without the benefit of a long-term research program in the region, we would not have been able to recognize the shifting nature of mobility and organization within the terminal Late Archaic landscape. Therefore, it is understandable that few research programs like this exist to evaluate the nature of non-shell assemblages and how they relate spatially and temporally to their better-known shell midden counterparts. When this does happen, the evidence is usually limited or poorly contextualized, such that these sites and assemblages often lead to assumptions of settlement hierarchies based on presumptions of contemporaneity and intensity of occupation.

As a final point, we also argue that intellectual histories bias us against viewing non-shell sites as more than limited-use sites. To a great degree, our view of the archaeological record of hunter-gatherers is heavily influenced by early ethnographic research, and especially the ethnoarchaeological research of the late twentieth century (e.g., Binford, 2001; Binford, 1980; Yellen, 1977; Yellen and Harpending, 1972). This literature, and its subsequent critiques, provided important insights into the nature of hunter-gatherer settlement and subsistence (see Bettinger, 1980, 1987; Kelly, 1983, 2013; Lane, 2014). Indeed, this work continues to play a role in archaeological research in both the Americas and across Europe and Asia (e.g., Blades, 2003; Crombé et al., 2011; Gr n and Robson, 2016; Habu, 2004), as archaeologists attempt to deal with the changing nature of the evidence for settlement and subsistence for hunter-gatherers. Yet, this work has also limited us in envisioning more complex histories of socio-ecological interactions. Even after years of recognition that coastal hunter-gatherers exhibit highly complex forms of settlement, political, and social systems (Arnold, 1995; Price, 1985; Sassaman, 2004), we often still uncritically rely on schemes of site types derived from earlier studies. In so doing, we limit our ability to consider other possibilities, especially when the weight of the recovered archaeological record represents the easiest to access and locate and, consequently, most well studied sites.

To understand large complex shell middens, we must also understand, in detail, the broader landscape. To do this, we need to critically examine the historical contexts of shell-bearing sites, which are often the most visible. We argue for the systematic re-evaluation of regional systems to better represent the position of non-shell bearing sites in terms of their intensity of occupation and temporal associations with better understood shell midden sites. In this way, we will produce a clearer picture of how coastal and riverine populations constructed their socio-ecological systems over the course of history. An emphasis on holistic and systematic landscape approaches allows us to understand the complex ways that people used both shell bearing and non-shell bearing sites contemporaneously. Viewing the archaeological record in this way may reveal, as in our case, the possibility that there may have been times in the past when shell fishing completely, or nearly completely, disappeared from the archaeological record. In either case, such re-examinations are necessary to understand how the histories of various coastal peoples and their landscapes developed over time and how these histories inform our understanding of broad global patterns of social interactions with and among changing environments and climatic conditions.

Declaration of competing interest

The authors declare that they have no known competing interests or personal relationships that could have appeared to influence the work reported in this paper.

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