APALACHICOLA VALLEY RIVERINE, ESTUARINE, BAYSHORE, AND SALTWATER SHELL MIDDENS

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Shell midden sites in the Apalachicola-lower Chattahoochee valley region of northwest Florida/southwest Georgia/southeast Alabama can be classified by content, size, geographical area, and other attributes. So far, few have indications of being much more than domestic garbage piles. This article synthesizes the data on these sites to describe the types and characteristics, provide some interpretations of their functions, and outline directions for future research. I have gained insights from decades of survey and test excavation in this region, and also from ethnographic experiences with indigenous groups halfway around the world in coastal and interior Borneo.

Background

The Chattahoochee River flows southward from the north Georgia mountains, forming the Georgia-Alabama border, then the Georgia-Florida border; then it merges with the Flint to make the Apalachicola, which flows south 110 more miles (177 km) to the Gulf of Mexico (Figure 1). This large alluvial valley, with its lower delta estuaries, bayshores, and barrier islands, offers a wide range of shellfish species that were gathered by aboriginal peoples for at least the last four millennia. I have surveyed throughout this region – along the lowest 50 river (navigation) miles (80 km) of the Chattahoochee, the 110 miles (177 km) of the Apalachicola, the large tributary Flint and Chipola Rivers, and up to 75 east-west miles (120 km) of bay and lake shores. My work and that of others has included recording several distinct types of shell midden sites in the region. They are worthy of examination at a time when such sites are continuously the subject of debate concerning their constructions and uses beyond the obvious disposal of refuse (e.g., Claassen 1991a, 1998; Marquardt 2010; Randall 2008; Randall et al. 2014; Russo 2008). The region as outlined has a great deal of internal cultural continuity, and it contrasts with the archaeological record upriver (to the north, closer to the fall line [the inland edge of the coastal plain]), as well as to the east and west, away from the large valley system (Schieffer 2013; White 2014). Thus it maintains a regional integrity justifying consideration as a unit.

The discussion begins with the assumption that shellfish were obtained for food (slimy things though they might be); hence the traditional term "shell midden" instead of "shell-bearing," or "shell matrix" sites or other nomenclature (cf. Claassen 1991a, for example). After consumption, shells and other food waste were discarded in patterns that are recognizable, though the degree to which the patterning was intentional is not necessarily discernible. That nearly all such sites include an abundance of other faunal remains is a clear indication that shellfish were not the only or even the principal subsistence resource (with a few possible exceptions, described below), simply the most archaeologically visible. As Griffin (1988) noted, we have come away from the notion that the people who left these sites were "the shellfish eaters," and now realize that fish and other resources made up the bulk of the diet but left far less material evidence. When fine screens began to be used in shell midden excavations decades ago, the faunal assemblages recovered indicated that other types of animals provided much more meat than the shellfish that accounted for the more visible garbage.

Shell midden sites are diverse and representative of many different lifeways at different times and places. Humans must have begun eating shellfish as early as they could. Sites in Africa provide evidence of shellfish collection as early as the Middle Paleolithic, some 200,000 years ago (summarized in Álvarez et al. 2011:4). The first Florida natives probably collected them as a more reliable and safe protein source than a humongous, dangerous mammoth or other Pleistocene megafauna. This might be demonstrated by locating underwater sites along Florida's coastlines of perhaps 15,000 years ago. At least one oyster shell midden dating to about 7800 cal. B.P. has indeed been recorded 6 km offshore from northwest Florida under 3 m of water in the Gulf of Mexico, along a paleo river channel (Faught 2004).

Waselkov (1987:142, 170) noted how the "deceptive visual similarity of shell middens obscures a considerable diversity in shellfish gathering strategies," and how there is "incredible diversity that is subsumed under the hopelessly vague term, shell midden," since the activities that created these sites vary greatly. So, dealing with these diverse types of sites under one heading does blur huge differences in site function, time period, and other archaeological characteristics. Nonetheless, the commonalities they share make them worthy at least of typologizing and discussing as a group.

A recent GIS study of the Apalachicola-lower Chattahoochee valley region (Schieffer 2013) permits comprehensive integration of the recorded archaeological information. Our University of South Florida (USF) database now includes well over 1000 sites of all types and time periods, of which 156 are shell middens (Table 1). Of course this list will lengthen with more survey data. Inland sites contain river molluscs and snails; in the lower valley estuary the sites are marsh-clam middens with occasional oysters; and on the bayshores and barrier islands they are of oyster shell

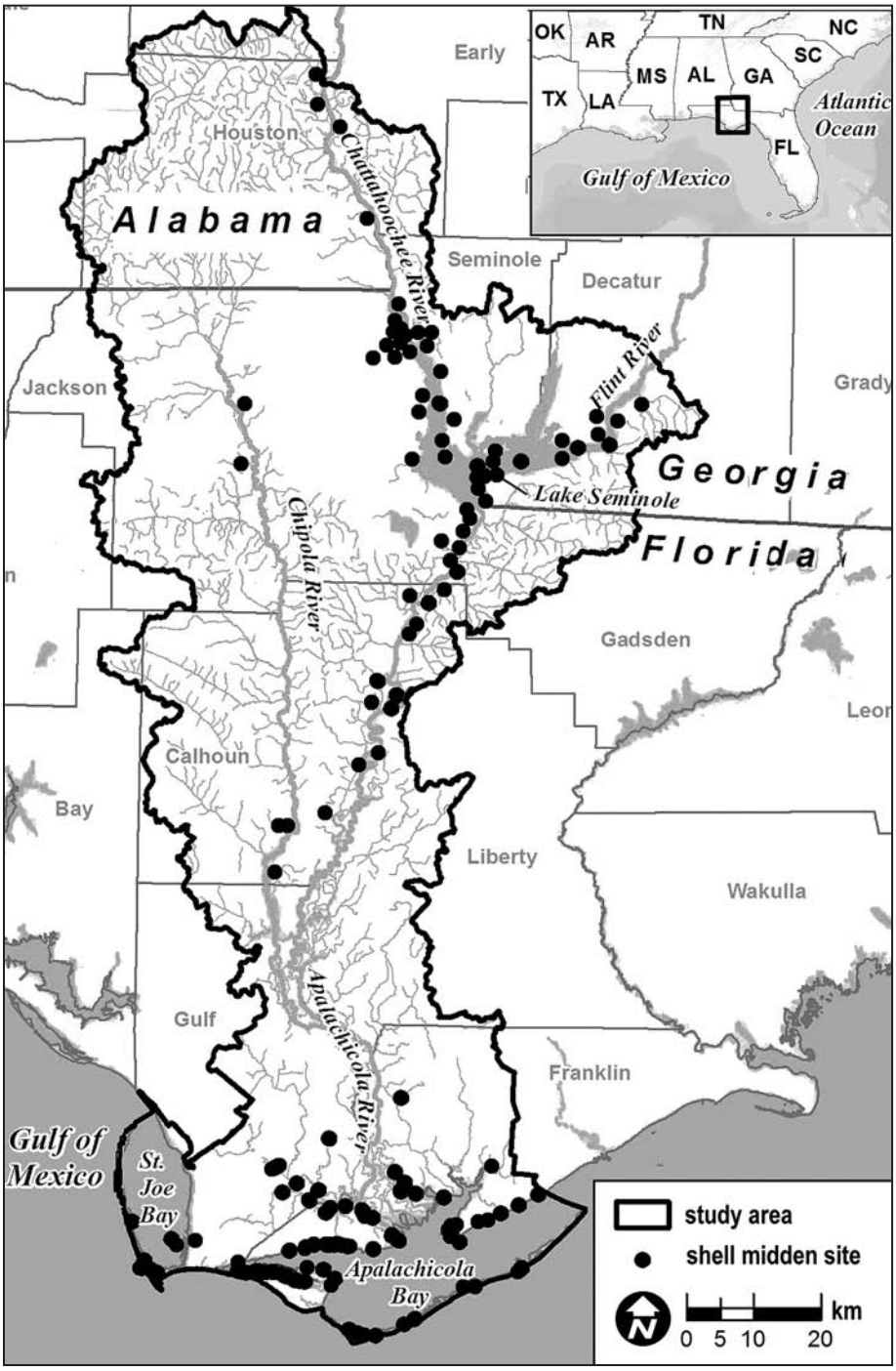

Figure 1. Distributions of known shell midden sites in the Apalachicola-lower Chattahoochee valley region of northwest Florida-southeast Alabama-southwest Georgia. Map by Adam Schieffer

with occasional marsh clams. In the southwest delta, around St. Joseph Bay, the shells are large gastropods, whelks and conchs, a reflection of the saline conditions here.

Shell middens worldwide are easy to find because they are so visible, white areas in the green forest or plowed field. It is no surprise that most are multicomponent sites. Later prehistoric peoples returned to them, for the higher elevation, or to live where ancestors obviously did, or because these sites showed where to get food easily. The shell neutralizes the acid soils to preserve faunal remains. So it is also no surprise that archaeologists devote great attention to shell middens, since they are packed with so much more information than typical sites where organic materials have disappeared. Worldwide, shell middens can show aspects of not only settlement but also diet, seasonality, site formation processes, architectural design, local environments, sometimes human manipulations of those environments, social behavior, and other less accessible aspects of the human past (Álvarez et al. 2011; Claassen 1998; Waselkov 1987). Many researchers (e.g., Claassen 1991a, b; Roksandic et al. 2014; Russo 2008) have pointed out that we cannot narrowly interpret shell middens in a simplistic functional manner when they might have been, say, piles of garbage from fish bait, or burial places, or other kinds of monuments, and also that we cannot assume that shellfish and other species represented in middens were gathered only or at all for food.

Saunders and Russo (2011) comment on the inadequacy of our old models for shell middens. Traditional interpretations held that rapidly rising sea levels at the end of the Pleistocene prevented establishment of estuaries with shellfish beds until the Holocene, when people could then exploit them beginning during the Late Archaic. Further, shellfish have been seen as a less important, supplemental, or marginal resource obtained by kids, the elderly, and women (as opposed to supposedly more crucial resources obtained by men). But shellfish, like people, can adapt to fluctuating water levels, and now their caloric value and dietary importance are more emphasized, and the ethnographic record more widely explored to demonstrate that there are many differences among cultures worldwide as to who collects shellfish, when, and why (e.g., Meehan 1982, Waselkov 1987).

Data on the wide array of sites discussed here are of course not unbiased. For example, survey in the northern end of the region was confined to immediate riverbanks (Belovich et al. 1982). Excavations in natural levels and wide exposures, needed for seeing midden deposition history (e.g., Claassen 1991a:254), have seldom been done in this region. Most sites are known through surface collection and shovel tests during surveys. Only a few have been tested, and these have displayed hardly any visible stratification or discrete depositional history, except for the horizontally individual shell piles. The

Table 1. Shell midden sites in the Apalachicola-lower Chattahoochee valley region.[1]

SITE #	NAME	SHELLS	CULTURE	DIAGNOSTIC ARTIFACTS	OTHER
1HO26	Omussee Creek Park	freshwater	FW	f-t, FW, Lamar	near FW md
1HO60	[no name]	freshwater	FW	FW Inc, ch-st, indet punc	lg shell feature
1HO309	Oakley	freshwater	EWd? MWd? LWd?	Sw Cr, ch-st, indet inc, shell pin, hist crockery	
8CA10	Parish Lake	freshwater	LWd	gr stone, Carr, Keith Inc, ch-st	
8CA31	Jumping Fish	freshwater	indet cer	stp, ch-st, grit-t	single small pile
8CA36	McQuade	oyster	indet cer	stp	modern shell?
8CA62	Turning Point	freshwater	FW, indet cer	stp, ch-st, FW Inc	
8CA131	Frozen Bluff	freshwater	indet cer	stp	
8CA133	Horseshoe Crab	freshwater	indet	recent? no artifacts	shells only
8CA142	Corbin-Tucker	freshwater	FW	greenst celts, copper, ch-st, FW Inc, LJ, cer mushroom	pile at village; cemetery includes contact period
8FR1	Porter's Bar	oyster	LArch, EWd, MWd, FW	hematite, kaolin, copper, mica, pts, galena, celts, FW Inc, Sw Cr, ch-st, cordmk, Dept S-St, stp, red	bur md w/shell strata
8FR9	Nine Mile Pt	oyster	LArch, MWd, LWd	f-t, Carr, stp, Sw Cr, ch-st, WI Inc, WI Punc	
8FR10	Eleven Mile Pt	oyster	EWd, MWd, LWd, FW	WI Pl, Sw Cr, s-st, ch-st, Carr	bur md w/shell strata
8FR11	Green Pt	oyster	MWd	pts, stone tools, celts, gr stone, Sw Cr, stp, red, red, tetrapods, pipes	bur md w/shell strata
8FR12	Huckleberry Landing	marsh clam	MWd, FW	pts, gr stone, copper, celts, mica, turtle rattle, pipes	bur md w/shell strata, ridge
8FR13	Five Mile Pt	oyster	FW	daub, FW Inc, LJ, ch-st, Pens Inc, stp	
8FR14	Pierce Mds	oyster	EWd, MWd, LWd? FW	celts, pts, copper, silver, LJ, Sw Cr, cordmk, s-st, red, stp, tetrapod, WI Inc, Keith, Carr, pipe, pearls,	bur mds w/shell strata, ridge, shell temple md
8FR16	Singer Md	oyster	indet	celts, stp, ch-st	bur md w/shell stratum, ridge
8FR17	No Name	oyster	EWd, MWd?	s-st, stp, Sw Cr, ch-st	2 middens
8FR20A	Md Near Apalachicola	oyster	MWd, FW	Sw Cr, Keith, Carr, early WI, ch-st, FW	sand bur md w/ shell base; gone
8FR20B	Shell Md Near Apalachicola	oyster	MWd, LWd?	Sw Cr, Keith, Crooked River, ch-st	shell heap in shell field/ridge; gone
8FR21	Cemetery Md	oyster	E-MWd, LWd?	Sw Cr, Keith, Carr, ch-st, exotics	bur md w/shell base; gone
8FR24	Saint George West (Little St. G.I. #2)	oyster	FW	greenst celt, FW Inc	
8FR27	New Pass	oyster	FW, Lamar	microtools, FW Inc, LJ, Lamar, ch-st, cobmk	
8FR55	Eight Mile Pt	oyster	Arch, EWd, MWd, LWd	Arch pts, triangular pts, scraper	md?
8FR59	No Name	oyster	LArch, MWd, LWd	f-t, s-st, ch-st, Carr, Sw Cr,	
8FR60	Sportsman's Motel	oyster	FW, Lamar	chipped celt, FW Inc, ch-st, Lamar	
8FR71	Paradise Pt	oyster	LArch, EWd, MWd, LWd, FW	Paleo? pt, Hernando pts, f-t, s-st? cordmk, Sw Cr, WI Punc, ch-st, FW Inc, Carr, Keith	midden strata; human skeleton
8FR73	North Ridge	marsh clam?	indet cer	stp, grit-t	
8FR74	Cistern	oyster	indet cer	stp	
8FR77	Jackson Midden	marsh clam	MWd	Sw Cr, ch-st	adjacent to bur md 8FR15; gone
8FR352	St Vincent Ferry	oyster	MWd, FW, Lamar	Sw Cr, WI Inc, ch-st, LJ, FW Inc, Pens Inc, Lamar	
8FR354	Saint Vincent Pt	oyster	MWd, LWd, FW	ch-st, Carr, Keith, WI Punc, FW Inc, Cool Br, ch-st	
8FR356	Big Bayou 1	oyster	indet cer	stp	low density shell
8FR357	Big Bayou 2	oyster	FW	FW Inc	low density shell

SITE #	NAME	SHELLS	CULTURE	DIAGNOSTIC ARTIFACTS	OTHER
8FR358	Headquarters Marsh	oyster	indet cer	stp, ch-st, indet punc	
8FR360	Saint Vincent 1	oyster	LArch, EWd, MWd, FW	stone tools, f-t, clay ball, Dept S-St, tetrapod, Sw Cr, SantaRosa st, LJ, ch-st, FW Inc	
8FR361	Saint Vincent 2	oyster	LArch, EWd, MWd, FW	celt, f-t, tetrapod, ch-st, s-st, Sw Cr, LJ, Carr, FW Inc, cobmk	
8FR362	Saint Vincent 3	oyster	Wd	stp?	
8FR363	Saint Vincent 4/Pickalene	oyster	LArch?, MWd	f-t?, red, Carr, WI Inc, Sw Cr, ch-st	
8FR364	Saint Vincent 5	oyster	MWd, LWd, FW	Sw Cr, ch-st, Keith, indet inc, LJ, Pens Inc	human skeletons -md?
8FR365	Saint Vincent 6	oyster	LArch, MWd, LWd, FW, Lamar, LC	f-t, ch-st, Sw Cr, Keith, red, cobmk, FW Inc, LJ, Pens Inc, Lamar, Chatt Br	
8FR366	Saint Vincent 7	oyster	MWd, FW	Sw Cr, WI Inc, red, ch-st, Carr,	
8FR367	Saint Vincent 8	oyster	EWd, MWd	ch-st, s-st, Carr, Sw Cr	
8FR368	Saint Vincent 9	oyster	FW	ch-st, FW Inc, LJ	
8FR369	Saint Vincent 10	oyster	FW, Lamar? LC?	LJ, indet brushed, Lamar rim? gun flint	
8FR370	Saint Vincent 11	oyster	MWd	stone tools, Sw Cr, ch-st, red, Carr	
8FR744	Van Horn Creek	oyster, marsh clam	LArch, FW, Wd?	microtools, microcores, clay ball, f-t, ch-st, FW Inc, LJ	
8FR745	Hendrix 2	oyster	indet cer	stp?	
8FR746	Pits Cove	oyster	indet		
8FR754	Sam's Cr Cutoff	oyster	LArch	microtools, f-t	human skeleton
8FR755	Thank You Ma'Am Creek	marsh clam	LArch, indet cer	steatite sherd, stp	
8FR757	Carmichael	oyster	FW	stp, ch-st, grog-t, Pens Inc, FW Inc	
8FR759	Gardner Landing	oyster	indet cer, LArch?	stp, grit-t, f-t?	
8FR804	Cape St George/ Hendrix 1	oyster	FW	FW Inc, ch-st	
8FR806	Gardner Landing Shell Md	marsh clam	LArch, MWd, LWd, FW?	f-t, Keith, ch-st, Carr, clay ball, Sw Cr, red? handle?	
8FR809	Jack Dodds Site	oyster	indet cer	cer	
8FR832	Nagel 1	oyster	Arch, indet cer	Arch pts, scraper, drill, grit-t	
8FR833	Nagel 2	oyster	Arch, LWd, FW	Arch pts, scraper	
8FR834	Nagel 3	oyster	Arch? FW	Arch? pts, scraper, drill, Pt Wash	
8FR835	Nagel 4	oyster	Arch?, MWd, FW	pts, scraper, drill, microtool, LJ, Pt Wash	
8FR840	Rattlesnake Cove	oyster	FW	stone tools, FW Inc, grit-t, stp	
8FR841	Ft. Gadsden Weeden Site	oyster?	indet cer	stp	
8FR845	Rattlesnake Cove #1	oyster	LWd, FW	gr stone, LJ, FW Inc, Cool Br, Pt Wash, ch-st	
8FR846	Rattlesnake Cove #2	oyster	FW? indet	stp	
8FR848	Harry A's NW	oyster	indet cer	cer	low density
8FR854	Two Mile	oyster	LArch, indet cer	f-t, ch-st, stp, grit-t, grog-t	
8FR855	10 1/2 Mile	oyster	FW, indet cer?	ch-st, stp, grit-t	
8FR856	Sneads Hammock	marsh clam	EWd	sandstone, Dept Ch-St, stp, grit-t, grog-t	
8FR858	Bay City Lodge	oyster, marsh clam	indet cer	cer	

SITE #	NAME	SHELLS	CULTURE	DIAGNOSTIC ARTIFACTS	OTHER
8FR859	Breakaway Marina	oyster, marsh clam	indet cer	cer	
8FR864	Sand Beach Hammock	oyster, marsh clam	LArch, MWd	microtool, clay ball, Sw Cr	
8FR869	Turtle Kill	oyster	indet cer, FW?	stp, grit-t	
8FR888	Cape Saint George East	oyster	LWd, FW	ch-st, Keith, FW Inc, LJ	
8FR908	4-Turtle Site	oyster	LArch, L?Wd	f-t, ch-st, grit-t, stp	
8FR915	Millender Tract	oyster	FW	LJ, grit-t	
8FR948	Little Huckleberry Creek	marsh clam	indet cer	ch-st, stp	
8FR957	Huckleberry Landing West	marsh clam	indet		
8FR1265	Big Bayou South	oyster	LWd, FW	LJ, Pens Inc, Ruskin Dentate-St?	low density
8GD1	Aspalaga Landing	freshwater	MWd	stone tools, Sw Cr, ch-st, grit-t	burial mounds
8GD13	Sycamore	freshwater	LArch, EWd, MWd, LWd	stone tools, f-t, s-st, cordmk, ch-st, Keith, Sw Cr, Carr, cobmk	
8GU2	Gotier Hammock	oyster	MWd, FW	pt, celts, mica, Basin Bayou Inc, WI Inc, red, Sw Cr, ch-st,	low density; MW bur md nearby
8GU10	Richardson's Hammock	lg gastropod	EWd, MWd, LWd? FW	greenst celt,WI Inc, Sw Cr, ch-st, FW Inc, cobmk, shell beads	beads; MW bur md
8GU11	Black's Island	lg gastropod	LWd, FW, hist	Keith, FW Inc, glass, brick	indurated
8GU17	Indian Pass	oyster	EWd? LWd? FW	linear ch-st, ch-st, stp, Cool Br	
8GU20	Conch Island	lg gastropod	MWd	Sw Cr	
8GU50	Doug Birmingham	freshwater	MWd, LWd?	rim effigy, WI Punc, WI Inc, Carr, ch-st, stp, grit-t	bur md nearby
8GU53	Former Md	oyster	indet	dredged up; fauna only	
8GU54	Six Palms	marsh clam	LArch, MWd? LWd?	Talahatta tool, f-t, stp, Carr, Keith	
8GU55	Yellow Houseboat	marsh clam	EArch, EWd, MWd, FW	Bolen pt, pts, microtools, Dept S-St, FW Inc, cordmk, LJ, clay bead	human skeleton
8GU56	Depot Creek	marsh clam	EWd, LArch	bone tool, f-t, Dept S-St, Sw Cr, ch-st, cordmk	
8GU57	Lake Wimico SE	marsh clam	MWd?	indet inc, Sw Cr	
8GU60	Clark Creek	marsh clam	LArch, EWd	f-t, microtools, clay figurine, Dept S-St, stp, grit-t, grog-t, linear ch-st, clay ball, shell beads	
8GU85	Old Cedar	lg gastropod	MWd, LWd, FW?	WI Pl, WI Inc, red, WI Punc, Indian Pass Inc, ch-st	
8GU105	Lake Wimico NW	marsh clam	EWd, MWd	ch-st, Dept Linear Ch-St, Sw Cr, indet punc, inc	
8GU114	Lighthouse Bayou	lg gastropod	FW, Lamar	FW Inc, Lamar	individual piles
8GU134	X654-B	lg gastropod	FW, LC?	FW Inc, LJ, Chatt Br?	
8GU139	Firetower South	lg gastropod	indet cer	ch-st, stp, indet inc	individual piles?
8GU229	Wildfire	lg gastropod	FW, Lamar	FW Inc, Lamar Pl	individual piles
8JA5	Jim Woodruff (J-2)	freshwater	EWd, MWd, LWd, FW, Sem,	FW?, tetrapod, ch-st, Sw Cr, Carr?, Keith?, s-st, Chatt Br, WI Punc?, LJ	
8JA7	Curlee	freshwater	LWd, FW, Lamar?	Lamar?, brushed, FW, ch-st, LJ, Cool Br	shell in small features
8JA8	Chattahoochee River 1 (J-5)	freshwater	LArch, EWd, FW	pts, steatite, tetrapod, s-st, cobmk, ch-st, FW Inc, LJ	now under water
8JA19	Butler Village (J-17)	freshwater	MWd	celt, WI red, WI Punc, WI Inc, Carr, Sw Cr, ch-st, Keith, cobmk	
8JA40	Timberlake Farm (J-38)	freshwater	MWd?	red, Carr, ch-st	

SITE #	NAME	SHELLS	CULTURE	DIAGNOSTIC ARTIFACTS	OTHER
8JA41	Walnut Ridge (J-39)	freshwater	LWd?	ch-st, grit-t, stp, Carr	
8JA42	Buena Vista Landing/Leslie (J-40)	freshwater	Arch, indet cer	Arch pt, ch-st, stp, grit-t	
8JA56	Rock Shelter	freshwater	Arch? indet cer	pt, ch-st	cave
8JA63	J-Y Field	freshwater	MWd	steatite, Sw Cr, WI Inc, cordmk	
8JA104	Scholz Steam Plant	freshwater	Sw Cr-eWI, MWd	Carr, Keith, ch-st, WI Punc, Sw Cr, WI Inc, cobmk	
8JA201	Scholz Parking Lot	freshwater	FW	FW Inc, LJ, ch-st, brushed	
8JA204	Arnold's Soybean Field	freshwater	EArch, MWd	Bolen pt, cordmk, ch-st, Sw Cr	
8JA214	Cox Plantation 3	freshwater	indet	lithics only	
8JA221	Blue Worm	freshwater	indet cer	ch-st	
8JA225	Godwin Lake	freshwater	MWd	ch-st, Sw Cr, WI Pl	pile in sinkhole
8JA233	Mercer	freshwater	EArch, MWd, LWd	pts, ch-st, Carr, Sw Cr, cordmk, WI PL	
8JA249	Rowan	freshwater	LWd	pt, Carr, Keith, ch-st	
8JA253	ACI Boat Landing	freshwater	MWd	Carr, Keith, ch-st, Sw Cr	
8JA261	Prison Hill West	freshwater	indet cer	stp	
8JA387	Hornsville/Buena Vista	freshwater	MWd, LWd	pts, tools, ch-st, Sw Cr, Carr, Keith, clay ball	
8JA411	Curtis Lee 2	freshwater	Arch, LArch, MWd, LWd	pts, f-t, ch-st, Sw Cr, Carr, Keith, cordmk	
8JA413	Castle Root	freshwater	FW	ch-st, FW, grit-t	
8LI8	Torreya Ranger	freshwater	MWd, LWd, FW	pts, ch-st, Carr, Keith, Sw Cr, WI Inc, Punc, FW Inc	bur? md
8LI54	No Name	freshwater	indet	cer	
8LI56	Garden Of Eden	freshwater	LArch	stone tool, f-t	
8LI76	USFS84-5	freshwater	indet	stp	
8LI136	Outside Lake	freshwater	MWd	scraper, Sw Cr, Carr	
8LI165	Lower Green Houseboat	freshwater	EWd?	stp, s-st	
8LI166	Velvet Ant	freshwater	indet cer	stp	
8LI172	Otis Hare	freshwater	MWd, LWd, FW	mica, pts, Sw Cr, WI Inc & Punc, ch-st, FW	
8LI217	Sunstroke	freshwater	MWd? LWd?, FW, Lamar	SwCr, ch-st, FW, Sw Cr, LJ, Lamar	
9DR7	White Springs	freshwater	indet cer	ch-st	human skeleton
9DR10	Montgomery Fields	freshwater	Arch, indet cer	Arch pts, tools, clay pipes, stp	
9DR12	Sandy Ridge	freshwater	MWd, LWd?	stone tools, stp, ch-st, Sw Cr, Keith Inc	
9DR15	Hale's Landing	freshwater	MWd?LWd?	Sw Cr, WI Punc?, ch-st	
9DR19	Four Mile Creek	freshwater	MWd? hist	WI Plain, ch-st, cordmk, hist crockery	
9DR23	Shackleford Springs	freshwater	indet cer	ch-st	
9DR25	Bowers	freshwater	LWd?	Carr, ch-st, cobmk, cordmk	confused w/ Dr53?
9DR26	No Name	freshwater	MWd	WI Inc, Sw Cr, Carr, ch-st	may be md;
9DR27	No Name	freshwater	MWd	pts, ch-st, indet inc, WI Pl	
9DR33	Ten Mile Still Landing #2	freshwater	LWd? LC	Carr, ChattBr	
9DR118	Housing Development	freshwater	LWd?	stemmed pt base; ch-st	small shell pile
9DR183	Christopher	freshwater	indet Wd	ch-st, indet inc, Tallahassee? pt	

SITE #	NAME	SHELLS	CULTURE	DIAGNOSTIC ARTIFACTS	OTHER
9ER54	Andrews Dam	freshwater	indet Wd	ch-st, pts	
9SE3	Butler's Ferry Island	freshwater	Arch? LWd? FW, LC	pt, Carr, ch-st, FW Inc, ChattBr	
9SE10	Whaley's Mill	freshwater	LArch, EWd	f-t, ch-st, stp, tetrapod	
9SE12	Turkey Md	freshwater	indet cer	ch-st	
9SE13	Bird Field	freshwater	LArch, indet cer	f-t, ch-st	
9SE15	Old Rambo Landing	freshwater	FW	FW Inc	FW mound?
9SE17	Cummings Field	freshwater	LWd?	Sw Cr, ch-st	
9SE22	Gaulding's Landing	freshwater	indet cer, hist	ch-st, hist crockery	
9SE27	Underwater Indian Mound	freshwater	Arch, EWd, MWd, LWd, FW, LC	Dept S-St, Sw Cr, Wl Inc, Carr, FW Inc, LJ, Cool Br, copper	burial md, patches of shell midden
9SE32	SBSY	freshwater	MWd? LWd?	Sw Cr, ch-st, grit-t	
9SE77	One Mile	freshwater	Arch, MWd? Lamar, LC	Elora pt, pts, Lamar, Chatt Br, majolica	
9SE89	Ranger Station	freshwater	LWd?	Carr, ch-st	
9SE103	Stubble Field	freshwater	LWd?	pt, Carr, ch-st, red	Md near Steam Mill?
9SE106	Bartow's Landing	freshwater	EWd, MWd, FW, LC	Dept Ch-St, Sw Cr, FW Inc, LJ, ChattBr, pt	

likely explanation is that most individual dumping episodes are obliterated by continual use, trampling, bioturbation, and mixing through time.

Zooarchaeological samples analyzed are still relatively few. I have not taken column samples by digging into the unit wall, which damages the integrity of the adjacent potential unit. Instead, heeding advice from zoologist Elizabeth Wing (personal communication, 1987) and ethnobotanist Elisabeth Sheldon (personal communication, 1981) concerning adequate soil sample size for flotation, I have consistently taken samples measuring 30 cm x 30 cm and 10 cm deep (9 liters) for each arbitrary (10 cm or 15 cm) level, and have shoveled or otherwise chunked them out to avoid trowel-scraping that damages fragile biotic remains. Coring is impossible; shells are too large and resistant (they bend the bucket auger blades). Besides collecting tiny remains in flotation fractions, we have waterscreened through 1/8" mesh or window screen whenever possible, so that comparison of materials recovered in the unit level with those in the flotation sample can be done within the same overall provenience.

We still cannot tell if shellfish were a major dietary staple or a supplementary food, easily collectible in times when other resources were scarce or people were lazy. Even if the shells are in a matrix packed with other animal bone, the lack of fine-tuned stratigraphic knowledge will continue to prevent answering this question. As discussed below, if agriculturalists were still gathering river mussels and snails, it could be for several reasons: shellfish might have been considered a tasty delicacy, or perhaps they provided protein obtainable more easily and reliably than did running after deer. Also, people probably got whatever they could whenever they could, to add to the volume of food and the diversity of the diet.

Shell middens/mounds are often discussed in terms of their predominance during the Archaic (e.g., Saunders and Russo 2011; Randall 2008), when Holocene environments with melting glaciers up north increased the flow of rivers in the eastern U.S., backing them up at their mouths and creating productive estuaries for shellfish beds. While Apalachicola-lower Chattahoochee valley region shell middens do have many Late Archaic components, there are also plenty of Woodland and Fort Walton sites, in many different environments. These unsurprising findings are consistent with the archaeological record all over the Southeast (e.g., Peacock 2000). Saunders and Russo (2011:42-43) describe shell middens within the Choctawhatchee Bay drainage in northwest Florida, 170 km (100 miles) west of the Apalachicola delta, that are dated as early as 7200 cal. B.P. Farther west, a *Rangia* (marsh clam) midden offshore on the continental shelf at the Texas-Louisiana border, along a buried, submerged river channel, has been dated to over 8000 B.P. (Pearson et al. 2014). Thus, there is no reason that shell middens in the Apalachicola region could not be even earlier, which we could determine if we could dig deep enough below the water table or the Gulf. Shell middens are probably as early as the first people to arrive in Florida.

Work on all these research issues is just beginning in the Apalachicola-lower Chattahoochee region, as compared with more extensive investigation elsewhere in Florida and the

Southeast. Before model-building, a first step is to develop a taxonomy of sites upon which to build, and a list of questions that need addressing (e.g., Morrison 2013). The types of sites are presented here in the order that they appear from upriver (north) downward (to south). The sites are listed in Table 1 in numerical and alphabetical order by site number.

Individual Freshwater Shell Piles

Far inland, scores of sites at least as early as the Late Archaic have piles of freshwater shells, both bivalves, usually in the family Unionidae, and gastropods (snails). Along the eastern Gulf, the Apalachicola Basin has the greatest number of freshwater mollusc species (33 species of mussels) and greatest number (10) of endemics (Williams and Fradkin 1999). Bivalves (pelecypods) may have been preferred over snails because they offered greater amounts of meat (Percy 1976:118), but we do not know how the efforts of collecting both compared.

A site can be as little as one small (bowl-sized) shell pile (Figure 2), as at the Jumping Fish site (8CA31) on the riverbank in the middle Apalachicola, which must represent trash from a meal. Another pile at the Godwin Lake site (8JA225) on the lower Chattahoochee was exposed in the forest back from the riverbank, in the side of a small sinkhole that must have opened after deposition of the midden garbage. These two sites, discovered on small surveys, are recorded in the Florida Master Site File. Another example of a single pile is the Housing Development site (9DR118) on the lower Flint River in south Georgia, where a feature that was a pit full of shells surrounded by dark midden (Figure 3) had been freshly exposed by the road grader (White 1981:410-11). All these examples are Woodland-period sites, but Fort Walton sites (see Table 1) can have similar small individual piles, showing continuation of this practice.

At the Curlee site (8JA7) on the upper Apalachicola, many small individual shell piles were washing out of the riverbank in the 1970s, associated with both the Fort Walton and earlier Late Woodland cultural strata; their spacing, between 5 and 20 m apart, suggested discrete deposition events that might have represented individual domestic units. The one pile recorded *in-situ*, a white lens within the thick black Fort Walton midden stratum (Figure 4), appeared to be the result of a single refuse deposit (White 1982:46-50). The obvious interpretation is that such small piles represent one-time events of tossing garbage amid all the other garbage, but a pile with shells is more obvious and is better preserved.

The Fort Walton-period Corbin-Tucker site (8CA142;White 1994:167-170), within a pine plantation on a small creek that was once an old river meander, contained a single shell pile (Figure 5) that was examined in detail. The feature surface, spread by the plow, was an oval 100 cm by 88 cm. An excavation unit was arranged around it and the feature pedestaled and cross-sectioned, revealing a pit with two strata totaling about 70 liters (9 kg) of fill that contained the only biotic materials preserved at the site. Zooarchaeological analysis by Judith Fandrich (1989:256) demonstrated that the >2 kg of shells were from Unionidae (bivalves) *Elliptio*, *Amblema*, and *Obovaria*, and Gastropoda (snails) *Viviparus*, *Pulmonata*, and *Polygyra*. The pit also contained garfish, raccoon, and turtle remains, pine, oak, and other wood charcoal fragments, and carbonized nutshell and seeds. Two radiocarbon dates on the charcoal placed this feature at cal A.D. 831-1049, within the range of early Fort Walton (Marrinan and White 2007:302,

Figure 2. The Jumping Fish site (8CA31) on the west bank of the middle Apalachicola River; archaeologist Mike Burt uncovers a small pile of freshwater molluscs that probably represent a single meal or snack (trowel in closeup points north/upriver).

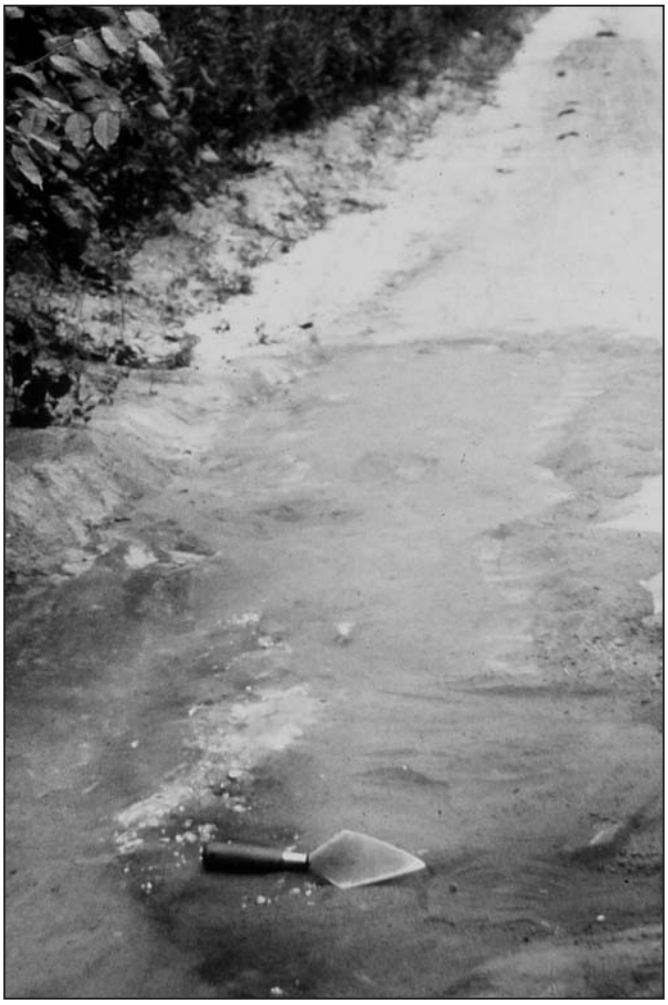

Figure 3 Shell pile exposed by a road grader at the Housing Development site (9DR118) on the east bank of the Flint River above its confluence with the Chattahoochee. Dark area around feature is midden that has been shovel-skimmed to define feature limits; trowel points north.

Table 2). So even as people were beginning to grow maize, of course they still collected shellfish and other wild species. Adjacent to this habitation area of the site was a Fort Walton cemetery with high-status burials that was used through the contact period (White et al. 2012).

When I began surveying in this valley, I was surprised to see oyster shell piles along the lower Chattahoochee, on roadsides or in the middle of the woods. This is some 150 river miles inland, but the fresh nature of the shell and the associated complete drinking vessels (metal ones) indicated modern trash disposal. I learned that hunters love to bring sacks of oysters and drinks to have while they sit and wait for game. But this modern practice illustrates well how shell midden piles get made – just throw it all on the ground and move on!

Freshwater Shell Strata

Next in the shell midden typology are the riverine sites with thick freshwater shell strata. These must have been made up of lots of the same kinds of small piles, as people stayed

Figure 4. The author in the mud cleaning a small shell feature visible at the top of the lower dark Fort Walton midden zone at the Curlee site (8JA7); above the feature is a lighter, nearly culturally sterile layer and above that, another dark midden zone.

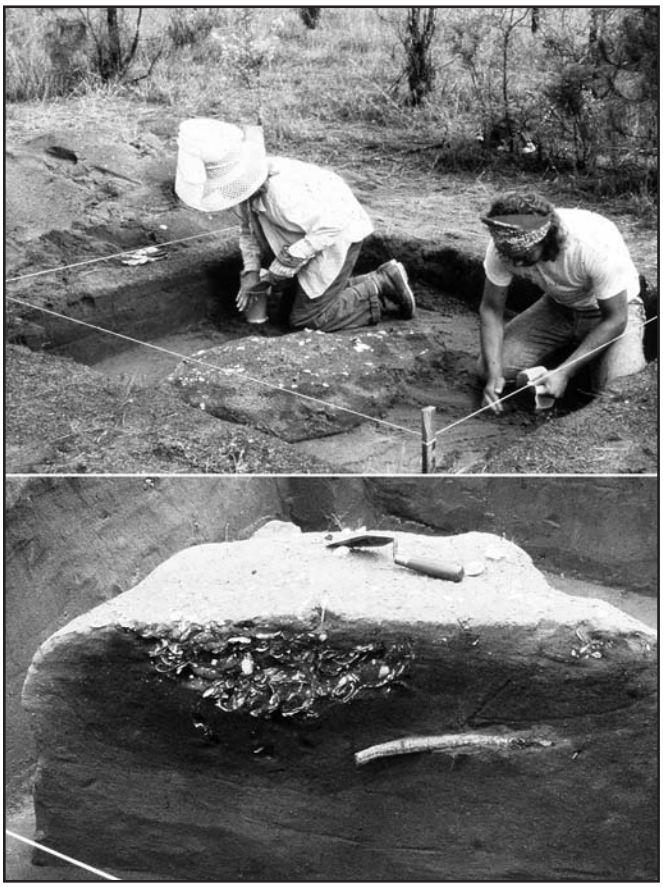

Figure 5. Shell feature at the Corbin-Tucker site (8CA142), with Maggie Goetze and John Kato digging in the 2-x-2-m unit placed around the feature; after pedestaling and cross-sectioning it is seen as a refuse pit with the top spread by the plow (large white root is at lower right of the feature; trowel points north).

longer, even year-round, or returned seasonally or otherwise often over the years. Multiple deposit episodes through time left piles that merged into layers with a wide horizontal extent.

Clusters of such sites are on the lower Chattahoochee at its confluence with the Flint, in Seminole County, Georgia. Here, thick shell midden ridges along stream banks and grouped around springs were full of check-stamped pottery (White 1981:32-84), though we often do not know if it is Deptford (Early Woodland) or late Weeden Island (Late Woodland) or from some other time period. Farther upriver the same kinds of sites are numerous along old river meanders. The Arnold Soybean Field site (8JA204) measures about 80 m, with dark midden soil and projectile points ranging from Archaic to Mississippian in age, as well as Middle Woodland Swift Creek pottery; the 35-m spread of shell within the wider midden was the area where the crops grew less vigorously (White 1981:218-220).

The Mercer site (8JA233), also on the lower Chattahoochee (White 1981:239-244), was a similar dark midden with a large area of shell on the northeast side. It was first exposed when the land was cleared of forest to plant watermelons, and though collectors got to it before the archaeologist, they shared their information. The site produced a Tallahassee point, Archaic and Woodland points, and check-stamped, Carrabelle Punctate, and Swift Creek Complicated-Stamped pottery, all of which indicate multiple components (at least Middle and Late Woodland and Archaic). The shallow midden stratum was disturbed by plowing at the top but had small undisturbed concentrations of shell below the plow zone, with bigger sherds—suggesting primary deposits of garbage piles or pits.

The Mercer site illustrates well another aspect of such shell middens: many (including some of the individual piles noted above) are far from the modern river channel on old meanders. They were probably right on the bank before the river moved, and might even provide good geomorphological data. Or they could have been on the bank of cutoff meanders, oxbow lakes that still had some flow, where shellfish might still be available. The Mercer site is today 2 km west of the main river channel. The SBSY site (9SE32) is another freshwater shell midden stratum right on the lower Chattahoochee riverbank (White 1981:509-512) with a shell layer 60 cm thick that is visible from a boat out in the river (Figure 6). Its ceramics indicate a Middle to Late Woodland age.

The Otis Hare site (8LI172) along the middle Apalachicola is a large freshwater shell midden washing out of the bank; data from test excavations are still being analyzed in the USF lab. The north end of the site had a meter-thick black midden stratum packed with shells, which merged horizontally into a dark brown midden stratum without shell at the south end. The entire midden was buried under 1 to 1.5 meters of historical alluvial deposits. Diagnostics indicated continual occupation from Early Woodland through Fort Walton. Included were typical domestic stone and ceramic artifacts, Middle Woodland exotics such as a cut-mica arrowhead and a quartz crystal fragment, cut cane fragments, and coprolites. At the bottom of this deep midden we uncovered a feature indicating where the first people to arrive dug into the culturally-sterile pale sand to leave a small pit full of shell (Figure 7), with Swift Creek sherds and charcoal dated to cal. A.D. 550. Possibly more than other kinds of archaeological information, this feature shows how the site began as a single episode of burying shellfish trash in a pit.

Summary of Interior Riverine Shell Middens

Freshwater shell middens dot the Apalachicola-lower Chattahoochee valley all the way down to about 35 km (straight-line distance) inland. As seen in Figure 1, there is a gap in the upper part of the lower valley, but it is probably due to survey bias since there has been less work in this area as

Figure 6. Shell midden stratum at the SBSY site (9SE32), visible from a boat in the Chattahoochee River.

Figure 7. Cross-sectioning a small shell pit feature at the Otis Hare site (8LI172), indicating individual shell midden refuse deposit underneath a meter-thick black shell midden.

access to the backwater swamps and myriad small streams is difficult. Furthermore, the heavy deposition of alluvial sand in the lower valley and standing water over much of it means that archaeological sites are often buried and/or submerged.

All these shell middens noted so far contain freshwater bivalves and gastropods. Some even have a newly named species of unionid river mussel that is now extinct and known only from prehistoric archaeological sites in this valley. The Apalachicola Ebonyshell, *Fusconaia apalachicola*, was first identified by Williams and Fradkin (1999) and is thought to have died out because of pollution and habitat destruction coming from forest clearing and agricultural runoff beginning in the early 1800s. Shells of this new species were first identified during a contract project analyzing the faunal assemblage from the USFS84-5 site (8LI76), on U.S. Forest Service land along a tributary stream in the middle valley. *Fusconaia apalachicola* is recognized by its circular shape and other morphological characteristics, and is the only unionid known to have become extinct before it was actually described. Williams and Fradkin (1999) also found it in archaeological collections from three other sites: Sycamore (8GD13) and Scholz Steam Plant sites (8JA104) on the upper Apalachicola, and the Omussee Creek Park site (1HO26), on the lower Chattahoochee at the northern end of the region in Alabama. Omussee Creek Park was the village at the Omussee Creek (or Seaborn or Columbia) Mound (1HO27/Ho101), a Fort Walton platform mound and village center (Blitz and Lorenz 2006:59, 218; Belovich et al. 1982:162-168). Sycamore was a Late Woodland (late Weeden Island) site excavated in the path of the construction of the Interstate 10 where it crossed the river (Milanich 1974). Scholz was a Middle Woodland occupation, probably associated with C. B. Moore's Sampson's Landing mound (8JA1), which required salvage work before new construction (Percy 1976). The large amount of shells able to be recovered from these sites, because they were intensively excavated, allowed a better characterization of the species composition of the shellfish assemblage, not to mention a better chance of including the extinct species. I was a student crew member when heavy equipment sliced open the undisturbed lower portions of large shell features at Scholz, and I remember they were densely packed refuse pits. Later the shells were identified as bivalves (*Elliptio crassidens, Elliptoideus sloatianus, Megalonaias boykiniana, Pleurobloma pyriforme, Quincuna infucata*), gastropods (C*ampeloma geniculum, Lioplax choctawhatchiensis, Viviparus georgianus*), and also two species of land snails that crawled into the midden (Percy 1976:121, Table 13).

These examples show how shell midden data can provide practical information on past environments and changing ecosystems, and how old collections, especially larger, more representative ones can shed light on the human past and present. Williams and Fradkin (1999) mention other shellfish species that are at risk of becoming extinct in the same way. Meanwhile, *Fusconaia apalachicola* is probably present at more sites in the region, but simply remains to be identified (imagine what we will be able to do when DNA sampling becomes cheap and easy). The four sites from which it is known range in age from at least Middle Woodland to middle Fort Walton, perhaps A.D. 500 to 1300. It was probably just one of many kinds of resources scooped up in a typical collecting activity. More work is needed in this region on the freshwater shellfish individual habitats and seasonal availability. For example, Percy (1976:115) notes that both pelecypods (bivalves) and gastropods would probably have been gathered in summer or fall (June through November), because during winter and spring, when it is colder, they would have been buried/submerged in deeper water (say, 3 m vs. 60 cm) and harder to obtain. Size and morphological studies with carefully controlled stratigraphic samples might also determine whether aboriginal peoples might have contributed to population declines or extinctions of particular species.

As for considerations beyond subsistence systems and scheduling, all these riverine freshwater shell midden sites so far show only deposition of garbage: people dumped their shells and other trash and apparently lived next to it or on top of it. These sites are doubtless the results of many different habitation episodes through time. Each time a group returned, they may have camped on an older part of the midden where the shell was more weathered and less smelly. The sites with small individual shell piles or pits may represent a meal during short stay near a shellfish bed while traveling along the river, or a menu item at a particular time for a larger Fort Walton village site such as Curlee. Whether such food indicates feasting, indeed the whole concept of what constitutes evidence of prehistoric feasting, might be worth exploring as more data become available. But none of the Apalachicola-lower Chattahoochee valley freshwater shell middens has any mounds of shell or use of it for anything beyond food waste (though some are near mounds, as noted, and as with other middens discussed below). These riverine sites are not big, certainly nothing like the huge shell mounds on Kentucky rivers, though they may have multiple components. Because it is so visible, the shell garbage might have drawn later peoples to return, indicating the locations of the richest shellfish beds and maybe the homes of revered ancestors.

Estuarine Marsh Clam Middens

The lower Apalachicola delta estuary is even richer than upriver in naturally occurring shellfish, which indigenous peoples harvested in large quantities and left as mounded middens in the river swamp. The predominant species in these sites is *Rangia cuneata*, marsh clam, common in estuarine shell middens all along the Gulf Coast. We did not even notice a second species, *Polymesoda caroliniana*, Carolina marsh clam, until conscientious archaeology student Brian Parker (1994), checking the shellfish manuals against the identifications returned by the zooarchaeologist, recognized it among the Apalachicola *Rangia* middens. How or why two different marsh clam species were obtained by prehistoric collectors remains a matter of speculation. Both live in brackish waters where rivers empty into bays, and have a salinity tolerance ranging from zero to about 25 ppt, with about 15 ppt being optimal (Andrews 1951; Auil-Marchalleck

et al. 2000). It is unclear what habitat or other differences there might be between the two clams that would result in their differential distribution in estuarine shell middens, though both temperature and salinity might be factors.

Most of the marsh clam middens also have a small percentage of oyster shells. Oyster (*Crassostrea virginica*) usually lives farther out in the bay, in slightly saltier water, with a salinity between 6 and 35 ppt, the optimal range being 10-18 ppt (Puglisi 2008). As the ranges of all three species overlap, they may reflect fluctuating conditions near one site or (possibly less likely) deliberate choices of aboriginal collectors. Salinity changes by season or with tides or after storms may have meant that people inhabiting or coming to the same place for a long time or repeatedly just kept getting whatever species was available and dumping the shells, building up the living space. The relative frequencies of these three species of molluscs have yet to be extracted from the site reports and subjected to fine-tuned investigation.

The estuarine shell midden mounds are usually well known by local hunters and others seeking higher, dryer ground in the swamps. Probably that is what made native peoples continue to occupy them from Late Archaic times onward. Many other taxa of fish, turtles, deer and terrestrial small mammals have been identified along with the shells of the midden matrix. Local informants have helped us record these shell mounds; many are remote and reachable only by small boat and wading through swamp muck (White 1994). At least two of them were cleared for apiaries (bee yards), showing up on aerial photos as white streaks within the dark river swamps. The Apalachicola delta supports the largest stand of tupelo trees (*Nyssa ogeche*) in the world. At Clark Creek (8GU60) and Depot Creek (8GU56), bees were brought in by boat for a few weeks to make tupelo honey, which is prized because it never crystallizes and has types and ratios of sugars that make it safe for diabetics. The high elevations of the marsh clam middens provided the perfect camps for prehistoric Native Americans and for early twentieth-century beekeepers. We learned from a local elderly resident that Depot Creek shell mound even had a 1930s secret moonshine still (Hockersmith 2004).

Some distinctive characteristics can be noted for the estuarine middens. While the riverine sites generally have more sandy soil to contain the shell matrix, the marsh clam shell middens are often of solidly packed shell with little intervening blackened sand or discernible stratification. Seldom do they contain postmolds or other features, though this may be a function of how few have been extensively excavated. They are mounded and long, curved or banana-shaped (Figure 8), conforming to the shape of the current or old stream bank. They have so far produced no evidence of deliberate design or indication of ceremonial activity or monument construction. Their artifacts range from Late Archaic microtools and fiber-tempered ceramics to Fort Walton pottery, and most sites are multicomponent. Well-preserved faunal remains indicate, in addition to shellfish, a reliance on fish, turtles, small mammals and deer that continues throughout some four millennia (White 1987, 1994, 2003). Comparative zooarchaeological work is needed to see cultural practices and natural environments of different time periods.

Among the mysteries at these sites is why there are so few features. At least postmolds would be expected from structures built for shelters or other facilities. If wooden posts decayed or were pulled up, the postmolds may have filled in with shell falling into the void. When we returned after 10 years to relocate our old units at Depot Creek shell midden, where wooden stakes had been left pounded down to the ground in the southwest corners of all four units, we could locate only one stake, rotted away, visible as a tiny rectangle

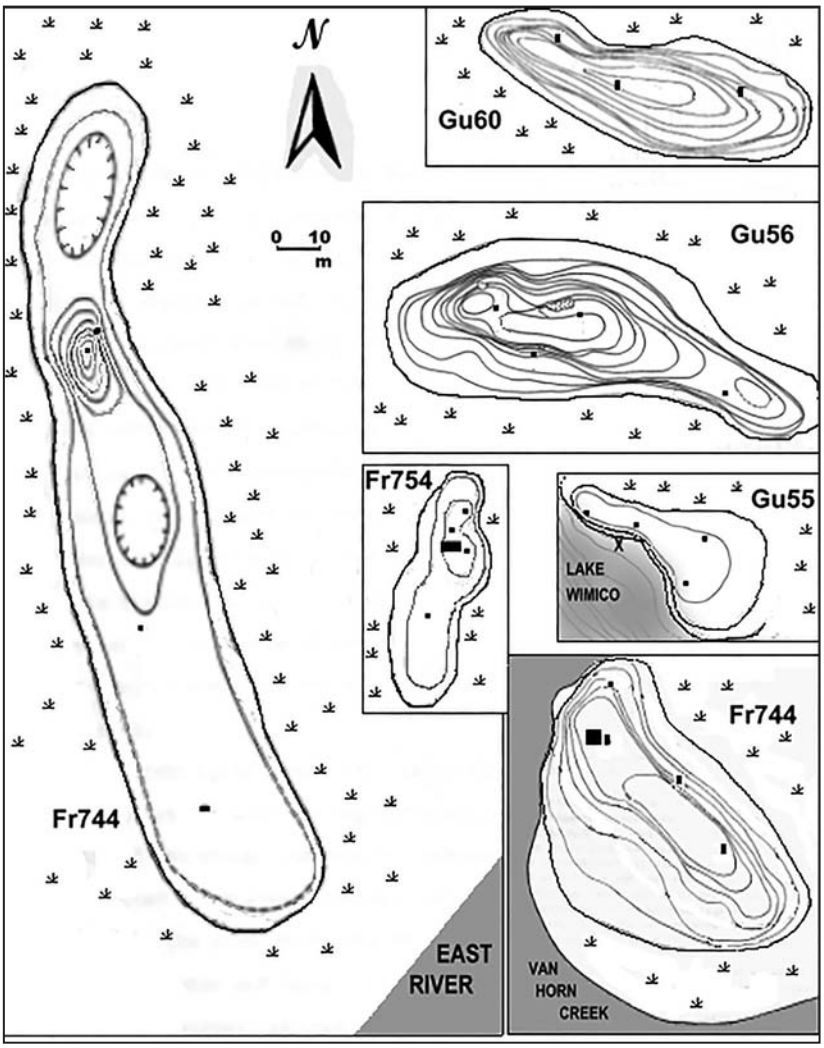

Figure 8. Shapes and relative sizes of Apalachicola estuarine marsh clamshell mounded middens; these are the sites that have had test excavations (tiny black squares and rectangles); 8FR744 was mined for shell (for road fill) at the north end; X at 8GU55 was burial location; contour interval is 20 cm except at Fr744, 50 cm.

in the shell outlined in orange flagging (which was also nearly rotted away). The only real features within the marsh clam mounds were a possible prepared floor at Clark Creek and a single human burial at Yellow Houseboat (8GU55), both apparently Late Archaic (White 1994:94-96, 109-111, 119-21). The possible floor was a thin bright yellow sand lens exposed in the corner of a unit (Figure 9). Lacking time to open an adjacent unit, we did not learn if this was a portion of a real prepared floor or a lens of some spilled or stored sand used for a special purpose. The burial was a flexed, adult male skeleton exposed in the side of the mounded shell midden; we had to excavate it since it was on the slope where people docked boats on Lake Wimico and had been damaged by exposure. It had no grave goods but was probably a deliberate burial, since the postcranial skeleton was articulated (the skull was disturbed). But it looked like someone simply laid into an ancient refuse pile; perhaps placing the dead in the shell midden left by ancestors made it sacred.

The question remains, as with the riverine shell midden sites, of whether people lived directly on the mounds of clamshells. I always try to locate at least one test unit away from the shelly parts of a site, but it is hard to dig off the raised mound area when the surrounding ground is squishy low wet swamp or marsh. Possibly people lived in stilt houses and created mounded middens by throwing garbage out the sides.

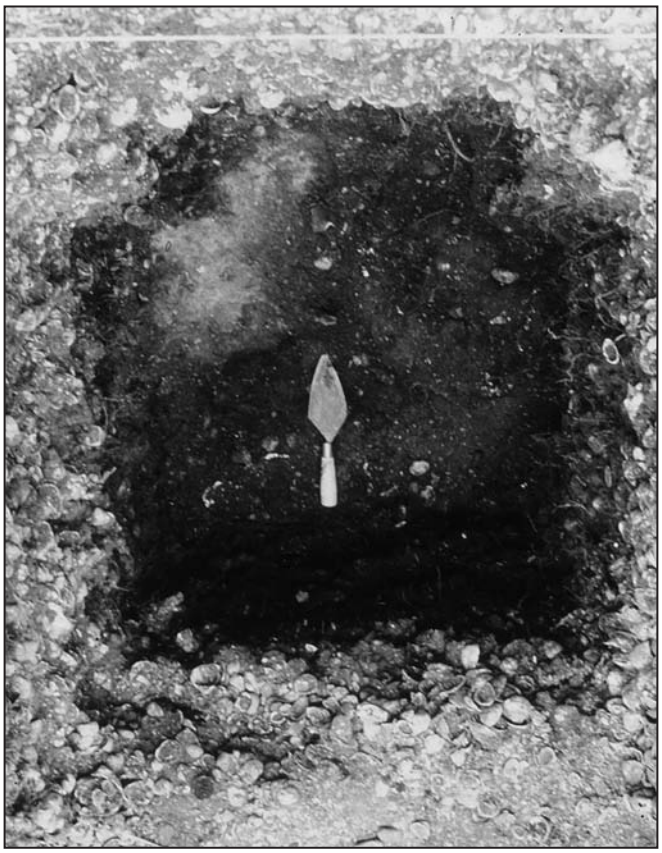

Figure 9. Yellow sand lens (upper left corner of unit floor) that may represent a prepared floor within Clark Creek shell mound (8GU60). This is one of very few features in lower valley marsh clam shell middens.

Or they camped on these middens periodically and found each time a spot where the shell had aged and was no longer fresh garbage.

Locations of marsh clam shell middens (Figure 10) range from about 5 to 15 km (straight-line distance) inland today. Their settings and distances from the current bayshores indicate characteristics of ancient river mouths and shoreline configurations that we are just beginning to understand (Donoghue and White 1995). Since they usually contain some oyster shell, they were probably in fluctuating aquatic environments that were exploited for whatever shellfish were available at the times of the different occupations. Huckleberry Landing Mound (8FR12) is Middle Woodland sand burial mound with extensive ridges of clamshell along the lower river (Glowacki and White 2005:16-17; Moore 1902:234-238); this site has the farthest downriver clamshell midden, with the exception of Jackson Midden, described below.

Oyster Shell Middens in the Estuary and on Bayshores

Apalachicola Bay is Florida's most productive estuary, and famous today for supplying annually 6 million pounds of shrimp and 90 percent of Florida oysters, which is 10 percent of the nation's oysters. Modern oyster shell mounds are common as waste from the shucking houses piled up along the shore, sometimes overlying ancient middens, but sometimes useful to recycle back into the bay to make substrate for growing new oysters. Claassen (1991a) has pointed out the many types of historic and modern shell middens left by industrial processes.

Prehistoric oyster shell middens on the bayshores of both the mainland and the barrier islands in the lower Apalachicola delta are numerous. They can be of 100 percent oyster but usually have a small percentage of marsh clam. They are typically of packed shell with little sandy soil, and full of artifacts and faunal remains, allowing a good characterization of subsistence on aquatic and a few terrestrial resources, again, as far back as the Late Archaic. Interestingly, just a few are not on the current bayshores (see Figure 10): those two known on the east side of the lower river deep in the estuarine river swamps; those lining the west bank of the river above its mouth, which once formed a near-continuous shell ridge around the city of Apalachicola and include Pierce Mounds complex; and one small midden on the east shore of St. Joseph Bay that is of oyster and not the large gastropods more typical on this bay. These exceptions are described first.

Estuarine Oyster Midden Mounds

The high adventure of test excavations at the two unusual oyster shell midden mounds back in the river swamps have already been described in detail (White 1994, 2003). Their deeper cultural deposits, extending below the water table, required hauling in dewatering equipment to reach. At Van Horn Creek (8FR744; see Figure 8), the mounded shell midden was up to 3 m high, with late prehistoric Fort Walton occupation overlying a thicker Late Archaic component dated to cal. 1400 to 1450 B.C., possibly with a Woodland

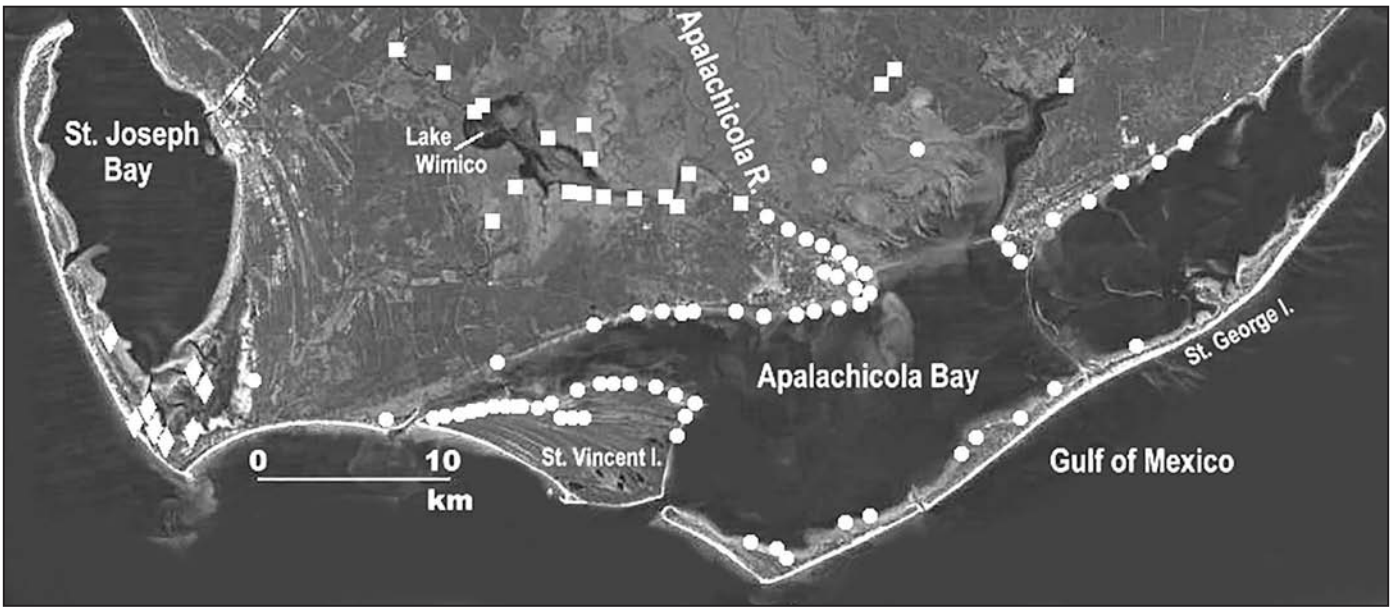

Figure 10. Distribution of marsh clam (squares), oyster (circles) and large-gastropod (diamonds) shell middens in the lower Apalachicola valley (bayshore and barrier islands), shown on aerial image adapted from Google Earth, September 2014.

component in between. The deepest deposits (over 165 cm) may represent a preceramic Archaic component that could not be sampled due to inundation. The shell was packed solid, difficult to dig except with picks, and so excavated in 15 cm arbitrary levels. Zooarchaeological specimens recovered from the small number of flotation samples indicated that the upper two levels were dominated by marsh clam and the deeper ones by oyster until Level 9 (135 cm depth), which was little over half oyster and nearly 40 percent clam.

Given the assumption (not yet testable) that people got whatever resources were closest, the original interpretation after the 1987 testing was that the local environment had been farther from the fresh water of the river during the Late Archaic, meaning saltier local environments and collection of mostly oysters. Then as sea level continued rising in the later Holocene, backing up the mouth and forcing the river to migrate eastward, more fresh water was brought nearby, so that more marsh clam was available. But the dewatering in 1993 permitted the sampling down through Level 9, where more marsh clam and other remains of freshwater fauna were mixed with the species from more salty habitats. So the relationships of fluvial processes and human systems are more complex than expected. Within even the tiny faunal samples able to be analyzed, zooarchaeologists Karen Walker (1988) and Arlene Fradkin (1994) identified some 70 taxa of creatures obtained by the inhabitants at Van Horn Creek. One of these was snow goose, which shows up only in winter, suggesting that season of occupation, but far more comparative work remains to be done with the rest of the samples. The site did have one feature, a pit 50 cm in diameter, 45 cm deep, extending from the surface in one unit (Figure 11), that contained all marsh clam shells with a very small coating of blackish sandy clay, as opposed to surrounding oyster shells which were in a browner slimy clay. The radiocarbon dates came from Levels 10 and 11, which also produced fiber-tempered sherds. Besides ceramics, the artifacts included clay balls and chert microtools relating to the Poverty Point or Elliott's Point adaptations of the Late Archaic farther west along the Gulf and up into northeast Louisiana.

Sam's Creek Cutoff shell mound (8FR754), the second estuarine oyster midden, even farther to the east, was even more submerged, protruding barely 50 cm above the surrounding marsh (White 2003). It was all of oyster (only 19 marsh clam valves recovered) and all Late Archaic, with fiber-tempered pottery, clay balls, and microtools. An AMS radiocarbon date on unburned, undecayed fiber in a sherd was cal. 2292-1942 B.C. Unexpectedly, this site also had a feature, a skeleton of a young or teenaged woman only 2 to 20 cm deep, with no grave goods or indications of a burial pit. The skeleton was in an unusual position, partially flexed on the right side but with the face turned away to the left, one or both hands under the body, and both femurs broken. Similar to the burial at Yellow Houseboat shell midden, it looked like someone who was left in the garbage pile, possibly under atypical circumstances. But this site's overwhelmingly oyster matrix and the 62 taxa identified, with a majority of saltwater fauna, do support the hypothesis that the river was farther away during the Late Archaic and more saline aquatic conditions prevailed nearby.

Pierce Mounds Complex

Along the west-side mainland at the Apalachicola River mouth and bayshore, the oyster shell midden ridge surrounding the whole peninsula probably once extended continuously for 3 to 5 km. Running along the old riverbank (the river has moved 1 km to the northeast) for 1.5 km of this ridge sits the Pierce mound complex, a group of 13 mounds comprising a major center for at least two millennia (Moore 1902; White 2013). On the west side of an oval of 7 mounds were an Early to Middle Woodland occupation area and burial mounds

Figure 11. Test Unit 5 at Van Horn Creek shell mound (8FR744), with biologist Woody Miley, then director of the Apalachicola National Estuarine Research Reserve, at left and geologist Joe Donoghue, then of Florida State University, at right. View facing northwest; Miley's hand marks the boundary in the north wall between the upper stratum dominated by marsh clam and the lower deposits of oyster. To his left in the west wall is a large pit in which the clam deposits extend some 45 cm below the surface.

(Deptford, Swift Creek-early Weeden Island) constructed with shell lenses and strata over or under burials with exotic grave goods. Our work at Pierce included cleaning and backfilling looter trenches in Pierce Mounds C and A, and testing in Singer Mound, all of which had such oyster shell layers or lenses, as well as strata of yellow sand and gray sand. These construction practices suggest possible ceremonial use of midden refuse – or maybe just use of a convenient fill material that was close at hand and, with its lime content, might alleviate the smell and decomposition of the dead. Preliminary examination of deposits from both the midden ridge and mound fill indicate they are full of artifacts and animal bone typical of domestic refuse. But placing a lens of shell over or under a Woodland grave might have been a ritual practice full of symbolism that we simply do not understand.

On the east side of the oval of mounds at Pierce, the Fort Walton village is centered by a temple mound made of oyster shell from the midden (Figure 12). Moore (1902:228) did not even consider it worthy of being named, simply calling it a shell heap, but Willey (1949:280) recognized its deliberate construction as a flat-topped mound. It was mostly destroyed by the building of the adjacent railroad bed in the early twentieth century, as well as recent looting. It has not been tested, but all-terrain vehicle ruts up the sides of it do offer views of its construction material, which seems to be all oyster shell and black sand throughout, with Fort Walton ceramics and animal bone garbage. At present it is not possible to see the use of shell in building this admittedly probably ceremonial structure as anything but utilitarian; it is the closest and toughest building material. Test excavation is necessary, as well as comparison of the detailed composition of shell midden samples taken from other parts of this site. Waselkov (1987:148) has noted how some domiciliary or temple mounds are known to have been "constructed using old shell middens from earlier occupations.... All such activities seem to have been motivated by a desire to create interpretive difficulties for archaeologists."

East of the Fort Walton component at Pierce are at least three other burial mounds: Cemetery Mound (8FR21), Mound Near Apalachicola (8FR20A), and Shell Mound Near Apalachicola (8FR20B), which were all or partially built of oyster shell. These are now destroyed and we can only learn a little more from surface collection around where they were, since the location is in a modern cemetery. Shells from these

Figure 12. Remains of the temple mound (Mound H) at Pierce Mounds Complex (8FR14 and other numbers), built of oyster shell midden, with archaeologist Jeff Du Vernay standing on top. In right foreground is old railroad bed made of midden sand and shell mined from the mound and the midden ridge. Mound bears scars of off-road vehicle tracks (at left).

mounds have been taken for road building and to shore up the drainage ditch in the cemetery. Elsewhere along the bayshores, several other burial mounds, mostly Middle Woodland, have strata or lenses of oyster shell (see Table 1).

Isolated Midden Near Single Burial Mound

The only other oyster midden not on the actual Apalachicola Bay shore is at Gotier Hammock mound site (8GU2), far west of the river on St. Joseph Bay (White 2010). It is unusual because, as explained below, prehistoric shell midden sites around St. Joseph Bay are typically characterized by large gastropod shells. Though they might have some oyster shells, those are just a few in the mix of all the other shellfish and fish. Gotier Hammock is a Middle Woodland burial mound, now mostly destroyed, with Swift Creek-early Weeden Island ceramics. It is on a high hammock 200 m back from the eastern bayshore, and there are no cultural deposits between it and the low-density oyster shell midden that sits right on the shore to the west. Occasional shell tools at the site are made of large-gastropod columellae, but the food remains west of the mound are all oyster, loosely scattered along an area 50 m wide and 350 m long. This shell midden has been disturbed by construction of the paved road (highway 30A) along the bayshore, as well as recent bulldozing, so the data are biased, but oyster shell was also recovered from subsurface tests.

An interesting question is where the oysters came from, because St. Joseph Bay is too salty for oysters. It might have been fresher centuries ago, but Harke (2012) demonstrates it was just as salty at least as far back as A.D. 1300. Possibly the oysters were brought in from Apalachicola Bay, or perhaps they were obtained from the mouth of the tiny creek near the site that was probably the original attraction for people to live there, since it is one of the rare freshwater tributaries into this bay. We had assumed the oysters were consumed by people who used the burial mound, and the midden area does have Middle Woodland ceramics, but also plain and check-stamped non-diagnostic sherds. Though the mound was well-dated, from soot on two ceramic vessels, to cal. A.D. 650, dates from the midden area were cal. A.D. 1290-1420 (on charcoal) and cal. A.D. 1450-1580 (on shell). These dates do not disprove

the idea that Middle Woodland people camped here or left the oyster shells, but clearly later prehistoric Fort Walton people also inhabited the campsite, and harvested at least the oyster that provided the late dates.

The curious relationship of burial mound and slightly unusual shell midden might be compared to that of the Jackson Mound (8FR15), an Early-Middle Woodland burial mound on a small stream in the lower Apalachicola just 1.5 km north (upriver) from the Pierce mounds complex. We began investigating what remained of it in 2013, and also examined the adjacent marsh clam shell midden (Jackson Midden, separately numbered 8FR77). The sand mound contained Swift Creek and early Weeden Island pottery and exotics with burials (Moore 1902:213-236). The midden had been bulldozed for planned housing, but it must have been the occupation site for people who used the burial mound. However, it is only that short distance away from the extensive oyster midden ridges at Pierce, described above; indeed, Jackson Midden is the farthest south (downriver) of any *Rangia* shell midden in this valley. Perhaps the unexpected marsh clam here, like the unexpected oyster at Gotier Hammock, indicates something special about eating non-commonplace shellfish at the time of a funeral or burial ceremony at a Middle Woodland mound.

Typical Oyster-Shell Middens

Most of the Apalachicola oyster-shell middens are right on bayshores, on either the south side of the mainland or the north side of the barrier islands (see Figure 10). They can be linear middens, small or large mounds, or extensive ridges, as at Pierce. A few have burial mounds partially of shell, though no good investigation of any of these has been possible as yet, and there are certainly no data on any ceremonial or monumental functions for the sites, except inasmuch as burial mounds are monuments. The larger sites seem to be where freshwater springs and creeks empty into the bay.

On St. Vincent Island, a national wildlife refuge and the largest, widest barrier island, oyster shell ridges run almost continuously along the entire northern shore, including the Big Bayou inlet, and the north end of the east shore. Our survey of the 12,000 acres (4860 ha) of St. Vincent (Kimble 2012) located no prehistoric sites in the interior. The thickest shell midden is along the middle north shore, where a rich oyster bar still extends out into the bay (oystermen were out in their boats there during our fieldwork). Collectors have recovered from here everything from a Clovis point to a Late Archaic Poverty Point-style jasper bead, and ceramics from fiber-tempered Late Archaic through historic Native American. Two looted burials within the shell midden were not documented or examined but recovered and reburied elsewhere on the island by federal authorities. They may have been in an actual mound that is now gone.

We tested the extensive St. Vincent 5 site (8FR364), located on the shore near the oyster bar. It had a meter-thick stratum of shell within a little black sand, overlying culturally sterile pale beach sand. Ceramics indicated Woodland through Fort Walton occupation, and the abundant faunal assemblage included many species of fish, turtles, birds, mammals, and even a large whale bone (Marrinan and Parsons 2010). We were trying to see if the midden retains intact portions, since it is much damaged by storms that blow chunks offshore then dump reworked deposits back on land. The large artifacts and bones uncovered in a single 1-x-1 m test unit indicated undisturbed cultural deposits. Charcoal from Level 10, a meter deep and right above the culturally-sterile subsoil, was radiocarbon-dated to cal. A.D. 560-660. Another sample from Level 4, where Keith Incised sherds had been recovered, returned a date of cal. A.D. 870-1010. Thus, an average of 30 cm of midden was deposited per century.

St. Vincent Island has been used by geologists for decades to examine sea level fluctuations (e.g., Walker et al. 1995). It is made up of numerous near-parallel beach ridges (visible in Figure 10), the oldest of which are on the northeast side. The Paradise Point site (8FR71), at the northeastern tip of the island, on what is considered the oldest beach ridge, has three linear shell midden strata. The lowest is separated from the middle by a sandy, probable washover deposit, and the middle oyster midden is in a clay matrix similar to the gray clay layer above it that represents a marine deposit. Above that is the upper midden with a little sand around the shell. The middle midden with the clay produced a Swift Creek Complicated-Stamped (Middle Woodland) sherd and dates of cal. 1500-1350 B.P. (A.D. 450-650; Walker et al. 1995:214), and suggested a sea level stand 137 cm higher than at present. Above this, the upper midden suggests that sea level dropped and allowed people to return and continue collecting oysters. This site has, over the decades, produced a poorly-documented human skeleton of a young man, eroding into the water, as well as Hernando and Tallahassee points that look Early Archaic or even Paleo-Indian. The uppermost midden has Fort Walton ceramics. Our 2010 work exposed stratigraphy of 60 cm of that uppermost oyster shell midden overlying the gray clay, with the middle oyster midden below that, at the water table. The bottom of the upper midden at its juncture with the gray clay was sampled and dated by visiting geologists Frank Stapor and Joe Donoghue, using OSL (optically stimulated luminescence) to A.D. 1400 (Kimble 2010:131), supporting the sea-level fluctuation curve suggested by Walker et al. and the identification of the Fort Walton component.

Since archaeological research on St. Vincent Island has mostly focused upon on prehistoric subsistence and environmental concerns, and since the contexts of the human burials within the shell middens are not known, it is hard to say much about any ceremonial practices or other non-utilitarian activities here, as with any of the others along the bayshore.

Large-Gastropod Shell Middens on St. Joseph Bay

In the southwest corner of the Apalachicola delta, enclosed by the 24 km (15 mile)-long St. Joseph Peninsula, is St. Joseph Bay (see Figures 1, 10). It is unusual because it is extremely saline, as salty as the Gulf of Mexico, since few freshwater streams (at present, only two creeks) empty into it. Such an ecosystem provides different fauna (and flora) from

those of the other parts of Apalachicola Bay system. Instead of oyster or clam, the shell middens around St. Joseph Bay are dominated by large gastropods, mostly lightning whelk, *Busycon sinistrum* (formerly *contrarium*), and horse conch, *Triplofusus giganteus*. Sites range from individual piles of these large shells to continuous linear shoreline middens presumably made up of such piles (White 2005). Two islands out in the bay (Black's Island, 8GU11, and Conch Island, 8GU20) consist entirely or partially of large-gastropod shell midden.

The Lighthouse Bayou site (8GU114) has 16 individual shell piles ranging in age from prehistoric Fort Walton through protohistoric Lamar times. Piles are as small as 1.5 m in diameter and as large as 20 x 10-m ovals. The site is on the south side of the bay near a swale that fills seasonally with fresh water and in a place where winter cold causes sea turtles caught in the bay to swim south and potentially end up easily in human hands.

The 2013 USF field school investigated the Wildfire site (8GU229), which had only two small shell piles, one Fort Walton and one Lamar (Novell and White 2013). The latter pile had been destroyed in a firebreak, but we excavated about 75 percent of the undisturbed Fort Walton pile in a 2-x-2 m unit (Figure 13), removing a total of 130 large shells, 104 lightning whelk and 19 horse conch. Totals for all other faunal remains were 3 crown conchs, 2 unspecified *Busycon*, 2 unidentifiable smaller gastropods and, for bivalve shell, only 38 scallop, 1 cockle, and 1 oyster. Of course the large number of unidentifiable shell fragments means that these numbers only approximate what was originally discarded here. However, the data suggest that the site was a special-purpose camp to gather whelk and conch. Of the 51 ceramic sherds recovered, 12 were Fort Walton Incised and one Lake Jackson. There were no other artifacts and no bone. A radiocarbon date on charcoal inside a large shell in the middle of the pile was cal. A.D. 1290-1410, indicating middle to late Fort Walton.

Though we have no idea how many other shells, fish bone or other things the people camping at the Wildfire site threw back into the water, or what materials left there did not preserve, we can reconstruct the caloric value represented by the large shellfish and estimate that it might feed a group of four or five for about three to five days. Waselkov (1987:166) warns of all the "potential for mischief" in guessing at the number of site occupants and their length of stay at shell midden sites by computing daily consumption rates for the food remains recovered, and how evidence of food collection is not necessarily equivalent to evidence of consumption. We cannot assume all the shellfish at this site were immediately eaten. The meat might have been dried or smoked to take home or to exchange, and some shells, valuable commodities in the Southeast, might have been taken for trade and removed from the site. There is no adjacent water source, so perhaps fresh water, and preserved foods were brought in, and time of occupation was limited by those factors. Meanwhile, we cannot know if these large shellfish were gathered because they were all that was available in a lean season, or because they were a nice treat to schedule into the subsistence system, much like people today are out on St. Joe Bay collecting scallops the minute the season opens in July.

Richardson's Hammock site (8GU10) is a large, shallow midden characterized by a mostly continuous stratum (Figure 14) that is undoubtedly made up of similar piles left by campers over the centuries. It has a Middle Woodland sand burial mound at the north end, where a few Early Woodland Deptford sherds were also recovered, and a Fort Walton component at the south end, radiocarbon-dated to A.D. 1280-1400 (White 2005:30). Amid the shells are remains of fish, other kinds of shellfish, turtles, and ceramics, but no lithic artifacts. The majority of shell artifacts made from the whelks and conchs (Eyles 2004) appear to be utilitarian, often expedient tools (slightly modified pieces of shell used briefly and discarded). A conscientious collector shared his find of a cache of 23 pointed columella tools, left as if forgotten by a craftworker or trader. An interesting feature was an arc of sunray venus clam shells (*Macrocallista nimbosa*) laid carefully in the ground nested upright on the short end (Figure 15). While this could have been evidence of some kind of ritual practice, it could also have been left by a kid playing the prehistoric equivalent of dominoes. Other features were small black postmolds and individual shell trash pits that extended into the white sand subsoil.

Richardson's Hammock is the first site to have been examined for seasonality of shellfish collection using shell chemistry. Ryan Harke's (2012) sclerochronology study of the periodic growth structures in shells by stable-isotope analysis examined 11 shells, comparing them with modern specimens collected from St. Joseph Bay and also from Tampa Bay. Oxygen isotopes suggested year-round collection. I would not have expected summer occupation because of the nearly unbearable insects (which made archaeological investigation difficult). Meehan's (1982) ethnography of Australian aboriginal shellfishers and other such useful studies document many reasons for seasonal movement, from weather to insects to other scheduling issues. But rather than indicating a population that stayed at the site over the course of a year, the results for Richardson's Hammock might indicate that people repeatedly visited at different seasons for different reasons (convenience? cravings for whelk and conch meat? ritual calendar event?). Harke's data on carbon isotopes showed that the prehistoric shells were far less depleted than the modern shells from both bays. This is undoubtedly a result of recent pollution from urban development and the notorious paper and chemical plants in the town of Port St. Joe. Archaeological shells are useful not only for understanding past human behavior but also modern processes; this is applied anthropology.

Summary of Estuarine and Coastal Shell Middens

Especially with coastal shell middens, natural processes cut away and redeposit cultural soils, and therefore leave a biased record, most often on the barrier islands, the most dynamic landforms. Modern coastal development, mining shell for road building, and other historic processes have also damaged or destroyed sites for the last two centuries.

Figure 13. Test unit (2 x 2 m) at the Wildfire site (8GU229) exposing top of individual pile of whelk and conch shells. View facing north; about 25 percent of the pile remains unexcavated beyond the northwest wall (under the gloves).

Certainly natives mining their own or earlier shell middens for construction materials have altered tremendously or removed these sites over thousands of years as well. But the remaining archaeological record does show that nearly all the archaeological sites known on the coast are all or partially shell middens – not unexpectable when the resource is so abundant.

So far the data from both the estuarine clamshell middens and the coastal oyster middens overwhelmingly inform us about subsistence practices. More comparative work is needed to see how different they are from shell midden sites elsewhere in Florida and all along the Gulf Coast, not to mention the Atlantic. For example, in south peninsular Florida the quahog or Venus clam, *Mercenaria campechiensis*, commonly makes up the bulk of many midden deposits. But this species is rare in northwest Florida. It occurs live in the Gulf, but archaeologically only in a few shell tools, and not so far in any food debris.

Interestingly, there is so far no evidence for agriculture at any of the coastal and estuarine sites, though many are Fort Walton and later in temporal and cultural affiliation. Maize remains and cob-marked pottery are documented from inland Fort Walton sites (White et al. 2012:263), including those like Curlee (described above), which have freshwater shell midden deposits. The intensive farming in the upper and middle valley interior was coupled with wide collection of wild resources, including shellfish. But in the lower valley delta wetlands and on the coast, late prehistoric subsistence was apparently still based on aquatic resources, as in earlier millennia (though aquaculture or other manipulation of wild resources is also possible). Perhaps maize was brought in when upriver people visited (traded for smoked oysters?). To the west, maize at coastal sites is known from the Choctawhatchee Bay area (Mikell 1990) and the Bottle Creek mound complex in the Mobile delta of Alabama (Brown 2003:22). It may have been brought into these sites, not grown there on the swampy, low, salty coast. The Bottle Creek maize is thought to have been brought in already processed, possibly as tribute (Scarry 2003:124-28).

The coastal shell midden sites in the Apalachicola delta also have the only evidence in this valley for use of shell

Figure 14. Test Unit B, north wall, at Richardson's Hammock site (8GU10), showing continuous stratum of large-gastropod shell midden in black sand, overlying culturally-sterile white dune sand (large root is in foreground).

Figure 15. Unusual feature in Test Unit A at Richardson's Hammock site (8GU10): an arc of sunray Venus clamshells (ritual deposit, child's play, or something else?).

midden deposits for later construction, both for lenses and strata in Early-Middle Woodland burial mounds and for building a Fort Walton temple mound at Pierce. Whether these were sacred deposits in ritual architectural fabrication is not yet known. Surely the mounds served as monuments of some kind, perhaps drawing later people back to reoccupy, maybe also to honor the ancestors.

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Discussions

In sum, for the Apalachicola/lower Chattahoochee valley of northwest Florida, south Georgia and Alabama, shell middens range from one meal's garbage pile to thick strata, ridges, and mounds. The typology includes inland middens of river mussels and snails, estuarine and bayshore middens of marsh clam and oyster, and large whelk and conch middens on St. Joseph Bay. They appear by the Late Archaic and may be reoccupied through protohistoric times, showing subsistence continuity. Most are refuse deposits, the larger ones linear or curved along stream banks. Some shell was reused in Middle Woodland burial mounds and also to construct a Fort Walton temple mound, so food garbage sometimes became construction material with possible sacred associations.

Subsistence, Settlement, and Environment

These diverse types of shell midden sites might have been year-round or temporary settlements occupied for the easy harvest of aquatic species, with fish and turtle clearly being a greater food source than shellfish when amounts of meat are considered. These sites overwhelmingly indicate exploitation of locally available shellfish species, probably just like gathering any other accessible resource. Waselkov (1987:167) notes how such sites show close correspondence

between species collected and those available in the immediate site environs; ethnographically-known groups considered proximity to shellfish beds important for selecting base camp locations. Environmental conditions can vary throughout the year and thus affect the season of shellfish availability and consequent human settlement systems (Meehan 1982, Waselkov 1987:114). The sites could have been just processing stations to extract the meat and leave the heavy shell near the place of collection (Waselkov 1987:114-115), but camping for a day to process them, if done over years and centuries, can accumulate a big pile of trash. Or these sites can represent more sedentary settlements where resource abundance and reliability allowed people to stay for a long time.

Marquardt (2010:561) suggests that indigenous Americans did not live right on top of their shell middens because of the smell, attraction for insects and other animals, potential for disease, and shoreline flooding. But if they were short-term camps that people left and returned to later, the shell could be bleached out, the organic waste decayed, and the surface high and dry for camping again. If they stayed longer, they could move their habitation zone a few meters away along the bank and in this way also continue construction of these linear midden ridges and mounds. These processes are seen in south Florida (Marquardt 2010:555-557), where exposure of older shell midden can result in the occurrence of "clean shell" without much organic or soil residue, but does not represent deliberate preparation or gathering of construction materials. Thompson and Andrus (2011:144) examined season of harvest for individual shells, and suggested that old shell middens were preferred in selecting sites because they were a good matrix for shellfish roasting and steaming pits.

Though there is no evidence as yet, there is a possibility that native people built stilt houses, which are well known in other parts of the world (e.g., southeast Asia, Oceania), from which they could throw garbage over the side into the water or marsh and build up a midden. I have visited traditional longhouses of several ethnic groups in Borneo, where the elevated house on sturdy ironwood pillars collects midden underneath – food garbage, human waste, whatever – much of which is then eaten by pigs, dogs, and other scavengers. Waselkov (1987:116-117) describes dwelling types for ethnographic groups who make shell middens. These range from simple shelters set into depressions on the surface of the midden, with interior hearths, and disposal of shell garbage outside the hut, to more substantial structures with sturdy walls and wooden posts. So far, the large coastal site of Richardson's Hammock is the only Apalachicola region shell midden with multiple postmolds indicating structures, though the small diameters of these features suggest only flimsy shelters, drying racks or other insubstantial construction.

The resources were harvested and used in many ways: shellfish were roasted, baked, boiled, steamed, cracked open and shucked (Waselkov 1987:100). YouTube videos easily available online show how large conchs are processed at Caribbean tourist sites by hammering open the shell on the upper spiral and extracting the animal. The meat can be dried, salted, smoked or otherwise processed for storage, so it could have easily been exchanged along the riverine waterways. Evidence for all these strategies, however, is so far unknown. Tools in the Apalachicola shell middens seldom are of stone, and those of shell are mostly utilitarian. No artifacts made of smaller shells – river molluscs, marsh clams, or oyster, are known. Only sturdy *Busycon* whelks and horse conch, and very rarely, the thick *Mercenaria* (quahog) clam, were used for everyday tools and items such as shell beads, with the occasional *Marginella* or olive shell bead as well. Probably most toolkits were of easily available wood.

Study of subsistence information from shell middens in the region has barely scratched the surface. Vast amounts of faunal assemblages remain to be examined. Site formation processes need to be examined to find stratigraphic differences where none are apparent, and more dates obtained to see rates of midden accumulation. More seasonality analysis may become possible with better archaeometric methods. Examinations of middens of different time periods elsewhere in Florida and the coastal South are showing some seasonality but also a great deal of year-round habitation (Quitmyer 2013; Quitmyer and Jones 1997; Thompson and Andrus 2011). Marquardt and Walker (2013) found that people at Pineland, in south peninsular Gulf Coast Florida, were mostly there year-round, evidently using long-traditional knowledge to gather species at the different times of their maximum biomass or other advantageous factors.

Seasonality is a tricky issue that is intimately tied up with social organization and even ideological systems. We have little ethnographic data specifically pertaining to the Apalachicola-lower Chattahoochee region. But one interesting historical source is an adventure tale written by Frenchman Pierre Viaud in 1767 and later confirmed by a historian (Fabel 1990). Viaud was shipwrecked in 1766 on Dog Island, on the east side of the lower Apalachicola delta, and wandered the barrier islands until he was rescued. He noted an encounter with Antonio the Indian, who was staying in a hut, wintering on the island with his (matrilineal) family consisting of his mother, wife, sister and nephew, to fish, moving slowly along the coast; Viaud also noted how other Indians left home to go hunting in winter, returning to their mainland villages by April (Fabel 1990:55-60).

The shell middens offer great potential to document how human groups adapted to large-scale and local climate change. As described, they can indicate aspects of fluvial shifts in this river system, which has been moving eastward for so long. Marquardt (2010:559-60) notes how the diversity, types, and sizes of fish and shellfish in middens at Pineland show how the local environment and cultural practices changed in response to sea level fluctuations. Examination and dating of the underlying culturally-sterile subsoil could indicate how past peoples chose locations for shellfish collection in the first place, and how shorelines might have become stabilized enough for human occupation (e.g., Shiner et al. 2013). If shellfish collecting really only did begin as post-Pleistocene environments transformed human adaptations, archaeological research can contribute to analyses of human responses to global warming (Van de Noort 2013).

A huge amount of work remains to be done in the Apalachicola-lower Chattahoochee region along the lines of shell midden studies elsewhere in the South (e.g., Peacock 2000). This includes measurement of individual shells, calculations of size, shape, and relative frequency variations of different species over time, comparison with modern natural species assemblages to show ecological change or cultural change in dietary preferences, and exploration of the possibilities of prehistoric overexploitation of different shellfish beds. Archaeological shells could show effects of past and modern land-use practices to address current management issues such as impacts of agricultural runoff, stream channelization, impoundment through dams, and so on. Results can be useful, often unexpected; for example, Peacock and coauthors (2013) determined how an Arkansas stream that is still free-flowing and relatively unmodified has modern shellfish assemblages that are not much changed from what is evident in the prehistoric shell midden sites along it. A major goal, then, should also be good applied anthropology.

Construction, Intent, and Ideology

Many researchers now emphasize ideological and political aspects of shell middens in the southeastern U.S., how they can be special places for ritual and feasting, and monuments symbolizing political power (e.g., Gibson and Carr 2004; Randall 2008; Randall et al. 2014; Thompson and Andrus 2011). Similar findings come from elsewhere in the world, especially with the benefit of bioarchaeological approaches. For example, *sambaquis* in Brazil are now viewed from perspectives of biology, labor, monumentality, and cemetery construction, and even include offerings of fish and other animals in graves; however they are also still well understood as huge accumulations of shell midden refuse (Roksandic et al. 2014). It has taken a while for archaeologists to realize that ancient peoples did not have to be settled farmers to construct monumental sites. The elaborate stone circles and carved megaliths of Turkey's Göbekli Tepe site were built 12,000 years ago by nomadic hunter-gatherers with no domestic draft animals (Scham 2008). Archaic mounds and earthworks at Watson Brake and Poverty Point in Louisiana are as old as 5,400 and 3,500 years, respectively, and were made by what are interpreted to be mobile but socially-complex foraging peoples (Gibson and Carr 2004).

Some shell middens, especially on the Atlantic coast, including in Florida, are shaped like rings, and their architecture and stratigraphies have been related to change through time in social organization and ceremonial practice, with inference of egalitarian, ranked, or stratified society (e.g., Russo 2004, 2006, 2008; Thompson and Andrus 2011). Two or three shell "rings" have been recorded in northwest Florida, on Choctawhatchee Bay some 170 km (100 miles) west of the Apalachicola delta, but Russo (2006:58, 151-154) notes that they are inadequately documented and atypical, and may not be rings or ceremonial places at all. Perhaps ring construction was a phenomenon restricted to the Atlantic-draining stream basins of the Southeast, and absent from Gulf of Mexico drainage systems. As to whether they are ceremonial places, deliberate shaping of garbage into rings may reflect construction of these sites as monuments, but it could also just reflect camp layout with dwellings in a circle for social and practical reasons (easier babysitting if you can see all the families' houses). Further, though many of these shell rings are obviously circles, others are horseshoe-shaped or partial ovals or of other more amorphous configurations, possibly following the meander curves of stream banks. This is certainly the case with the estuarine shell midden mounds of the lower Apalachicola delta (see Figure 8), as noted; even when they are no longer on a direct bank after some fluvial shift, their shapes cannot be random but more logically reflect the typical flow of the river's tributary and distributary creeks.

Feasting is another hot topic in shell midden studies of late. For example, Thompson and Andrus (2011) looked at season of harvest for shellfish at Georgia coast shell rings and found a contrast between gradually accumulating strata in some areas and rapid, large-scale deposition in other areas. They interpreted the latter as refuse from feasting that then constituted commemorative monuments. This is the type of fine-scale study necessary in the Apalachicola region; compositional differences do exist within shell middens that might indicate such special activities. However, evidence of feasts –special meals for larger numbers of people requiring distinctive foods and preparations and larger amounts of food, and commemorating some important ceremonial occasion –is often ambiguous. Greater amounts or faster timing of food-waste deposition could seem like debris from a feast but may just be from spring cleaning or mass processing episodes. Even the presence of rare food types could mean simply that some species happened to be more available at a particular season or by chance, like we might have steak for a week if there is a discount special on it at the grocery store.

So far the archaeological record of shell middens in the Apalachicola-lower Chattahoochee valley region has only a small amount of evidence that can reliably be interpreted in any ideological context. None is known for the Archaic period (White 2004). No deliberate rings or other apparent intentional shapes have yet been recognized for any time period. As described, the only two burials recorded so far (outside of those in nearby sand burial mounds) appear Late Archaic in age and done with little ceremonial accompaniment to placing the deceased in the trash heap. Though probably not constructed as deliberate monuments, the larger/more visible shell midden sites with mounds and long ridges probably became monumental in the sense that later peoples might have chosen to reoccupy them often with their ancient forbears in mind, whether for practical or reverential reasons or both. An example of this is at Pierce, with its multiple components. Any large-scale architecture must be understood from multiple perspectives, from functional to ideological. Mounds, platforms, or ridges can accumulate as dumps, can be levees or other structures to raise people above a flood level, and can also, even simultaneously, commemorate or symbolize something; their significance can also change over time.

In the lower Apalachicola delta, the rare use of shell for special construction in Early and Middle Woodland burial mounds and a temple mound could also be utilitarian if it is the closest, cheapest building material available, or it could be ritual that we are far from understanding. Humanistic speculation is fun, and certainly there were social differences and complex religious practices throughout prehistory. During eight months of study in Borneo (in 2007 and 2014), I witnessed how coastal and riverine indigenous groups still make astoundingly diverse assemblages of complex fishing gear of bamboo and rattan (and now plastic strip) in all shapes and sizes, for many different kinds of aquatic environments. Incorporated into these utilitarian objects are designs symbolizing concepts beyond the mundane, relating to beliefs about esthetic, social and magical things. Had we a Florida site with preserved fishing nets, traps, baskets, weirs, and other devices, which could all have been made of sturdy river cane, wood, and other fibers, we probably would appreciate more the kinds of subsistence pursuits that the people who created shell middens might have undertaken on a daily basis. If the shape of the artifact or the pattern woven into it had a ritual symbolism, then people also might have had daily spiritual or other non-material reminders of the abundance of their rich aquatic environments. In short, I am very willing to say that shell middens and activities represented by them probably served sacred or spiritual functions, but cannot do so without convincing scientific evidence.

Social and Economic Aspects

Related to issues of ideology and monument-building is the socio-political organization of peoples who left shell midden sites in the Apalachicola-lower Chattahoochee region. Given the great time depth and spatial expanse, social systems must have varied from small seasonal groups of foragers to centrally-organized village agriculturalists, since the sites range from Late Archaic through Fort Walton in age, and interior riverine to coastal in location. The lack of domestic structure patterns or any other kind of social indicators beyond mound burials makes speculation difficult. As noted, settling on the bay or Gulf coast, with its reliable aquatic resources, may have meant more sedentary and complex social systems, even without an agricultural foundation, in the Apalachicola region, as in many other parts of the world (Álvarez et al. 2011:3-4; White 2014:237), though archaeological evidence for what constitutes native hierarchies is always controversial. Similarly, whether shell midden/mound construction might have been "a symbolic strategy to link people together in regional alliances or to demarcate territories...necessary only where population levels were high and competition for resources was intense" (Anderson et al. 2007:463), is an interesting but still only speculative possibility.

Long-distance socioeconomic interaction is a more visible aspect of Apalachicola coastal shell middens. Shellfish were obtained for more than subsistence; marine shell artifacts moved far inland from at least Early Woodland times onward. Scrapers and awls, more decorative items such as pins, beads, and pendants, and especially cups, presumably for drinking the ritual black drink (Hudson 1979), are found well into the interior, upriver in this valley and all over the Southeast, often in ceremonial contexts such as graves.

The enormous abundance of the whelk and conch raw material in St. Joseph Bay might have been exploited by those coming to eat the shellfish, then moving the shells along in economic (or other types of) exchange. However this picture is also extremely speculative until trace element study or other materials-science investigation is done. While upriver people visiting St. Joseph Bay shell middens might have thought they were stepping onto a Fort Knox, with all the wealth of large gastropod shell lying around, (see Figure 14) the sites themselves so far have little evidence for ritual object production or connections with the interior through trade or other exchange, as most of the shell artifacts are utilitarian implements. However, as with most such systems, the connections are probably not very visible.

Inland and coastal peoples must have been distinctive but related by biological, social, and economic ties, as everywhere else in the world. The river system is the central network for the flow of people, goods, and information. I visited some of the interior ethnic groups in Borneo who are collectively known as *Orang Ulu*, upriver people, as opposed to coastal peoples. No matter how difficult the travel, up mountains and well past the point where streams were navigable, both groups of peoples always had connections, no matter how sporadic or irregular. At present, evidence relating to ethnicity among any aboriginal societies in the Southeast is difficult to come by, even in historic times. Some of the whelk/conch shell piles around St. Joseph Bay were left by people who made Lamar ceramics (White 2005; Novell and White 2013). Lamar is now fairly well dated in this valley to about A.D. 1700 (Du Vernay 2011; White 2014), and its abrupt appearance and striking differences from Fort Walton material culture suggest that these historic Indians were not native to the region but moved in for a short time. It is so far unknown whether they were Apalachee or other missionized groups fleeing the attacks by the British and Creeks from Georgia, or someone else.

Another social issue is gender. Some researchers have suggested, based on ethnographic data, that shellfish collection was done by women (Claassen 1991b; Meehan 1982) and thus shell midden archaeology can be a way of seeing gender in the prehistoric past. Radical feminist that I am, I still cannot see much scientific support for this hypothesis. Even if there were something like DNA residues on the shells, it would not prove who was the primary collector, only who handled them for some reason. Bone chemistry might eventually indicate who ate more shellfish, but again this does not mean that those people were also the collectors. Meanwhile, essentialist views of gender in prehistory that see women doing the easy tasks because they must care for children are overturned by countless ethnographic descriptions of women who hunt and men who collect. It is usually so easy to pick up shellfish that I think any adults, feeling lazy, would simply tell the kids to go get dinner in the water because mom and dad are tired tonight! Shell middens might be indicators of child labor practices.

Summary

Future work on shell middens in the Apalachicola-lower Chattahoochee valley should utilize fine-scaled individual site data to establish models of landscape, demographic and local population changes and social intensification, responses to climate change, and natural processes that modify the archaeological record, from sea-level fluctuations to storm activities to stability in coastal landforms. A first step is establishing the typology upon which to base models. A recent example of this in Australia (Morrison 2013) defines three broad types, based on stratigraphy and composition: light shell scatters; low shell mounds up to 30 cm thick, with little internal layering, overlying natural strata; and 'classic' shell mound deposits with complex stratigraphy. The last type shows patterns of shifting local discard through time, so that repeated midden deposition in a specific area leads to the formation of new mounds, which then coalesce further to form large elongated mounds and ridges (Morrison 2013: 178-179). Given this classification, new data can then be compared and the model refined.

The recent trendy archaeology attributing the building of mounded shell middens to the ritual purposes of native leaders striving for wealth and power provides explanation that is not yet scientifically testable, and ignores the sophisticated abilities of Native Americans to develop strategies for practical reasons under different environmental conditions (Marquardt 2010:566). Even if it all was testable, we need to establish culture history and discern site types first before we attempt analysis. Apalachicola-lower Chattahoochee shell midden sites are like so many others across the South and elsewhere in representing "multiple processes and behaviors over time" (Thompson and Andrus 2011:318). Until more intensive and sophisticated research is possible, so far in the Apalachicola Valley region (to paraphrase Freud's quote about cigars), sometimes a shell midden is just a shell midden.

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Notes

1. Abbreviations for Table 1:

bur	burial
Carr	Carrabelle Incised or Punctated sherds
cer	ceramic
ch-st	check-stamped sherds
Chatt Br	Chattahoochee Brushed sherds
cobmk	cobmarked sherds
Cool Br	Cool Branch Incised sherds
cordmk	cordmarked sherds
Dept	Deptford (Early Woodland)
EWd	Early Woodland
f-t	fiber-tempered (Late Archaic) sherds
FW	Fort Walton
gr	ground
greenst	greenstone
grit-t	grit-tempered plain sherds
grog-t	grog-tempered plain sherds
hist	historic
inc	incised
indet	indeterminate
Keith	Keith Incised sherds
LArch	Late Archaic
lg	large
LC	Lower Creek/Seminole (historic)
LJ	Lake Jackson sherds
LWd	Late Woodland (late Weeden Island)
md	mound
MWd	Middle Woodland (Swift Creek-early Weeden Island)
Pens	Pensacola (shell-tempered)
pl	plain
Pt Wash	Point Washington Incised sherds
pt	projectile point
punc	punctate
red	red-painted or -filmed sherds
s-st	simple-stamped (usually Deptford) sherds
-st	stamped sherds
stp	sand-tempered plain sherds
Sw Cr	Swift Creek Complicated-Stamped sherds
w/	with
Wd	Woodland
WI	Weeden Island

References Cited

Álvarez, Myrian, Ivan Briz Godino, Andrea Balbo, and Marco Madella
2011 Shell Middens as Archives of Past Environments, Human Dispersal and Specialized Resource Management. *Quaternary International* 239:1-7.

Anderson, David G., Michael Russo, and Kenneth E. Sassaman
2007 Mid-Holocene Cultural Dynamics in Southeastern North America. In *Climate Change and Cultural Dynamics: A Global Perspective on Mid-Holocene Transitions*, edited by David G. Anderson, Kirk A. Maasch, and Daniel H. Sandweiss, pp. 457-490. Academic Press, London.

Andrews, Jay D.
1951 Range and Habitat of the Clam Polymesoda Caroliniana (Bosc) in Virginia (Family Cycladidae). *Ecology* 32(4):758-760.

Auil-Marchalleck, Stephanie, Colleen Robertson, Angela Sunley, and Lance Robinson
2000 Preliminary Review of Life History and Abundance of the Atlantic Rangia (*Rangia cuneata*) with Implications for Management in Galveston Bay, Texas. *Management Data Series* No. 171, Coastal Fisheries Division, Texas Parks and Wildlife, Austin.

Belovich, Stephanie J., David S. Brose, Russell M.Weisman, and Nancy Marie White
1982 *Archaeological Survey at George W. Andrews Lake and Chattahoochee River, Alabama and Georgia.* Cleveland Museum of Natural History Archaeological Research Report No. 37.

Blitz, John H., and Karl G. Lorenz
2006 *The Chattahoochee Chiefdoms*. The University of Alabama Press, Tuscaloosa.

Brown, Ian W. (editor)
2003 *Bottle Creek: A Pensacola Culture Site in South Alabama*. University of Alabama Press, Tuscaloosa.

Claassen, Cheryl
1991a Normative Thinking and Shell-Bearing Sites. In *Archaeological Method and Theory* 3:249-298.
1991b Gender, Shellfishing, and the Shell Mound Archaic. In *Engendering Archaeology: Women and Prehistory*, edited by Joan M. Gero and Margaret W. Conkey, pp. 276-300. Blackwell Publishing, London.
1998 *Shells*. Cambridge Manuals in Archaeology. Cambridge University Press, Cambridge, UK.

Donoghue, Joseph F., and Nancy Marie White
1995 Late Holocene Sea Level Change and Delta Migration, Apalachicola River Region, Florida. *Journal of Coastal Research* 11(3):651-663.

Du Vernay, Jeffrey P.
2011 *The Archaeology of Yon Mound and Village, Middle Apalachicola River Valley, Northwest Florida*. Ph.D. dissertation, Department of Anthropology, University of South Florida, Tampa. Electronic document, http://search.proquest.com/pqdtft/docview/876176915/7EAFD5A2108544AEPQ/1?accountid=14745, accessed June 30, 2014.

Eyles, Eric
2004 *Prehistoric Shell Artifacts from the Apalachicola River Valley Area, Northwest Florida*. Master's. thesis, Department of Anthropology, University of South Florida, Tampa. Electronic document, http://etd.fcla.edu/SF/SFE0000498/eeylesthesis.pdf, accessed June 21, 2014.

Fabel, Robin F. A. (translator and editor)
1990 *Shipwreck and Adventures of Monsieur Pierre Viaud [Naufrage et aventures de M. Pierre Viaud, natif de Bordeaux, Capitaine de Navire…*originally published 1768 by P. Viaud, France]. University Press of Florida, Gainesville.

Fandrich, Judith E.
1989 Yellow Houseboat (8GU55) and Clark Creek (8GU60) Shell Mounds and The Corbin-Tucker Site (8CA142) Faunal Remains. In *Archaeological Investigations at Six Sites in the Apalachicola River Valley, Northwest Florida.* National Oceanic and Atmospheric Administration Technical Memorandum, NOSSRD 26., Appendix 1B, Tables A1.17-A1.22, pp. 233-237, 251-256. Department of the Interior, Washington, D.C.

Faught, Michael K.
2004 The Underwater Archaeology of Paleolandscapes, Apalachee Bay, Florida. *American Antiquity* 69:275-289.

Fradkin, Arlene
1994 *Prehistoric Estuarine Adaptations in the Lower Apalachicola River Valley: The Archaeological Faunal Assemblages from Van Horn Creek and Sam's Cutoff Shell Mounds*. Report submitted to the Department of Anthropology, University of South Florida. Environmental Archaeology Range, Florida Museum of Natural History, Gainesville.

Gibson, Jon L., and Philip J. Carr (editors)
2004 *Signs of Power. The Rise of Cultural Complexity in the Southeast.* University of Alabama Press, Tuscaloosa.

Glowacki, Mary, and Andrea White
2005 *Inventory and Assessment of Cultural Resources in the Box-R Wildlife Management Area, Franklin County, Florida*. CARL Archaeological Program, Florida Bureau of Archaeological Research, Tallahassee.

Griffin, John W.
1988 *The Archaeology of Everglades National Park: A Synthesis*. National Park Service, Southeast Archaeological Center, Tallahassee.

Harke, Ryan M.
2012 *Stable Isotope Analysis of Busycon sinistrum to Determine Fort Walton-Period Seasonality at St. Joseph Bay, Northwest Florida*. Master's thesis, Department of Anthropology, University of South Florida. Electronic document, http://scholarcommons.usf.edu/etd/4328/, accessed September 20, 2014.

Hockersmith, Kelly S.
2004 *Apalachicola's Gold: Archaeology and History of Tupelo Honey Production in Northwest Florida*. Master's thesis, Department of Anthropology, University of South Florida. Electronic document, http://scholarcommons.usf.edu/etd/1080/, accessed June 28, 2014.

Hudson, Charles (editor)
1979 *Black Drink: A Native American Tea*. University of Georgia Press, Athens.

Kimble, Elicia
2012 *Archaeological Survey and Testing on St. Vincent Island, Northwest Florida*. Master's thesis, Department of Anthropology, University of South Florida. Electonic document, http://search.proquest.com/pqdtft/docview/1264918877/D7CCC1629F3543F3PQ/1?accountid=14745, accessed June 29, 2014.

Marquardt, William H.
2010 Shell Mounds in the Southeast: Middens, Monuments, Temple Mounds, Rings, or Works? *American Antiquity* 75:551-570.

Marquardt, William H., and Karen J. Walker (editors)
2013 *The Archaeology of Pineland. A Coastal Southwest Florida Site Complex, A.D. 50-1710*. Monograph No. 4, Institute of Archaeology and Paleoenvironmental Studies, University of Florida, Gainesville.

Marrinan, Rochelle A., and Alexandra Parsons
2010 Faunal Remains from St. Vincent 5 (Pickalene Midden), 8FR364. Report to the University of South Florida Archaeology Lab. In *Archaeological Survey and Testing on St. Vincent Island, Northwest Florida*, by Elicia Kimble, pp. 177-186. Master's thesis, University of South Florida Department of Anthropology.

Marrinan, Rochelle A., and Nancy Marie White
2007 Modeling Fort Walton Culture in Northwest Florida. *Southeastern Archaeology* 26:292-318.

Meehan, Betty
1982 *Shell Bed to Shell Midden*. Australian Institute of Aboriginal Studies, Canberra.

Mikell, Gregory A.
1990 The Sheephead Bayou Site (8BY150): A Single Component Fort Walton Hamlet Site in Northwest Florida. *The Florida Anthropologist* 43:198-208.

Milanich, Jerald T.
1974 Life in a Ninth Century Household: A Weeden Island Fall Winter Site in the Upper Apalachicola River, Florida. *Bureau of Historic Sites and Properties Bulletin* No. 4, Florida Department of State, Tallahassee.

Moore, Clarence Bloomfield
1902 Certain Aboriginal Remains of the N.W. Florida Coast, Part II. *Journal of the Academy of Natural Sciences of Philadelphia* 12:123:355.

Morrison, Mick
2013 From Scatter to Mound: A New Developmental Model for Shell Mound Sites at Weipa. *Queensland Archaeological Research* 16:165-184.

Novell, Evan, and Nancy Marie White
2013 *Archaeological Investigations at the Wildfire Site, 8GU229, St. Joseph Bay, Northwest Florida*. Report to the Florida Division of Historical Resources, Tallahassee.

Parker, Brian Thomas
1994 *Archaeological Investigations of the Thank You Ma'am Creek site, Northwest Florida*. Master's thesis, Department of Anthropology, University of South Florida, Tampa.

Peacock, Evan
2000 Assessing Bias in Archaeological Shell Assemblages. *Journal of Field Archaeology* 27:183-196.

Peacock, Evan, Amy Moe-Huffman, Robert J. Scott, and Marvin D. Jeter
2013 Prehistoric Freshwater Mussell Faunas from Bayou Bartholomew, Southeastern Arkansas. *Southeastern Archaeology* 32:1-13.

Pearson, Charles E., Richard A. Weinstein, Sherwood M. Gagliano, and David B. Kelley

2014 Prehistoric Site Discovery on the Outer Continental Shelf, Gulf of Mexico, United States of America. In *Prehistoric Archaeology on the Continental Shelf: A Global View*, edited by Amanda M. Evans, Joseph C. Flatman, and Nicholas C. Fleming, pp. 53-71. Springer Press, New York.

Percy, George W.
1976 *Salvage Investigations at the Scholz Steam Plant Site, A Middle Weeden Island Habitation Site in Jackson County, Florida.* Bureau of Historic Sites and Properties Miscellaneous Project Report Series 35. Division of Archives, History, and Records Management [now Division of Historical Resources], Florida Department of State, Tallahassee.

Puglisi, Melany P.
2008 *Crassostrea virginica*. Smithsonian Marine Station at Fort Pierce Species Inventory. Electronic document, http://www.sms.si.edu/irlspec/Crassostrea_virginica.htm, accessed June 28, 2014.

Quitmyer, Irvy R.
2013 Precolumbian Site Seasonality and Harvest of Estuarine Resources at the Pineland Site Complex. In *The Archaeology of Pineland. A Coastal Southwest Florida Site Complex, A.D. 50-1710*, edited. by William H. Marquardt and Karen J. Walker, pp. 349-372. Monograph No. 4, Institute of Archaeology and Paleoenvironmental Studies, University of Florida, Gainesville.

Quitmyer, Irvy R., and Douglas S. Jones
1997 The Sclerochronology of Hard Clams, *Mercenaria* spp., from the Southeastern U.S.A.: A Method of Elucidating the Zooarchaeological Records of Seasonal Resource Procurement and Seasonality in Prehistoric Shell Middens. *Journal of Archaeological Science* 24:825-840.

Randall, Asa R.
2008 Archaic Shell Mounds of the St. Johns River, Florida. *The SAA Archaeological Record* 8:13-17.

Randall, Asa R., Kenneth E. Sassaman, Zackary I. Gilmore, Meggan E. Blessing and Jason M. O'Donoughue
2014 Archaic Histories Beyond the Shell "Heap" on the St. Johns River. In *New Histories of Pre-Columbian Florida*, edited by Neill J. Wallis and Asa R. Randall, pp. 18–37. University Press of Florida, Gainesville.

Roksandic, Mirjana, Sheila Mendonça de Souza, Sabine Eggers, Meghan Burchell, and Daniela Klokler (editors)
2014 *The Cultural Dynamics of Shell Middens and Shell Mounds: A Worldwide Perspective*. University of New Mexico Press, Albuquerque.

Russo, Michael
2004 Measuring Shell Rings for Social Inequality. In *Signs of Power: The Rise of Cultural Complexity in the Southeast*, edited by Jon L. Gibson and Philip J. Carr, pp. 26-70. University of Alabama Press, Tuscaloosa.
2006 *Archaic Shell Rings of the Southeast U.S*. National Historic Landmarks Historic Context. Southeast Archaeological Center, National Park Service, Tallahassee. Electronic document, http://www.nps.gov/nhl/learn/themes/ArchaicShellRings.pdf, accessed June 22,2014.
2008 Late Archaic Shell Rings and Society in the Southeast U.S. *The SAA Archaeological Record* 8:18-22.

Saunders, Rebecca, and Michael Russo
2011 Coastal Shell Middens in Florida: A View from the Archaic. *Quaternary International* 239:38-50.

Scarry, C. Margaret
2003 Food Plant Remains from Excavations in Mounds A, B, C, D, and L at Bottle Creek. In *Bottle Creek: A Pensacola Culture Site in South Alabama,* edited by Ian W. Brown, pp. 114-129. University of Alabama Press, Tuscaloosa.

Scham, Sandra
2008 The World's First Temple. *Archaeology* 61(6):22-27.

Schieffer, Adam M.
2013 *Archaeological Site Distribution in the Apalachicola/Lower Chattahoochee River Valley of Northwest Florida, Southwest Georgia, and Southeast Alabama*. Master's thesis, Department of Anthropology, University of South Florida. Electronic document, http://scholarcommons.usf.edu/etd/4576/, accessed June 28, 2014.

Shiner, J. S., P.C. Fanning, S. J. Holdaway, F. Petchey, C. Beresford, E. Hoffman, and B. Larsen
2013 Shell Mounds as the Basis for Understanding Human-Environment Interaction in Far North Queensland, Australia. *Queensland Archaeological Research* 16:65-92

Thompson, Victor D., and C. Fred T. Andrus
2011 Evaluating Mobility, Monumentality, and Feasting at the Sapelo Island Shell Ring Complex. *American Antiquity* 76:315-343.

Van de Noort, Robert
2013 *Climate Change Archaeology: Building Resilience from Research in The World's Coastal Wetlands*. Oxford University Press, New York.

Walker, Karen Jo
1988 Faunal Remains from Five Apalachicola River Sites. In *Archaeological Investigations at Six Sites in the Apalachicola River Valley, Northwest Florida*. National Oceanic and Atmospheric Administration Technical Memorandum, NOSSRD 26., Appendix 1A, Tables A1.4-Ai16, pp. 227-232, 239-260 U.S. Department of the Interior, Washington, D.C.

Walker, Karen J., Frank W. Stapor, Jr., and William H. Marquardt
1995 Archaeological Evidence for a 1750-1450 BP Higher-than-Present Sea Level Along Florida's Gulf Coast. In *Holocene Cycles: Climate, Sea Levels, and Sedimentation*, edited by Charles. W. Finkl, pp. 205–218. Special Issue No. 17, *Journal of Coastal Research*. Coastal Education and Research Foundation, Charlottesville, Virginia.

Waselkov, Gregory A.
1987 Shellfish Gathering and Shell Midden Archaeology. *Advances in Archaeological Method and Theory* 10:93-210.

White, Nancy Marie
1981 *Archaeological Survey at Lake Seminole.* Cleveland Museum of Natural History Archaeological Research Report No. 29.
1982 *The Curlee Site (8JA7) and Fort Walton Development in the Apalachicola Lower Chattahoochee Valley, Northwest Florida*. Ph.D. dissertation, Department of Anthropology, Case Western Reserve University, Cleveland.
1987 Shell Mounds of the Lower Apalachicola Valley, Northwest Florida. *The Florida Anthropologist* 40:170 174.
1994 *Archaeological Investigations at Six Sites in the Apalachicola River Valley, Northwest Florida.* National Oceanic and Atmospheric Administration Technical Memorandum, NOSSRD 26. U.S. Department of the Interior, Washington, D.C.
2003 Testing Partially Submerged Shell Middens in the Apalachicola Estuarine Wetlands, Franklin County, Florida. *The Florida Anthropologist* 56(1):15-45.
2004 Late Archaic Fisher-Foragers in the Apalachicola-Lower Chattahoochee Valley, Northwest Florida-South Georgia/Alabama. In *Signs of Power. The Rise of Cultural Complexity in the Southeast*, edited. by Jon L. Gibson and Philip J. Carr, pp. 10-25. University of Alabama Press, Tuscaloosa.
2005 *Archaeological Survey of the St. Joseph Bay State Buffer Preserve, Gulf County, Florida*. Report to the Apalachicola National Estuarine Research Reserve, East Point, Florida, and the Division of Historical Resources, Tallahassee. Department of Anthropology, University of South Florida.
2010 Gotier Hammock Mound and Midden on St. Joseph Bay, Northwest Florida. *The Florida Anthropologist* 63(3-4):150-182.
2013 *Pierce Mounds Complex. An Ancient Capital in Northwest Florida*. Report to George Mahr, Apalachicola, and the Florida Division of Historical Resources, Tallahassee.
2014 Woodland and Mississippian in Northwest Florida – Part of the South but Different. In *New Histories of Pre-Columbian Florida*, edited by Neill J. Wallis and Asa R. Randall, pp. 223-242. University Press of Florida, Gainesville.

White, Nancy Marie, Jeffrey P. Du Vernay, and Amber J. Yuellig
2012 Fort Walton Culture in the Apalachicola Valley, Northwest Florida. In *Late Prehistoric Florida: Archaeology at the Edge of the Mississippian World*, edited by Keith Ashley and Nancy Marie White, pp. 231-274. University Press of Florida, Gainesville.

Willey, Gordon R.
1949 *Archaeology of the Florida Gulf Coast*. Smithsonian Miscellaneous Collections 113. Washington, D.C.

Williams, James D., and Arlene Fradkin
1999 *Fusconaia apalachicola*, a New Species of Freshwater Mussel (Bivalvia: Unionidae) from Precolumbian Archaeological Sites in the Apalachicola Basin of Alabama, Florida, and Georgia. *Tulane Studies in Zoology and Botany* 31(1):51-62.