Early metal use and crematory practices in the American Southeast

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Long-distance exchange of copper objects during the Archaic Period (ca. 8000–3000 cal B.P.) is a bellwether of emergent social complexity in the Eastern Woodlands. Originating from the Great Lakes, the Canadian Maritimes, and the Appalachian Mountains, Archaic-age copper is found in significant amounts as far south as Tennessee and in isolated pockets at major trade centers in Louisiana but is absent from most of the southeastern United States. Here we report the discovery of a copper band found with the cremated remains of at least seven individuals buried in the direct center of a Late Archaic shell ring located in coastal Georgia. Late Archaic shell rings are massive circular middens thought to be constructed, in part, during large-scale ritual gatherings and feasting events. The exotic copper and cremated remains are unique in coastal South Carolina and Georgia where Archaic-age cremations are conspicuously absent and no other Archaic copper objects have been reported. Elemental data produced through laser ablation inductively coupled plasma mass spectrometry shows the copper originated from the Great Lakes, effectively extending Archaic copper exchange almost 1,000 km beyond its traditional boundaries. Similarities in mortuary practices and the presence of copper originating from the Great Lakes reveal the presence of long-distance exchange relations spanning vast portions of the eastern United States and suggest an unexpected level of societal complexity at shell ring localities. These findings are consistent with the hypothesis that elite actors solidified their positions through ritual gatherings and the long-distance exchange of exotic objects during the Archaic.

long-distance exchange | Late Archaic | southeastern United States | archaeology | sociopolitical complexity

Long-distance exchange of prestige goods is an important factor in the emergence of expansive and more complex social relations spanning diverse communities (1–4). Within North America, the exchange of copper during the Archaic Period (ca. 8000–3000 cal B.P.) is a notable example of long-distance trade and nascent social complexity (5–8). Originating from the Great Lakes, the Canadian Maritimes, and the Appalachian Mountains, Archaic Period copper tools and objects were produced as early as 7500 cal B.P. (9). By the Late Archaic (ca. 5000–3000 cal B.P.), the production of utilitarian items, such as projectile points, was giving way to the creation of smaller, often decorative items (8, 10), which were traded in significant numbers as far south as Tennessee (11) and in isolated locales as distant as Poverty Point, LA (Fig. 1) (6, 12–15).

The creation of copper objects and the expansion of their exchange have been directly tied to rising sociopolitical complexity during the Late Archaic (8). As mobility decreased and population levels and densities increased, interactions between Late Archaic groups in the Great Lakes, Ohio Valley, Midwest, and Northeast grew in importance, scale, and permanence (16–19). Exchange of objects was an important aspect of intergroup interactions, perhaps as a method of maintaining and reaffirming alliances (11, 17, 20). Exchange networks likely included both "down-the-line" relations located within the community and networks in which individuals or small groups of entrepreneurs traveled outside their region on trading missions (20). Copper objects, along with shells, raw lithic materials, and effigy beads were highly valued, and the control over their distribution provided opportunities for emergent elites to gain status, acquire debt, and cement relationships (11, 21).

Other social practices (e.g., cremation) also traveled along trade routes (22). The co-occurrence of copper and crematory practices across the Great Lakes region (8, 23–25), northeastern United States (26), and the Ohio (27) and Tennessee River valleys (28) suggests the presence of trade partnerships and shared mortuary practices across North America. The Late Archaic Period is characterized by a broad, interconnected social landscape, although it is unclear if this constellation of interrelated communities was formed or sustained through elite trade networks, alliances built on marriages, large-scale ritual gatherings, or a mixture of practices (17, 29, 30).

Significance

Chemical sourcing of a Late Archaic (ca. 4100–3980 cal B.P.) copper artifact reveals extensive trade networks linking the coastal southeastern United States with the Great Lakes. Found alongside the cremated remains of at least seven individuals and in the direct center of a plaza defined by a circular shell midden, the copper artifact demonstrates the existence of long-distance networks that transmitted both objects and mortuary practices. In contrast with models that assume coastal hunter-gatherer-fishers typically lived in small, simple societies, we propose that trading for and utilizing copper is evidence of emergent hierarchical social organization during the Archaic and the likelihood that power was gained and displayed during large-scale gatherings and ceremonial events.

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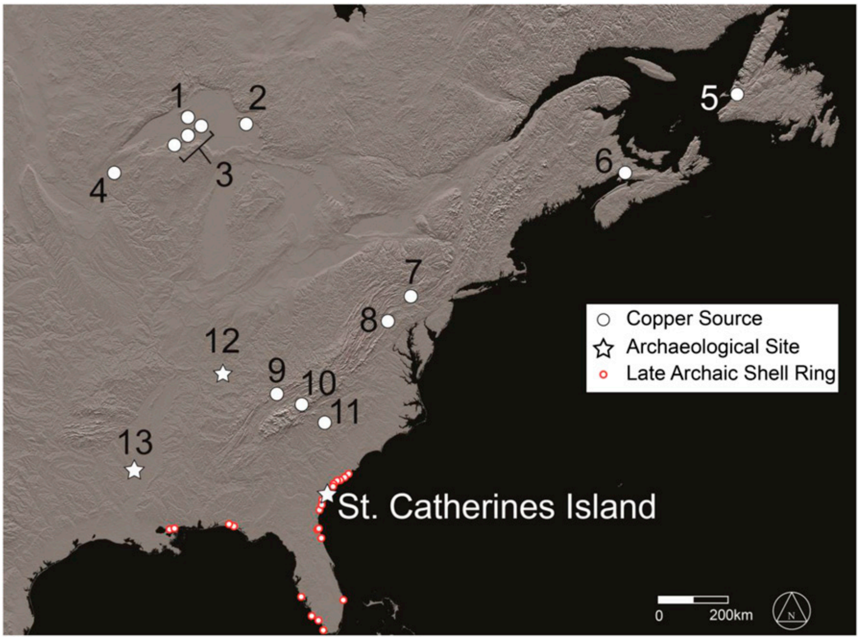

Fig. 1. Locations of raw copper sources, selected archaeological sites, and selected Late Archaic shell rings. (1) Isle Royale; (2) Michipicoten; (3) Keweenaw; (4) Snake River; (5) Trout River; (6) Cap d'Or; (7) Cornwall; (8), Adams County; (9) Ducktown; (10) Fanning County; (11) Oglethorpe County; (12) Indian Knoll; (13) Poverty Point.

While large portions of the eastern United States are tied together through copper exchange and shared mortuary patterns, there is little evidence for linkages with communities living in the American Southeast where Archaic-age copper is virtually absent, apart from Poverty Point, a massive earthen mound complex in Louisiana, and an associated shell ring (6, 12–15). The presence of copper at Poverty Point provides further evidence that the site was a major trade center and likely was a stage for large-scale ritual gatherings. Cremations are likewise extremely rare in the Archaic American Southeast (30), where burials are more often placed within shell middens (31, 32), in ponds (33), or as flexed or seated interments in pits (34). The closest instances of cremation to the Southeast are also the closest instances of Archaic-age copper finds, including a few individuals in the southern Ohio Valley (27) and a small cluster of burials in the Tennessee River Valley (28).

This paper provides evidence that Archaic Period networks were far more expansive than traditionally assumed and that peoples living along the southeastern Atlantic coast, often thought to be disconnected from trading partnerships found inland, were instead deeply imbricated in the broader eastern exchange network. Excavations on St. Catherines Island, located off the Georgia (USA) coast, revealed cremated remains of at least seven individuals placed in a pit alongside a copper band and associated copper fragments, all sourced to the Great Lakes region. Radiometric dating demonstrates the cremains are Late Archaic in age and are contemporaneous with a ring midden that encircles the burial pit and associated plaza (Table 1). More than 50 similar circular middens, known as Late Archaic shell rings, have been found across the southeastern US coast (35). Archaeologists debate the function of shell rings, but most recognize that the sites were formed, in part, during large-scale ritual gatherings and feasts (36–39). The debate over shell ring function is complicated by our discovery of copper and cremated remains—evidence that at least some shell rings served as mortuary sites and important trade locales. Taken as evidence of social networks linking coastal peoples to groups far into the interior, the trade and mortuary practices detailed in this article challenge the assumed paucity of maritime economies (40), as we suggest ring residents included elite actors who solidified their positions through ritual gatherings and long-distance exchange of exotic objects. Viewed as such, the southeastern Atlantic coast provides an essential locus in the broader discussions of emergent societal complexity within hunter-gatherer societies and highlights the importance of ritual gatherings, long-distance exchange, and exotic objects in the rise of an emergent elite social group.

Late Archaic Shell Rings

More than 50 shell rings have been located along the Atlantic and Gulf coasts between South Carolina and Mississippi (Fig. 1) (35). Dating to the Late Archaic Period (ca. 5000–3000 cal B.P.), shell rings consist of large, arcing middens made up of mollusk shells (primarily oysters with lesser numbers of clams, mussels, and other bivalves) that encircle plazas typically devoid of shell deposits. Accumulation rates vary among rings, with some forming in less than a century and others over a millennium, as do their scales, with the smallest measuring fewer than 50 m across and less than 1 m in height, while the largest are more than 200 m across and several meters tall (35). At many shell rings, seasonality data suggest that people lived on-site year-round (39, 41), and there is strong evidence that population levels were increasing dramatically along the coast during the Late Archaic (42). Along nearby river valleys, including the Savannah, larger social groups were forming, defined in part by shared ritual activities and intermittent ceremonial gatherings (34, 43). It is likely shell ring residents were engaged in periodic gatherings involving large-scale feasts of shellfish and other foods, as seasonality profiles of shellfish often show they were consumed during limited portions of the year, typically the late winter/early spring (39, 44). While other hypotheses remain untested (45), there is a growing consensus that shell rings were year-round villages, occupied by multiple family groups, who hosted intermittent, perhaps seasonal gatherings, in which large numbers of people came to feast on shellfish and engage in ceremonies and rituals (36, 37, 39).

Table 1. Radiometric results

Laboratory no.	Provenience	Conventional ^{14}C age, y B.P. ± 1 SD	Method	$\delta^{13}C$ (‰ VPDB)	Description	Material	Calibrated range B.C., 95.4%
OxA-32446	Center pit no. 13283	3715 ± 31	AMS	−20.17	Calcined bone	Carbonate	2200–2030
UCIAMS-130901	Center pit no. 12035	3710 ± 15	AMS	ND*	Calcined bone	Carbonate	2190–2030
Beta-238324	Test pit 2	4100 ± 60	Radiometric	−0.9	*Mercenaria*	Carbonate	2540–2190
Beta-238325	Test pit 2	3780 ± 50	Radiometric	−3.2	*Mercenaria*	Carbonate	2090–1760
Beta-238326	Test pit 2	3990 ± 50	Radiometric	−1.3	*Mercenaria*	Carbonate	2390–2040
Beta-244620	F.21, 4.0–3.9 m	3800 ± 40	Radiometric	−25.3	Charred material	Organics	2440–2060
Beta-251761	N243 E233, 4.5–4.4 m	3720 ± 40	Radiometric	−23.9	Charred material	Organics	2280–1980
Beta-251762	N243 E233, 4.5–4.4 m	3820 ± 50	Radiometric	−0.8	*Mercenaria*	Carbonate	2140–1820
Beta-251764	N272 E200, 5.3–5.2 m	3710 ± 40	Radiometric	−25	Charred material	Organics	2210–1980
Beta-251765	N272 E200, 5.1–5.0 m	3990 ± 50	Radiometric	−1	*Mercenaria*	Carbonate	2390–2040
Beta-251766	N272 E200, 5.1–5.0 m	3800 ± 40	Radiometric	−27.5	Charred material	Organics	2440–2060
Beta-251767	N243 E233,4.4–4.3 m	3680 ± 40	Radiometric	−24.8	Charred material	Organics	2200–1950
Beta-251768	N243 E233,4.4–4.3 m	3910 ± 40	Radiometric	−2.4	*Mercenaria*	Carbonate	2240–1960
Beta-251769	N243 E233, 4.3–4.2 m	3830 ± 40	Radiometric	−4.2	*Mercenaria*	Carbonate	2130–1870
Beta-258561	Feature 38	3710 ± 40	Radiometric	−25	Charred material	Organics	2210–1980
Beta-258562	Feature 38	3810 ± 40	Radiometric	−2.3	*Mercenaria*	Carbonate	2120–1850
UCIAMS-84269	N243 E234, 4.46–4.35 m	3620 ± 20	AMS	ND*	charred material	Organics	2030–1920
UCIAMS-84270	N243 E234, 4.4–4.3 m	3640 ± 20	AMS	ND*	Charred material	Organics	2120–1940
UCIAMS-87903	N243 E234, 4.46–4.35 m	3685 ± 20	AMS	−22.0	*Odocoileus virginianus*	>30 kDa gelatin	2140–1980
UCIAMS-87904	N243 E233, 4.4–4.3 m	3730 ± 20	AMS	−21.1	*Odocoileus virginianus*	>30 kDa gelatin	2200–2040
UCIAMS-87905	N243 E235, 4.4–4.36 m	3690 ± 20	AMS	−21.3	*Odocoileus virginianus*	>30 kDa gelatin	2140–1980
UCIAMS-123543	N243 E174, 5.2–5.1 m	3885 ± 15	AMS	ND*	*Mercenaria*	Carbonate	2150–1960
UCIAMS-123544	N243 E174, 5.1–5 m	3960 ± 15	AMS	ND*	*Mercenaria*	Carbonate	2270–2070
UCIAMS-123545	N242 E230, 4.4–4.34 m	4000 ± 15	AMS	ND*	*Mercenaria*	Carbonate	2320–2130
UCIAMS-123546	N239 E229, 4.4–4.3 m	3710 ± 20	AMS	ND*	*Mercenaria*	Carbonate	1920–1740
UCIAMS-123547	N272 E200, 5.3–5.2 m	3945 ± 20	AMS	ND*	*Mercenaria*	Carbonate	2250–2040
UCIAMS-123548	N272 E200, 5.1–5 m	3985 ± 15	AMS	ND*	*Mercenaria*	Carbonate	2300–2120
UCIAMS-123549	N272 E200, 5.2–5.1 m	3975 ± 20	AMS	ND*	*Mercenaria*	Carbonate	2300–2090
UCIAMS-80932	N243 E234, 4.46–4.35 m	3870 ± 20	AMS	ND*	*Mercenaria*	Carbonate	2140–1940
UCIAMS-80933	N243 E234, 4.46–4.35 m	3900 ± 20	AMS	ND*	*Mercenaria*	Carbonate	2180–1990
UCIAMS-80934	N243 E234, 4.46–4.35 m	3910 ± 20	AMS	ND*	*Mercenaria*	Carbonate	2190–2000
UCIAMS-80935	N243 E234, 4.46–4.35 m	3915 ± 20	AMS	ND*	*Mercenaria*	Carbonate	2200–2000
UCIAMS-80936	N243 E234, 4.46–4.35 m	3850 ± 20	AMS	ND*	*Mercenaria*	Carbonate	2120–1920

Calibrations were done in OxCal version 4.2.3 (https://c14.arch.ox.ac.uk/) using the IntCal13 and Marine13 curves (67). ND, no data; VPDB, Vienna Pee Dee Belemnite (international reference standard for carbon isotopes).

*University of California, Irvine does not report $\delta^{13}C$, as all results have been corrected for isotopic fractionation according to the conventions offered in ref. 68, with $\delta^{13}C$ values measured on prepared graphite using the AMS. These can differ from $\delta^{13}C$ of the original material if fractionation occurred during sample graphitization or the AMS measurement and therefore are not presented.

Because prior research has only occasionally encountered human remains, and no formal burials have been reported (35), archaeologists assume shell rings are not mortuary sites. The lack of shell ring burials is part of a broader pattern in which very few Archaic-age interments have been reported from much of the Atlantic coast, particularly along the shores of Georgia and South Carolina where only a single Archaic burial has been recorded (46). Archaeologists have largely assumed that coastal Archaic peoples handled their dead in a manner that makes them exceedingly difficult to find, likely including cremation (47). Alternatively, excavations into coastal Archaic-age sites are rare and, when conducted, are often limited in the scale and distribution of excavation areas (35). Shell ring plazas, and particularly their direct centers, are underrepresented in the archaeological literature, as most excavations have focused on the surrounding shell middens (48). As we report the discovery of cremated human remains found in the direct center of the McQueen Shell Ring, it is possible that the paucity of burials found at other rings is not because they are absent but rather because archaeologists have been digging in the wrong locations.

Although there is broad consensus over the use of shell rings, there is little agreement regarding the social structure of ring-building groups. Considering the lack of high-profile foods, few exotic materials, and the overall utilitarian nature of recovered materials, some argue rings were created by relatively simple societies (49) with minimal links to other groups living further into the interior (50). Others argue rings were built by trans-egalitarian societies characterized by competing groups who displayed their prowess and achieved greater social standing through the large-scale feasts held at the shell rings (51).

Recent research from the McQueen Shell Ring and its contemporaneous neighbor, the St. Catherines Shell Ring, has provided evidence of subterranean food storage, including tree nuts, further strengthening the hypothesis that ring residents may have included emergent elites (37). Food storage is often considered a critical factor in the emergence of more complex hunter-gatherer societies, as accumulated resources can be controlled and deployed by aspiring elites to acquire and solidify social relations that promote their own status (52, 53). Accumulated resources are often distributed during large-scale gatherings by aspiring elites, as these events provide a highly visible venue for the acquisition and display of social capital (54).

The discovery of storage pits within shell rings is important not only because it suggests the presence of a food surplus but also because it shows ring residents and contemporaneous residents of nearby river valleys were likely in direct contact with one another, as they both created nearly identical pits that were distributed in very similar patterns (37). Additional evidence that ring residents were in contact and perhaps trading with other distant groups comes from lithic analyses that demonstrate that a small but significant portion of stone found at the McQueen Shell Ring originated at least 100 km away, with some samples coming from locales at least 300 km away (48).

To summarize, recent research has called into question traditional hypotheses that characterize shell ring societies as small, simple, and provincial groups. Instead, it is possible these groups were involved in large-scale gatherings, during which emergent elites solidified their status through the display and distribution of resources. To date, however, evidence of increasingly complex social structures and practices at shell rings has been ambiguous and highly inferential. As such, the discovery of exotic copper in the center of the McQueen Shell Ring is the strongest evidence that long-distance exchange networks connected ring builders to distant neighbors and that power imbalances were emerging and solidifying at the shell rings.

Located on the seaward side of St. Catherines Island, one of the many barrier islands that line the eastern seaboard, the McQueen Shell Ring includes a circular midden that measures 0.3–1 m in height and encircles a shell-free plaza spanning 30–40 m across (Fig. 2). Excavations in the direct center of the plaza revealed a single conical pit measuring ~1 m across and ~1 m deep, containing ~34,000 small, calcined human and nonhuman bone fragments. A copper band and smaller fragments were recovered near the center of the pit, below the plow zone and alongside the largest concentration of bone fragments. Although they do not refit, we assume that the copper fragments found in the pit were once part of the band, which is broken and incomplete. The band varies between 19 mm and 38 mm wide, is 160 mm long and only 1 mm thick, and is clearly worked, as it has been shaped and flattened. The band has not been exposed to heat, so it likely was placed in the pit after the bones were cremated. There are no engravings, impressions, incisions, or other embellishments on either face of the band (Fig. 3).

Radiometric analyses of the human cremains show they are contemporaneous with the formation of the shell ring (see *SI Appendix* for an extended description of dating methods). The 27 radiometric dates processed from the McQueen Shell Ring reveal that the shell deposits formed between 4270–3680 cal B.P. (55, 56), while two direct accelerator mass spectrometry (AMS) radiocarbon dates of calcined human bone were statistically indistinguishable and place both at 4100–3980 cal B.P. (Table 1). The dates were drawn from a cranial vault fragment found 2 cm above the cluster of copper objects and a femur fragment immediately adjacent to the copper band. Several hundred pottery fragments, all locally produced and none thermally altered after formation, were also recovered from the burial pit and its immediate surroundings. While seemingly high, the quantity of pottery found within and near the burial pit is similar to the quantities found elsewhere at the ring, which were likewise quite rich. Notably, the burial pit and its immediate surroundings contained a significantly higher number of stone tools than other locations at the ring, including projectile points, some of which were heat-altered, suggesting they were exposed to fires alongside the human and nonhuman bones (48).

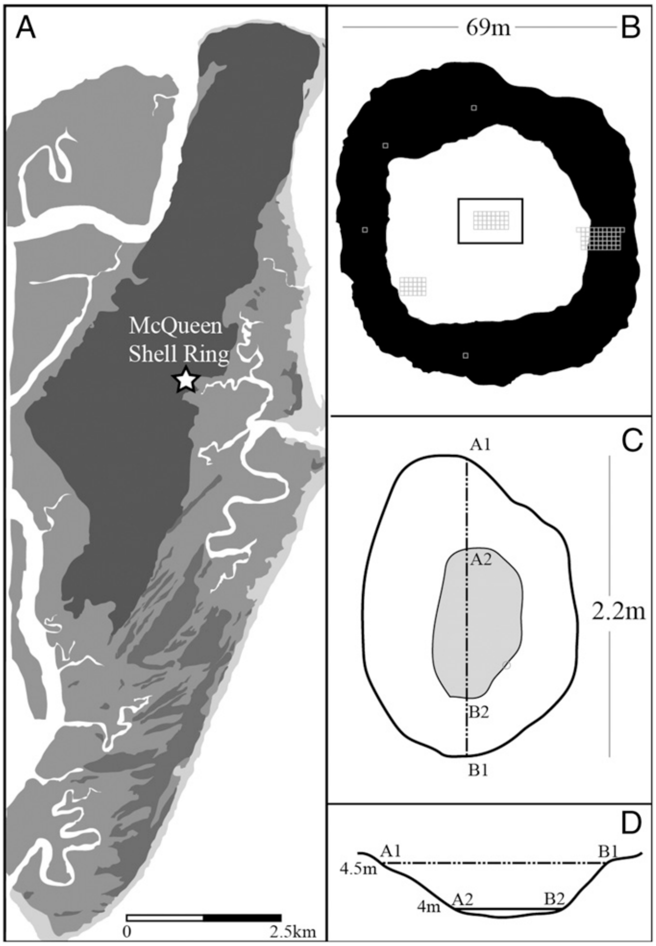

Fig. 2. (*A*) St. Catherines Island with the location of McQueen Shell Ring. (*B*) Excavation units at McQueen; the center block is outlined. (*C*) Plan view of burial pit. (*D*) Profile of burial pit.

Elemental Study of Copper Objects. By comparing the elemental composition of the copper band and fragments with 60 source samples from the Great Lakes region, central Appalachians, and northern Maritimes, we found the greatest similarities to raw material samples from the Great Lakes, specifically sources associated with the Keweenawan volcanic deposits on the northern side of the Lake Superior Syncline (Minong Mine and Michipicoten Island sources) (Fig. 4 and Table 2). There was little similarity with Maritime sources and virtually no similarity with Appalachian sources (see *SI Appendix* for an extended description of chemical analyses). This is surprising since the McQueen Shell Ring is located closer to native copper sources in the southern Appalachians (roughly 480 km) and much further from sources in the Great Lakes (roughly 1,850 km).

Because of different geological processes and contexts, native copper from Appalachian, Maritime, and Great Lakes deposits has predictably different elemental compositions, and it is possible to distinguish between localized deposits within each of these regions (6, 11, 21, 57–59). We conducted two sets of analyses to verify that the copper objects originated from the Great Lakes. In both studies, the McQueen Shell Ring copper was most consistent with Lake Superior sources; while there is a small level of variability between each of the fragments, they all were found to trace their highest probability of association to the Minong Mine on Isle Royale (with probability values ranging from $P = 0.64$ to $P = 0.95$) (Fig. 4 and Table 2). The Minesota Mine of the southern Keweenaw was found to be the second most probable source for four of the artifact fragments, but that probability was quite low ($P = 0.03$ to $P = 0.12$). The southern Appalachians were found to be the second most probable source for three of the artifact fragments, but the probability was again low ($P = 0.04$ to $P = 0.34$). Sources from the Canadian Maritimes and central Appalachians show minimal similarity to the McQueen copper. These results strongly suggest that copper from the Great Lakes region, specifically the Isle Royale deposit, is the likely source for the McQueen Shell Ring copper. We assume that the variability found within the McQueen fragments reflects

Fig. 3. Copper artifact.

the heterogeneity of the original source, although it is possible that it could represent the presence of more than one object.

Osteological Analysis. Approximately 34,000 calcined and commingled human and nonhuman bone fragments (9,095 g) were recovered from the pit at the center of the McQueen Shell Ring. Human remains consist of at least seven individuals, including six adults (both male and female) and one child (sex unknown). Age at death among adult remains ranged from adolescence to 45+ y.

The distribution of bone fragments suggests there were two different deposits within the pit. A lower burial made up of fewer human remains likely from a single female is divided from an upper burial by a thin (4–6 cm) layer of dark brown, sandy loam containing far fewer bone fragments. The upper burial consists of a larger number of cremains representing the other five adults and a single child interment. The two direct dates on human bones were both drawn from the upper burial and show that it dates to 4100–3980 cal B.P. We assume the lower burial is the same age or older.

The pit shows no signs of thermal alteration (e.g., soil colors associated with heat). The bones from both upper and lower burials, in contrast, were calcined gray, white, or blue-white, evidence of prolonged exposure to higher temperatures, likely ranging between 500 and 900 °C (60–62). Several bone fragments show green staining, indicating depositional proximity to copper. The breakage patterns suggest the bodies were intentionally burned in the flesh (61–63). Considering the small size of the bone fragments (mean weight per fragment = 0.27 g), it is likely the bones were pulverized or otherwise manually reduced during or after thermal treatment—common practices in cultures where open-air cremation is customary (60).

We recovered a juvenile-sized frontal fragment with evidence of cribra orbitalia, which indicated the child likely experienced some episode of nutritional stress. The lower burial shows signs of trauma; we recovered a fragment of the right radius exhibiting hypertrophic trabecular tissue, which is evidence of osteomyelitis, and an unidentifiable long bone fragment exhibiting periosteal reaction.

Three cranial fragments in the assemblage exhibit perimortem treatment. The most conspicuous evidence is on a cranial vault fragment from the upper burial bearing short subparallel cutmarks, seemingly organized in series, with some cutmarks very thin and shallow and others wider and deeper across the ectocranial surface. Some of the cutmarks extend beyond the edges of the fragment, indicating a process that occurred before breakage. Furthermore, many of these cutmarks present complex profiles with multiple subparallel "ledges" (as opposed to a V-shaped profile) that are more compatible with the edge of a retouched stone tool rather than a smooth, sharp blade (see ref. 64 for comparison). The endocranial surface shows signs of a modern impact, likely created during excavation, and of perimortem treatment—much older marks caused when a thin implement penetrated the bone at a more vertical angle.

In summary, the McQueen site contains the remains of at least seven people who died on or near St. Catherines Island during the Late Archaic Period. The first to be interred was probably a young female adult who suffered an injury that became infected. Her body was cremated, and the remains were buried at the center of the McQueen Shell Ring. At some point not long thereafter, six other individuals died and were cremated and interred. They may have been interred in one or more events. The interred people had suffered some minor ailments during their lives, including evidence that at least one individual suffered an injury. Their remains were interred at the center of a shell ring, along with faunal remains, especially from fish and deer, and lithic, ceramic, and copper artifacts. Analysis of zooarchaeological materials is ongoing, but along with the more common taxa mentioned above, preliminary results include the identification of animals rarely encountered in Late Archaic deposits, such as pygmy sperm whale (*Kogia breviceps*) and eagle ray (Myliobatidae), as well as high proportions of bird and alligator remains (65).

Discussion/Conclusion

The discovery of a Late Archaic-age cremation with associated mortuary items, including copper objects made from materials originating from the Great Lakes, contradicts interpretations that characterize shell ring residents as simple, provincial groups, largely disconnected from their more interior neighbors. These interpretations often rely on outdated models that suggest maritime economies are inherently poor and not stable enough to provide for societal expansion, diversification, or complexity (40).

Instead, our findings are consistent with hypotheses that characterize ring residents as both living in social groups that included emergent elites (51) and participating in long-distance trade. Prior research suggests that aspiring elites could have utilized marine and terrestrial resources, including tree nuts, to host large-scale gatherings during the winter months (37). These gatherings likely included the mass consumption of shellfish that were then piled, perhaps to display the relative status of individuals or groups.

We suggest that long-distance exchange played a key role in helping aspiring elites attain, display, and share social capital. The copper object originating from the Great Lakes is likely part of a larger pattern in which ring residents participated in long-distance exchange networks trading raw materials and objects. Considering that a copper object was emplaced alongside cremated human and nonhuman remains, we propose that long-distance exchange practices were intertwined with ritual events. It is likely that emergent elites used both exotic items and ceremonies to elevate their positions within the broader political landscape.

To this point, it is important to note that the placement of the copper band among the cremated remains of at least seven individuals, some of whom may have died violently, suggests that this object was purposefully taken out of circulation, likely during a very visible event in which human bodies were burned, pulverized, and then emplaced in the ring center. We know little about who these individuals were, why they were buried together, and why they were interred in the ring center along with the copper object and other potent items, including a whale vertebra. Perhaps these individuals were exalted members of the community and were given a high-status burial to reflect their position(s) in life. It is equally possible that these individuals were murdered by ring residents for political, social, or religious reasons, and their burial in the ring center had motives other than honoring the lives of the interred. It is also possible this group died an abnormal death, perhaps caused by disease or accident, and their burial was an act designed to alleviate the suffering of the dead or to protect the living from similar calamity.

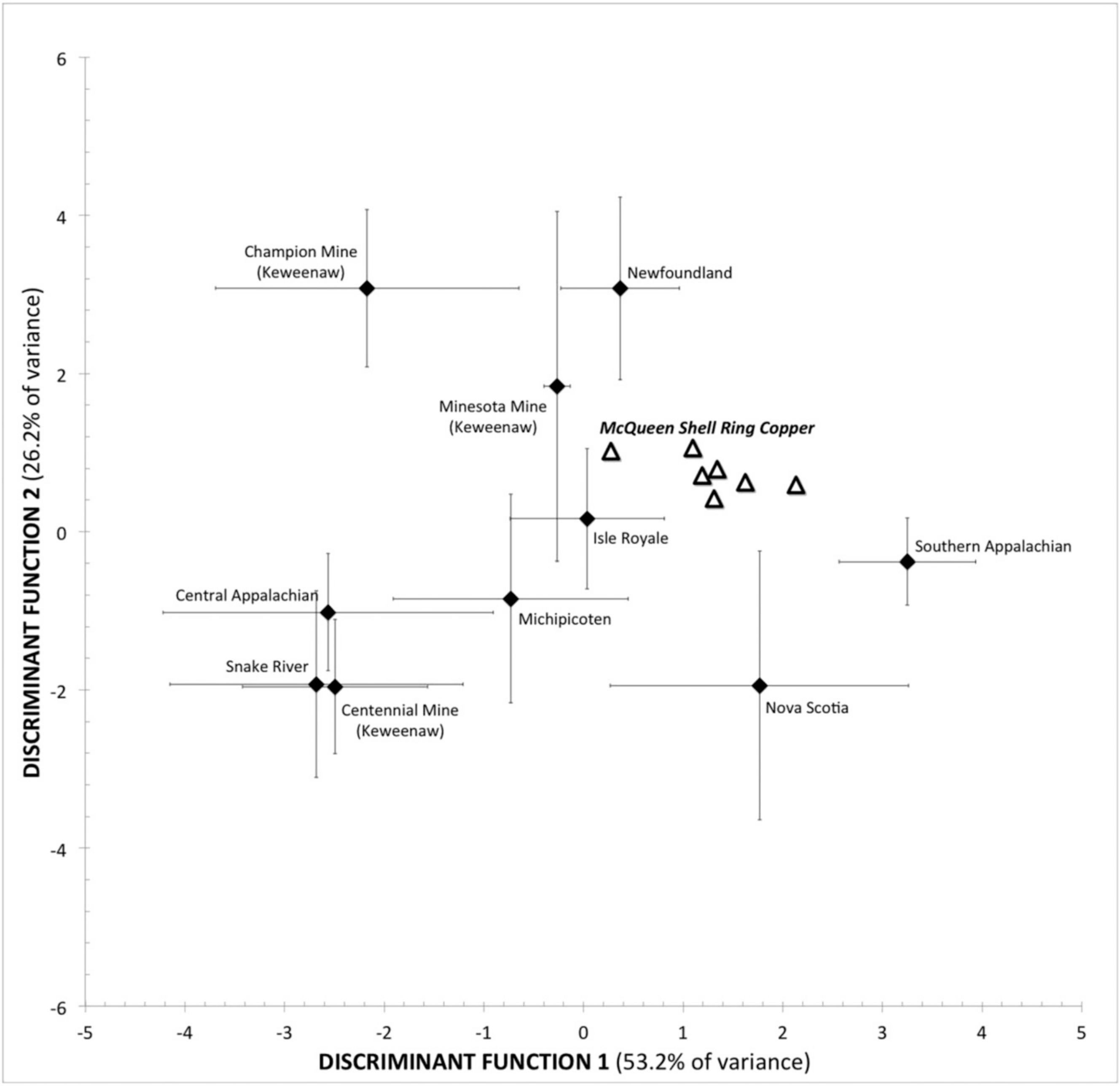

Fig. 4. Discriminant function plot comparing McQueen Shell Ring copper artifacts with geological sources in the Great Lakes, Appalachians, and Maritimes.

Importantly, the act of cremating the dead has virtually no precedent in the American Southeast, but it is common in the Great Lakes region where the copper band originated. This suggests the band travelled not as a lone object but rather as a material reflection of a potential line of communication through which objects and ideas flowed. As such, it is possible that some

Table 2. Probabilities of copper source assignments

Artifact no.	Most probable source	*P*	Second most probable source	*P*
9058/17490	Isle Royale	0.916	Minesota mine (Keweenaw)	0.039
9057/17489	Isle Royale	0.863	Minesota mine (Keweenaw)	0.116
9059/17490	Isle Royale	0.637	Southern Appalachian	0.342
27.4/774.3	Isle Royale	0.950	Minesota mine (Keweenaw)	0.042
9060	Isle Royale	0.893	Southern Appalachian	0.068
9061	Isle Royale	0.901	Minesota mine (Keweenaw)	0.085
2783	Isle Royale	0.918	Southern Appalachian	0.038

or all of the dead interred in the center of McQueen were from distant lands, perhaps as far flung as the Great Lakes. The lower burial—an adult woman—was set apart from the rest of the dead, perhaps because she was a foreigner who acted as the conduit through which the copper band arrived. At her time of death (and perhaps the death of the other individuals), her body may have been handled using the traditions of her homeland.

Although their identities and causes of death are unknown, the dead were interred alongside a copper band—an exotic object displayed and interred during a cosmologically charged mortuary event held in the most visible portion of the ring: its direct center. We struggle to understand the meaning of this act, but the presence of the copper object is evidence of long-distance exchange networks that would have promoted the possibility of increasingly hierarchical power relations that were earned and displayed during large-scale seasonal gatherings in which ritual acts were undertaken and feasting was common.

Methods

Elemental signatures from raw materials included two sets of samples analyzed at (*i*) the Institute for Integrated Research on Materials, Environment, and Society at California State University, Long Beach using a New Wave Research UP213 laser ablation system (Electro Scientific Industries) coupled with a GBC OptiMass 8000 inductively coupled plasma time-of-flight mass spectrometer (GBC Scientific Equipment) and (*ii*) the Elemental Analysis Facility at the Chicago Field Museum of Natural History using a Varian quadrupole mass spectrometer and a New Wave UP213 laser ablation system. Archaeological samples included seven copper fragments analyzed at the Elemental Analysis Facility at the Chicago Field Museum of Natural History. Artifacts and source samples were preablated with the laser collimated to a 100-μm beam to remove weathered products and other contaminants, before sampling with an 80-μm beam. Five samples were taken from each artifact and source specimen to compensate for heterogeneity. All artifact and source data were calibrated with the use of three standards: National Institute of Standards and Technology (NIST) 500 Unalloyed Copper, NIST 1107 Naval Brass, and NIST 1110 Red Brass. The use of these standards provides valid data in parts per million for 12 elements, including iron (Fe 57), cobalt (Co 59), nickel (Ni 60), copper (Cu 63), zinc (Zn 66), arsenic (As 75), silver (Ag 107), tin (Sn 120), antimony (Sb 121), tellurium (Te 128), lead (Pb 208), and bismuth (Bi 209). Studies showed that only 10 elements could be consistently compared across datasets, as tellurium, and bismuth varied slightly from one laboratory to the other. Results were averaged to compensate for heterogeneity, and the resulting means were transformed to enhance normality as described in previous analyses (18, 24, 56, 58). These transformed data were then subject to discriminant function analysis using SPSS version 22 (IBM).

The adult minimal number of individuals (MNI) in the upper burial was established through repetition of intermediate hand phalanges. This is not typical, but with 36 manual intermediate phalanges from the upper burial, the adult MNI = 5. Subadult remains were also recognized in the upper burial, representing, according to dentition, a juvenile aged 6–7 y, meaning at least six individuals were interred in the upper portion of the burial pit. In the lower burial, osteometric analysis of an intact intermediate cuneiform (66) and visual assessment of nonmetric features indicate the remains are those of an adult female.

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