

Maritime Means and Mountain Ends: the origin of stoneware jars in mid 15th CE burial complexes of the Southern Cardamom Ranges, Cambodia.

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Abstract

Southeast Asia during the first half of the second millennium CE. Their hegemony is particularly apparent in lowland areas throughout the Lower Mekong basin, expressed in both architecture and ceramics. How strongly this control was exercised in more geographically marginal regions – and what the nature of power was after the capital moved southward -- has not been explored. In this paper we present the results of a geochemical analysis of ceramics from absolutely and comprehensively dated mid-15th century CE burial complexes in the Southern Cardamom Ranges of southeastern Cambodia and a nearby contemporary shipwreck. The

wreck assemblage was typical of a Southeast Asian maritime trader. Comparison of burial and shipwreck ceramic compositional data enables us to confirm a provenance for some of the jars and fine wares from production centres in central Northern Thailand. A second group, not represented in the wreck assemblage, is from a yet unidentified source that we suggest is located in the adjacent Cambodian lowlands. The results of this provenience analysis highlights both the role of the relatively well-known maritime trade, as well as a previously unsuspected continuity in local Cambodian stoneware production. This window into 15th c exchange networks expands our understanding of the context of subsequent European 16th-17th c engagement during the Early Modern Period, is one piece of the broader picture needed to more closely define the processes of economic transformation.

Key words: Southeast Asia, ceramics, geochemical analysis, shipwreck, Cardamom Mountains

Introduction

The dramatic expansion of archaeology across mainland Southeast Asia in the last twenty years is beginning to provide the level of detail needed to evaluate previous models of exchange and interaction (e.g., Bronson 1977; Reid 1988). The role of maritime interaction and trade has long been argued to be a critical factor in the development of coastal polities throughout the region (Manguin 2000). However, this perspective has relied heavily on historical data, much of which begins in the Early Modern period for this region. This historical bias has focused attention on economic and political development for the coastal regions and the Early Modern period as an instant of economic and political rupture (Wallerstein 1974). It has also promoted an externalist bias in how mainland political and economic transformations are viewed. Arguably, our understanding of the posited economic and political ruptures in the region remains hampered by the still relatively sparse direct archaeological evidence of the local economic trajectories across the transition (Stark 2010).

Here we add to a growing body of material evidence that Southeast Asia was a large scale, internally complex and integrated exchange system prior to European engagement (e.g., Carter 2013; Manguin 2004; Manguin 2014). Ceramic compositional data from exceptionally well dated mid-15th c burial sites in the Cardamom Mountains of Cambodia, as well as from a contemporary shipwreck just off the west coast of Cambodia, are analyzed to better understand these local maritime/coastal economies outside the main political centers, in the decades prior to the Early Modern period engagement in SE Asia and the Pacific.

Maritime exchange spheres in mainland SE Asia

The organization of trade and exchange systems in Southeast Asia is a key research area for archaeologists and historians of the region. In the 1970s, Bronson suggested a dendritic model integrating coastal and inland sites (Bronson 1977), while others have focused on maritime patterns over time (Cartier 1988; Evers 1988; Manguin 1993). These earlier models heavily relied on historical data and ethnographic comparisons, but with a few exceptions, little direct archaeological data (e.g., Junker 1993; Junker 1998). More recent terrestrial archaeology across both island and mainland Southeast Asia has greatly expanded our understanding of the development of polities and their interaction beginning in the first millennium CE (Hendrickson 2010; Hendrickson 2011; Manguin 2004; Manguin 2014; Murphy and Stark 2016; Stark 2010; Stark 2006).

Two main types of evidence are used to reconstruct pre-modern trade and exchange in the region: shipwrecks and trade goods. Shipwreck data allow us to track the expansion of maritime trade (and technology). Beginning with the 9th c. Belitung shipwreck in Indonesia, with cargo from China and the Middle East, the shipwreck evidence increases through the

early second millennium CE. The Gulf of Thailand, in particular, has a shipwreck record of extensive local trade from the 13th-15th c. CE (Brown 2004; Green and Harper 1987). Wrecks like the 15th c. Pandanan, in the South China Sea, reveal the extensive exchange between island and mainland SE Asia, and with points to the west (Diem 1998). In terms of ceramics, these wrecks commonly include a range of jars and fine tablewares (typically glazed bowls and plates) from a wide range of production centres in Southeast Asia and China (Grave and Maccheroni 2009).

With the improvement and expansion of both regional archaeological databases and archaeometric analyses, we can begin to evaluate the regional trajectories of trade across SE Asia. In addition to site excavations and surveys, specific trade goods, such as carnelian beads from burials, provide some evidence of the direction, scale, and intensity of interaction across mainland SE Asia (Carter, et al. 2016; Carter 2015; Carter and Dussubieux 2016; Theunissen, et al. 2000). Patterns of exchange and emulation of South Asian religious items and iconography have also provided insights into inland and maritime exchange networks (Brown 1996; Shaffer 2015).

Large scale changes in economic and political relationships SE Asia took place in the 10th-11th c. CE. These included the development of the Khmer Empire and the expansion of interaction with China (Wade 2009). Chinese interaction and exchange is apparent through both technological adoption and trade goods. Manguin (Manguin 2000) argues that the 10th-13th c CE is one the major phases of intensified maritime exchange that promoted the growth of coastal polities (Baker 2003). However, while the Khmer traded with the Chinese, and expanded northward in mainland SE Asia, their production and exchange appear to have remained internal.

The 15th c CE was a critical nexus in both political and economic reorganization in SE Asia. Documentary sources suggest the Khmer Empire collapsed by the mid-15th c. CE. Post-Angkorian power migrated south to a series of 15th-18th c capitals that flanked the Tonle Sap lake (Srei Santhor, Bakan [Pursat] and then to the Oudong and Longvek area that lies c. 35 km NW of Phnom Penh). At the same time, other polities emerged across the region during this time (Grave 1995), and the expansion of maritime trade was supported by a network of entrepôts (e.g., Melaka, in the Malacca Straits).

Chinese records suggest that 15th c Cambodia was a sea power in close relations with China (Vickery, et al. 2004:43). Despite Ming Dynasty trade restrictions, 15th c private Chinese ships continued their active trade throughout Southeast Asia (Hall 2016:406-409; Wade 2004:19-27). At least one previously-established Ming trade route through Southeast Asia included Siam (Ptak 1998:27), and maritime research on 15th c shipwreck sites offer ample evidence of durable Southeast Asian goods, including high-fired ceramics from kiln complexes in central northern Thailand (Flecker 2001:225-226).

The onset of the Early Modern period, in the 16th c. with the European intervention in the region, arguably, caused a major rupture, redefining production, exchange and scale of interaction. While current research projects are beginning to address the nature of this transformation, we argue that the political and economic relationships of the 15th-16th c. CE in Southeast Asia are critical elements for understanding the impact of the Early Modern economic transformation in SE Asian societies. Our use of two Cambodian case studies allows us to trace one such relationship: mid-15th century commodity flows across the region.

Here we make use of contemporary evidence from mid-15th c. CE isolated burial sites in the Cardamom Mountains as well as a contemporary shipwreck on an adjacent coastline to assess exchange networks on the eve of the Early Modern Period. Our Cardamom Mountain samples derive from work at “Jar and Coffin burial sites” whose artifacts and bioarchaeology has been reported previously (e.g., (Beavan, et al. 2012a; Carter and Beavan 2014; Halcrow, et al. 2014).

Using Neutron Activation Analysis [NAA] we characterize ceramics from both the burial and shipwreck sites, and compare these results with legacy stoneware data sets from both well dated shipwrecks and production centers in Thailand and Cambodia. These analyses allow us to begin to evaluate the economic relationships of these upland communities with coastal shipping and elsewhere at this key historical juncture.

Background: The Sample & Context

A relatively small sample of seventy one ceramics were selected for geochemical profiling from fragmentary material in four contemporary mid-15th c CE archaeological assemblages (i.e. three burial sites in the Cardamom Range and the shipwreck Koh Sdech assemblage)(Fig 1). A total of fifty samples were selected from the three burial sites and 21 samples came from the shipwreck (Table 1). Both the burial sites and the shipwreck included earthenware and stoneware samples. Due to the disparity in sample populations between the burial sites the burial sites are combined into a single Southern Cardamom group to compare with both the shipwreck assemblage and other reference NAA datasets. The contemporaneity of these sites facilitated this grouping.

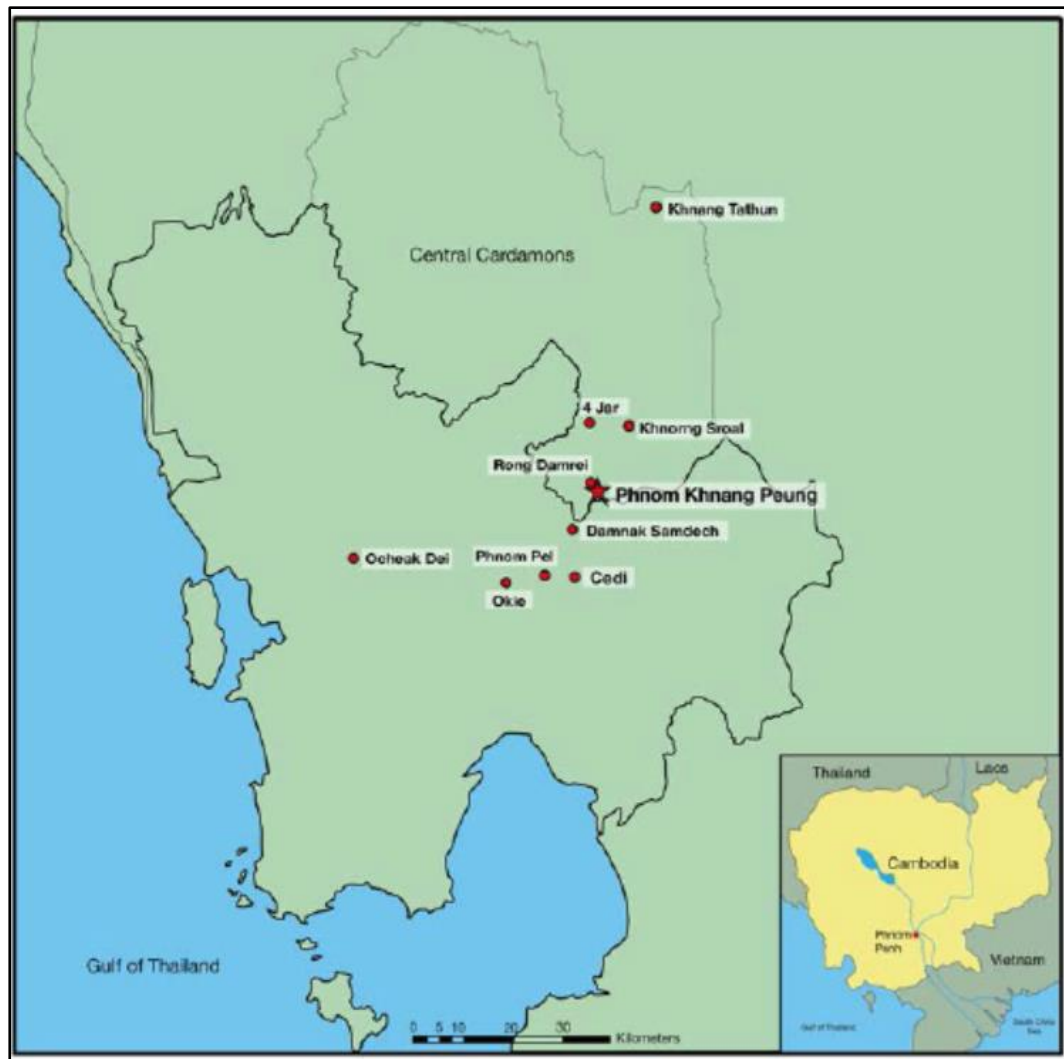


Fig. 1: Study area and general location within mainland Southeast Asia (inset) showing locations of burial sites and shipwreck discussed in the text.

Table 1: Summary of the NAA geotechnical results for the Cardamom and Shipwreck samples organized by ware type (stoneware/earthenware) and by compositional group (A-D for stoneware, E refers to the celadon singleton; 100-500 for earthenware).

	Group	N	Koh Sdech Shipwreck	S. Cardamom
Stoneware	A	20	12	8
	B	4	1	3
	C	2	1	1
	C1	1	0	1
	C2	1	0	1
	D	11	0	11
	E	1	0	1
Earthenware	100	4	0	4
	200	3	0	3
	210	2	2	0
	300	5	5	0
	400	12	0	12
	500	5	0	5
	Σ	71	21	50
	SW	40	14	26
	EW	31	7	24

The earthenwares include cooking pots, kendis, water jars, while the glazed stoneware are mainly storage jars but also includes a few fine glazed and decorated bowls. The glazed stoneware jar assemblage includes brown, black, and green glazes, and potentially some unglazed samples.

The shipwreck site is located in the Gulf of Thailand near the island of Koh Sdech (20 km off shore). Radiocarbon dating of a piece of short-lived cargo (bamboo core lacquerware box) established a mid-15th c CE date for this assemblage (Beavan, et al. 2012b). The shipwreck included a large assemblage of small, medium and large stoneware jars,

predominantly from Singburi / Maenam Noi (based on typology (Cort 2017), as well as basins, bowls, mortars, kendis and Sisatchanalai and Sukkhothai bowls (black under-painted and green glazed/celadons). Earthenware types included cooking pots, lids, and stoves. Only a few Chinese ceramic bowls were found, and were interpreted as the private items of the ship crew (Sokha 2013). Non-ceramic items included lacquerware, 'picul' (lead tokens), a betel box, ingots, a cannon, two ivory tubes, and some sandstone.

The three burial sites, all with secondary interments, are distributed in a cluster within the southern Cardamom Mountain range, 150-700 m asl, ca. 40 km inland from the east coast of the Gulf of Thailand. Both log coffin and jar inhumations are present at these sites. Through an extensive program of radiocarbon dating these burials have also been chronologically bracketed within the mid-15th c. CE (Beavan, et al. 2012a; Beavan, et al. 2015). Other trade goods present in the burials include simple copper finger rings and glass beads (Carter, et al. 2016). The glass beads are consistent with types circulating in the maritime trade of SE Asia at the time.

Methods

The ceramic samples were processed at UNE, and shipped to Maxxam Labs, Ontario Canada for NAA. Processing included documentation, photography prior to sampling. Subsamples were cleaned and crushed to homogenize the sample, and submitted for analysis.

NAA results were structured and grouped using an iterative combination of non-parametric multivariate procedures (PCA) and hierarchical cluster analysis (Ward's method).

The compositional data from the ceramics were compared with two general reference stoneware compositional data sets from Thailand and Cambodia. For Thailand the production sites include Sisatchanalai/Sawankhalok, Sukkhothai, and Suphanburi (n=24); the production sites from Cambodia, dating to the Angkorian period, include: Tani, Sar Sei, Thnal Mrech, Bangkok, Khnar Po, Torp Chey, Chong Samrong, Veal Svey, and Cheung Ek (n=877). Several of these kiln sites are closely clustered and have similar compositional fingerprints (e.g., Sar Sei/Thnal Mrech as one group, and Torp Chey/Chong Samrong/Veal Svey as another). Our sample of five stoneware samples from the Suphanburi kilns are of unglazed grey stamped jars.

The excavated shipwreck assemblage included a large number of jars of various, all attributable to the Maenam Noi kiln complex in the Singburi province of central Thailand. While we could not include reference results from the Maenam Noi kilns in Singburi, we suggest that there is a common geochemical profile for Singburi and Suphanburi (75 km to the southwest), reflecting the geographic proximity of these two Thai production centres in the same geochemically undifferentiated (?) alluvial plain.

Results

The Cardamom Mountains and Shipwreck data (Table 1)

Analysis of the NAA dataset for the combined Cardamom Mountains burial and shipwreck assemblages shows that it is highly compositionally structured with multiple discrete groups. We identified six earthenware groups (n=31) and four stoneware groups (n=40) including one singleton outlier (Group E; a fine ware celadon, typical of Sisatchanalai/Sawankhalok, central Northern Thailand)(Table 1).

The largest stoneware group (Group A, n=20) is split between burial (n=8) and shipwreck (n=12) samples. The samples in the second largest stoneware group, (Group D n=11), are from burial sites only, and include several samples previously identified as dark brown glazed “Angkorian” jars.

Four of the six earthenware groups are from burial sites only, and are dominated by cooking pots. None of these have compositional matches or external parallels and therefore are treated here as locally produced in the Cardamom Mountains area. The other two earthenware groups are exclusive to the shipwreck samples and include a range of vessel types. Therefore, the distribution of earthenwares in this sample shows no evidence of maritime trade in earthenwares.

Comparison with all SE Asian production centers (Table 2)

Table 2: In this table we compare the burial and shipwreck stonewasamples with the reference kiln ceramics from Thailand and Cambodia. The data presented are a subset of the data illustrated in Figure 2, focusing on the groups found only in the Cardamom Mountain burials and the shipwreck. Singleton samples have also been excluded.

The table notes the total number of samples for each assemblage (N) followed by percentage membership in each compositional group. The letters following groups 3 and 4 refer to group identifications defined in Table 1 (e.g., 3(A)). The matches in the greyed blocks are suggested to be misleading, see Discussion section. The matches in black boxes indicate matches between assemblages. For example, for Group 3, matches are between the Cardamom and shipwreck jars and a production center in Suphanburi/Singburi; the greyed block for Cheung Ek indicates an apparent, but rejected, connection to the Group 3 burial and shipwreck

Site		N	% Jars		W. ware
			3 (A)	4 (D)	2.9
S. Cardamom burials		26	42	42	4
Koh Sdech Shipwreck		14	93	--	--
Thai.	Suphanburi	5	100	--	--
	Sisatchanalai	16	--	69	19
Cambodia	Chong Samrong	117	--	98	--
	Torp Chey	53	--	100	--
	Veal Svey	41	--	98	--
	Cheung Ek	145	92	--	--

Given the size of the region with potential production centres, and the strong likelihood there were many more production centers in operation than we have reference material for, we undertook a further comparative analysis to provide more general provenience information. This combined analysis is useful for allowing a better understanding and differentiation of shared or unique geological settings.

We combined the compositional data from the nine Khmer and two Thai ceramic production complexes (n=799). In this analysis, five general geochemical groups were identified (Table 2) which were most clearly distinguished by systematic variations in Fe (iron) and Sb (antimony)(Fig. 2). Four singletons are discounted due to small sample size (with the exception of two fine ware bowls: Sukhothai underpainted and Sisatchanalai celadon sample). The groups and sites with singleton matches, or with production groups not matched in our burial and shipwreck assemblages, are excluded from Table 2.

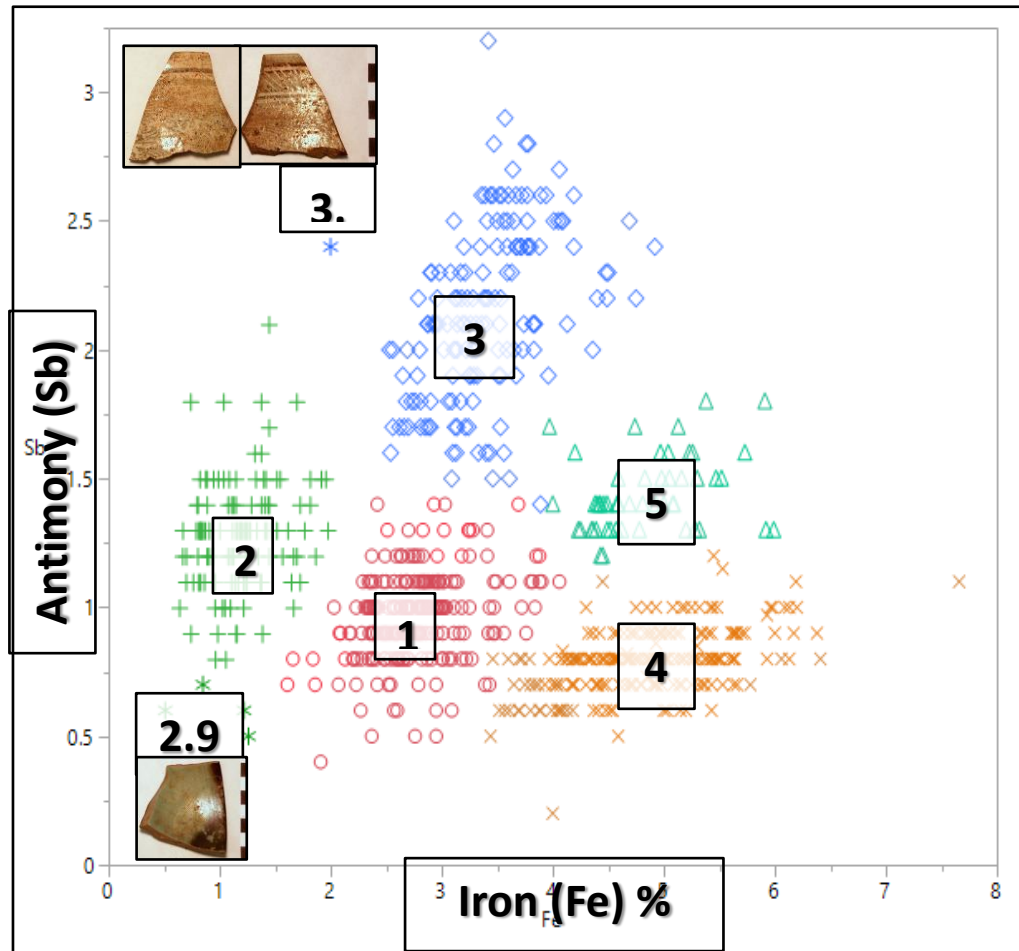


Fig. 2: Five compositional groups for stoneware samples identified in the combined NAA dataset ($n=839$) defined by Fe/Sb concentrations in the Southern Cardamom burial sites, the Koh Sdeach shipwreck assemblage, Thai production centres at Sisatchanalai and Suphanburi, and nine Khmer production centres (Bangkong, Cheung Ek, Chong Samrong, Khnar Po, Tani, Thnal Mrech, Torp Chey and Veal Svey). Note group 2 is composed entirely of whitewares from residual clays in the Kulen hills and is not represented in the burial or shipwreck assemblage. It is also distinct from white wares from Sisatchanalai (group 2.9). The singleton 3.9 is the only example of a fine ware bowl produced at Sukhothai (inset) from the Cardamom burials.

At this scale, these groups represent the broad differences in chemical composition of stoneware clays across the region. In some cases, specific kiln complexes can be identified within specific groups, but more commonly where complexes shared geologically similar settings, multiple kiln complexes are grouped together (as noted above). For example, one group combines kiln samples from Torp Chey, Chong Samrong, Veal Svey, and Sisatchanalai although these can be differentiated at a finer level of analysis.

Evaluation of the shipwreck and burial assemblages within this combined analysis of production centers, shows that all of the burial and shipwreck samples can be assigned to four of five general compositional groups (Groups 1, 3-5; Table 2, Fig 2). (The fifth group [Group 2] is composed entirely of whitewares from the Kulen hills which are absent in the shipwreck and burial assemblages.)

Group 3, which matches with the Suphanburi kiln samples, includes both shipwreck and burial site samples. In addition to the Suphanburi reference samples, Group 3 also includes all the Cheung Ek samples. We discount Cheung Ek as a source for this material for several reasons. First, a more detailed separate analysis of Group 3 shows that Group A samples group separately from Cheung Ek reference material. Second, the Cheung Ek kilns date to the 11th c. CE, centuries before the Cardamom Mountains burials. Lastly, there is no evidence for Cheung Ek jars, or any Khmer jars, in Southeast Asian shipwreck assemblages.

However, the burial sites also match a second source (Group 4) that is not found in the shipwreck assemblage. In addition to samples from the burial sites, Group 4 includes the proxemic Angkorian production centers of Torp Chey/Chong Samrong/Veal Svey (also the latest dated Angkorian production center 14th c CE). While not direct support for an origin in these

specific complexes, it does suggest an origin in a similar geological setting within the region.

We would note that Group 4 also includes samples from the Thai reference group of Sisatchanalai/ Sawankhalok. We suggest that the Cambodian reference groups provide a more likely source region for two main reasons. First, Sisatchanalai jars are not found in the shipwreck assemblages; and second, the burial samples are compositionally closer to the Cambodian reference samples when Group 4 is analyzed separately.

Archaeological perspective

Burial site assemblage: The earthenwares from the burial sites are predominantly cooking pots. Their compositional differentiation into multiple groups is likely to reflect local production groups.

The stoneware samples from the burial sites include matches with both the Suphanburi and the Sisatchanalai reference samples (jars and bowls; Groups 3 and 2.9). A further group of jar samples ($n=10$), is not represented in the shipwreck assemblage and only broadly/generically matches our Thai reference groups. This group (Group 4) includes the “Angkorian” jars and compositionally is better approximated by the geographically proximate Cambodian centres of Torp Chey/Chong Samrong/Veal Svey.

Shipwreck assemblage: The earthenware groups identified in the shipwreck assemblage only occur in the shipwreck. We do not have sufficient data to posit any origin for these earthenware samples. The shipwreck stoneware sample, including typical Maenam Noi jar types, are strongly dominated by one compositional group (93%), which

approximates the Suphanburi grouping, supporting a likely origin in this region (Singburi).

Discussion

The unusually fine chronological resolution of these data, based on an extensive dating program of multiple materials from multiple sites, allows a high degree of certainty about the mid-15th c. single generation use of the Cardamom burial sites (Beavan, et al. 2012a; Beavan, et al. 2015). In addition to this inland assemblage, the shipwreck assemblage is also firmly dated to the mid-15th c. from short-lived cargo (Beavan, et al. 2012b). In combination these two assemblages provide an unparalleled window on exchange dynamics between inland and maritime trade.

The shipwreck assemblage is typical of other contemporary local trading vessels within the Gulf of Thailand: with a few exceptions, the cargo is composed of locally produced (mainly Thai) goods, cooking pots, multiple jar types, and fine ware bowls (Brown and Sjostrand 2002). The composition of the stoneware samples from the shipwreck are consistent with production from a single complex, in this case jars that are readily typologically attributed to Maenam Noi, Singburi province. The Cardamom Mountains burial assemblage includes locally produced earthenwares, fine wares and jars from Thailand (Sukkhothai, Singburi, and Sisatchanalai), but also a typologically unmatched stoneware jar type.

This distinctive stoneware jar type has no parallels in the shipwreck assemblage, either in form or composition. However, geochemically it is consistent with stoneware samples from the 14th c. Angkorian kiln complexes (Torp Chey/Chong Samrong/Veal Svey) east of Angkor. As the likelihood that this group reflects heirlooming of old jars is small given the number of jars represented ($n=11$), we suggest this compositional type

was probably produced in a similar geological zone (near Torp Chey?) in the 15th c.. The combination of both maritime and inland trade goods in the Cardamom Mountain burials supports a scenario where upland groups are providing goods in both directions as part of a larger regional interaction sphere.

This is better documented in Northern Thailand where upland and lowland groups were closely connected through an inland exchange economy in the 13th-16th c.. Lowland urban elites controlled production of stonewares, both emulating exotic types and innovating new ceramic types (Grave 1995). Upland groups, thought be harvesting and exchanging forest goods (Wheatley 1959), consumed both these regionally produced ceramics as well as relatively large volumes of maritime trade wares. Again the combination of local and exotic stoneware ceramics were critical to the operation of Northern Thai inland economic networks.

A further parallel is the similar and distinctive mortuary practices of the Cardamom Mountain and upland northern Thai groups, particularly in relation to stoneware consumption. These comparable patterns of consumption suggest that while historically invisible, groups in the upland and inland regions across mainland Southeast Asia engaged in extensive interaction networks which supported local lowland production centers and their controlling elites (in this case, stoneware production, but likely a wider range of goods).

Conclusion

Historians have presented the transition from the premodern to Early Modern period in Southeast Asia primarily through the lens of maritime trade (Reid 1993). Arguably, the greatest impact of this transition is in the

production and consumption dynamics of groups in the interior of Southeast Asia, who remained beyond the reach of historical sources. While as yet relatively rare (e.g., Grave 1995), archaeological research on the Early Modern period in inland areas offers the potential to understand the interior dynamics of this transition.

Our data provide insight into an economy that was apparently still functional within and beyond the Greater Angkor region after the collapse of the Khmer Empire. This economy utilized (at least) local stoneware production to articulate with a large regionally integrated economy. We conclude that local lowland elites in Cambodia found ways to engage with the larger regional exchange economies after the political collapse of Angkor Wat. How these inland groups negotiated the transformations of the Early Modern period of the following century is now the challenge and opportunity for future fine-grain, chronologically high resolution studies.

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