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The impact of Ming and Qing dynasty maritime bans on trade ceramics recovered from coastal settlements in northern Sumatra, Indonesia



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ABSTRACT

We review published literature and historical texts to propose that three periods of official Chinese maritime bans impacted the composition and circulation of trade ceramics along Asian trade routes: Ming Ban 1 (1371 – 1509), Ming Ban 2 (1521 – 1529), and Qing Ban (1654 – 1684). We use ceramics collected during a landscape archaeology survey along 40km of coast in Aceh, Indonesia to show how the three ban periods manifest in the ceramic record of settlements along an important stretch of the maritime silkroad. All three ban periods overlap with reductions in the quantity of Chinese ceramics. Within several decades of the start of Ming Ban 1, people in Aceh began importing ceramics from production centers in Burma and Thailand as a substitute for Chinese ceramics. Following Ming Ban 2, there is an increase in imports from Chinese production centers, albeit from new kilns sites. While brief, the Qing ban resulted in an almost immediate influx of ceramics from Japan and Vietnam, which maintained some market share until the mid-17th century, after which Chinese ceramics dominate the record until the end of the Qing dynasty. Our data show both the importance of Chinese ceramics within regional trade networks and how those networks and local patterns of consumption adapted to disruptions of supply.

1. Introduction

For over a thousand years, Chinese ceramics were an important component in Asian trade networks (Brown and Sjostrand, 2004; Krahl and Effeny, 2010; Zhu, 2007). Historical and archaeological evidence show that Chinese ceramics had spread around the Indian Ocean by the Tang dynasty (Fig. 1). A combination of the technological innovations and artistic virtuosity needed to produce delicate fine ware porcelain made Chinese ceramics highly prized commodities that were traded throughout Asia, Europe and Africa through networks that returned incense, precious stones and metals, fabric, wood, etc. back to China (Christie, 1998; Edwards Mckinnon, 1977; Finlay, 2010; Flecker, 2001; Gerritsen and McDowall, 2012; Guy, 2004; Hall, 1985, 2010; Heng, 2012; Morgan, 1991; Oka et al., 2009; Pierson, 2012; Prinsloo et al., 2005; Schottenhammer, 2017; Stargardt, 2014; Takahito, 1988; Wade, 2008; Zhao, 2012). During the Ming (1368–1644) and Qing (1644–1911) dynasties, a combination of security issues, internal

political tensions and a series of Imperial maritime bans affected the production and export of Chinese ceramics.

Scholars have long noted the impact of the Ming sea ban on maritime trade (Cao, 2005; Hiroshi, 2004). In 1958 Tom Harrisson, Curator of the Sarawak Museum, pointed out that he could not find any Chinese ceramics dated to the Ming dynasty along over a hundred miles of the southwest coast of Borneo (Harrisson, 1958). Given the presence of earlier and later Chinese ceramics, he named this phenomenon the “Ming Gap”. While his discovery was challenged by Chin (Chin, 1977), Brown’s subsequent analysis of trade ceramics recovered from shipwrecks in Southeast Asia established that the Ming Gap was real and occurred in stages between 1350 and 1567. Brown proposed that there was a brief rebound in trade between 1488 and 1505 (Brown, 2004; Evans, 2004).

Brown also showed that the limited availability of Chinese ceramics starting in the late 14th century occurred around the same time as an increase in the percentage of ceramics from Southeast Asian production

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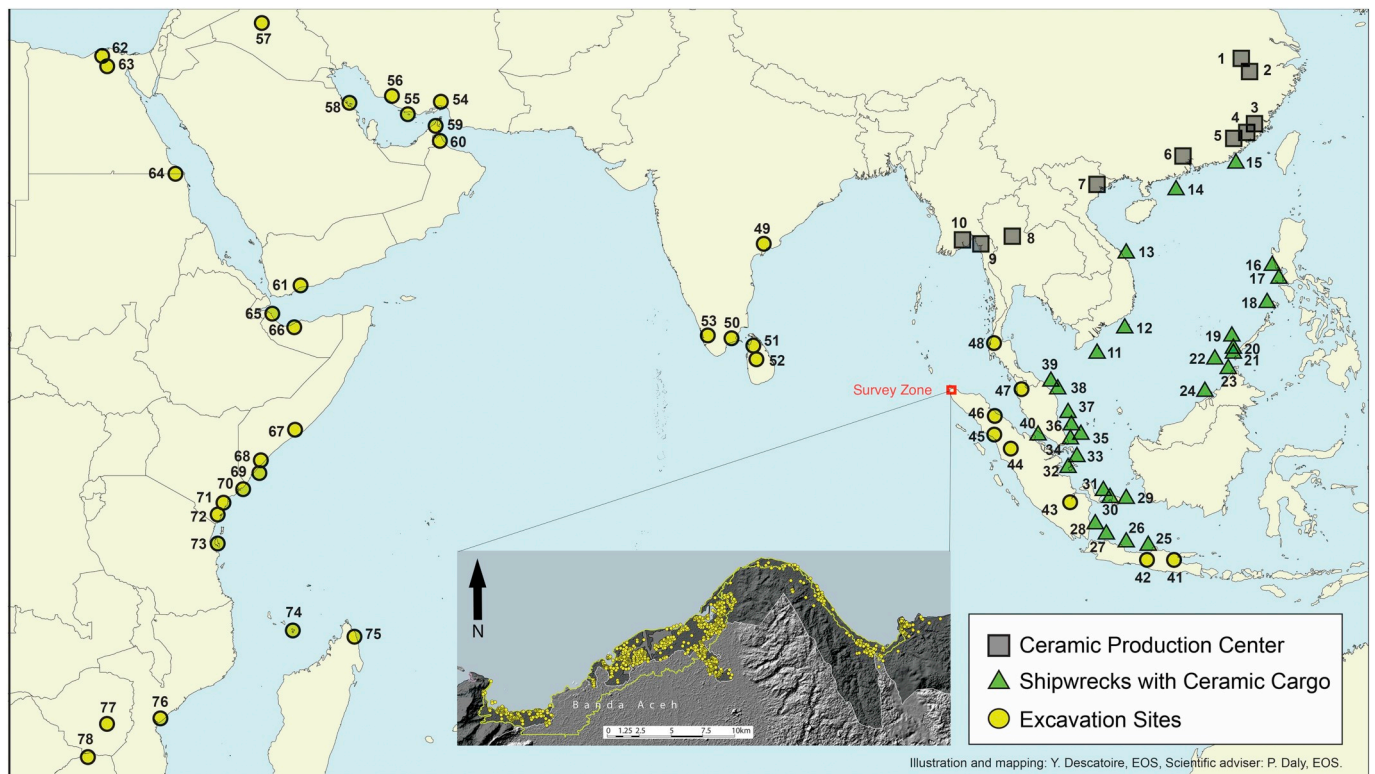


Fig. 1. Map of the Indian Ocean showing location of ceramic production sites [1 – 10], shipwrecks with Chinese trade ceramics in the cargo [11 – 40] and selected excavation sites with medieval (Tang – Qing) Chinese trade ceramics [41 – 78]. See Appendix C for a list of supporting selected references. The map insert is the study zone in Aceh, Indonesia showing all sites where surface material was recovered.

centers found within ship cargoes (Brown, 2009). In particular, ceramics made in Thailand and Vietnam comprise at least half of the ceramic cargo in shipwrecks between 1380 and 1430; followed by a “golden age of Thailand celadon” between 1430 and 1487 (Ibid.). Champa ceramics from central Vietnam were exported in 1450–1475, and Burmese ware has been found on shipwrecks dating between 1470 and 1505 (Ibid.). (Fig. 1)

The work of Brown and others has done much to illustrate the changing patterns of ceramic trade in Southeast Asia during the Ming dynasty. However, some scholars have suggested that official trade prohibitions could have been circumvented by trade networks and smugglers, mitigating the impact of the bans on the quantity of Chinese ceramics in circulation (Oka et al., 2009). There are three issues that need to be further resolved related to the impact of Chinese maritime bans upon ceramic supply and consumption, which we address in this paper. 1) Most of Brown’s research on the Ming Gap ceramics is based upon data from shipwrecks. This does not allow for a more nuanced examination of how Chinese maritime bans changed patterns of ceramic consumption and use in settlement sites connected to maritime trade routes. 2) Brown’s chronology for the Ming Gap did not include a rigorous review of historical sources. 3) There has been no explicit research on the possible impacts of a Qing dynasty trade ban on ceramic trade and consumption between 1654 and 1684.

In this paper, we analyze over 50,000 ceramic sherds collected as part of a large landscape survey along 40 km of the coast of Aceh, Indonesia to comment on the chronology and trade implications of disruptions in Chinese ceramic exports in the Ming and Qing dynasties. Aceh, strategically located at the confluence of the Melaka Straits and the Indian Ocean, was an important node in maritime trade since at least the 9th century and thus an ideal site to study the composition of trade ceramics over time (Feener et al., 2011). We first present a detailed discussion of the timing and justifications for the prohibitions on maritime trade during the Ming and Qing dynasties based upon official

Chinese records. We then present analysis of imported trade ceramics recovered along the Aceh coast to show how the composition of local assemblages changed as a result of the Chinese trade bans.

1.1. Historic records of the disruption of ceramic production and maritime trade in the Ming and Qing Dynasties

1.1.1. Chinese ceramic production and Maritime trade during the Ming Dynasty

There is extensive archaeological evidence that that ceramics, and in particular fine porcelain wares, were produced in China in large quantities for export markets starting in the Tang dynasty (618–907 CE) dynasty (Christie, 1998; Finlay, 2010; Flecker, 2001; Guy, 2004; Pierson, 2012; Schottenhammer, 2017; Stargardt, 2014) (Fig. 1). The popularity and value of Chinese ceramics reached new levels with the production of blue-and-white fine porcelain wares, coloured by cobalt, during the late Yuan dynasty in the 1330s in Jingdezhen (Carswell, 2000). However, a combination of conflict, imperial regulations on ceramic production, and restrictions on maritime trade disrupted the circulation of Chinese ceramics in the early Ming dynasty (Heng, 2012; Ptak, 1999; Wade, 2008). Conflict in Jingdezhen in 1352 between various parties of rebels and the Mongol army likely caused the Porcelain Bureau of Fuliang (Jingdezhen) to close down briefly and reduced the production of ceramics (Tai, 2011). The war ended in 1361 with Jingdezhen under the control of Emperor Taizu (1328–1398), the founder of the Ming dynasty, with ceramic production resuming, albeit under a new set of regulations.

The newly established Ming Court enacted a number of policies that limited the production of blue-and-white porcelain (Wade, 2008). According to Ming law, Imperial kilns were located in Jingdezhen, Jiangxi province, and Longquan, Zhejiang province [Appendix A.1] (see Fig. 1). These kilns produced blue-and-white porcelain during the early and middle Ming period almost exclusively for Imperial use, commissioned

by the Taizu (1368–1398), Chengzu (1402–1424), and Xuanzong (1426–1435) emperors. By 1431, the Imperial court exerted tight control over cobalt imported from both the Middle East and Chinese sources, effectively giving the court exclusive control over the production of blue-and-white porcelain. The kilns sent their products to the Imperial palace, where the court selected items for Imperial use and gifts. All ceramics not selected for Imperial use were smashed and buried to ensure they did not end up in circulation outside officially sanctioned purposes. This limited the availability of blue-and-white porcelain within China and abroad starting at the end of the 14th century.

The Imperial court allowed commercial kilns to obtain cobalt after 1435. This led to a rapid increase in the commercial production of blue-and-white porcelain for markets within China. However, the Emperor Yingzong (reigned 1436–1449, 1457–1464) issued ordinances in 1439 and 1449 that limited the commercial production of blue-and-white porcelain and punished violators with death, confiscation or banishment [Appendices A.2–A.4]. These controls were put in place because of Imperial concerns that commercial mass production was devaluing the blue-and-white porcelain associated with the royal court (Tai, 2011). There is no indication that Imperial kiln production was affected (Tai, 2012). The Emperor Wuzong of the Ming dynasty did not enforce the ban of producing blue-and-white ware in commercial kilns, leading to a surge of blue-and-white export between 1509 and 1521, as discussed more below.

A number of Imperial ordinances that limited and/or banned maritime trade further disrupted ceramic export. The first emperor of the Ming dynasty, the Emperor Taizu (1368–1398), imposed a ban on maritime trade starting around 1371 [Appendix A.5]. This ban was a response to the predation of Japanese pirates that had been harassing Chinese and neighboring kingdoms' coastal regions for several centuries along shipping lanes stretching from Korea to Vietnam. According to the edict, communities living along coastal regions were not allowed to set sail in any capacity whatsoever. The ban on seafaring was so strict that even fishing boats were not allowed to venture out to sea. This ban was codified into formal law in 1393 [Appendix A.6].

During the early Ming period, the Imperial court used porcelain as part of a system of 'ceramic diplomacy'. The Court sent selected types of ceramics and other valued materials overseas with diplomatic missions to be distributed as Imperial gifts to vassals. According to official Chinese records, the Emperor Taizu started to send ceramics to rulers as state gifts soon after 1376 [Appendix A.7]. There are at least two additional records of Ming missions in 1383 and 1386 to Siam, Champa and Chenla that presented ceramics to the rulers of foreign polities during the Hongwu reign (1368–1398) [Appendices A.8–A.9]. During the Yongle (1403–1424) and Xuande (1426–1435) reigns, the Chinese emperors sent Admiral Zheng He with a large fleet on a number of voyages through Southeast Asia and the wider Indian Ocean world (Dreyer, 2006; Finlay, 2008; Levathes, 1997; Wade, 2005). He brought along sets of highly distinctive ceramics, as well as other presents, for rulers of the polities he visited during his missions.

While restrictions on maritime trade spanned much of the early and mid-Ming dynasty, some scholars have suggested that trade restrictions were relaxed during the late 15th century (Brown, 2009; Wade, 2008). Our review of historic sources suggests the sea ban was temporarily lifted between 1509 to 1521 by the Emperor Wuzong (reigned 1506–1521). There are reports of foreign ships coming into Chinese ports during this period and of a growing realization amongst some civil servants that the maritime ban was limiting access to imported products desired by the Emperor, such as incense [Appendices A.10–A.12]. Officials saw taxes on cargo as a way to shore up the treasury and help support the military. This is the first time in the Ming dynasty that the sea ban on trade was lifted. In a memorial to the throne, Censor He Ao described ships trailing endlessly at sea, indicating that trade flourished during this period. [Appendices A.13]

The Portuguese established contact with the Ming court in 1518 after their conquest of Melaka in 1511. This brief period of access to

Chinese ports led to an increase in ceramic export – in particular blue-and-white porcelain from Jingdezhen. In 1521, Investigating Censor Qiu Daolong stated in a memorial to the new emperor that the Portuguese had attacked Melaka, which was a vassal state of the Ming dynasty, and therefore China should not trade with or accept tribute from the Portuguese until they withdrew from Melaka [Appendix A.13]. There was a strict ban on trade for eight years. The Imperial court ended the ban on 7 November 1529 and opened the port at Guangdong for trade [Appendix A.14]. In Fujian Province, officials advocated re-opening ports for trade. The Ming Emperor Jiajing (1522–1567) supported this, ordering court officials to eliminate piracy and restart trade. Once piracy was reduced in Fujian province, the Zhangzhou Yuegang (Moon Port) was opened to trade in 1567, resulting in a surge of export of ceramics from the Zhangzhou kilns (Zhang, 2000) [Appendix A.15–A.16].

1.2. Chinese ceramic production and export during the Qing Dynasty

While the Ming bans on maritime trade and resultant ceramic gap has gotten significant attention from scholars, historical records show that there were also sea bans during the Qing dynasty that limited the export of Chinese ceramics (Schottenhammer, 2010). The Qing trade bans resulted in part from the Manchurian conquest of China in 1644. This led to a period of turmoil and involved retaliation by Han Chinese during which time armed merchant ships that had formerly been considered 'pirates' became a vanguard against the Manchurian forces. In March 1654, Supervising Secretary of the Ministry of Rites, Ji Kaisheng proposed a sea ban to defend against Ming resistance forces. The following year, the Ministry of Defense decided "not even a single sail is allowed to enter the sea". In 1656, the sea ban was formalized [Appendix A.17]. The Emperor Qing Shizu (Shunzhi) imposed a ban on all maritime activity to cut the supply and communication lines of the resistance forces. The Imperial court ordered officials to erect barriers at all possible landing locations and not allow any ship to sail or land along the Chinese coast. Those who supplied or traded with the resistance were executed, with their cargo and property confiscated. Those who failed to report offences were executed. Any officials who failed to conduct their duties were severely punished.

When the resistance leader Zheng Chenggong (1624–1662) expelled the Dutch from Taiwan in 1661 and made it his base, the Manchurian emperor imposed the strictest sea ban order in Chinese history, referred to as the 'Great Clearance' [Appendix A.18] (Hayes, 1974; Po, 2018; Shi, 2006). The policy forced all residents living in coastal areas of China to move approximately 25 km inland to prevent any form of maritime activity or interaction with resistance forces in Taiwan. During this period, major ceramic manufacturing centers shifted from Pinghe to Hua'an and Nanjing counties, both about 100 km from the sea.

On 17th March 1681, the resistance leader Zheng Jing (1642–1681), son of Zheng Chenggong, passed away in Taiwan. The Governor-general of Fujian, Yao Qisheng (1624–1683), and Grand Coordinator, Wu Xingzuo, suggested they should open the border and allow people to return to the coast. In 1683, the 12 year-old Zheng Keshuang (1670–1707) surrendered to the Qing dynasty, effectively ending the need for the ban. On 6th December of that year, Wu Xingzuo, Governor-general of Guangdong and Guangxi provinces, started to repopulate the coast. With the surrender of resistance forces and the end of the 'Great Clearance' policy in 1683, the Qing dynasty sea ban was lifted in 1684 [Appendix A.19].

Given the almost total monopoly on the ceramic trade enjoyed by the Chinese before the Ming dynasty in Southeast Asia, these periods of maritime bans impacted regional trade. Below we analyze ceramics collected from our survey zone along Aceh coast of Sumatra to investigate whether the disruptions in Chinese ceramic export can be seen in the archaeological record of an important center of Southeast Asian maritime trade.

2. Methods

We collected the data presented in this paper through a systematic landscape archaeological survey conducted by Acehese researchers at the International Centre for Aceh and Indian Ocean Studies between 2015 and 2017. Our study area covered 40 km of coast near the city of Banda Aceh, Indonesia (Fig. 1). We selected the study zone to investigate the coastal areas on either side of what became the center of the Acehese Sultanate in the 16th century and because ad-hoc field walking had previously found clusters of historic grave markers and scatters of imported trade ceramics on the ground surface. The field team worked with village elders to identify known archaeological sites. They then walked transects through each of the villages, marking all sites where archaeological material was visible on the ground surface. We located over 1000 sites, most of which contained ceramic material. We define ‘sites’ as any discrete concentration of archaeological material visible on the surface, such as clusters of grave stones, scatters of ceramics, and structural remains.

For each site containing ceramics, the team measured the extent of the surface scatter, took GPS coordinates and photos, and collected all sherds found on the surface large enough to be identified. We collected, cleaned, tagged, weighted, photographed and analysed 52,939 ceramic sherds. We were able to identify the date range and provenance (manufacture center) for 40,850 pieces of imported trade ceramics which form the basis of this study. We collected over 8,000 sherds of non-descript earthenware ceramics, many presumably manufactured locally. However, the lack of dated, comparable material prevents us from including this in our analysis. Our ceramic identification was informed by comparing the forms, styles, and decoration of the sherds recovered during our survey with dated material from shipwrecks, excavated kiln sites, and museum collections (see references associated with Fig. 1).

We created a spreadsheet for each site containing ceramics, listing the site code, unique ID number for each sherd, weight, fabric, decoration, provenance, vessel type, chronology, and comments. Date ranges vary considerably by the type of ceramic vessel - some types were only produced in a specific year, while other types were produced for decades or even centuries. To manage the date ranges and constrain human activity to multi-decadal precision we applied a statistical model to the ceramic dataset to calculate probable activity levels for each year, using the *BchronDensityFast* function in *Bchron* (Haslett and Parnell, 2008; Parnell et al., 2008). This function considers the date ranges for each sherd and provides a statistical estimate for when different kinds of ceramics found in Aceh were most likely in use. We provide a more detailed technical overview of the *TheBchronDensityFast* function in Appendix B. Furthermore, acknowledging the problems posed by the ceramic date ranges, we present both the minimum and maximum potential totals for the ceramics for each time period under investigation (Table 1, Table S1).

3. Results

The bulk of the trade ceramics recovered from our survey area date between the early 13th to 19th centuries C.E. The Aceh assemblage contains a wide range of material from East Asian, Southeast Asian, South Asian, Middle Eastern and European production centers, reflecting Aceh’s connections to global trading networks (Fig. 2; Tables 1 & S1). The overall quantity of ceramics increased over time, with most dating from after the mid-16th century. As discussed in detail below, we found decreases in the quantity of Chinese ceramics and increases in non-Chinese material recovered in our study area that date to the Ming and Qing ban periods.

3.1. Ceramics in Aceh before the Ming Bans (Pre-1371)

Before the Ming Bans, the Aceh assemblage consists almost exclusively of Chinese ceramics produced in Guangdong, Fujian, Zhejiang

and Jiangxi provinces (Table 1 & Table S1). More than half the sherds are fragments of large jars and basins applied with a layer of yellowish-brown glaze that were produced in Guangdong. These jars were used as storage containers on merchant ships exporting material from China. (Fig. 3a & b) The Fujian wares were made in specialized production centers in Tong’an, Cizao, and Dehua. The Tong’an ceramics are mainly green ware rice bowls used for food preparation and consumption. (Fig. 4a & b) The Cizao material are ubiquitous small-mouth jars, fired at high temperatures, which were commonly used as containers for liquids such as mercury, condiments and alcohol. (Fig. 5a & b) The Dehua material are mainly covered boxes often used as incense containers.

We recovered significant quantities of high quality fine ware from Zhejiang (Longquan) and Jiangxi (Jingdezhen) respectively. The Longquan material mainly consists of monochrome celadon bowls and dishes. Longquan celadon fine wares were a major export product during the later Southern Song and Yuan dynasties and are found throughout Southeast Asia (Chin, 1977; Edwards McKinnon, 1977; Evans, 2004; Flecker, 2001, 2013, 2015; Ho, 1994; Li, 2014; Lim, 2018; Miksic, 2006, 2009; Stargardt, 2001). The Jingdezhen fine ware includes *shufu* ware, *qingbai* ware, and blue-and-white ware.

3.2. Ceramics dating to Ming Bans 1 & 2 (1371 - 1506 & 1521 - 1529)

Our data shows that during the Ming Ban periods there was a major reduction in the quantity of Chinese coarse ware ceramics in the Aceh assemblage. In our study area we recovered only five sherds each of Fujian and Guangdong coarse ware vessels, indicating the two most common types of pre-ban ceramics were not imported during the Ming Bans. However, we found a continued but greatly reduced presence of Chinese fine ware. We recovered 48 sherds of Longquan fine ware that we can date to within the period of Ming Ban 1. We suspect that one interesting sherd of underglaze copper-red, part of a large bowl with a band of “lotus petal” pattern border just above the ring foot, dates to between 1380 and 1398 based upon comparison with ceramics in the Palace Museum, Beijing, dated to the reign of Ming Dynasty founder, Taizu (Fig. 6a & b). A sherd with a ‘diaper’ pattern similar to celadon from the Chinese Imperial collection in the National Palace Museum, Taipei (Fig. 7a & b) was most likely produced in the early 15th century (Tsai, 2009 p. 76 - 77). Although only a small sample, we believe that these ceramics were gifted by the Imperial court to elites within our study area as part of formal diplomatic connections during the first Ming Ban period; possibly even brought to the Aceh coast during visits by Zheng He’s fleet, which historical records show passed the Aceh coast five times in 1405, 1408, 1413, 1417 and 1430 (Dreyer, 2006; Wade, 2005).

The reduced quantity of Chinese ceramics is partially offset by an increase in ceramics from production centers in Burma, Thailand and Vietnam (Fig. 2; Table 1 & Table S1; Fig. S1 - 5). The Burmese material is mainly from relatively crudely-potted celadon bowls and dishes for serving food and large coarse ware Martaban storage jars. The Thai ceramics are mainly bowls and dishes for serving food from the Sawankhalok kilns in Sukhothai. The Thai bowls and dishes are mostly high quality celadon, coated with a greenish glossy glaze and decorated with carved feather-like patterns. We recovered a small quantity of high quality Vietnamese bowls decorated with underglaze iron black, cobalt blue, or in some cases both colors.

Interestingly, there is a spike in the quantity of Chinese fine ware that we date between 1506 and 1521, which falls between Ming Bans 1 & 2 (Fig. 2, Fig. S2). We recovered at least 254 sherds of Jingdezhen blue-and-white wares that we believe date between 1506 and 1521, mainly dishes and bowls for serving food, some covered boxes and fragments from a bottle (Fig. 8 a & b). Some of this material is similar in style and decoration to a vessel from the Hutian kiln with an inscription on the bottom that reads “Made in the Great Ming Zhengde Reign Autumn Auspicious Day” (Liu, 1980), and from a small jar excavated from a tomb in Boyang dated to 1520 currently found in the collection of the Jiangxi Museum.

Table 1

Sherd counts by location of production for the key time periods in the study. This table only includes material that we can definitely date within the time periods, removing all sherds that overlap multiple periods. The maximum count for all material from each production center that *could possibly date* within that time period is shown in Table S1. We applied a statistical model to control for sherds that have date ranges that overlap with the time periods listed in the table. (see Fig. 2 and Supplementary Figs. 1 – 5).

Country	Region	Sub-region	Pre 1371 count	1371 – 1529 count	1529 – 1654 count	1654 – 1684 count	1684 – 1850 count	Total by country	
Burma	Karen	Kaw Don		2	10			701	
		Mon		247	326				
	Yangon	Twante		9					
	Unknown	Unknown		53	54				
China	Fujian	Anxi					15	23,411	
		Cizao	123						
		Dehua	9		20		3289		
		Minnan	55	1					
		Quanzhou	16						
		Tongan	381						
		Shaowu				5			
		Zhangzhou (Swatow)	1			4481			
		Zhangzhou (Dongxi)					8		6602
		Unknown	212	4	503		4,089		
		Guangdong	Guangzhou	21					
		Unknown	1246	6	5		10		
		Hebei	Cizhou	2					
		Quyang	1						
		Jiangsu	Yixing						14
Jiangxi	Jingdezhen	52	254	876	1	766			
Zhejiang	Longquan	225	48						
Unknown	Unknown	51	3	3		16			
Japan	Hizen		1	13		149	377	540	
Thailand	Ayutthaya	Unknown		2				247	
		Singburi	Unknown		1				
	Sukhothai	Sawankhalok		186	2				
		Sukhothai			15				
Unknown	Unknown	1	20						
Vietnam	Hai Duong	Hop Le	4	1			3	43	
		Unknown		35					
Totals			2400	888	6298	158	15,181	24,925	

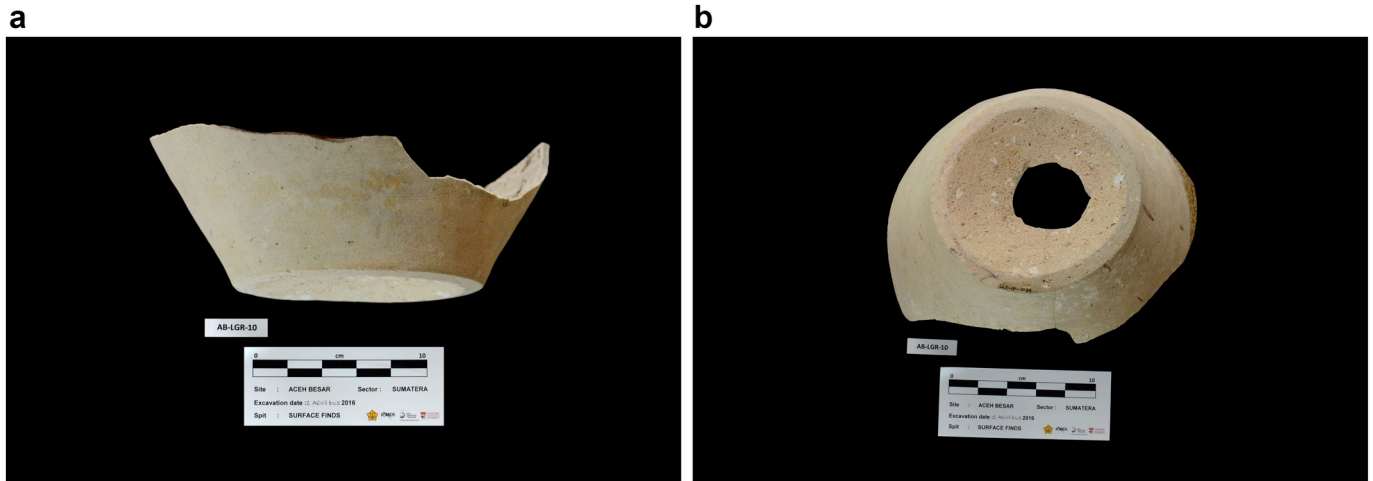
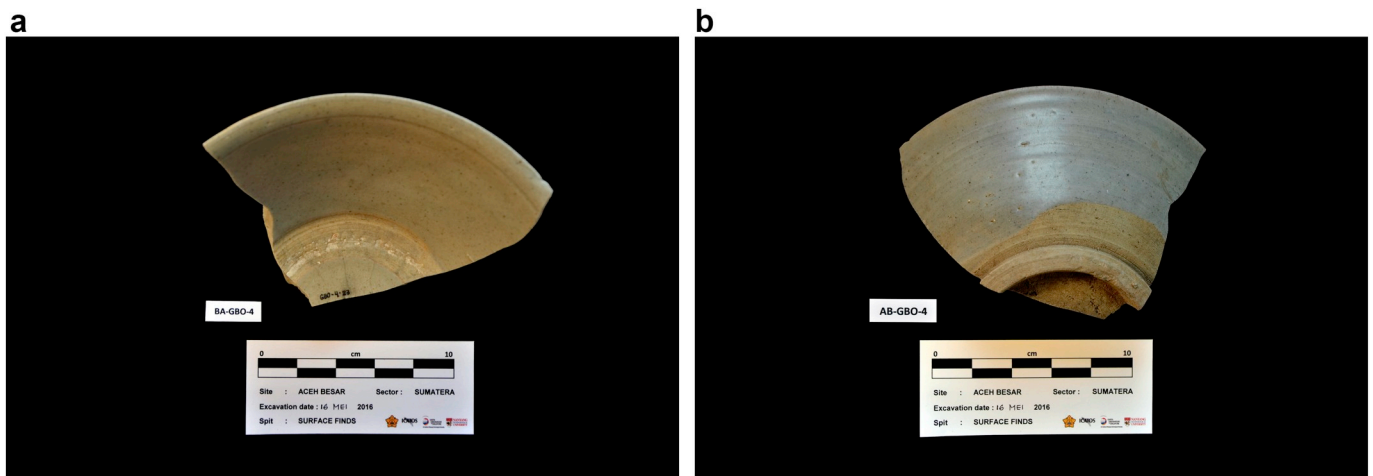


Fig 2. The plot shows estimated probability densities over time based upon statistical analysis of the quantity of sherds and their individual date ranges. The peaks represent the probable density of ceramics that date to every given year, relative to the total count and date ranges for each country respectively. We use these densities as a proxy for the timing of when the different types of ceramics were most likely present and in use by people along the Aceh coast. The red bars indicate the Ming and Qing export bans.

Table 2

Changes in the dominant production centers for the main types of ceramics within the study area, showing change over time.

	Pre 1371	1371 – 1529 Ming Bans	1529 - 1654	1654 – 1684 Qing Ban	1684 - 1850
Coarse ware jars	Guangdong (China)	Martaban (Burma)	Martaban (Burma)		
Coarse table wares (bowls, dishes, etc.)	Tong'an (China) Cizao (China) Minnan (China) Quanzhou (China)	Martaban (Burma) Twante (Burma)	Pinghe, Zhangzhou (China) Twante (Burma)	Hua'an and Nanjing, Zhangzhou (China)	Hua'an and Nanjing, Zhangzhou (China)
Fine table wares (bowls, dishes, bottles, boxes, vases, etc.)	Longquan (China) Jingdezhen (China)	Jingdezhen (China) Sawankhalok (Thailand) Longquan (China)	Jingdezhen (China) Sawankhalok (Thailand) Dehua (China)	Hizen (Japan) Hop Le (Vietnam) Dehua (China) Jingdezhen (China)	Dehua (China) Hizen (Japan) Jingdezhen (China) Hop Le (Vietnam)

**Fig. 3.** a & b. Example of base of a pre-1400 Guangdong jar.**Fig. 4.** a & b. Sherd from a small pre-1400 Tong'an ware bowl.

3.3. Ceramics after the Ming Ban 1529 - 1650

Between the Ming Bans and the Qing Ban there was a major increase in the quantity of Chinese export ceramics recovered in Aceh, mainly coarse ware bowls and dishes from kilns in the Zhangzhou region. This material, often known as Swatow ware, which was produced in Pinghe county, is a form of mass-produced domestic ceramic that flooded regional trade markets in the second half of the 16th century following the opening of the Moon Port (Zhangzhou Yuegang) in 1567. There is also an increase of fine ware bowls, dishes and boxes from Dehua and Jingdezhen.

While we recovered small amounts of Thai and Japanese ceramics that we can date between 1529 and 1650, the main non-Chinese ceramic

import during this period were large, coarse ware Martaban jars from southern Burma. This suggests that Burmese production centers retained market share for large storage vessels and also that Chinese traders were either using Burmese jars for shipping, or may have developed alternative shipping practices after the Ming Bans. Before the Ming Bans were lifted, Martaban jars typically had black-brown glaze and were decorated with vertical and horizontal lines in relief, which divide the body into two panels (Goddio et al., 2002). Early Martaban jars also had three horizontal lugs and saddle straps with distinct 'dot' decoration (OCSHK, 1979). Later Martaban jars do not have applied lines and strap decoration (Fig. 9a & b). There is a gradual decrease in Thai ceramics by the mid-16th century (Fig. 2, Table 1 & Table S1).

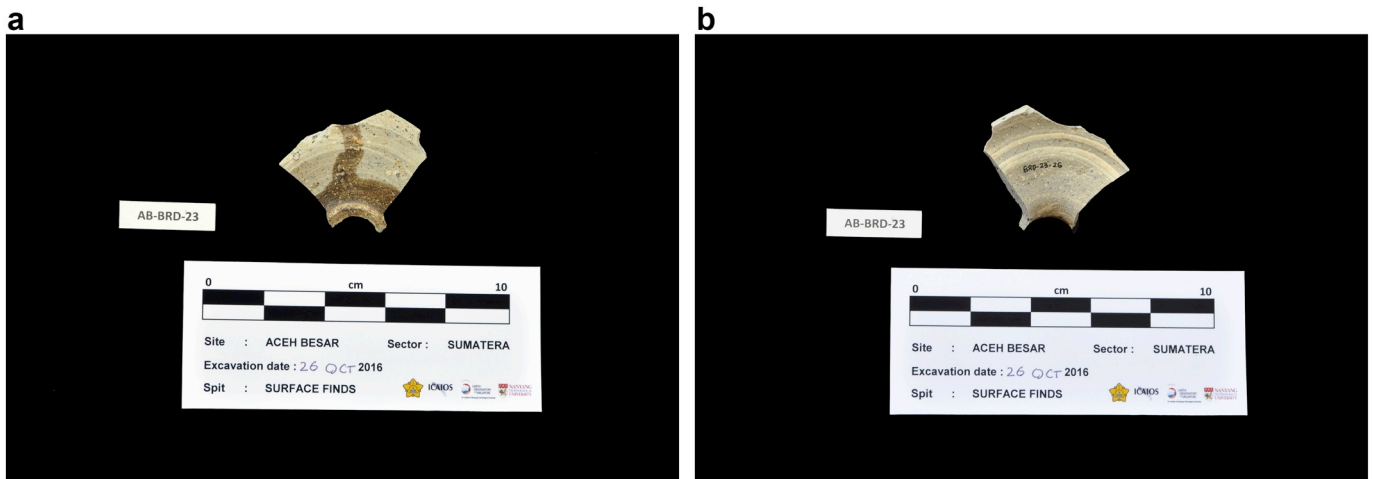


Fig. 5. a & b. Rim sherd from a pre-1400 small mouth jar from Cizao.

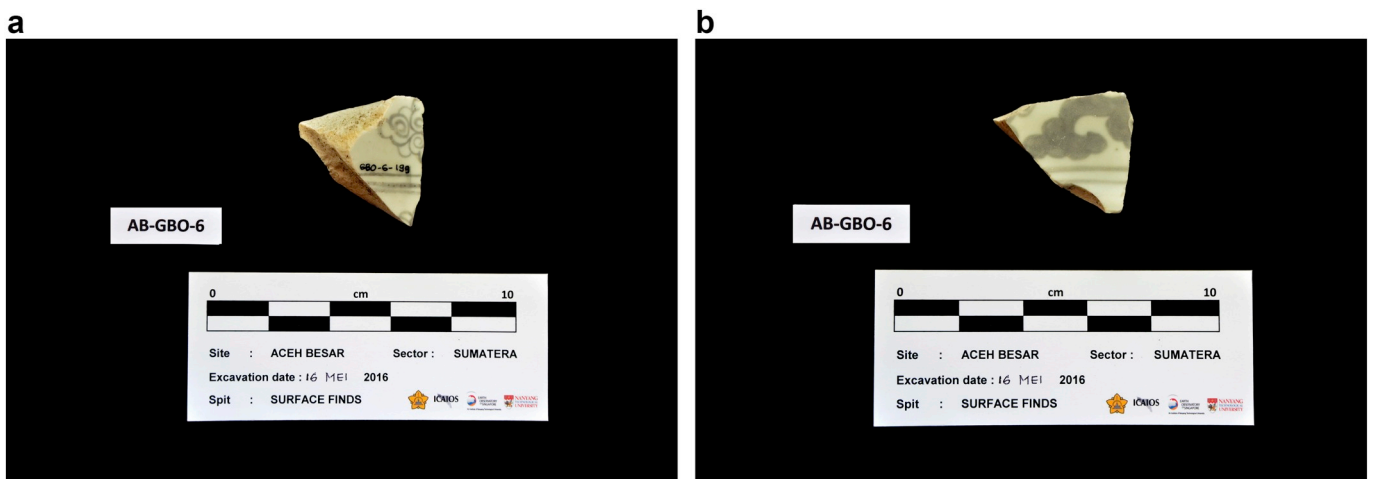


Fig. 6. A & B. Underglaze copper-red bowl found in Aceh with a band of lotus-petal pattern. Examples of similar underglaze copper-red bottle and bowl dated to the Hongwu reign (1368-1398) from the collection of the Palace Museum, Beijing.

3.4. Ceramics dating to the Qing Ban period 1654 - 1684

The Qing Ban period is characterised by 1) a slight decrease in the quantity of Chinese ceramics, 2) a lack of Thai ceramics, 3) an increase in the quantity of Burmese ceramics, and 4) the entrance of Japanese and Vietnamese ceramics¹ (Fig. 2, Table 1 & Table S1). We recovered at least 149 sherds of Japanese Hizen porcelain bowls and dishes dated between 1650 and 1700.² These Japanese ceramics are relatively fine blue-and-white ware and have some similarities with ceramics produced in Zhangzhou, such as a slightly underfired off-white paste and use of dull

¹ It is difficult to provide a precise analysis of the impact of the three-decade Qing ban as some styles of Chinese and other southeast Asian ceramics have possible date ranges of 50 to 100 years, overlapping with, or including the decades of the Qing ban. However, our statistical analysis clearly shows on aggregate that there are shifts in the counts of ceramics found in our survey zone during and after the Qing ban period.

² Japanese potters started making porcelain in 1616 with their main manufacturing center in Hizen, which includes important kiln sites in Arita (Kyushu). The Japanese ceramic industry developed rapidly over the next 50 years. Japan began commercially exporting ceramics after the Dutch established a trading post at Dejima, Nagasaki, in 1641, that hosted a range of Japanese, Chinese, and other international merchants. By 1660, Japan was exporting large quantities of high quality ceramics.

blue pigment for the decoration. Some of this material is decorated with dragon or phoenix motifs, with other examples having the Kanji character *ni* (日sun), which is also found on some Zhangzhou ceramics.

3.5. Ceramics dating after the Qing Ban period 1684 - 1850

Following the Qing Ban there was a significant increase in the quantity of Chinese ceramics, with a pronounced spike in the early 19th century. The Chinese ceramics from this period are dominated by coarse ware bowls and dishes from Zhangzhou. We found a sherd of a Zhangzhou magnolia leaf and poem dish with a sexagenary cycle calendar date of Jia Zi Nian (1684), the year the Qing Ban ended (Fig. 10a & b). We are confident that the inscribed date is 1684 (rather than another date in the cycle) because this ceramic style was not in production either 60 years before or after the date. We recovered numerous sherds from Zhangzhou cursive *shou* (longevity) character bowls (Fig. 11a & b). These vessels are decorated with cursive characters "shou" (寿longevity), with some fragments displaying other characters such as *yu* (玉jade), *jia* (佳excellence) or *ya* (雅elegant) painted on the center of the interior. The Zhangzhou material before the Qing Ban was produced in Pinghe county and fired in saggars on coarse sand, which leaves traces of sand on the running glaze along the base of the vessels. Following the Qing Ban there is a shift to manufacturing centers in Hua'an and Nanjing counties, where the ceramics were stack fired. These different manufacturing techniques leave distinct signatures on the vessels, making it relatively easy to

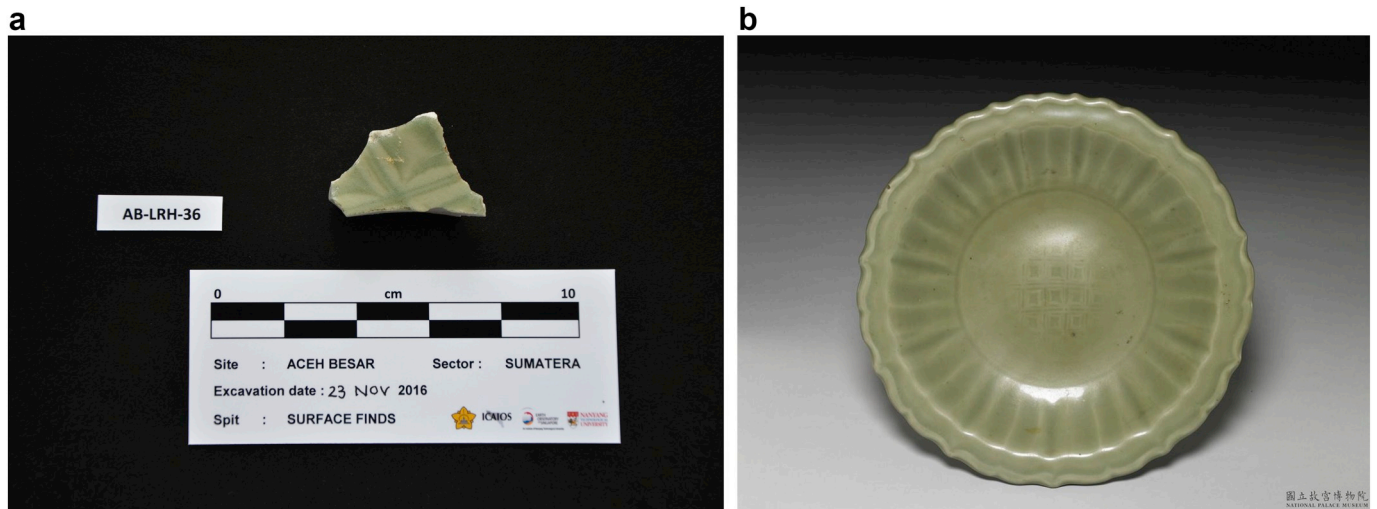


Fig 7. A. Longquan celadon with diaper pattern, found in Aceh. B. Example of similar ceramics from the Chinese imperial collection at the National Palace Museum, Taipei. (With kind permission from the National Palace Museum, Taiwan).

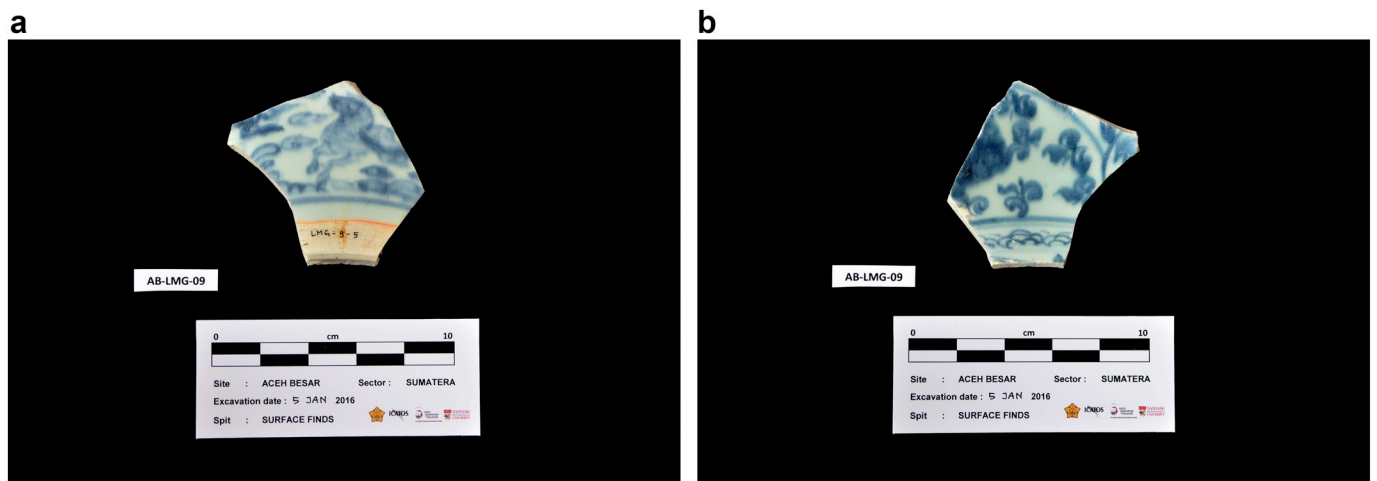


Fig. 8. A & B. Sherd of Jingdezhen blue-and-white dish decorated with a mythical creature galloping on a wave. We date this sherd between Ming Ban 1 and Ming Ban 2, 1506 and 1521.

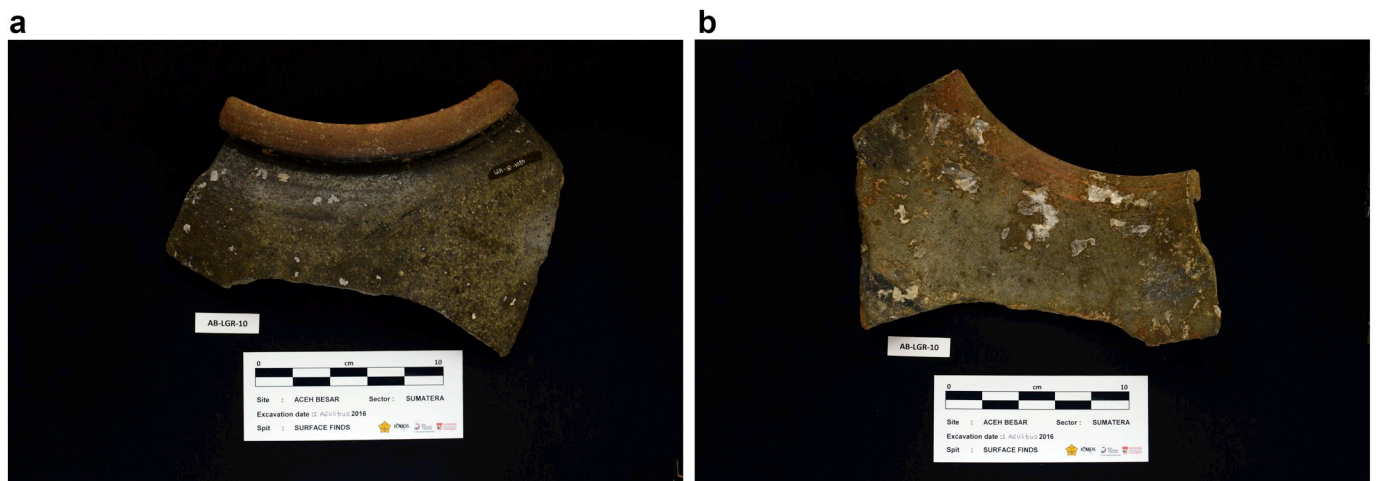


Fig. 9. a & b. Rim sherd from a large Martaban jar most likely dating after the Ming Ban period.

identify. The ceramics produced in Hua'an and Nanjing counties are also known as Dongxi ware. We recovered large quantities of fine ware bowls, dishes, bottles, boxes, and vases from Jingdezhen and Dehua.

We also found a persistence of Burmese, Japanese and Vietnamese ceramics until the mid-18th century. The Burmese material consists of coarse ware Martaban bowls and jars. The Japanese ceramics are high

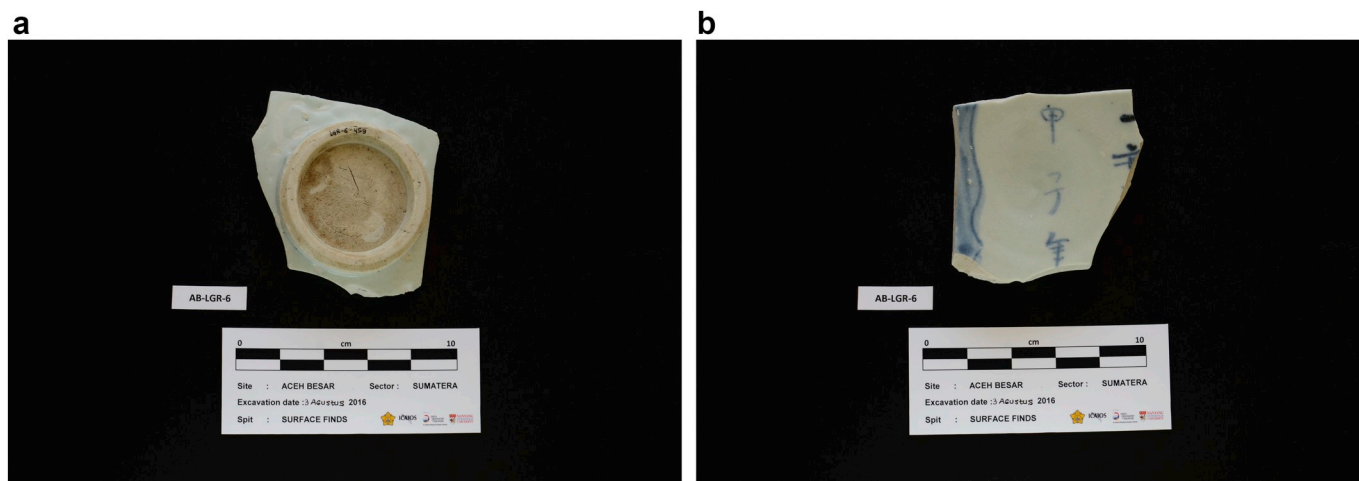


Fig. 10. A & B. Sherd from a Zhangzhou magnolia leaf and poem dish with a sexagenary cycle calendar data of Jia Zi Nian (1684) from Aceh.

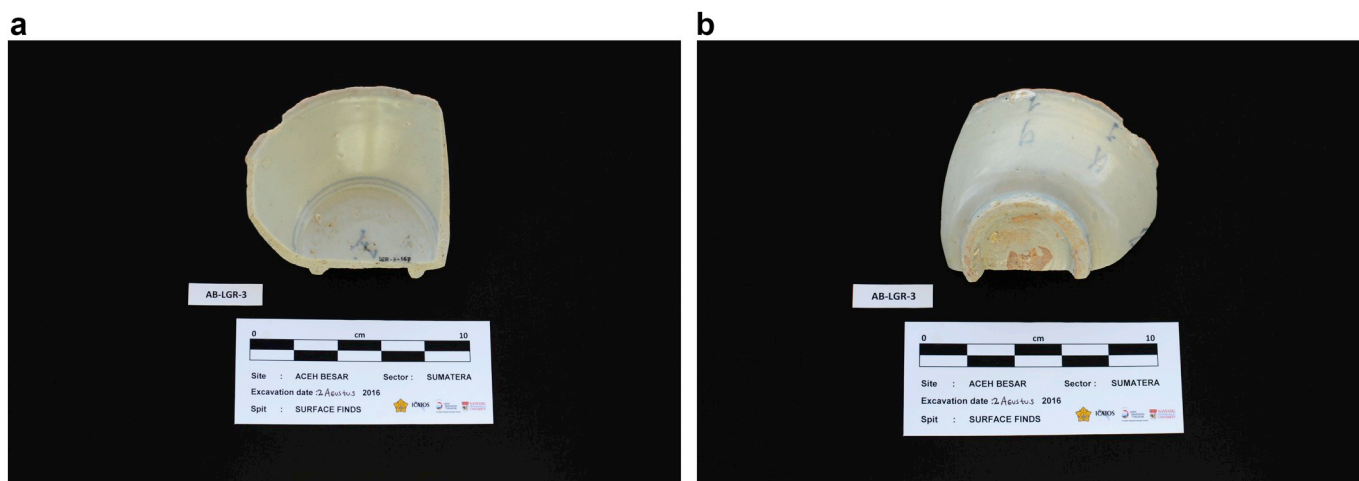


Fig. 11. A & B. Sherd from a Zhangzhou cursive 'longevity' character bowl dating after the Qing gap from Aceh. The character 'yu' is on the inside of the bowl, while 'shou' is written in cursive along the outside of the bowl.

quality fine ware vessels. Most of the Japanese sherds came from Kraak ware vessels, with painted decorations including flowers, insects, birds, and landscape scenes (Fig. 12a & b). All of the Vietnamese ceramics are 'sunburst' bowls produced in Hop Le (Hai Duong), with many decorated with a block-printed sunburst (chrysanthemum) pattern (Fig. 13a & b). Burmese, Japanese and Vietnamese ceramics all disappear from Aceh's archaeological record around the same time in the mid-18th century.

4. Discussion

Our review of historical Chinese records shows that the Ming Gap (1371 – 1529) consisted of three stages: Ming Ban 1 (1371 – 1509), followed by a brief resumption of trade (1509 – 1521), and then Ming Ban 2 (1521 – 1529). Historical records from the Qing dynasty report a number of ordinances that limited export between 1654 and 1684, which we identify as the Qing Gap.

Our analysis of trade ceramics recovered from the Aceh coast shows that both the Ming and Qing Bans, as well as changes in production centers in China, impacted the import and use of ceramics along the Straits of Melaka (Table 2). Before the Ming Bans almost all imported ceramics were produced in China. The Ming Bans significantly reduced the import of Chinese ceramics. However, within several decades of the ban, the main forms of Chinese ceramics used in Aceh had been partially replaced by similar material produced in Burma and Thailand. Burmese coarse wares from Martaban and Twante substituted for coarse ware jars and table

wares from Guangdong and Fujian (Table 2). The high-quality celadon and porcelain from Longquan and Jingdezhen that most likely were used by affluent elites in Aceh were replaced by fine wares from the Sawankhalok production centers in Thailand.³

Following the end of the Ming Bans, our data show a gradual increase in Chinese ceramics through the mid-16th century in Aceh. This was followed by a major influx of coarse table wares from Zhangzhou and increased imports of fine wares from Jingdezhen and Dehua. Large storage jars continued to be imported from Burma. Imports of Thai fine ware decreased steadily and ended by the mid-16th century, after which Thai material is absent from our study area.

While brief, the Qing Ban resulted in major changes in the ceramic record. The date ranges of Chinese ceramics make it difficult to evaluate the extent of the decrease in Chinese material, but our statistical analysis shows some reduction. However, there is a clear spike in the quantity of Burmese ceramics, and the import of fine wares from production centers in Japan and Vietnam occurs within years of the Qing Ban. In fact, the styles of the Japanese and Vietnamese wares closely mimic some of the characteristics of

³ The Thai wares were rarely as well fired as the Longquan material in our survey zone. The Thai examples are commonly discolored, greens with grey or brown patches. As such, while we feel the Thai material was used as a substitute for the fine ware from Longquan, we do not feel that they matched the quality of the earlier Longquan ceramics.

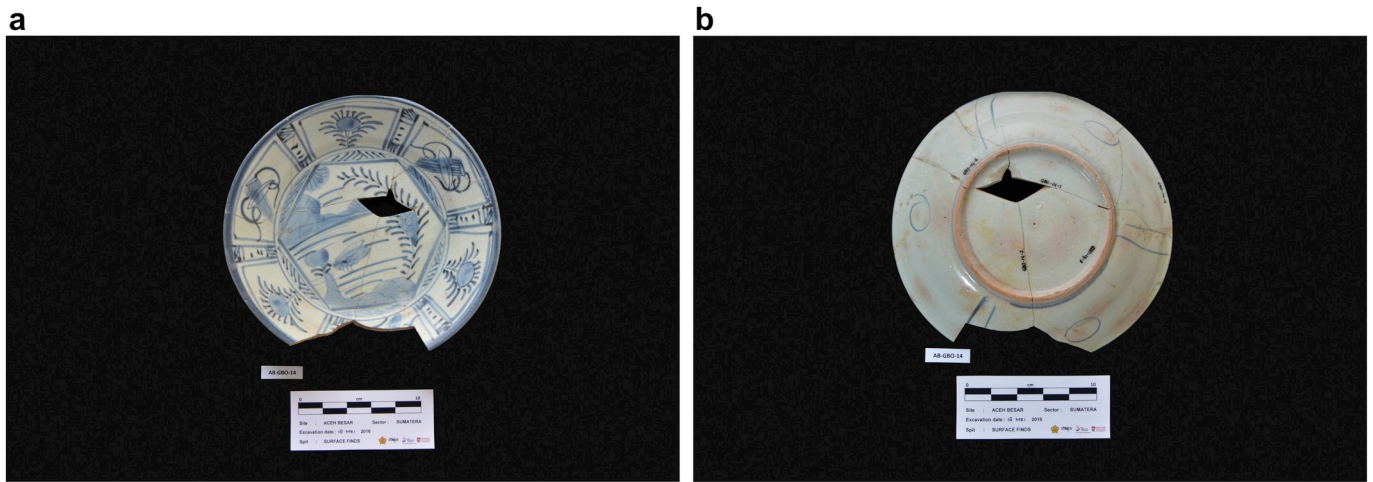


Fig. 12. A & B. Sherds from a Japanese Kraak dish (reconstructed) recovered in Aceh.

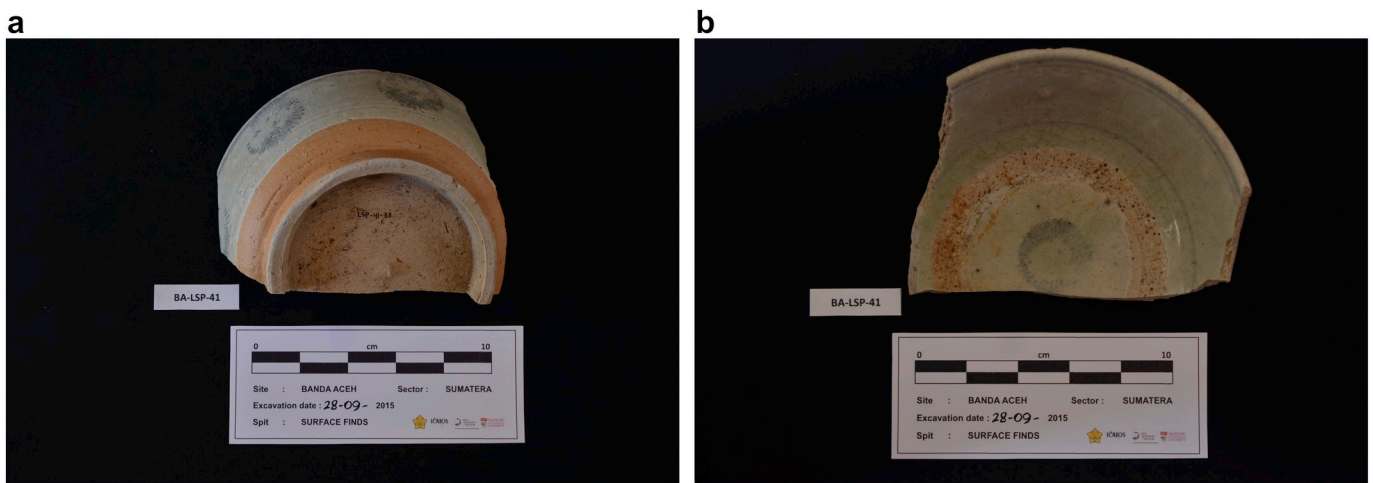


Fig. 13. A & B. Sherd from a Vietnamese sunburst bowl produced in Hop Le, Hai Duong.

Chinese fine ware from Jingdezhen. Following the Qing Ban, Burmese, Japanese and Vietnamese fine wares are present in Aceh until they all disappear around the same time in the mid-18th century, after which time almost all trade ceramics were imported from China until the entrance of European ceramics in the 19th century.

Our findings are in general agreement with Brown's timeline for the Ming Gap, with one notable exception. Brown proposes that there is a brief rebound of trade during the Hongzhi reign (1488 – 1505), supported by the dating of ceramics from the Brunei and Lena Shoal shipwrecks (Brown, 2004; Goddio et al., 2000a, 2002). Our review of Chinese historical sources suggest that the Ming trade ban was relaxed during the Zhengde reign (1506 – 1521), but we found no indication that it was also relaxed during the Hongzhi reign. Second, we have been able to date some of the Jingdezhen ceramics from our study area with confidence to the Zhengde reign. Interestingly, we noticed that some of the material we can date to the Zhengde reign is very similar to material recovered from the Lena Shoal wreck and currently dated to the Hongzhi reign. Additional research is needed to test whether similar styles of Jingdezhen ceramics could have spanned both the Hongzhi and Zhengde reigns (thus accounting for the overlap), or if the dating of the cargos of the Lena Shoal and Brunei wrecks needs to be reconsidered in light of similar types of ceramics from dated contexts in China.

5. Conclusion

For over 600 years, settlements along the Aceh coast at the northern tip

of Sumatra were deeply connected to regional trading networks, verified by the rich collection of trade ceramics we collected. We have reason to believe that some of the changes we can see in the ceramic assemblage in Aceh were the result of economic and political changes caused when a large tsunami destroyed all low-lying coastal settlements in our survey area at the end of the 14th century and disrupted society for at least several decades thereafter (Daly et al., 2019; Sieh et al., 2015). However, the historic trading site of Lamri, positioned on an elevated headland within our study area, continued to import trade ceramics from Thailand and received diplomatic gifts of Imperial ceramics from China during the 15th century. Furthermore, by the end of the 15th century, we start to see an increase of imported ceramics in the area that emerged as the center of the Aceh Sultanate.

Therefore, we suggest the changing patterns of ceramic import along the Aceh coast are representative of broader regional trends. What emerges from our analysis is a picture of how producers, consumers, and traders adjusted fluidly to the massive shocks caused by the Chinese maritime bans. While informal trade might well have circulated limited amounts of Chinese ceramics during the ban periods, the official prohibitions had a major impact on the quantity of Chinese trade ceramics along the Aceh coast and led to stimulating other regional production centers. While there are indications from both our data and shipwreck cargos that Southeast Asian ceramics started be exported prior to the disruption of Chinese ceramics, our analysis shows that it might have taken up to several decades for other producers to accelerate ceramic manufacturing technology and scale up production, and for new trading networks to emerge. However, during the Qing gap, producers and

markets responded more rapidly, and production centers in Japan and Vietnam deliberately produced ceramics with many of the characteristics and decorative motifs found on Chinese ceramics. Looking at the trade ceramics imported over an extended period reveals the ability of Chinese ceramics to regain market share and quickly return to dominate regional markets, most likely because of a combination of technological superiority and economies of scale enjoyed by Chinese production centers through the end of the Qing dynasty.

Declaration of Competing Interest

None

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Appendix A. Chinese imperial ordinances related to the manufacture and export of ceramics

A.1. 洪武二十六年定:凡烧造供用器皿等物,须要定夺样制,计算人工物料。如果数多,起取人匠赴京,置窑兴工,或数少,行移饶、处等府烧造。(《大明会典》卷一百九十四“陶器”)

Implemented in 1393: Whenever (there is a need to) fire Imperial wares, [you] must design the pattern and calculate the cost of manpower and materials. If the quantity is large, send the potters to the capital and set up kilns to do the job. If the quantity is small, fire it in the Raozhou (today's Jingdezhen) and Chuzhou (today's Longquan) kilns.

[Shen Shixing, *Collected Statutes of the Ming* (《明会典》), 1587 A.D. juan 194. Beijing: Zhong Hua Publishing, 2007, p. 980.]

A.2. (正統三年十二月丙寅)命都察院出榜,禁江西瓷器窑场,烧造官样青花白地瓷器,于各处货卖及馈送官员之家。违者正犯处死,全家谪戍口外。

(1 Jan 1439, the Emperor) ordered the Censorate to post a notice banning the production, sale and gifting to officials of naval blue-on-white ground porcelain from the kilns of Jiangxi. Offenders will be sentenced to death and their families will be banished to a frontier post.

[Sun Jizong ed., *Veritable Records of Ming Dynasty Emperor Yingzong* (《大明英宗实录》), 1467 A.D., juan 49, p. 4a. Taipei: Institute of History and Philology, Academia Sinica, 1964, vol. 24, p. 946.]

A.3. (正統十二年九月戊戌)禁约两京并陕西、河南、湖广、甘肃、大同、辽东沿途驿递镇店军民客商人等,不许私将白地青花瓷器皿卖与外夷使臣。

(18 Oct 1447) Soldiers, civilians, visitors and businessmen at postal relay stations, transport offices, defence commands and shops/inns along the roads of northern and southern Capitals, Shanxi, Henan, Huguang, Gansu, Datong and Liaodong are not allowed to sell naval blue-on-white ground wares to foreign emissaries.

[Sun Jizong ed., *Veritable Records of Ming Dynasty Emperor Yingzong* (《大明英宗实录》), 1467 A.D., juan 158, p. 3b. Taipei: Institute of History and Philology, Academia Sinica, 1964, vol. 29, p. 3074.]

A.4. (正統十二年十二月甲戌)禁江西饶州府私造黄、紫、红、绿、青、蓝、白地青花等瓷器。命都察院榜谕其处,有敢仍冒前禁者,首犯凌迟处死,籍其家货,丁男充军边卫。知而不以告者,连坐。

(On the 22nd Jan 1448, the Emperor) banned the private production of yellow, purple, pink, green, naval blue, light blue and naval blue-on-white ground coloured ceramics in Raozhou (now Jingdezhen), Jiangxi. [The Emperor] ordered the office of the Censorate to post notice there. Offenders will be sentenced to death by the slow process of slicing, their property will be confiscated and male family members will be sent to a frontier post as a soldier. Any who fails to report this offence will be prosecuted as well.

[Sun Jizong ed., *Veritable Records of Ming Dynasty Emperor Yingzong* (《大明英宗实录》), 1467 A.D., juan 161, p. 4b. Taipei: Institute of History and Philology, Academia Sinica, 1964, vol. 29, p. 3132.]

A.5. (洪武四年)仍禁濒海民不得私出海。(《明太祖实录》)

(1371) Do not allow people living along coastal regions to set sail.

[Yao, Guangxiao (1335-1418) eds., *Veritable Records of Ming Dynasty Emperor Taizu* (《明太祖实录》), 1418 A.D., juan. 70, p. 3b. Taipei: Institute of History and Philology, Academia Sinica, 1964, Vol. 3, p. 1300.]

A.6. 充军按律充军凡四十六款,而诸司职掌内二十二款,则洪武年间例、皆律所不载者。其嘉靖二十九年,奏定条例内充军凡二百十三款,与今所奏定、大略相同、诸例已附载各律之下、永为遵守。今仍类次于后。其职掌所载、仍列于前、以备参考。

洪武二十六年定:贩卖私盐、诡寄田粮、私充牙行、私自下海、鬪吏、土豪、应合抄札家属、积年民害官吏、诬告人充军、无籍户、揽纳户、旧日山寨头目、更名易姓家属、不务生理、游食、断指诽谤、小书生、主文、野牢子、帮虎、伴当、直司。

嘉靖二十九年定:..... (《大明会典》)

According to the law, there are 46 articles on crimes that can be punished by banishment to an army post. The 22 listed in *Zhu Si Zhi Zhang* were regulations of Hongwu reign (1368-1398) and were not listed in the law book. Laws approved in 29th year of Jiajing reign (1550) have 213 articles on banishment to an army post... Now all [of these laws] are included and listed accordingly as follows, with those (laws) in the (*Zhu Si Zhi Zhang*) listed first for consideration: (Those laws) drafted in the 26th year of Hongwu reign (1393): Smuggling salt, evading grain tax, acting as agent in private, putting to sea without permission..... (Those laws) drafted in the 29th year of Jiajing reign (1550):

[Shen Shixing, *Collected Statutes of the Great Ming* 《大明会典》, 1587 A.D. *juan* 175, p. 1, in *Continuation Series of the Complete Collection of the Imperial Library* 《续修四库全书》, Vol. 792, Shanghai: Shanghai Guji 1995, p. 129.]

A.7. 洪武九年.....夏四月甲申朔, 刑部侍郎李浩还自琉球.....浩因言其国俗市易, 不贵纨绮, 但贵磁器、铁釜等物。自是赐予及市马, 多用磁器、铁釜云。(《明太祖实录》卷一百五)

On 19 April 1376..... The Deputy Minister of Law, Li Hao, returned from Ryukyu..... He reported that when they trade, they highly value Chinese ceramics and iron cauldrons, but not silk. From then on, presents for foreign rulers and the trading of horses will be ceramics and iron cauldrons.

[Yao Guangxiao ed., *Veritable Records of Ming Dynasty Emperor Taizu* (《明太祖实录》), 1418 A.D., *juan* 105, p. 3b-4a. Taipei: Institute of History and Philology, Academia Sinica, 1964, Vol. 4, p. 1754-1755.]

A.8. 洪武十六年八月.....遣使赐占城、暹罗、真腊国王织金文绮各三十二匹、磁器一万九千事。(《明太祖实录》卷一百五十六)

In the 8th month of 1383, a mission was sent to Siam, Champa, and Chenla, and presented each king 32 pieces of gold thread woven damasks and 19,000 pieces of ceramics.

[Yao Guangxiao eds., *Veritable Records of Ming Dynasty Emperor Taizu* (《明太祖实录》), 1418 A.D., *juan* 156, p. 2b-3a. Taipei: Institute of History and Philology, Academia Sinica, 1964, Vol. 6, p. 2426-2427.]

A.9. 洪武十九年九月.....癸未, 遣行人刘敏、唐敬偕内使赍磁器, 往赐真腊等国。(《明太祖实录》卷一百七十九)

On the 23rd Oct 1386... Sent Liu Min, Tang Jing and eunuch(s) to bring ceramics to present to Chenla and other kingdoms.

[Yao Guangxiao eds., *Veritable Records of Ming Dynasty Emperor Taizu* (《明太祖实录》), 1418 A.D., *juan* 179, p. 5a. Taipei: Institute of History and Philology, Academia Sinica, 1964, Vol. 6, p. 2711.]

A.10. (正德四年三月乙未)暹罗国船有为风飘泊至广东境者, 镇巡官会议税其货, 以备军需。市舶司太监熊宣计得预其事以要利, 乃奏请于上。礼部议:阻之。诏:以宣妄揽事权, 令回南京管事。以内官监太监毕真代之。(《明武宗实录》卷四十八)

(23rd March 1509) A Siamese ship drifted into Guangdong territory due to a storm. The Grand Defender and Grand Coordinator held a meeting and decided to tax the cargo in order to subsidize the army. The Superintendent, Eunuch Xiong Xuan, wanted to be involved so as to profit from it. He sent his request to the emperor, but was blocked by the Ministry of Rites after the ministry meeting. (The Emperor) proclaimed: Xiong Xuan acted beyond his authority, he is ordered to return to Nanjing, Eunuch Bi Zhen will take over his post.

[Xu Guangzuo (?-1526) eds., *Veritable Records of Ming Dynasty Emperor Wuzong* (《明武宗实录》), 1525 A.D., *juan* 48, pp. 1b-2a. Taipei: Institute of History and Philology, Academia Sinica, 1964, Vol. 63, pp. 1082-1083.]

A.11. (正德十二年五月辛丑)命:番国进贡并装货船舶, 榷十之二。解京及存留饷军者, 俱如旧例, 勿执近例阻遏。先是:两广奸民, 私通番货, 勾引外夷, 与进贡者混以图利, 招诱亡命, 略买子女, 出没纵横, 民受其害。参议陈伯献请禁治之:其应供番夷, 不依年分亦行阻回。至是, 右布政使吴廷举, 巧辩兴利, 请立一切之法。抚按官及户部, 皆惑而从之。不数年间, 遂启佛朗机之衅, 副使汪鋐尽力剿捕, 仅能胜之。于是, 每岁造船、铸铳, 为守御计, 所费不貲。而应供番夷, 皆以佛朗机故, 一概阻绝, 舶货不通矣。利源一启, 为患无穷, 廷举之罪也。(《明武宗实录》卷一百四十九)

(15th June 1517) Ordered: Imposes 20% tax on foreign tributary mission and cargo on ships. Those (who) need to be escorted to the capital or those meant for military expenditure will stick to the original regulations. Do not cite the new regulations to obstruct the procedure. Prior to this, the people in Guangdong lured foreigners and tributary missions for profit. (They) attracted the outlaws, buying sons and daughters (of the locals for slavery), haunted the region and became a problem for the people. The Assistant Administration Commissioner Chen Boxian requested a ban on trade. He demanded any visiting foreign tributary mission visiting anytime other than on the designated dates be turned back. But the Provincial Administration Commissioner, Wu Tingju (吴廷举1462-1527), suggested to increase the revenue and to draft new regulations (for trade). The Grand Coordinator and Surveillance Commissioner (of Guangdong Province) and Ministry of Revenue (of the central government) accepted his suggestions. In a few years, the Portuguese intruded. Vice Censor Wang Hong (汪鋐1466-1536) only managed to withhold their aggression.

[Xu Guangzuo (?-1526) ed., *Veritable Records of Ming Dynasty Emperor Wuzong* (《武宗实录》), 1525 A.D., *juan* 149, p. 9a. Taipei: Institute of History and Philology, Academia Sinica, 1964, Vol. 68, p. 2911.]

A.12. 先是, 暹罗、占城、爪哇、琉球、浣泥诸国互市, 俱在广州, 设市舶司领之。正德时, 移于高州之电白县。嘉靖十四年, 指挥黄庆纳贿, 请于上官, 移之壕镜, 岁输课二万金, 佛郎机遂得混入。(《明史》)

Prior [to the arrival of Portuguese], Siam, Champa, Java, Ryukyu and Boneo traded with the supervision of the Superintendent in Guangzhou (Canton). During the reign of Zhengde (1506-1521), the office moved to Dianbai. In 14th year of the reign of Jiajing (1535), the Military Officer Huang Qing accepted bribes and requested his superior to set up the Office of the Superintendent at Macau. The Portuguese pay 20,000,000 bronze coins yearly as rental and have thus managed to stay in China.

[Zhang Tingyu eds., *Ming History* (《明史》), 1739 A.D. Beijing: Zhonghua Publishing, 1999, p. 5649.]

A.13. (正德十五年十二月己丑)海外佛朗机,前此未通中国,近岁吞并满刺加,逐其国王,遣使进贡。因请封,诏许来京,其留候怀远驿者,遂略买人口、盖房立寨,为久居计。满刺加亦尝具奏求掠朝廷,未有处也。会监察御史丘道隆言:满刺加,朝贡诏封之国,而佛朗机并之,且啖我以利,邀求封赏,于义决不可听。请却其贡献,明示顺逆,使归还满刺加疆土之后,方许朝贡,脱或执迷不悛,虽外夷不烦兵力,亦必檄召诸夷声罪致讨,庶几大义以明。御史何鳌亦言:佛朗机最号凶诈,兵器比诸夷独精。前年驾大船,突进广平省下,铙炮之声震动城郭。留驿者,违禁交通,至京者桀骜争长。今听其私舶往来交易,势必至于争斗而杀伤。南方之祸,殆无极大矣。且祖宗时,四夷来贡,皆有年限,备倭官军,防截甚严。间有番舶诡称遭风飘泊欲图贸易者,亦必核实具奏,抽分如例。夷人获利不多故其来有数。近因布政使吴廷举首倡缺少上供香料及军门取给之议,不拘年分,至即抽货,以致番舶不绝于海澳,蛮夷杂沓于州城。法防既疏,道路益熟,此佛朗机所以乘机而突至也。乞查复旧例,悉驱在澳番舶及夷人潜住者,禁私通,严守备,则一方得其所矣。礼部覆议:道隆先为顺德令,鳌顺德人,故备知其情。宜俟满刺加使臣到日,会官译诘佛朗机番使侵夺邻国扰害地方之故。奏请:处置广东三司掌印并守巡、巡视备倭官不能呈详防御,宜行镇巡官逮问。以后严加禁约,夷人留驿者,不许往来私通贸易。番舶非当贡年,驱逐远去,勿与抽盘。廷举倡开事端,仍行户部查例停革。诏:悉如议,行之。(《明武宗实录》卷一百四十九)

(13th Jan 1521) Prior to this, the overseas' Portuguese never contacted China. In recent years, [the Portuguese] conquered Melaka, expelled its King, and sent a mission to the Ming Court to pay tribute. Because they asked for a title to be conferred upon them, they were allowed to visit the capital. Those in the Huai Yuan Station started to buy slaves and build houses and a fortress for staying long-term. Although Melaka asked for help, no action was taken. Now, the Investigating Censor Qiu Daolong requested [in his memorial]: Melaka is our vassal state, the Portuguese attacked it and wanted to trade with us and requested to be conferred a title. Morally it is not acceptable. Please reject their tribute to show [the difference between] submission and defiance [of them]. Only if [the Portuguese] return the land of Melaka, will they be allowed to pay tribute. If they refuse, even though they are foreigners which we need not use military force, we will still request the kingdoms in the region to condemn them, thus delivering a righteousness message. Censor He Ao (1497-1559) also said [in his memorial]: the Portuguese are famous as the most malicious and cunning (people). Their weapons are the best among the foreigners. The year before last year, they sailed large boat(s) and intruded into Quang Binh Province (now part of Vietnam). The sound of cannons shook the city walls. Those who stay at the station break the law by engaging with locals, and those who came to the capital did not observe social norms and acted in their own arrogant manner. Now if we allow their private ships to trade, it will inevitably lead to conflict and injury. The problems in the south will be endless. Furthermore, the foreigners pay tribute according to an allocated schedule and the navy has intercepted and guarded them very closely. Sometimes there are ships that claim to have been struck by a storm, which drift [into the port] and want to trade, [we will] verify that and report [to the Emperor], imposing a tax as required by the regulations. Because the foreigners have not profited from it thus they did not come regularly. Recently, due to the lack of income for the emperor and military expenses, Guangdong Provincial Administration Commissioner Wu Tingju suggested to tax the cargoes [of ships], regardless of the designated date [of the tributary mission]. It caused the foreign ships to come endlessly at sea, and large numbers of foreigners appeared in the capital of the province. The laws and defences are slack, and [the foreigners are] familiar with the routes. This is the reason behind the intrusion of Portuguese. Requests: Check and return back to the original regulation, and expel the foreign ships at Macau and all foreigners who stay illegally. Do not allow any to engage foreigners, strengthen the defences, and the region will be all right. The Ministry of Rites replied after discussion: Daolong once was the Magistrate of Shunde County and Ao is a native of Shunde, therefore they know the details. It is appropriate that when the envoy from Melaka is here, gather the officials and translators to question the Portuguese envoy about their reason for invading a neighbouring country. Suggestion to the Emperor: Punish the person in charge of the Guangdong Three Provincial Offices [note: (they are the) Provincial Administration Commissions, Provincial Surveillance Commissions and Regional Military Commissions], Governor, Grand Coordinator and the Censor Inspecting the Readiness Against Japanese pirates for their inability to mount a proper defence. Have them arrested and sent to the judge for interrogation. From now on, strictly prohibit foreigners in the station to trade with locals. Foreign ships [that come to China] outside the designated seasons of the tribute year will be turned back and not taxed. Tingju caused this problem, the Ministry of Revenue removed [him] from the office in accordance with the regulation. [The Emperor] ordered: As requested, implement.

[Xu Guangzuo (?-1526) eds., *Veritable Records of Ming Dynasty Emperor Wuzong* (《武宗实录》), 1525 A.D., *juan* 194, p. 2b-3a. Taipei: Institute of History and Philology, Academia Sinica, 1964, Vol. 69, p. 3630-3631.]

A.14. (嘉靖八年十月己巳)初,佛朗机火者亚三等既诛,广东有司乃并绝安南、满刺加。诸番舶皆潜泊漳州,私与为市。至是,提督两广侍郎林富疏其事,下兵部。议言:安南、满刺加,自昔内属,例得通市,载在祖训会典。佛朗机,正德中始入,而亚三等以不法诛,故驱绝之,岂得以此尽绝番舶?且广东设市舶司,而漳州无之,是广东不当阻而阻,漳州当禁而不禁也。请令:广东番舶,例许通市者,毋得禁绝;漳州则驱之,毋得停舶。从之。(《明世宗实录》卷一百六)

(7th Nov 1529) After the Portuguese [interpreter] Huo-Zhe-Ya-San (Khoja Hassan) was executed (in 1521), the officials in Guangdong stopped all trading with Annam and Melaka. Foreign ships secretly berthed at Zhangzhou (in order) to conduct illegal trade. Now, the Supreme Commander of Guangdong and Guangxi Provinces cum Vice Minister of the Ministry of War Lin Fu file in the case in his memorial to the throne, and it was sent to the Ministry of War for discussion. It is decided that: Annam and Melaka are vassal states, they are allowed to trade, as stated in the Code of Great Ming Dynasty. The Portuguese came to China during the Zhengde (1506-1521) reign, and Ya-San was executed for breaking the law, therefore they were expelled. This should not be used as a reason to block all foreign ships. Furthermore, Guangdong has a Shipping Superintendent Office but Zhangzhou does not have one. Guangdong is a port which should not ban foreign ships but has banned them, whereas Zhangzhou should ban foreign ships but has not done so. Please issue an edict: The foreign ships allowed to trade at Guangdong should not be banned. Send them off at Zhangzhou, do not allow them to berth there. Approved [by the Emperor].

[Zhang Rong, *Veritable Records of Ming Dynasty Emperor Shizong* (《明世宗实录》), 1577 A.D. *juan* 106, p. 5a. Taipei: Institute of History and Philology, Academia Sinica, 1964, Vol. 76, p. 2507.]

A.15. 四十四年,奏设海澄县治,其明年隆庆改元,福建巡抚都御史涂泽民请开海禁,准贩东西二洋。

In 44th year (1565 CE), a memorial to the throne requested to set up the county of Chenghai. The following year (note: early 1567, not 1566 because the Chinese calendar and the Gregorian calendar are not fully overlapping each other), Emperor Muzong (1537-1572) was enthroned. Grand Coordinator of Fujian Province Tu Zemin requested to lift the sea ban and allow trade in the East Ocean (note: East China Sea and east of South China Sea eg. Borneo and the Philippines) and the Western Ocean (note: West of the South China Sea eg. Vietnam, Thailand, and Indian Ocean).

[Zhang Xue, *An Investigation of Western and Eastern Ocean* (《东西洋考》). Beijing: Zhong Hua, 2000, p. 131.]

A.16. 凡沿海去处下海船只，除有号票文引许令出洋外，若奸豪势要及军民人等，擅造二桅以上违式大船，将带违禁货物下海前往番国买卖，潜通海贼、同谋结聚及为向导劫掠良民者，正犯比照谋叛已行律处斩，仍枭首示众，全家发边卫充军。(《大明律集解附例》)

Along the coastal region, ships are allowed to go overseas only if they have a permit. If influential persons, military or civilian, build ships [with or more than] two masts, bring along banned items to foreign countries to trade, cooperate with pirates to rob or guide them to rob civilians, those responsible will be prosecuted as traitors and will be decapitated publicly. His whole family will be banished to the outpost as soldiers.

[Anon., *The Great Ming Code* (《大明律集解附例》), 16th Century, *juan* 15, p.15a. Taipei: Student Bookstore, 1970, p. Vol.3, p. 1203.]

A.17. (顺治十三年六月癸巳)严禁商民船只私自出海。有将一切粮食、货物等项，与逆贼贸易者……皆论死。凡沿海地方，大小贼船，可容湾泊登岸口子，各该督抚镇，俱严饬防守……不许片帆入口，一贼登岸。(《清世祖实录》)

(6th Aug 1656) Do not allow traders or civilians to sail on the sea. Anybody caught supplying food and goods to the pirates……will be executed……. Every Governor, Grand Coordinator and Grand Defender should setup defences in coastal areas where the pirates may dock……Do not allow a single sail to enter (the bay), or a single pirate to land.

[Ba Tai ed., *Veritable Records of Qing Dynasty Emperor Shunzhi* (《清世祖实录》), 1672 A.D., *juan* 102, p. 7a. Beijing: Zhonghua Publishing 1985, vol. 3, p. 789.]

A.18. (顺治)十八年，郑成功攻台湾，逐和兰而取其地。诏徙沿海居民，严海禁。(《清史稿》)

Eighteenth year [of the reign of Shunzhi, 1661], Zheng Chenggong attacked Taiwan, expelled the Dutch, and occupied their land. [The Emperor] ordered: Relocate the coastal residents, enforce the sea ban. [Zao Erxun, *Qing History Draft* (《清史稿》), 1927, *juan* 159. Beijing: Zhonghua Publishing, 1976, Vol. 16, p. 4650.]

A.19. (康熙二十三年)是时始开江、浙、闽、广海禁，于云山、宁波、漳州、澳门设四海关，关设监督，满、汉各一笔帖式，期年而代。……免外国贡船税，减洋船丈抽例十之三。(《清史稿》)

Since then (1684), the sea ban in Jiangsu, Zhejiang, Fujian and Guangdong was lifted. Four customs posts were set up in Yunshan, Ningbo, Zhangzhou and Macau. Han and Manchurian Superintendents were appointed [at each customs post], rotating every year……The tributary mission levy was waived and the foreign ship tax [calculated by length of yard] was reduced by 30%.

[Zao Erxun, *Qing History Draft* (《清史稿》), 1927, *juan* 125. Beijing: Zhonghua Publishing, 1976, Vol. 13, p. 3675-3676.]

Appendix B. The BchronDensityFast function

The BchronDensityFast function estimates activity levels for a large set of dates by first drawing a large number of samples (default 2000) from the probability distribution of each date, and then using the Mclust density estimation procedure (Fralely and Raftery, 2002; Scrucca et al., 2016) to fit a mixture of univariate normal distributions to the samples. The mclust procedure fits the model via the EM algorithm and so does not produce estimates of uncertainty in the parameters. It further requires as input the number of individual mixture components; we set this at 30. Some informal exploration showed that the results were insensitive to this value. The output of the BchronDensityFast model is an estimate, for each age value, of the activity level measured as a probability density and so summing to 1. This can subsequently be interpreted as showing periods of high and low relative activity, especially when compared across different groups. By default Bchron only accepts either radiocarbon or normally distributed dates whereas the present data set contained dates only defined on a uniform interval. For that reason all dates were converted so that the uniform range was re-expressed as a 99% confidence interval for a normally distributed date. In general, the BchronDensityFast function can be seen as a more sophisticated density estimation method to that of the SUM functions currently implemented in OxCal (Bronk Ramsey, 1995).

Appendix C. References of excavated sites and shipwrecks shown in Fig. 1

Site name	Date range	References
1	Jingdezhen	(Jiangxi Provincial Institute of Cultural Relics and Archaeology, 2007; Peking University, 2009a)
2	Longquan	(Provincial Institute of Cultural Relics and Archaeology, 2005; Peking University, 2009b)
3	Dehua	(Fung Ping Shan Museum, 1990; Dehua Kiln Excavation Team, 1979)
4	Tong'an	(Du, 2017)
5	Zhangzhou	(Fujian Museum, 1998; Yang, 2016)
6	Guangzhou	(City University of Hong Kong, 1987)
7	Hai Duong	(Aoyagi et al., 2000)
8	Sawankhalok Sukhothai	(Hein, 1980; Hein et al., 1981)
9	Martaban	More clues to Martaban jar mystery, 26 Nov 2012. Myanmar Times. Accessed on 25 March 2019. https://www.mmimes.com/national-news/3359-more-clues-to-martaban-jar-mystery.html Possible kiln site for Martaban Jars discovered, November 28, 2012. Southeast Asian Archaeology. Accessed on 25 March 2019. http://www.southeastasianarchaeology.com/2012/11/28/possible-kiln-site-for-martaban-jars-discovered/ Japan and Myanmar conduct research on ancient pottery kilns in Mon and Kayin States, February 25, 2016. Myitmakha News Agency website. Accessed on 25 March 2019. http://www.globalnewlightofmyanmar.com/japan-and-myanmar-conduct-research-on-ancient-pottery-kilns-in-mon-and-kayin-states/
10	Yangon	(Myo and U, 2003)
11	Vung Tau	Late 17th century (Christie's, 1992; Flecker, 1992; Jorg and Flecker, 2001; Nguyen, 1992)

12	Binh Thuan	Late 16th to early 17th century	(Pierre Bergé and Associés, 2008; Flecker, 2002b, 2004a, b)
13	Hoi An	Late 15th to early 16th century	(Pope, 2007; Ysaguirre et al., 2000)
14	Nanhai I	c. 12th century	(SACH Center of Underwater Cultural Heritage, 2018a, 2018b)
15	Nan'ao I	c. 16th century	(Guangdong Provincial Institute of Cultural Relics and Archaeology, 2014)
16	San Isidro	Late 16th century	(Crick, 1997; Cuevas, 1997, 2002; Tan, 2007; Goddio, 1997)
17	San Diego	Early 17th century	(Crick, 1997, 2000; Cuevas, 1997, 2002; Destoches et al., 1996; Dizon, 2016; Tan, 2007; Goddio, 1994, 1997; Orillaneda, 2002; Valdes and Diem, 1993)
18	Lena Shoal	Early 16th century	(Goddio et al., 2000a, 2000b, 2002)
19	Royal Captain Shoal	Late 18th century	(Goddio et al., 2000)
20	Breaker Reef Shoal	c. 13th century	(Dupoizat, 1995)
21	Pandanan	15th century	(Diem, 1997, 1998 - 2001; Loviny, 1998)
22	Investigator Shoal	13th century	(Dupoizat, 2007)
23	Tanjong Simpang Mengayau	11th – 12th century	(Sjostrand et al., 2006)
24	Brunei	Early 16th century	(L'Hour, 2001; Osman, 2015; Perrin, 2000; Pirazzoli-t'Serstevens, 2011; Richards, 2003)
25	Jepara	12th century	(Djuana and Edwards McKinnon, 2005)
26	Cirebon	Late 10th century	(Chiew, 2010; Harkantingsih et al., 2010; Liebner, 2014)
27	Karawang	10th century	(Liebner, 2014)
28	Intan	10th century	(Flecker, 2002, 2005)
29	Bakau	15th century	(Flecker, 2001)
30	Belitung	Late 9th century	(Chong, 2017; Flecker, 2000; Krahl and Effeny, 2010)
31	Tek Sing	Early 19th century	(Nagel Auctions, 2000; Pickford, 2002)
32	Pulau Buaya	12th century	(Ridho and Edwards McKinnon, 1998)
33	Hatcher Junk	Early 17th century	(Christie's, 1984, 1985; Sheaf and Kilburn, 1988)
34	Desaru	Early 19th century	(Brown and Sjostrand, 2004; Sjostrand et al., 2006)
35	Turiang	Late 14th century	(Brown and Sjostrand, 2000; Sjostrand and Barnes, 2001)
36	Nanyang	Mid 15th century	(Brown and Sjostrand, 2004; Sjostrand et al., 2006)
37	Royal Nanhai	Mid to late 16th century	(Brown and Sjostrand, 2004; Sjostrand et al., 2006)
38	Longquan	Mid 15th century	(Brown and Sjostrand, 2004; Sjostrand et al., 2006)
39	Singtai	16th century	(Brown and Sjostrand, 2004; Sjostrand et al., 2006)
40	Diana	Early 19th century	(Ball, 1995; Christie's, 1995)
41	Trowulan		(Mundardjito, 1986)
42	Borobudur		(Miksic, 1990)
43	Palembang		(Edwards McKinnon, 1979; Taim, 1992)
44	Padang Lawas		(Perret and Surachman, 2014)
45	Barus		(Dupoizat, 1998, 2003)
46	Kota Cina		(Edwards McKinnon, 1975, 1976, 1977; Milner et al., 1978)
47	Kedah		(Peacock, 1958)
48	Takuapa		(Lamb, 1961, 1964)
49	Andhra Pradesh		(Karashima, 2004)
50	Periyapattinam		(Karashima, 1989, 2004)
51	Mantai		(Karashima, 2004)
52	Yapahuwa		(Carswell, 1978)
53	Quilon		(Karashima, 1989)
54	Hormuz		(Morgan, 1991)
55	Qais (Kish)		(Shih, 2001; Whitehouse, 1976)
56	Siraf		(Tampoe, 1989; Whitehouse, 1971, 1972, 1973, 1974)
57	Samarra		(Gyllensvard, 1973)
58	Karababad (Bahrain Fort)		(Kervran et al., 1982) Zhao, B. 2011. 16th–17th centuries Chinese and Southeast Asian ceramics from Qal'at al-Bahrain. https://www.researchgate.net/publication/279253372_16_th_17_th_centuries_Chinese_and_Southeast_Asian_ceramics_from_Qal%27at_al-Bahrain
59	Julfar		(Hansman, 1985)
60	Sohar		(Kervran, 1994; Pirazzoli-t'Serstevens, 1988)
61	Abyan		(Hardy-Guilbert and Axelle, 1997)
62	Al Qarawi		(Hardy-Guilbert and Axelle, 2016; Lane and Serjeant, 1948)
63	Fustat		(Mikami, 1980 - 1981)
64	Aydhab		(Hobson, 1928)
65	Sa'ad ad-Din		(Curle, 1937)
66	Berbera		(Chittick, 1976)
67	Mogadishu		(Murdoch, 1959; Zhao, 2015)
68	Kismayo		(Elliot, 1925; Wilson, 1984)
69	Coiama		(Chittick, 1969; Elliot, 1926; Sanseverino, 1983)
70	Lamu, Pate, Manda		(Chittick, 1984; Horton, 1996; Wilson and Omar, 1997)
71	Mambrui, Malindi, Gede		(Kirkman, 1958; Pradines, 2004, 2006, 2009, 2010; Pradines and Blanchard, 2005; Qin et al., 2012)
72	Kilifi, Mnarani, Mombasa		(Kirkman, 1959; Sassoon, 1980)
73	Unjuja Ukuu		(Chittick, 1966; Horton and Clark, 1985)
74	Dembeni		(Pradines, 2013; Pradines and Brial, 2012)
75	Vohemar		(Gaudebout and Vernier, 1941a, 1941b; Molet, 1974; Schreurs et al., 2011; Vernier and Mulot, 1971)
76	Sofala		(Dickinson, 1975)
77	Great Zimbabwe		(Duffey, 2008; Garlake, 1973)
78	Mapungubwe Hill		(Gardner, 1963; Prinsloo et al., 2005)
79	Cape Town		(Klose, 1997;)

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