This article was first published in "Southeast Asia – China Interactions" which was published by the Malaysian Branch of the Royal Asiatic Society in 2002. Articles selected by Dr. Geoff Wade with foreword by Wang Gunawu.

Turiang: a 14th century Chinese shipwreck, upsetting Southeast Asian ceramic history

By Sten Sjostrand

Edited: Dr. Geoff Wade Photographs, sketches, maps and images: Sten Sjostrand

Introduction

<u>The *Turiang*</u> is one of several 14-16th century wrecks discovered in the South China Sea by Sten Sjostrand. All carried ceramics and offer new insights into this glorious period of maritime trade in Southeast Asia, and in particular into the history of Thai ceramics. The *Turiang* was a Chinese ship with a multinational cargo of Thai, Vietnamese and Chinese ceramics, apparently heading for Borneo and/or Sulawesi. The wreck is tentatively dated to AD 1305-1370. This is one of the earliest shipwrecks yet discovered with Thai export ceramics. The find prompts a reassessment of the relative importance of the two major production centres at Sukhothai and Si-Satchanalai. It also proves that almost-identical black underglaze ware was available simultaneously from Sukhothai and Vietnam.

Turiang's ceramic significance

The *Turiang* cargo suggests that:

- Decorated underglaze ware from Thailand and Vietnam was popular before Chinese blue-and-white
- Longquan celadon's made in China were fired on tubular supports, identical to those later used at Si-Satchanalai
- Sukhothai was in production earlier than previously thought
- Sukhothai was not always a minor producer; initially it was a volume exporter
- Sukhothai was exporting before the 'Ming ban'
- Sukhothai developed its export industry earlier and independently of Si-Satchanalai
- Sukhothai was achieving higher firing temperatures than Si-Satchanalai in this period
- Know-how on high-temperature firing and above-ground kilns may have been transferred from Sukhothai to Si-Satchanalai, rather than the other way around
- Sukhothai was exporting before Si-Satchanalai produced mature celadon
- Si-Satchanalai may have started to produce mature celadon later than previously thought
- Both Sukhothai and Si-Satchanalai may have benefitted from the expertise of refugee Chinese potters.

The *Turiang* and other ship sites together suggest that the early dominance of Chinese ceramics in export markets during the Song and early Yuan dynasties was threatened by vigorous competition from Vietnamese and Thai producers from the 14th century onwards. Chinese involvement dwindled further in the late 14th and early 15th century, following the 'Ming ban'.

The ceramics sections of this preliminary report are as follows:

Ceramics background & issues

- The state-of-debate pre-*Turiang*: assumptions of TCAP
- Difficulties of dating the Thai kilns
- Other difficulties with TCAP's view
- Relative importance of Si-Satchanalai and Sukhothai: a shifting balance of evidence
- Si-Satchanalai and Sukhothai: Turiang forces a re-think
- Vietnamese ceramics: who influenced whom?
- The absence of blue-and-white
- Tubular supports for the Chinese celadon
- Politics, trade, and waves of migration the early brain drain

The ceramics on Turiang

- Overview
- Sukhothai ceramics
- Si-Satchanalai (Sawankhalok) ceramics
- Vietnamese ceramics
- Chinese ceramics
- Other Asian ceramics, from Suphanburi and elsewhere.

The importance and interest of the wreck goes beyond the ceramics. General readers may be interested to read this site in the order of the navigation bar, and that is the order in which we will guide you through it. Those interested specifically in the ceramics will find other relevant comments in the following sections:

- Site description
- Dating
- Other wrecks.

Several wrecks investigated by Sten Sjostrand have represented a useful time series for interpreting the history of Thai ceramics. A brief summary of the findings, and a chronological chart, may be found in 'other wrecks'. Reference will be made to those other wrecks in the course of this report. Names were given to each ship by the excavation team, by association with the ceramics carried or with their history (in this case, with the 'Turiang kiln sites' in Sukhothai); original names, if assigned, are unknown. Images on this site have been chosen with regard to download times; many can be clicked to obtain a larger or higher-quality version.

Location & destination

The *Turiang* sank in the southern part of the South China Sea, more than 100 nautical miles east of Peninsular Malaysia. Given the cargo, she was clearly sailing southwards. The monsoon winds necessary to undertake the voyage, together with prevailing ocean currents, preclude accidental drift to this location from the established coast-hugging sailing routes to Java and Sumatra. The ship was probably heading to Borneo and/or Sulawesi, both of which had established Chinese trade links. Moreover, the green-glazed ware in the cargo is known to have been popular in Borneo.¹

The ship must have sailed on the north-east monsoon. The ocean currents at this time follow the winds and can add 1.5-2 knots to a vessel's speed. At this location, waves average 2-3 metres in height, and reach 4-5m during squalls. If a rudder breaks in these conditions, the ship will broach, leaving her broadside to the direction of wind and waves - a dangerous situation, hard to overcome. If sails are not lowered immediately, even a modern sailing craft may founder. An alternative is that heavy seas could have strained the hull excessively, causing planking to break. Another reason why ships may be lost in the open sea is fire. It is impossible to determine the cause of sinking, as no timber from above the waterline has been found.



Sailing routes in the South China Sea were guided by the monsoon winds. The northeasterly wind facilitated southbound voyages between late December and early March. Ships waited until July for a south-easterly wind to return northbound.

Site description

From the first site inspections it was clear that trawlers' nets, scouring the seabed, had significantly damaged the *Turiang* site. Usually wrecks are covered by a mound of ceramics and other material: this had been shaved off and dispersed. Utilitarian ware is often found in the surface layer, probably because it was originally stowed on deck; its near-absence shows the extent of destruction. The remaining ceramic cargo had sunk into the seabed with the hull. Only the broken necks of a few large storage jars were visible at first inspection, along with a few iron oxide conglomerates.

In the hope of gleaning all possible historical information, which might for example include evidence of the ship's routing and the sequence of loading, a pre-disturbance survey was conducted, with detailed mapping of all visible features.

1. By 1349, Wan Da-yuan visited many countries in Southeast Asia. He noted that Borneo and Jambi favoured green-glazed ceramics and large water storage jars over the other wares available, but that at Bintan island, on the same sailing route, Cizhou wares were preferred.

This survey was guided by a numbered reference line, pegged to the seabed and stretched the length of the wreck at approximately 040/220 degrees. Each meter along this numbered line was thoroughly surveyed, with lateral measurements taken from the reference line. Later discovery of two transverse bulkheads confirmed the orientation of the vessel as 030/210 degrees, with the bow apparently pointing 210 degrees. The vessel lies at a depth of 43 meters. Diving conditions are favorable only in April and October.

Despite the heavy trawling damage, the starboard side of the vessel revealed many longitudinal stacks of Sukhothai underglaze fish plates. All had damaged rims, but their quantity was impressive. The port side was found covered with shards of broken storage jars; shallow trenches indicated that this side of the vessel was loaded with Thai jars of various sizes. (No other cargo was found on top of these jars; the *Royal Nanhai* had similar jars, with many celadon dishes stacked on top.) Forward of the storage jars were Vietnamese bowls together with brown-glazed



Chinese bowls. Below these were Chinese celadon dishes, which were in turn above small and medium-sized brown Chinese jars. Larger Chinese celadon plates were found stacked horizontally, upside down between and resting on the

shoulders of the large storage jars.

Following the investigation and mapping of visible features, representative samples of ceramics were recovered from the surface and from some shallow pits on a grid layout throughout the wreck site. Each artefact was engraved on the base with a serial number corresponding to its location on the site. This permanent marking proved a practical way of tracking wet and dirty artefacts, expected to receive prolonged handling and chemical treatment. While marking, it was noted that similar wares (such as fish plates) differed significantly in hardness,

depending on their firing temperature.



The Sukhothai and Si-Satchanalai wares were loaded in separate cargo compartments, while Chinese and Vietnamese wares were found mixed

N Solar

Vietnamese wares were found mixed _{Chinese} ceramics were concentrated towards the in others. Plates from Si-Satchanalai bow, south of line No.8. Sukhothai ware was found were all in the aft section, while only amid-ship on the starboard side, and large Sinalai jars and bottles were scattered Satchanalai storage jars on the port side Si-

smaller Si-Satchanalai jars and bottles were scattered Satchanalai storage jars on the port side. Si-throughout the wreck. Chinese and Vietnamese wares Satchanalai underglaze ware was concentrated aft, were all forward. The apparent density of ceramics north of line No.1. suggests that the vessel was fully loaded. All areas but the

bow have Thai cargo, and the ship would have been impossibly unbalanced if these areas had been empty during the voyage from China to Thailand. The cargo could have been redistributed in Thailand, but it is much more likely that some cargo was offloaded and replaced there

Ship design & construction

It is almost certain that ship design in the region changed significantly at around the time of the Ming ban of AD 1371. Ships plying the South China Sea before this event can be clearly distinguished as of either traditional Chinese or Southeast Asian design. Shipwrecks discovered in the South China Sea and dating from the 15th and 16th century have been of a later hybrid design which combined elements from these two original types. While there is reason to believe that the first merger of design elements occurred in Java, which adopted transverse bulkheads following the Mongol intervention of AD 1293, it appears



to have been only after AD 1371 that Chinese shipbuilders adopted Southeast Asian features.

The *Quanzhou wreck* which sank in the later part of the 13th century is a typical example of a traditional Chinese vessel. Built of fir with bulkheads, she was joined by iron clamps, a common feature seen on early Chinese vessels. No wooden dowels, which would have been used in contemporary Southeast Asian vessels, were present.

The *Pandanan wreck* lost in the mid 15th century in the Philippines represents a relatively pure Southeast Asian vessel. Although divided into Chinese-type cargo

compartments, separated by means of transverse bulkheads, she was joined with wooden dowels, with no iron nails of any kind. Like most Southeast Asian and hybrid vessels, she was built of tropical hardwood.¹

The *Bukit Jakas wreck* off Bintan Island in Indonesia, also dated to the mid-15th century by carbon 14 and one ceramic shard, is representative of the hybrid vessels which mixed the two traditional design elements and have recently become known as 'South China Sea' ships. On this wreck, the excavators found planks joined with wooden dowels, but frames fastened by square iron nails. Tropical hardwood was again the main construction material.² The *Royal Nanhai* and the *Longquan* are of this type.

From the limited investigation of the *Turiang*, it is almost certain that no wooden dowels were used. Instead, a number of 14mm square holes have been seen, surrounded by oxide stains, confirming the use of iron nails. The two transverse bulkheads near the surface had collapsed and prevented proper measurements. The distance between them varied between 1.10 and 1.25 metres. The thickness of these decomposed bulkheads was about 60 mm, but is likely to have been thicker at the time of construction.

- 1. Christophe Loviny, 1996, op.cit., pp 66-73
- 2. Jeremy Green & Rosemary Harper, 1983, op.cit., appendix 2, p 83.

A few bottom planks located in the aft and shallowest part of the site varied between 22 and 24 centimetres in width and had the same thickness as the bulkheads. None of these planks had any signs of drilled holes or associated wooden dowels. Sacrificial planks, often added annually to the hull to compensate for attacks by woodworm (as in the *Quanzhou wreck*), could not be seen. The lack of sacrificial planking may indicate that the vessel was relatively new when lost.

An original piece of wood sent for identification failed because of the decomposed state of the sample. A second attempt, using branch growth within the same piece of bulkhead, confirmed that the wood belonged to one of four possible types of temperateclimate softwood. Further analysis of cross and tangential sections and investigation of resin canals showed with some



certainty that the samples were *Pinus sp.*, or pine.³ This tree grows in China, Laos and northern Vietnam. It does not grow in Thailand or farther south. Amongst the vessels mentioned above, it is notable that the two Chinese ships, the *Turiang* and the *Quanzhou wreck*, are built from temperate-climate wood, and all the later Southeast Asian and South China Sea vessels are built from tropical hardwood.

Due to scattered surface ceramics, the wreck outline was difficult to measure. Electronic mapping of the wreck and its nearest perimeter indicated a pottery site of eighteen by seven metres. This type of acoustic measurement, which records hard reflectors on the seabed, does not have any penetration capability and can only detect surface remains. Experience with measurements of this type suggests that the overall length of the vessel could have been around twenty-six metres.

Plans for further excavation and research include further analysis of remaining ship's timber, and an attempt to identify the place of construction and any local shipbuilding features. (For example, Guangdong junks are known to have used different wood in different sections of the keel; mast steps, often made of tropical hardwood, may give additional information.)

3. Wood analysis by Forest Research Institute Malaysia. Report no. 394/665/1/1Klt.(85)

Ceramics background & issues

The state-of-debate pre-Turiang: assumptions of TCAP

The chronology of Thai ceramics has been ebbing and flowing with the archaeological evidence. As a starting point, we will summarise the major recent study, by the Thai Ceramics Archaeological Project (TCAP). This joint Thai-Australian project was set up in 1980 by the Research Centre for Southeast Asian Ceramics, managed by the University of Adelaide and the Art Gallery of South Australia. Several years of kiln site excavations at Si-Satchanalai (which produced the ceramics sometimes known as 'Sawankhalok')⁽¹⁾, and some at Sukhothai, suggested that Si-Satchanalai was the first centre to produce and to export Thai ceramics - reversing the earlier belief that neighbouring Sukhothai had started the industry. TCAP's conclusions can be summarised as follows.

The Si-Satchanalai site is divided physically and chronologically into two main production phases, each representing a time period of about 250 to 300 years. During the first of these phases, which included only the Ban Ko Noi and Bang Nong O kiln complexes, in-ground kilns were used. Production at these early kilns was less organised than in the second phase, and appears to have been family-based. The ceramics of the early period were made from secondary clay, producing rather crude utilitarian black and unglazed ware. The most sophisticated products of the time were underglaze decorated dishes with painted decoration applied on a whitish slip, referred to as 'Mon ware'.⁽²⁾

After some time a better clay was discovered and the kilns improved. The clay of this period allowed underglaze decoration to be applied directly on the clay without the use of slip. These products are referred to as 'MASW' or 'Mon Associated Stoneware'. The TCAP investigators concluded that MASW was fired in in-ground kilns. Slow and steady improvements of the kilns were suddenly succeeded by a 'major leap' development and above-ground kilns appeared.

During this time, an early type of green-glazed ware was also introduced, sometimes including incised decorations. This was categorised by TCAP as 'TRSW' or 'Transitional Stone Ware'. The second phase included the newly established Ban Pa Yang kiln complex and was characterised by above-ground brick kilns producing export ware. These products, made from the better clay and covered by a matured celadon glaze, were identified by TCAP as 'LASW' or 'Later Associated Stoneware'.

- The term 'Sawankhalok' was used at one stage to describe all ceramics made at Si-Satchanalai in northcentral Thailand. By the mid 14th century, the rising kingdom of Ayudhya used the name Sawankhalok ('place of heaven') to describe the ancient town of Si-Satchanalai, which had a long ceramic tradition. However, the modern town and province of Sawankhalok were never associated with ceramics, so to avoid confusion the name Si-Satchanalai should be used to describe the ceramics made in that area.
- 2. The term 'Mon' is borrowed from the local villagers, who recognise the difference between this ware and the later ceramics from the site (they used to stop digging for saleable artefacts when they reached the Mon layer), and customarily attributed it to the Mon people who lived in the area before the Thai. The actual ethnicity of the potters is unclear. Thais are known to have lived in the area since at least the 13th century. Michael Vickery (1986, *op.cit.*) noted that the local words for the kiln sites, 'tau thuriang', mean 'saucer, dish' in the Old Mon language.

Based on these developments and the apparent lack of similar progress at Sukhothai, where only above-ground kilns were used, the TCAP investigators surmised that the Sukhothai kilns were established after Ban Pa Yang and obtained their kiln design and techniques from that area.

Difficulties of dating the Thai kilns

The earliest Mon kilns at Si-Satchanalai were initially thought to have started production around the 9th or 10th century, based on chronological and stratigraphic evidence. However, three separate radiocarbon dates from kilns of this type indicated a mid-14th century date.⁽³⁾

The first above-ground kiln was originally thought to have been constructed around the mid-13th century, a date thought to have allowed three centuries of in-ground kiln production. Following the receipt of the three radiocarbon dates, the investigators concluded: 'if it can be shown that the production of the wares used for export (LASW) occurred from about the middle of the thirteenth century, it follows that production at Si-Satchanalai must have begun around the tenth or eleventh century.'⁽⁴⁾

Other difficulties with TCAP's view

The TCAP gave no reason why successful export-oriented potters at Si-Satchanalai should venture to Sukhothai to produce an earlier 'primitive' ware, by that time less attractive on the overseas market. The impact of foreign technology may have been overlooked, since all kiln and ceramic developments, despite the 'major leap', 'appeared as a continuum'. Therefore, Ban Ko Noi was also credited for introducing the first above-ground kiln and for finding the better clay, despite its discovery near Ban Pa Yang.

Relative importance of Si-Satchanalai and Sukhothai: a shifting balance of evidence

Back in the 1970s, the late William Willetts believed that the first Thai trade ware came from the Sukhothai kilns.⁽⁵⁾ It was thought that potters moved from Sukhothai to start additional kilns at Si-Satchanalai when better clay was discovered in that area. Si-Satchanalai, it was supposed, first made a few fish and flower plates in imitation of Sukhothai and then developed its own export wares.

- 3. The term 'Sawankhalok' was used at one stage to describe all ceramics made at Si-Satchanalai in northcentral Thailand. By the mid 14th century, the rising kingdom of Ayudhya used the name Sawankhalok ('place of heaven') to describe the ancient town of Si-Satchanalai, which had a long ceramic tradition. However, the modern town and province of Sawankhalok were never associated with ceramics, so to avoid confusion the name Si-Satchanalai should be used to describe the ceramics made in that area.
- 4. The term 'Mon' is borrowed from the local villagers, who recognise the difference between this ware and the later ceramics from the site (they used to stop digging for saleable artefacts when they reached the Mon layer), and customarily attributed it to the Mon people who lived in the area before the Thai. The actual ethnicity of the potters is unclear. Thais are known to have lived in the area since at least the 13th century. Michael Vickery (1986, *op.cit.*) noted that the local words for the kiln sites, 'tau thuriang', mean 'saucer, dish' in the Old Mon language.
- 5. Mike Barbetti and Don Hein, 1989, op.cit. p 63.

This was consistent with earlier thinking. H.Otley Beyer, who first examined Thai ceramics in the Philippines, was convinced that Sukhothai ware was earlier than Si-Satchanalai ware, which he found to be associated with 15th-century Chinese blue-and-white. At Cebu, he noted Sukhothai underglaze ware in association with Chinese celadon (similar to the combination on Turiang) in one stratigraphic layer. In an upper layer, there was no Sukhothai ware, but only mature Si-Satchanalai celadon and Chinese blue-and-white porcelain.⁽⁶⁾

This chronology was adjusted in the 1980s after archaeological excavations at Si-Satchanalai, which suggested that this was the earlier producer. It also came to be accepted that Si-Satchanalai was consistently the larger producer. It was thought that the Sukhothai kilns might not have opened until the 15th century, and that Sukhothai's output was only 10-12% that of Si-Satchanalai. These suggestions were supported by the number of kilns identified: over 800 at Si-Satchanalai, compared to only 51 in Sukhothai.⁽⁷⁾

Numerous wreck sites in the Bay of Thailand, although often spoilt by looting, yielded some information, and generally supported the predominance of Si-Satchanalai, as did other known wreck sites. In land excavations in the Philippines, Sarawak and Indonesia, shards of Si-Satchanalai celadon far outnumbered shards of Sukhothai underglaze ware.^(B) A growing body of evidence showed that Si-Satchanalai exported large volumes of celadon in the 15th and 16th centuries, often in combination with limited amounts of Chinese or Vietnamese blue-and-white porcelain.

Based on this later evidence, scholars devised theories to explain the relative importance and relationship of the two kiln sites. It was thought that Sukhothai might have had insufficient clay resources, and/or that river rapids affected access, or that the Si-Satchanalai site was just better managed.

Four other wrecks discovered by Sten Sjostrand, all fully loaded with Thai trade ware, also showed a majority of Si-Satchanalai ware. The *Longquan* wreck gave the first indication that the importance of Sukhothai might not be as small as assumed, or at least not during all periods. In this case, one third of the Thai ceramics came from Sukhothai, which was estimated to make up 20% of the total cargo, with Si-Satchanalai 40%, and the rest from China.

Then came the discovery of the *Turiang*, with a huge preponderance of Sukhothai ware, and evidence that the Sukhothai kilns were in operation much earlier than assumed. The *Longquan* and the *Turiang* may prove that Sukhothai produced and exported far more than previously known, at least in its earlier production period.

- 6. Don Hein and Mike Barbetti, 1998, *op.cit.* p 12.
- 7. William Willetts, 1971, op.cit.
- 8. The work of Beyer, who did not personally supervise the excavations, was described by Walter Robb, 1930, *op.cit.*, and Michael Sullivan, 1956, *op.cit.*

Si-Satchanalai and Sukhothai: Turiang forces a re-think



Most of the ceramics from Sukhothai and Si-Satchanalai were transported to Ayudhya on the Yom river, and thence to the South China Sea. There seems to have been an alternative overland route towards Martaban, perhaps used mainly during periods of unrest. Not only were Sukhothai ceramics the predominant cargo on the *Turiang*; the Si-Satchanalai ware on board is 'Mon' ware, dated by radiocarbon samples from the kiln site to the mid-14th century, which is earlier than the previously assumed starting date for the Sukhothai kilns. This suggests that the Sukhothai kilns were in operation earlier than previously assumed, and before the Ming ban of AD 1371. The few Chinese ceramics recovered are indeed of types traditionally assigned to the Yuan dynasty (AD 1279-1368).

While there is no reason to think that one cargo should necessarily reflect the overall market shares of the two major production centres, it gives pause for thought. Sukhothai may have been exporting in volume before Si-Satchanalai, although certainly the latter was more important by the 15th century, when its wares were of higher quality.

The absence of mature celadon (LASW) on the *Turiang* prompts a rethink of the dating for introduction of

above-ground kilns at Si-Satchanalai. The *Turiang* carried Mon, MASW and early TRSW wares, placing it in TCAP's later transitional period (between in-ground and above-ground kilns). If this transitional period had ended in the middle of the thirteenth century as TCAP suggested, the Chinese celadons found on the site should also date to this period - and they do not. It seems likely that the production of mature celadon at Si-Satchanalai started after the *Turiang*'s voyage - which, with the balance of evidence suggesting a shipwreck date in 1305-1370, suggests a 14th century date for the mature celadon start-up, and perhaps mid or late 14th century. (1378, or soon after, is especially plausible - allowing time for Chinese potters emigrating after the Ming ban to have regrouped, and for the export route via Ayudhya to be reopened following Sukhothai's defeat and annexation.)

The possibility that the mature celadon was available at Si-Satchanalai and declined by the *Turiang*'s merchant, who had already accepted Chinese celadon, seems relatively unlikely.

It is notable that the stylistic dating of the *Turiang*'s Chinese celadon to the mid-14th century coincides with the three carbon-14 dates for the Mon kilns in which the *Turiang*'s Mon ware was made. The *Turiang* contains fish and flower plates from both Sukhothai and Si-Satchanalai, the first such documented instance in which both have been found together. (Fish plates were produced for a short period at Si-Satchanalai, and for hundreds of years at Sukhothai.) The Sukhothai products on the *Turiang* are of high quality, fired at high temperatures. The equivalent Si-Satchanalai products are inferior, suggesting that the firing techniques associated with underglaze black ware had not yet been mastered at Si-Satchanalai.

Vietnamese ceramics: who influenced whom?

The Vietnamese ceramics on the *Turiang* show marked similarities with the Sukhothai ware, for example the stylized chrysanthemum blossom, the bands of calligraphic scroll, and the use of disc-shaped firing supports leaving spur marks - usually five - on dish interiors. (However, the scars are circular on the Thai ceramics, and triangular on the Vietnamese.) Either one centre was copying the other, or both borrowed ideas from a common source. It is likely that the technique of painted underglaze decoration was introduced in Thailand and Vietnam at about the same time.

The absence of blue-and-white

No blue-and-white ware from either China or Vietnam has yet been found on the *Turiang*. The start of Chinese blue-and-white exports is currently put at 1328, so it has been suggested that an earlier sailing date is more likely - but it may have been available and not carried. Other wrecks suggest that the blue-and-white trade was relatively small in volume terms, at least for Asian destinations. Demand soared only in the sixteenth century, following the arrival of European traders.

Tubular supports for the Chinese celadon



Remains and scars of tubular supports was seen on many Chinese celadon plates

Many of the (Chinese) Longquan celadon's on the Turiang show scars from a tubular support, and two of those recovered have attached remains of the support itself, with a beveled edge resulting in a very fine scar-ring. This is identical to the scar-rings and support remains on the early mature celadon from Si-Satchanalai which was found on the Nanyang. The use of tubular supports in the production of Chinese ceramics, particularly Longquan celadon's. is not widely known to international scholars, although shown in at least one recent Chinese publication. Tubular supports were used for early Thai export ceramics: one of several similarities of technique suggesting Chinese influence in the development of the Thai industry.



Tubular support and spur disc's as used by the potters in Sukhothai and early Sisatchanalai production

Politics, trade, and waves of migration - the early brain drain

A late 14th century start-up date for Si-Satchanalai's mature celadon would support the widely-accepted, if not always popular, belief that experienced Chinese potters from the famous celadon kilns of Longquan in China were responsible, and that their migration followed the 'Ming ban' on private overseas trade by the emperor Hongwu, which became effective in 1371 (following earlier rumblings from 1369). After centuries of successful ceramic development and profitable trade, thousands of potters, merchants and shipbuilders suddenly found their income slashed by edict. Many were furious and left for other countries; 'the maritime merchants of Zhejiang and Guangdong built fast seagoing ships without permission, and bought goods in places such as Zhangjiang and Quanjian of Fujian' prior to departure.⁽⁹⁾ Ma Huan and other chroniclers



of the voyages of Admiral Zheng He in 1403-1433 reported that Chinese emigrants were settled and prosperous at numerous locations in Southeast Asia.⁽¹⁰⁾ A rich Chinese community lived in Ayudhya by the 1420s.

'Major leap' developments at Si-Satchanalai involved larger and better-organised brick kilns with separating firewall and a well-arranged water supply system. Other improvements included better clay, new forms, incised decorations, and the introduction of 'mature' celadon ware. The loss of the *Turiang* preceded these improvements; the loss of the *Nanyang* came just after. It seems unlikely that such developments and improvements would have been achieved by trial and error in the interval. Given the coincidence of dates with the Ming Ban, it seems highly probable that Chinese migrants were responsible - which of course does not preclude continued Thai involvement.

Identical groups of Chinese celadon plates on the *Turiang* and the *Longquan* are interesting in this context, as the current dating is to AD 1360 and 1390 respectively. The implication is that the Chinese kilns continued to turn out the same products over several decades, during which all of these 'major leap' developments occurred. Si-Satchanalai's mature celadon remained in production with relatively little development for the next three hundred years.

- 9. This is partly because Si-Satchanalai has been more thoroughly investigated. Don Hein, the principal investigator of the Si-Satchanalai kiln sites, estimates that the Sukhothai area may reveal more than one hundred kilns if properly excavated. (Meanwhile, significant damage has been done to the Sukhothai site by the construction of a new road through the Historical Park.) Si Satchanalai may have had over a thousand kilns.
- 10. For example, at Muara Ciaruteum in West Java, the finds were similar to Beyer's upper layer: shards of Si-Satchanalai celadon in combination with Vietnamese blue-and-white porcelain of C15-16th. Edmund Edwards McKinnon, 1985, *op.cit.* pp 29-30.

Although many scholars agree that there was foreign influence in the Thai ceramic industry in the late 14th century, few have recently argued for earlier foreign influence at Sukhothai, despite Thai tradition attributing its development of glazed export ware to the arrival of five hundred Chinese potters during the reign of Ram Kamheng (1292-1299).⁽¹¹⁾ A group of high-ranking officials and other refugees arrived in Sukhothai in 1283, following the collapse of the Sung dynasty. Other followers of the Sung dynasty were welcomed in Vietnam and allowed to engage in commerce, but hundreds were reportedly captured there by the Mongols in 1283-1288, which may have encouraged onward migration to Sukhothai. The stylistic similarities of Vietnamese, Sukhothai, and early Si-Satchanalai underglaze ceramics to products of the Sung kilns at Cizhou are remarkable. Independent development of such similar styles and techniques seems improbable.

There are many similarities between the black underglaze ware from Si-Satchanalai and Sukhothai: techniques of firing, support, the painting of decoration, and the use of iron oxide for that paint. The similarities are uncontentious; only the direction of influence is debated. (Some maintain that the technology was a natural development of an indigenous industry at Si-Satchanalai, and that Chinese potters imitated their Thai counterparts.)

The arrival of already-experienced potters would explain the apparent lack of evidence for a development period at Sukhothai, and the 'significant leap' at this stage in Si-Satchanalai. It has been noted that the early use of slip in stoneware production suggests that the potters came from a developed production centre, rather than evolving the technique.⁽¹²⁾



Si-Satchanalai bowl T-410

Another piece of evidence is the difference in foot-rings between the black underglaze ceramics of Sukhothai and Si-Satchanalai. The Sukhothai foot-rings are high and flare slightly outwards; the Si-Satchanalai foot-rings are low and slope inwards, continuing the pattern of the earlier Si-Satchanalai ware.

Incidentally, it seems likely that the availability of ceramic products influenced the architects of the huge programme of temple

construction which started in Sukhothai around the 1340s. The demand for bricks and architectural ceramics may have arisen as a result of the production capability, rather than the other way around as previously assumed. Surely the architects would not specify particular construction and decorative materials unless readily available?

Whoever the Sukhothai potters were, the *Turiang* challenges the assumption that Thai and Vietnamese ceramics became popular only after the 'Ming ban' created a shortage of Chinese ware. The Sukhothai potters were exporting in volume, in direct competition with Yuan China.

- 11. Anthony Reid, 1988, op.cit. p 105.
- 12. Dick Richards, 1995, op.cit. p 23.

The ceramics on the Turiang

The *Turiang*'s multinational ceramic cargo is of great interest, as it represents a variety of export wares sourced from different countries at one point in time. The absence of Chinese blue-and-white porcelain is as interesting as the presence of Chinese celadon. The presence of both Sukhothai and Vietnamese underglaze iron-decorated ceramics together with early Si-Satchanalai ware is an interesting combination, and suggests a number of questions about 14th century Asian trade patterns.

Only representative samples of each type of ceramics have been recovered. The following table shows the estimated size and breakdown of the cargo remaining at the *Turiang* site at the time of discovery. It includes the 1,135 articles brought to the surface, and those still on the seabed, but not those pulled away by fishing nets. As much as 30% of the original cargo may have been lost in this manner.

Ceramic pieces of each type	Number	%
Thai: Sukhothai - underglaze decorated plates	2,500	46%
Thai: Sukhothai - other underglaze decorated ware	500	
Thai: Si-Satchanalai - early blackish brown-glazed ware	100	
Thai: Si-Satchanalai - early underglaze decorated ware	100	
Thai: Si-Satchanalai - early green-glazed ware	500	11%
Thai: Si-Satchanalai - early glazed stoneware jars	30	
Thai: Suphanburi - storage jars	5	
Vietnamese: underglaze decorated bowls	500	8%
Chinese: Guangdong - monochrome bowls	500	
Chinese: Guangdong - green-glazed saucers	700	
Chinese: Guangdong - brown-glazed storage jars & bottles	40	35%
Chinese: Guangdong - other brown-glazed ware	800	
Chinese: Longquan - celadon	200	
Estimated pieces in cargo at time of discoverv	6,475	100%

Many of the ceramics are badly deteriorated, as is normal with shipwrecks. About 80% have deteriorated beyond meaningful display and research condition. The underglaze Si-Satchanalai decorated wares seem to have deteriorated more than their Sukhothai counterparts, and may have

been underfired in the first place - one of many early examples of sub-standard products in the long history of Asian trade.

Three Thai production centres are represented on the *Turiang*: in order of their proportionate importance, as seen from the table, Sukhothai (an estimated 46% of the total cargo, by volume), Si-Satchanalai (11%), and Suphanburi (a few storage jars). Two earthenware cooking pots are of unknown origin but categorised for the time being as Thai. Chinese ceramics represent an estimated 35% of the cargo, and Vietnamese pieces 8%.

Sukhothai ceramics on Turiang





The *Turiang* carried large quantities of plates with fish and floral decorations in underglaze iron oxide. Plates of this shape and design seem to have been in production for three centuries, but the *Turiang*'s are generally smaller and deeper than later examples, typically 21-24cm in diameter and 6.5-8cm high. Other documented examples, and those recovered from the *Longquan* and other shipwrecks investigated by Sten Sjostrand, are of 24-29cm diameter.





The decoration of the fish plates comprises a single fish at the interior bottom, encircled with two rings, with the tail often extending outside the border. Other rings decorate the rim, and the exterior walls. The ends of the rings almost never meet perfectly. The rim is usually slightly flattened, but can also be everted (curved convex exterior for the rim), with just a hint of a raised lip. Variations include an encircled band of chevrons for the rim. Occasionally the fish is accompanied by foliage, presumably seaweed. The fish vary considerably in design. Some face to the left and some to the right, whereas on plates so far recovered from the *Longquan* the fish nearly always face left.

The floral plates are similar, but in place of the fish have a single blossom with three or four stems. The flowers are probably intended to be











The decoration of the fish plates comprises a single fish at the interior bottom, encircled with two rings, with the tail often extending outside the border. Other rings decorate the rim, and the exterior walls. The ends of the rings almost never meet perfectly. The rim is usually slightly flattened, but can also be everted (curved convex exterior for the rim), with just a hint of a raised lip. Variations include an encircled band of chevrons for the rim. Occasionally the fish is accompanied by foliage, presumably seaweed. The fish vary considerably in design. Some face to the left and some to the right, whereas on plates so far recovered from the *Longquan* the fish nearly always face left.



The floral plates are similar, but in place of the fish have a single blossom with three or four stems. The flowers are probably intended to be chrysanthemum. The designs are very similar to those on the Vietnamese ceramics recovered.







Other Sukhothai wares, also painted with iron oxide, include bottles of various shapes and sizes. The largest type, with ring handles, has notably thin walls. Decorations on these bottles are mostly running calligraphic scrolls. Like the flowers, the scrolls are similar to those on the Vietnamese ware. All oxide paintings are applied over a creamcoloured slip, which is often smeared near the footring.





The clay is a gritty grey, which sometimes fires to red-brown, speckled with notable whitish impurities (quartz). The glaze is clear, or sometimes greenish and riddled with pin holes, in a manner peculiar to Sukhothai. No smaller Sukhothai bowls have been seen in the cargo, while smaller Vietnamese equivalents are present in limited number. This is the reverse of the underglaze ceramic mix on the *Longquan* shipwreck, which had many Sukhothai bowls and none from Vietnam.





Sukhothai floral designs from Turiang



Si-Satchanalai ceramics on Turiang

The Si-Satchanalai ware on the *Turiang* is made of two different clays. The first is a secondary (lower grade) clay which varies from brick-red to a dark grey-brown to almost black. The second is a near-white clay, often with a yellowish cast. Both types are densely speckled with tiny black impurities, contrasting with the larger white specks in Sukhothai clay. None of these clays are even remotely similar to the uniformly light grey clay used for the mature celadon on the *Royal Nanhai* and *Longquan* wrecks. The clay used for the *Nanyang* celadon was different again: creamy in texture and colour

Early blackish brown-glazed ware



This crudely-potted, heavy ware is made with the dark clay, unevenly mixed. A thin opaque glaze generally stops well short of the base, although often running down messily. These ceramics are referred to by TCAP as 'Mon ware'.

The early brown-glazed wares recovered from the *Turiang* include ringhandled bottles, mostly with a flared mouth, 9-13cm high. They have a

flat base, often with curved concentric lines which result from being cut from a turning wheel with a fine cord. Some have thin handles which stretch down the body. The shapes vary considerably: many are tall and narrow, others bulbous, and others almost pear-shaped. Some have vertical or slanting striations.



Many storage jars of this ware were found, mostly broken at the neck; many are still buried in the seabed. Three were recovered. They have four lug handles and a flared mouth. They are 33cm high and would hold about 12 litres of liquid. The flat base is made from a distinct disc of clay, on which the walls were coiled. Of the samples, one is marred at the top by blisters from trapped air bubbles. Some much larger storage jars were too big to be retrieved to date; similar examples from the *Royal Nanhai* had a



capacity of 75 litres and contained fish bones.

Early underglaze ware



The early Si-Satchanalai underglaze ware, painted on slip, uses the Mon clay, and is also characterised by TCAP as 'Mon ware'. The underglaze decoration is painted over a thin yellowish-white slip which, in contrast to the Sukhothai ware, is carefully applied. The slip is generally applied over the whole shape, including the exterior of the foot-ring. Foot-rings are well carved, with tapered sides



and a shallowly recessed base in which accidental patches of slip can be noticed. Rims have a raised lip, more pronounced than on the Sukhothai counterparts.



All of the Si-Satchanalai underglaze ceramics on the *Turiang* are plates, 25.5-27cm in diameter and 4.5-6.5cm high. Most have fish and flower decorations. The fish designs are less exuberant than the Sukhothai versions, but more carefully drawn, frequently with foliage trailing from the mouth. The floral designs are very stylized, and so far unique to Si-Satchanalai, with no hint of other origin. The glaze, where it remains, is generally clear with a green tinge, but sometimes glassy, crackled and dark green.



Most of the plates have spur marks in the lower interior, and a few have the circular impression of a tubular firing support on the base. The circular support scars are less pronounced on the *Turiang* plates than the black scars seen on later Si-Satchanalai ware, such as the mature celadon from the *Royal Nanhai* and *Longquan* wrecks. Later supports appear to have been attached with some sort of glue (so that the support could be used as a handle for dipping into the glaze), whereas the slight depressions on the ceramics from the *Turiang* and *Nanyang* seem to have been from simply supporting the unfired objects in the kiln.



Whereas all Sukhothai underglaze dishes on the *Turiang* have pitted glaze, the remaining glaze on the Si-Satchanalai ware shows no evidence of pitting. Similar underglaze wares using the finer clay without slip are referred to by TCAP as 'Mon associated stoneware'. There are two examples of the latter on the *Turiang*, including the plate in the next photograph. These plates are covered with a thick glaze which survived better than the glaze on other early Si-Satchanalai underglaze wares.



Early green-glazed ware

This has no slip, and a watery glaze ranging in colour from pale to dark green, suggestive of an underdeveloped celadon glaze. The same near-white clay with black impurities is used. Foot-rings are not as well formed, and frequently there is no recess in the base. Generally only traces of glaze remain: many objects appear to have been underfired, allowing the glaze to peel away. These ceramics were referred to by TCAP as 'transitional stoneware'.



The *Turiang* carried early green-glazed bottles of many shapes and sizes, including a number which are roughly spherical and have two ring handles. The largest of these are about 15cm high and undecorated; they have the size and



shape of coconuts and are disrespectfully known as 'coconut jars'. Small 'jarlets' are 7-8.5cm high. The ring-handled jarlets and the medium-sized jars, 10-12cm high, are decorated with two rows of vertical striations. They are unglazed inside. (Over ten thousand jarlets were found on the *Royal Nanhai*, but only small numbers on the *Nanyang* and *Turiang*. Jarlets have been found in burial sites throughout Southeast Asia, and in the Philippines were used to hold perfume, cosmetics, medicines and charms¹. In the jarlets on the wrecks, there is no evidence of contents. The large quantity on the *Royal Nanhai* is intriguing.)

The *Turiang* cargo also included plain mini-jarlets without handles, 4.5-7cm high; tall bottles with two ring handles, 18.5-20cm high with a flat or shallowly-recessed base and vertical striations; bottle vases; and covered jars. No dish-shapes have yet been found in the early green-glazed ware.





The bottle-vases are of two types. One is decorated with vertical striations and/or carved rings. The other, made of notably lighter clay, has incised decoration, common on later celadon. One pear shaped bottle-vase of the latter type, 27cm high, features a stylized peacock with elaborate cloud motifs.





Four covered jars recovered had lids with lotus-bud handles. These were of three different sizes (12-13, 15, and 18cm high, without the covers). The two smallest jars are still sealed, and are decorated with wide striations; the others have carved rings at the shoulder.

Another early green-glazed item worth mention is a 'guan' style jar, 18cm high and 25cm in diameter. This pot is similar in form to a Chinese guan jar found on board, although the structure is different and the Thai jar has very little trace of decoration. It is interesting that two similar products of different origin are found on the one wreck.

Vietnamese ceramics on Turiang



All of the Vietnamese ceramics discovered so far on the *Turiang* are bowls. The size range is limited: they are 14.5-17cm in diameter and 5.5-7cm high. Most are **underglaze black**, and decorated in similar fashion with a stylized chrysanthemum flower at the interior bottom, a stylized calligraphic or chevron scroll inside the rim, and another within line borders around the outside wall. The side of these bowls is S-shaped; the rims are straight and thin. The off-white clay is fine, smooth enough that no slip was required, although some had a chocolate wash on the base. The little glaze remaining is thin and often olive-green. Most of these bowls have five triangular spur-disc scars in the lower interior. Foot-rings are thinly cut with a flat recess in the base.



Calligraphic scrolls represent the earliest known Vietnamese style, and are almost identical to the scrolls on the Sukhothai wares. The Vietnamese paintings however are made directly on the body. Bowls like these with an underglaze black floral decoration had appeared in Japan by AD 1331¹/₂.



Five Vietnamese monochrome bowls have been recovered. Four are plain. One has a delicate foliate rim, with impressed interior decoration. Eight panels with Buddhist emblems surround an 8-petalled flower. The lower interior displays five triangular scars from a five-legged spur-disc. The diameter of this bowl is 16 cm. These bowls have traces of an original pale green glaze.

In all, twenty-four Vietnamese bowls have been recovered, of which seven have a chocolate wash on the base. The foot-rings on these bowls are different, squarely cut, with a rather deep and flat recess in the base. The chocolate wash is characteristic of Vietnamese ware but by no means exclusive; in combination with the creamy clay, foot-rings, and decorative style, there is little doubt as to origin. All of these are typical of central Vietnamese ware of the 14th century.

Chinese ceramics on Turiang

The Chinese ceramics, categorised here in five groups, correspond to patterns of the Yuan dynasty (AD 1279-1368) or the early years of the succeeding Ming dynasty. The celadon came from the Longquan kilns in Zhejiang province; the other ninety per cent of the items came from Guangdong province.

Monochrome bowls

There were great numbers of bowls, 15-17cm in diameter and 6-7cm high. Some have traces of a dark glaze; others appear unglazed. Their creamy clay and bevelled foot-ring design could easily allow confusion with Vietnamese products, but for reddish lumps of clay affixed in many cases to the interior. These were for stacking in the kiln, an unusual method. Similar lumps were found in the brown glazed storage jars and the green glazed dishes, both of which are definitely of Chinese origin, so it was concluded that the bowls are also Chinese. The rim of these bowls is either slightly everted, or pinched inwards for an 'S'-shaped side profile.

Green glazed saucers

These are small flat plates, 12-13cm in diameter, made of a near-white clay with a thin green glaze which varies from pale blue-ish green to grey-green to dark-green. The body colour and texture also vary. The foot-rings are always well carved, but vary in detail. The bases are roughly recessed and of small diameter. Some have a broad unglazed stacking ring on the interior, some have spur marks, and some have the same lumps of red



stacking clay. The wide variation in all the details is common for Guangdong ware, and suggests that there may have been many different family-sized workshops, each supplying the same types of product - a pattern of manufacturing still familiar in the region.

Brown glazed storage jars and bottles

A number of Chinese storage jars, 22-39cm high, are made of cream-coloured clay with remaining traces of brown glaze. The necks are short, concave and well finished with a rounded rim. Each jar has four small lug-handles, evenly placed around the shoulder. One of these jars contained 52 covered boxes, described below. However, most of the Chinese jars were found empty, while many of their Thai counterparts were filled with cargo or provisions. One jar has a rim fragment from another jar stuck to its base, the result of a firing accident.





The same clay, lug-handles, and well-shaped base are seen in a number of bottles, 15-20cm high. These bottles are thinly potted and feature a tall neck with a rounded rim. Glazes vary.



Other brown glazed ware



 \bigcirc



Cup (top) & bowl

ware. The 'cups', averaging 9cm in diameter, are thinly-potted with rounded sides and a pronounced recess below the rim. The glaze is almost matte, free from blots and stops short of the base. A high well-made foot-ring with a concave base, together with the clay, indicate Chinese manufacturing. The 'bowls' are similar in form and size - slightly larger, averaging 10cm in diameter. These are S-sided with a straight rim. The glaze is sometimes uneven and lumpy because of blistering, leaving the surface with lighter coloured patches, and slightly glossier than the first type. The clay is coarser than the first type, and the foot-ring surprisingly roughly finished.



Some larger bowls, 14.5-16.5cm in diameter and 6-7cm high, were distinguished by the unusual cut of the base, with a slanted cut reversing to leave a lower centre. It is no longer possible to tell whether these bowls were originally glazed. Some had large spur marks on the interior.



Two thickly-potted basins with a thick straight rim, 20-23cm in diameter and 8.5-10.5cm high, are also believed to be of Chinese origin because of their clay and glaze, although similar forms have been noticed among Vietnamese wares. The interiors are brown-glazed, but the exteriors left unattended. The clay is rather coarse. One basin had patches of the red stacking clay stuck to the interior.

Fifty-two small covered boxes were found inside a broken Chinese storage jar. These boxes were complete with lids. They have a finely potted rim and recess between the two parts, and a blackish brown glaze.

Just two of the lids were fixed to the body by small spots of glaze, a practical feature found with similar boxes from other shipwrecks, including the Longquan and the Xuande. (A gentle knock is sufficient to separate the two parts.) It took the investigators a very long time to match up all the others, as all are slightly different in diameter - so, contrary to common belief, the rims are not moulded. Two of the lids have an 'X' mark, drawn in a black glaze contrasting with a brownish background. The glaze, clay, foot-ring and concave base are very similar to those of the cup-bowls, and the boxes almost certainly originate from China. The boxes are of three diameters, 5.5, 7.5 and 8cm. They have an oval profile; some proportionately higher than others.





Eight jarlets were recovered, each with two ring handles and a dark brown glaze and 5-6.5cm high.



Chinese celadon guan



Celadon

The most impressive celadon items from the *Turiang* are 'guanstyle' covered jars, with carved decorations of lotus flowers, and vertical lotus petals around the lower body. Two jars were recovered, and four lids. The rounded foot-rings are thick, with a deep base recess. Strong convex base-plates were fitted after initial potting - an unusual technique sometimes used with heavy pots to relieve stress during firing. One jar has a wellexecuted flower stamped into an unglazed circle inside the base. One lid is small and plain, without any handle or decoration. The other lids have lotus-bud handles and wavy rims, with carved exterior floral decoration similar to the jars. One of these has a stamped design on the inside, covered in glaze, with eight characters including luck, wealth and long life. These jars are each 28cm high, and weigh 6-7kg.









Two smaller guan jars were found, 14-15cm high, with four lids. The lids are flatter than for the large guan; one is decorated.

Also interesting are a few very large dishes, up to 45cm diameter. These have impressed and incised decorations of varying degree, in the centre, on the cavetto (the curving surface of the interior sides), and sometimes also on the exterior. One of these dishes has a weak radial fluting on the cavetto. The rims are sometimes plain, and sometimes beautifully foliated. The glaze is opaque, thick, and covers the foot except for an unglazed stacking ring.



A number of other Longquan celadon dishes are between 26 and 28 cm in diameter. These often display a stamped floral motif in the centre, under the glaze, and frequently feature a foliated rim with a high vertical edge. Some of these pieces have incised radial striations on the cavetto, made by a five or six pronged tool. The glaze is similar to the large dishes. The clay varies from reddish-brown to grey.



Yet another Longquan celadon dish type is slightly smaller, 25-26 cm in diameter. These dishes have a proportionately smaller foot-ring which is fully glazed. These dishes are made from bright red clay, and the opaque glaze has frequent black impurities. The layer of glaze is thick, but badly abraded. Rim edges are straight and high. The recessed bases are always free from glaze, and show scars from tubular supports.



As noted in 'ceramic issues', many of the Longquan celadon dishes had scars or remains of tubular supports.



Two unidentified celadon plates were recovered. These are undecorated but for radial striations, and have a translucent glassy glaze similar to that on Si-Satchanalai celadon from later shipwrecks, and not otherwise seen elsewhere. However, the glaze extends down the exterior walls and over the whole foot-ring, which suggests Chinese manufacture. External glaze drapery and teardrops are rarely seen on Chinese ware, but in this case are around the foot-ring; the feature is common on Thai ware, but only further up the side.





These plates are 25.5cm in diameter and about 5.5cm high. On the unglazed area of the base is a thin circular scar from a tubular stacking support. The whitish clay is more smooth and compact than for Thai ceramics, and the rim is bent more to the horizontal, although the lip of the rim has a raised edge also seen on Si-Satchanalai plates. Three plates found but not recovered were similar but for an opaque celadon glaze. This suggests a Chinese origin for the whole group, and the plates were found among the Chinese and Vietnamese ceramics. No similar plates have been identified at known kiln sites in Thailand, but plates and bowls of this type have been found in the Tak-Omkoi burial sites of western Thailand.

Other ceramics on Turiang



A number of storage jars from Suphanburi province have been found on the *Turiang*. One jar decorated with horizontal grooves and made of a coarse, blackish-gray clay, stands 26cm high to the broken neck. A similar jar was found on the *Royal Nanhai*

Another jar has an everted rim carved with tiers, four small token lug handles, and an impressed band of leaf-like motifs with carved rings around the shoulder. It is of light grey clay, finely pitted, which may be the result of abrasion over time. Splashes of reddish stain may be the result of contact with the iron in the ship's cargo. This jar is 46cm high.

There are at least four very large jars still buried in the seabed. Two fragments of similar broad-shouldered jars were recovered. One has a faint impressed band of temple-style (leaf-like) motifs at the shoulder, and two (originally four) small token lug handles at carved rings

just below the neck. The other comprises only a rim and part of the neck. The rim diameter of both is about 36cm; the clay is dark and gritty and about 2.5cm thick. This appears identical to a jar recovered from the *Longquan*, which had a capacity of about 260 litres.



Asian earthenware pots

One earthenware pot is made from a vivid red clay, impressed with circular cord marks which begin at the centre of the rounded but relatively flat base, and with vertical stamped zig-

zag patterns at the shoulder. It is 23cm in diameter and 16cm high, and was probably used by the crew for cooking. Similar pots, often referred to as rice pots, have been found on many Southeast Asian shipwrecks.









Another earthenware pot of brownish clay, very similar in shape and decoration and 28cm high, contained a resinous substance which flowed before recovery and solidified in air. A sample is to be analysed.

Non-ceramic finds on Turiang



One of the Thai storage jars found on the forward port side contained fishbones. Everything else relating to the crew was aft, and the fish are thought to have been part of the commercial cargo⁽¹⁾. These bones are similar to others found in nine large martabans on the *Royal Nanhai*, and there are equally large jars in the equivalent position on the *Turiang*

which have yet to be investigated. The *Royal Nanhai* bones were identified as mackerel of the *Rastrelliger* genus.⁽²⁾ The three species of this genus have all been caught in the South China Sea, and the bones best fit those of *Rastrelliger brachysoma*. This fish lives in saltwater or the brackish water of river deltas, and remains popular for eating. The forklength is 16-18cm. The remains do not include gills, which must have been removed in order to salt, dry or smoke the fish. *Rastrelliger* bones also predominate in the *Turiang* sample, which includes some bones from another fish species yet to be identified.

Eggs were also found in a storage jar - aft, where the cooking facilities may have been (C-01 on the site plan). One unbroken egg, marred only by two pinholes, was brought to the surface.





Small chunks of sphalerite or zinc blende were found in ten storage jars, all similar to the jar with the fishbones. These jars were found some distance outside the hull, dragged out by trawlers, suggesting that they were stored on deck or in the upper layers of the cargo. Sphalerite has a resinous lustre; it contains zinc sulfide (ZnS), and is mined in many parts of the world, including

currently near Chiang Mai in northern Thailand. Sphalerite has thin shiny flakes which are easily crumbled; the resultant powder is not only 'glitter', but sticks readily to the skin, and may have been used as makeup.

Large lumps of iron oxide were found inside the wreck area, and also outside, dragged by modern fishing nets. Similar iron oxide conglomerate lumps were found on the *Royal Nanhai*, as well as bar-shaped iron ingots (not recovered because fused together). The lumps are red-brown on the inside and whitish on the outside, and are thought to derive from iron ore carried as cargo in granular form.

- This pushes back the history of commercial fish exports from Thailand by 'a good quarter millennium', according to Kennon Brezeales. European references to trade in dried and salted fish in the 17th and 18th centuries were previously the earliest known. Personal correspondence, Professor Jan Wirgin 2000.
- 2. Fishbones identified by Arne Andersson, a Swedish archaeologist specialising in osteology: a Short Mackerel of the family *Rastrelliger brachysoma* (Jordan & Starks, 1908). Ref. 35/663 73. Analysis of the *Royal Nanhai* fishbones. He is now analysing the *Turiang* fishbones. The Ko Si Chang One wreck in the Bay of Thailand had similar jars containing unspecified 'fish vertebrae'.

No ingots of any kind have yet been found on the *Turiang*. Iron in seawater forms sprawling concretions, and some of the lumps have enveloped ceramics.

The iron conglomerate on the Royal Nanhai was associated with traces of flattened bamboo, suggesting to the investigators that it had originally been packed in bamboo bags; it appeared to have trickled down from higher levels as these deteriorated after the ship sank. Iron or iron ore has been found on other historic wrecks in the region, and appears to have been a common cargo item.

One shaped stone was found, 23.5cm long and 15cm wide, with marks suggesting it was used for sharpening knives.

At least four elephant tusks were noted on the seabed, but were too decomposed to be brought to the surface.

No anchors have yet been found, on the *Turiang* or any of the other wrecks, including the *Royal* Nanhai which has been almost fully excavated.

Dating

The *Turiang*'s multinational cargo both challenges the chronology of Thai ceramics and presents its own dating puzzle. One intriguing issue is the absence of blue-and-white porcelain from either China or Vietnam, and the large load of Chinese celadon. Could this wreck be so old that it pre-dates the export of Chinese blue-and-white, now estimated to have started in 1328?(1)

The years of work at the Thai kiln-sites are of little assistance in dating the Turiang. However, the ceramics excavated from the Ko Si Chang *Two* wreck, with a carbon 14 date of 1290 ± -60 years, may be relevant. The Ko Si Chang Two site was looted before even cursory inspection, but provided a few underglaze wares similar to those on the *Turiang*, for Individual dish pictures on

which no manufacturer was suggested. However, a fragment of an the Longquan page of the unusual high straight-rimmed celadon dish⁽²⁾ appears identical to several Nov'01 exhibition. found on both the *Turiang* and the *Longquan*.⁽³⁾ Thus the *Ko Si Chang*

Two carbon date gives us one starting point for dating the Turiang ceramics.



The Chinese celadons were shown to a number of experts, in an attempt to date these independently from the Thai ceramics.

- 1. 1328 is the latest estimate for the date of first export, to the Middle East, by Liu Xinyuan of the Ceramics Archaeological Research Institute at Jingdezhen in China. Liu Xinyuan, op.cit., 1999.
- 2. Jeremy Green and Rosemary Harper, 1987, op.cit., fig 15.
- 3. Common features of the *Turiang* and *Longquan* plates include a bracket-type mouthrim, accented with incised lines which follow their shape on the flattened part of the mouthrim; an inward-slanting footrim, covered with glaze; and wide striations on the interior walls.

Professor Jan Wirgin of The Museum of Far Eastern Antiquities in Sweden viewed detailed photographs of all the Chinese celadon types from the *Turiang* and suggested, subject to actual inspection, that they may be from provincial kilns near Longquan and could have been manufactured in either the late Yuan or the early Ming periods⁽⁴⁾ - ie either side of 1368.⁽⁵⁾

Professor Wang Qingzheng of Shanghai Museum saw the same set of photographs, reaffirmed that the celadons were 'Longquan Yao', and dates them as 14th to early 15th century. His personal view, subject to inspection, is that they are more likely to have been made after 1371 than before.⁽⁶⁾

Roxanna Brown, adjunct curator of Southeast Asian ceramics at Pacific Asia Museum in California, personally inspected all of the recovered wares and is of the opinion that the Chinese celadon and the Thai ware may date to the early part of the 14th century. The calibrated carbon 14 range of the *Ko Si Chang Two* shipwreck supports this date.

An early or mid-14th century date would also correlate with the ship type, which is of Chinese construction using temperate-climate wood. Later vessels with the observed shipbuilding details are likely to have been of South China Sea type and built from tropical hardwood.

It seems reasonable to assume that a vessel built in China and heavily loaded with Chinese ceramics was originally loaded in a Chinese port. If so, it is likely that this was before the Ming ban of 1371, as the ports were closely guarded and departures dwindled after that date. The volume of Vietnamese ceramics suggests that the ship stopped in Vietnam, which might not have been a safe option post-1371, as the Vietnamese kings were known to report illegal departures to the Chinese authorities.

A Chinese vessel stranded in Ayudhya following the ban is worth considering. Both Chinese and Vietnamese ceramics were commonly available in that port. However, it seems unlikely that the large quantities of Chinese ceramics on the *Turiang* would have been available in Ayudhya following the ban. The rather voluminous Thai ceramic cargo is also less likely to have been available in Ayudhya then: Ayudhya's prolonged war with Si-Satchanalai/Sukhothai between 1372 and 1378 is likely to have prevented river transport from the kilns. Use of the Ayudhya port for consolidation of cargo or even for transit was becoming less popular at this time. The imposition of export taxes, compounded by demands for 'gifts' on return, were irritations which may have contributed to the war.

A departure date following the 1378 peace treaty, when Sukhothai and Si-Satchanalai became vassals of Ayudhya, does not correspond to the mix of cargo. By that time, the potters at Si-Satchanalai would have developed the mature celadon, and the variety on any ship after that date would be different. Consequently, the only dates likely for the *Turiang* to have loaded her cargo and departed safely from China, visited Vietnam, and loaded pre-celadon ceramics in Thailand, are before the 1371 ban.

- 4. Yuan dynasty AD 1279-1368, Ming dynasty AD 1368-1644.
- 5. Personal correspondence 16 Dec 98.
- 6. Personal correspondence 21 Jan 99.

Radiocarbon dating of a piece of structural timber from the *Turiang* gave a conventional carbon age of 620 ± 50 years BP.⁽⁷⁾ While the sample was reportedly suitable for the purpose, it was also subjected to cellulose extraction in order to achieve highest possible precision date. Following calendar calibration, adjustments for additional year-rings, and allowing time for seasoning of the timber, construction of the ship, and some years in service, the result is a 95% probability for a date of ship's loss anywhere between AD 1305 and 1435.

Comparisons with the *Ko Si Chang Two* and *Royal Nanhai* both strongly suggest that the *Turiang* sank in the earlier part of this range. This is based on the difference in the Thai ceramics in the different ships, allowing time for new kilns to be developed, technical aspects of production to be refined, and stylistic changes to emerge.

The tentative working date, adjusted to correlate with all the above, is AD 1360+/-.

Other relevant wrecks

To set the context, this is a brief description of the other wrecks investigated by Sten Sjostrand which were carrying Thai ceramics. The advantage of the point-in-time snapshots presented by shipwrecks in analysing historical development can be seen, with tentative dates, in the following photograph:



Nanyang - c. AD 1380

<u>The Nanyang</u> is in Malaysian territorial water, 10 nautical miles from the island of Tioman, which was a popular stop for fresh water on the Southeast Asian routes. The remains of the wreck sit upright on the seabed in 54 metres of water. Excavation is intended, some time in the future. So far the site has been only partially surveyed. The construction details noted so far, which include transverse bulkheads and wooden dowels, suggest a ship of the South China Sea type. The remains indicate that the vessel measured about 18x5 metres.

The *Nanyang* carried an estimated 10-15,000 pieces of Si-Satchanalai celadon, and does not appear to have had any other ceramics on board. This may have been one of the earliest shipments including celadon plates. These are unusual for the spur marks on their face. Spur marks are also seen on the earlier underglaze decorated plates, but on celadon the disfiguring is more marked, and the practice of stacking with disc-shaped supports was thought to have been discontinued soon after celadon production started. By the time the *Royal Nanhai* sailed in the mid 15th century, spur marks on celadon are rare. Most of the large dishes among the 420 pieces recovered from the *Nanyang* display spur marks; only five of the thousands from the *Royal Nanhai* do. Instead, many pieces from the *Royal Nanhai* have circular scars on the base from tubular stacking supports; fewer *Nanyang* plates have these, and when they exist they are of larger diameter than the later examples - a size reflecting the earlier practice of stacking in piles.

The foot-ring of the celadon plates on the *Nanyang* is tapered inwards and is shorter than on later ware; it resembles the foot-ring of the earlier underglaze black decorated plates found on the *Turiang*. Most of the *Nanyang* plates have an undecorated exterior and plain rim, and provide a stylistic bridge between the earlier *Turiang* and the later *Longquan*.

The *Nanyang* also carried very large storage jars, maybe as large as the jars of approximately 260 litres on the *Turiang* and *Longquan* - much bigger than those on the later *Royal Nanhai*.

Longquan - c. AD 1390

<u>The Longquan</u> may be one of the largest trading ships of the period yet found. Like the Nanyang, the site has been only pre-surveyed, but suggests a vessel over 30 metres long and 8 metres wide. The ship appears to have been built of tropical hardwood with a typical South China Sea design, and to be largely intact, so may eventually provide invaluable details on shipbuilding. Located 23 nautical miles from shore (15 from the nearest Malaysian island) and in 63 metres of water, this wreck would be time-consuming and costly to excavate.

The *Longquan* appears to have been fully loaded, and the cargo of ceramics is estimated at 100,000 pieces. Samples collected from the surface include white-glazed porcellaneous bowls from southern China and celadon from the kilns of Longquan; Chinese ware represents perhaps 40% of the ceramics visible. Another 40% is Si-Satchanalai celadon of an early character, the majority distinguished by a rare bluish glaze unknown on the Si-Satchanalai celadon from other wrecks. The decoration of these pieces is more similar to those of the *Nanyang* than to the more elaborate decoration of the *Royal Nanhai* celadon. There are various dish shapes and jars; no jarlets have yet been seen. The remainder of the visible ceramics are Sukhothai ware, including underglaze black decorated plates, with fish and flower designs but not the cakra (solar whorl) motif which seems to have appeared around the mid 15th century. The later *Xuande* wreck has bowls decorated with cakra, but no fish or flowers. No Vietnamese pieces have been found so far on the *Longquan*.

The *Longquan* is tentatively dated on the basis of the Chinese and Si-Satchanalai celadon to AD 1390. Sappanwood from the ship's cargo will be recovered as soon as possible for radiocarbon dating.

No Chinese blue-and-white ceramics have yet been found on the *Turiang*, *Nanyang* and *Longquan*, which follow each other in time sequence. The earliest occurrence of Chinese blueand-white will be interesting. These wares are believed to have been extremely scarce on Southeast Asian trade routes during the early Ming dynasty.

Royal Nanhai - c. AD 1450

<u>The Royal Nanhai</u> was a South China Sea vessel carrying more than 21,000 pieces of mature Si-Satchanalai celadon, which have provided new insights into mid 15th century techniques and developments. The cargo and position suggest that the ship was heading from Ayudhya to Java or Sumatra. The only wreck to have been fully excavated⁽¹⁾, the *Royal Nanhai* was found 40 nautical miles east of Kuantan in Peninsular Malaysia, in 46 metres of water.

The vessel was about 28x7metres, and built of tropical hardwood of the *Hopea* species, which grows throughout Southeast Asia. Transverse bulkheads were 1.35metres apart throughout the length of the vessel, and the bulkheads and limited remains of the hull planking were edge-joined with wooden dowels. The single layer of hull planking was 8cm thick. (Schematic plan of the site.)



Radiocarbon dating⁽²⁾ of the timber gave a wide date range of AD 1320-1460. Four pieces of Chinese blue-and-white ware found in a hidden compartment next to the keel were similar⁽³⁾ to others which have been dated to the Jingtai/Tienshun years of the Interregnum period, 1450-1564, and the style of the Thai ceramics also points to a date in the mid 15th century. (Two Vietnamese blue-and-white covered boxes in the same compartment could be dated only broadly as 15-16th century.)

- Sten Sjostrand, 1996, The Royal Nanhai Shipwreck and its Ceramic Cargo, including preliminary report on the excavations to date, written for the *Malacca Museum Corporation, unpublished*. Sten Sjostrand, 1998, The Ceramic Cargo of the Royal Nanhai. *Unpublished*. *Royal Nanhai* discovered 1995; excavation completed 1998.
- Royal Nanhai wood sample dating by Beta Analytical Inc. Radiocarbon report no. 125179. Conventional carbon age 560+/-50 years BP. Calibrated with the latest available data set and adjusted for additional year-rings of wood sample, seasoning/construction and the likely age of the ship when lost, the date of shipwreck was estimated as AD 1320-1460 at 95% probability.
- 3. Similar in the use of figures in landscape in scenes separated by cloud outline borders. See Larry Gotuaco, Rita C Tan and Allison I Diem, 1997, *op.cit.* p 126.

The *Royal Nanhai* is therefore about the same age as the *Pandanan* wreck, found in the Philippines in 1993. Both carried Chinese blue-and-white ware of the Interregnum period, but in both cases it was a small percentage of the cargo; 75% of the *Pandanan* cargo was from central Vietnam. There were four 14th century Chinese ceramics on the *Pandanan* wreck, two of them blue-and-white, which are assumed to have been part of an early antique trade. From the first exports in 1328 to the mid 15th century, Chinese blue-and-white ware seems to have been a rare commodity. Analysis of thousands of the Si-Satchanalai celadon dishes distinguished one group which had survived in relatively good condition, with a straight foot-ring, and little re-oxidised colouring in the base. These are likely to have come from a particular kiln which had perfected its technique.

Besides Si-Satchanalai celadon and black-glazed storage jars, and various Chinese blackish brown glazed jars, a variety of utilitarian earthenware, probably used by the crew, was recovered. No Sukhothai ware was found on the *Royal Nanhai*, although there was some in the *Pandanan* cargo.

Non-ceramic finds included bar-shaped iron ingots and conical lead ingots, and large concretions of iron, which appears to have been shipped in a loose granular form, spaced along the centre line of the ship. The iron shipment must have weighed at least 20 tonnes. Traces and imprints of woven bamboo on the iron ore indicate that it was packed in bags. The *Turiang* appears to have carried similar granular iron, but no ingots of any kind. Conical lead ingots were found on the *Nanyang* and *Longquan* sites.

The hidden compartment contained exquisite items: a carved ivory sword handle (with traces of the vanished blade originally visible on the seabed), a cylindrical lacquer box and cover incised with floral designs, and an elephant-shaped bronze seal with a moon-hare impression.

Xuande - c. AD 1500-1520

<u>The *Xuande*</u> site, which is 30 nautical miles north of the Malaysian island of Tioman, in 53 metres of water, offers no evidence of a ship's structure. The outline of the finds produced an acoustic image of a vessel approximately 28x8 metres in size, but site investigation produced no evidence of timber. Scattered ceramics on the surface of the seabed outlined the shape of a wreck, as did side-scan sonar, but the finds extended only a few inches into the muddy sea floor. Despite extensive scanning with a sub-bottom profiler and a magnetometer, plus probing three meters into the sea bed with water jets, no wood fragments at all could be found.⁽⁴⁾

The ceramics recovered include Chinese blue-and-white porcelain and monochrome whiteglazed ceramics, and Si-Satchanalai and Sukhothai underglaze black decorated ware. Seven of the Chinese pieces display the reign mark of the emperor Xuande (1426-1435), but two cannon imply that the wreck post-dated the arrival of the Portuguese in Asia⁽⁵⁾, and date the wreck to the early sixteenth century. The ceramics may have been commemorative, as Xuande-reign pottery was highly regarded, rather than early counterfeits. The Sukhothai samples, with the 'solar whorl' motif believed to be from the later years of the Sukhothai kilns, confirm this later date.

- 4. Sten Sjostrand, 1997, op.cit.
- 5. The *Xuande* cannon were of Portuguese design, but probably cast in Asia. Portuguese designs and influence may have preceded the arrival of the Portuguese themselves; they reached India in 1498, Malaysia by 1509, and China by 1513



Bibliography

- Atkinson, Karen, Jeremy Green, Rosemary Harper, and Vidya Intakosi, 1989, 'Joint Thai-Australian Underwater Archaeological Project 1987-88 Part I: Archaeological survey of wreck sites in the gulf of Thailand 1987-88', *International Journal of Nautical Archaeology and Underwater Exploration*, Vol 18/4, pp299-315.
- Barbetti, Mike, and Don Hein, 1989, 'Palaeomagnetism and high-resolution dating of ceramic kilns in Thailand; a progress report', *World Archaeology*, Vol 21/1.
- Blake, Warren, and Mike Flecker, 1994, 'A preliminary survey of a South-East Asian wreck, Phu Quoc Island, Vietnam', *International Journal of Nautical Archaeology*, Vol 23/2, pp 73-91.
- Brown, Roxanna, 1975, 'Preliminary report on the Ko Khram sunken ship', *Oriental Art Magazine*, Vol 21/4, pp356-370.
- Brown, Roxanna, 1997, 'The Xuande cargo and the Ming Gap', *Oriental Art Magazine*, Vol XLIII/2 (summer), pp2-6.
- Brown, Roxanna, and Sten Sjostrand, 2000, *Turiang: A Fourteenth Century Wreck in Southeast Asian Waters*, Pacific Asia Museum, Pasadena, USA.
- Chan, Hok-Lam, 1966, 'Chinese refugees in Annam and Champa at the end of the Song Dynasty', *Journal of Southeast Asian History*, vol V11/2, pp1-10.
- Charoenwongsa, Pisit, and Sayan Prishanchit, editors, 1990, Underwater archaeology in Thailand II: Ceramics from the Gulf of Thailand, Department of Fine Arts, Bangkok.
- Diem, Allison I, 1997, 'The Pandanan Wreck 1414: Centuries of regional interchange', *Oriental Art Magazine*, Vol XLIII/2 (summer), pp7-9.
- Dupoizat, Marie-France, 1995, 'The ceramic cargo of a Song dynasty junk found in the Philippines and its significance in the China Southeast Asia trade', *Southeast Asia & China: Art, interaction, and commerce,* Percival David Foundation of Chinese Art, London.
- Edwards McKinnon, Edmund, 1985, 'West Java's increasing involvement in overseas trade in the 13th-14th centuries', SPAFA Digest, Vol VI/1, pp28-33.
- Gotuaco, Larry, Rita C. Tan and Allison I. Diem, 1997, *Chinese and Vietnamese blue and white wares found in the Philippines*, Bookmark Inc, Makati, Philippines.
- Green, Jeremy, 1981, 'Further light on the Koh Khram wrecksite', *Transactions of the Southeast Asian Ceramic Society*, No 8, pp18-26.
- Green, Jeremy, 1983, 'The Ko Si Chang excavation report 1983', *Bulletin of the Australian Institute for Maritime Archaeology*, Vol 7/2, pp9-37.
- Green, Jeremy, and Rosemary Harper, 1983, 'The excavation of the Pattaya wreck site and survey of three other sites in Thailand 1982', *Australian Institute for Maritime Archaeology Special Publication No* 1.
- Green, Jeremy, and Rosemary Harper, 1987, 'The maritime archaeology of shipwrecks and ceramics in Southeast Asia', *Australian Institute for Maritime Archaeology Special Publication No 4*.
- Green, Jeremy, Rosemary Harper, and Vidya Intakosi, 1987, 'The Ko Si Chang Three shipwreck excavation 1986', *Australian Institute for Maritime Archaeology Special Publication No 4*.
- Guy, John, 1986, *Oriental trade ceramics in Southeast Asia, ninth to sixteenth centuries*, Oxford University Press, Singapore.

- Hein, Don, and Mike Barbetti, 1988, 'Si-Satchanalai and the development of glazed stoneware in Southeast Asia', *Siam Society Newsletter*, Vol. 4/3 (Sept), pp8-18.
- Hein, Don, Peter Burns and Dick Richards, 1986, 'An alternative view on the origins of ceramic production at Sisatchanalai and Sukhothai, Thailand', *SPAFA Digest*, Vol VII/1, pp22-33.
- Howitz, P.C., 1977, 'Two ancient shipwrecks from the Gulf of Siam, a report on archaeological investigations', *Journal of the Siam Society*, Vol 65, pp1-22.
- Kasetsiri, Charnvit, 1976, *The rise of Ayudhya: a history of Siam in the fourteenth and fifteenth centuries*, Oxford University Press, Kuala Lumpur.
- Kasetsiri, Charnvit, 1992, 'Ayudhya: capital-port of Siam and its Chinese connection in the fourteenth and fifteenth centuries', *Journal of the Siam Society*, Vol 80/1.
- Khoksanthiya, Mali, 1972, Guide to Old Sukhothai, Department of Fine Arts, Bangkok.
- Liu Longwen, 1991, 'The characteristics of Guangdong wooden junks', paper presented at the *International Sailing Ships History Conference*, Shanghai.
- Liu Xinyuan, 1999, 'Imperial export porcelain from late Yuan to early Ming', *Oriental Art Magazine*, Vol XLIV/1, pp98-100.
- Loviny, Christophe, 1996, *The Pearl Road, Tales of Treasure Ships in the Philippines*, Asiatype Inc, Makati, Philippines.
- Manguin, Pierre-Yves, 1993, 'Trading ships of the South China Sea: shipbuilding techniques and their role in the development of Asian trade networks', *Journal of the Economic and Social History of the Orient*, Vol 36, pp253-280.
- Medley, Margaret, 1974, Yuan porcelain and stoneware, Faber and Faber, London.
- Miyata, Etsuko, 1998, '14-16th century Southeast Asian ceramics', paper presented at the Asian Ceramics Conference, Field Museum of Natural History, Chicago.
- Pijl-Ketel, C.L. van der, editor, 1982, *The ceramic load of the Witte Leeuw 1613*, Rijkmuseum, Amsterdam.
- Reid, Anthony, 1988, Southeast Asia in the Age of Commerce, 1450-1680, vol 1, Yale University Press.
- Reid, Anthony, 1999, *Charting the shape of early modern Southeast Asia*, Silkworm Books, Thailand.
- Richards, Dick, 1995, South-East Asian ceramics: Thai, Vietnamese, and Khmer, Oxford University Press, Kuala Lumpur.
- Robb, Walter, 1930, 'New data on Chinese and Siamese ceramic wares of the 14th and 15th centuries', *Philippine Magazine*, Vol 27/3-4 (Aug & Sept).
- Rooney, Dawn, 1981, 'Progress report on the sunken ships in the Gulf of Thailand', *Oriental Art Magazine*, Vol XXVII/2, summer, pp 190-197.
- Sjostrand, Sten, 1996, 'Shipwrecks in Malaysia', *Acro Update*, Asian Ceramic Research Organization, Chicago, Dec, pp 3-4.
- Sjostrand, Sten, 1997, 'The 'Xuande' wreck ceramics', Oriental Art Magazine Vol XLIII/2, pp 7-14.
- Solheim, Wilhelm, 1971, 'H.OtleyBeyer', Asian Perspectives, Vol XII, pp 1-18.
- Sullivan, Michael, 1956, 'Archaeology in the Philippines', *Antiquity*, Vol 30/118 (June), pp 68-79.
- Tan, Rita, 1998/9, 'A note on the dating of Ming minyao blue and white ware', *Oriental Art Magazine*, Vol XLIV/4, pp69-76.
- Vickery, Michael, 1986, 'Some new evidence for the cultural history of Central Thailand', *Siam Society Newsletter* Vol 2/3 (Sept), pp 4-6.
- Willetts, William, 1971, The Ceramic Art of Southeast Asia, Southeast Asian Ceramic Society, Singapore.
- Wu Zhenglian, 1991, 'The verification of the merchant ship's types in the Sino-Japanese trade from the end of the Ming dynasty to the beginning of the Qing dynasty', paper presented at the *International Sailing Ships History Conference*, Shanghai.
- Zhu Boqian, 1998, Celadons from Longquan kilns, ISBN 957-8273-08-8.

What's new - the Turiang

5 May 2002: Some of the ceramics on the *Bakau* wreck, a Chinese ship found in Indonesia and dated by coins to the early C15th, overlap with the *Turiang*'s cargo, which is still thought to be from a few decades earlier. See MaritimeAsia 'what's new'.

21 Oct 2001: An exhibition on eleven historic shipwrecks discovered around Malaysia is due to open in mid-November at the national museum in Kuala Lumpur. Related material will be added to the site thereafter.

The 'central estimates' of dates for the *Turiang*, *Longquan* and *Royal Nanhai* shipwrecks have each been pushed back by ten years - to around 1370, 1400, and 1460 respectively. A decade is well within the margins of error of the previous estimates, and no particular new information can be cited - this is just the latest assessment of the balance of probabilities. For the moment at least, we have left the dates in the *Turiang* section of the website unchanged.

5 Aug 2001: "The Turiang: a fourteenth-century Chinese shipwreck upsetting Southeast Asian ceramic history" was published in the Journal of the Malaysian Branch of the Royal Asiatic Society, Volume LXXIV Part 1 (No.280), 2001. All of the contents of the paper are included on this website. This web version may be amended or augmented over time and any significant changes will be noted on this page.

5 May 2001: Thai Underwater Archaeology - a new web site by the government archaeologists about their finds since 1976. It appears that more material will be added over time.

4 May 2001: The *Turiang* monograph, a 64 page colour book by Roxanna Brown and Sten Sjostrand, is now priced at US\$25 plus p&p, and credit cards are accepted. It can be ordered by e-mailing PacAsiaMus@aol.com with 'Store Manager' in the subject line; or see contacts page for address & fax.

23 Apr 2001: Sten Sjostrand revisited the <u>Longquan</u> site two weeks ago, and was appalled at the severe damage caused by trawlers. Over a period of just over two years, a 1.6 metre wreck mound has been levelled, and multiple layers of cargo have been shaved off, exposing much more of the wood. A virtually unspoilt site of great archaeological potential has been devastated. Malaysian fishermen were inactive in the area, but it is now intensively fished by Thai boats, which have moved further afield following the depletion of fish stocks in the Gulf of Thailand.

Donald Wagner has written some fascinating reports on regional iron trade and technology, of which the following may be especially interesting in this context:

- The traditional Chinese iron industry and its modern fate, his 1997 book
- Blast furnace operation in Song-Yuan China with reference to fuel demands, availability of

- timber, and the use of coal
- 13th century Chinese pelletising kilns? on the site of Hong Kong's new international airport at Chek Lap Kok

- although we believe the granules on the *Turiang* were iron ore, and different from those found in Hong Kong.

15 Mar 2001: Corrected statement about the non-mackerel fishbones on the non-ceramics page: not larger, but definitely of a different species.

14 Mar 2001: Added photos of stamped flower inside celadon guan to Chinese ceramics page.

9 Mar 2001: Clarified slightly the wording on the non-ceramics page about the iron oxide conglomerates, thought to have been iron ore. We hope to learn more about the regional iron trade and how the finds on the various wrecks may fit in. Feedback welcome.

8 *Mar 2001*: Added clarification on the overview page of the name *Turiang*, taken from the Sukhothai name for their kiln sites, once thought to relate to 'fish', but now more probably to 'dish' - see ceramic issues note 2.

7 *Mar 2001, pm*: Added a few extra details about fishbones on the non-ceramics page, after Arne Anderssen received the *Turiang* sample for analysis. He hopes to report fully by August.