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## **Use of ceramic sherds for stratigraphic and process interpretations of recent coastal deposits in Malaysia**

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**Abstract:** Occurrence of ceramic sherds in recent coastal deposits in the Malaysian region can be used to date the deposits especially those less than about 1,000 years old. The sherds occurring in the region are mainly from wares of Chinese origin with lesser contributions from Southeast Asian and European provenances depending on the age of the deposit. The occurrence of sherd deposits from the Merbok estuary area, Kedah, Merang estuary area, Terengganu and Cape Rachado, Port Dickson are given as examples for the dating of the deposits using the sherds and also how they can be used to interpret processes at the time of deposition. To assist in the identification of the sherds in the Malaysian region a list of areas with sherd assemblages of known ages is drawn up covering the whole 1,000 years period.

### **INTRODUCTION**

Vast tracts of coastal areas of Southeast Asia including Malaysia are covered by recent deposits such as alluvium, present beach deposits and earlier raised beach and shallow marine deposits. The latter deposits are the result of higher former sea levels. In the more tectonically active archipelagic part of Southeast Asia uplift of recent sediments including coral reefs can be quite significant. But in the more tectonically stable peninsular Malaysian region higher Holocene sea levels of 2–3 m have been recorded and summarized in Khoo (1996).

The dating of the raised beach and marine deposits have relied on the radiocarbon method on fossil shells and wood. However in the dating of materials about 1,000 years or younger the radiometric methods may have error margins quite disproportionate to their actual ages especially for materials of one or only a few hundred years old. For deposits of less than about 1,000 years old occurrence of ceramic sherds can provide an age for the deposit. Unlike shells and wood which are often destructible by solution or other processes ceramic sherds are durable, insoluble and well nigh indestructible. They can be dated geochronologically by the thermoluminescence method which is suitable for ages from 100 to more than 10,000 years (Singhvi and Wagner, 1986). The sherds can also be identified and dated by its make, body and decorative elements if preserved. In this article I

shall concentrate on and demonstrate with examples how the ceramic sherds are identified and interpretations made regarding the age and also how certain features on the sherds can be used for process interpretation.

With the coastal areas of the region increasingly being settled and infrastructures built it is important to understand the immediate past history of the coastal zone and shoreline development. It is the aim of this effort to demonstrate the usefulness of ceramic sherds in understanding the geological development of the coastal zone since about 1,000 years ago and the considerations that need to be made should the shoreline development history repeats itself.

### **OCCURRENCES OF CERAMIC SHERDS**

Since about 1,000 years ago Southeast Asia has been at the crossroads of trade between the Far East and India and farther to the west including the Middle East and Europe. Up to the late 19th century there was a thriving seaborne ceramic trade from China and Japan to the Middle East and Europe. The trade route passed through Southeast Asia especially the Malacca Strait. In addition Southeast Asia itself was an important importer of ceramics from China. Vietnam and Thailand also exported ceramics to other parts of Southeast Asia (Spinks, 1956; Willetts, 1971; Guy, 1986). However from the mid 19th century European wares

especially from England, Scotland and Holland started to appear in the Southeast Asian marketplace and there was an enthusiastic clientele for the European wares as well.

In the years before the steamship, the trading pattern between east and west through the Malacca Strait was controlled by the Southeast Asian monsoon system. In the Chinese Song (960–1270), Yuan (1270–1368) and Ming (1368–1644) periods ceramic wares were carried by Chinese ships to ports on both sides of the Malacca Strait such as Malacca, Palembang, Djambi, and early Kedah (Fig. 1) for transshipment by Arab and Indian vessels for places farther to the west. The northeast monsoon would be favourable wind for the Chinese ships to bring their cargoes to Southeast Asia and the ships would make the return trip when the wind direction changed with the southwest monsoon. It was also possible for Arab ships to make the trip to China and there were records of Arab ships at Quanzhou (Wheatley, 1961; Rugoff, 1986; and in the *Zhufanzhi* compiled by Zhao Rugua, 1225, translated by Hirth and Rockhill, 1911). In the succeeding Qing period (1644–1912) much of the Chinese ceramics were carried by European ships for European destinations and the Southeast Asian entrepot ports played relatively minor roles in the redistribution trade.

The ports bordering the Malacca Strait were port-cities with proper infrastructure and facilities to cater for the entrepot trade. Chinese junks making the trip from the South Chinese coast where the ceramic wares were loaded generally required at least a couple of weeks to arrive at the Malacca Strait. The ceramic wares which were found to be broken on unpacking after reaching the port-cities were generally discarded overboard. The ships were also known to call at places enroute to break journey, rest, repairs, replenish water stock or whatever other reasons and at these places too wares found to be broken were also discarded into the sea, for example, at Pulau Tioman (Kwan and Martin, 1985; Russell, 1985). At Pulau Balambangan, a small island on the northern tip of Sabah, a depot was established by the British in their China trade and at this place too very many ceramic sherds have been found (Willettts, 1981). They were probably discards from broken pieces. The sherds falling on the seafloor became clasts in the shallow marine sediments and if washed ashore on to the beach they constituted part of the beach or littoral deposits. The sherd deposits may also form stratigraphic layers as a result. The waterfront tracts of ancient port-cities, depots and rest places are therefore good localities for the discovery and study of recent coastal deposits.

In addition all coastal localities which have

been settled or where there have been economic activities are also places where ceramic sherds in coastal deposits can be found. For examples which are not present day I shall report in this article the discovery of ceramic sherds in coastal deposits at Kuala Merang, Terengganu and Cape Rachado, Port Dickson (Fig. 1) and make geological interpretations from a study of the sherds from the deposits at these two locations.

## IDENTIFICATION OF CERAMIC SHERDS

The high prices which collectors and lovers of ceramics are prepared to pay for the objects of their obsession have unfortunately given rise to an increasingly technically sophisticated industry of producing fake and imitation wares. This industry is not a recent phenomenon but dates back to antiquity for the collectors of old too like the present collectors were prepared to pay fortunes for particularly desirous pieces. The technical skills and trickery of forgers then and now know no bounds and the situation has given rise to the profession of non-destructive authentication (Lee, 1992). However, fortunately, fake and imitation ceramic wares pose no problem whatsoever for the study of sherds in recent coastal deposits. The sherds came from wares which were mass produced and meant for everyday uses. They were cheap wares at their time of manufacture and the question as to whether the sherds could be from fake or imitation pieces does not arise at all. So the task of identifying the sherds does not need to take into consideration the problem of fakes and forgeries.

Most of the ceramic sherds found in the Southeast Asian area are of Chinese origin except for more recent deposits dating from the late 19th century. However there are increasing evidence of sherds of Southeast Asian origin. In particular Vietnamese wares appear to be deceptively Chinese and with further interest and research into such lesser known wares (Guy, 1986; Hancock and Hancock, 1992), sherds of such origins may well be found and be more accurately identified. Pre-late 19th century Japanese export wares such as those made in Arita and Imari in Kyushu have not been reported from coastal deposits in Southeast Asia to the best of my knowledge. Such wares were usually carried by European ships such as the Dutch (Gorham, 1991) and large quantities of the goods were sent to Batavia (present Jakarta) for Holland and elsewhere (Du Boulay, 1990). For the moment in this study the most important ceramics of concern are Chinese.

Without the possibility of fakes and imitations the identification of sherds of Chinese wares is made easier. The literature on Chinese wares is

large and copious. The existence of reference collections in easily accessible museums in China, Taiwan, Japan, Britain, Holland, the United States, Turkey and many other places has assisted in the understanding of dating Chinese wares. Also dating of Chinese wares have been further improved by the discovery of well dated wrecks with cargoes of Chinese ceramics such as the well known Nanking Cargo and the tremendous amount of work done in the excavation and study of the stratigraphy of kiln sites in China (Li and Cheng, 1984). The main problems inhibiting identification are the sherds could be small and do not have any distinctive decorative element to permit identification or the sherds have been badly worn and abraded by wave action resulting in the removal of important decorative elements. But such problems are rendered somewhat less problematical as at many sites the sherds are found in their thousands or more pieces. More than 1500 pieces were collected and studied from the Pulau Tioman site by Kwan and Martin (1985) and many more pieces remain uncollected at the site. At Pengkalan Bujang,

Kedah, Lamb (1980) reported the occurrence of abundant ceramic sherds in a stratified layer in sand interpreted to be a raised beach in Khoo (1996) and more than 10,000 pieces have been collected (Kwan and Martin, 1985). Perhaps a fair idea of the amount of sherds which can be recovered from such stratified layers can be obtained from the report of Carswell (1985) who excavated a trench 5 m by 2 m dug into a ceramic sherd bearing coastal dune at Allaipiddy, Sri Lanka and the amount of sherds recovered filled more than 3 large baths and it took more than 2 days to wash them.

It will be inappropriate here to dwell deeply into the subject of identification of ceramics as this subject will fill treatises. Instead it will suffice to demonstrate here how the ceramics can be used for dating of recent deposits and in the examples I shall show how the ceramic sherds can be used to interpret processes at the time of deposition. To my surprise the identification and dating of ceramics also made use of methods adopted in palaeontology such as evolution of decorative motifs and styles with age.

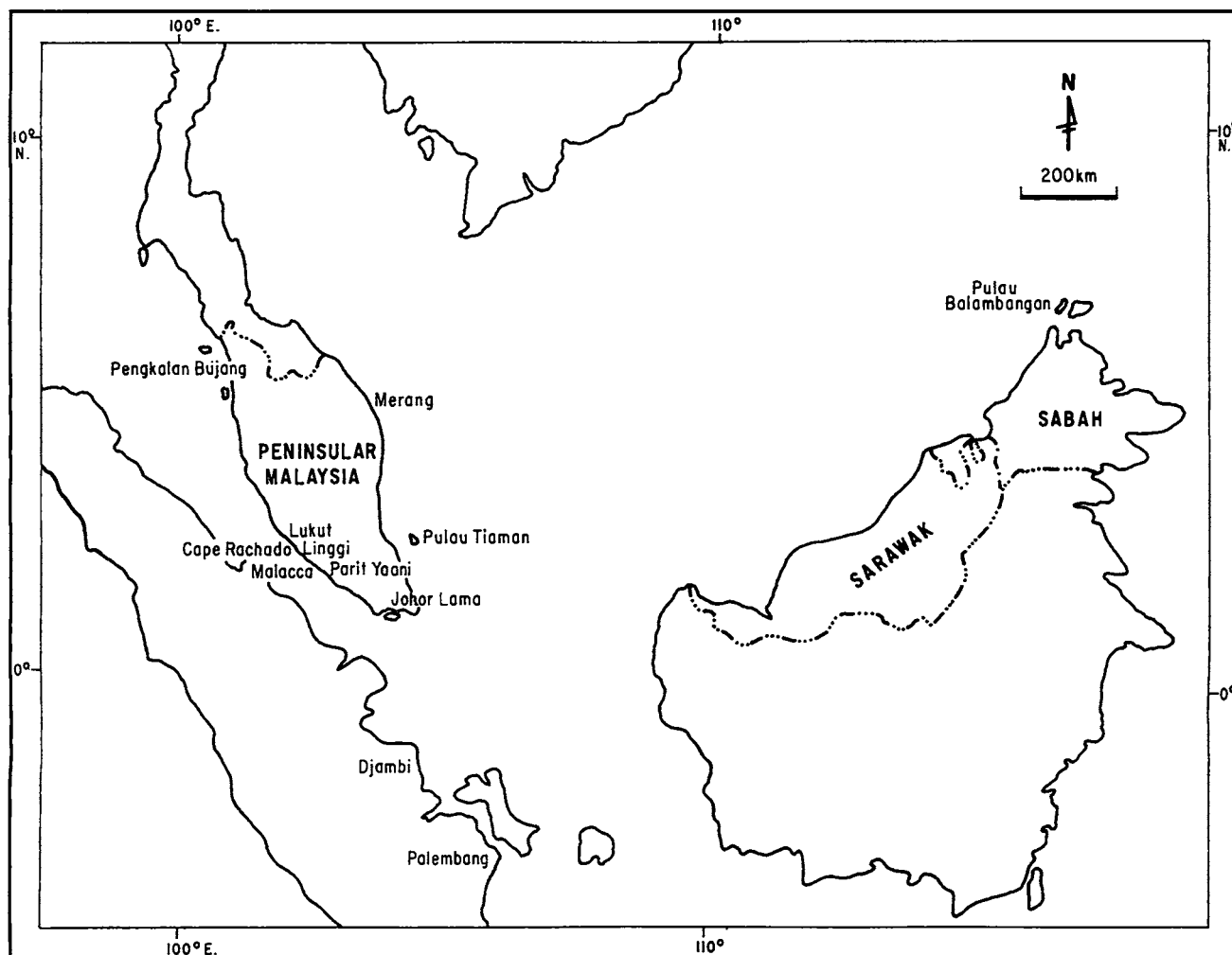


Figure 1. Geographical localities in Malaysia and adjacent areas.

For Chinese ceramics a rather imprecise identification (for collectors and auctioneers) such as early Song or late Ming will give an age of A.D. 1050  $\pm$  100 years and A.D. 1600  $\pm$  50 years respectively. But the age range will be extremely useful for stratigraphic purposes in the study of the recent deposits. For some groups of Chinese ceramics minimum ages can be obtained if no other distinctive features are available to assign a more precise age. For example white ground wares decorated with a distinctive overglaze opaque rose enamel is classified as famille rose by collectors. This colour was introduced by Jesuit priests on Imperial (palace) wares during the early 18th century and became available in commoners' and export wares later especially since the 19th century. As there is no likelihood of sherds of Imperial wares occurring in the recent deposits, it can be quite confidently said that sherds with famille rose enamel indicate an age no older than early-mid 18th century. As for Chinese underglaze blue-and-white large amounts were exported to Southeast Asia and beyond from the Yuan period onward, that is since the late 13th century. But from the decorative style, a more precise attribution can be made. In the 17th century blue-and-white porcelain decorated with motifs in panels appeared and this class of wares is called Kraak porcelain by collectors. The decorations in the panels evolved rapidly (palaeontologically like the ammonites) and experts are reputed to be able to date the Kraak porcelain up to plus or minus 10 years or even lesser. In contrast to the rapidly evolving Kraak porcelain patterns there are blue-and-white wares decorated with what Harrisson (1995) termed the *enduring patterns* such as the peach-and-fungus motif. This decoration has been used as early as 1613 as evidenced by the cargo of the sunken Dutch ship the *Witte Leeuw*. This pattern has continuously been used in wares up to the present day albeit slightly more simplified or devolved in the jargon of ceramic experts (Willetts, 1981). The enduring patterns are therefore the equivalents of the palaeontological living fossils. The wares of commoners such as those contributing to the sherd deposits generally have no date marks or if marked usually that of the manufacturer and may not contribute toward the dating of the piece.

European wares began to compete in the Southeast Asian marketplace in the 19th century and in particular the products from Maastricht in Holland, J. and M.P. Bell & Company in Scotland and numerous English potteries are present as sherds in recent coastal deposits. The dating and identification of the European wares are made easier by the availability of records and pattern books and good reference collections in museums. Unlike

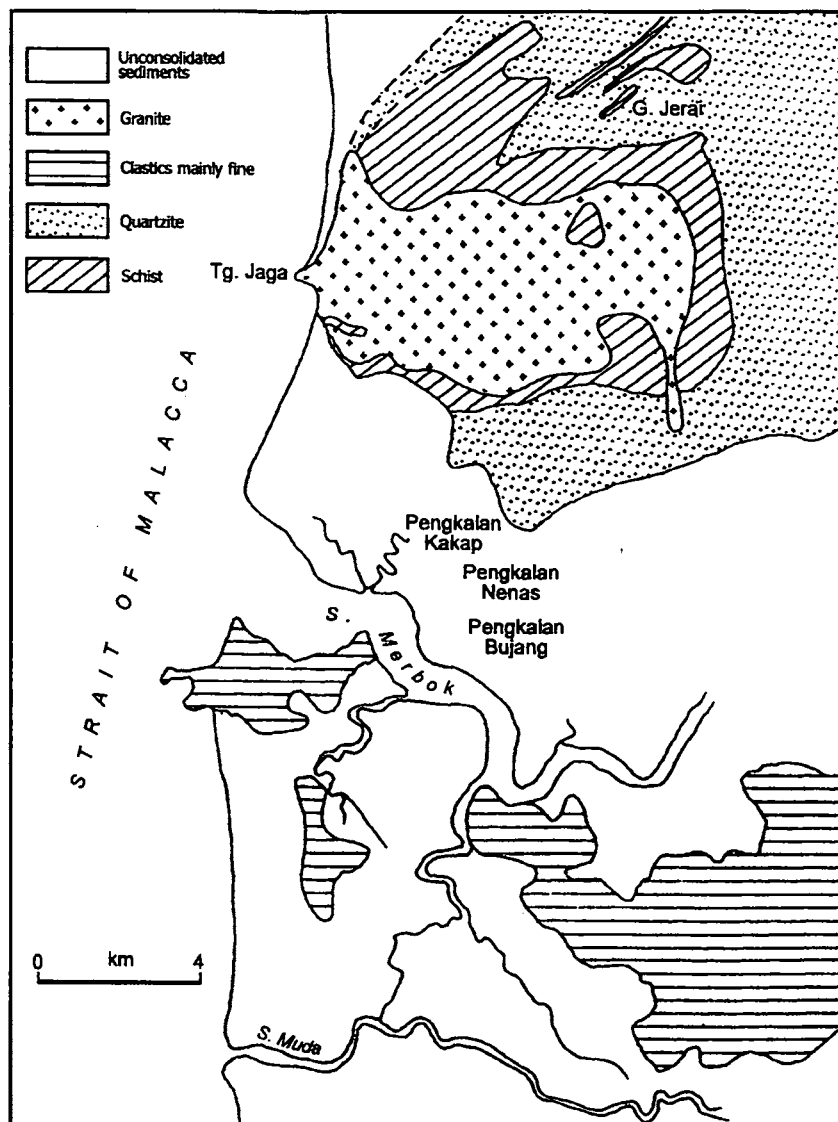
Chinese ceramics which are generally porcelain or stoneware European ceramics of the 19th century are usually earthenware and sometime stoneware. So a wave-worn piece of porcelain sherd is likely to be Chinese rather than European. European ceramics however do not always have European decorative styles and products with imitations of Chinese and Japanese decorative styles and motifs appeared in Dutch and British wares. Even unreadable non-existent Chinese characters were put on the base of the wares purporting to be Chinese marks in wares from potteries such as Worcester (England), Delft (Holland), and Meissen (Germany) according to Selby *et al.* (1994). For distinguishing the oriental-looking European wares from their oriental cousins one has to consider other traits including the body of the sherds. Transfer printing was used for decorating British wares a technique never if ever used on pre-20th century Chinese wares which may have block printed motifs repeated on the same piece. Marks on European wares are much more reliable for identification and the use of trademarks on British wares began in 1862 after the Trade Marks Act. Sherds from European wares are especially useful for the study of recent coastal deposits dating from the 19th century.

## STUDY OF RECENT MALAYSIAN COASTAL DEPOSITS

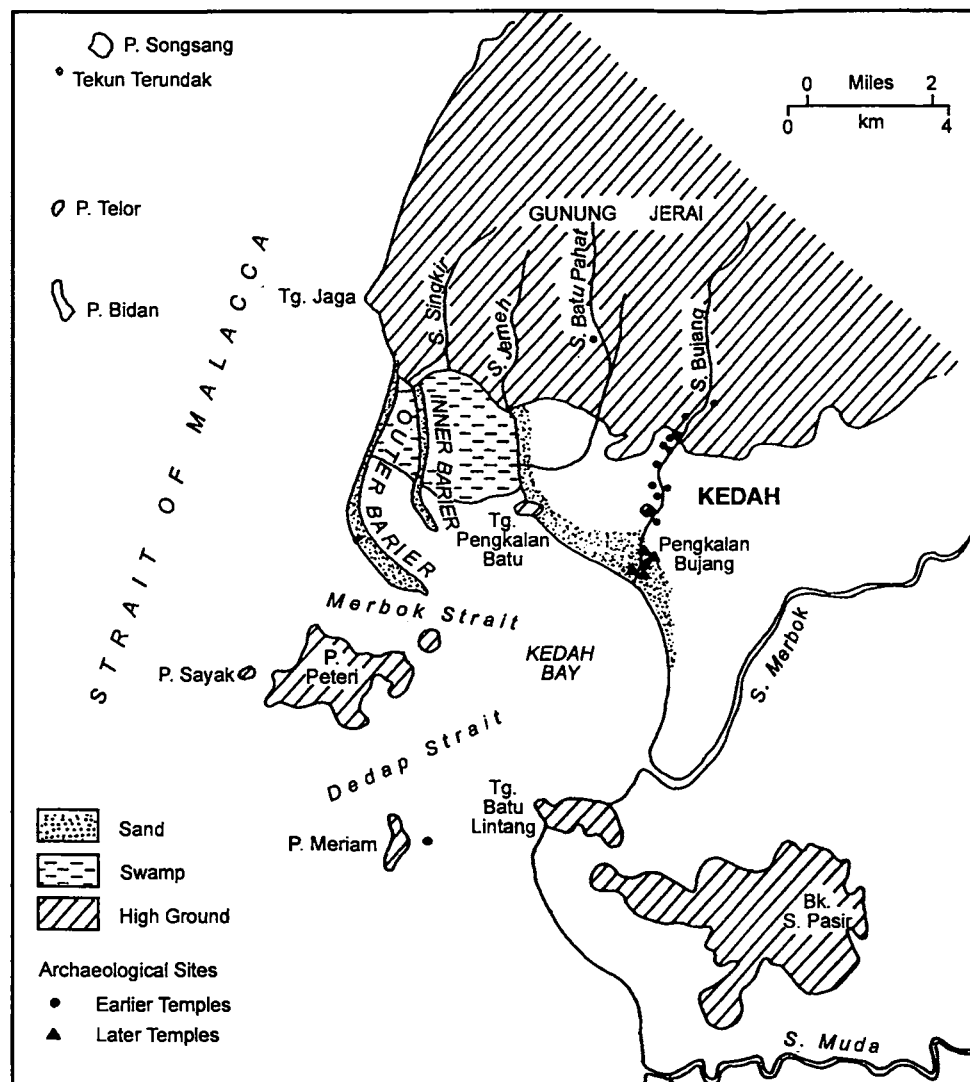
In this section recent coastal deposits from 3 sites in Malaysia in which ceramic sherds have been found will be used as examples to illustrate the potential of studying ceramic sherds in the deposits and to give an idea of the interpretations which can be made from studying the sherds in the deposits. The 3 sites are the Merbok estuary area, Kedah, the Kuala Merang estuary area, Terengganu and the Cape Rachado area, Port Dickson (Fig. 1).

### Merbok Estuary Area, Kedah

The present Merbok estuary area shown in Figure 2 was formerly a lagoon. The disproportionately wide estuary of the short Merbok river which has a small drainage area is a remnant of the former lagoon. Evidence for this interpretation is detailed in Khoo (1996). The early state of Kedah was sited on the beaches of this lagoon which was protected by a well developed bay-mouth sand bar (Fig. 3). A fall in sea level of 2–3 m has caused the sea to retreat and the destruction of the lagoonal area which became *terra firma* except for the remnant estuarine area. The former beach was stranded inland at Pengkalan Bujang, Pengkalan Nenas, Pengkalan Kakap and other localities. The presence of ruins of old temples



**Figure 2.** Present configuration of the Merbok estuary area, Kedah.



**Figure 3.** Reconstruction of Merbok estuary area before 15th century (from Khoo, 1996 with modifications).

at Pengkalan Bujang is evidence of its status as the main centre during its heydays as a port-city. The fall in sea level had catastrophically recessed its economy when sea-going ships stopped calling on account of the shallowness of the remnant of the lagoon.

The beach deposits at Pengkalan Bujang have been cut by the rejuvenated Sungai Bujang as a result of the fall in sea level. At one locality a more than 60 cm thick layer of ceramics in the beach deposit has been exposed. The constituents of the sherd layer include Song and Yuan celadon, Ding and *qingbai* wares (Lamb, 1980; Leong, 1980; Othman, 1980; Feng, 1981). The *qingbai* ware is a white porcelain with pale bluish or greenish tint especially discernible where the glaze had pooled thicker on the surface of the piece. The Ding is a thin white porcelain ware with ivory-toned glaze. Both the Ding and *qingbai* wares were manufactured in large amounts and exported to Southeast Asia during the Song and Yuan times (Medley, 1977; Wilson, 1991). The Ding and the *qingbai* wares were being manufactured into the succeeding Ming times but the active period of their manufacture and export was during Song and Yuan (Medley, 1977).

The pot-pourri of potteries from Song to Yuan vintage would indicate that the place was an important port of call during Song and Yuan times. The sherds represent the broken wares thrown overboard and washed ashore and those littered on the beach itself by not so-environment friendly workers in the then busy entrepot port-city. The mingling of the Song and Yuan sherds in the beach deposit was contributed by the reworking of the earlier Song sherds on the seafloor by storm or that sedimentation had not been rapid enough to cover

all the broken Song wares to any significant depth by Yuan times so that they can be continuously swept ashore.

The scant reference of early Kedah as an important state and port of call in the *Wubeizhi* charts of the Ming Admiral Zhenghe and in the reports of his expeditions of 1403–1433 in the *Ying Yai Sheng Lan* by Ma Huan (translated by Feng, 1970) point to a significant fall in sea level from the preceding Yuan period to the early Ming period. This inference is supported by the lack of Ming ceramic sherds in the raised beach deposits although there was continued trade between China and Southeast Asia, both official and illegal smuggling, during the Ming period (Chan, 1967). However, the change in dynasty from Yuan to Ming in China and the turmoil of war saw a period of disrupted ceramic production in China and export wares of the earliest Hongwu period (1368–1398) are exceedingly rare in any collection. As the Yuan period is short from 1280 to 1368, an 88 years span, the evidence from the ceramic sherds point to a very rapid fall in sea level, maybe a fall in 2–3 m during a period of 100 or less years. A fuller discussion on this aspect is given in Khoo (1996).

In conclusion the stratified sherd layer in the raised beach deposit at Pengkalan Bujang indicates an age of about 650–1,000 years old. Other interpretations that can be made are that the sea level dropped significantly only about 650 years ago and that the significant fall in sea level occurred only within a relatively short period of less than 100 years.

### Kuala Merang Estuary Area, Terengganu

The Sungai Merang has a sand bar across its estuary (Fig. 4) and fishing boats used to manoeuvre through a deeper channel at high tide to get in and out of the river. Immediately to the east of the river mouth was a wide extensive beach up to 1995. The construction of a rubble breakwater from the beach to the sea in 1996 is interpreted to have caused massive erosion of the beach to the west of the breakwater including a portion of the sand bar (Siti Hassulaini, 1997). The erosion of the sand bar has exposed a deposit of ceramic sherds which has not been exposed since burial.

About 50 pieces of sherds were collected from the deposit and more remained uncollected or yet to be exposed at the time of collection. The collection turns out to be rather cosmopolitan. The sherds can be put into 6 groups. Kitchen Qing wares form the largest group. The other groups, Dutch Maastricht, Scottish (or less likely English), Chinese monochromes, possibly Japanese and Southeast Asian, are each only represented by a few specimens. The sherds are described in Khoo (in manuscript).

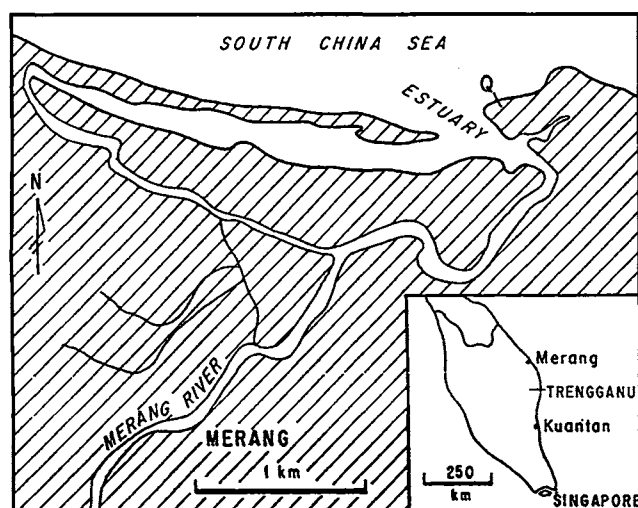


Figure 4. Sungai Merang estuary area, Terengganu. Q, site of ceramic sherd deposit.

Perhaps some explanation is required for the term Kitchen Qing which is familiar to collectors but not to geologists. The Kitchen Qing wares as defined by Willetts (1981) are coarse Chinese underglaze blue-and-white wares for everyday or kitchen use to distinguish from the finer Chinese wares meant for use on special occasions such as the Nonya wares. The Kitchen Qing wares were produced from kilns located in Southeast China such as Fujian and Guangdong during the late 19th century to the earlier part of the 20th century. However, some restricted the use of the term Kitchen Qing to wares with plates having an unglazed ring at the centre (for example, Wilson, 1991) and not as originally defined. Kitchen Qing wares without the unglazed ring at the centre like the ware with enduring design, peach-and-fungus mentioned earlier, may well be considerably earlier. But the majority of Kitchen Qing in the Southeast Asian region are indisputably late 19th to early 20th century and pristine examples of the full range of Kitchen Qing wares are in fact available in the family heirlooms of Chinese families who can vouch for their ages.

The Kitchen Qing sherds (Plate 1) came from a variety of wares and following the pioneering classification of Kitchen Qing by Willetts (1981) the following types can be identified: Sino-Sanskrit, *Fu*, *Batik*, Birthday (peach-and-fungus enduring design) and numerous unclassifiables. The Kitchen Qing sherds came from wares of the late 19th century, the last quarter. The other wares which permit an age to be obtained are the Dutch Maastricht and Scottish (or English) wares, both earthenwares and with decorations permitting their identification (Plate 1). These wares date from the late 19th century, a view agreeable to Barbara Harrison, former Director of the Princesshof Museum, Holland (written communication). Sherds from the other groups are difficult to date. Both the Kitchen Qing and European wares give a late 19th century age for the sherd deposit. The unlikelihood of the sherds being deposited many years later will be discussed later.

Two specimens of Kitchen Qing, 96.28 and 96.37 (Plate 1), in the collection are of especial interest. Specimen 96.28 is a fragment of Sino-Sanskrit decorated porcelain saucer-dish with the characteristic toothbrush pattern (simplified Sanskrit *om* character) in rows on the cavetto of the dish. The dish had a 2.5 cm wide biscuit (unglazed part of the body) band surrounding the glazed central medallion part. In the firing of wares with the biscuit band in the kiln, pieces were stacked on top of each other with each standing on the unglazed biscuit band of the piece below. The whole stack was fired in a clay box called saggar to

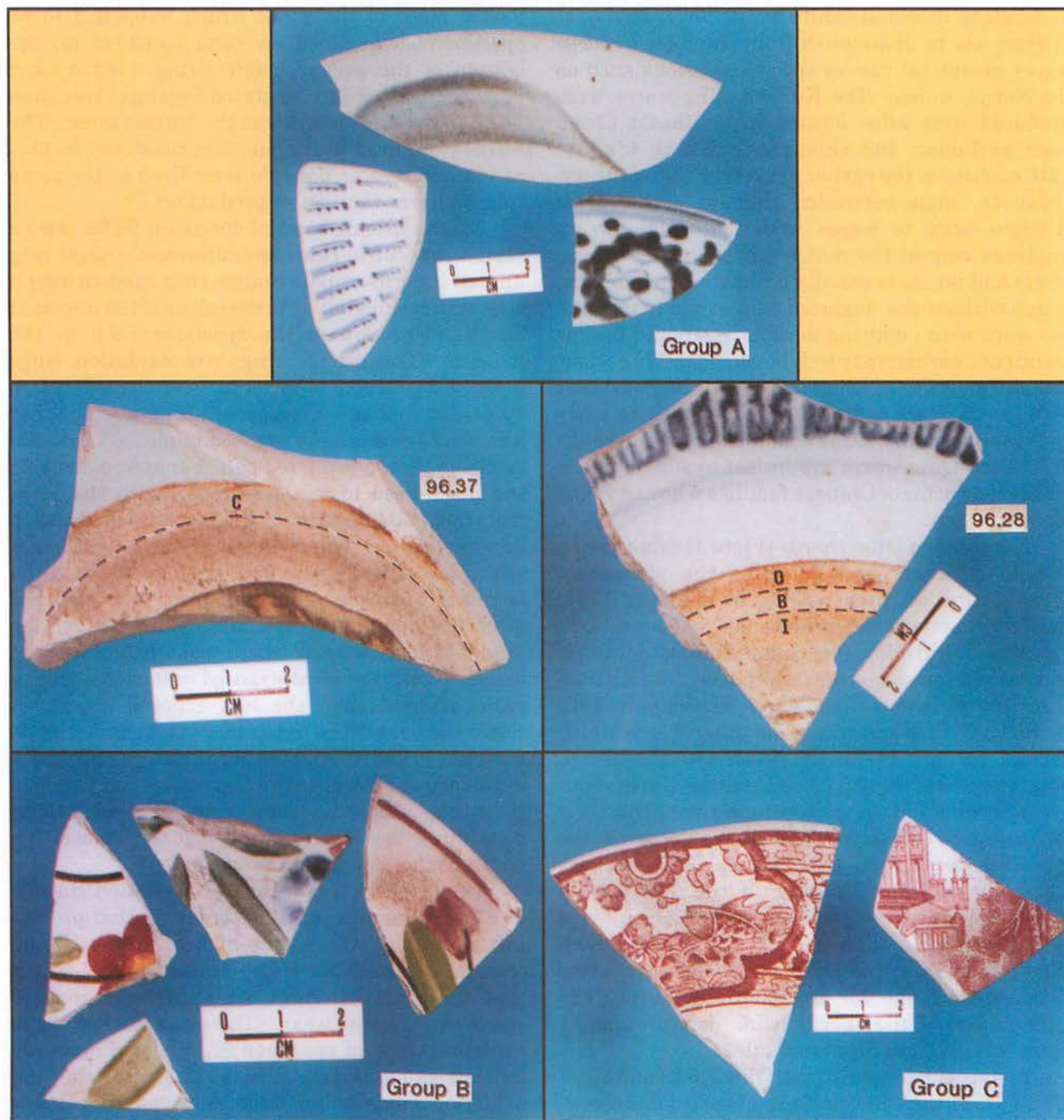
prevent dirt and ashes from settling on the pieces being fired. The pieces have to stand on the biscuit bands so that the base of the upper piece would not be affixed to the lower piece by molten glaze. The lowest piece of the stack which happened to be specimen 96.28 stood on sand spreaded on the bottom of the saggar before firing. Some sand particles are fused to the glazed footrim of specimen 96.28 indicating that it was the bottom piece. The wares were fired in the just described way so that as many pieces as possible were fired at the same time to lower the cost of production.

On the biscuit band of specimen 96.28 can be seen 3 concentric rings, an outermost orange ring and an innermost pale orange ring sandwiching a ring with colour similar to the colour of the unglazed biscuit elsewhere in the specimen such as the footrim. The orange rings are oxidation rings usually developed if the kiln was opened before sufficient cooling. Oxygen entering the still hot kiln would oxidize any exposed unglazed biscuit to orange, yellow or even reddish. For specimen 96.28 the unoxidized biscuit-coloured ring is the fossil footprint of the footrim of the piece stacked on top during firing. The footrim of the upper piece effectively shielded the part it stood on from the circulating oxygen while the piece was still hot after the opening of the kiln. The rest of the unglazed biscuit band which was unshielded was oxidised with the most exposed outer ring getting more oxidized than the less exposed innermost under the base of the upper piece surrounded by its footrim. Therefore the innermost ring only developed a pale orange colouration compared to the strong orange outermost ring. The width of the unoxidized ring is incidentally also the same as the width of the footrim of the specimen.

The preservation of the kiln oxidation rings is of especial significance for sedimentation process interpretation. One of the highest authorities on oriental ceramics Sir Harry Garner (1954) stated that the oxidation rings are superficial and are removed by slight wear. The preservation of the oxidation rings in specimen 96.28 would certainly indicate rapid burial. It is inconceivable that the oxidation rings could have survived continuous abrasion and scouring on the littoral or shallow marine environment. The piece has not been used as a kitchen ware either as slight wear in the sense of Garner (1954) caused by daily scrubbing and wiping by fastidious homemakers would have removed the oxidation rings.

Another feature in specimen 96.37 supports the above interpretation. The specimen is a fragment of a porcelain saucer-dish with a portion of the biscuit band around a small remnant of the glazed central medallion. There is no oxidation





**Plate 1.** Some ceramic sherds from the Merang estuary area, Terengganu (Bar scale = 2 cm).

Group A — Kitchen Qing.

On 96.28 — O, outermost orange ring; B, middle biscuit colour ring; I, innermost pale orange ring.

On 96.37 — C, clay arc.

Group B — Dutch Maastricht.

Group C — Scottish (or English) wares.



ring on the biscuit band of this piece. But on the biscuit band can be seen a thin protruding arc of clay concentric to the central medallion circle. This clay arc was extruded when the piece was spun on the potter's wheel and the extruded clay arc was not smoothened off before firing. Like specimen 96.28 the fragile, delicate clay arc would not be able to withstand long and repeated periods of winnowing and abrasion by sand in the marine and littoral environment. A rapid burial is indicated. This interpretation is akin to what would be made for the discovery of a well preserved fossil, say a productid complete with exterior spines. Rapid burial or death *in situ* would be suggested.

Other evidence in support of rapid burial is that the overglaze polychrome enamel of the Dutch wares and the overglaze red transfer printed thin enamels of the Scottish wares are well preserved and show no significant wearing. If they have not been rapidly buried the overglaze enamels would be significantly worn off. The Kitchen Qing wares however have underglaze blue and the decorative motifs are preserved until the hard feldspathic glaze has been worn through.

From the above it can be interpreted that the sherd deposit in the sand bar dates from the last quarter of the 19th century. Also the deposit has been buried rapidly and indicating rapid development of the sand bar about 100–120 years ago.

The interpretation given above considers it very unlikely that the sherds were deposited there many years after manufacture. The diversity of the species

of the wares from both East and West of the same age with evidence that the vessels have not been used, build a picture that the sherds originated from wares brought to the Merang estuary area by boats for trading when the road system was poorly developed. Terengganu coastal trading boats called *kapal besar* were well-known coastal traders during the 19th to early 20th century. It is possible that the sherds came from discarded broken wares from the coastal traders arriving at the Merang estuary for trade. I cannot envisage any reason for the breaking of a collection of new wares from diverse origins at the estuary area and all at the same time. It would be reasonable to assume that newly produced wares would be available in the market soon after manufacture, maybe 1–2 years or less. The shoddy workmanship of the Kitchen Qing and the opening of the kiln before sufficient cooling are evidence of impatience resulting from high demands for the wares.

### Cape Rachado, Port Dickson

The Cape Rachado area is a scenic tourist spot (Fig. 5) and in the vicinity of Pulau Babi there are exposures of ferricreted beds of beach deposits having the same amount and direction of dip as the present beach. There are also beds which are rather horizontal. The deposits overlie laterite and are also developed around and surrounding large laterite boulders resting on laterite substratum. Two types of ferricreted beach deposits are noted. One, an incipient ferricreted beach deposit

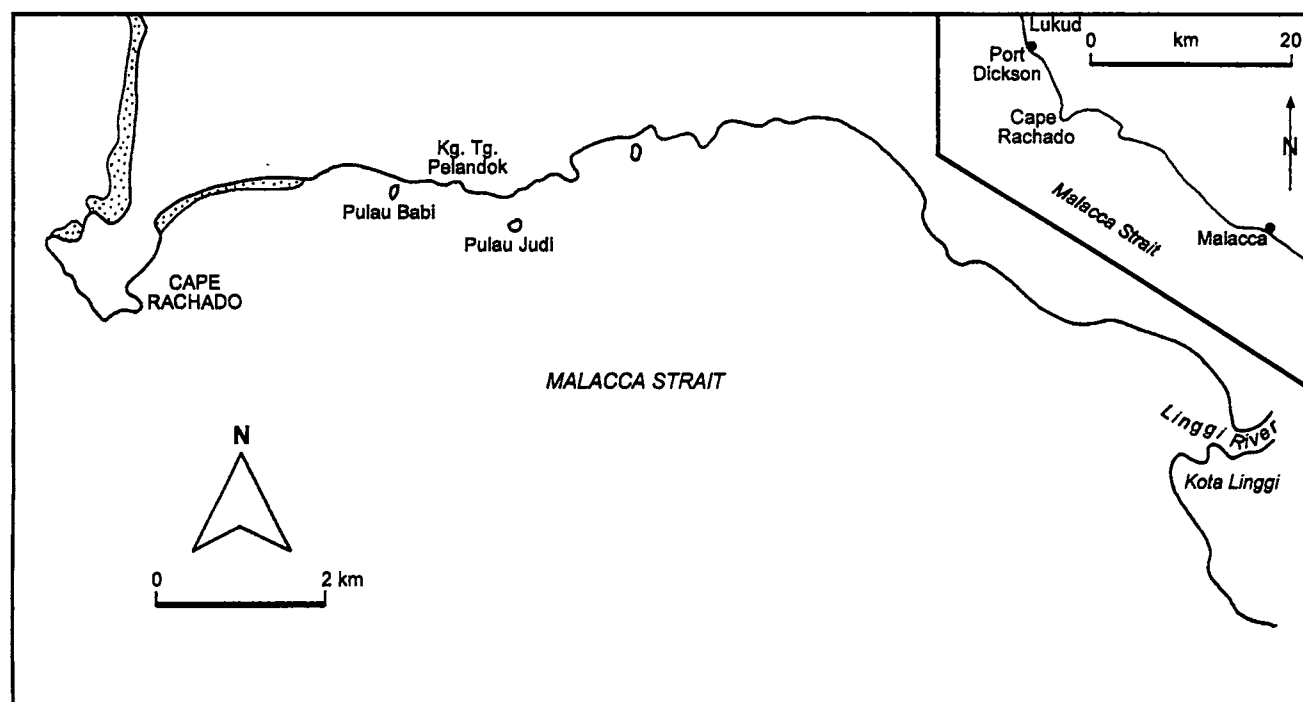


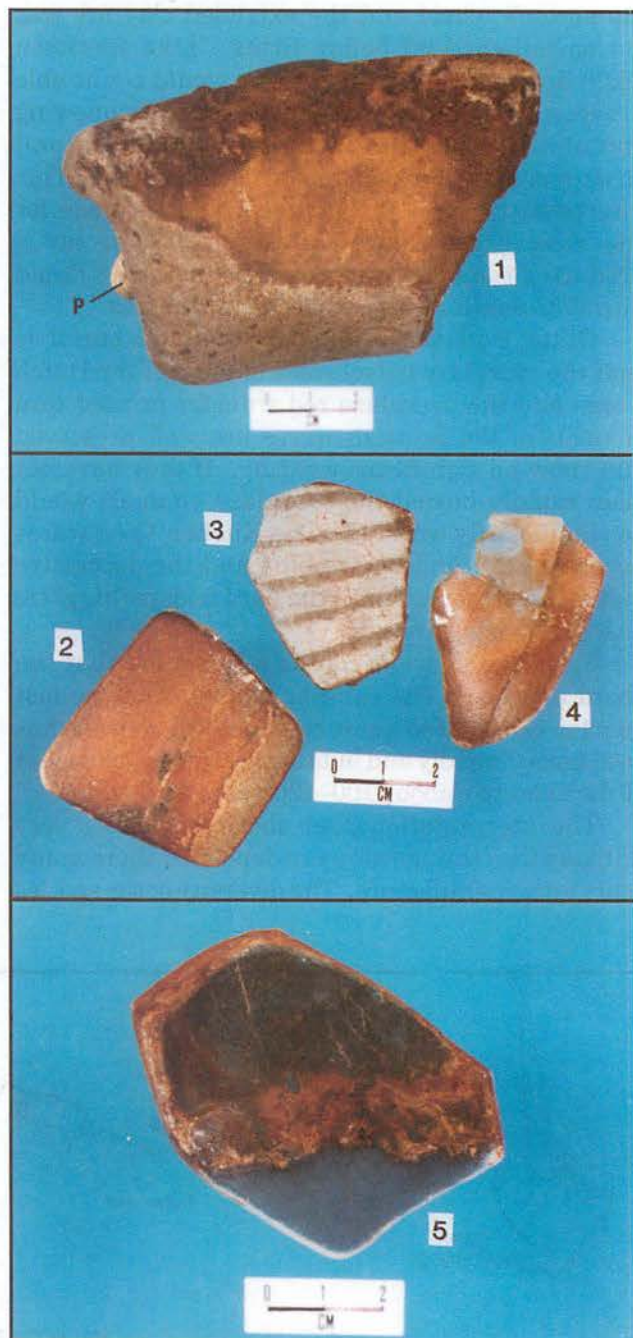
Figure 5. Cape Rachado area, near Port Dickson.

developed at the lower part of an elevated old beach about 2 m above present sea level. This elevated beach can be seen to be overlying laterite and the incipient ferricreted sand of the beach deposit is semi-consolidated and cemented by iron oxide derived from the laterite. The colour of this incipient deposit is yellow being the colour of the iron oxide but the loose beach sand of the elevated beach is whitish. The second type of ferricreted beach deposit is red, dark red and chocolate being the colour of the iron oxide cementing the sand and pebbles of the beach deposit. The rock is consolidated and coherent. A specimen can only be extracted by a hammer, and not by a knife for example. The pebbles are mainly quartz, laterite and quartzose schist, the general lithology of the area.

Interestingly the laterite in the area show signs of former laterite cutting with remains of angular cavities where blocks of lateritic parent clay material have been extracted. Such cavities can be seen near Pulau Babi and at Teluk Pelandok. It appears that the area has been extensively mined for laterite and present flat planed off areas floored by laterite with angular cavities were once plinthite (clay which could turn to laterite later) before the areas were abandoned and the clay later turned to hard laterite *in situ*.

The ferricreted beach deposits and the cut laterite sites were discovered in 1996 and during a subsequent visit in late 1997, 2 pieces of sherds were discovered in the red ferricreted beach deposits. The abstract of this paper written for Geosea IX in Kuala Lumpur was written after these initial findings. Two more short visits were made in 1998 and up to the time of writing this article 7 more ceramic sherds were discovered in the red ferricreted beach deposit. In addition were also found 2 fragments of glass (Plate 2) and several wood fragments embedded in the red ferricreted beach sand deposits. One piece of the wood fragment has 2 copper nails embedded in it.

The 9 pieces of ceramic sherds found were derived from a several kinds of vessels. There are 4 pieces of earthenware. They include 2 relatively large earthenware fragments, one from a jar and another possibly from the neck area of a *kendi*, a Southeast Asian pouring vessel (Khoo, 1991), variously used but often filled with water for washing hands before meals (Plate 2). Both pieces of earthenware do not have any glaze and they do not appear to have been glazed. Another piece is an earthenware fragment from a thin-walled vessel, probably a bowl, dish or pot. This piece is worn but does not appear to bear any glaze originally. The remaining earthenware sherd is of especial interest. It is whitish and derived probably from a small jar



**Plate 2.** Some specimens of sherds from the Cape Rachado area (Bar scale = 2 cm).

1. Fragment from presumably neck of earthenware *kendi*, P is glimpse of quartz pebble in ferricreted beach sand on concave side of fragment; 2. Earthenware fragment from a thin-walled vessel; 3. Porcelainous stoneware sherd from a probable bowl; 4. Glass fragment; 5. sapphire-blue glazed fragment from Chinese saucer-dish.

with smooth exterior and fluted interior. All these pieces appear to be Southeast Asian and except for the last piece the rest do not permit an age to be suggested. A fuller discussion of the fluted piece will be given later.

The remaining 5 pieces are represented by one piece of porcelainous stoneware fragment from a bowl perhaps and 4 pieces of porcelain, 3 from saucer-dishes and one from a flat bottomed cup (maybe a wine cup) or small bowl. The porcelain sherds are Chinese and the stoneware sherd with decorations worn off save for 5 narrow concentric greenish bands (Plate 2) could well be Chinese as well. Two of the porcelain sherds are badly wave worn, one with some remnants of underglaze blue wavy lines visible. The cup is white glazed and the features are insufficient for any age determination. The only piece in this group which has potential is from one of the sherds from saucer-dishes which has a monochrome sapphire-blue glaze on the interior and plain white exterior (Plate 2).

Wares with the sapphire-blue glaze appeared on Qing Imperial wares in the early 18th century (Till, 1983). Innovations and new styles such as the famille rose mentioned earlier very often started on Imperial wares and as such became trend setters in Chinese ceramics. Unless prohibited by law such as the imperial yellow and tea dust glaze (Till, 1983), the new innovations later became available in commoners' wares. For example the famille rose wares which were first used in Imperial wares during the early 18th century was already available in export porcelain in 1722 (Howard and Ayers, 1981). Therefore it is possible that the sapphire-blue sherd could not predate mid 18th century. I have also considered the possibility of the piece being a blue glaze Wedgewood jasper ware (Dawson, 1984) but as the jasper wares are stoneware and not porcelain like the piece under discussion the possibility does not arise.

I have rummaged through the debris in and around the ruin of the old Dutch fort (Kota Linggi) at the mouth of the Linggi river located about 12 km along the coast southeast from Cape Rachado. Among the debris I have found Qing blue-and-white sherds, forerunners of the Kitchen Qing, and also one piece exactly similar to the fluted earthenware sherd found at Cape Rachado (Plate 3). I would interpret that the sherds were used by the Dutch garrison in the fort which was built in 1756 to corner the tin trade coming down river from Rembau and adjacent areas up river. It was probably abandoned even before Napoleon declared war on Holland in 1793 and the British took over Malacca from the Dutch in 1795 (Harrison, 1985). The Kota Linggi sherd assemblage (equivalent to

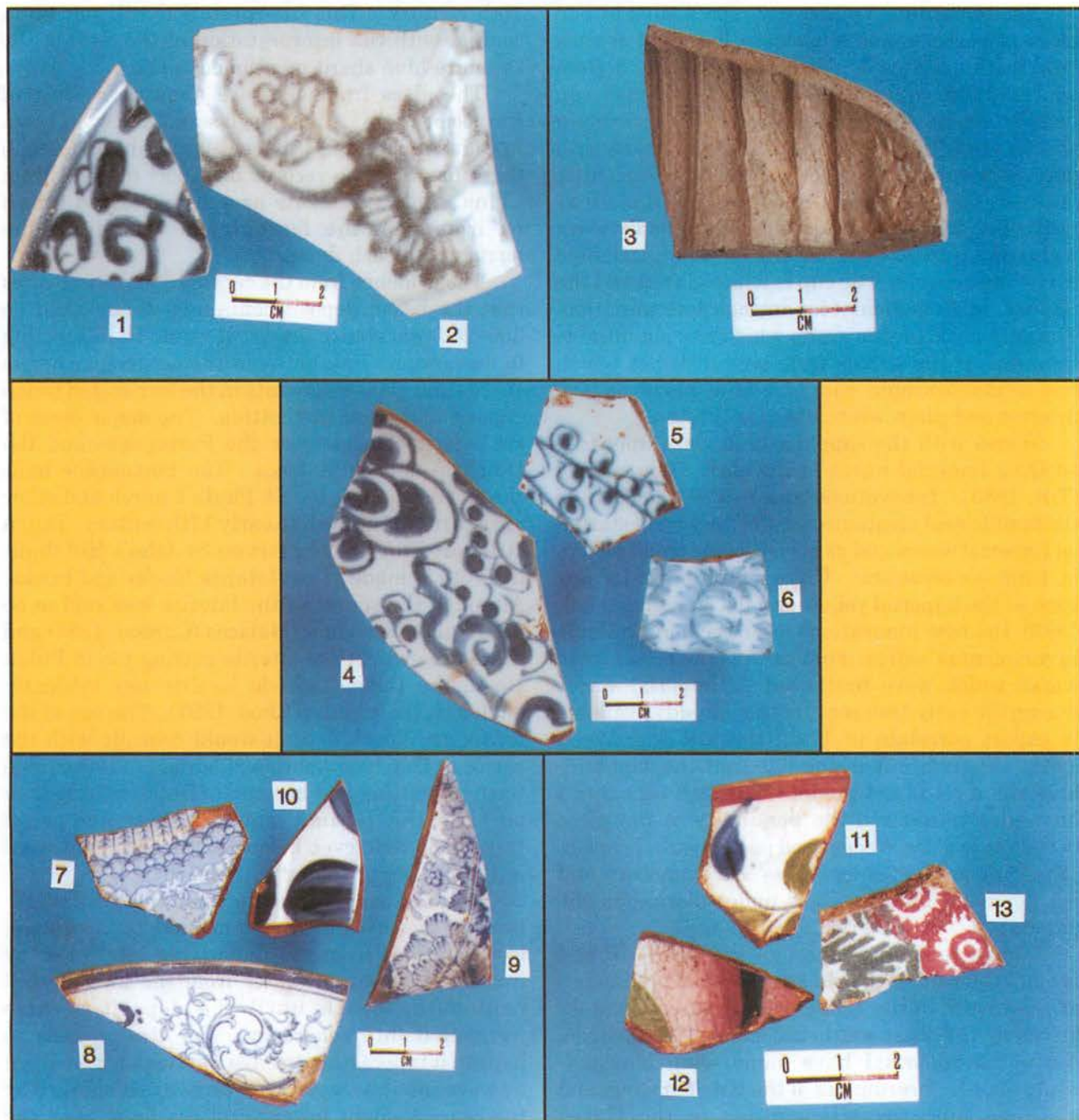
fossil assemblage) is likely to be second half of the 18th century. In view of the close proximity of the Linggi site to Cape Rachado it is possible that the fluted earthenware sherd found in Cape Rachado could be deposited during the second half of the 18th century. This interpretation will not be in conflict with the interpretation of the date of the sapphire-blue sherd mentioned earlier.

The glass fragments are almost certainly of European origin. Although glass making was known in China during the 18th century (Mehlman, 1982) there has been no records of export of glass from China. Both fragments have been stained brown by iron from the ferruginous cement of the ferricreted beach deposit.

The evidence from the ceramic sherds indicates that the beach deposit containing them could be 200–250 years old or lesser. It would be interesting to discuss any link between the occurrence of the sherds and glass fragments in the ferricreted beach deposit to the laterite cutting. The major users of cut laterite blocks were the Portuguese and the Dutch in nearby Malacca. The Portuguese built the fort *A Famosa*, the St. Paul's Church and other structures in the 16th to early 17th century. Dutch structures such as the fort on St John's Hill (built in 1760) is made of cut laterite blocks and bricks. Although the source of the laterite was said to be from Pulau Upeh near Malacca (Cardon, 1934) and there are evidence of laterite cutting too in Pulau Upeh, the Cape Rachado locality has evidently eluded the historians (Khoo, 1997). The age of the ferricreted beach deposit would coincide with the period of Dutch occupation of Malacca. If the Cape Rachado cutting was because of Dutch mining then perhaps the ceramic sherds, glass and wood fragments could even belong to the people involved in the mining of the laterite nearby.

It is, however, uncertain when the loose sherd-bearing beach sand was cemented by ascending iron solutions from the underlying laterite or by iron enriched groundwater from the lateritic hill behind the beach until the deposit became ferricreted into coherency. For this process to happen it is necessary to have a system unperturbed by waves and sea water or in anyway submerged by the sea. A slight lowering of sea level after the sherd-bearing deposit was covered by more sand would be able to eventuate the system. So perhaps there was a slight lowering of sea level, say 30–50 cm, sometime in the period 18th to 19th century before the sea level rose again to present level. Perhaps some low level calcareous beachrock often found along Malaysian coastal areas could be formed at the same time as the red ferricreted beach deposit at Cape Rachado.





**Plate 3.** Some specimens of sherds from Kota Linggi (1–3) and Kota Lukut (4–13) (Bar scale = 2 cm).

1–2. Forerunners of Kitchen Qing; 3. Fragment of Southeast Asian earthenware jar or pot with fluted interior surface; 4–6. Forerunners of Kitchen Qing and 6 is a fragment from a Shanghai ware with characteristic sweet pea foliage scroll; 7–10. English blue decorated earthenware, 7–9 are transfer printed, 10 hand painted, and 9 has Davenport mark on base; 11–13. Hand painted multi-colour decorated Dutch Maastricht wares.

## A SCHEME FOR MALAYSIAN CERAMIC SHERD GEOCHRONOLOGY FOR PAST 1,000 YEARS

It will be very useful if reference assemblages of sherds occurring in the Malaysian environment and of known age range can be established to facilitate study, age determination and correlation. It is important to have knowledge of the kinds of wares imported into the country from various sources. There is as yet no evidence of any significant pre 20th century ceramic industry in the country and so we only need to be concerned with imported wares. For determining the wares imported and used in the country, ceramic sherds occurring in sites within the country are more reliable than from existing collection of complete pieces in museums and other collections as the provenance of such pieces may not be known. They could be acquired overseas and brought into the country as collector's items and such pieces are never ever imported to be used. Such pieces will not appear as sherds in recent coastal deposits in Malaysia. So museum and other private collections of wares are not suitable for reference assemblage purposes in this context.

To date sherd assemblages from several sites have been studied and ages obtained. Some give a rather short age range and some rather long such as the Kuala Merang and Pengkalan Bujang assemblages respectively. But if the assemblage is well studied like the Pengkalan Bujang we can obtain an idea of the range of wares imported during a particular time range. For monochromes such as celadon, Ding and *qingbai* wares it is more difficult to determine their age range more precisely. However for wares with decorative elements such as the blue-and-whites and polychrome enamelled wares, innovations and changes in customers' tastes and preferences resulted in the continuous introduction of new lines of products. Earlier lines were rapidly discontinued which will allow more precise determination of age range if their sherds can be identified.

As an illustration of the above point if you are to make a stock check of the actively used ceramic crockeries in your home you will find that there are very few which have been with you for 30 years and hardly any for 50 years. The only wares which have a longer life span are those used only for special occasions like birthdays and marriages or those used exclusively for religious purposes. They are normally displayed or securely kept away. They are seldom broken and may eventually become antiques in the family heirlooms like the Nonya wares in many Strait Chinese houses and the Ming Swatow and Song celadon wares in Iban longhouses

in Sarawak. For the former kitchen category the replacements will have motifs entirely different from the older pieces as taste and preferences have changed with time. Therefore the kitchen midden of your house will be an important site for sherds in use during the time of occupation of your house. An out of place antique sherd in this example will be like a reworked fossil deposited in a once living community such as Cretaceous pollen deposited in Pliocene rocks (Fleming, 1994).

The above examples show that sherds from sites such as ancient ports, places of trading and places which were occupied for known period of time are good for establishing reference ceramic assemblages. A shipwreck which could yield plentiful sherds and whole pieces can be a useful site provided the age of the wreck and also the destination of the cargo are known. If the cargo was meant only for the European market then it would be unlikely that the wares could be found in Malaysia as sherds. In this case the wares would be akin to palaeontologically belonging to a different faunal province but could be of value for international correlation. Finally grave sites yet to be investigated may prove to be repositories of reference assemblages (Rau and Hughes, 1985; Othman, 1981). In the Philippines, Tan (1990) noted that Chinese ceramics are found under the ground in virtually every island throughout the entire archipelago. She was referring to pre-Christian era graves in the Philippines.

For the establishment of reference ceramic assemblages in the Malaysian region I have tentatively identified collections of sherds from different periods of time which can be taken as representatives of the wares imported into and used in the region at the time concerned. These sherd assemblages can be used to date new discoveries and for correlation studies. Ideally sherd assemblages for, say every 100- or 50-year period, can be erected for the past 1,000 years. The sherd assemblages identified are given below. Localities given in Figure 1.

### Pengkalan Bujang Sherd Assemblage

This locality gives the ceramics imported into the country during the Song and succeeding Yuan periods. As such the assemblage from this locality can be divided into an older Song Group and a younger Yuan Group. The Song Group will cover the period from 1000–1279 and the Yuan Group from 1280–1368.

### Parit Yaani-Johor Lama Sherd Assemblage

These 2 localities are in Johor. Excavations made by Muzium Negara have recovered sherds and even quite complete vessels of Ming blue-and-



white wares from both localities (Othman, 1981). These wares are 16th century.

### **Kota Linggi Sherd Assemblage**

The sherds from this old Dutch fort represent wares used in the country during the second half of the 18th century. They include forerunners of Kitchen Qing and Southeast Asian wares (Plate 3).

### **Pulau Balambangan Sherd Assemblage**

At this locality a British depot was established in 1773 and abandoned in 1805. Chinese ceramic sherds were found in large amounts at this locality. Some of the sherds are described by Willetts (1981). The sherds here would be representative of wares imported during the last quarter of the 18th century.

### **Kota Lukut Sherd Assemblage**

This fort was built in 1847 and was the residence of the Lukut Rajas up to 1878. The Rajas were appointed by the Sultan of Selangor to administer the place which was a booming tin mining locality in its heydays during the mid 19th century. The kitchen midden of the fort yielded several hundred pieces of ceramic sherds (Plate 3) and some glass fragments. From the sherds collected it appears that the Rajas had a fetish for English wares. Much of sherds are English earthenwares from various sources including Davenport, a company which went out of production in 1882 (Cushion and Honey, 1958). In addition there are sherds of possibly Dutch Maastricht and forerunners of Kitchen Qing. One piece of Kitchen Qing has sweet pea foliage scroll characteristic of Shanghai wares which have been conjectured by Willetts (1981) to have a debut in the mid 19th century. The occurrence of Shanghai wares in the Rajas' kitchen confirmed the accuracy of the conjecture of Willetts (1981). The sherd assemblage from Kota Lukut would represent the wares imported into the country during the third quarter of the 19th century. A fuller description of the sherds will be made elsewhere.

### **Kuala Merang Sherd Assemblage**

The sherd assemblage here would give an age for the fourth quarter of the 19th century and as mentioned earlier the assemblage includes both Chinese Kitchen Qing and European wares.

### **Pulau Tioman Sherd Assemblage**

In addition to the above there is the special locality of Pulau Tioman where ceramic sherds have been found at several places such as Tekek, Juara and Teluk Nipah in the island. Lord Medway (1962) was credited with the first discovery of sherds in Tioman by Kwan and Martin (1985) but earlier Linehan (1936) had reported some Song ceramics

discovered in Tekek. However, the Nipah locality is more important as it has yielded abundant sherds littered on the shore or on the seafloor exposed during low tide. Kwan and Martin (1985) have made an excellent study of the sherds discovered and the sherds range from the Song period about 1,000 years ago to early 20th century Chinese wares. In addition there were also some late 19th century European wares such as Dutch Maastricht and Scottish products. This locality can be interpreted to be a rest and restocking water stop as there is no evidence of any sizeable population centre in Tioman even up to present day. There is also a possibility that this site could be a favourite place where pirates retire to examine and sort out their loot for a 900 years period as European sherds were also present in the same site and not just Chinese. It is difficult to interpret this site to be a peculiarly favourite stopping area for Chinese navigators through the ages and a reason cannot be found as to why a Chinese ship from China should be carrying European wares to Southeast Asia. In palaeontological term this locality would have been said to have yielded an almost complete fossil record.

From the study of Kwan and Martin (1985) the sherds can be divided into several groups. They are Early Song Group (11th–12th century), Late Song to Yuan Group (12th–14th century), Ming Group (15th–17th century), Early to Late Qing Group (17th–19th century), Late Qing Group (19th–20th century), European Group (late 19th–20th century) and Thai Group (15th–17th century). Elements of the European Group and Late Qing Group are present in the Kuala Merang Assemblage. Elements of the Late Song and Yuan Groups are also present in the Pengkalan Bujang Assemblage. The Pulau Tioman Assemblage is important as it has representatives of wares not present in the other assemblages.

Although Chinese ceramics older than 1,000 years ago such as the Tang wares (618–906) are exported to Southeast Asia (Spinks, 1956) little is known about occurrences of Tang ceramic sherds in recent coastal deposits in Southeast Asia. So this study has to begin with about 1,000 years ago in the Song period. Southeast Asian wares of earlier ages are also rare and presently their occurrences as sherds in recent coastal deposits are relatively unknown.

## **CONCLUSIONS**

Ceramic sherds are non-biodegradable and unless worn by abrasion will remain in recent coastal deposits.

When present they can be used like fossils in sediments and the usual methodology of

palaeontology and stratigraphy can be applied in interpretations. They can provide an age for young deposits less than 1,000 years old and also may permit some interpretations as to sedimentary processes at the time of sedimentation. With increasing use of the coastal zone a knowledge of the past 1,000 years history of the coastal zone is important such as shoreline development and sea level fluctuations of short duration. Study of ceramic sherds in recent coastal deposits will assist in this endeavour.

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## REFERENCES

- CARDON, F.R., 1934. Portuguese Malacca. *JMBRAS*, 12, Part 2, 1–25.
- CARSWELL, J., 1985. Chinese ceramics from Allaippidy in Sri Lanka. In: *A ceramic legacy of Asia's maritime trade*. Southeast Asian Ceramic Society (West Malaysian Chapter), 31–47.
- CHAN, C., 1967. The smuggling trade between China and Southeast Asia during the Ming Dynasty. In: Drake, F.S. (Eds.), *Symposium of historical, archaeological and linguistic studies*. Hong Kong Press, 223–227.
- CUSHION, J.P. AND HONEY, W.B., 1958. *Handbook of pottery and porcelain marks*. Faber and Faber, London.
- DAWSON, A., 1984. *Masterpieces of Wedgwood in the British Museum*. British Museum Publications Ltd., London.
- DU BOULAY, A., 1990. Porcelain for palaces. *Arts of Asia*, 20(4), 112–120.
- FENG, CH'ENGCHUN, 1970. *Ma Huan: Ying Yai Sheng Lan*. Hakluyt Society, Cambridge University Press.
- FENG XIANGMING, 1981. Export of Chinese ceramics up to the Yuan Dynasty. *SPAFA Digest*, 2(2), 37–41, 43.
- FLEMING, R.F., 1994. Cretaceous pollen in Pliocene rocks: implications for Pliocene climate in the Southwestern United States. *Geology*, 22, 787–790.
- GARNER, H., 1954. *Oriental blue and white*. Faber and Faber, London.
- GORHAM, H.H., 1991. *Japanese and oriental ceramics*. Charles Tuttle, Tokyo.
- GUY, J.S., 1986. *Oriental trade ceramics in Southeast Asia: ninth to sixteenth centuries*. OUP, Singapore.
- HANCOCK M. AND HANCOCK D., 1992. Sleeping celadon of Vietnam. *Arts of Asia*, 22(1), 130–133.
- HARRISON, B., 1985. *Holding the fort: Melaka under two flags 1795–1845*. MBRAS Monograph No 14.
- HARRISON, B., 1995. *Later ceramics in Southeast Asia*. OUP, Shah Alam.
- HIRTH, F. AND ROCKHILL, W.W., 1911. *Chau Ju-kua: His work on the Chinese and Arab trade in the 12th and 13th centuries, entitled Chu-fan-chi*. Printing Office, Imperial Academy of Sciences, St Petersburg.
- HOWARD, D. AND AYERS, J., 1981. *Masterpieces of Chinese export porcelain*. Sotheby Parke Bernet.
- KHOO, J.E., 1991. *Kendi: pouring vessels in the University of Malaya Collection*. OUP, Singapore.
- KHOO T.T., 1996. Geomorphological evolution of the Merbok estuary area and its impact on the early state of Kedah, northwest Peninsular Malaysia. *J. SE Asian Earth Sci*, 13, 347–371.
- KHOO T.T., 1997. Coral as building material in Late Portuguese and Early Dutch Malacca. *JMBRAS*, 70, Part 2, 97–114.
- KHOO T.T., in manuscript. Occurrence of Kitchen Qing sherds at the Sungai Merang estuary, Terengganu.
- KWAN, K.K. AND MARTIN, J., 1985. Introductions to the finds from Pulau Tioman. In: *A ceramic legacy of Asia's maritime trade*. Southeast Asia Ceramic Society (West Malaysia Chapter), 69–82.
- LAMB, A., 1980. Pengkalen Bujang: An ancient port in Kedah. In: *Lembah Bujang*. Persatuan Sejarah Malaysia, 79–81.
- LEE, Y.H., 1992. *Antique ceramics*. Asiapac, Singapore.
- LEONG, S.H., 1980. *Lembah Bujang*. In: *Lembah Bujang*. Persatuan Sejarah Malaysia, 76–78.
- LI ZHIYAN AND CHENG WEN, 1984. *Chinese pottery and porcelain*. Foreign Languages Press, Beijing.
- LINEHAN, W., 1936. *A history of Pahang*. *JMBRAS*, 14, Part 2.
- MEDLEY, M., 1977. *A handbook of Chinese art*. Graham Brash, Singapore.
- MEDWAY, LORD., 1962. Archaeological notes from Pulau Tioman, Pahang. *Federation Museum Journal*, n.s. 7, 55–6.
- MEHLMAN, F., 1982. *The illustrated guide to glass*. Peerage Books, London.
- OTHMAN MOHAMAD YATIM, 1980. Masaalah pentarikhan Lembah Bujang dan keramik-keramik dari Pengkalen Bujang. In: *Lembah Bujang*. Persatuan Sejarah Malaysia, 22–31.
- OTHMAN MOHAMAD YATIM, 1981. *Penggunaan tembikar dalam masyarakat Malaysia*. Jabatan Muzium, Kuala Lumpur.
- RAU, J.L. AND HUGHES, C., 1985. Significance of 13th–15th century ceramics and other artifacts in upland burial sites of the Tak-Mae Sot-Umphang region, Western Thailand. *Siam Society's Newsletter* 1(2), 1–21.
- RUGOFF M., 1986. *The travels of Marco Polo*. New American Library.
- RUSSELL, T., 1985. Sherds discovered in the sea at Teluk Nipah, Pulau Tioman. In: *A ceramic legacy of Asia's maritime trade*. Southeast Asia Ceramic Society (West Malaysia Chapter), 64–65.
- SELBY, A. AND THE DIAGRAM GROUP, 1994. *Antique marks*. Harper Collins.
- SINGHVI, A.K. AND WAGNER, G.A., 1986. Thermoluminescence dating and its applications to young sedimentary deposits. In: Hurford A.J. et al. (Eds.), *Dating Young Sediments*. CCOP Technical Publication 16, Bangkok, 159–197.
- SITI HASSULAINI ABDUL RAHMAN, 1997. *Geology kawasan Merang*

- dan sekitarnya dengan penekanan kepada geologi persekitaran. B.Sc. Project Report, Dept. of Geology, University of Malaya.
- SPINKS, C.N., 1956. Siam and the pottery trade of Asia. *Journal of the Siam Society*, 44(2), 61–111.
- TAN, R.C., 1990. The Roberto T Villanueva Collection in Manila: Export wares of the Yuan Dynasty. *Arts of Asia*, 20(4), 70–86.
- TILL, B., 1983. *Porcelain of the High Qing*. Art Gallery of Greater Victoria, Victoria, Canada.
- WHEATLEY, P., 1961. *The Golden Khersonese*. University of Malaya Press, Kuala Lumpur.
- WILLETTS, W., 1971. *Ceramic art of Southeast Asia*. Ceramic Society of Southeast Asia, Singapore.
- WILLETTS, W., 1981. Introduction and description of exhibits 1–120. In: *Nonya ware and Kitchen Ch'ing*. Southeast Asia Ceramic Society (West Malaysia Chapter), 1–16, 50–94.
- WILSON, E., 1991. *A guide to oriental ceramics*. Charles Tuttle, Tokyo.

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