IN SUPPORT OF TRADE: COASTAL SITE LOCATION AND ENVIRONMENTAL TRANSFORMATION IN EARLY HISTORICAL-PERIOD MALAYSIA AND THAILAND

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ABSTRACT

Geoarchaeological evidence from south central Kedah, Malaysia, and Satingpra, Thailand, suggests that the broad, fertile coastal plains that dominate both areas are relatively recent formations. Important early historical-period (AD 400-1500) trade centers once interpreted as supported by intensive rice agriculture on these plains were not, as the plains did not exist until late in the period. These sites, although landlocked inland behind the plains today, occupied beach ridges and other high ground beside rivers or the coast at the time. They were supported by dryland agriculture on hill slopes inland. Eventually, overuse of the hill fields produced soil erosion, and the coastal plains formed sometime after AD 1200 or 1300.

Many segments of the west and east coasts of the Thai-Malay peninsula are dominated today by broad coastal plains that are intensively settled and cultivated, creating an illusion of long-term environmental stability. It has been suggested in the past that certain important archaeological sites in these areas – centers for early states that flourished during the early historical period, between AD 400 and 1500 – were supported by irrigated rice grown on this fertile plain.

During the early part of the 20th century, most researchers believed that the development of complex polities in Southeast Asia was secondary (derivative), influenced primarily from India. Irrigated rice agriculture was also credited to India. Foreign domination was assumed for states such as Angkor, which were known to have been supported by irrigated rice, and also for coastal states for which an agrarian rice base was assumed. These latter included importantly Funan, and smaller states like the ones that developed in south-central Kedah on the northwest coast of Malaysia, and at Satingpra on the east coast of southern Thailand (Figure 1) (e.g., Coedès 1968; Quaritch Wales 1935, 1940; Stargardt 1983; Wheatley 1975; Zaharah 1969). It was not yet realised generally that the development of internal and later external (regional and extraregional) exchange in Southeast Asia provided a powerful economic base for state formation in its own right. This base, which developed locally and was not secondary, established the hierarchical and economic structures for a distinct type of state: that represented by Kedah and Satingpra.

The assumption that Kedah and Satingpra were agrarian had important implications for the interpretation of their sites. First, they were believed to have been foreign-dominated. Second, because of their small sizes, they were relegated to

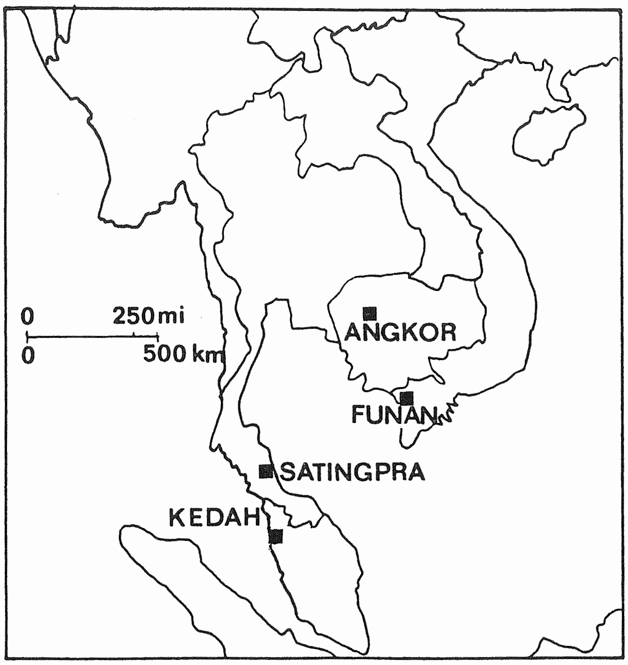


Figure 1: Southeast Asia, showing main historical-period centers mentioned in text.

positions of secondary importance, in the context of better-known and much larger interior states like Angkor. If, however, Kedah's and Satingpra's sites were not supported by foreign-introduced agriculture, and if in fact the coastal plains did not exist at the times the sites grew and flourished, then the sites and their economies must be explained in other terms. This article examines pedological, sedimentological, geomorphological, and historical evidence that strongly suggests that neither the south-central Kedah sites nor those at Satingpra occupied a coastal plain; that they instead occupied high and dry coastal and riverine landforms that facilitated site involvement in, and control over, trade; and that the coastal plain developed in large part as the result of processes that were both anthropic and anthropogenic (unintentionally and intentionally altered; Holliday 1992:251, citing earlier work by Eyles).

Building on evidence from aerial photographs and other documents that the coastal plain in south-central Kedah probably had not formed until recently, my dissertation research focussed on collecting further evidence to try to clarify the role that agriculture on the plain had or had not played in the development of the early historical-period sites there. The full soils and sedimentological data are available in the dissertation itself and are summarised in other articles (Allen 1988, 1991, 1999); this article presents detailed information for a few of the most important sites, and explains how the data were interpreted.

The Kedah study focussed on a large cluster of sites in an area drained by the Sungai (S.; River) Merbok and the S. Muda (Young River) (Figure 2). The study was limited to surface survey, at the preference of the host country, but contributed palaeoenvironmental evidence, partly through the study of sequences exposed in road- and streamcuts and old excavations – some dating to Quaritch Wales' (1940) fieldwork in the late 1930s. Site areas and surrounding natural areas were analysed. Surface and subsurface soils and sediments were fully described in the field following standards current in 1980 (Leamy and Panton 1966; Paramananthan 1978; Shackley 1975; U.S. Department of Agriculture Soil Conservation Service 1975; U.S. Department of Agriculture Soil Survey Staff 1951, 1962); the soil profiles included here are updated to accord with more recent sources including Holliday (1992), Paramananthan (1987), and Schoeneberger *et al.* (1998).

At the University of Hawai'i, 172 soil/sediment samples underwent further analysis: petrographic analysis to interpret sedimentary sources; particle size analysis of 94 samples (67 from sites, 27 from agricultural and natural localities); microscopic analysis for rounding, sphericity, luster, and etching; preparation of histograms for recognition of depositional modes and cumulative curves for calculation of moment statistics, following Folk and Ward (1957); and statistical analysis of depositional regimes (e.g., Friedman 1967; Martins 1965; Moiola and Weiser 1968; Shackley 1975; Visher 1969). Although most charcoal samples collected proved inadequate for radiocarbon dating, one sample collected from a deeply buried dryland (rainfed) agricultural soil on a mountain slope was dated using accelerator mass spectrometry (AMS).

The Satingpra study, which involved documentary research and a field visit, focussed on a cluster of sites on the east coast of isthmian Thailand, approximately 200 km northeast of the Kedah sites (Figure 1); it was a natural offshoot of the Kedah study, as evidence increasingly suggested that the broad coastal plains on both coasts were recent phenomena (Figure 3).

SOUTH-CENTRAL KEDAH'S ARCHAEOLOGICAL SITES

South-central Kedah was known by 1988 to contain at least 87 early historical-period sites, all connected in some way with exchange: internal exchange, exchange with other Southeast Asian polities, and/or extraregional exchange with China, India, the Middle East, and possibly Venice (Allen 1988, 1991; Lamb 1961a, 1961b; Leong 1973, 1980, 1993; Nik Hassan Shuhaimi and Othman Yatim 1990; Quaritch Wales 1940; Sullivan 1958). Every one of these sites is today landlocked behind the coastal plain, which is up to 14.5 km wide and at least 29 m deep in south-central Kedah (Allen 1988:72; Bradford 1972:54).

The area is known historically to have been intensely involved in extraregional trade from the 7th century on, under several names including 7th-century Chia-cha or Chieh-ch'a and 8th- through 11th-century Kataha; and probably 7th-century Ko-lō, 9th- through 14th-century Kalah, and 11th-century Kadaram (Allen 1988:214; Lamb 1964; Mohd. Kamaruzaman A. Rahman 1990; Nik Hassan Shuhaimi and Othman Yatim 1989; Tibbetts 1957; Wheatley 1961).

Archaeologically, the area's sites include two major site clusters at Kampong (Kg.; Village) S. Mas and Pengkalan Bujang (Landing Place on the S. Bujang) (Figure 2), which participated in early historical-period (AD 400-1500) trade with India, China, and the Middle East; these centers were A-level centers in trade, following Bronson's (1977) model. Kg. S. Mas, Pengkalan Bujang, and later Kg. S. Mas together with a smaller riverine center (a B-level center) at Kg. Sireh served in sequence as the primary coastal centers in Kedah's external exchange. This external trade relied on a well-maintained internal exchange network, which used streams to transport forest products including valuable woods to the coast, and to return coastal and foreign goods including ceramics and iron nails to upstream dwellers.

At Kg. S. Mas, 12 sites include charcoal deposits and shell middens representing habitation; small, brick or stone,

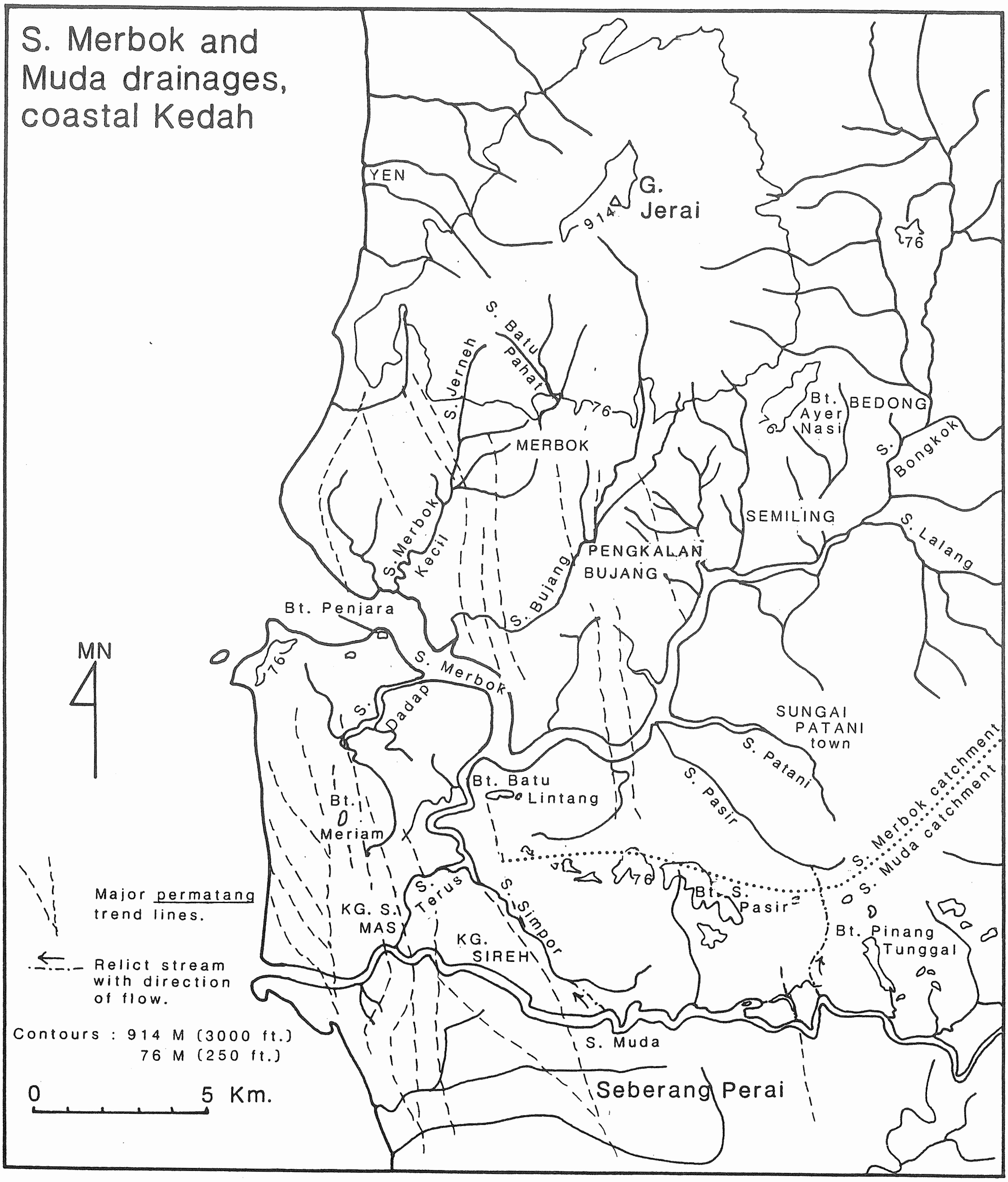


Figure 2: South-central Kedah, with main sites and beach ridge zones.

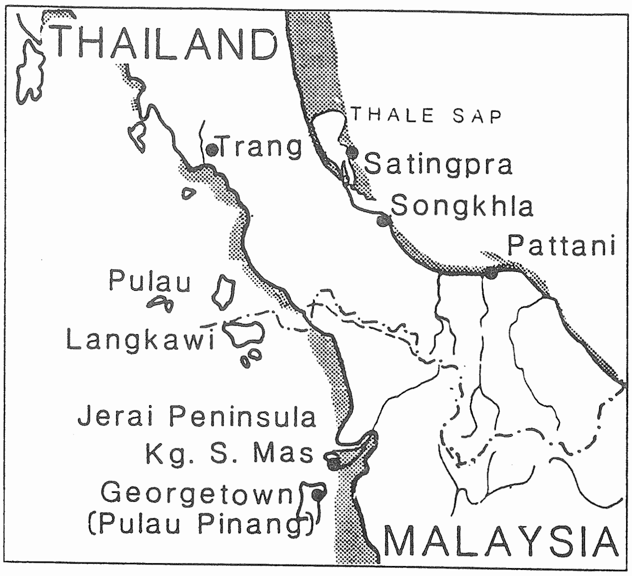


Figure 3: Reconstructed early historical-period coastline, Kedah and Satingpra, with recent coastal plains screened.

Hindu and Buddhist shrines built for use by visitors to the centers; deposits of beads and vessel glass sherds, some fire-affected, suggesting local bead manufacture; and extensive ceramic deposits containing both earthenwares and tradewares. Imported ceramics include 6th/7th- to 17th-century Chinese porcelains and porcellaneous stonewares, 11th- to 12th-century Middle Eastern soft-paste wares, 12th to 14th-century porcellaneous stonewares from Vietnam and Thailand, and an Indian rouletted ware. One dumpsite, where broken vessels were discarded, covers at least 3 ha; this site has also produced two Buddhist tablets – a small clay votive tablet and a much larger tablet probably made of local shale, with a *stupa* relief and inscribed lines (Allen 1988:263, 389, Site maps 41-52; Allen 1989; Wisseman 1980). A deposit discovered in a cut streambank during boat survey includes four cultural layers, the earliest of which produced only local wares, suggesting occupation before the foreign trade began. The main site cluster (seven sites) at Kg. S. Mas covers 23.9 ha. Two main trade periods are reflected: the 10th- to 11th centuries, and the 13th-15th centuries.

Pengkalan Bujang contains at least 14 sites (Allen 1988:345, Site maps 17-23; Lamb 1961a, 1961b, 1964; Leong 1973; Quaritch Wales 1940; Sullivan 1958), including midden and charcoal deposits; permanent structures (several now reconstructed) of brick, tiles, and stone; glass and bead deposits with fire-affected materials, again suggesting local bead manufacture; earthenware and tradeware concentrations; and a harbour dump containing huge numbers of waterworn earthenwares, tradewares, beads, and glass fragments. The tradewares recovered during our survey include 9th- through 13th-century wares imported from China, Vietnam, Thailand, and the Middle East; and stoneware mercury jars probably made in Southeast Asia. No 14th- to 17th-century wares have been recovered at Pengkalan Bujang; the center was apparently abandoned before the Ming Dynasty began (AD 1368) in China, and Kg. S. Mas again became the main center. As at Kg. S. Mas, at least one site contains only local materials and may have predated the sites involved in foreign trade. Pengkalan Bujang's main site area covers 20 ha. The main trade period here spanned the 12th and 13th centuries.

Kg. Sireh, a short distance up the S. Muda from Kg. S. Mas, traded from the 10th century on, probably served Kg. S. Mas as a major support site in internal exchange during the 13th to 15th centuries, and continued to trade into the 16th century. Kg. Sireh is small (6.2 ha) but contains extensive ceramic and glass deposits, and a later moated fort. Dateable tradewares include Vietnamese, Sawankhalok, Chinese and Khmer wares, and span the 10th through 17th centuries (Allen 1988:365, 616, Site map 31; Sullivan 1958:216). In 1980 a deeply stratified streamcut revealed at least five layers containing tradewares.

Smaller sites throughout south-central Kedah have produced local wares, with trade items in far lower frequencies. One inland findspot, upstream on the S. Muda (Allen 1988:408-409), produced a piece of *damar*, tree resin, a product of inland forests and one known to have been of value in the early historical-period export trade.

SATINGPRA'S ARCHAEOLOGICAL SITES

At Satingpra, stone and brick shrines, tanks and other hydraulic works, tradeware and occupation deposits, ceramic kilns, and other sites including deposits possibly dating to a period as early as the 2th to 5th centuries AD have been documented by Stargardt (1976, 1977, 1983). As in Kedah, the shrines are of Indian types and were presumably used by foreign visitors staying in Satingpra.

Historical documents refer to centers in the Satingpra area, although none has yet been attributed specifically to Satingpra itself. As summarised by Mohd. Kamaruzaman A. Rahman (1990), these include 12th- to 17th-century Fo-lo-an, which may have been located at Patthalung, on the east shore of the lake shown in Figure 3. Other toponyms include 7th-century Ch'ih-t'u, possibly located near Pattani; 7th- to 13th-century Lang-ya-hsiu, (Langkasuka), probably also located near Pattani; and 13th-century Tan-ma-ling (Tambralinga), at Nakhon Si Thammarat, approximately 120 km north of Satingpra (Stargardt 1983:11; Mohd. Kamaruzaman A. Rahman 1990; Wheatley 1961).

Satingpra's archaeological sites have been interpreted as an urban complex supported by intensive rice agriculture, which, it was once believed, had characterised the Satingpra peninsula since the 5th century BC. Extensive rice fields on the coastal plain, irrigated and drained by a tank and network of waterways described as canals, were believed to have produced a surplus that stimulated trade and urbanism (Stargardt 1983:7, 19; *cf.* Allen 1990).

The artifact inventories at Satingpra, like those in Kedah, are dominated by tradewares. Excavations produced Chinese tradewares manufactured between AD 100 and the mid-14th century; as at Pengkalan Bujang in Kedah, no Ming-Dynasty wares were found. A local kiln produced wares that were exported to areas in isthmian Thailand, Peninsular Malaysia, Sumatera, Jawa, and Sri Lanka (Stargardt 1983:24, 32). Initial urbanisation was believed to have taken place in the 6th century AD; the sites were intensively involved in inter- and extra-regional trade five centuries before that date. Environmental evidence to be discussed suggests that, as in Kedah, it was involvement in trade, not extensive rice agriculture on the coastal plain, that stimulated urbanism.

COASTAL LANDFORMS AND SITE LOCATIONS IN KEDAH

Although many of the Kedah sites occupy land at low elevations, none (except for boats and isolated artifacts) occupied the coastal plain. Harbour dumps and isolated artifacts have been found in streambeds. Otherwise, every site, whether surrounded by the plain today or not, occupies a landform that provided a high and dry location for habitation and other activities. These areas include beach ridges, stream levees, stream terraces, and hill slopes and summits.

Sites on Beach Ridges

Of the 87 sites, 35 occupy primarily land on *permatang*, sand and often gravel ridges that were once coastal beaches and today parallel the north-south shoreline along the Selat Melaka (Straits of Malacca), forming concentric bands up to 14 km inland in the area (Figure 2). Beach ridges are found up to 19 km inland in the Beruas/S. Dinding area in Perak, south of Kedah (Koopmans 1964; Zainol bin Haji Husin 1992). In Johor, at the southern tip of the peninsula, *permatang* have been recorded up to 45 km inland (Swan 1974).

While some Malaysian beach ridges formed as the result of earlier sea level changes, most of Kedah's near-coastal ridges are believed to have formed primarily as the result of coastal progradation during late prehistoric and early historical times, becoming landlocked inland as recently as 2000 years ago. The processes that resulted in the ridges becoming landlocked included wasting of fine silts and clays from inland hills, their transportation in streams to the coast, and their redeposition around formerly coastal beaches. Most *permatang* in the project area probably formed as *cheniers* (Bradford 1972), which overlie muddy coastal flats. These flats were acidic and supersaturated, like the acid sulfate soils that form throughout coastal and estuarial areas under mangroves today, and were not arable until drained or buried under more fertile soils. Most of south-central Kedah's plain appears likely to have accumulated since AD 1200, suggesting that the isolation of the ridges it surrounds is also relatively recent.

Figure 2 indicates the main bands of *permatang* that are discernible in aerial photographs of the south-central Kedah area (LANDSAT 1981). As seen at ground level, they interrupt and rise very slightly above the surrounding coastal plain. They still provide the locations for most houses in areas surrounded by the plain, and can be distinguished from it by the presence of houses, coconut palms, and other trees.

Most of Kedah's *permatang* sites are located within or near Kg. S. Mas or Pengkalan Bujang. At Kg. S. Mas, the main beach ridge, nearly 4 km inland today, parallels the coast north of the mouth of the S. Muda and west of a navigable river, the S. Terus, a tidal stream that connects the Muda with the S. Merbok. Eleven of 12 sites at Kg. S. Mas occupy beach ridge sands and gravels; the final one (our Site 62: Allen 1988) may also – no subsurface exposures were available for examination.

Kg. S. Mas provided several streambank segments and trench faces excavated for an irrigation project. Table 1 presents information for the layers exposed in a 144 cm deep excavation through a portion of the main tradeware concentration (our Site 53: Allen 1988:702). All the layers above Layer VIII contain charcoal, and three contain significant numbers of earthenwares and tradewares. Layers III and IV represent the 13th- to 15th-century trade period. Layer V represents a hiatus in the trade. Layer VI represents the 10th- to 11th-century trade period. Layer VII contains only a bead and charcoal, both possibly sifted downward in the profile. Layer VIII, at the base of the exposed cut, appears precultural and is cemented by tidal action.

The quartz and quartzite sands and gravels of this *permatang* were deposited by relatively high-energy marine waves and tides. Most grains are subangular, with rounding, etching, and faceting suggesting aeolian reworking. Grains are typically elliptical to subspherical – relatively waterworn. Although most samples are statistically leptokurtic, suggesting one dominant depositional mode (marine waves), histograms reflect multiple modes, with waves of varying velocities and winds producing low peaks in pebbles, granules/coarse sands, and fine sands or silts. The positive to very positive skewness (tails of fines) that typifies most Kedah *permatang* is the opposite of what is expected in active beach sands, but is predictable in inactive

Table 1: Soil profile, Site 53, Kampong Sungai Mas, Kota, Kedah

Layer	Depositional Unit and Soil Horizon	Depth (cmbs)	Profile
--	O1	+1-0	Dried and partially decomposed grass parts.
I*	A11an	0-9	Very dark grayish brown (10YR 3/2, moist) gravelly very coarse sandy loam; moderate, fine, subangular blocky structure; friable when moist, slightly sticky and nonplastic when wet; many, fine to coarse roots; 23% angular gravels, including shale; charcoal flakes and stains throughout; clear, smooth boundary.
II	A12an	9-19	Dark brown (7.5YR 3/2, moist) gravelly very coarse sandy loam; moderate, fine, subangular blocky structure; friable when moist, slightly sticky and nonplastic when wet; many, fine to coarse roots; 23% angular gravels, including shale; scant charcoal; abrupt, smooth boundary.
III	IIA13anb	19-70	Dark brown (7.5YR 3/2, moist) gravelly very coarse loamy sand; moderate, medium, subangular blocky structure; very friable when moist, nonsticky and nonplastic when wet; common, medium to fine roots; 30% fine, subangular, pebble gravels and granules; 7 earthenware sherds, 8 imported wares: 3 Southern Song qingpai, 1 celadon, 1 Vietnamese 13th-century creamware, 3 Islamic glazed ware; 1 bead; 4 glass sherds; clear, smooth boundary.
IV*	IIA14anb	70-90	Dark brown (7.5YR 3/2, moist) gravelly very coarse loamy sand; moderate, medium, subangular blocky structure; very friable when moist, nonsticky and nonplastic when wet; common, medium to fine roots; 31% fine, subangular, pebble gravels; charcoal flakes throughout; 7 earthenware sherds, 1 13th-century Guangdong sherd (all at 85 cmbs); abrupt, smooth boundary.
V	IIA31anbC	90-120	Dark brown (7.5YR 3/2, moist) gravelly very coarse loamy sand; weak, coarse, subangular blocky structure; very friable when moist, nonsticky and nonplastic when wet; common, medium to fine roots; 30% fine, subangular, pebble gravels and granules; scant charcoal; no artifacts noted; abrupt, smooth boundary.
VI*	IIA15anb	120-135	Dark grayish brown (10YR 4/2, moist) gravelly very coarse loamy sand; weak, medium, subangular blocky structure; very friable when moist, nonsticky and nonplastic when wet; few, fine roots; 21% pebble gravels; charcoal throughout; 3 earthenware sherds, 2 celadons: 10th-century South Chinese/Southeast Asian and provincial South Chinese wares; 3 beads; 7 glass sherds; abrupt, smooth boundary.
VII*	IIIA32anb	135-138	Black (10YR 2/1, moist) gravelly very coarse sandy loam; weak, fine to medium, subangular blocky structure; very friable when moist, nonsticky and nonplastic when wet; 26% gravels; charcoal flakes and stains throughout; 1 seed bead; very abrupt, smooth boundary.
VIII*	IVC2x	138-144+	Brown/dark brown (10YR 4/3, wet) very gravelly very coarse loamy sand/sandy loam; nonsticky and nonplastic when wet; weakly $CaCO_3$-cemented; base not reached.

*Sample subjected to laboratory particle size and shape analyses

an = anthropic (cultural); b = buried; x = fragipan (weak cemeted pan) development beach ridges, which no longer receive coarser materials that would produce negative tails.

The sites at Kg. S. Mas occupied the sands of an inactive beach ridge a short distance inland from the shoreline on the Selat Melaka. The location was optimal for sites involved in maritime trade: high and dry; beside the tidal S. Terus, which could be used to transport forest goods to the coast and foreign goods upstream; and initially near the Selat Melaka shoreline.

At Pengkalan Bujang, further north, 12 of 14 sites occupy fine *permatang* sands on two beach ridges currently landlocked 5 km north of the Merbok estuary, and 8 km east of the Selat Melaka. The S. Bujang currently flows through the western ridge, but has migrated there from a more easterly route. Table 2 presents information for a sequence at a former excavation site near the north end of the eastern *permatang* – the original locality of one of Quaritch Wales' (1940) sites, since relocated to the Muzium Lembah Bujang in Merbok. Layers III and IV, representing the main cultural horizons, contain scant organics; any cultural materials were presumably collected during excavation. The (medium) sands here are much finer than those at Kg. S. Mas, with fewer gravels; this area was well protected from storm waves when these sediments were laid down.

The sites on both ridges are believed to have been located directly beside the Merbok estuary until sometime after the 6th century (Quaritch Wales 1940:1). Lamb (1961a:29, 33) pointed out that *pengkalan* means "landing place" and suggested that the waterworn ceramics and other materials he excavated had been dumped in a harbour. Fluvial deposition of silts and clays since the 13th century, mangrove colonisation (*Rhizophora*, *Bruguiera*, *Avicennia*, *Sonneratia* spp. around the Merbok estuary: Allen 1988:132), and coastal progradation have moved the estuarial shoreline well downstream, 5 km south of this main tradeware concentration. During our project, one elderly village resident recalled that mangroves had grown in the *kampong* 75 years earlier; the first mangrove zone began 1 km downstream in 1980 (Allen 1988:355). The S. Bujang is typically small, underfit, today, but turns reddish brown with suspended silts and clays, flooding its banks, during rains.

Pengkalan Bujang's fine to medium sands reflect deposition by relatively low-velocity marine waves and tides, and by estuarial waters. Most grains are subangular to subrounded, and subspherical. Positive skewness again reflects the presence of a tail of (aeolian and fluvial) fines. Sorting is occasionally better than that at Kg. S. Mas, and extremely leptokurtic values suggest strong dominance by

Table 2: Soil profile, Pengkalan Bujang, Bujang, Kedah

Layer	Depositional Unit and Soil Horizon	Depth (cmbs)	Profile
--	O1	+2-0	Dried and partially decomposed leaves, branches, grass blades.
I*	E	0-13	Light gray (10YR 7/2, dry to moist), brown/dark brown (10YR 4/3, wet) loamy medium sand; weak, coarse, subangular blocky structure; very friable when moist, nonsticky and nonplastic when wet; many, fine roots; abrupt, wavy boundary.
II*	IIBtb	13-27	Brown/dark brown (10YR 4/3, moist) medium sandy loam; weak, coarse breaking to fine, subangular blocky structure; very friable when moist, nonsticky and nonplastic when wet; many, fine roots and tubular pores; abrupt, smooth boundary.
III*	IIIA11anb	27-62	Dark yellowish brown to brown/dark brown (10YR 4/4 to 4/3, moist) loamy medium sand; weak, fine to medium, subangular blocky structure; very friable when moist, nonsticky and nonplastic when wet; common, fine to very coarse roots; many, coarse, vesicular and tubular pores; charcoal flakes; abrupt, smooth boundary.
IV*	IIIA12anb	62-65+	Dark yellowish brown (10YR 4/4, moist) loamy medium sand; weak, fine to medium, subangular blocky structure; very friable when moist, nonsticky and nonplastic when wet;common, fine roots; brick fragments; charcoal flakes coarser and more common than in Layer III; base not reached.

* Sample subjected to laboratory particle size and shape analyses
an = anthropic; b = buried; t = containing illuvial clays

a single depositional mode, quiet waters. Histograms reveal secondary fluvial silt peaks for the area profiled in Table 2. This area at the northern tip of the eastern ridge has frequently received fluvially deposited silts and clays; clayey rice field soils now dominate a large area between this point and the next high ground upstream, a little more than 1 km away.

If, as suggested, the trade center at Pengkalan Bujang was located beside the S. Merbok estuary until the 6th century or later, its location would have been optimal for the overseas trade, providing not only easy access to and from the Selat Melaka, but also a sheltered anchorage.

Sites on Stream Terraces and Levees

Twentytwo sites in south-central Kedah occupy stream levees or fluvial terraces, both of which provide dry land, protection from most floods, and easy riverine access. One of the most important sites is Kg. Sireh, on a levee on the north shore of the S. Muda, approximately 2 km upstream above Kg. S. Mas. Table 3 presents information for a deep streamcut at Kg. Sireh (Allen 1988:697). The surface layer has lost clays to underlying Layers II-IV, probably during floods. Layers I-IV are dominated by fluvial sands and silts; Layer V is strongly dominated by fluvial clays and silts. These soils are very different from the sandy soils of *permatang* in the area. Levees are flood formations, and the clays, silts, and sands in these soils have been deposited during repeated floods. Roots in all five layers nevertheless suggest considerable soil and surface stability since the levee was first occupied.

Layer II contains scant cultural materials; the main cultural layers are Layers IV and V. The materials in Layer IV postdate the mid-13th century. The Cambodian or Siamese brown/black-glazed tradeware from Layer V is interesting in that it may suggest that Southeast Asian regional exchange preceded the China trade here.

Sites on Mountain and Hill Summits and Slopes

Twentyfour sites occupy the summits or slopes of hills and Gunong (G.; "Mountain") Jerai, the massif that dominates south-central Kedah and forms the western end of the Kedah-Singgora Range, which continues northeastward into the Satingpra area. With a summit 1217 m high, G. Jerai is a major promontory visible for long distances out into the Selat Melaka; it has been a navigational landmark for many centuries and contains, on the summit and around the base, many sites that participated in the early historical-period trade. The sites on the lower slopes are invariably associated with permanent streams, along which forest products could be floated.

Most hills occupied by early historical-period sites were probably coastal capes, promontories, or islands offshore during the early historical period. A traditional history, the *Hikayat Merong Mahawangsa* (*Kedah Annals*; Malaysia, Kementerian Pelajaran 1973), names several hills and a mountain that were *pulau* (islands) during the period. In north Kedah, these named *pulau* are located up to 33 km inland today. In south-central Kedah, the former islands include G. Jerai (Pulau Jerai), which is said to have become a peninsula, and then a landlocked mountain, both during the early historical period.

Sites in Low-Lying Land

Six sites occupy low-lying, silty or clayey soils – floodplain lands or river channels. One constitutes isolated artifacts dredged from the S. Terus in 1914. Two are old boats. One is a 19th-century site beside a stream further inland. The fifth and sixth sites in low-lying land, our Sites 77 and 78, consist of isolated stones from destroyed structures in *bendang* (irrigated rice land), approximately 200 m from a structure on a stream levee beside the S. Bujang (Muzium Negara Site 50). No existing cuts were available for profiling, but the surface soils were clayey, indurated, and cracking (Vertisols) when visited during the dry season. Both fields had been plowed, and the ground level had apparently been lowered by at least 1.5 m, as a small, disturbed baulk that high remained at Site 78. Both sites had once presumably occupied levee sediments or a stream terrace.

None of Kedah's sites therefore seems to have been oriented toward irrigated rice lands. All were located beside rivers or near the coast, in order to participate in first internal exchange and later the lucrative foreign trade. The centers at Kg. S. Mas and Pengkalan Bujang both became landlocked inland early in their occupations, and had to rely entirely on river/estuarial access beyond that point.

COASTAL LANDFORMS AND SITE LOCATIONS AT SATINGPRA

The Satingpra area is dominated by a large backswamp, a saltwater lake that includes a northern segment, Thale Luang, and a southern segment, Thale Sap. Between the site complex and the lake, a wide coastal plain is cultivated today, checkered with rice fields separated by berms that support rows of *Borassus* (sugar palm), in a mosaic much like the Khmer pattern that dominates farther north, in Cambodia (Liere 1980; Stargardt 1983).

As aerial photographs (Stargardt 1983:Figures 15 and 17) demonstrate, villages in the area occupy beach ridges. Satingpra's *permatang* are more numerous, narrower, and more closely spaced than Kedah's, and are separated by swales that are also narrower than those in Kedah. In contrast with the ridges on Malaysia's rapidly prograding west coast, beach ridges at Satingpra include active beaches and are not uniformly landlocked behind many kilometers

Table 3: Soil profile, Kampong Sireh, Rantau Panjang, Kedah

Layer	Depositional Unit and Soil Horizon	Depth (cm bs)	Profile
--	O1	+1-0	Partially decomposed grass parts, leaves.
I*	Ean	0-18	Light yellowish brown (10YR 6/4, dry) clay loam/loam; moderate, fine, subangular and angular blocky structure; slightly hard when dry, slightly sticky and plastic when wet; many, very fine to coarse roots; scant charcoal; no sherds noted; abrupt, smooth boundary.
II*	A31anB1tg	18-38	Light brownish gray (10YR 6/2, dry) clay loam; moderate, coarse, subangular blocky structure; hard when dry; slightly sticky and plastic when wet; common, fine and few, very coarse roots; less than 5% gravel; scant charcoal; 3 ceramic sherds noted; clear, smooth boundary.
III*	A32anB21tg	38-47	Light brownish gray (10YR 6/2, dry) clay loam; moderate, coarse, angular blocky structure; hard when dry; sticky and plastic when wet; common, fine roots; 6% gravel; charcoal present; no sherds noted; abrupt, smooth boundary.
IV*	IIA1anB22tgb	47-79	Very dark gray (10YR 3/1, moist) clay loam; moderate, medium, subangular blocky structure; firm when moist, sticky and plastic when wet; many, fine roots; 10% subangular, subspherical gravel; much charcoal; 8 ceramic sherds noted, including 1 Yuan-Ming blue-and-white and 1 Islamic glazed sherd; clear, wavy boundary.
V*	IIA3anB23tgb	79-134+	Gray (5Y 5/1, moist) silty clay with many, coarse, prominent, strong brown (7.5YR 5/6) mottles; moderate, medium, angular blocky structure; firm when moist, sticky and plastic when wet; common, fine roots; <5% gravel; no charcoal noted; 2 ceramic sherds, including 1 Khmer or Sawankhalok brown/black-glazed sherd, at 91 cmbs; base not reached.

* Sample subjected to laboratory particle size and shape analyses
an = anthropic (cultural); b = buried; g = gleyed; t = containing illuvial clays; x = fragipan (weak cemented pan) development

of clays and silts. East-coast areas experience periods of marine transgression and coastal retreat more regularly than do west coast areas; nonetheless, the net result is a growing series of beach ridges with their backswamps (swales).

As in Kedah, terrigenous silts and clays transported by streams from inland hill slopes have filled many swales, building an alluvial zone up to 34 km wide behind the current shoreline ridges (Stargardt 1983:Figure 17; also, Moormann and Rojanasoonthon 1972). Even today, however, much of this alluvial zone constitutes acid sulfate soils, which are infertile and toxic and have been turned into arable soils only since the advent of modern, mechanised drainage technology. The remainder of Satingpra's "homogeneous" plain (Stargardt 1983:45; Allen 1990) actually contains large areas covered by sand beach ridges and dunes.

The peak urban period represented at Satingpra began around AD 800 and ended around 1350. Current evidence suggests that no extensive floodplain agriculture was possible around Satingpra until sometime after AD 1250/1300, when, according to Stargardt's (1983:144, 162) data, sedimentation increased dramatically, filling coastal water tanks and the main canal with terrigenous (hill-slope) silts and clays. The results of a major geomorphological research project (Trebuil *et al.* 1983) suggest, in fact, that most of the Satingpra peninsula actually held open water with islands, like Thale Sap, until as recently as the 19th century.

Aerial photographs and map data, supplemented by information collected during a field visit, indicate that most or all of Satingpra's sites occupy beach ridge sands. Even the tanks used during the early and peak periods were not agricultural, but were instead located in the urban area to supply urban residents with water. Satingpra's waterways, most of which were not canals but rather natural drainages in a perpendicular network that emphasised swales (Trebuil *et al.* 1983:18), were not irrigation channels, but rather transshipment routes. Site location was designed for access to the waters of the Gulf of Thailand, to the forested interior and to the west coast of the isthmus, where other trade centers were located. As in Kedah, navigable drainages were critical corridors in internal exchange, facilitating shipment of forest products from the mountains to the coast, and returning coastal products and imports upstream.

THE AGRICULTURAL BASE

Both Kedah and Satingpra required a reliable subsistence base to feed urban residents who did not grow their own food. The evidence suggests strongly that dryland cereal agriculture on hills inland supported these centers until late in the historical period.

As Hill (1977) suggests for the Malay Peninsula generally, the crops grown in hill-slope fields in Kedah may have included both rice and millet, as well as garden vegetables, tree crops, and other produce. Disregarding today's plain, south-central Kedah possesses at least 21,500 ha of land ideal for dryland cultivation (Allen 1988:100, 590; Malaysia, Kementerian Pertanian 1968, 1970; Paramananthan 1978). Areas further upstream add many thousands of hectares of potential dryland agricultural fields. Old-growth secondary forests cover many of these soil areas, having replaced primary forests long ago. Direct archaeological evidence for old agricultural fields is exposed relatively rarely, but, when it is, suggests that more and more food was needed by the centers through time, until fallow periods became too short to allow regrowth of binding root systems and regeneration of stable topsoils.

At a midslope locality on G. Jerai, 46 m above sea level, where more sediments have been lost than gained, 228 cm of sediments and soils had accumulated by 1980 above a charcoal-bearing, dryland agricultural soil layer that produced an AD 675-930 calibrated AMS radiocarbon date, at one sigma. The vertical accumulation rate at even this primarily erosional locality had been at least 1 cm every 6 years based on the AD 675 date, and 1 cm every 4.6 years if the later, AD 930, date is correct. The accumulation rate at the base of the mountain after approximately AD 930 would have been much higher than the rate at this midslope locality.

The dated agricultural layer was the lowermost of four agricultural layers (Layers VIII, X, XII, and XIII) exposed in the roadcut (which has since been bulldozed). As Table 4 indicates, the agricultural layers were dark, friable, buried A1-horizon topsoils, humic due to the addition of charcoal and other organic matter. The non-agricultural layers were not humic and did not contain charcoal. Two agricultural layers, Layers VIII and XII, contained oxidised, rounded and tubular mottles 10-20 cm in diameter, which could represent either burrows or tubers; these bright mottles contrasted clearly with the layer matrices, which retained moisture supplied by rainfall.

The two deepest agricultural soils, Layers XII and XIII, and Layer XI above them, were clays; although Layer XIII might possibly have been a residual clay, the rest of the soils in the sequence had formed on newly deposited sediments. Layers VII-X showed the effects upward through time of increasing sedimentation. Layer X was a clay loam, while, above it, Layers VII, VIII, and IX were coarse sandy clay loams, suggesting deposition of coarsening colluvial sediments. The upper soils, in Layers I-VI, were finer but sandy, representing renewed deposition.

Layers IX and XI appeared likely to have formed during fallow seasons. They were thin, suggesting relatively brief abandonment, and contained minimal plant matter; their topsoils were the agricultural topsoils (Layers VIII and X) that overlay them. No wavy erosional boundaries were noted; management of these noncultural, fragile soils seems suggested, as might be the case in a fallow situation. The evidence weakly suggests that field reuse throughout the sequence of the four agricultural soils took place quickly – probably too quickly.

Budgetary constraints did not allow radiocarbon dating of the three upper agricultural layers. Other dryland agricultural fields in the area need to be profiled and radiocarbon-dated so that we may understand how quickly field reuse took place throughout the early and later historical periods. Since the dated field was probably cultivated until nearly AD 1000, and three layers were cultivated after it was abandoned, most sedimentation here probably postdated AD 1100/1200.

Satingpra's trade-associated and non-agriculturally producing population also needed to be supported by agriculture practised beyond the urban center. Potentially productive areas short distances inland from Satingpra include high alluvial terraces and fans, low terraces, and hill slopes covered today by agricultural soils (Gobbett and Hutchison 1973; Moormann and Rojanasoonthon 1972; Scholten and Siriphant 1973). Alluvial Entisols in the young fan area bordering Satingpra still produce more irrigated rice than areas nearer the coast.

Although no agricultural deposits have yet been dated in the hills inland from Satingpra, Maloney's (1999) study of pollens, pteridophytes, and microfossil charcoal concentrations in a long sequence extracted from the floor of a lake, Nong Thale Song Hong, in Trang, across the isthmus from Satingpra (Figure 3), suggests that cultivation on hill slopes nearby has probably been practised for at least the last 1500 years. While earlier charcoal (e.g., *c.*3700 BP) in the sequence

Table 4: Soil profile, agricultural locality on G. Jerai, Merbok, Kedah

Layer	Depositional Unit and Soil Horizon	Depth (cmbs)	Profile
--	O1	+2-0	Decomposed and partially decomposed rubber (*Hevea brasiliensis*) and other leaves.
I*	E1	0-55	Reddish yellow (7.5YR 6/6, dry) very fine sandy clay loam; moderate, coarse, subangular blocky structure; slightly hard when dry, slightly sticky and plastic when wet; common, very fine to coarse roots; common, thin clay skins on ped faces; abrupt, smooth boundary.
II*	E2	55-78	Reddish yellow (7.5YR 6/6, dry) fine sandy clay loam; moderate, medium, subangular blocky structure; hard when dry, slightly sticky and plastic when wet; few, fine roots; abrupt, smooth boundary.
III*	A3(?an)	78-102	Strong brown (7.5YR 5/6, dry) fine sandy clay loam with few, fine, faint, strong brown (7.5YR 5/8) mottles; moderate, medium, crumb structure; slightly hard when dry, slightly sticky and plastic when wet; few, fine roots; common, dispersed charcoal flakes; abrupt, smooth boundary.
IV*	B1t(?with Aan)	102-132	Strong brown (7.5YR 4/6, moist) fine sandy clay loam; moderate, medium, subangular blocky structure breaking to moderate, medium, crumb; firm when moist, sticky and plastic when wet; few, fine roots; common, dispersed charcoal flakes; abrupt, smooth boundary.
V*	IIE(?an)b	132-152	Strong brown (7.5YR 5/6, moist) fine sandy clay loam; moderate, fine to medium, subangular blocky structure; friable when moist, slightly sticky and plastic when wet; common, dispersed charcoal flakes; abrupt, smooth boundary.
VI*	IIB2tb	152-164	Strong brown (7.5YR 5/6, dry) fine sandy clay loam; moderate, medium, platy structure breaking to subangular blocky; slightly hard when dry, sticky and slightly plastic when wet; few, fine roots; abrupt, smooth boundary.
VII*	IIIA3b	164-174	Strong brown (7.5YR 4/6, moist) coarse sandy clay loam; moderate, medium to coarse, subangular blocky structure; friable when moist, slightly sticky and plastic when wet; few, medium roots; abrupt, smooth boundary.
VIII*	IVA1amb	174-185	Brown/dark brown (7.5YR 4/4, moist) coarse sandy clay loam with few, coarse, distinct, reddish yellow (7.5YR 6/6) mottles^{+}; moderate, medium, subangular blocky structure; charcoal layer, with flakes and stains throughout; abrupt, smooth boundary.
IX*	IVA3Bb	185-189	Strong brown (7.5YR 4/6, moist) coarse sandy clay loam; moderate, medium, subangular blocky structure; friable when moist, sticky and plastic when wet; few, medium roots; clear, smooth boundary.
X*	VA1anBb	189-195	Dark brown (7.5YR 3/4, moist) clay loam; moderate, medium, platy structure breaking to angular blocky; friable when moist, sticky and plastic when wet; charcoal layer, with flakes and stains throughout; clear, smooth boundary.

continued...

Table 4 continued

Layer	Depositional Unit and Soil Horizon	Depth (cmbs)	Profile
XI*	VBtb	195-205	Brown/dark brown (7.5YR 4/4, moist) clay; moderate, medium, platy structure breaking to angular blocky; firm when moist, sticky and plastic when wet; common, thin clay skins on ped faces; clear, smooth boundary.
XII*	VIA1anBb	205-218	Dark brown (7.5YR 3/4, moist) clay with common, medium to coarse, distinct, yellowish red (5YR 5/8) mottles[+]; moderate, medium, angular blocky structure; friable when moist, sticky and plastic when wet; few, medium to fine roots; charcoal layer, with flakes and stains throughout; clear, smooth boundary.
XIII*	VIIA1anBb	218+	Brown/dark brown (7.5YR 4/4, moist) clay; moderate, medium, angular blocky structure; friable when moist, sticky and plastic when wet; few, fine roots; charcoal layer, with flakes and stains throughout; base not reached. AMS date (Beta-15153), 228 cmbs: conventional age, 1210±95 BP; cal. date, 1 standard deviation, AD 675-930 (Stuiver and Pearson 1986).

* Sample subjected to laboratory particle size and shape analyses. [+] Mottles rounded to tubular
an = anthropic; b = buried; t = containing illuvial clays

probably represents both natural and human-induced fires (Maloney 1999:132), purposeful burning of hill slopes near the lake may have been taking place by *c.*2900-2200 BP, when charcoal peaked and pteridophyte spores (representing a wet environment) decreased in numbers. A much higher charcoal peak *c.*1500 BP almost certainly reflects burning to clear agricultural fields.

FORMATION OF THE COASTAL PLAINS

As indicated, it was not agricultural production on a coastal plain that created the known urban sites, either in Kedah or at Satingpra. Instead, the sites created the plains, in that their residents' increasing food requirements stimulated overly intensive cultivation on inland slopes, bringing about widespread soil erosion. Kedah's residual soils are lateritic, fragile, and inherently infertile; fertility is maintained not by the soils, but by root systems that recycle nutrients. We know that cultivation in Kedah's hills stripped away the primary forest at some point. After that point, as long as fallow seasons remained long enough to allow regrowth of grasses or secondary forest, the soils remained relatively stable. But, if fallow periods were shortened to the point where no effective vegetation cover could regenerate, the soils began to erode away, to be carried to the coast in streams.

Calculations of rates for the progradation of the western coastal plain include Quaritch Wales' (1940) estimate that the coast near Pengkalan Bujang had prograded 4.5 km since the 6th century, a rate of 3 m a year. Braddell (1939-1940) suggested a 16-m annual rate for northern Perak and Seberang Perai, south of Kedah. Kamaludin bin Hassan's (1991) analysis of 1950 and 1966 aerial photographs of the Pulau Kelumpang area in Perak suggests an accretion rate between 11 and 37 m a year for that period, with greatest accumulation along the west shore. Koopmans (1964) projected a 12.5 m annual rate for the period between 1880 and 1960 in Perak's S. Dinding drainage. Further south, Batchelor projected an 18.5 m annual rate for the early 20th century in Selangor (Batchelor 1977; also, Allen 1988:516, 598).

Most evidence for the youth or antiquity of coastal plain formation in Kedah and at Satingpra prior to the 20th century is indirect. First, large stands of old secondary forest contain many trees reportedly more than a century old (fully grown prior to living memory). These forests replaced primary forests at some point, suggesting vegetation clearing for agriculture. Second, erosion of hill-slope sediments and their transport down streams to the coast are dramatic today. Third, exposed agricultural sequences like the one described here demonstrate cycles of repeated cultivation and deposition of new sediments. The AD 675-930 radiocarbon range for the agricultural field on G. Jerai suggests increasing deposition of fine sediments at the coast after AD 1200/1300. Dated ceramics at the *permatang* sites suggest that those locations still had direct access to rivers or the coast i.e., were not yet landlocked) until the 12th or 13th century.

Fourth, Kedah's coastal soils are typically young, formed on silts and clays deposited at the coast by sluggish, meandering streams (Paramananthan 1987:12). These soils are often brackish, toxic and saturated nearly to the surface; until drained, they form swampy tracts under mangroves and *nipah* (*Nypa fruticans*) (Allen 1988:113; Eswaran *et al.* 1977; Kawaguchi and Kyuma 1969a; Paramananthan 1978, 1987). At Satingpra, these soils include very sticky low humic gleys formed in swales, with subsoils saturated 9-10 months a year; and acidic soils that have only recently been reclaimed (Kawaguchi and Kyuma 1969b; Trebuil *et al.* 1983).

Fifth, mangrove successions suggest recent soil formation, with *Avicennia* and *Sonneratia*, the pioneer species, growing on mud and sand banks inundated daily, on a prograding shoreline. As Kamaludin bin Hassan (1991:80, 87) points out for Pulau Kelumpang in Perak, mangroves on Peninsular Malaysia's west coast thrive especially in confined, sheltered areas where high volumes of fine sediments are brought to the coast by rivers, and low-energy coastal environments allow them to settle out. *Avicennia* and *Sonneratia* die out quickly if the shoreline becomes erosional (Carter 1959:85). *Rhizophora* and *Bruguiera* species grow behind these pioneer species, in areas of lower salinity and inundated less regularly.

Aerial photographs show lowland soils and sediments increasingly surrounding beach ridges in both Kedah and the Satingpra, and illustrate old river connections now completely sealed off by terrigenous sediments. While earlier sea level changes contributed to this coastal transformation, the sea level has risen by approximately 2 m since *c.*AD 800 (Tjia 1991), so that coastal progradation cannot be explained simply by a lowering of sea level. Relatively recent river capture, the existence of large beheaded estuaries (such as the Merbok estuary) that now drain tiny catchments, estuarial infilling with silts and clays, and the creation of the coastal plains have all changed peninsular shorelines to the point where the coastlines shown on modern maps bear very little resemblance to the pre-AD 1200 coastlines. The east coast, although it fluctuates seasonally and shows less extensive progradation over time than the west coast, has experienced changes as dramatic as complete stream flow reversals in inland areas.

CONCLUSION: COASTAL PROGRADATION AND SHIFTING SITE LOCATIONS

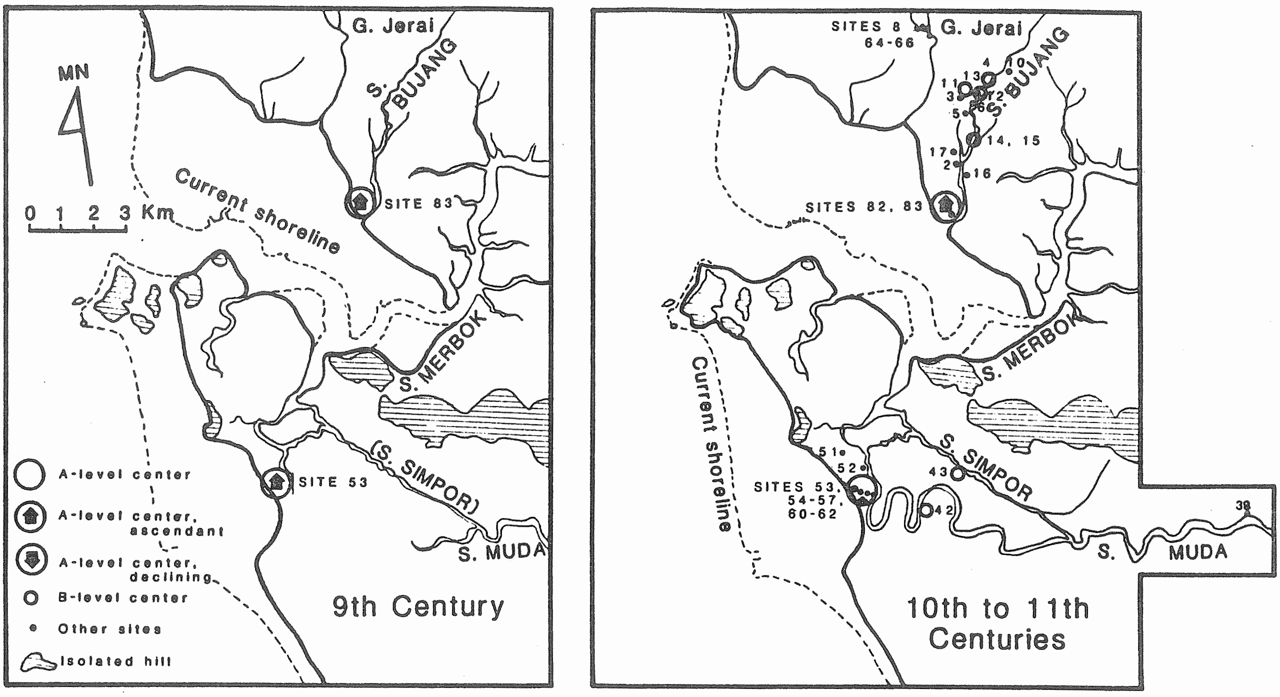
The need to be located beside rivers or the coast eventually meant that Kedah's main centers had to shift locations at least twice during the early historical period; the dates for these shifts are suggested by dateable tradewares at the centers, and at sites on now-closed river routes. Similar shifts may be suggested for the area around Satingpra, where Patthalung, Satingpra, Nakhon Si Thammarat, and Pattani all functioned at various times as coastal trade centers.

Kedah's main, A-level trade center shifted through time from Kg. S. Mas to Pengkalan Bujang and back again to Kg. S. Mas, with Kg. Sireh finally taking over briefly as the main center. Initially (Figure 4), both Kg. S. Mas and Pengkalan Bujang had access to the Selat Melaka; Kg. S. Mas thrived somewhat earlier than Pengkalan Bujang, but both prospered in the maritime trade. At some unknown date, the S. Merbok was captured by the southward-flowing S. Muda some distance inland, east of the Merbok estuary. Although the beheading of the huge Merbok estuary could have hurt Pengkalan Bujang's ability to acquire forest goods, several streams navigable at least by raft still emptied into the estuary and remained in use, as indicated by sites still occupied in upstream areas (Figure 5). Furthermore, as described in the following paragraph, the Muda drained into the Merbok estuary at this point. Pengkalan Bujang remained an important trade center through the 13th century (Figure 6), after which it became landlocked behind a now-widening coastal plain (Figure 7), and was abandoned.

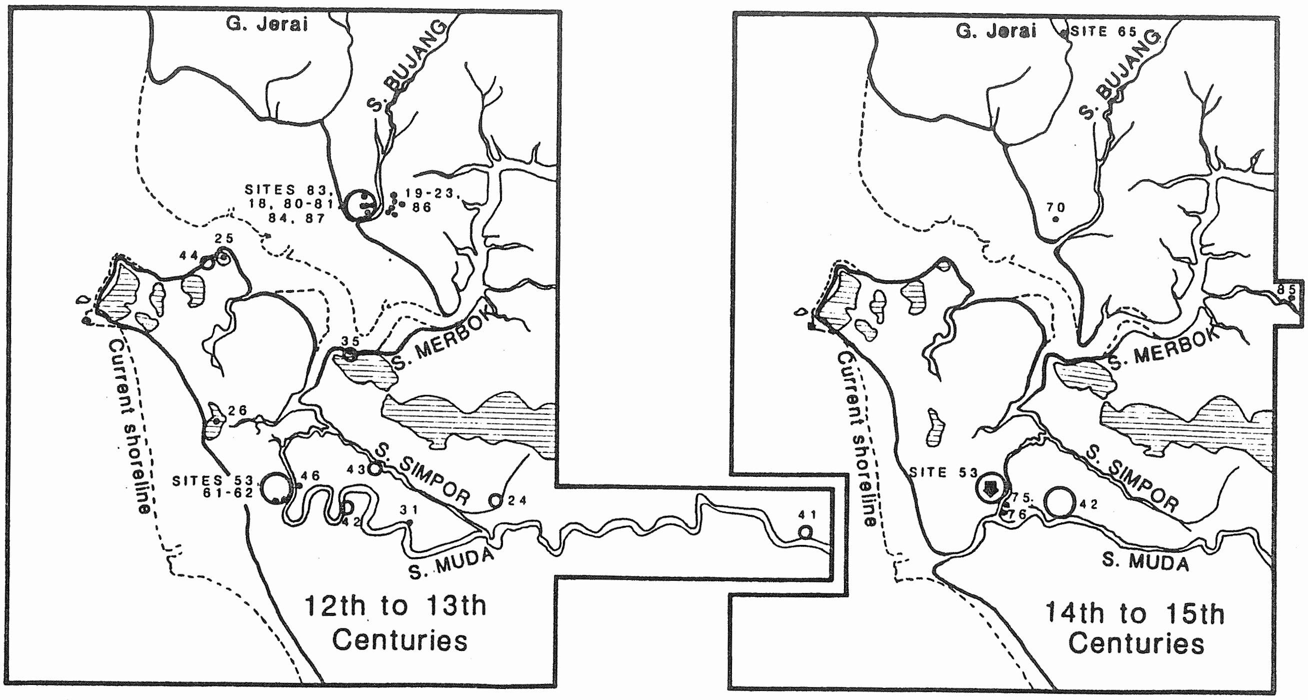
Kg. S. Mas became isolated inland from the coast by the 12th century. It now had access only to the S. Terus, since the S. Muda was unable to break through several bands of beach ridges to reach Kg. S. Mas and the Selat Melaka until the 14th century. Until then, the S. Muda turned northward along the S. Simpor, inland behind Kg. S. Mas (Figures 4-6), and actually drained into the Merbok estuary – Pengkalan Bujang's territory. In the 12th and 13th centuries, the importance of Kg. S. Mas was greatly diminished, while Pengkalan Bujang remained very active. The S. Simpor eventually infilled with sediments and no longer connected the S. Muda with the Merbok estuary, although the tidal S. Terus still connects the two.

By the early 14th century, the S. Muda broke through the *permatang* at Kg. S. Mas and began to flow directly into the Selat Melaka (Figure 7). Kg. S. Mas once again had fairly direct coastal access, and had additionally a far larger riverine network to exploit than Pengkalan Bujang. Pengkalan Bujang passed out of use, and Kg. S. Mas was once again the main trade center for a time. Kg. Sireh, inland on the S. Muda, also benefited from the S. Muda's new direct connection with the Selat Melaka.

A similar situation, with dramatic coastal progradation, river captures, and resultant site relocation, has been reported for the S. Dinding/Beruas area in Perak, south of Kedah. Here, *permatang* occupied by early historical-period sites have been plotted several kilometers inland from the Selat Melaka shoreline (Zainol bin Haji Husin 1992:Figure 1). Relict river channels suggest sequential river capture and southward river migration, which apparently resulted in the



Figures 4 and 5: Ninth- through eleventh-century sites and shorelines, south-central Kedah.



Figures 6 and 7: Twelth- through fifteenth-century sites, Kedah.

sedimentary infilling of the old estuary beside Beruas, the old capital, and the abandonment of the site around AD 1511.

Similar changes may help to explain the seemingly anomalous inland locations of other sites once involved in maritime trade – such as the sites at Chaiya, Takuapa, and Pattani in Thailand (Nik Hassan Shuhaimi 1993; Welch and McNeill 1989); and, in Malaysia, Jenderam Hilir in Selangor, and a Dong-son-style bell and other finds located 26 km upstream by the S. Muar in Melaka (Adi bin Haji Taha 1983; Batchelor 1977; Leong 1991, 1993).

Additionally, evidence for landscape change may help reinterpret the sociopolitical roles played by the sites involved. To summarize three important points discussed here: first, neither Kedah's nor Satingpra's sites were supported primarily by foreign-introduced, plain-based irrigated agriculture; the evidence suggests instead that Malay dryland cultivation in the hills inland supported these sites. Second, foreign control need not be invoked if the evidence for a foreign-dominated economic support base is contradicted; Kedah's and Satingpra's sites appear to have been entirely focussed on the maintenance and control of trade, which has historically been conducted by, and controlled by, Malays and other Southeast Asian coastal groups. Finally, the complex polities that emerged in Kedah and Satingpra, rather than being relatively unimportant imitations of the large inland agrarian states, took their own unique and local forms, growing out of the networks and hierarchies needed to maintain and control this trade.

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