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World Archaeology Volume 16 No. 1 Coastal archaeology
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Coastal landforms and archaeology in the Hong Kong archipelago

William Meacham

Recent archaeological investigations in Hong Kong have revealed that a marine-oriented population occupied coastal sites, principally back-beach sand dunes and elevated sand bars, from Middle Neolithic times (c. 4000 B.C.) down to the founding of Chinese clan villages in the Sung period (A.D. 960–1179). Although there appears to be a major break in the archaeological record from around 400 B.C. to A.D. 300, similarities in site selection and in many facets of life suggests either continuity in population or recurrence of a coastal life-style, or both. The question of a local evolution of population from prehistoric to early historical times is of major importance in South Chinese archaeology and history, for it bears on the emergence of such sub-ethnic groups as the Cantonese, Hoklo (Fukienese), and Hakka. For Hong Kong as a specific area, the 700 year hiatus is a major issue; it may derive in some unknown way from the impact of the Ch'in-Han southern expansion in the third to second centuries B.C. Equally puzzling is the reappearance of coastal occupants at around A.D. 300–400, in conditions very similar to the prehistoric inhabitation: no discernible villages or fixed habitation sites, hardly any penetration of the interior, and virtually every available beach site utilized.

Coastal evolution and site selection

Almost from its inception in the 1920s, archaeology in Hong Kong has focussed on the beach sites. Isolated adzes had been found on lower slopes near the sea, but this was, in the words of Hong Kong's first archaeologist Professor J. L. Shellshear (in a letter to John Walden dated October 27, 1952), 'before discovering the richness of the sand banks' – a bitter-sweet event occasioned by the destruction of many deposits by commercial sand merchants. Much debate has been generated since the 1920s on the age and manner of formation of the sand banks, the possible indication they give of former higher sea levels, and the degree of disturbance by typhoons. The obvious attractions of the sites – protected bays with good anchorage, or a calm lagoon behind the sand bar; the availability of fish and shell foods – were noted by early archaeologists, but only recently have paleo-environmental studies been conducted in a multi-disciplinary framework specifically on archaeological sites and their environs. The questions raised in earlier debates on the geomorphology, age and significance of the raised sand bars have been satisfactorily answered, but, inevitably, newer and more difficult problems have presented themselves.

World Archaeology Volume 16 No. 1 Coastal archaeology
 0043-8243/84/1601-128 $1.50/1

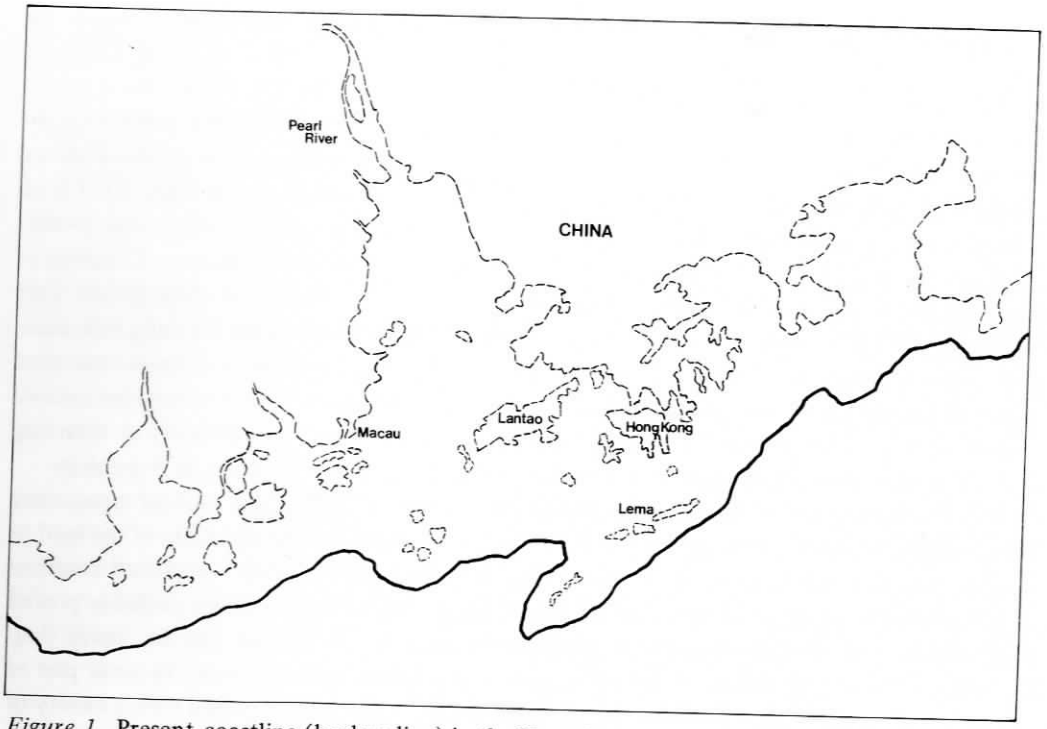

Figure 1 Present coastline (broken line) in the Hong Kong-Macau area. The coastline at 10,000 BP is estimated (solid line) based on the present 25 m sub-marine contour

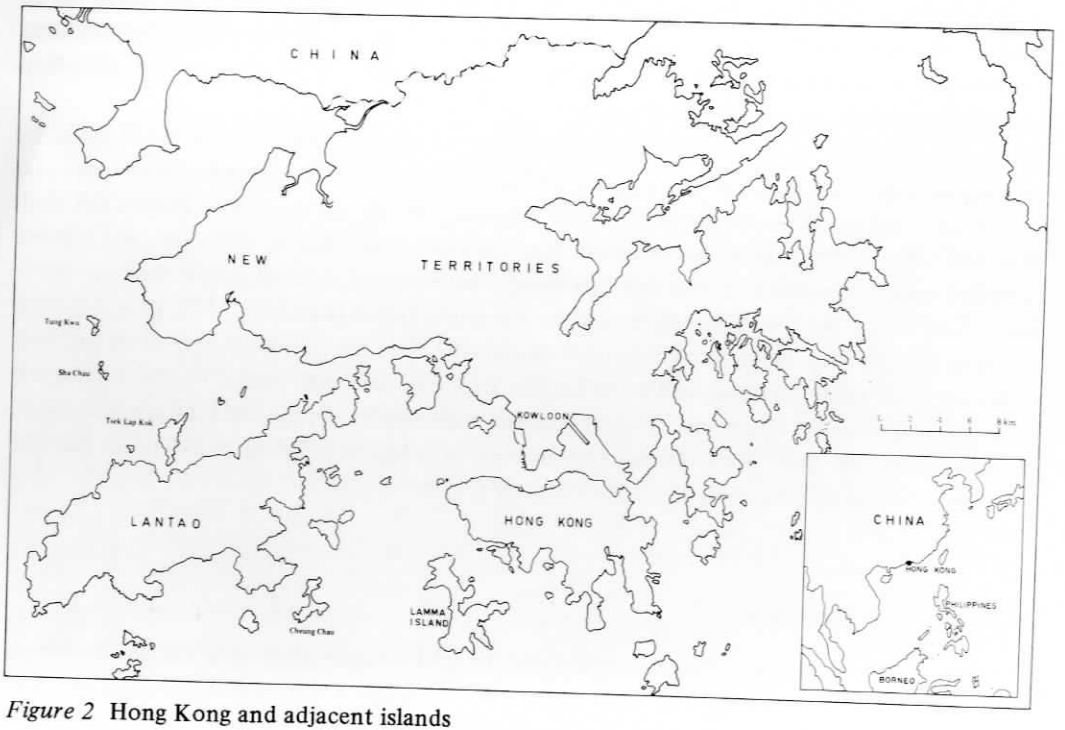

Figure 2 Hong Kong and adjacent islands

Among these more recent and more refined queries are *not*, in this writer's opinion, the questions of the origins of the earliest inhabitants of the coastal region of Hong Kong and South China, or of the immediate environmental changes which literally carried these people into the region. Prior to the stabilization of the sea at its present level around 4000 B.C., the floating, coast-hugging population of the area were probably utilizing sites on the exposed continental shelf. From the lowest levels of Holocene beach sites (i.e. post-4000 B.C.) from central Vietnam to Shanghai, the evidence is consistent and clear – a population was present with well developed Neolithic culture, relying heavily on marine exploitation and capable of extended sea travel. It would appear more a deduction than a surmise that these people were evolving a particular 'Marine Neolithic' way of life as the sea level rose during the early Holocene, perhaps even mainly *because* of the rise of sea. Certainly the environmental changes associated with the inundation of the coastal shelf had an intimate relationship with the material cultural change of the same period, stimulating (especially in the need for transport) or retarding (perhaps in the provision of ample new resources for gathering) improvements in technology.

From the viewpoint of an agriculturalist or village dweller, Hong Kong's inland topography is relatively inhospitable and uninviting and there is a 'tendency for the physique of the land to turn its inhabitants to coastal areas' (So 1968). But the present, highly crenellated coastline with sheltered bays, areas of mud flat and marsh, and small stream-fed valleys probably proved highly inviting to the early Yueh boat people who, according to Chinese sources, 'made their homes upon the water'. Many of the bays and tombolo islands created during the latter part of the Holocene transgression provided shelter in all weather, and were endowed with a variety of shellfish, crabs, and edible seaweeds, in addition to the land fauna and flora for the gathering. The shallow waters of the archipelago also served as spawning grounds for fish in enormous quantities. Remains of thousands of marine catfish and 'headgrunt' (*Pomadasys*), many 80 to 100 cm long when captured, have been unearthed at Hong Kong sites, and giant shell middens dot the coasts of South China and Taiwan. Bones of deer, wild pig, bovids, dog and other land mammals are also common in coastal sites.

On the environment prior to the entry of the sea, at around 8000 B.C. for the Hong Kong region, there is little data, and no evidence of human occupation. Drillings and off-shore excavation for construction have revealed alluvial deposits beneath the marine sediments. Off High Island at −20 m below sea level the alluvium was dated to greater than 40,000 years, and yielded nuts and wood fragments mostly of oak (*Quercus*). The botanical remains suggest that the native vegetation would have been largely evergreen oak-laurel forest (Kendall 1975), though pollen evidence has yet to be evaluated. Other undersea alluvial clays have been dated (−20 m off Tsek Lap Kok to 25,000 years and −14 m in Lai Chi Kok Bay to 8,800 years), but environmental data on these deposits is lacking. Alluvial deposits with similar depths and C14 ages have been reported from the Pearl River Delta. The absence of artifacts is taken as evidence that the hunting-gathering forest population was extremely sparse.

Processes of site formation

The Holocene marine transgression is well dated, by C14 measurements on shells and mangrove wood fragments, taken from basal marine clays at −18 m to −9 m and yielding dates of 7,900 to 6,500 years B.P. Datings obtained from beach and sand bar sites all post-date 6,500 B.P., and

range in elevation from 0 to +9.5 m. (All elevations are given in relation to Hong Kong Principal Datum – a point 0.1 m below the lowest tide of the year; mean sea level is +1.2 m, and the highest tides reach +2.5 m.) There is, however, *no* evidence in Hong Kong of higher stands of sea in the Holocene. Indeed, there is much evidence for a stable sea level since c. 4000 B.C., as each cultural phase from Middle Neolithic to Bronze Age (c. 1500–400 B.C.) to Early Historical (c. A.D. 300–900) is represented by occupation levels in certain sites down to + 3.5 m, which is present storm beach level. That is to say, sand dunes above +3.5 m were not in normal times subject to wave action, and cultural material left on the surface was preserved intact and in situ. In a few sites, basal deposits below +3.5 m contain gravel and cobbles in sand, and potsherds rounded by water-action, probably representing wave-reworking of the initial surface deposit.

The dunes themselves were stabilized by vegetation, possibly by unintentional human agency, and/or by topography in the case of tombolos and sand bars forming against or on a saddle or low spur. The term raised beach, long in use in Hong Kong archaeology, is thus not applicable, as the sand formations were built up mainly if not entirely by wind action, are not clearly separated in most cases from the present beach deposits, and were never beaches themselves relating to a +6 m to +8 m stand of sea, as has often been suggested (So 1968; Berry 1961).

In a few instances, an inner and presumed older sand bar stands on the valley floor isolated from the present beach and storm beach, but sedimentation, drift and other causes of shoreline change are more likely to be responsible for the present topography than is a former high sea level. At Hac Sa Wan in Macau, Middle Neolithic deposits are found in the inner bar at +5.8 m, whereas at Tsek Lap Kok in the Pearl River Delta the same cultural phase is found on an inner sand bar at +3.5 m. Early historical occupation levels on inner sand bars vary in a similar fashion, with a +6.0 m surface at Pui O and +4.3 m at Tsek Lap Kok.

The so-called inner bars were most probably part of an extensive back-beach sand accumulation, and are remnants surviving from extensive stream cutting and erosion of these deposits. On many sites, the rate of deposition decreased sharply after the maximum (see below), and shifts in wind direction or velocity, the volume of stream discharge, and off-shore currents may have initiated the destruction of the dunes. It is evident that the cultural deposit survived in the present sites not only because of their elevation above the wave zone, but also because of the stability of the dunes themselves for the reasons previously cited. Many of the present sites are, however, only small remnants of extensive deposits at the time of occupation. Severe erosion of these sites due to modern human agency has also been recorded, since at least the 1920s, with a host of possible or known causes: commercial sand digging, clearing of vegetation, cultivation and subsequent abandonment, and changing currents due to land reclamation.

Although most sand dune sites in Hong Kong have similar topographic and vegetational features, rates of sand deposition have varied considerably through time and from site to site. With the higher sand bars of +8 m to +10 m, no more rapid sand deposit can be demonstrated through archaeological time, while the typical +5 m to +6 m sites also vary dramatically in the depth and nature of their cultural deposits – shown in Table 1 at the lowest point recorded, excluding hearths and constructions.

In some instances (e.g. Tsek Lap Kok), the sand bar has prograded over time at virtually the same elevation, while other sites (e.g. Lo So Shing) built up rapidly in one period (1.5 m in the Late Neolithic), with only slight deposit thereafter. At Pui O, however, some 2 m of sand has been deposited since the abandonment of the site at c. A.D. 900, compared with 0.6 m at Sham Wan in the same period, etc. Clearly, dating estimates based on deposition rates will be doomed to failure in most sand dune contexts, and perhaps in most other contexts as well!

Table 1 Elevations of cultural deposits in sand dune sites

Site	Present Surface	Early Historical	Bronze Age	Late Neolithic	Middle Neolithic
Tai Long, Lantao	9.3	8.6	8.0	–	6.6
Sham Wan, Lamma	9.2	8.7	8.2	8.0	5.9
Pui O, Lantao	7.9	5.5	–	–	–
Sha Chau	6.2	5.6	–	5.2	–
Chung Hom Wan, HK	6.1	5.4	5.1	4.7	2.1
Tung Kwu	6.0	5.5	–	5.0	4.6
Tsek Lap Kok	5.5	4.3	–	4.3	3.5
Lo So Shing, Lamma	5.3	5.1	4.8	3.3	–
Hai Dei Wan, Lantao	5.0	4.8	?	?	3.4

Paleo-environment and subsistence

While the attention of archaeologists has been directed mainly to questions of site formation and stratigraphy, studies in recent years have also been undertaken to determine the immediate environment around important archaeological sites. At Sham Wan on Lamma Island, scene of five seasons of excavation in the early 1970s (Meacham 1978), an investigation of the low-lying valley adjacent to the sand bar yielded data which put into sharp focus the general assumption of a lagoon-to-valley evolution during the occupation of sand bar sites. Assuming an original drowned coastline with intertidal rocky shores at 10,000 B.P. and a gradual rise of sea to its present level by 6000 B.P., Morton (1978) postulated early development of a mangrove inter-tidal mud flat behind the low sand bar, on the basis of shells obtained from 1.0 m to −2.2 m in the valley clay; these shells were subsequently dated to 4550-3970 B.C. Bivalves, and gastropods of the *Potamidae* family dominate the sample, indicating an estuarine or brackish water inter-tidal environment. From clay deposits at +0.6 m to +1.4 m in the same valley and dating to 2645-2120 B.C., quite a different ecological picture was presented; a low salinity marsh possibly with sedges and rushes surrounding seasonal pools and streams, with predominance of the low salinity gastropod *Sermyla*. In later historical times, the valley was used for wet rice cultivation. The possible role of man was noted in the abrupt changes in shell strata, perhaps representing clearing of the mangrove or draining the marsh for agriculture, with dramatic changes in the molluscan population. Wet rice cultivation has been reported from low-lying coastal sites in South China as early as 4500 B.C., and brackish rice was noted by Han observers (c. 100 B.C.) to have been grown in lowlands near the sea.

However, in spite of much indirect evidence, ethnographic analogy and hypothesizing on the possible importance of cultigens to the Neolithic coastal population, the archaeological record still suggests that fishing and marine collecting were the major sources of sustenance. Neolithic shell mounds along the coast have several metres of deposit, mainly bivalves, oysters and large marine gastropods. Fish, crab and lobster remains are also common. At two Hong Kong sites, extensive fish bone deposits have been found, in Late Neolithic and Bronze Age middens, consisting almost entirely of remains of *Pomadasys hasta* (headgrunt) and *Arius leiotetocephalus* (catfish). No satisfactory explanation has yet been obtained for the virtual absence of all other fish; both *Pomadasys* and *Arius* spawn seasonally in shallow coastal waters in extensive schools making them easy prey, but other local species do so as well, and it appears likely that only these two types were being captured.

Shellfish exploited for food included bay-enclosing rocky shore species (mainly the gastropods *Tegula* and *Nerita* and the bivalve *Barbatia*), lagoon mangrove mud flat species (notably the Pacific oyster *Crassostrea*), beach types (the surf clam *Atactodea*), and deeper water shellfish (the limpet *Patella*) which can only be collected by wading or shallow diving. The absence of large shell mounds in the Hong Kong area is thus far unexplained, as most bays occupied by man would have provided ample supplies of shell fish from the zones exploited simply on foot. Diving would have opened up a much wider food resource, and a few larger gastropods (*Turbo*, *Strombus*) may have been collected in this manner.

The technology employed for these fishing and gathering activities is reflected in the material culture by the 'oyster pick' chipped pebble tools and the notched or perforated net sinkers. Tanged bone and stone harpoon points are found, but undisputed fish hooks do not appear until the Bronze Age. The presence of Middle Neolithic sites on remoter islands and beaches is taken as evidence of travel by boat by at least 4000 B.C., and probably much earlier. Remains of canoes have been found near Hangchou and dated to c. 1000 B.C. From literary sources (c. 100 B.C.) it is known that the Yueh people of the South were especially adept at naval warfare, had multi-tiered boats for their chieftains, had excellent communications by water; data suggesting a lengthy evolution of sea travel.

It is probable, however, that much of the coastal exploitation technology as suggested by ethnographic analogy, is not reflected in the archaeological record. These techniques might have included bamboo stake fences across tidal inlets, fish poisons, and sophisticated netting methods involving several boats. It is also quite likely that land-based economic activities had a greater importance than presently acknowledged. One possible indication is seen in recent results of stable carbon isotopic analysis of human bone from a Middle Neolithic stratum at Sham Wan (Chisholm and Shutler n.d.), with an indication that the particular individual measured obtained only 30 per cent or less of his dietary protein from marine sources. This finding contrasts sharply with the presumed diet of coastal inhabitants elsewhere, notably those of British Columbia in whom a 90 per cent marine protein intake is calculated (Chisholm *et al.* 1983), but it lends credence to the claim that rice had already, by 3000 B.C., become the staple food even for the coastal fishing population of South China. Other Hong Kong samples of human bone are currently being analyzed for corroboration, along with samples from local herbivores and fish to confirm the C-13/C-12 ratios in the likely terrestrial and marine dietary sources of the early inhabitants.

Conclusion

Rather intensive archaeological investigations of recent years in the limited coastal territory and islands of Hong Kong have shed much light on the mechanics of site formation in beach and other coastal settings. The post-Pleistocene rise of sea level is seen as a highly important factor in the development of Early Neolithic marine-exploiting populations along the coast of the continental shelf, especially in increased mobility, site selection, adaptation to resources in changing ecological conditions, and in development of the material culture. No evidence of former higher sea levels has been found, but extensive sand dune deposits are believed to have existed in the vicinity of the present sites, which survive as remnants of the earlier topography. The evolution of contiguous zones from shallow lagoon or inter-tidal mud flat to fresh water marsh to rice paddy has been demonstrated and partially dated, suggesting possible man-land

relationships at various times in the occupation of sand dune sites. Finally, the question of prehistoric diet has been approached from the perspectives of the resources available, the archaeological record, and the direct examination of bone collagen.

There is, certainly, every indication that the neolithic inhabitants of coastal regions were extremely well adapted to the exploitation of their environment – in certain respects more so than the neolithic village agriculturalist. Though perhaps not directly involved in the development of food production, peoples of the marine neolithic way of life did nevertheless contribute significantly to the technology and advance of civilization through their refinement of sea travel and communications, so important in later trade, and of course through their fishing technology. I suspect that they may also have made progress in small and long since forgotten ways to harness the productivity of the sea – a revolution still decades if not centuries beyond the grasp of modern man.

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Abstract

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Coastal landforms and archaeology in the Hong Kong archipelago

Most prehistoric and early historical sites (4000 B.C.–900 A.D.) in Hong Kong occur in beach dune deposits 4 to 8 m above sea level. Surveys and stratigraphic evidence indicate that the

deposits formed by wind action, coupled with the stabilizing activities of man and vegetation, and did not result from a former higher sea level. Geological investigations of low-lying areas around the sites indicate an evolution from lagoon to tidal mud flat to brackish water marsh. Evidence regarding subsistence in these coastal areas and at sea suggests extensive reliance on shellfish and fish as food sources, but preliminary results from bone collagen analysis contradict this notion.