

## ARCHAEOLOGICAL INVESTIGATIONS AT BUKIT TENKORAK AND SEGARONG, SOUTHEASTERN SABAH

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This report is an expansion of the brief description of the site of Bukit Tengkorak presented in a recent issue of *Antiquity* (Bellwood and Koon 1989). Fuller details of the artefacts from the site are here presented, together with an account of additional minor investigations in the Segarong Peninsula.

### BUKIT TENKORAK

The rock shelter complex of Bukit Tengkorak, which lies 5 kms south of Semporna (Figures 1 and 2), was test excavated by a Sabah Museum team under the direction of Peter Koon and the author for a period of 8 days in late January 1987. The shelters are formed amongst large boulders which lie just below the summit of an eroded volcanic crater remnant of Pliocene age. This surviving crater remnant rises to about 130 metres above sea level in the form of a partially cliff-girt mass of breccia, and is separated from the Sulawesi Sea by a strip of drained mangrove swamp about one kilometre wide. At the time of occupation of the complex, between 2000 and 3000 years ago, it is likely that the crater remnant was either an island just off the coast, or near the end of a promontory of raised coral limestone and alluvium (see Figure 2). No systematic geomorphological investigations were undertaken around the hill in 1987, but the very high density of marine fish bones in the archaeological layers indicates that the inhabitants had easy and continuing access to the sea. The many coral reefs and the rich marine resources offshore have been described in detail by Sather (1985; Map 3) with respect to modern Bajau Laut exploitation.

The site name 'Bukit Tengkorak' ('Skull Hill' in Malay) is a recent one according to informants, and refers to the finding of a human skull believed by local people to date from World War II. This skull is kept in a Semporna school and was not examined by the research team. There is no reason to doubt its recency, since there is little evidence from the research reported here that the location was ever used for human burial in prehistoric times. The name of the hill until c.1953 was 'Bukit Kabogan', and the 1:50,000 map (Malaysian Directorate of National Mapping, sheet 4/118/11) refers to it as 'Hood Hill'. Bukit Kabogan is thus the

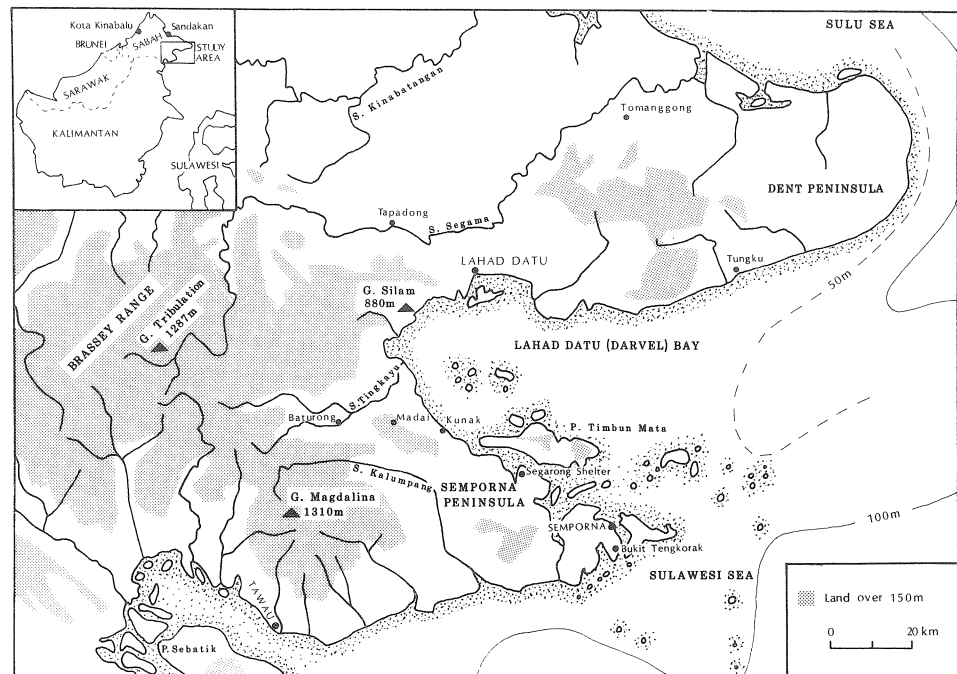
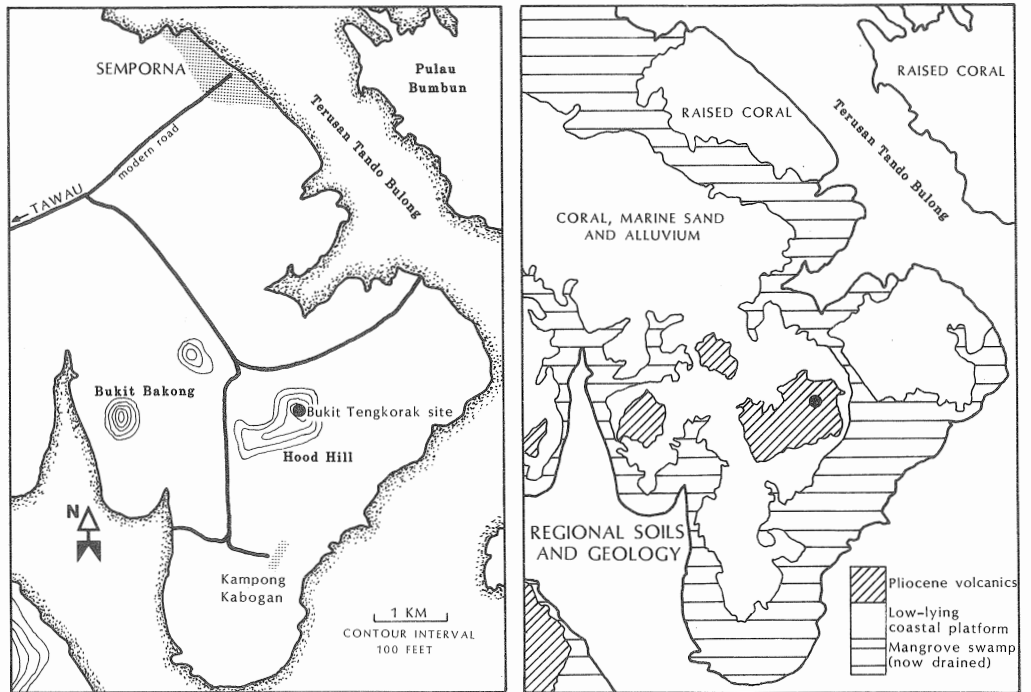


FIGURE 1: SOUTH-EASTERN SABAH, SHOWING SITES INVESTIGATED BY SABAH MUSEUM TEAMS BETWEEN 1980 AND 1987 (BATURONG, TINGKAYU, MADAI, SEGARONG SHELTER, BUKIT TENGGORAK). Source: Malaysian Directorate of National Mapping, 1:760,000 Sabah sheet, 1980.

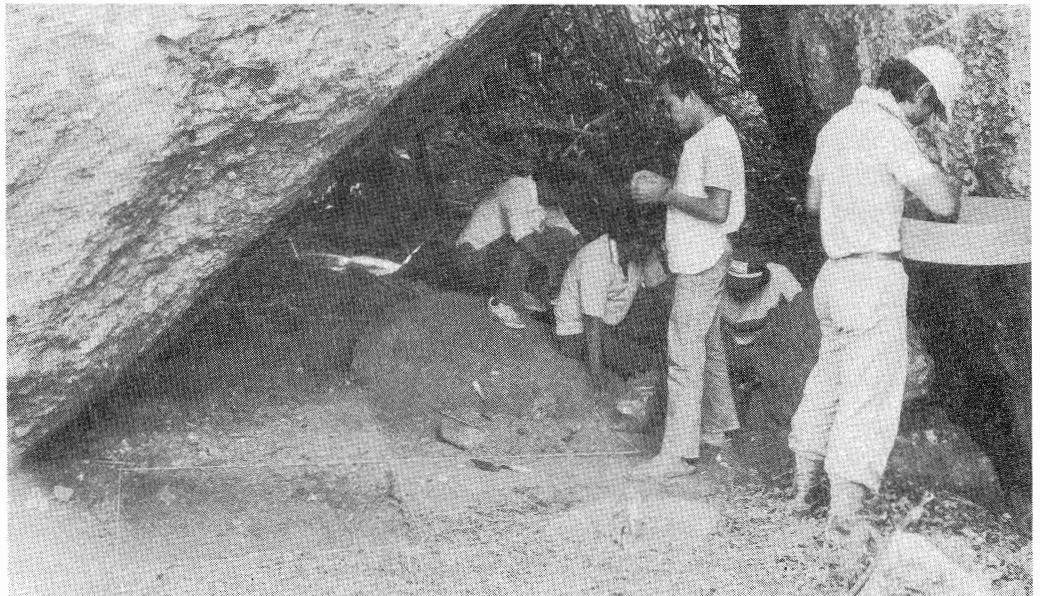
traditional name of the site in the local Southern Sama ('East Coast Bajau') dialect (King and King 1984; Sather 1984). There is a Kampong Kabogan about 2 kms to the south.

Some idea of the layout of the Bukit Tengkorak shelter complex can be gained from Figure 3. Between the western and eastern summit rocks, which both tower vertically above the shelter zone, there lies a narrow strip of gently sloping ground dotted with massive boulders of volcanic breccia which rise to 3-5 metres above ground level. These boulders have clearly tumbled and fallen together from a now-vanished portion of crater rim between the two summit rocks, and several rock-shelters occur beneath them. Of those shown on Figure 3, Shelters 3 and 4 are very small, and despite surface scatters of potsherds there are no indications that they contain archaeological deposits. Shelter 3 is only about 50 cms high.

Shelters 1 and 2, however, which were discovered in 1987, contain archaeological deposits up to 1 metre deep. The discovery of these shelters came as quite a surprise, because when the site was first visited in 1984 we only walked around the base of the hill, where a surprising density of sherdage was visible on the ground surface. At that time it was suspected that the



**FIGURE 2: THE LOCATION AND ENVIRONS OF BUKIT TENKORAK (HOOD HILL).** Sources: Malaysian Directorate of National Mapping, 1:50,000 Series, sheet 4/118/11. Soils and geology from Kirk 1962; Paton 1963.



**PLATE 1: BUKIT TENKORAK SHELTER 1 FROM THE EAST.** The excavation of square O32 has just commenced in the foreground.

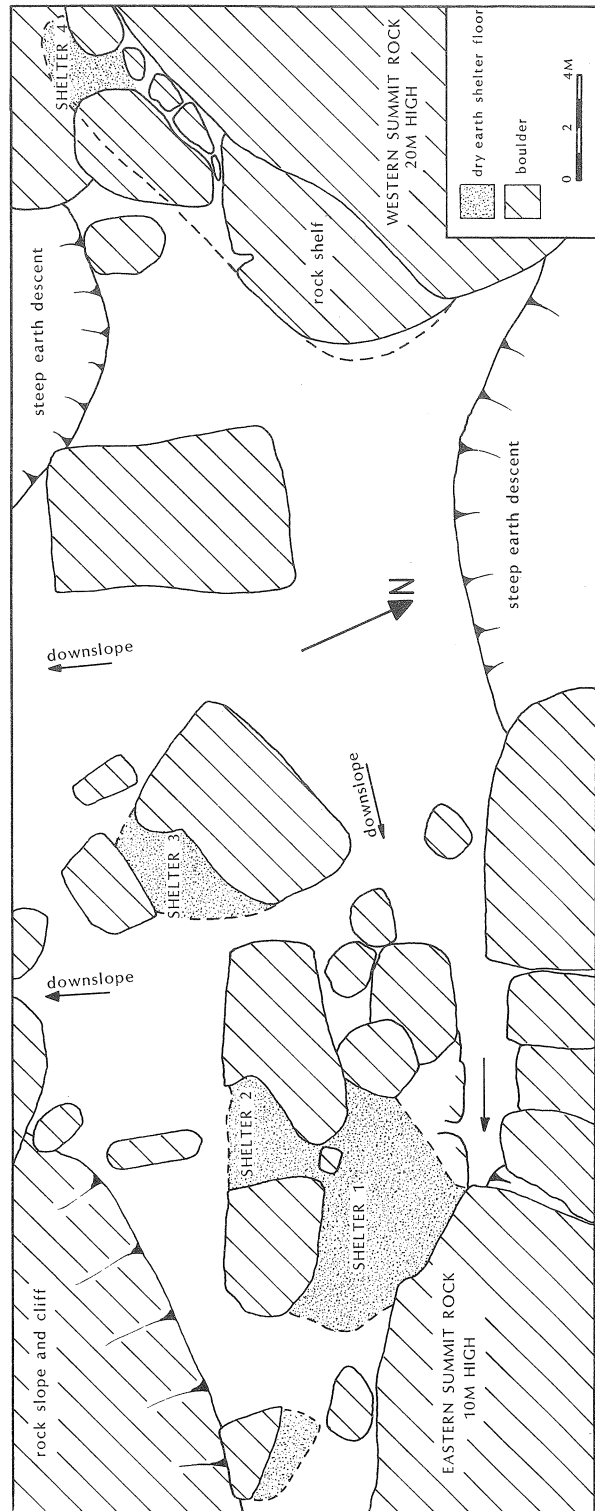


FIGURE 3: THE LOCATIONS OF THE BUKIT TENGORAK ROCK SHELTERS, FROM A PLANETABLE PLAN MADE IN 1987



boulders of Bukit Tengkorak probably sheltered jar burials of the Early Metal phase, but no time was available for a detailed search. It was only with the discovery of the shelters on top of the hill in 1987 that the source of all this sherdage became obvious; it has simply fallen down the cliffs and steep slopes which form the flanks of Bukit Tengkorak, through a vertical height of well over 20 metres. Much of this material was probably thrown down during occupation, while some of the upper deposits of the shelters, particularly Shelter 1, have also been eroded away around their edges. The whole process was doubtless assisted by disturbance of the deposits in recent times.

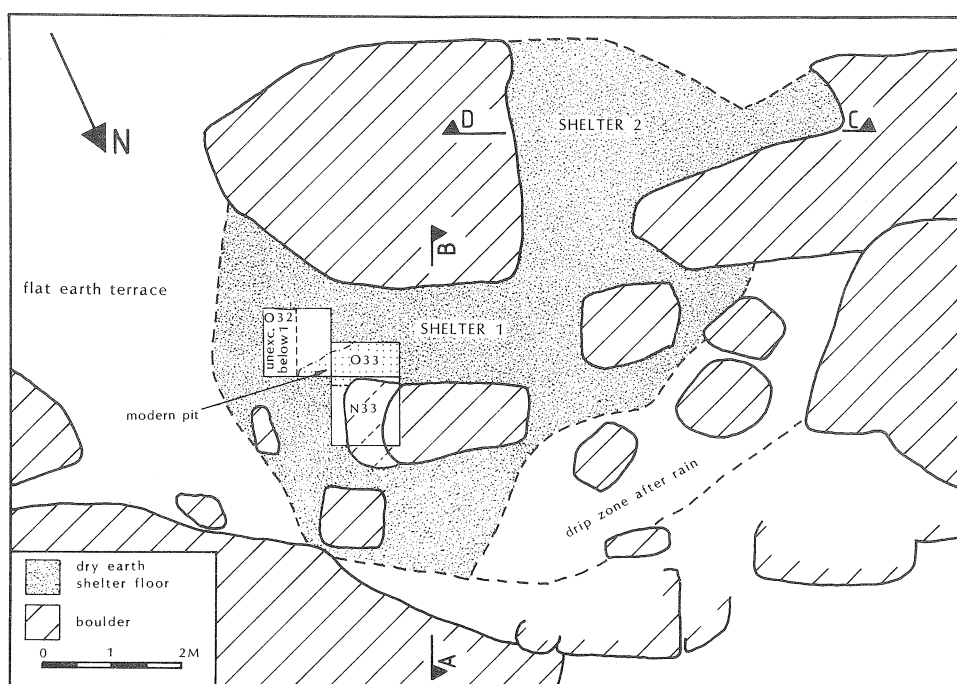


FIGURE 4: BUKIT TENGGORAK SHELTERS 1 AND 2, SHOWING THE EXTENT OF THE MODERN PIT IN SHELTER 1. Square O32 was only excavated through layer 3 in its western half.

Shelter 1 (Plate 1, Figures 4 and 5) has been formed where a large boulder leans against the base of the 10-metre cliff of the eastern summit rock. It offers a floor area, suitable for sitting or standing, of about 10 square metres, and the archaeological deposits appear to extend outside on to a flat open area in front of its eastern end. The shelter is open at both ends and tends to be penetrated by cold easterly or westerly winds during squally weather; at such times the inhabitants may have moved into the smaller but better protected Shelter 2. It is possible to crawl from one shelter to the other without going out into the open. When discovered, both shelters had earth floors strewn with prolific quantities of sherds, bones and shells, and these high densities obviously reflect the washing or blowing out of soil matrix, as well as recent disturbance. The outer parts of Shelter 1 also become quite wet with drips during heavy rain, and rain spray can blow right through the shelter from one end to the other.

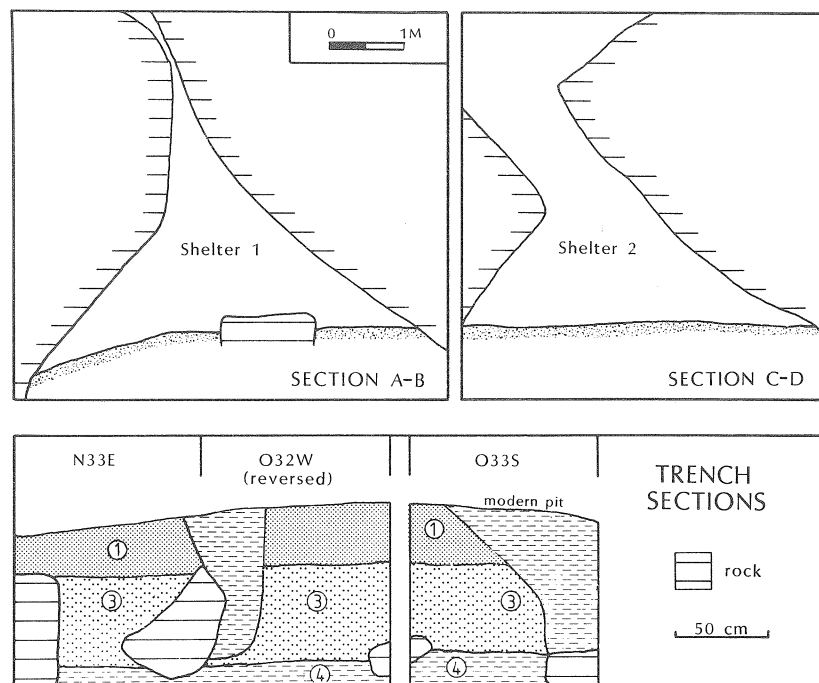


FIGURE 5: CROSS-SECTIONS OF BUKIT TENGKORAK SHELTERS 1 AND 2 AND TRENCH SECTIONS FROM THE JANUARY 1987 EXCAVATION

A total area of 2.5 square metres was excavated inside Shelter 1 (Shelter 2 was not excavated), with one-square-metre units being identified by letter-number combinations as shown in Figure 4. Square N33 was mainly occupied by a large boulder which expanded horizontally below ground level to occupy most of its area, and owing to shortage of time only half of square O32 was excavated through the lower cultural layer (layer 3). Much of square O33 was disturbed. The area excavated to the base of undisturbed cultural deposits was a little under one square metre, but this is sufficient to give a fairly accurate sample of the site sequence and cultural contents. Most of the site remains intact for future research. The deposits are alkaline (pH 8.5-9) and very dark grey in colour; the natural matrix is derived from decomposition of the soft volcanic breccia, but its volume has been augmented by hearths and humanly-deposited refuse.

The basic stratigraphy of the site is illustrated in Figure 5. Layer 1, an undifferentiated grey soil (5YR 3/1), has suffered from a fair degree of modern disturbance in its top 10 cms, but beneath this it seems to be relatively compacted and undisturbed in N33 and O32. However, it has suffered massive disturbance in O33 and part of O32, where a large modern pit (called feature 2 during excavation, even though it may technically postdate most of layer 1) has destroyed much of the original stratigraphy. The extent of this modern pit, perhaps the result of a treasure hunt, is shown in plan and section in Figures 4 and 5. Since it was recognised during excavation its existence does not affect the integrity of the results presented in this

paper, although it was not clear until radiocarbon dates were received that the pit was completely modern. Its contents, as might be expected, were a complete mixture of artefacts from layer 1 and layer 3 sources.

Layer 3 is the main stratified cultural deposit in the site, and is formed of lenses densely packed with artefacts, fishbones and shells in a matrix of yellowish brown ashy lumps which have clearly resulted from the use of the shelter as a locus for cooking. These midden lenses are up to 5 cms thick, and are interstratified with bands of soft brown soil, perhaps representing material brought in to the shelter from time to time to cover the ash. Layer 3 sits on layer 4, the archaeologically sterile and pre-human earth deposit (10YR 4/3) of the shelter, which in turn grades downwards into a mass of boulders. No attempt was made to dig through this, but there seems little reason to suspect earlier occupation given the restricted nature of the site.

Since layers 1 and 3 are sharply differentiated in colour, texture and other visible features it is possible that the site was abandoned for a short time between them, unless of course the differences are post-depositional (which seems unlikely) or reflect aspects of site function and use. Insufficient data are available to solve this problem, but it is worth mentioning that the artefact analyses, to be discussed in more detail below, do reveal considerable differences between the two layers in terms of pottery decoration and the occurrence of obsidian. It is possible, therefore, that they represent chronologically-separate stages of occupation, presumably by a single cultural group. In cultural terms the archaeological materials from layer 3 can legitimately be referred to as 'Early Phase', and the contents of layer 1 are likewise referred to as 'Late Phase'. Feature 2 has Early and Late Phase materials mixed, as do the surface collections<sup>1</sup>.

During excavation, artefacts were bagged separately from 5 cm levels within each layer, and all material was sieved through 1.5 and 2.5 mm meshes (a 5 mm mesh used at the beginning of excavation was quickly rejected as too coarse). Although a number of soil samples were subjected to flotation in the Sabah Museum, none contained recognisable plant remains apart from charcoal. Since all of Shelter 1 suffers from periodic dampness it seems most unlikely that any uncharred plant materials could have survived, although better results might one day be derived from excavation in the better-protected Shelter 2. Analyses of fish and other animal bones from Shelter 1 are in progress.

#### Dating

All radiocarbon dates from the 1987 fieldwork are listed in Table 1. Seven are from Bukit Tengkorak, and four of these are directly relevant for dating the deposits. Of the other three, two (ANU 5772 and 5773) are modern, and sample ANU 5771 evidently had too little charcoal to give a reliable determination. The three charcoal dates ANU 5768, 5769 and 5770 all date layer 3; there is some degree of inversion between the last two, but not enough to arouse too much suspicion of disturbance<sup>2</sup>. If the three dates are taken at their one sigma limits then layer 3 has an overall timespan between 2935 and 2049 BP. The *Tridacna* shell date ANU 6544 clearly fits well within this range, and as will be suggested below this piece was probably disturbed out of layer 3.

LAB. NUMBER	CONVENTIONAL AGE BP	CALIBRATED AGE BP*	MATERIAL	NOTES
ANU 5773	145.4±2.5%M	-	charcoal	Bukit Tengkorak, 032, layer 1, 0-5cms.
ANU 5772	138.4±4.8%M	-	charcoal	Bukit Tengkorak, 032, layer 3, 45-50cms from top of layer. Originally thought to be a good basal sample for the site, but has clearly been disturbed by the adjacent feature 2 (modern pit).
ANU 5771	1050±500	1420(959)550	charcoal	Bukit Tengkorak, 032, layer 3, 40-45 cms from top of layer. This sample was of very small size.
ANU 5768	2320±250	2749(2344)2049	charcoal	Bukit Tengkorak, 033, 70-75cms below shelter surface. This sample presumably comes from layer 3, but 033 stratigraphy was confused by the extent of feature 2 (modern pit).
ANU 5769	2700±110	2935(2787)2749	charcoal	Bukit Tengkorak, 032, layer 3, 0-5cms from top of layer.
ANU 5770	2330±170	2714(2346)2149	charcoal	Bukit Tengkorak, 032, layer 3, 30-35cms from top of layer. This sample is inverted at the one sigma range with respect to ANU 5769.
ANU 6544	2870±80	2420±87**	Tridacna shell (marine)	Bukit Tengkorak, surface of square 032. This specimen was presumably disturbed from layer 1 or layer 3 by the digging of feature 2 (modern pit).
ANU 5764	1190±70	740±78**	Anadara shell (marine)	Segarong Shelter, square C, 0-10cms.
ANU 5765	9640±110	***	Brotia shell (freshwater)	Segarong Shelter, square C, 0-10cms.
ANU 5766	790±70	768(698)675	wood	Hagop Bilo western shelter, Baturong. Wood taken from exterior of wooden coffin.

\* Cal BP dates (one sigma range) from the University of Washington Quaternary Isotope Laboratory Calibration Program, Revision 2.0 (Stuiver and Reimer 1986).  
 \*\* Marine shells have been calibrated according to the recommended oceanic reservoir correction for Australia given by the ANU laboratory (-450±35 years).  
 \*\*\* No precise data are available for calibrating freshwater shell, but dates run on modern samples from Sabah indicate that this determination may be too old, perhaps by 500-1000 years.

TABLE 1: RADIOCARBON DATES FROM BUKIT TENGGORAK, SEGARONG AND BATURONG, DERIVED FROM 1987 FIELDWORK. These dates are additional to those presented in Bellwood 1988.

No dateable charcoal samples were recovered from layer 1, but since the site contains no glazed ceramics, metals, or Indian-style beads of glass, agate or carnelian it is a reasonable assumption that this layer predates the mid-first millennium AD. This calculation is given support by the rarity of the Class 1 rim type so common during the early first millennium AD at Madai, only about 60 kilometres northwest of Bukit Tengkorak (Bellwood 1988; Chapter 11), and during the same period at Leang Buidane across the Sulawesi Sea in the Talaud Islands (Bellwood 1980a). In addition, a plain sherd collected from the surface of the unexcavated Shelter 4 was dated in 1985 by the ANU Thermoluminescence Laboratory to 2310 years BP.

Both layers in Shelter 1, taken together, can thus be dated with some confidence from the early first millennium BC to the early first millennium AD, and claims for greater precision without further excavation are unwarranted. The dividing line between the two layers can perhaps be placed sometime in the last 300 years BC.

#### ECONOMIC REMAINS

Economic remains from Bukit Tengkorak consist of shellfish and the bones of fish and mammals. Only the shellfish are described here. Species represented in the site, identified with the help of Chio Cheng Leng, are listed in Table 2. The only statistics presented here are those of weight; much shell is burnt and/or broken into small pieces (despite generally good preservation in the alkaline conditions of the site), and the effort of trying to reconstruct numbers for each species seemed unwarranted given the preliminary nature of the excavation. As one would expect, the bulk of the shell comes from the meaty estuarine bivalves *Anadara* and *Batissa*<sup>3</sup>, and bivalves were clearly favoured generally over gastropods for food. The use of shell for artefacts is described in a later section.

The distribution of food shells in the site shows little variation throughout layers 1 and 3. For layer 1 in squares N33 and O32 the average weight per 0.025 m<sup>3</sup> (i.e. a slice of soil 5 cm thick over 0.5 m<sup>2</sup>) is 954 grammes, whereas for layer 3 it is 705 grammes. Overall average per 0.025 m<sup>3</sup> through both layers is 768 grammes. There is therefore a slightly greater density of shell in layer 1, but this can perhaps be explained by removal of matrix by wind and rain rather than by any real variation in quantity of shellfish meat consumed over time. Layer 3, in addition, seems to contain lenses of clean soil without midden refuse, which would tend to reduce the overall concentration of shell in this layer.

Some idea of the proportional importances of the various species by percentage weight per 5 cm excavation spit in squares N33 and O32 is given in Table 2. It should be remembered that the area excavated is very small, so the pattern shown here is not necessarily fully representative of the whole site. Nevertheless, there are two interesting observations which can be made. One is obviously the minor importance of gastropods compared with the bivalves *Anadara*, *Batissa* and *Tridacna*. The second is the wide range of percentage weight values by 5 cm spit for these last three species, and this range does require brief discussion.

Although the percentage figures do not reveal the fact, it was my general impression when the shells were being weighed that the numbers of *Anadara* and *Batissa* varied little from spit

FAMILY	SPECIES	PERCENTAGE WEIGHT BY 5CM EXCAVATION SPIT IN SQUARES N33 AND 032		HABITAT (IF KNOWN)
		Average	Range	
<b>GASTROPODS</b>				
Cerithiidae	1. <i>Cerithium</i> sp.	4	1-12	sandy intertidal to reef (depending on species)
Cypraeidae	2. <i>Cypraea</i> sp.	under 0.5		intertidal reefs
Muricidae	3. <i>Chicoreus</i> sp.	3.5	1-8	tidal mudflats, mangroves
Neritidae	4. <i>Nerita</i> sp.	under 1		
Potamididae	5. <i>Telescopium telescopium</i> (L.)	under 0.5		tidal mudflats, mangroves
Strombidae	6. <i>Strombus</i> sp.	6	1-14	mudflat to reef (depending on species)
Terebridae	7. <i>Lambis lambis</i> (L.)	under 0.5		intertidal reefs
Turbinidae	8. <i>Terebralia sulcata</i> (Born)	under 0.5		sandy intertidal
	9. <i>Trochus</i> sp.	under 0.5		intertidal reefs
	10. <i>Lunella hecnivosus</i> (Tredale)	under 0.5		intertidal reefs
	11. <i>Turbo intercostalis</i> (Menke)	under 0.5		intertidal reefs
<b>BIVALVES</b>				
Arcidae	12. <i>Anadara antiquata</i> (L.)	29	5.70	intertidal reef flats
Corbiculidae	13. <i>Batissa violacea</i> (Lamarck)*	20	2.24	tidal mudflats, mangroves
Pectinidae	14. <i>Comptopallium (Pecten) radula</i> (L.)	under 0.5		
Pteridae	15. <i>Pinctada margaritifera</i> (L.)	under 0.5		sandy intertidal
Tridacnidae	16. <i>Tridacna gigas</i> (L.)	34		intertidal reefs
Veneridae	17. <i>Gafrarium pectinatum</i> (L.)	under 0.5	1-86	tidal mudflats, mangroves
	18. <i>Trachycardium alternatum</i> (Sowerby)	under 0.5		
<b>FRESHWATER</b>	(see descriptions in Bellwood 1988:133)			
	19. <i>Sulcospira/Brotia</i> sp.	1.7	1.4	freshwater streams
	20. <i>Balanocochlis</i> sp.	under 1		freshwater streams

\* this species may also include specimens of *Polymesoda (Galoina)* sp.

TABLE 2: THE REPRESENTATION OF MARINE AND FRESHWATER SHELL SPECIES IN BUKIT TENGGORAK

to spit. Were there no *Tridacna* in the site then both the former species together would probably account for 80 to 90 per cent of shell weight per layer, each being almost equal to the other in importance. The average percentage shell weights and ranges presented in Table 2 are highly skewed by the presence of large quantities of *Tridacna* shell in the site, mostly in the form of large heavy chunks which may possibly have been broken for industrial purposes after the meat was removed. Most of these chunks were concentrated in the bottom 20 cms of layer 3, where percentage weights for *Tridacna* ranged from 46 to 86 per cent of all shell per 5 cm spit. Many pieces also occurred in the upper part of layer 1 (25 to 42 per cent of shell weight per spit) and on the site surface, both locations which appear to reflect upthrow from layer 3 by the feature 2 modern disturbance. This circumstance is supported by date ANU 6544 for a surface piece of *Tridacna* shell, which has an age in the first millennium BC.

The concentration of large *Tridacna* individuals in the lower layer of the site suggests that they were common on the reef during the early years of occupation but soon became scarce, presumably as a result of exploitation. Although there can be no certainty, I suspect that the inhabitants of Bukit Tengkorak were the first in the region to exploit the offshore reefs which formed the habitats of *Tridacna*, and this may be a very important point for the culture history of this part of Southeast Asia.

#### POTTERY

The system used for classifying the Bukit Tengkorak pottery is based on that used previously for the Leang Buidane assemblage in the Talaud Islands (Bellwood 1980a), and for the Madai, Baturong and Tapadong assemblages from Sabah (Bellwood 1988, Chapter 11). The system is repeated here (with a few necessary additions) in its three basic divisions; vessel shape, rim shape, and type of decoration. No attempt is made to classify decorative motifs and no detailed observations have yet been made of pottery fabric, although most sherds are clearly sand tempered.

#### *Vessel shapes* (excluding appendages)

- A Simple restricted vessels
- B Dependent restricted vessels with composite (i.e. carinated) contours
- C Independent restricted vessels with inflected contours
- D Independent restricted vessels with complex contours (i.e. flasks with high narrow necks)
- E Simple unrestricted vessels
- F Unrestricted vessels with composite (i.e. carinated) contours

These forms are illustrated in Bellwood 1988: Figure. 11.1.

*Rim classes* (as Bellwood 1988:175, with additions)

- 1 Everted, indirect rims with three cross-sectional angles (see Bellwood 1988: Figure 11.2), typical of Leang Buidane and the Mature Atas Phase at Madai (first millennium AD). Virtually absent at Bukit Tengkorak.
- 2 Everted, unthickened and indirect rims with flattened lips. Typical of the Idahan Phase at Madai (c.400 BP to recent), and virtually absent at Bukit Tengkorak.
- 3 Everted, unthickened and indirect rims with rounded lips, on restricted vessels. The most common form at Bukit Tengkorak.
- 3(A) Everted, unthickened and indirect rims with rounded lips, on unrestricted vessels.
- 4 Inverted or everted direct rims, unthickened.
- 5 High, narrow flask necks, common at Leang Buidane and in the Mature Atas Phase at Madai. Not found at Bukit Tengkorak, although one flask body was found in layer 1 (Figure 9). A narrow neck is labelled as type 5 in Figure 6, but this is hardly a classic form.
- 6(A) Rims with marked external overhangs. Class 6 rims are typical of the Pusu Semang Tas jar burial site at Madai (Bellwood 1988:207-12) and do not occur at Bukit Tengkorak, but two variants distinguished as type 6(A) are shown in Figures 9 and 10.
- 7 Everted indirect rims with thickened triangular cross-sections.
- 7(A) Everted indirect rims with thickened rounded or beaded cross-sections.

*Decoration classes*

- a red slip on vessel interior
- b red slip on rim
- c red slip on exterior
- d simple tool incision and impression (including impressed circles)
- e multiple line incision (Raranganusa style; absent at Bukit Tengkorak)
- f paddle impression
- g lip notching and scalloping
- h carination notching and scalloping
- i deep vertical scalloping on a direct rim.

The pottery from Bukit Tengkorak is illustrated in Figures 6 and 7 (Early Phase), 8 and 9 (Late Phase), and 10 and 11 (surface of Shelters 1 and 2, and eastern summit rock). Figure 12



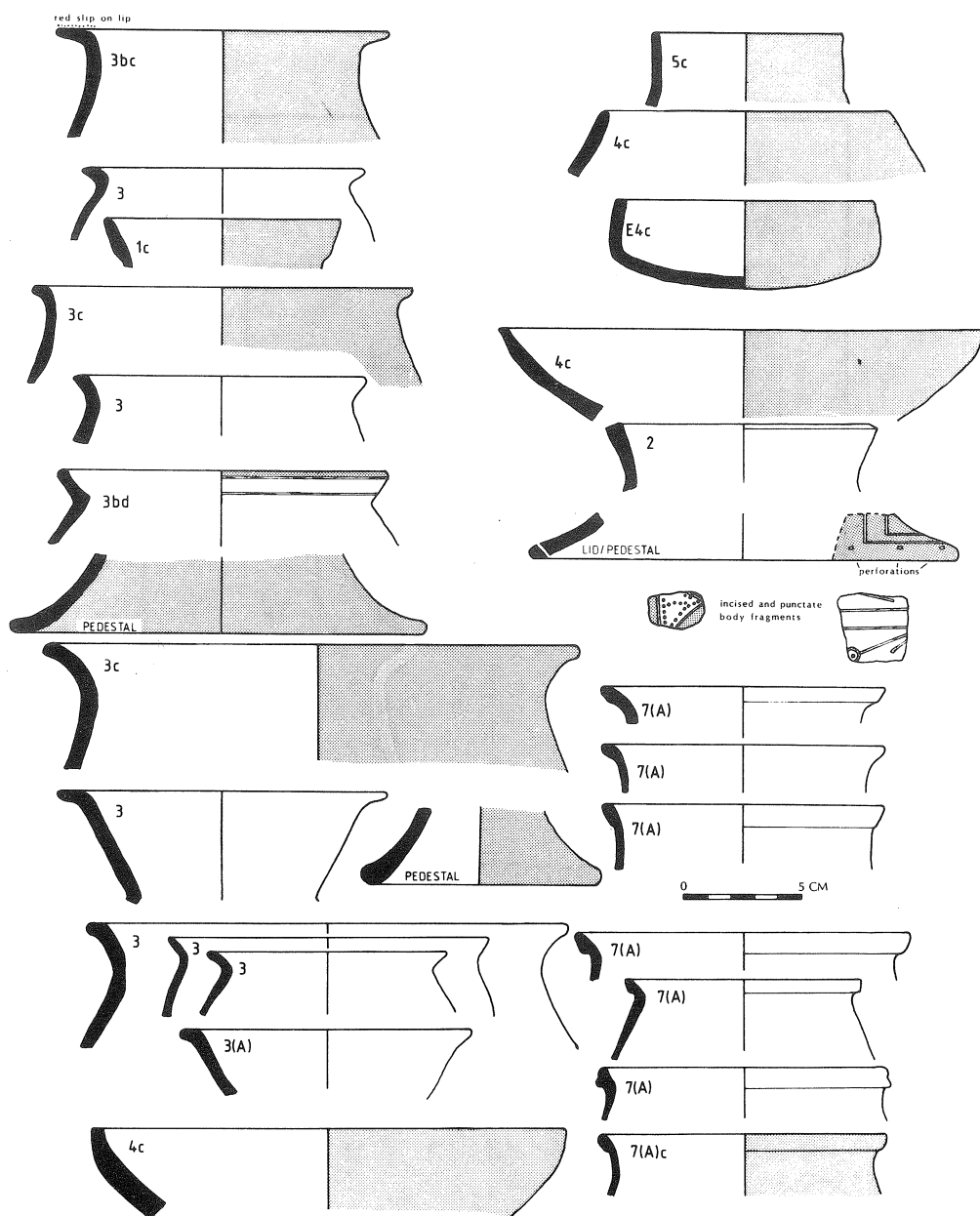


FIGURE 6: POTTERY FROM BUKIT TENGGORAK EARLY PHASE (LAYER 3). Stippling = red slip. For codes see text.

shows the percentage distribution of decorative and rim classes through the two phases. In a visual sense these figures are self-explanatory, but a few points of interest do merit some comment;

- 1 There is a dominance of red slip, virtually at the expense of all other kinds of decoration except for a little incision, in the Early Phase.
- 2 There is a relative efflorescence of decoration of all types, including lip and carination notching (but excluding red slip), in the Late Phase.
- 3 There is an absence of any clear differentiation between the two layers in rim classes, except for the Late Phase popularity of notching.
- 4 When the Bukit Tengkorak rim seriation is compared with those for Madai, Baturong and Tapadong (Bellwood 1988: Figure 11.31), it becomes clear that the virtual absence of class 1 and 2 rims<sup>4</sup> and the dominance of class 3 rims puts the site at the same time level as Agop Atas (MAD 1) layer 11a, that is basically prior to 2000 BP.
- 5 Figure 12 does not give details for vessel accessories, but it may be noted that ring feet or pedestals, and the feet and flanges which seem to have belonged to pottery stoves, are found in both phases. Lids, red-slipped flasks and spouts, on the other hand, seem to be found mainly in Late Phase and surface contexts, but it must be borne in mind that sample sizes from these contexts are much larger than for the Early Phase layer 3. The decoration of stoves by coarse cord-marking or fingernail impression seems only to have occurred in the Late Phase.

Some of the most important descriptive and comparative features of the Early and Late Phase assemblages may now be summarised.

#### Early Phase pottery

The Early Phase at Bukit Tengkorak has produced one of the most remarkable vessel-and-lid combinations to be recovered from a prehistoric context in Southeast Asia (Figure 7). They occurred in sherd form between 25 and 40 cms down within layer 3 in square O32. The lower vessel is incised with a repetitive geometric 'fence' or 'cricket stump' motif superimposed by patterns apparently stamped with an unusual wavy die, and the rim is slipped bright red. The matching lid has lines of joined circles stamped with dies of two diameters around its side, and identical circles forming a slightly different motif occur on the lip of the lower vessel. The lid also has zones of red slip around its lip and on its upper surface. The meticulous precision with which this vessel is decorated is paralleled to some extent in contemporary Lapita assemblages in the western Pacific, although there is no sign of the typical Lapita trait of dentate stamping in the Bukit Tengkorak site. Furthermore, since this vessel is unique in the site the possibility exists that it may be an import.

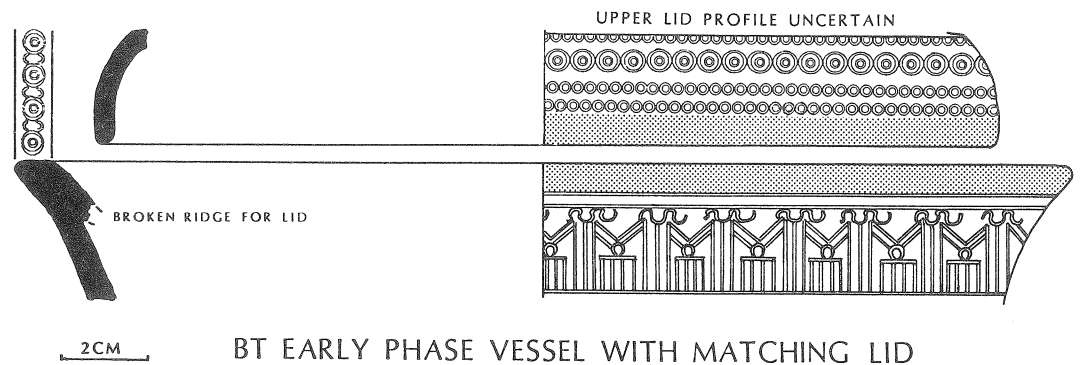


FIGURE 7: A DECORATED VESSEL WITH LID FROM BUKIT TENGGORAK LAYER 3 (EARLY PHASE). Designs are incised, circles are stamped, and stippling = red slip or paint.

The other Early Phase pottery from the site (Figure 6) is mostly plain or red slipped and without any other decoration apart from occasional incision or punctation. Cord-marking and carved paddle impression are absent, and vessels generally have thin bodies and fairly short rims. Not surprisingly, they are paralleled quite precisely in the Early Atas Phase assemblage at Agop Atas, Madai (MAD 1, c.2750 cal BP; Bellwood 1988: 178-9) and in the early pottery assemblage from the rock shelter of Leang Tuwo Mane'e in the Talaud Islands (c.4500 cal BP to c.2000 BP; Bellwood 1980a, Figure 19). These three assemblages all fit quite comfortably within a Neolithic tradition of plain or red slipped pottery reported through the Philippines and around the shores of the Sulawesi Sea (Bellwood 1985:222-7).

#### Late Phase pottery

The Late Phase pottery from Bukit Tengkorak reveals a number of important decorative innovations, and features which appear to be confined almost entirely to this phase include notching on lips and carination angles, perforations and deep indentations, cord-marking, and carved paddle impression. Red slip, incision and punctation continue from the Early Phase. Some of the most striking types of decoration seem to have been applied to lids and pedestals, perhaps because these would be more visible if looking down on to a pot from above. In its general decorative repertoire the Late Phase assemblage seems to fit well in a transitional position between the Bukit Tengkorak Early Phase pottery and that represented in the Mature Atas Phase (c.2000-1500 BP) at Madai.

The Late Phase assemblage also has many sherds which appear to have belonged to pottery stoves, similar to those still made today by local Sama-speaking people (a group which includes the Bajau Laut 'Sea Nomads'; see Sather 1984) for cooking in stilt houses or on boats (Plate 2). These sherds include flanges for vessel support and large flat side pieces (Figure 9 base), and vessel feet (Figures 8, 9 and 11). Some of the Bukit Tengkorak specimens have exuberant decoration which includes parallel lines of thumbnail or fingernail impression and

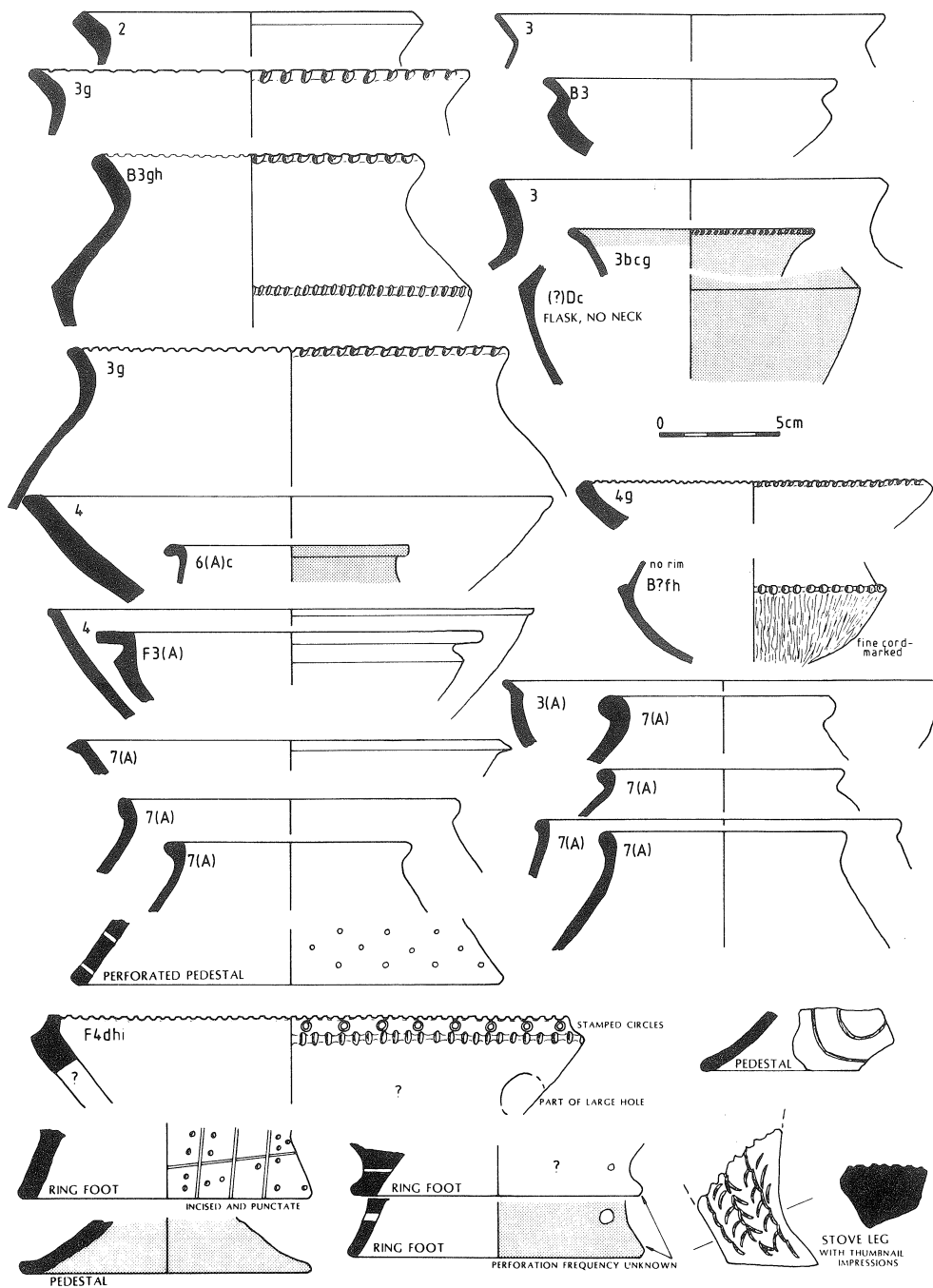


FIGURE 8: POTTERY FROM BUKIT TENKORAK LATE PHASE (LAYER 1), SHOWING ESPECIALLY THE RANGE OF RIM CLASSES, WITH RING FEET AT BOTTOM



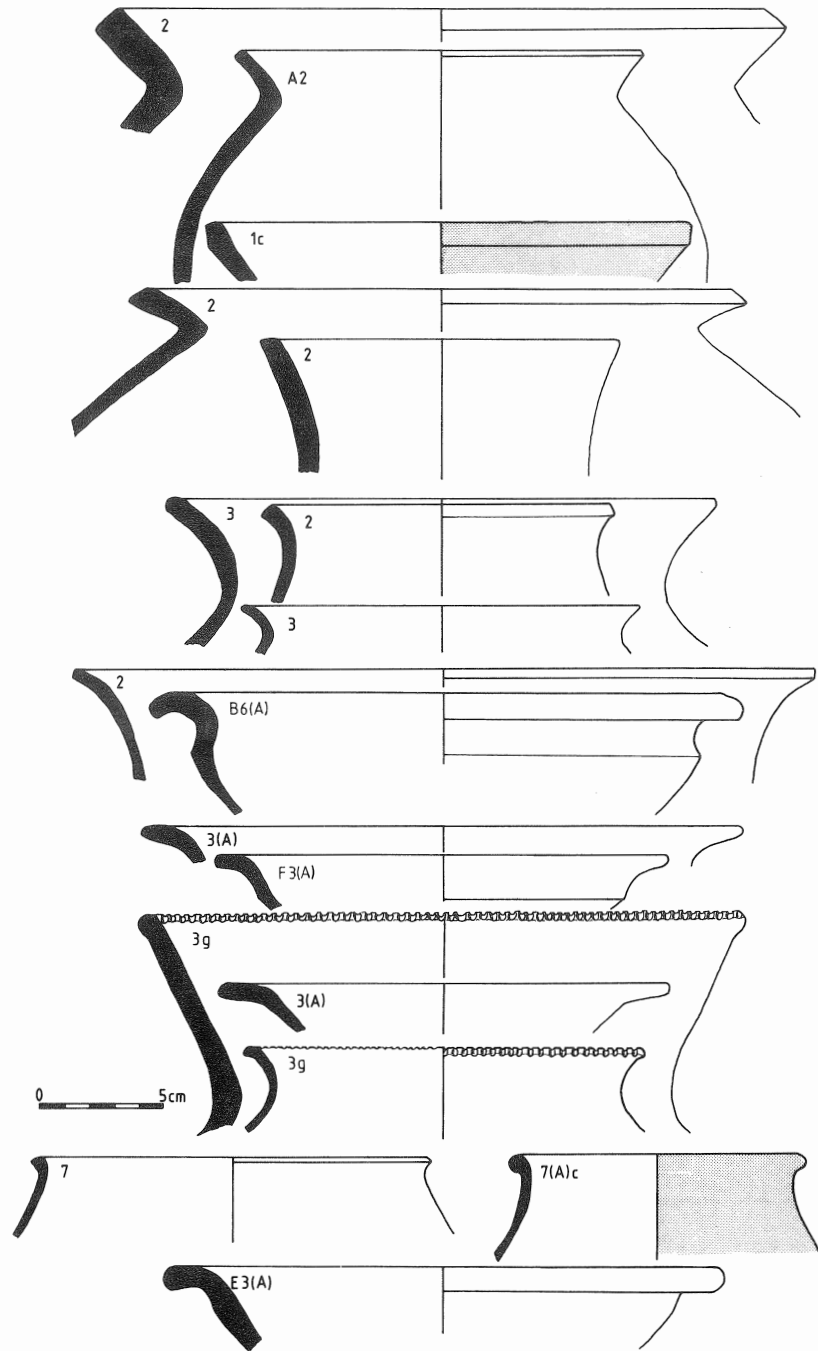


FIGURE 10: POTTERY FROM BUKIT TENGORAK SURFACE CONTEXTS. The upper three rims of class 2 are from the top of the eastern summit rock and may be of recent date. Stippling = red slip.

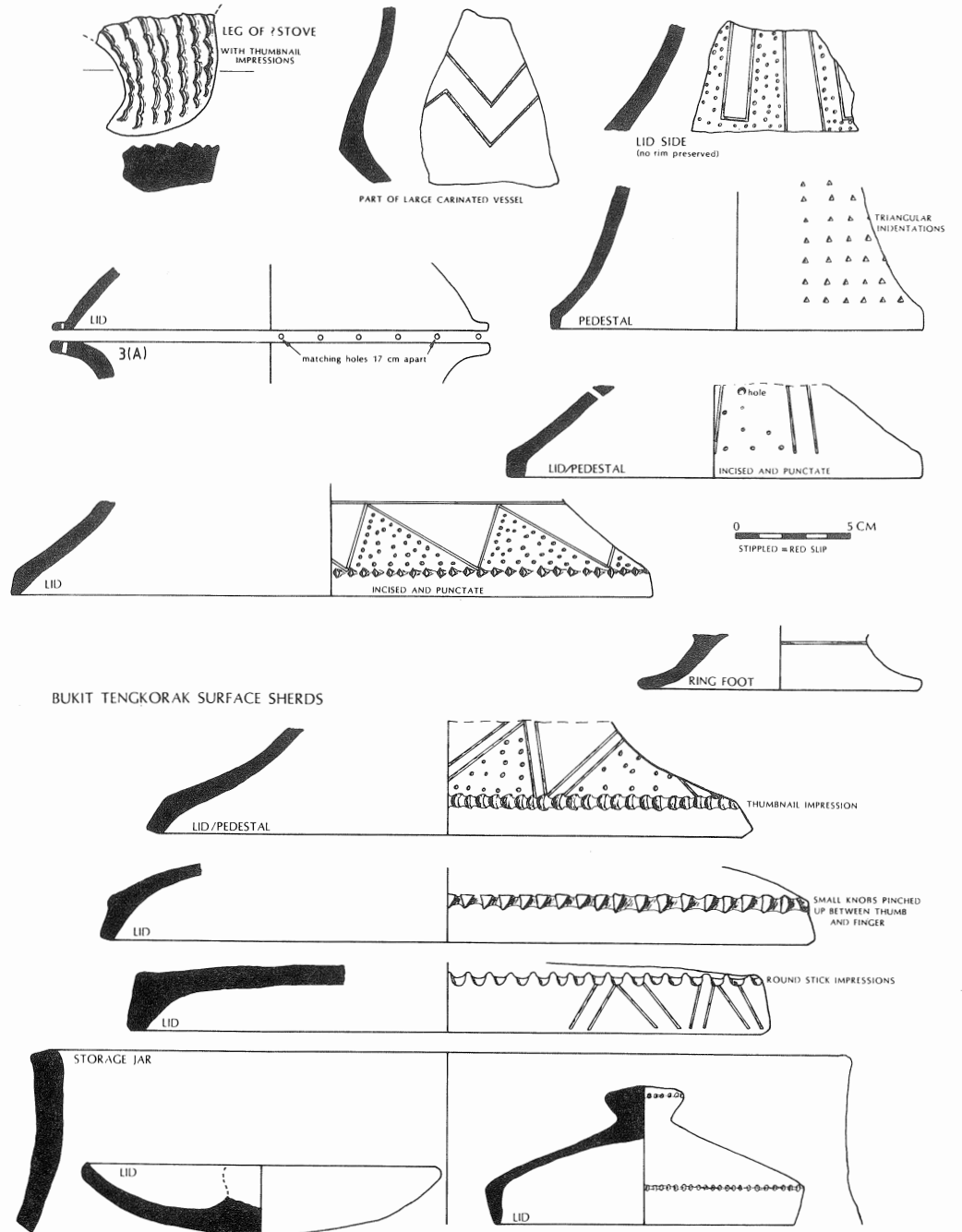


FIGURE 11: POTTERY FROM BUKIT TENGGORAK SURFACE CONTEXTS, MAINLY PEDESTALS AND LIDS





large spiral designs made by impressing coils of very coarse cordage. Stove fragments are present in the Early Phase also, but always plain. To my knowledge no one has reported their presence in prehistoric assemblages in Island Southeast Asia before, yet the discovery of one from layer 3 in the site of Hemudu in Zhejiang Province (Plate 3), presumably dating to the fifth millennium BC (Hemudu Archaeological Team 1980: Figure 3, no.19)<sup>5</sup>, makes it clear that the idea has been around for a long time. It is also of interest that Spennemann (1989, 1.1:151) has recently suggested their existence in Lapita sites in Tonga, and Clunie (1984:110) illustrates a nineteenth century specimen from Fiji similar in design principles to those used by the Sama-speaking peoples of Sulu and the Semporna Peninsula.

Parallels for the Bukit Tengkorak Late Phase assemblage are geographically as widespread as for the Early, although nearby parallels are harder to find because this phase mainly represents a time during the late first millennium BC when the Madai-Baturong sites were apparently unoccupied. However, a common type of Late Phase decoration characterised by a punctate infilling of geometric zones bordered by incised lines has some very obvious parallels in the 'three-colour ware' assemblages from the Niah Caves and Lobang Angin (Mulu National Park) in Sarawak (Solheim, Harriison and Wall 1959; Ipoi Datan, current research), Manunggul Chamber A on Palawan (Fox 1970:113), Kalumpang in west-central Sulawesi (van Heekeren 1972, Plates 101-102), and from the Nansay Resort site on Saipan in western Micronesia (Butler and De Fant 1989). Although Kalumpang is undated the other assemblages presumably date within the first millennium BC and early first millennium AD, and all attest to a considerable degree of shared stylistic inspiration at this time.

#### STONE TOOLS, EARLY AND LATE PHASES

##### Stone adzes and adze chips

Although no metal items have been found in Bukit Tengkorak, stone tools are common. Two complete stone adzes (Figure 13) were excavated from the disturbed area of the site in square O33, both of the common Sabah untanged and trapezoidal-sectioned type similar to a set of 11 excavated by Barbara Harriison from Tapadong Cave (Harriison 1965; Bellwood 1988:214), and to one dated uncertainly between AD 500 and 1000 from the Hagop Bilo shelter in the Baturong massif (Bellwood 1988: Figure 11.36F). This form is also reported from undated surface collections in Mindanao and from several other localities in the Philippines. No complete adzes were found in Early Phase layers at Bukit Tengkorak, except for one tiny wedge-shaped axe-adze of shell.

Stone adze chips were surprisingly common, no less than 16 being found throughout both layers in the site. One chip from layer 1 in square O32 was analysed for the Sabah Museum by the Geological Survey Department in Kota Kinabalu and found to be of a Semporna Peninsula rhyolite<sup>6</sup>. The large number of adzes and adze chips from such a small excavation suggests that my earlier observations (Bellwood 1980b:63) about the rarity of stone adzes in sites in the equatorial zone of Southeast Asia may well turn out to require modification.

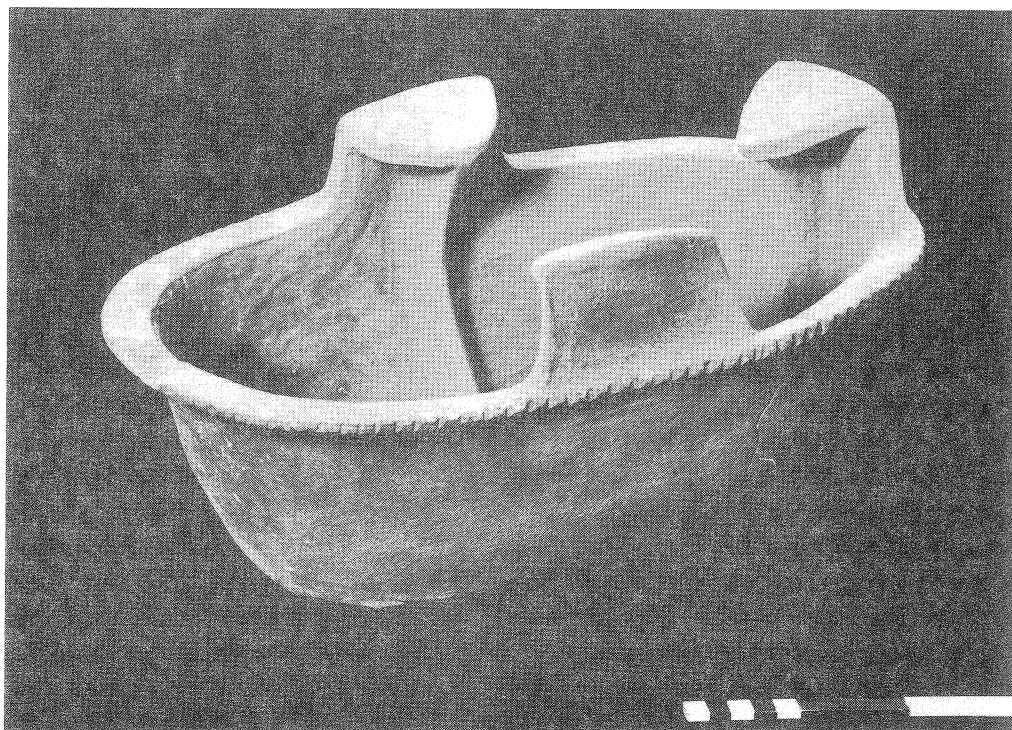


PLATE 2: POTTERY STOVE OF SAMA MANUFACTURE PURCHASED IN SEMPORNA IN 1987

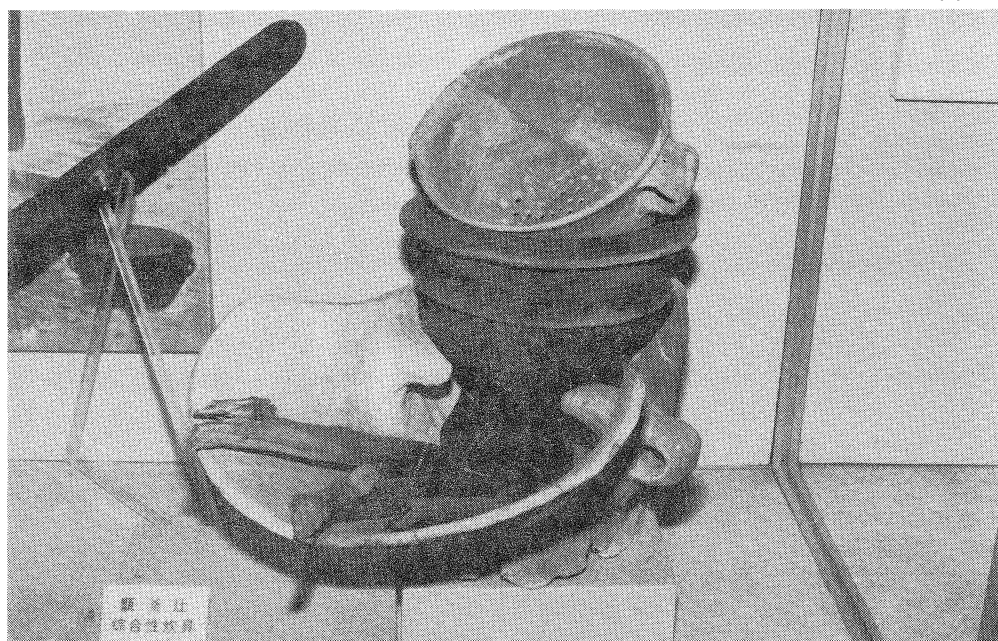


PLATE 3: POTTERY STOVE FROM LAYER 3, HEMUDU, ZHEJIANG PROVINCE, CHINA, ON DISPLAY IN THE ZHEJIANG PROVINCIAL MUSEUM, HANGZHOU

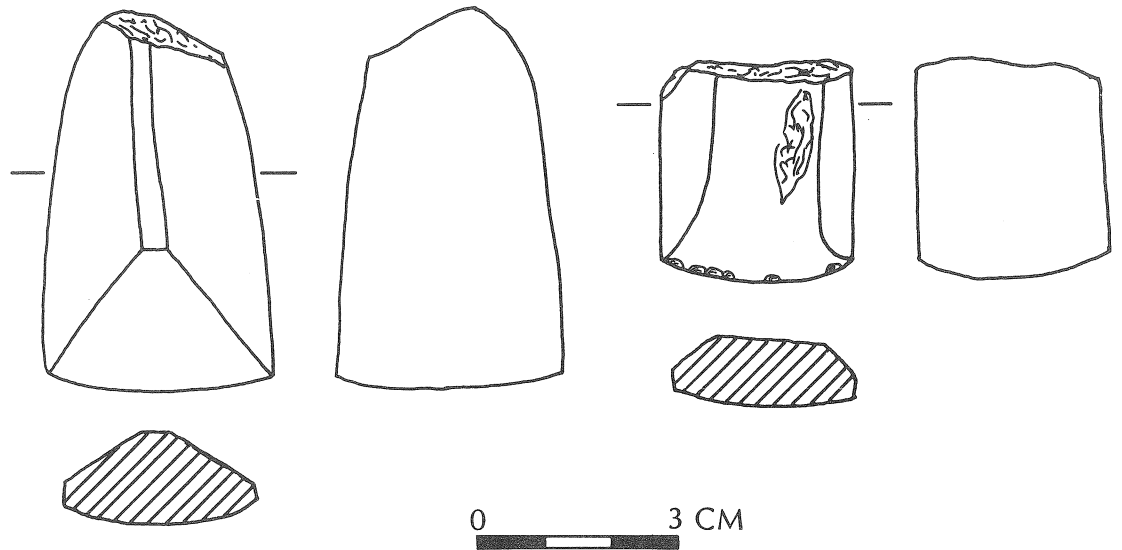


FIGURE 13: STONE ADZES FROM BUKIT TENGGORAK, DISTURBED CONTEXTS

#### The agate blade industry

A form of pale grey to honey-coloured agate, which occurs locally in the Semporna Peninsula, was worked into an outstanding series of small cylindrical or wedge-shaped blade cores in the process of making long thin blades up to 50 mm long. Many of these blades were worked further into drills, some of quite amazing length and narrowness (Figure 14, Plates 4 and 5). Agate tools occurred throughout both layers, unlike the obsidian to be described below. Some of the basic features of the agate assemblage are as follows:

- 1 A total of 22 agate cores was found in the site. Some were worked bidirectionally, and many show traces of bipolar working, an unsurprising observation since they would be too small to work in the hand.
- 2 Figure 15 (left) shows a bivariate plot of lengths and breadths for 123 flakes and blades (excluding those worked into drill points) from square O32, layers 1 and 3. The majority of pieces are under 25 mm in maximum dimension, and 28.5 per cent of the total are blades. Of the six pieces with use wear, three have silica gloss on one edge, two have flaking damage down one edge, and one has a double notch on one edge.
- 3 Figure 15 (middle) shows lengths and breadths for 35 complete agate drills from all squares. This reveals clearly the predilection for using blades for this kind of tool. Since the majority of used tools in the site are blades and/or drills it may be that the flakes should be regarded solely as core-preparation debitage.

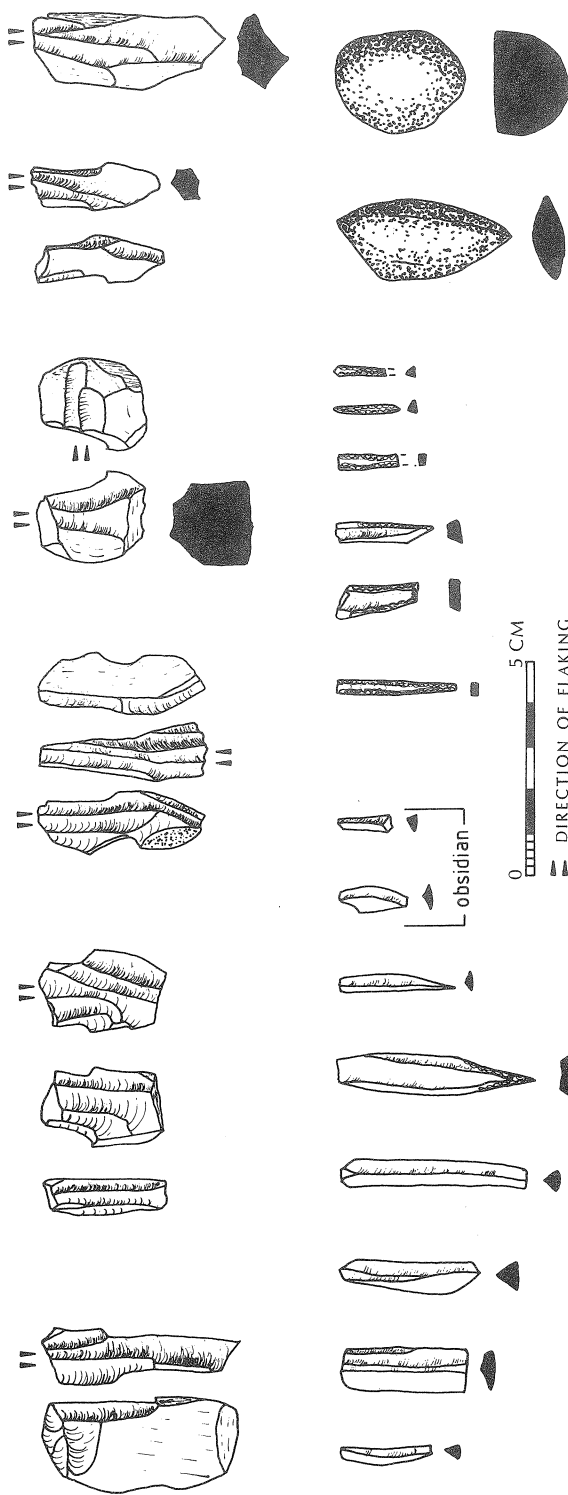


FIGURE 14: AGATE MICROBLADE INDUSTRY FROM BUKIT TENGKORAK. Top, agate blade cores; bottom, agate blades and drills, plus two small flake-blades of obsidian. The two pieces at bottom right are coarse lava files, presumably for shell-working.

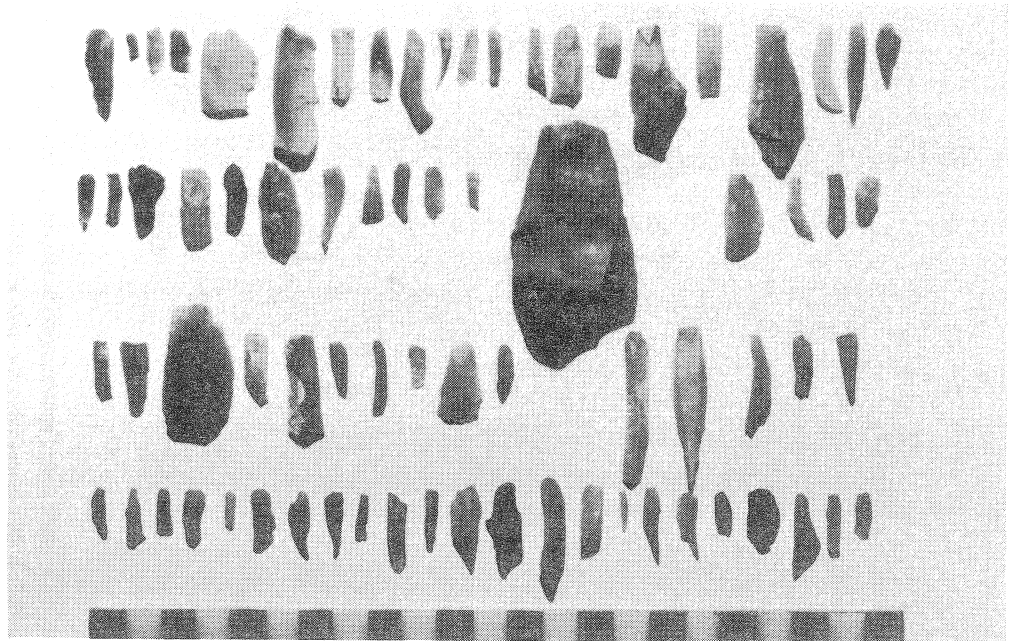


PLATE 4: AGATE BLADES AND BLADE-LIKE FLAKES FROM BUKIT TENGGORAK, ALL LAYERS. The piece fourth from the right in the third row has drill wear.

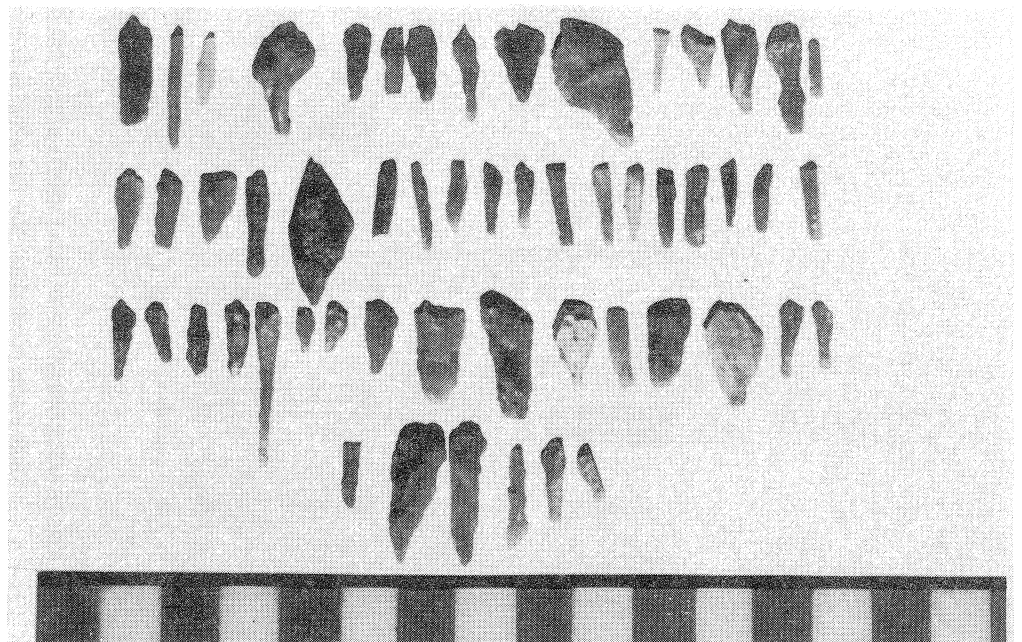


PLATE 5: AGATE DRILLS FROM BUKIT TENGGORAK, ALL CONTEXTS

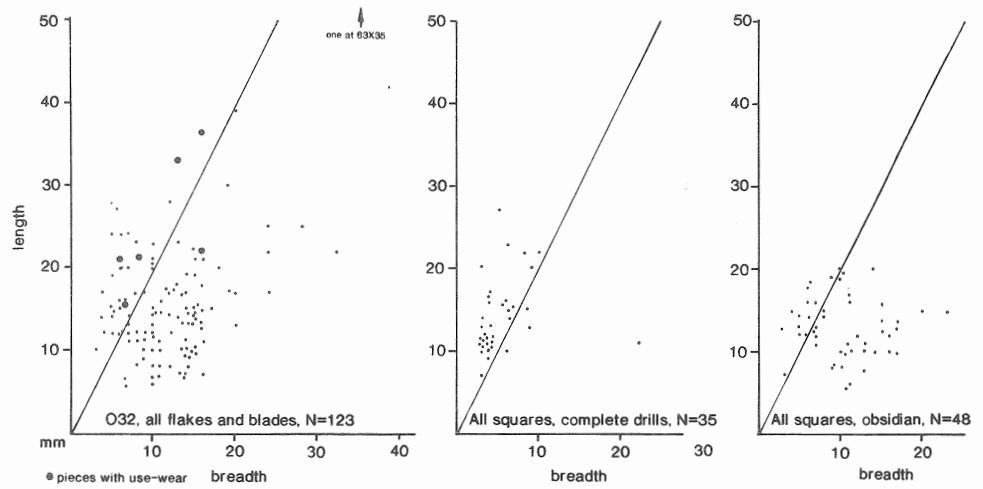


FIGURE 15: LENGTHS AND BREADTHS OF AGATE AND OBSIDIAN PIECES. Left, all complete agate flakes and blades from square O32 only (excluding drills); middle, complete agate drills only from all contexts; right, obsidian flakes from all contexts with preserved bulbs of percussion.

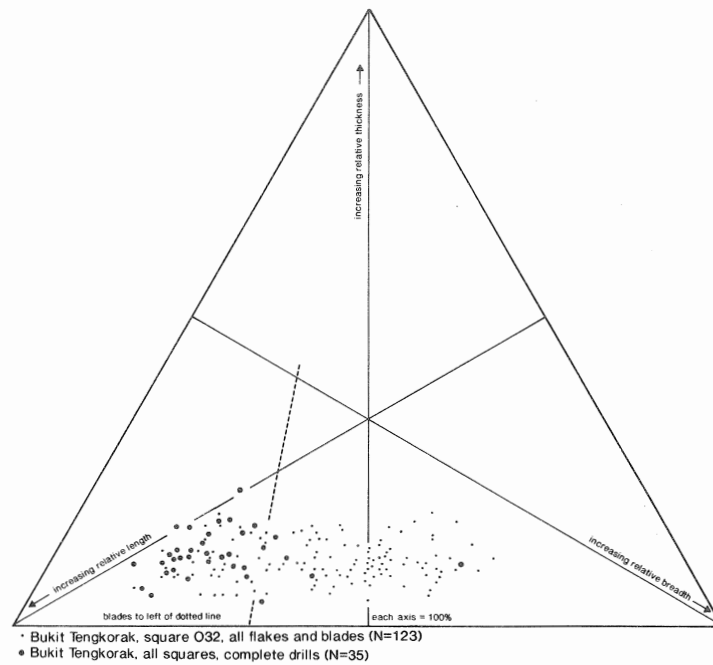


FIGURE 16: TRIANGULAR COORDINATE PLOT OF RELATIVE LENGTHS, BREADTHS AND THICKNESSES FOR ALL AGATE FLAKES AND BLADES FROM SQUARE O32, AND COMPLETE AGATE DRILLS FROM ALL CONTEXTS

- 4 Figure 16, a triangular coordinate plot of proportional length, breadth and thickness, again shows a concentration of drills (as opposed to unused flakes) to the left of the dotted 'blade line'<sup>7</sup>.
- 5 One possible pebble hammerstone weighing 110 gm was found in the site, and the use of a hard hammer bipolar core reduction technique seems to be a reasonable inference.
- 6 Drill shapes are best shown by an examination of Plate 5. Many are very long and thin but a few have rounded or splayed grips. Many have tips broken off. Perhaps the most remarkable is the one fifth from the left in the third row down. Plate 4 also has a single very long drill fourth from the right in the third row.

The technological focus on blade production at Bukit Tengkorak finds parallels in other plain and unbacked blade industries reported from a number of sites dating roughly between 5500 and 2000 years ago in north-eastern Indonesia, the Philippines and nearby regions of mainland Asia. Good examples come from the Talaud Islands (here preceramic and predating 2500 BC; Bellwood 1976), from Buad and Cebu Islands in the central Philippines (both undated; Cherry 1978; Tenazas 1985), from the Neolithic shell midden of Bau Tro in northern Vietnam (Patte 1924), and from the Neolithic site of Xiqiaoshan in Guangdong Province in southern China (c.3000-2000 BC; Huang *et al.* 1982; Huang Weiwen, pers.comm.). It is of interest that the Bukit Tengkorak and Talaud industries appear to be the most southerly examples of this type of unbacked blade industry on record in the islands of Southeast Asia, although the core and blade forms present in Talaud are considerably less prismatic than those from Bukit Tengkorak. Further south, the preceramic and Neolithic flake-blade industries of Java and southern Sulawesi (the 'Toalian') have a much greater emphasis on backed tools, points and other geometric types of microliths (Glover and Presland 1985), all items seemingly absent in the more northerly sites. The emphasis on drills is something unique to Bukit Tengkorak, however, and this can only be explained by a local specialisation in the manufacture of artefacts of marine shell. It is also quite possible that tiny stone drills have been simply overlooked in older unscreened excavations at other sites.

The historical significance of the Bukit Tengkorak agate blade industry is a little uncertain. On the one hand it may simply be a local outgrowth from the mid-Holocene flake-blade industries of the type referred to above from the Talaud Islands, present in the general region by at least 5500 years ago. On the other hand the industry could suggest Neolithic technological links between southern China, the Philippines, and extending southwards into Borneo and Sulawesi, perhaps as a result of the maintenance of contact between early populations of Austronesian language speakers similar to that which led to the dramatic case of obsidian movement next to be detailed.

#### The obsidian industry

The obsidian industry in Bukit Tengkorak occurs in the form of tiny flakes or chips (a chip simply being a small flake-like piece without a visible bulb of percussion) and occasional microblades. Two of the latter are shown in Figure 14. Cores are rare; a few broken fragments have survived but most were presumably broken down into non-existence in the



desire to make use of all the material. There are no obsidian drills, and the material would be too brittle to serve such a function. As can be seen from the bivariate plot in Figure 15 (right), most obsidian pieces are under 20 mm in maximum dimension. Although it has not been possible to carry out use wear or residue research in Sabah it seems likely that the flakes could have been used as spear barbs (for fish spears?) or in composite knife blades, tasks for which the local agate was perhaps not considered sharp enough.

The basic number and weight statistics for the obsidian industry are presented in Table 3, which gives data by 10 cm depth divisions within layers 1 and 3 for squares O32 and N33. Square O33 was almost entirely disturbed by feature 2, the modern pit, so the data for this square have been lumped. It is perhaps unfortunate that the greatest density of flaked stone, especially agate drills, should have been found in this disturbed square, and this is true also of the shell artefacts to be described below. However, it can be seen from this table that the obsidian in squares O32 and N33 is almost all from layer 3, and the four pieces in O32 layer 1 were probably pulled up from layer 3 by the digging of modern feature 2. Hence, it can be inferred that all obsidian in the site predates the temporal division between layers 3 and 1, which has been placed above at sometime within the last 300 years BC.

Another important observation about the obsidian concerns its sources. With the assistance of W.R. Ambrose of the Prehistory Department, Australian National University, 12 pieces from N33 layer 3 and O33 feature 2<sup>8</sup> were submitted to Dr J.R. Bird of the ANSTO Division of Applied Physics in Sydney. Dr Bird subjected the pieces to PIXE/PIGME measurements of nine element ratios, which were then compared with known obsidian sources by cluster and correspondence analysis. The results exceeded expectations. Of the 12 pieces analysed, seven came from a source which is still unknown<sup>9</sup>, but which was also the source for the single piece of obsidian in the lower pottery-producing layers (c.4000 BP) in the shelter of Leang Tuwo Mane'e in the Talaud Islands (Bellwood 1976:261). The other five pieces fell centrally in the ranges for the New Britain obsidian sources in western Melanesia. The best known of these is that at Talasea, although the Sabah pieces have not yet been sourced to any particular one of the five New Britain sources listed by Bird *et al.* (1988:111). (But see Appendix: Ed.)

The identification of the New Britain obsidian, a fairly prolific component of many Lapita sites in the Bismarck and Solomon Archipelagoes, doubles at one stroke the extent of its geographical distribution. It now extends for some 6500 kms from Sabah to Fiji, and probably ranks as the most widely-distributed commodity of its period anywhere in the world. Furthermore, Green (1987:247) has noted that the distribution of New Britain obsidian into the eastern Solomon Islands had virtually ceased by about 2000 years ago. This makes the date range for the obsidian at Bukit Tengkorak especially significant, since its disappearance from the site before 2000 years ago obviously ties in well with the evidence for the retraction of Lapita trade contacts in Melanesia. Both the sourcing and the dating of the obsidian from Bukit Tengkorak thus fit well within the emerging picture of Lapita activity in the western Pacific.

The quantity of obsidian in the Bukit Tengkorak shelter also raises a point of some interest. The total volume excavated, under 2 cubic metres, yielded from both stratified and disturbed contexts a total of 188 pieces of obsidian with a total weight of 58.25 grammes. If the source



SQUARE AND LAYER	FLAKED PIECES		FLAKED PIECES		OBSIDIAN		OBSIDIAN		AGATE DRILLS	
	TOTAL NUMBER	TOTAL WEIGHT(GM)	NUMBER (no.) (%)	WEIGHT (wt.) (%)	NUMBER (no.) (%)	WEIGHT (wt.) (%)	NUMBER	WEIGHT (wt.) (%)	NUMBER	WEIGHT (wt.) (%)
032, 1, 0-10	28	26	1	4	0.5	2			3	
10-20	61	63	3	5	0.7	1			6	
20-30	59	47.5	0	0	0	0			2	
3, 0-10	49	15.5	20	41	2.75	18			2	
10-20	38	15.5	12	32	4.5	29			1	
20-30	17	10	9	53	3.0	30			0	
30-40	10	6	6	60	1	17			1	
40-50	31	52.5	13	42	5	10			1	
50-60	23	15	8	35	3.2	21			1	
Totals for 032	316	251	72		20.65				17	
N33, 1, 0-10	53	43.5	0	0	0	0			2	
10-20	36	47.5	0	0	0	0			0	
20-30	19	26	0	0	0	0			0	
3, 0-10	13	33	5	38	11	33			2	
10-20	28	*(12)	18	64	*(3)	?			0	
20-30	17	12	7	41	1.5	13			1	
30-40	30	21	15	50	4	19			1	
Totals for N33	196	195	45		19.5				6	
033, feature 2 (lumped figures)	464	** (314)	71	15	** (18.1)	5.8			39	
Grand Totals	976	760	188		58.25				62	

\* Weights exclude 7 unweighed pieces of obsidian submitted to ANSTO Division of Applied Physics.

\*\* Weights exclude 5 unweighed pieces of obsidian submitted to ANSTO Division of Applied Physics.

NB: In square 032 the excavated area of layer 3 was only 50% of that for layer 1 (0.5m<sup>2</sup> compared to 1m<sup>2</sup>). A similar (but less exact) proportion also holds for square N33. The figures for 033 feature 2 also include the minor extensions of feature 2 into squares N33 and 032.

TABLE 3: THE DISTRIBUTION OF OBSIDIAN PIECES AND AGATE DRILLS IN BUKIT TENGGORAK

ratio of 5 New Britain to 7 unknown can be applied to these total figures, then the quantity of New Britain obsidian excavated may be about 78 pieces, totalling approximately 24 grammes in weight. Extrapolating to an admittedly-guessed total volume of deposit in the site, it is possible that Bukit Tengkorak as a whole contains up to 1000 pieces of New Britain obsidian. These quantities are, of course, still very small in terms of weight, but it is worthy of note that they seem to be much greater (at least in number) than those from the islands of central and eastern Melanesia.

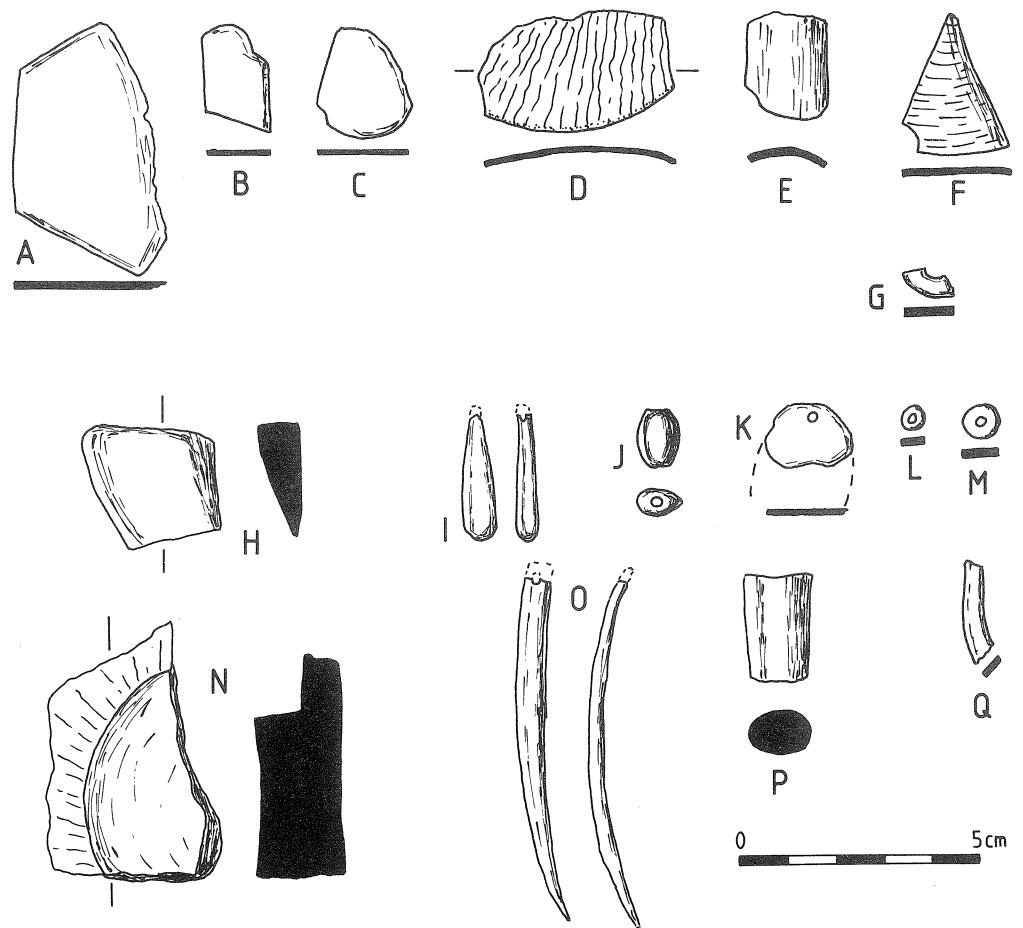
For instance, while Talasea obsidian seems to be common in Lapita sites to as far east as Santa Cruz (Green 1987), it appears that only two pieces have been identified from the Malo site in Vanuatu (Ambrose and Duerden 1982:84), one piece from the Isle of Pines to the south of New Caledonia (Ambrose 1976:366), and two pieces from the Naigani site on Viti Levu in Fiji (Best 1987). It can hardly be stated, therefore, that the Lapita inhabitants of the islands to the south and east of Santa Cruz were in frequent communication with the sources of supply of Talasea obsidian. Yet Bukit Tengkorak, which lies about the same distance away from Talasea as does Fiji, would appear to have had access to a fairly reliable, if limited, supply over a period of several centuries.

#### Shell artefacts and other ornaments

Shell artefacts were unfortunately most common in the disturbed square O33, probably because this area is always very dry, whereas squares O32 and N33 receive more rain spray; any fragile shell artefacts in these squares will have suffered more from weathering. The bulk of the small pieces of pearl shell, many of which look as if their edges may have been grooved and snapped, occur in O33, together with other seemingly worked pieces of *Tridacna* and other large bivalve species such as *Anadara* and *Batissa*. None of these blank-like pieces can definitely be demonstrated to have been worked, but many shapes are suggestive of one-piece fishhooks, adzes, and even a *Tridacna* trolling lure shank. I would stress, however, that these identifications are not yet secure.

Apart from the Early Phase *Tridacna* adze mentioned above, recognisable shell artefacts from the site include two small disc beads (Figure 18L,M), a barrel-shaped bead bored longitudinally (Figure 18J), two perforated pendants (Figure 18I,K; the former may be of polished coral), the core of a *Tridacna* bracelet (a manufacturing discard; Figure 18N), and a shank of a one-piece fishhook (Figure 18Q). There are also two lava files, perhaps used on shell, from Late Phase contexts (Figure 14). The agate drills were probably also used for the manufacture of shell artefacts, and the large number of these found might suggest that the number of shell items originally produced in the site was quite substantial.

Shell artefacts of the types found at Bukit Tengkorak have to date appeared only rarely in Island Southeast Asian excavations, but it is noteworthy that Glover (1986) has reported shell one-piece hooks and disc beads which date to about 3000 BP from cave excavations in East Timor, and Li (1983, Plate 94) illustrates one-piece hooks which are claimed to date to about 3000 BP from excavated sites in southern Taiwan. Shell adzes, beads and fish hooks also occur, the latter sporadically, in western Oceanic assemblages of this date, particularly in those of Lapita affinity (e.g. Kirch 1988; Kirch and Yen 1982:237-238).



**FIGURE 17: SHELL, AGATE AND BONE ARTEFACTS FROM BUKIT TENGGORAK.** (A-C) possible one-piece hook blanks of pearl shell, all from O33 feature 2. (D) cut blank of *Anadara antiquata*, O33 feature 2. (E-F) cut blanks of unidentified bivalve shell (*Batissa?*), O33 feature 2. (G) piece of agate disc bead, N33 layer 3. (H) small *Tridacna* adze, O32 layer 3. (I) perforated pendant of shell or coral, O33 feature 2. (J) barrel-shaped bead of shell, O33 feature 2. (K) perforated shell pendant, O33 feature 2. (L-M) shell disc beads, O33 feature 2 and N33 layer 1. (N) bracelet core of *Tridacna* shell, O32 layer 3. (O) perforated and curved needle of bone or tusk, O32 layer 3. (P) piece of polished bone shaft, O33 feature 2. (Q) possible shank portion of a one-piece fishhook, shell species unknown (but not pearl shell), O33 feature 2.

#### Other items

Other items found in the site can be listed briefly, as follows;

- 1 A piece of haematite weighing 6 grammes from O32 layer 3.
- 2 A bow pellet 18 mm diameter of soft volcanic ash or lava(?) from O32 layer 3. This is similar to the bow pellets of fired clay found widely in Southeast Asian and Indian prehistoric and tribal contexts.
- 3 A polished bone shaft (Figure 18P) with an oval cross- section, of unknown function. From O33 feature 2, and thus of uncertain age.
- 4 A curved and perforated needle of bone or tusk 7.3 cm long (Fig. 18O), from O32 layer 3.
- 5 Small stone beads - one of tubular shape 6 mm long from O32 layer 3, and one disc bead of agate (Figure 17G) from N33 layer 3.
- 6 Two human teeth, both from O33 feature 2 and thus of uncertain age. One is a lower left second milk molar, the other an adult upper first or second molar with Carabelli's cusp. The teeth were identified by Dr Ho Tze Hok of Kota Kinabalu, who also noted that the adult tooth probably belonged to a Mongoloid person.

#### CONCLUSIONS FOR BUKIT TENGGORAK

The rock shelter of Bukit Tengkorak was occupied during the first millennium BC by people who relied heavily on marine resources. During the Early Phase of occupation (prior to c.300 BC) the inhabitants used plain and red slipped pottery of a kind widespread in the Neolithic of Island Southeast Asia. One vessel from the site may illustrate some Lapita affinity, and the inhabitants also received small quantities of obsidian from New Britain, in the Lapita heartland region of the Bismarck Archipelago in Melanesia. The agate blade industry of the Early Phase, if outside parallels have any relevance, could reflect some degree of contact with Neolithic communities in the Philippines and perhaps even as far way as southern China.

During the Late Phase at Bukit Tengkorak the inhabitants developed a more florid pottery style, with decorative affinities with assemblages in Sarawak, western Sulawesi, the Philippines and western Micronesia. The agate and shell industries continued, but the import of obsidian had virtually ceased from both New Britain and the unknown source by the beginning of this phase.

Regardless of any links which the inhabitants of Bukit Tengkorak might have had with Lapita people far to the east in Melanesia (links discussed in more detail in Bellwood and Koon 1989), the assemblage from the site leads me to reflect that Early Phase Bukit Tengkorak, with its agate blade and drill industry, its access to obsidian and its evidence for a maritime economy, reveals a very different archaeological picture from the contemporary assemblage in the Agop Atas Cave at Madai (MAD 1 layer 11a; see Bellwood 1988), only 60 kilometres to the northwest. Madai is admittedly 10 kilometres from the sea, so the rarity of marine fish and shellfish here need occasion no surprise. But the total absence of any

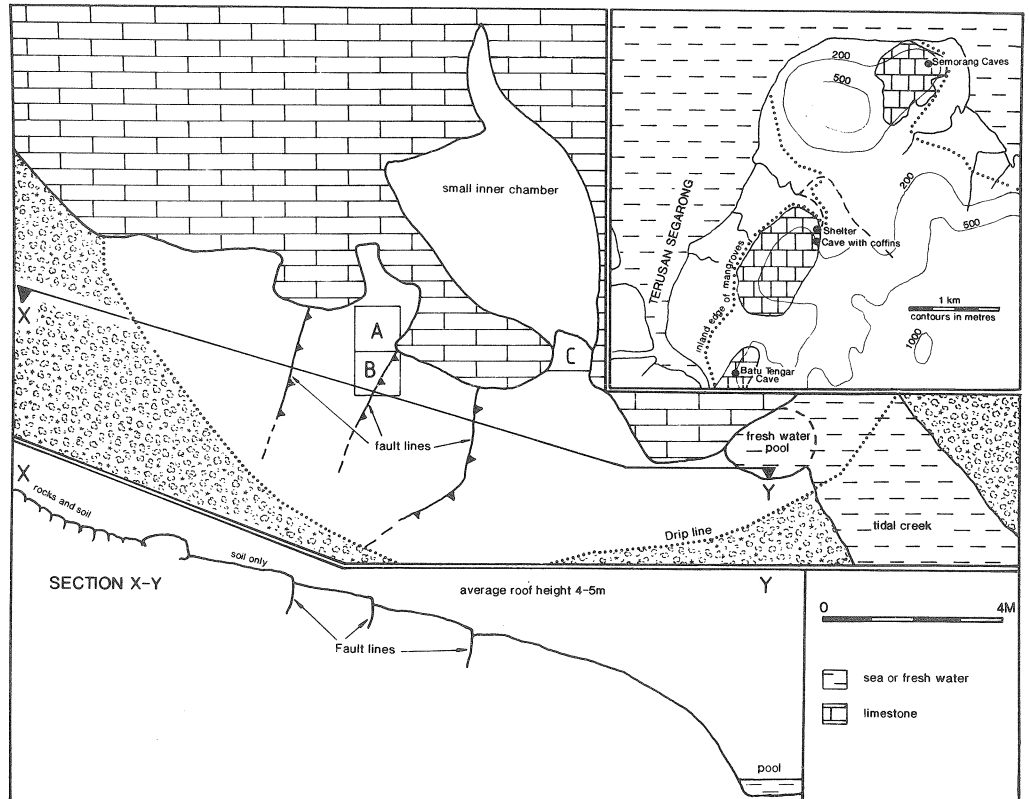


FIGURE 18: LOCATION, PLAN AND CROSS-SECTION OF THE SEGARONG ROCK SHELTER.  
The horizontal axis of the plan runs south (left) to north (right).

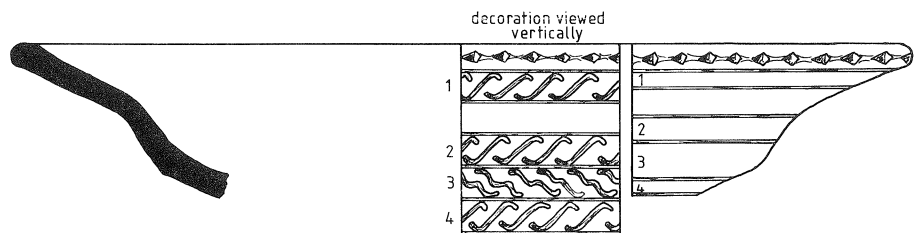


FIGURE 19: RECONSTRUCTED VESSEL FOUND IN SQUARES A AND C, SEGARONG SHELTER.  
The decoration runs right around the pot, but is drawn without perspective foreshortening.

obsidian, blades or drills in the site is remarkable. The few chert stone tools in MAD 1 layer 11a are no different from those used by the inhabitants of the cave in the early Holocene, and one wonders if Madai did not witness a considerable assimilation of pre-Austronesian peoples into the later ancestral Idahan (Austronesian speaking) communities who probably occupied this region by at least 3000 years ago (Bellwood 1988:257).

These differences lead me to suspect that southeast Sabahan societies of the first millennium BC, like those of the region today, may already have been differentially specialised into land-based groups who may have depended primarily on agriculture, and maritime-based groups with impressive mobility and long distance trade links. If this is so, then the complex pattern of lifestyle specialization recorded amongst modern Idahan and Sama speakers in and around southeast Sabah and the Sulu Archipelago (Spoehr 1973; Sather 1984; 1985) may have an antiquity in the area of at least 3000 years, perhaps more.

Such an antiquity need occasion no real surprise, and it carries back in time the rather interesting linguistic reconstructions of Pallesen (1985). These locate a Proto-Sama-Bajau (or Bajaw in Pallesen's Philippine spelling) linguistic stage in the Sulu Archipelago at least 1200 years ago. Pallesen's reconstructed cultural items for this stage include the use of pottery stoves, canoes, and the cultivation of dry rice, millet, banana, coconut, sugarcane, yam and taro. Bukit Tengkorak may not have produced any cultivated plant remains, but it has offered a window on a maritime adaptation which may have been partly behind the expansion of Austronesian speaking peoples into the vastnesses of the Pacific.

#### INVESTIGATIONS IN THE SEGARONG PENINSULA

The Segarong Peninsula, which lies opposite Pulau Timbun Mata, contains a number of limestone massifs with caves. These are termed the Sipit Caves and have been described from a geological viewpoint by Kirk (in Wilford 1964:169-70). The peninsula was visited for archaeological survey purposes by Barbara Harrison around 1968, and her report (Harrison and Harrison 1968:83-4) refers to a rock shelter with ten wooden coffins and/or coffin lids half buried in its floor. The coffins and lids are described as reflecting three styles; one with 'upcurving (or downcurving) flanges fore and aft', another with short projecting handles, and a third (presumably a lid fragment) carved with one end in the shape of a buffalo head. A photo of the shelter (Harrison and Harrison 1971: Plate 16) is unfamiliar to me; the site was clearly not visited by us in 1987 and I am not sure where it is.

On our 1987 fieldtrip only two of the four limestone massifs on the peninsula were visited. The two not visited were the most northerly one which contains the Semorang Caves, and a far southerly one which is not shown on my map (Figure 18). Perhaps Barbara Harrison's site was in one of these massifs. Of the sites visited in 1987, Batu Tengar Cave turned out to be wet, dark and archaeologically lacking, whereas the localities marked 'Shelter' and 'Cave with coffins' both had remains. Rather strangely, neither of these caves is recorded in Wilford 1964, and neither appears on the 1:50,000 sheet for the region. The limestone massif which contains them appears to have no name.

#### The cave with coffins

A very brief visit was made to this site, which was not surveyed. Three coffins, each empty and between 180 and 200 cms long internally (and thus for primary burials?) sit in a dark and sheltered portion of the cave. One<sup>10</sup> has no handles and a drainage hole, another has two plain end handles and a drainage hole, while the third has no drainage hole and a markedly phallic-shaped handle at either end. Little comparative study has ever been done of the stylistic variations in cave coffins in this region, but the coffin with plain handles may resemble the second type described by Harrison from her Sipit rock shelter. A Chinese blue and white sherd and a piece of a brown-glazed jar were amongst the 21 sherds (mostly plain earthenware) picked up from the cave surface. However, from the Madai and Baturong coffin dates (Bellwood 1988:252-253) these coffins, or at least the wood from which they were carved, could be up to 1000 years old.

#### The rock shelter

About 300 metres north of the coffin cave a rock shelter has been formed at the head of a small stream which runs through the coastal mangrove fringe from the Segarong estuary (Figure 18). The shelter has a floor of light yellowish brown alkaline soil (pH 8.5), fairly well cemented with calcium carbonate. The floor slopes steeply downwards from south to north longitudinally through the shelter, and is fissured by transverse faults formed where solution of the underlying limestone has occurred. These fault lines have trapped small amounts of cultural material. Virtually all traces of ancient settlement, however, will have been washed or rolled out of the shelter irretrievably soon after they were deposited.

Because the fault lines appeared to contain small amounts of cultural material, two squares, A and B, were laid out over one of them, and a third square, C, was placed in the mouth of a small side chamber. None of these squares contained any coherent archaeological stratigraphy; all cultural items were concentrated at or just beneath the surface and nothing occurred below 25 cms in depth. Cultural materials recovered included both marine and freshwater shellfish, land snails, a few chert flakes and fragments of bone, and potsherds. Since so little material was found, and since the deposit is clearly a lag formation with no chronological differentiation, only a few pertinent observations can be made.

Of the marine shellfish, most specimens are *Anadara granosa* and *Telescopium telescopium* (see Table 2), both species of the nearby mangroves. Other species which occur in small numbers include *Batissa violacea*, *Nerita* sp., *Crassostrea* sp., *Chicoreus* sp., and the freshwater genera *Sulcospiral*/*Brotia* and *Balanocochlis* (see Bellwood 1988: Figure 8.1). Animal bones have not been identified, but both mammals and fish are clearly represented.

Most of the pottery (43 out of a total of 59 sherds) was concentrated in square C. Plain earthenware body sherds dominate the assemblage, but one vessel had an organic glaze (*damar*?) weathered to a white colour on its exterior, another had carved paddle impression, and several pieces found in both squares A and C belonged to a single vessel (or perhaps a lid) reconstructed in Figure 19. This vessel has notched lozenges around its lip and bands of stamped S-shaped motifs done with two different stamps. No pottery of this type has been found in Sabah before, but it is remarkably similar to that reported by Fox (1970:169-170)

from the Sasak rock shelter in the Kalatagbak area of Palawan, inland from the Tabon Caves. The Sasak assemblage is undated, but it does have glass beads and iron in apparent association.

Two shell samples from the Segarong shelter have been radiocarbon dated, as listed in Table 2. The marine *Anadara* sample gave a calibrated age of around 740 BP, and this date may well apply to the pottery, including the piece with the S-shaped stamps. The other date, on freshwater *Brotia* shell, appears to be remarkably old, even with subtraction of several centuries to allow for the effects of limestone-region contamination. Yet the tenth millennium BP determination does fit well with the prolific evidence for settlement between 11,000 and 7000 BP in the Madai and Baturong caves about 35 kilometres to the northwest (Bellwood 1988). The few chert tools in the site might well belong to this phase, the surviving remains of which appear to have been inextricably mixed with those of the much younger pottery phase.

These dates, combined with those from Madai, Baturong and Bukit Tengkorak, leave one important question. Where is the evidence for occupation during the middle Holocene in eastern Sabah? Why are there no occupations dated to between about 7000 and 3000 years ago? This is an intriguing question which future fieldwork must address.

#### A new date for a Hagop Bilu coffin

Previous radiocarbon dates for a wooden coffin at Agop Atas, Madai, and one of the three wooden anthropomorphic figures in the western Hagop Bilu shelter in the Baturong massif (Harrison and Harrison 1971:105-111; Bellwood 1988:252-253), indicate that these pieces might have been carved as early as  $960 \pm 70$  and  $1000 \pm 70$  uncal. BP respectively. It will therefore be of interest that a piece of wood taken from the outer part of a coffin lying near the figures in the Hagop Bilu western shelter was dated in 1987 to  $790 \pm 70$  uncal. BP (ANU 5766; see Table 1). These dates in combination make it almost certain that the use of wooden coffins was replacing the use of jars for burial in this region as early as 1000 years ago. The wooden figures from Baturong, now in the Sabah Museum in Kota Kinabalu, are probably the oldest dated indigenous (i.e. non-Indic) art objects known from the whole of Borneo.

#### ACKNOWLEDGEMENTS

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#### NOTES

1 Not all surface finds from Bukit Tengkorak came from the rock shelters. Many potsherds, including pieces of pottery stoves, were found sitting on the bare flat surface of the eastern summit rock, indicating that people perhaps sat and cooked up there in periods of fine weather.



<sup>2</sup> There can be little doubt, however, that layer 3 has suffered some disturbance, perhaps during formation. For instance, pieces of the decorated vessel shown in Figure 7 were found between depths of 25 and 40 cms within layer 3 in square O32.

<sup>3</sup> Although referred to as *Batissa* in this report, it is possible that many of these shells may be specimens of *Polymesoda (Geloina)* sp. (Ken Heffernan, personal communication).

<sup>4</sup> The top three class 2 rims shown in Figure 10 come from the top of the eastern summit rock, and are clearly the result of recent Idahan Phase use of the area.

<sup>5</sup> I wish to thank Bao Rong Li for this reference.

<sup>6</sup> I wish to thank David Lee for this assistance.

<sup>7</sup> When preparing this figure I realised that the triangular coordinate plots for Madai, Paso and Leang Tuwo Mane'e published as Figure 10.2 in Bellwood 1988 have their relative length and breadth axes reversed.

<sup>8</sup> Five pieces came from O33 feature 2 and seven from N33 layer 3, 15-20 cms. Unfortunately, however, the pieces became mixed prior to labelling in the process of being mailed from Kota Kinabalu to Canberra, so it is no longer clear which specific pieces came from the two contexts.

<sup>9</sup> The analyses rule out the West Java, Minahasa, New Britain and Admiralty sources.

<sup>10</sup> Drawings of these coffins are in my possession.

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## APPENDIX

Since the above report was typeset I have received the following communication from Dr J.R. Bird of the Australian Nuclear Sciences and Technology Organisation at Lucas Heights in Sydney. To avoid delay in the production of this issue I here print it as received. Figure 1 is printed overleaf, but its caption is at the base of this page.

## SABAH OBSIDIAN ANALYSIS

Twelve obsidian samples were subjected to multi-element analysis using the PIXE/PIGME technique developed at Lucas Heights (P.Duerden, E.Clayton and J.R.Bird, 1987. "Obsidian Composition Catalogue" in *Archaeometry: Further Australasian Studies*, Eds W.R.Ambrose and J.M.J.Mummary, Research School of Pacific Studies, ANU, Canberra pp232-238). For comparison, five obsidian source samples from Indonesia and a representative set of Melanesian sources were analysed at the same time. The concentrations of 11 elements, which have been found to be most useful for characterising Pacific obsidian sources, show the presence of two compositional groups amongst the Sabah samples. This is illustrated in Figure 1, derived from a standard statistical analysis, in which distances in multi-parameter space between points for each sample are represented in two dimensions in such a way as to include most of the standard deviation of the data set.

Figure 1 demonstrates that the Sabah A group coincides in composition with that of source samples from Talasea (New Britain) while the Sabah B group is close to, but not identical to, the measurements on the sample from Talaud (Indonesia). The same conclusions are reached using several different cluster techniques. A more detailed comparison has been made between the 5 Sabah A results and those of a recent study of New Britain obsidian (R.Fullagar, W.Ambrose, R.Bird, J.Specht, R.Torrence and N.Baker, 1989. "Stocktaking the Rocks", *Proc. 6th Austr. Conf. on Nucl. Tech. of Analysis*, pp 187-189). There is an almost complete overlap of the Sabah A measurements and those for Kutau/Bao obsidian sources from the Willaumez Peninsula of New Britain. Other New Britain material (Mopir, Garua, Garala, etc.) is clearly distinct. Although such similarity in composition is not proof of origin of the Sabah A artefacts, information gained in the study of many thousands of artefacts indicates that a Talasea origin is a very high probability. Certainly no other source material with this composition has been found in extensive searches throughout Melanesia.

## FIGURE CAPTION

Figure 1 Two-dimensional plot from a correspondence analysis of 11 element concentration data for 12 artefacts from Sabah and a representative set of obsidian source samples. The artefacts fall into two compositional groups, one of which (A) has the same composition as obsidian from Talasea (New Britain) and the other (B) which is not quite identical to a sample from Talaud (Indonesia).

J.R.Bird, ANSTO, 14 Dec 1989