The Archaeology of Foraging and Farming at Niah Cave, Sarawak

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THE NIAH CAVES ARE A SYSTEM of spectacular caverns on the northern edge of the Gunong Subis limestone massif, on the coastal plain of Sarawak in northern Borneo (Fig. 1). The caves are renowned for their large populations of bats and swiftlets. The guano produced by them has traditionally been sold for fertilizer, and for centuries the nests of one of the species of swiftlets have been collected by local Punan foragers to be sold to the Chinese at premium prices for bird's nest soup (Beavitt 1992).

The caves are also famous for the major campaigns of excavations conducted in several of the entrances, especially in the West Mouth of the Great Cave of Niah (Fig. 2), by Tom and Barbara Harrisson in the 1950s and 1960s. Their remarkable discoveries in the West Mouth included (in 1958) a human skull, the so-called Deep Skull (Brothwell 1960), in deposits that yielded a ^{14}C date on charcoal of ca. 40,000 B.P.,[1] making it the earliest modern human in Southeast Asia. In the same part of the cave they found evidence for habitation and occasional burials dating to the late Pleistocene and early Holocene, and farther into the interior a large number of burials of broadly Neolithic date and character, yielding ^{14}C dates from ca. 6000 B.P. to ca. 1000 B.P. (B. Harrisson 1967; T. Harrisson 1958, 1965, 1970). They conducted smaller excavations in several other entrances of the cave complex, finding evidence for very small-scale Pleistocene occupation in Gan Kira, what was probably a late Pleistocene and early and mid Holocene occupation in Lobang Angus (though no ^{14}C dates were obtained), and further Neolithic burials in Lobang Tulang and Gan Kira. In Kain Hitam, the so-called Painted Cave a few hundred metres east of the Gan Kira entrance, the Harrissons found bodies buried in wooden boats dated to ca. 1000 years ago, together with wall paintings of boats and dancing figures that were thought likely to be associated with the boat burials. The Niah excavations yielded a wealth of cultural material, most of it stored today in Sarawak Museum, including stone tools, animal bones, bone tools, human skeletal remains, shell food refuse, local and imported pottery, textiles, basketry, and beads. The Niah Caves remain unique in

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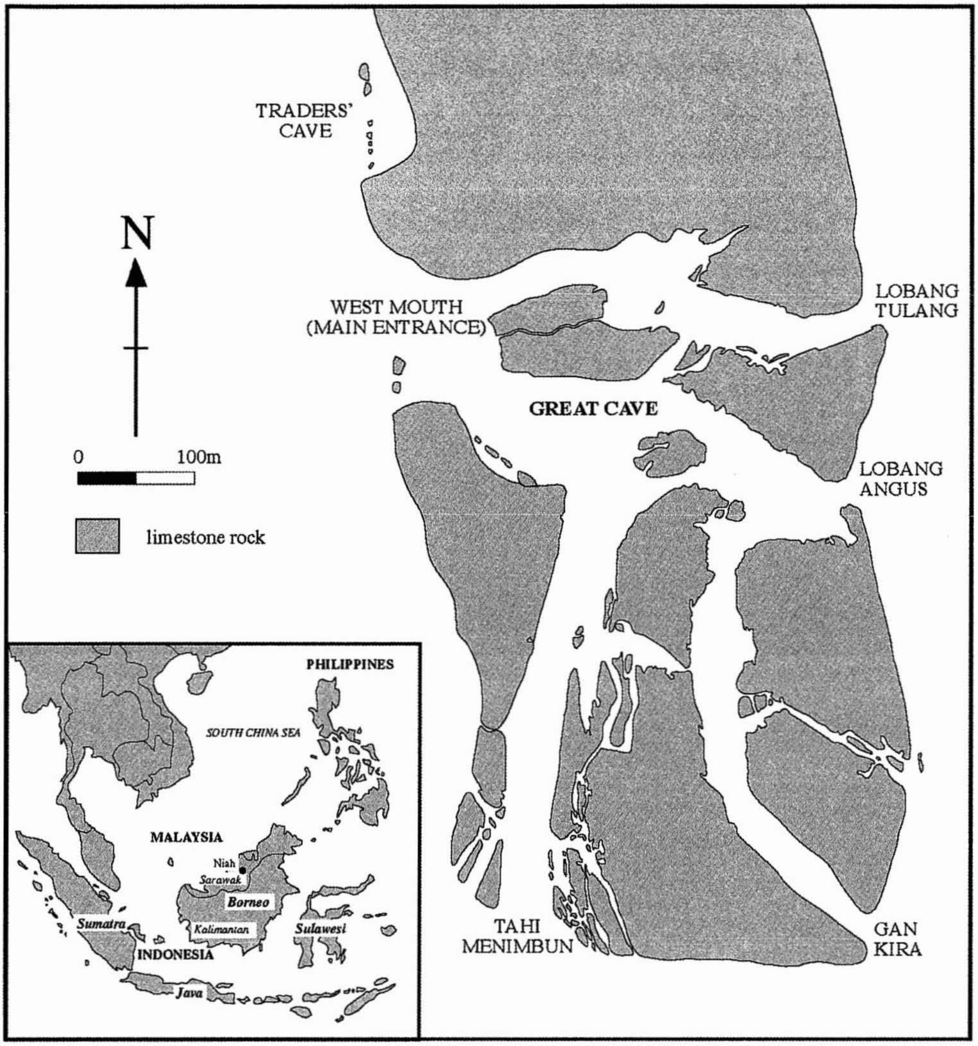

Fig. 1. The Niah Caves complex, Sarawak: the main excavations by the Harrissons were in the West Mouth, Lobang Tulang, Lobang Angus, and Gan Kira.

the region for the length of the sequence of human activity found and the wealth of the material culture associated with it.

However, although the Harrissons and their collaborators published numerous interim reports and specialist papers, they never published a final comprehensive report, and published very few drawings or photographs of the cave infill sequence. Also, they excavated in horizontal spits, a method liable to mix discrete sedimentary and cultural layers in the typically complex and frequently dipping deposits that have accumulated in caves. Furthermore, the various ^{14}C dates obtained were very early in the development of the method, and changes in methodologies since then have resulted in greater precision and accuracy. The

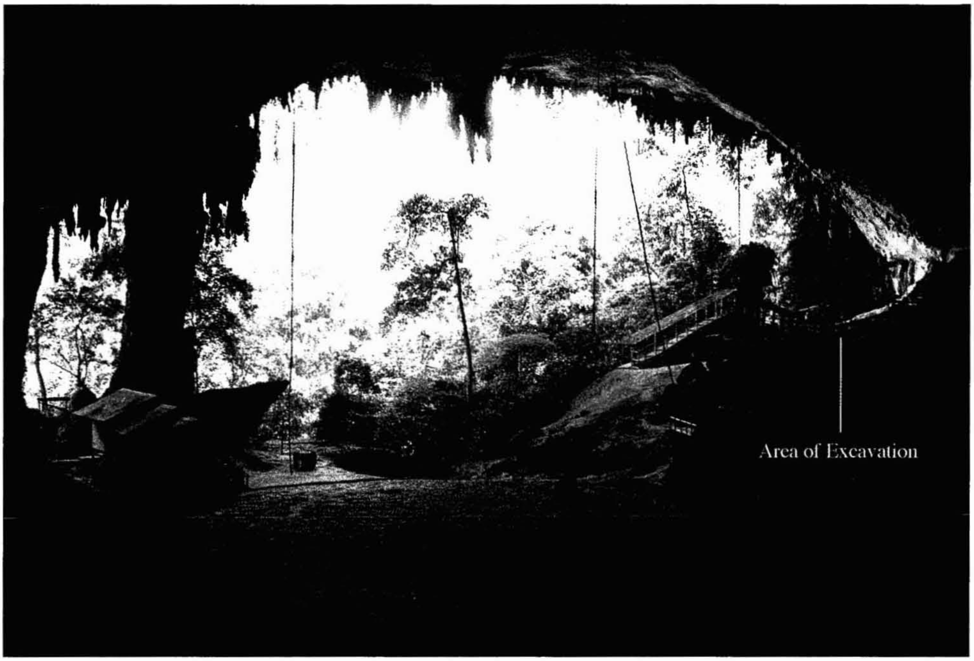

Fig. 2. The West Mouth of Niah Great Cave, showing the archaeological zone. (Photograph: Graeme Barker)

result is that there have always been major uncertainties about the Harrissons' findings at Niah (Bellwood 1985; Solheim 1977*a*, 1977*b*, 1983). Smaller-scale excavations in the West Mouth in the 1970s by Zuraina Majid yielded further insights into the sequence and further valuable ^{14}C dates, and her Ph.D. dissertation publication (Zuraina 1982) was a major contribution in clarifying the state of records and data gathered, but her study failed to resolve the major uncertainties about the integrity, significance, and chronology of the stratigraphy.

The Niah Cave Project was developed in this context, in an attempt to resolve the uncertainties of the caves' archaeology. Since 2000, an interdisciplinary team of archaeologists and environmental scientists has undertaken fieldwork in and around the caves, integrated with intensive laboratory studies of sediments, artifacts, and organic residues. The field interventions in the various cave entrances (with the main work concentrating in the West Mouth) have been kept deliberately small in scale, concentrating on cleaning and sampling sections and faces left by previous excavations. It was clear from reconnaissance visits before our project began that most of the archaeology had been removed by the previous work, so it has been a priority to leave the remaining archaeology as intact and undisturbed as possible for future generations of scholars and visitors, especially given that the caves and the surrounding national park (which includes primary dipterocarp rainforest) are currently being assessed for inclusion on the list of UNESCO World Heritage Sites. The three main goals of the project have been (1) to clarify the nature and chronology of the stratigraphies of the caves' remaining infill deposits and of the human uses of the caves, (2) to establish the climatic and envi-

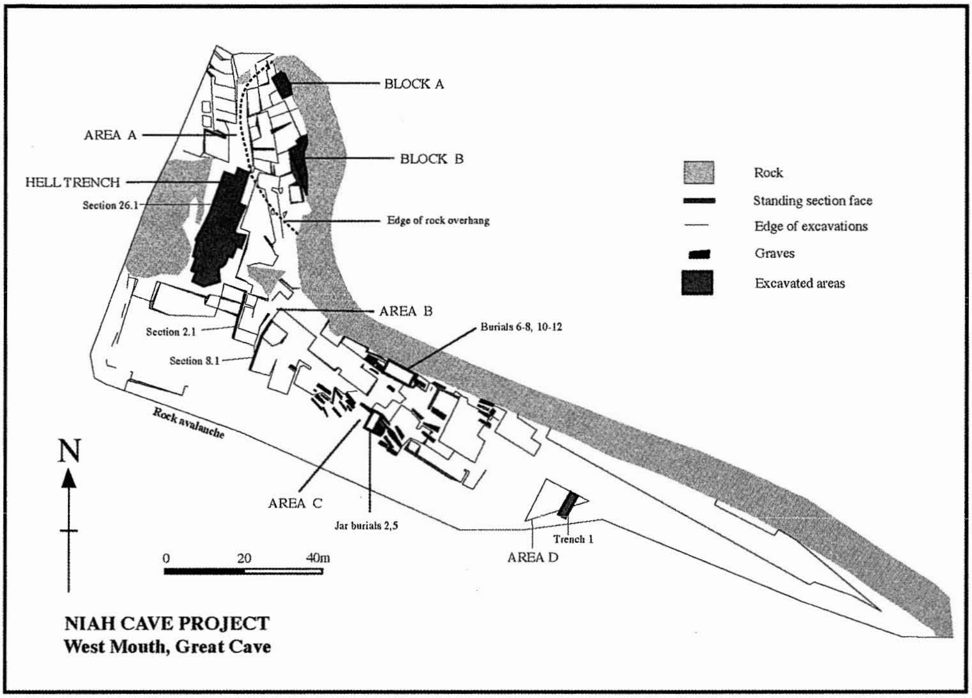

Fig. 3. The West Mouth of Niah Great Cave: plan of the enclosed archaeological reserve, showing the principal archaeological features mentioned in the text.

ronmental contexts in which the human uses of the caves were situated, and (3) to link the new information with the substantial archive of records from the previous excavations so as to provide a modern analytical framework for the earlier discoveries. Substantial interim reports have been published on the four field seasons that have taken place (Barker et al. 2000, 2001, 2002*b*, 2003), together with a summary paper on the results of the first three seasons of study (Barker et al. 2002*a*). The scope of the present paper is to discuss the evidence that has emerged so far from the project for the changing nature of the human use of the cave, the implications of this evidence for wider debates in Southeast Asia regarding the foraging behaviors of the modern human populations who colonized the region in the later Pleistocene, and the character of the later transition from foraging to farming.

THE FIRST FORAGERS

Although the West Mouth of the Great Cave of Niah is some 150 m wide, the main focus of its use by Pleistocene foragers was in and around a small rock shelter that is formed by the cave wall at the northwest corner and measures some 25 m wide and 10 m deep (Figs. 2 and 3). Our investigations have established that the sedimentary sequence in the West Mouth is far more complex than that reported by earlier excavators (this volume: Gilbertson et al., Stephens et al.). The evidence for the earliest occupation at the cave, the Deep Skull, was found

Fig. 4. The Hell Trench in the West Mouth, showing the location of the Deep Skull. The skull was in the Harrisson spit marked by the two parallel lines of white string, approximately at the position of the ranging pole (which is divided into 20 cm sections). This represents a slight recalculation made in 2003 of the position shown in Barker et al. 2002*a:* fig. 6). (Photograph: Graeme Barker)

by Harrisson in the so-called Hell Trench in front of the rock shelter. The geomorphological work has shown that this trench was cut into sediments filling a natural basin formed here between the cave rampart and the large cone of guano that fills the northern chamber of the cave interior (this volume: Gilbertson et al.: Fig. 2). We have established the depth and location where the Deep Skull was found with reasonable confidence and obtained ^{14}C dates that indicate it was deposited in sediments that were accumulating ca. 45,000–43,000 B.P. (Fig. 4). This seems to have been not long after the collapse of a large pillar of stalagmite at the cave lip, which would have effectively opened up the rock shelter and basin to daylight, making them more visible and perhaps more attractive for human occupation. Clay-rich colluvial sediments (classified as Unit [Lithofacies] 2C in our stratigraphy) slipped down into the basin and came into contact with sediments formed by ephemeral streams and pools of water that flowed down from the cave interior (this volume: Gilbertson et al.), eventually making their way through the basin toward a sinkhole at the back of the rock shelter.

Within the colluvial sediments is a series of darker, more humic layers that appear to represent what we have termed palaeosurfaces or stabilization events, when soils developed at the cave lip. Investigation in 2002 of one of the Harrisson baulks in the Hell Trench (HP6) indicated that these darker sediments were associated with clear evidence for human presence, in the form of charcoal and ash, fragments of butchered animal bone (sometimes burnt), mollusks, and occasional stone flakes (Fig. 5). Contexts 3131–3133 are particularly rich in such ma-

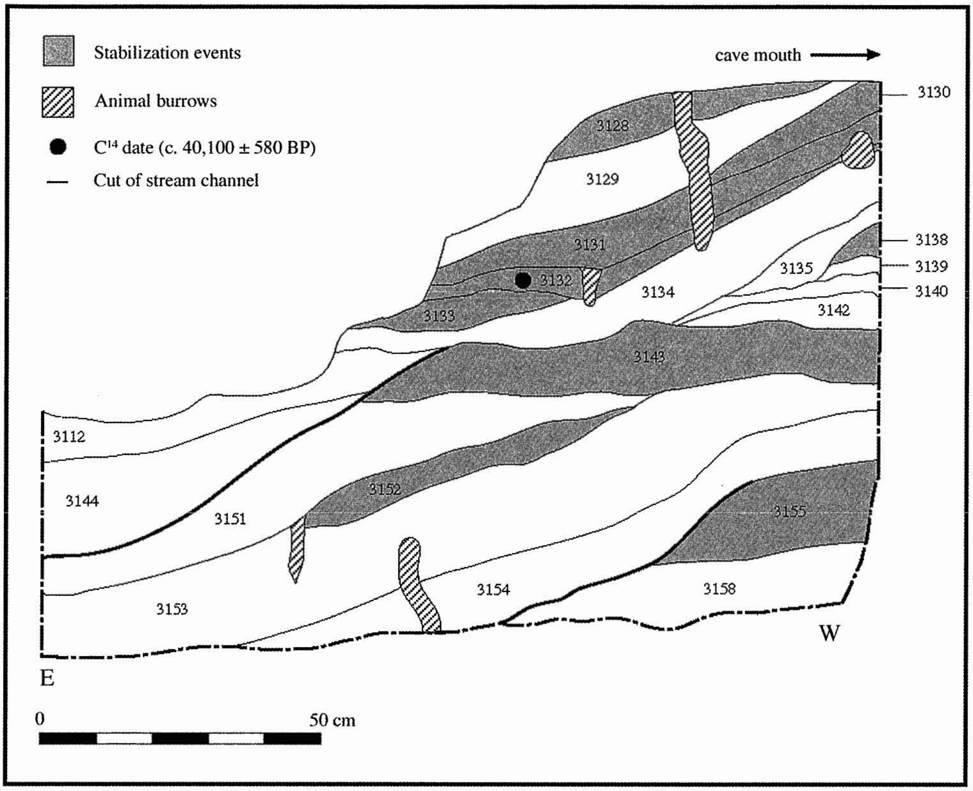

Fig. 5. The northern face of Harrisson's baulk HP6 in the Hell Trench (Section 26.1 in Fig. 3), showing the series of "stabilization events" associated with clear signs of human presence, of comparable antiquity to the Deep Skull (ca. 45,000–43,000 B.P.).

terial and can be correlated stratigraphically with the assumed location of the Deep Skull. There is evidence for bioturbation in the section (indicated schematically by the burrows in Fig. 5), presumably the reason for some of the new ^{14}C dates obtained being out of sequence, but overall the dates point consistently to human presence in this part of the cave in the period 45,000–38,000 B.P. (Table 1). Dates of similar antiquity have also been obtained from charcoal- and ash-rich Unit 2 sediments between the Hell Trench and the rock shelter. A 1.5-m-deep test pit excavated below the location of the HP6 baulk in the floor of the Hell Trench did not locate similar stabilization episodes below those shown in Figure 5, but did find hints of earlier human activity in the form of occasional fragments of charcoal, animal bone, and undiagnostic stone chips. The latter evidence implies that humans may have been visiting the West Mouth some time before 45,000–38,000 B.P., though how much earlier is not yet clear. It is hoped that samples for ^{14}C and OSL dating will provide us with reliable *terminus post quem* dates for both the definite evidence of human activity and the antiquity of the ephemeral or more doubtful evidence below it.

As Gilbertson et al. describe in their paper in this volume, a mudflow of guano plowed into and over these cave-mouth deposits shortly before ca. 38,000 B.P.,

TABLE 1. RADIOCARBON DETERMINATIONS FROM THE PLEISTOCENE AND EARLY HOLOCENE DEPOSITS IN THE WEST MOUTH, NIAH GREAT CAVE[a]

AREA	SECTION	CONTEXT	DATE
Area A Block A	12.1	1025	27,960 ± 200 (OxA-11304)
Area A Block B	10.1	1015	8,630 ± 45 (OxA-11549)
Area A Block B	10.1	1020	19,650 ± 90 (OxA-11550)
Area B	2.1	2096	29,070 ± 330 (OxA-11302)
Area B	2.1	2085	29,070 ± 220 (OxA-11303)
Area D	35.2	3206	8,005 ± 50 (OxA-11864)
Area D	35.2	3021	9,560 ± 60 (OxA-12391)
Area D	35.2	3230	10,000 ± 55 (OxA-11865)
Hell	26.1	3132	40,100 ± 580 (Niah-312)[a]
Hell	26.1	3132	41,800 ± 620 (Niah-311)[a]
Hell	26.1	3132	42,600 ± 670 (Niah-310)[a]

[a] All dates are AMS radiocarbon determinations. Those samples with the Niah prefix were dated by Michael Bird using the ABOX-SC sample preparation (see Bird et al. 1999). Also, they were taken by Michael Bird prior to excavation of the HP6 baulk, with their positions marked on the section, and were correlated with the excavated context 3132 when the latter was excavated the following year. All dates are on charcoal and are shown uncalibrated.

effectively preserving the earlier archaeology. It is not yet clear if people continued to use the cave between this event and the next clear evidence for human presence some ten millennia later. The latter is found within a deposit of friable brown silts some 4 m in depth termed Unit 4 that filled the rock shelter and much of the area in front of it. This deposit survives today only as isolated plinths of sediment at the back of the rock shelter (Fig. 3: Blocks A and B) and in Section 2.1 east of the Hell Trench. However, it is clear from the surviving sediment plinths and from T. Harrisson's records that this entire deposit was rich in midden refuse such as animal bones, charcoal, and mollusks, with most of the stone tools also being found in it—he referred to it as the "frequentation zone." Its lower age range is indicated by ^{14}C dates of ca. 29,000 B.P. from a remarkable series of pits containing nuts and other food debris preserved in Section 2.1 and ca. 28,000 B.P. from the base of Block A, and its upper age by a terminal Pleistocene/early Holocene date of ca. 9000 B.P. from the top of Block B. A flexed burial excavated by the Harrissons yielding a ^{14}C date on bone collagen of ca. 14,000 B.P. was also in Unit 4 deposits.

The physical and chemical characteristics of the Pleistocene sediments associated with the Pleistocene occupation of the West Mouth suggest predominantly drier conditions than today (this volume: Gilbertson et al., Stephens et al.). According to pollen and other palaeoecological microfossils, these conditions favored open wooded or savannalike landscapes around the cave (Hunt and Rushworth in press), though on the lowlands farther afield there were probably extensive rainforests and swamp forests, for example on the continental-shelf plains exposed by sea level regression (Anshari et al. 2001; Kershaw et al. 2001; Sun et al. 2000; Tapper 2002). The palaeoenvironmental data correlate with the range of fauna recovered in the Harrisson excavations of the deposits around the Deep Skull in the Hell Trench, for the habitats of the fauna indicated "a mosaic of closed forest alternating with scrub, bush, or parkland, and including extensive areas of swamp, lakes, or large rivers" (Cranbrook 2000:83). The lowering of mean annual temperatures at the LGM brought lower montane rainforest, now above 900 m above sea level, down to the coastal plains of the Malay archipelago (Morley and Flenley 1987), a phenomenon presumably indicated in the Harrisson fauna by the presence then of species such as the lesser gymnure *(Hylomys suillus)* and the ferret badger *(Helictis orientalis),* species now restricted in Borneo to Mount Kinabalu (Cranbrook 2000:78). Unless affected by local tectonic movements, the coast may have been some 30 km away from Niah ca. 45,000 years ago and ca. 100 km away at the LGM (Voris 2000).

The Pleistocene foragers who used the Niah Caves appear to have combined hunting a wide range of animals and birds with shellfish collection, fishing, and gathering plant foods. The animal bones recovered from the Harrisson excavations (Medway 1958, 1959, 1960, 1978) and from the current excavations include a wide range of larger prey species such as pig (*Sus barbatus,* the bearded pig), various primates, porcupine, monitor lizard, and turtle, together with an array of smaller species such as langurs and macaques, snakes, lizards, swiftlets, insectivorous bats, and fish, the latter including large freshwater and estuarine species probably caught by nets and traps as well as spears (Earl of Cranbrook, P. Piper, and R. Rabett pers. comm.). Pig appears to have been the primary prey species. There are hints in the spatial distribution of the fauna from the Harrisson excavations, currently in course of study by Piper and Rabett, that carcasses were brought back more or less whole to the West Mouth, and that primary butchery then took place around campfires in the Hell Trench zone, with food refuse being dumped in front of and within the rock shelter (the bones in the latter zone are unburnt and are often abraded, suggesting that they were lying on the surface, exposed to the elements and subject to trampling). The Harrissons found a series of crouched burials amidst these dumps of food waste (T. Harrisson 1957), their adjacency to the main living zone implying a close association between the living and the dead.

Mollusks from both the old and new excavations of the Pleistocene deposits consist largely of the species found in local streams by the site today, though they also include occasional estuarine species from coastal mangrove forest (J. Shimmon pers. comm.).

The new excavations have also produced remarkably well-preserved evidence that the Pleistocene foragers integrated hunting, fishing, and mollusk collection with plant exploitation, in the form of fragments of fruits, nuts, and plant tissue or parenchyma (this volume: Paz) and microscopic grains of starch (this volume: Barton). The data indicate the collection, processing in the cave, and presumably consumption of rainforest tuberous plants such as aroids, taro, yam, and sago palm, the latter being the staple plant food of the present-day Penan foragers of central Borneo (Brosius 1991). Many of the tubers require extensive processing to make them digestible. There are also indications from microwear studies of bone and tusk tools that several classes of tools were being manufactured specifically as implements for digging activities (this volume: Rabett). Along with pollen evidence for forest burning outside the cave from the time of the first human occupation (C. Hunt pers. comm.), the evidence of plant and animal remains and tools hints strongly that many of the characteristic strategies and technologies of rainforest foraging known ethnographically in Southeast Asia may in their essentials be as old as the human use of the Niah Caves. We cannot yet determine the relative importance in the diet of plant and animal foods, but it seems increasingly likely that the ability to extract high-energy carbohydrates from rainforests was an important component of the exploitation and colonization strategies of Pleistocene foragers in tropical Southeast Asia. In this respect the Niah evidence is an important contribution to the debate about the extent to which prehistoric foragers had the skills to exploit tropical rainforest effectively (Bailey and Headland 1991; Bailey et al. 1989; Colinvaux and Bush 1991; Endicott and Bellwood 1991; Townsend 1990).

THE TRANSITION FROM FORAGING TO FARMING

Archaeological evidence for the occurrence of pottery and domesticates (pig and rice, especially) in Southeast Asia has been combined with linguistic arguments for an original or pioneer Neolithic population speaking "proto-Austronesian" to account for the transition from foraging to farming in the early and/or mid Holocene and the present-day distribution of Austronesian languages. According to current orthodoxy, agriculture spread southward from mainland China via Taiwan and the Philippines to Borneo and thence across the Pacific as a result of a maritime migration of Neolithic colonists speaking proto-Austronesian and bringing with them new resources such as domestic rice and pigs (Bellwood 1985, 1990, 1996, 1997, 2001; Spriggs 1989). It is argued that Neolithic colonists reached Borneo about 4000 years ago on the evidence of rice phytoliths at Gua Sireh cave in northwest Sarawak (Beavitt et al. 1996; Bellwood et al. 1992).

The primary evidence for the use of the Niah Caves by Neolithic people consists of the hundreds of burials found by the Harrissons in the West Mouth 10–20 m farther into the interior (though still in the daylight zone) from the Pleistocene frequentation zone (Fig. 3: Area C). We have conducted small excavations in the cemetery that have succeeded in their main objective of refining understanding of the sequence of burial forms and associated material culture. As Barbara Harrisson showed (1967), the burial sequence begins with inhumations, probably ca. 5000 B.P. (though this is based on collagen ^{14}C dates obtained in the 1960 and 1970s; Brooks et al. 1977). The bodies we have investigated were commonly wrapped in a shroud made of some form of textile (as yet unidentified) or in bamboo matting, and then buried in wooden coffins fashioned from hollowed-out logs or crude planks (Fig. 6). The dominant burial rite later was to put individuals or groups of bodies into large jars (Fig. 7), the latter sometimes encased in basketry; we have obtained an AMS determination from burnt wood of 2308 ± 35 B.P. (OxA11548) for the latest jar burial (Burial 2) in a sequence we excavated. Whether the jars with multiple burials contained family or kin groups is uncertain, but one jar we excavated contained an adult male, a subadult, an older child, a young child, and a neonate (J. Manser pers. comm.). What is clear, though, is that there was a considerable degree of formal planning, and the preservation of memory, in the layout of the Neolithic cemetery through its ca. 2500-year life: postholes suggest that there were grave markers of some kind; groups of inhumations were generally placed on the same alignments; particular areas were reserved for child burials; and we have found several examples of coffins being placed exactly on top of earlier coffins and of jar burials exactly on top of earlier jar burials.

Fig. 6. The West Mouth of Niah Great Cave: Burial 10, a Neolithic inhumation. Scale: 1 m. (Photograph: Graeme Barker)

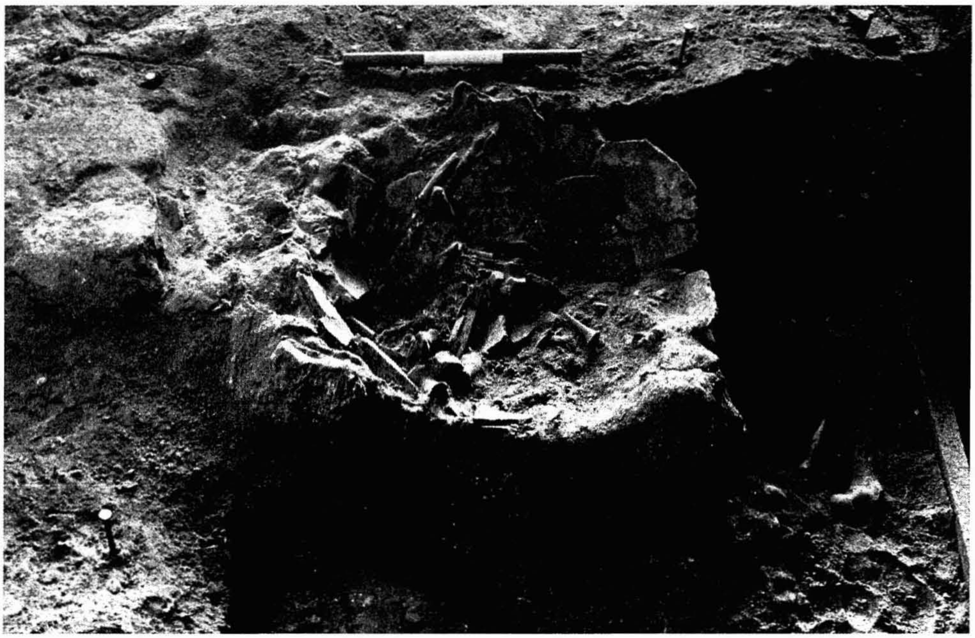

Fig. 7. The West Mouth of Niah Great Cave: Burial 5, a jar burial directly underneath another jar burial (Burial 2), both being cut into an earlier inhumation burial, Burial 1, some of the bones of which are visible to the right. Scale: 30 cm. (Photograph: Graeme Barker)

Whether the West Mouth was used for habitation during its use as a Neolithic cemetery is currently unclear, though other entrances in the cave complex certainly were. A few sherds of Neolithic type (including for example paddle-made ware) were found in the uppermost contexts of the plinths of Unit 4 midden material at the back of the rock shelter (Blocks A and B). However, the drying of these deposits has resulted in them lifting away from the rock wall at the back of the plinths, making it possible for artifacts lost or discarded at the back of the rock shelter after the deposition of Unit 4 to slip down and be incorporated in it. (This feature was noted at the time of excavation, though, and every care was taken to separate the "intact" Unit 4 contexts from the loose and potentially mixed material behind them.) In 2003 similar sherds were recovered from reliable contexts within Unit 4 midden material between the Neolithic cemetery zone and the Hell Trench, but there are as yet no dates available for this deposit. There were also Neolithic sherds in good stratigraphic contexts in the upper part of 1-m-deep midden deposits located farther into the interior of the West Mouth beyond the Neolithic cemetery (Fig. 3: Area D, Trench 1), deposits that yielded two terminal Pleistocene/early Holocene dates in the middle and lower part of the sequence (Table 1), so the upper deposit clearly dates to later in the Holocene. Without further ^{14}C dates, it is theoretically possible for these various pottery-bearing midden deposits to predate the West Mouth Neolithic cemetery or be contemporary with it, or both. (A date later than the Neolithic cemetery phase is unlikely given the durability and frequency of diagnostic material in the more recent occupation deposits, such as Chinese glazed wares and glass beads.) However, Neolithic sherds were also found by the Harrissons in midden deposits in the Lobang Angus entrance, in undated levels enormously rich in marine and estuarine mollusks that very likely date to the mid Holocene high sea level rise, which peaked between 6000 and 4000 years ago (Tjia 1996; Woodroffe 2000), so in part are almost certainly contemporary with the Neolithic cemetery. Despite the lack of good dates for the pottery-bearing midden deposits, it seems clear that, even though the primary use of the West Mouth entrance was for burying their dead, Neolithic people also made use of the Niah Caves for habitation.

Preliminary observations suggest that the food refuse from these deposits is much the same as that of the terminal Pleistocene/early Holocene sediments in the West Mouth: a similar range of animals, reptiles, fish, and birds, and similar botanical evidence for the collection of fruits, nuts, and forest tubers. In many respects this is surprising, given that the later Pleistocene landscape around Niah, as discussed earlier, is assumed to have been drier, more open, and more varied than the wet dipterocarp rainforest that developed across the coastal lowlands of Borneo in the Holocene. However, the molluskan remains from Lobang Angus suggest that coastal mangrove forest was within walking distance of the Niah Caves at the time of the Holocene high sea level, and pollen cores taken either side of the Niah massif also indicate freshwater peat-swamp forest and coastal mangrove forest in the locality at this time (C. Hunt pers. comm.), so Niah in the Neolithic period was not located in the midst of a uniform landscape of closed wet rainforest as it is today. Furthermore, stable isotope analysis of the Neolithic cemetery population of the West Mouth suggests that these people were consuming plant foods from more open environments that the terminal Pleistocene/early Holocene people buried in the frequentation zone (Krigbaum 2001, 2003; and this volume: Krigbaum), though such environments might well reflect human impact on forest as much as natural openings in a mosaic coastal landscape.

But were Neolithic people at Niah rice farmers rather than, or as well as, being foragers? Rice seems to have been quite common at Gua Sireh ca. 4000 B.P., and a single grain of rice has now been found in the temper of a vessel found under one of the Harrisson-excavated burials at Niah, Burial 110, which has a bone collagen date of ca. 5000 B.P. (Doherty et al. 2000), so domestic rice was clearly "within the system" by this time. There are also occasional bones of domestic dog (Clutton-Brock 1959) and domestic pig in the faunal collections from the West Mouth excavated by the Harrissons, though their context and antiquity are not clear. The role of rice farming and pig husbandry in the subsistence of the Neolithic people who buried their dead at Niah is therefore unclear, but so far it appears to have been very small scale. Our failure to find any other evidence for processed or unprocessed cereal remains such as *Oryza* spp. (rice) in the Holocene sediments of the West Mouth, compared with the wealth of wild plant foods recovered, is striking, and is difficult to explain in terms of survival factors given the wealth of many smaller and more fragile organic materials recovered from the flotation residues. The Neolithic sherd containing the rice grain is from a vessel type and fabric thought to have been an import rather than locally made (Doherty pers. comm.), so may indicate only that Neolithic foragers using Niah for burial were in contact with Neolithic rice farmers, rather than engaging in rice farming themselves.

At the very top of the Area D excavated sequence were substantial postholes that appear to be traces of scaffolding for bird-nesting, dated to the thirteenth century A.D. from glazed pottery and Chinese beads in their fills. They suggest that Punan foragers (or, rather, their forerunners) have been collecting birds' nests at Niah for the Chinese trade even earlier that the fifteenth-century date suggested by the historical records. It may be that Neolithic people at Niah, too, were also primarily foragers, though trading with neighboring agriculturalists.

CONCLUSION

The renewed program of excavations at Niah has broadly confirmed the principal conclusions of the Harrissons' work: that the West Mouth was used by foragers in the later Pleistocene and the early Holocene, and then, like several other entrances in the cave complex, for burials by Neolithic people. As a result of the new program of investigations, this sequence can now be properly understood in much greater precision in terms of its relations to complex cave stratigraphies and environmental sequences (this volume: Gilbertson et al., Stephens et al.) and in terms of the human behavior represented in those sequences.

The landscapes encountered by the people who first camped at Niah (ca. 45,000 B.P.?) were drier, more varied, more seasonal, and more open than the present-day dipterocarp rainforest, and the richly preserved organic materials from the excavations reveal that Pleistocene foragers were able to survive in them through effective systems of hunting, fishing, mollusk collection, and plant gathering. The evidence for the use of a wide range of plant foods, including forest tubers, some of which require careful processing to make them digestible, is particularly remarkable. As Barton (this volume) comments, "It is clear that from the outset of human use of Niah Cave, Pleistocene hunter-gatherers already had the necessary knowledge of plant distribution in rainforest, as well as the technical knowledge, to extract useful carbohydrates from roots, tubers, and palm pith." The presence of the starch of an aroid as yet unidentified to species, but which might derive from *Alocasia denudata,* a local species used by recent foragers as poison for their darts, is an intriguing hint that the technology of rainforest hunting known ethnographically might also be of great antiquity. The Niah findings chime with other evidence in Island Southeast Asia for the sophistication of rainforest colonization strategies by Pleistocene foragers, including forest clearance (Groube 1989), tuber processing (Loy et al. 1992; Pavlides and Gosden 1994), and, most remarkable of all, the enrichment of the food resources of New Ireland by the transport there—presumably deliberate—of the cuscus *Phalanger orientalis* (Allen et al. 1989; this volume: Leavesley).

Neolithic people at Niah seem to have been foragers, though perhaps (on the evidence of a single grain of rice in a nonlocal burial vessel) in contact with farmers using rice from ca. 5000 B.P. Though this sherd represents a very early occurrence of rice in the region, rice does not seem to have been widespread as a staple crop in Sarawak until a few centuries ago on the evidence of the frequency of rice temper in domestic pottery (Doherty et al. 2000). The remarkable antiquity and longevity of rainforest foraging knowledge and technologies at Niah, from the foraging behaviors of the first colonists to the sago management systems developed by the Punan today, surely provide further support for the growing number of scholars arguing against the Neolithic/Austronesian colonization model for agricultural origins in Island Southeast Asia. There is increasing evidence in Island Southeast Asia and Oceania that indigenous tree crops were managed or domesticated in some form or another long before the incorporation of domestic rice, pigs, and dogs into local subsistence systems (Gosden 1995; Latinis 2000; Terrell and Welsch 1997; Yen 1995). The eventual commitment to rice farming in Island Southeast Asia may have been more the culmination of a long process of experimentation and adaptation by the indigenous forager populations reaching back into the Pleistocene—at Niah earlier than anywhere else in Island Southeast Asia—than a sudden behavioral change by foragers in response to the acquisition of new resources or the sudden arrival of new people. (One test of these differing population scenarios at Niah will be a morphological comparison of the pre-Neolithic and Neolithic human remains that is the focus of an ongoing doctoral thesis [J. Manser pers. comm.].) Of course all three of these processes are likely to have played some role, at some time, in the transition from foraging to farming in Island Southeast Asia. A complex mesh of cultural interchange and movement through the Holocene chimes with the complex demographic history that is increasingly suggested by genetic studies of the modern populations of the region (Oppenheimer and Richards 2001).

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NOTE

1. The radiocarbon dates in this paper are uncalibrated.

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ABSTRACT

This paper reports on the principal archaeological results of a renewed program of fieldwork in the Niah Caves (Sarawak) by an interdisciplinary team of archaeologists and environmental scientists. The paper focuses on two main themes: (1) the evidence for the changing nature of the human use of the cave and the implications of this evidence for wider debates in Southeast Asia regarding the foraging behaviors of the modern human populations who colonized the region in the later Pleistocene, and (2) the character of the later transition from foraging to farming. The first foragers visiting the caves ca. 45,000 years ago encountered much more varied landscapes than the present-day equatorial evergreen rainforest around Niah, though they were ones in which rainforest probably remained a component. A remarkable array of organic evidence indicates that the Pleistocene foragers using the caves exploited such landscapes with a combination of hunting, fishing, mollusk collection, and plant gathering, the latter including tuberous forest plants such as aroids, taro, yam, and sago palm. In the mid Holocene, when the landscape surrounding the cave was more similar to that of today, the primary use of the caves was for burials: the West Mouth of the Great Cave in particular was the location for an elaborate Neolithic cemetery that was characterized by a considerable degree of formal planning through its ca. 2500-year life. However, Neolithic people may also have used the West Mouth for habitation, as they certainly used other entrances of the cave complex. Based on present evidence, their subsistence base appears to have been forest foraging, though they were in contact with rice farmers. The remarkable antiquity and longevity of rainforest foraging knowledge and technologies at Niah appear to be among the most important conclusions emerging from the project, findings that may provide further support for arguments against the forager-farmer dichotomy that underpins the currently dominant model of agricultural origins in Southeast Asia. Keywords: Niah Caves, Borneo, tropics, rainforest foraging, Neolithic burial, transitions to farming.