THE DISCOVERY OF CLAY-LINED FLOORS AT AN IRON AGE SITE IN THAILAND – PRELIMINARY OBSERVATIONS FROM NON MUANG KAO, NAKHON RATCHASIMA PROVINCE

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Abstract

Non Muang Kao was excavated as part of an effort to illuminate the origins of complex polities in Northeast Thailand and the rest of Southeast Asia. This large site, ringed by several channels, may represent an important prehistoric centre. Non Muang Kao, which was occupied during the Iron Age, revealed several burials containing Phimai black ceramic vessels and glass beads. Many of the burials were lined with a white clay and some were filled with burnt rice. A succession of floors made from the same clay as that in the burials were also discovered. One floor contained structural features including the remains of a wall and a post which had clay packed around it.

Introduction

Non Muang Kao was excavated as part of the 'The Origins of Angkor Archaeological Project' (OAAP). This project is co-directed by Charles Higham of the University of Otago, Dunedin, New Zealand and Ratchanie Thosarat of the Fine Arts Department of Thailand. Research began in December 1996 with the excavation of Ban Lum Khao[1], a Bronze Age site, located in Amphoe Non Sung, Nakhon Ratchasima Province, Northeast Thailand. Non Muang Kao[2] was excavated over two seasons from January 1996- February 1997.

The research explores the enduring question of the rise of civilisation in Southeast Asia. The civilisation of Angkor, founded in 802 AD, is famous for its vast temple complexes. It was the leading pre-industrial state of Southeast Asia, yet little is known of its origins. Under the French, attempts to understand the development of Angkor emphasised the impact of Indian culture, religion, architecture, language, as well as political and legal systems. The influence of these external factors, although significant, are insufficient to explain the rise of this powerful empire. To date, little consideration has been given to the contribution of the indigenous societies. The Origins of Angkor Archaeological Project seeks to focus upon internal developmental factors, which trace the cultural trajectory in Southeast Asia from the Bronze Age (beginning *c.* 1400 BC), through the Iron Age (from c. 500 BC) and the first contacts between the Indian subcontinent and Southeast Asia.

Objectives

The research programme was designed to illuminate the indigenous late prehistoric culture and assess the nature of the transition to the Angkorian state. The prehistoric roots of Angkor can be traced to the appearance of large, apparently moated sites in Cambodia and Northeast Thailand. These sites may represent a shift in the social organisation of the region from autonomous villages to what appear to be centralised chiefdoms. In order to understand this transition, OAAP proposed to investigate the transition from the Bronze Age, represented at Ban Lum Kao, and compare it with that of the Iron Age moated site of Non Muang Kao as well as Noen U-Loke which was excavated during 1996-97 by Higham and Thosarat.

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[1] Lat. 102°.20′, long. 15°.14′ (RTSD 1984)
[2] Lat. 102°.17′, long. 15°.13′ (RTSD 1984)

The late prehistoric landscape of the Mun River valley, where the excavations were conducted, was dominated by substantial sites, some attaining 50 ha in area and ringed by what appear to be concentric moats. It is a central aim of the project that the nature and use of these channels be determined. Based upon their morphology (Boyd pers. comm.), it is unlikely that they were utilised for defensive purposes, although they may have been used for the cultivation of fish or aquatic plants. The channels may have a symbolic purpose or perhaps were reserved by the elite for rice production. If we are able to document the development of centralised authority in later prehistory, it will allow us to appreciate more clearly the transition to statehood.

The excavation and analysis of material from Ban Lum Kao, Noen U-Loke and Non Muang Kao will make possible an assessment of the social, technological and economic life of both an early and a late prehistoric community. It will also contribute an essential foundation to our understanding of regional development and cultural evolution in Northeast Thailand. The research will clarify the nature of the societies which were prepared to incorporate certain Indian traits into their own culture, while continuing such long-established practices as rice cultivation, water control, exchange in exotic goods and the maintenance of ancestral cemeteries.

Previous research

There is a paucity of scholarly literature in the area of state formation pertaining to Southeast Asia. The presence of walled and moated sites on the Khorat plateau has been noted since the 19th century (Aymonier 1895, 1897). The first excavation of sites of this type occurred in 1955 when Wales (1957) dug test pits at Ban Thamen Chai and Muang Phet. Later the Thai Fine Arts Department surveyed moated sites in the Khorat region and undertook limited preliminary excavation at two sites, Muang Sema (F.A.D. 1959) and Kantarawichai (Subhadradis Diskul 1979). Non Dua, in Roi Et province, was investigated by Higham (Higham and Parker 1970), revealing evidence of occupation from 500 BC and Ban Chiang Hian, a large moated site revealed evidence of occupation from 1000 BC (Chantaratiyakarn 1984). Wichakana (1991) excavated at Noen U-Loke, one of the sites being investigated by the OAAP, finding evidence of Iron Age occupation atop a Bronze Age cemetery. Other sites which have recently been excavated include Ban Don Plong which revealed evidence of iron smelting and inhumation burials and Non Yang, a site with many parallels to Non Muang Kao (Nitta 1991). Ban Krabuang Nok lies at the confluence of the Mun and the Lam Sa Thaet rivers. It was excavated by Indrawooth et al. (1990) giving evidence of bronze and iron smelting. Moore (1992) excavated at Ban Takhong, another 'moated' site situated on a tributary of the Mun River, finding evidence of occupation dating to the early part of the first millennium.

Several studies have used aerial photographs and topographic maps of the Khorat plateau. Saengwan (1979), Higham, Kijngam and Manly (1982) and Srisakra (1984) located numerous sites in Northeast Thailand showing possible moats and earthworks. More recently, Parry (1992) undertook an examination of Landsat satellite images and conventional air photographs to categorise the main types of earthworks and demonstrate the value of this type of technology in settlement pattern analysis. Aerial photographs have been used by Elizabeth Moore (1985, 1986, 1988) in locational analysis and classification of moated settlements. Moore's work has found significant size differences between moated sites which may indicate a hierarchical arrangement.

A thorough synthesis and interpretation of the social and political developments in Southeast Asia as they were understood at the time was undertaken by Wheatley (1983). He laments the lack of archaeological research undertaken in the area. Welch and McNeill (Welch 1983, 1984, 1985, Welch and McNeill 1988-9) have turned their attention

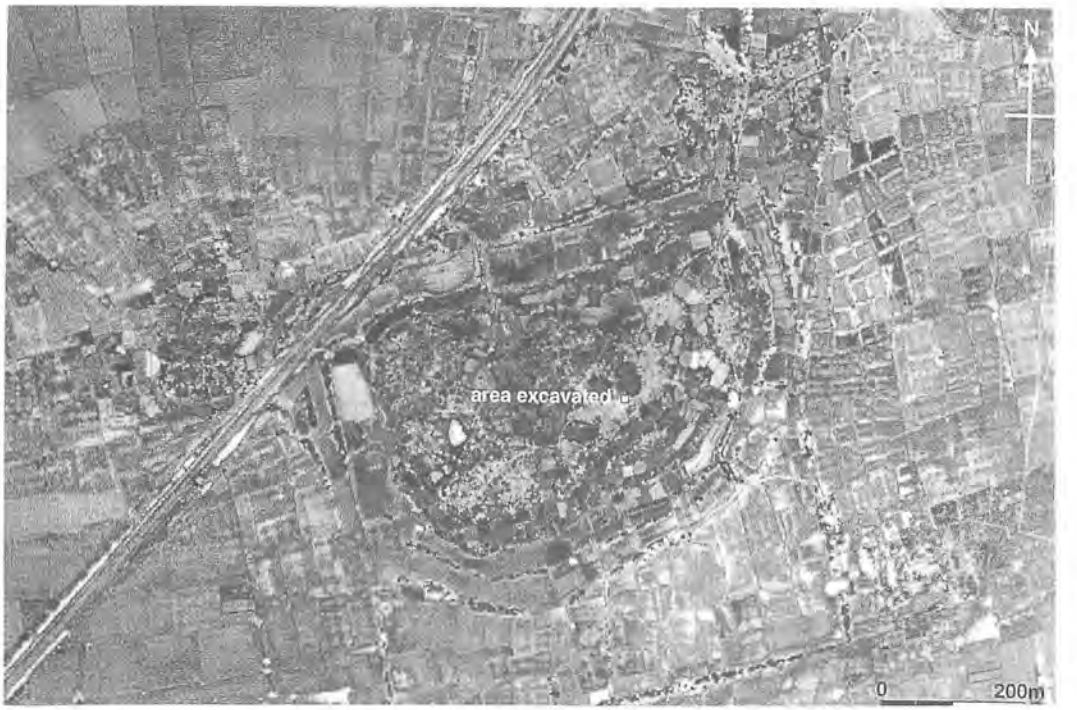

Figure 1. Aerial view of the mound at Non Muang Kao locating excavated area.

to the development of centres such as Phimai.

The 'moated' settlements of Northeast Thailand pose an important and intriguing range of problems. Sites of this type are documented in the Angkorian heartland, posited as seminal aspects of the later Khmer empire (Moore 1989, 1992). The current political climate in Cambodia and a host of other logistical problems render an examination of sites of this type more feasible in Thailand. Recognised in areas of both Thailand and Cambodia, moated sites are especially densely distributed in the Mun River valley.

The current research seeks to expand upon that which has already been undertaken. It is hoped that through examining Ban Lum Khao, Non Muang Kao, and Noen-U-Loke, that a more complete understanding of developmental processes in the Mun River valley will be attained.

Non Muang Kao

Non Muang Kao, 'Mound of the Ancient City', is a 50 ha prehistoric mound, ringed by two wide 'moats' or channels (Figure 1). These channels are 33 m in width and the 'ramparts' separating them are up to 3 m high. The mound itself is 300 m in diameter and rises seven metres from the surrounding rice fields. The only evident disturbance of the site has been the construction of a railway and a road which destroyed the moats to the west and east of the mound. The entire site is bounded by a rectangular feature, the date of which is unknown. Non Muang Kao today is surrounded by extensive rice fields. Isolation has probably contributed to its preservation clearly enhancing its archaeological value. Based on the recovered ceramics, Non Muang Kao appears to have been unoccupied since about AD 600 in the early historic period.

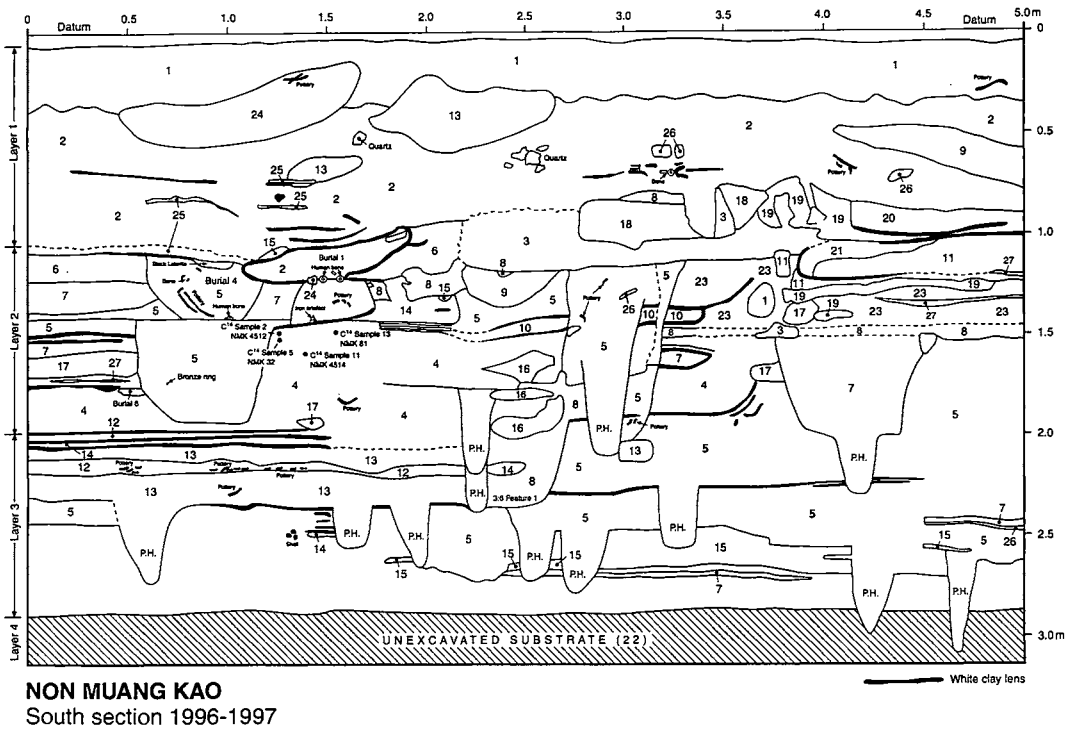

Figure 2. Key to south section of trench excavated at NMK in 1996.

1. 5 YR 3/3 Dark Reddish Brown 2. 10 R 4/6 Red 3. 2.5 YR 5/8 Red
4. 10 YR 8/6 Yellow 5. Mottled 6. 2.5 YR 4/6 Red 7. 5 YR 5/4 Reddish Brown
8. 2.5 YR 6/4 YR Lt. Yellowish Brown 9. 2.5 YR 5/2 Weak Red
10. 5 YR 6/3 Light Reddish Brown 11. 7.5 YR 7/4 Pink 12. 5 YR 7/3 Pink
13. 10 R 6/3 Pale Red 14. 10 R 6/8 Light Red 15. Laterite 16. 10 YR 8/1 White
17. 10 YR 7/6 Yellow 18. 2.5 YR 4/8 Red 19. 10 YR 7/3 Very Pale Brown
20. 10 R 4/6 Red 21. 7.5 YR 7/6 Reddish Yellow 22. 7.5 YR 5/6 Strong Brown
23. 7.5 YR 6/4 Light Brown 24. 5 YR 5/1 Grey 25. 7 YR 3/6 Dark Red
27. Black P.H. = Post Hole

The excavation

Excavations at Non Muang Kao were undertaken in a five by five metre area on the top of the mound. The excavation procedure involved the removal of cultural layers within ten cm spits. The cultural sequence was divided into three broad periods based upon the nature of the matrix (Figure 2).

Layer one comprised the surface layer and was found to be a dark reddish brown to reddish brown colour (Munsell: 5 YR 3/3 to 2.5 YR 5/4). Layer two was a mottled reddish yellow to light brown colour (7.5 YR 7/6 to 7.5 YR 6/4). The third layer was pinkish grey (5 YR 6/2). The basal layer was light brown (7.5 YR 6/4) (M. S. C. C. 1994). The datum referred to throughout this report was located 17 cm above the surface of the mound.

Based upon the ceramics recovered and the radiocarbon dates from the 1996-97 field season the entire sequence excavated at Non Muang Kao was found to date to the Iron Age. The archaeological material rested upon a natural mound which, in antiquity, would have been situated beside a major river (Boyd pers. comm.). The top of this

Code	Wk	dC13	% Modern	Result	2Σ corrected
NMK 32	4512	-26.9+/-0.2	80.4+/-1.6	1750 ± 160 BP	3 BC -639 AD
NMK 81	4513	-24.0+/-2.0	NA	1640 ± 70 BP	315–584 AD
NMK 66	4514	-25.3+/-0.2	80.9+/-0.9	1700 ± 90 BP	129–545 AD
NMK 32	4515	-26.2+/-0.2	81.9+/-0.6	1610 ± 60 BP	336–600 AD

Table 1. The radiocarbon dates from Non Muang Kao.

natural mound is four metres above the present fields with just over three metres of cultural material on top of it.

Radiocarbon determinations

Several samples from the first field season at Non Muang Kao were submitted to the University of Waikato's Radiocarbon laboratory. All the samples were taken from secure contexts. The resulting dates are listed in table one.

- NMK 32 (Wk 4512) Charcoal sample from within a pot in 2:1 Feature 1. This feature was sealed by a clay floor (Transition L1-2 Feature 4). This sample dates the use of the pot as a possible hearth base. 1.44 m below datum.

- NMK 81 (Wk 4513) Charcoal from the fill over a clay floor (2:5 Feature 15). The sample therefore postdates this floor and predates another clay floor (2:3 Feature 5). 1.54 m below datum

- NMK 66 (Wk 4514) Charcoal from fill over a clay floor (2:5 Feature 15) therefore post-dating the floor and contemporary with pot scatters 2:3 Feature 7 and 2:3 Feature 8. 1.53 m below datum.

- NMK 32 (Wk 4515) Charcoal from 2:1 Feature 1. The sample lay below a Phimai black pot which contained sample Wk 4512. It should date the use of the hearth and predate the clay floor (Transition Layer 1-2 Feature 4). 1.45 m below datum.

A further set of radiocarbon dates obtained during the 1996-97 excavation are being processed at the University of Waikato Radiocarbon Laboratory.

Layer One

The surface and first 50 cm of the excavated area featured concentrations of pot sherds (Figure 2). It is speculated that they were deposited as occupation material. One deposit appears to have been a midden. The first substantial feature was encountered 70 cm below datum. A collection of antlers, animal bone, pottery and ash were uncovered in close proximity to a hearth. The antlers were arranged end to end to the north of the hearth. Pottery and a line of rim sherds were arranged along one edge between an ash deposit and red soil. The pattern of concentrated ceramic material, bone and hearths continued in the excavated spits down to 1.3 m. The animal bone encountered in these layers were comprised mainly of *Bos* and pig.

At this same level the first of a series of unusual features were encountered. Two floors constructed of white (5Y 7/3 to 5Y 7/4) plaster or clay, one lying atop the other were uncovered. At the same level a circular feature, constructed of identical material to the floors, was discovered. In section it was seen to be *c.* 50 cm across and 7-10 cm high. The top surface was dish shaped. At a slightly lower level there was a two metres oblong extension of steel grey plaster from the cir-

cular feature. The function of the feature is unknown but may have served as a mortar in which rice was crushed.

The upper clay floor was rather degraded and covered an area of about one by one and a half m. The clay was very thin and patchy. Below this, however, lay another floor which covered a much larger area, being nearly three metres long and two metres wide before disappearing into the baulk. This surface was sloped downward in the southern end. The lower floor was found to be only three mm thick in section. The possibility that these floors may be alluvial or other naturally deposited features must be dismissed. The presence of packed white clay around former posts and walls negates this possibility. Some of the original posts have survived as pseudomorphs. Although there are no organic wooden remains, the morphology of these posts still clearly indicates growth rings.

At 1.26 m below datum the first burial was encountered. Burial one consisted of metatarsals and tibiae projecting out of the south baulk, with the head presumably orientated to the south. The burial appeared to rest on the lower of the two clay floors. In section however it was apparent that the body had been encased in a clay-lined grave, structurally unrelated to the clay floors. No grave goods were found in association with this interment.

Layer Two

The first level of layer two appeared to be uneven, dropping downward on the east side of the unit where a shallow ditch had been dug. In the same layer, below the white clay floor described above, the remains of a large pot sitting on an area of burnt soil and ash were discovered. The feature clearly represents an *in situ* cooking hearth which was sealed by the construction of the clay floor.

The second burial was discovered *c.* 1.5 m below datum. Burial two was only partially exposed, nearly everything except the skull remained in the north baulk. The post-cranial remains which were exposed were poorly preserved. The burial cut through another feature, which consisted of pot-sherds in a matrix of laterite pebbles in which were several post holes filled with laterite nodules. The grave contained nine copper alloy bangles, found to the left of the skull, two small monochrome drawn Indo-Pacific glass beads (Francis 1990), found to the right of the cranium and several fragments of copper alloy recovered from the fill. Although it was difficult to ascertain, it appears that this burial was orientated with the head to the south.

Another burial was encountered along the middle of the west baulk and again it was only partially exposed. Although the bone was very poorly preserved, several infant teeth were recovered. Burial three contained five copper alloy bangles, a copper alloy ring and a Phimai black pot. The fragility of the pot distinguished it from the sherds found in non-burial contexts from the same level. The skeletal remains were surrounded by rice silica and rested on a white clay surface which was curved and bowl-like in section. The orientation of the burial was unclear, but probably ran east-west.

Burial 4 was discovered at a depth of 1.44 m below datum along the south baulk. Only the cranium was protruding into the excavated area. The grave contained four Phimai black pots, a copper alloy earring and a bimetallic earring. The individual was interred with the head to the north, contrary to the orientation of the previous burials. Beneath the mandible an area of green staining was noted, and interpreted as the remnants of a rice bed. As the excavation progressed it became apparent that the prehistoric inhabitants of Non Muang Kao interred their dead with large quantities of rice often in graves lined and sealed with white clay. To the author's knowledge this practice has not been previously noted in the literature. A congruent burial practice was encountered during the 1996-97 excavation of Noen U-Loke, although none of the graves were clay lined (Higham pers. comm.).

At a depth of 1.45 m another feature, which may be related to the lower of the two clay floors above, was discovered. It covered the same area as the lower clay platform but consisted of reddish, burnt soil and charcoal as opposed to white clay. There was a very clear edge (to yellow silty clay) running north-south from the south baulk. In section this feature was found to be *c.* 10 cm deep. There was a great deal of charcoal mixed with reddish soil. Below this reddish soil there was another clay floor (1.55 m below datum). On the surface of this clay floor was found a great deal of broken pottery and charcoal. The floor appears to have been constructed in prehistory by excavating about 10 cm into the surface thereby creating a lip running north-south. The excavated surface then appears to have been covered with a thin coating of white clay. This floor, like those above it, disappeared into the east baulk.

Ten cm below this clay floor at *c.* 1.60 m below datum in the southeast corner, lay the patchy remains of yet another floor (Figure 3) which varied in thickness. Within this floor there were found linear features, which may have been seatings for wooden wall structures, although this was not readily apparent in section. Post holes were also

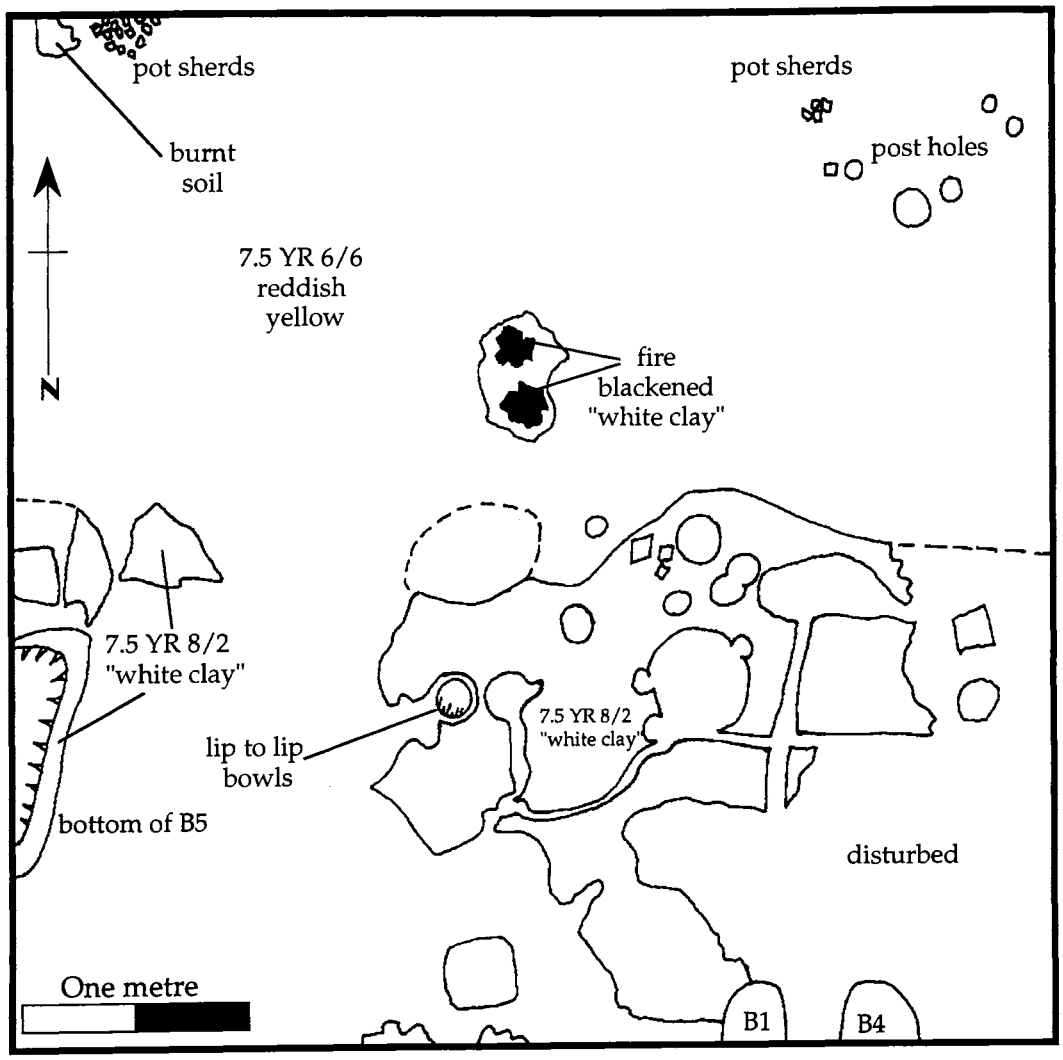

Figure 3. Clay lined burial and disturbed clay floor in Layer 2 at *c.* 1.60 m below datum.

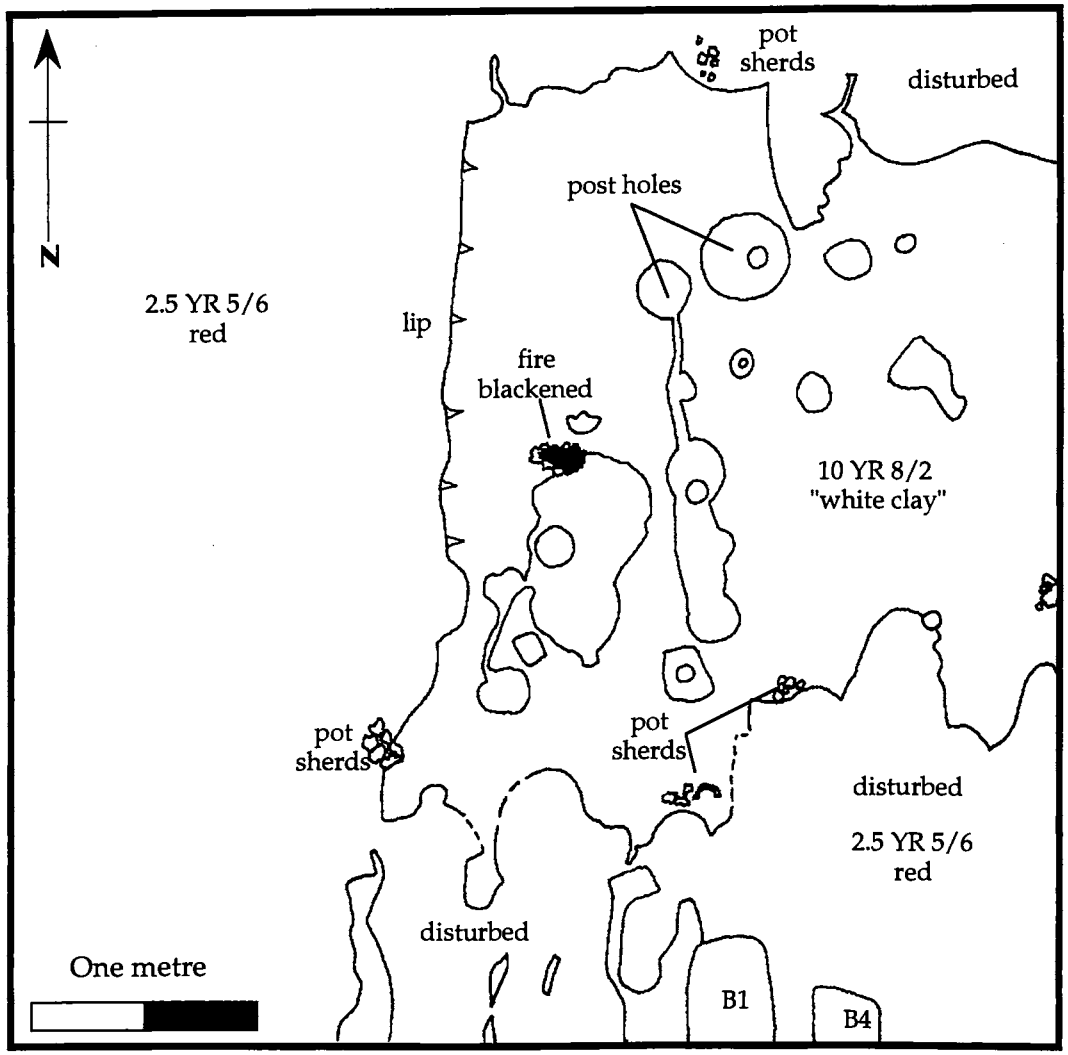

Figure 4. Clay floor at c. 1.76 m below datum, Layer 2.

noted which had the white clay packed up around them. Two small pots were discovered, lip to lip, set into the clay floor, in a precisely cut hole (Figure 3, centre).

An interesting feature was discovered *c.* 1.67 m below datum. During excavation it appeared to be a large area of broken pottery. The sherds seem to have been arranged in such a way to form a crude drain which disappeared into the western baulk. Some of the sherds were stained a sulphurous green. There was a similar feature discovered along the northern wall of the excavation slightly lower than the white clay floor. It is possible that these features served as drains.

At 1.76 m below datum a larger clay floor was revealed (Figure 4). This floor covered nearly the entire eastern half of the excavated unit. The morphology of this feature is identical to the others in that the floor is depressed *c.* 10 cm into the ground and plastered. The floor was covered with scatters of carbonised rice and bamboo.

Burial five was found in the south-west corner of the unit. The grave fill was a pebbly lateritic material. The grave appears to have been lined with clay. The bottom sur-

face was constructed of the same white clay as the floors. The grave cut was about 70 cm deep. The burial was capped with a thin layer of white clay and contained an infant-mandible. The only grave good recovered was a copper alloy ring. The orientation was impossible to determine.

Another burial was encountered along the eastern baulk. Burial six contained substantial quantities of rice silica and pieces of the clay floor through which it was dug. The grave appears to extend north-south from the south baulk. The bone was very poorly preserved, only fragments of the skull, pelvis and parts of the tibiae being recovered.

Burial six was the richest of the burials encountered, containing 25 artefacts. The head lay to the south, an agate bead rested on the chest, below the skull. On the arms, 14 bronze bangles were found and the legs had several bronze bangles apiece. On the fingers numerous bronze rings were discovered. There was a bimetallic ear ring as well as several other rings of iron and bronze, a hammerstone and some concreted iron. There were also 48 drawn Indo-Pacific glass beads recovered and a Phimai black bowl.

Along the south baulk, *c.* 1.80 m below datum, a concentration of pottery was discovered which was associated with bronze

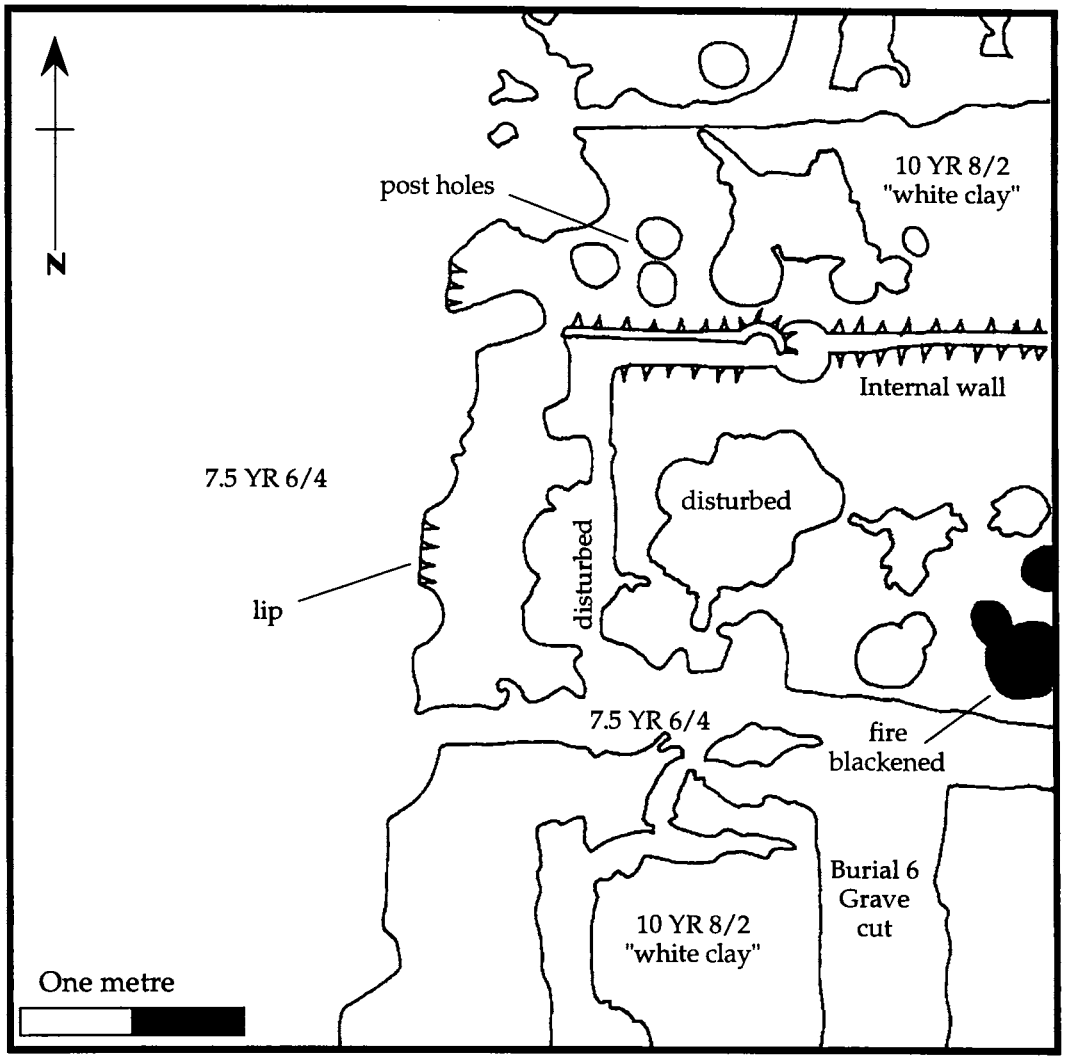

Figure 5. Clay floor at *c.* 1.98 m below datum, Layer 2, showing lipped edge and interior wall.

ear rings, one bimetallic bangle and two concentrations of drawn Indo-Pacific glass beads, one group comprising only yellow beads and the other of mixed colours. Other artefacts included several broken pots and more beads all encased in a clay envelope. No human remains were uncovered due to poor bone preservation. There was a notable amount of burnt bamboo and rice remains in the area as well.

Although no bone was recovered near the concentration of artefacts it is likely that this represents a burial, which, based upon the cross section of the clay envelope, ran north-south. It was lined with the same white clay as the others. This burial was in close proximity to one of the clay floors. It was difficult to distinguish where one began and the other ended but it was determined that the two were probably unrelated. The burial disturbed the white clay floor when it was dug. The clay bottom of the burial is thick and of a slightly different colour than the floor.

The remains of another white clay floor were found at a depth of 1.80 m below datum on the east side of the unit. This surface was found to be extremely patchy and discontinuous, the largest area covering 1 x 0.6 m.

The next major feature encountered was another white clay floor at *c.* 1.98 m below

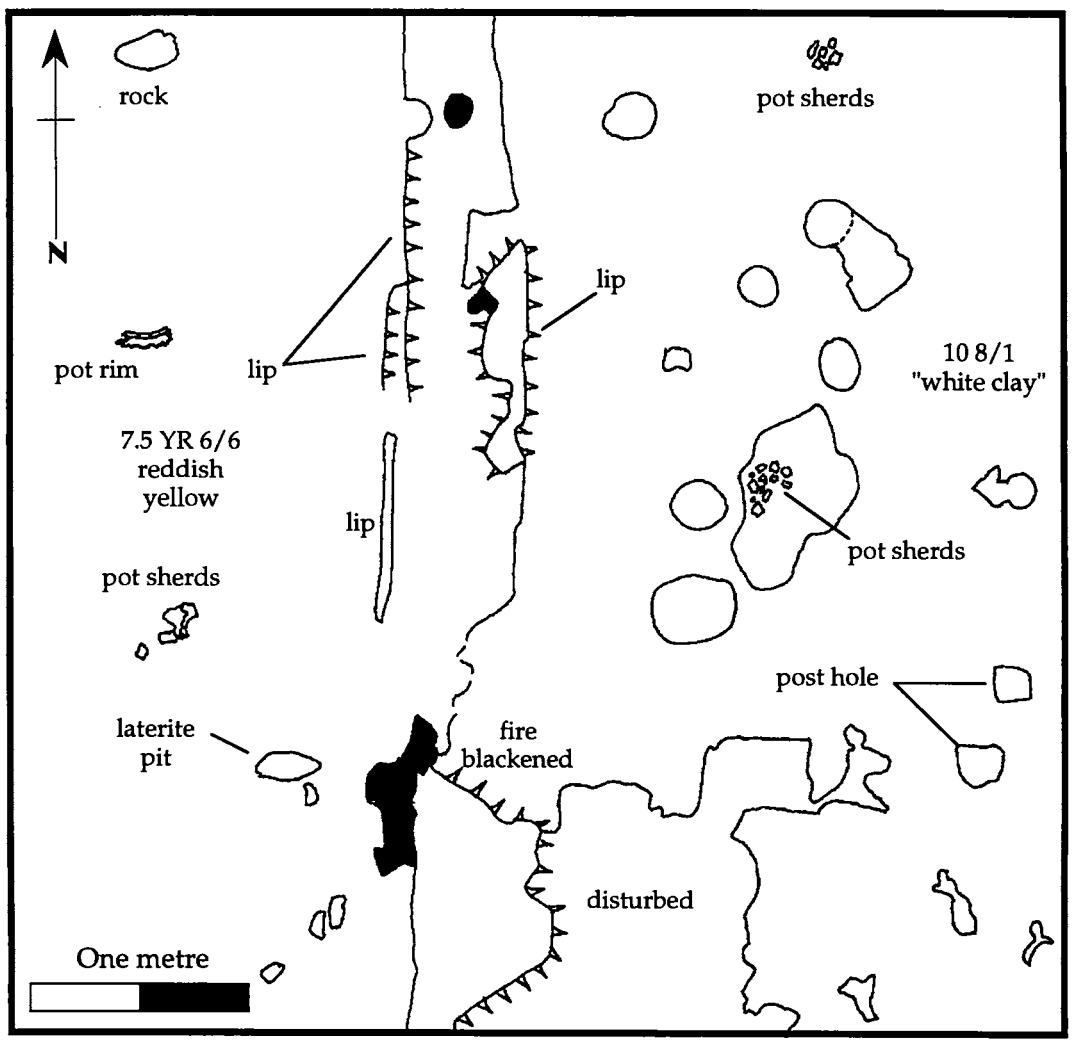

Figure 6. Three successive clay floors at c. 2.10 m below datum, Layer 3.

datum (Figure 5). There were some fire blackened areas (*c.* 40 cm in diameter) along the east baulk. The floor covered approximately two thirds of the excavation unit. Although it was disturbed in many places this feature was easily recognisable. The remains of an interior wall could be seen running east-west. The white clay lipped up on either side of the place where the wall had once stood. This lip was *c.* 20 cm in height. The remains of a large post (20 cm diameter) which had clay packed around it were also found.

This floor had been cut through by burial six, but there was yet another clay surface below it which had not been disturbed by the digging of burial six. It was difficult to determine the relationship between the clay floor and the bottom of the interment. It appeared that the floor below may represent a replastering of another floor which is two cm below it. This appears in section as three separate episodes in the same location, indicating perhaps, continuity over a very short period of time.

Layer Three

The advent of layer three was heralded by a notable change in matrix colour, from a mottled reddish brown (5 YR 5/3) to a very pale brown (10 YR 7/4) at a depth of 2.16 m. A clay floor demarcated the change in soil colour from layer two to layer three. This floor, although not as well preserved as those above it, was extensive, covering the entire unit from north to south and nearly two thirds of the unit, east to west (Figure 6). The floor was lipped along its western edge and the remains of two more lipped edges could be discerned below it. Excavation demonstrated that these lips were the only remains of the previous floors.

The reason for this was soon revealed as several large areas of burning were uncovered with the removal of the intact white clay floor. Directly beneath the clay floor and possibly related to the burning mentioned above, there was extensive blackening of the soil yet no charcoal. This may represent the removal of debris after the destruction of the structure and subsequent reconstruction in the same location.

At a depth of 2.16 m an interesting pyrotechnological feature was encountered which consisted of two abutting circles of burnt soil. There was a crust over the top, below which lay a powdery grey ash. The northern circle was about 9 cm deep when sectioned. The middle of the circle was 18 cm in diameter and consisted of a hard, fired, orange earth. This was surrounded by very fine grey ash. The southern circular feature also had a hard crust on the top, below which was the same fine grey ash contained in a passage which connected to the northern part. The purpose of this feature is unknown.

Along the eastern baulk a large area of dark brown soil (5 YR 6/4) was abutted by an area of reddened earth to the north at 2.25 m below datum. The feature became a good deal larger with the removal of another 10 cm spit (2.35 m below datum), extending two metres into the unit from the east wall. There were also four post holes along the edge of the feature, following its contour. The feature contained clumps of burnt clay and fragmentary shell, a drawn Indo-Pacific bead and pot sherds. It appeared to be a midden deposit.

At the same level the edge of a new clay floor was uncovered (Figure 7). This floor was located in a different position than those above it. The clay floor, fully exposed had been disturbed by many posts and a grave cut. This grave cut contained carbonised rice, 444 yellow glass beads and sherds of Phimai black pottery. No bone remained but the grave was orientated north-south.

The clay floor measured 3.90 m east-west and 3.60 m north-south where it disappeared into the south baulk. Its construction was the same as the others, a seven to eight cm lip around the edges. The floor was the best example encountered and was relatively undisturbed by later activity, with the exception of some post holes and the grave cut mentioned above. There was some evidence of burning on the floor in the south west corner. This floor lacked evidence of interior walls.

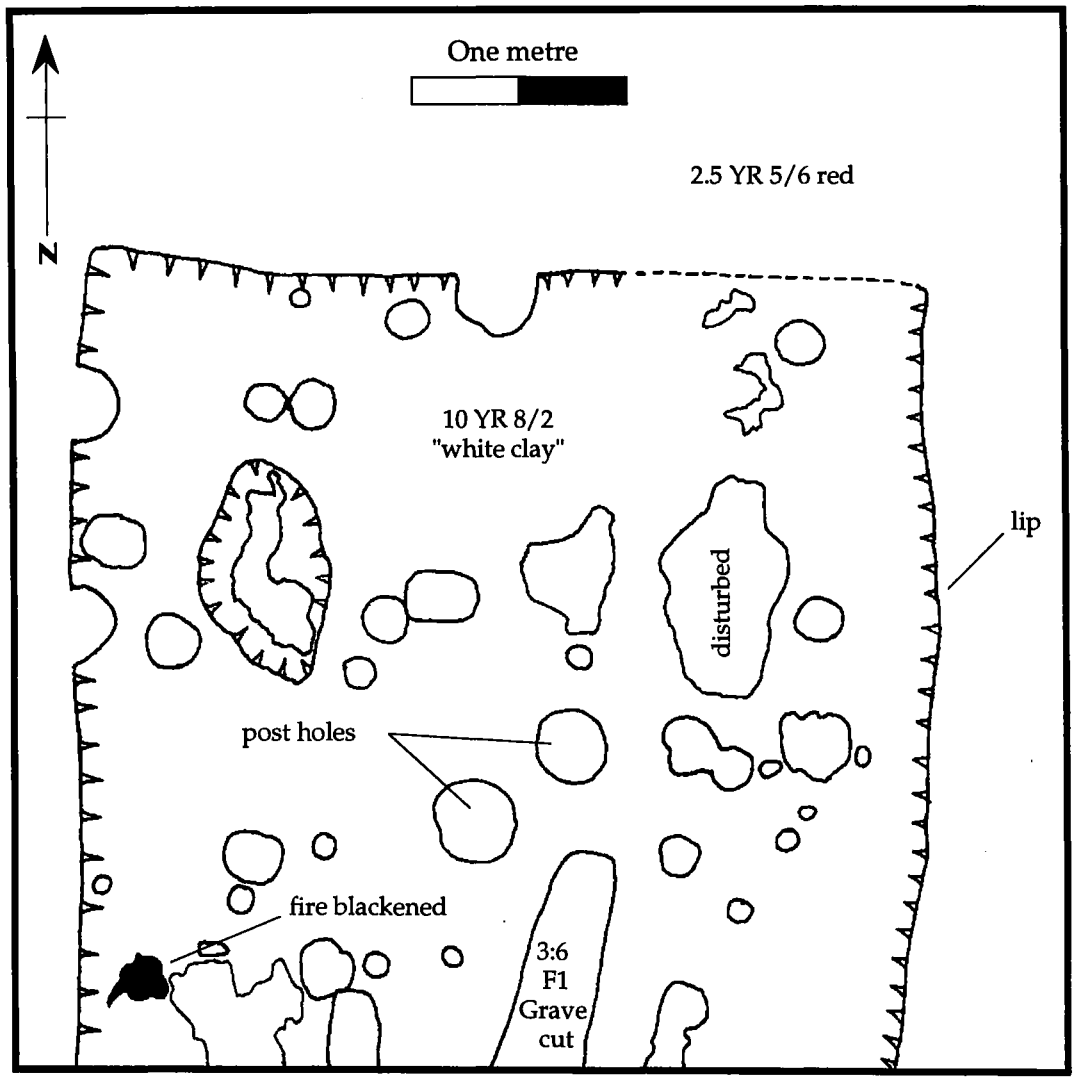

Figure 7. Clay floor at c. 2.43 m below datum, Layer 3.

Near the southeast corner at 2.54 m below datum, an iron artefact, which although corroded resembles a chisel, was discovered encased in the lip of the clay floor.

The surface of layer three, spit nine, consisted of soft yellowish-brown clay-like material about four cm thick. A sample of the white clay was removed revealing a layer of very red soil beneath. There was also a great deal of pottery embedded in the white material. The absence of skeletal material renders a precise determination of body orientation impossible but the grave appeared to run north-south.

In the south west corner of layer three, spit 11, a curious feature was discovered. An area of 60 by 30 cm was coloured black and red from heat exposure, in which were blocks of highly heated ceramic. This was originally interpreted as a smithing hearth. Later analysis by the project palaeometallurgist determined that this was not the likely function (MacDonnell pers. comm.). The feature was notable for the heavily-tempered clay which appeared to have been heated causing it to be white-yellow and orange in colour. The temper appears to be rice chaff and stems as opposed to just rice husks often

found in pottery. The heavy tempering would allow the clay to withstand repeated thermal stress (Skibo 1992). In section this hearth feature was found to have a thin base of white clay beneath it. In this base three post holes were identified going through the clay floor of the hearth. There was a large lump of charcoal in the section of the hearth and the clay was burnt a yellow-orange colour.

Another hearth of similar morphology was discovered in the northwest corner of the unit. This was a white clay depression filled with ash and charcoal surrounded by the same heavily tempered clay.

At 2.91 m below datum another burial (burial eight) was discovered in the western portion of the unit. A grave cut was clear due to the rice silica outlining it. A curious linear band of lateritic deposits was found in close association. There was a sharp division of soil types across the square running from north to south. The grave was situated in a matrix of light brown soil/sand (7.5 YR 6/4), while the rest of the unit was of a reddish brown hue (5 YR 5/4) and much harder.

During excavation the grave cut appeared to taper inwards about 3 cm down, creating a step. The cut, 130 cm by 57 cm, was full of rice silica. Burial eight contained a Phimai black bowl, some pot sherds and two small bangles. It would appear to be a child's burial, with a similar orientation to burial seven, although no bone was recovered.

Layer Four

The nature of the matrix changed abruptly to a homogeneous brown (7.5 YR 6/4) at *c.* 3.09 m below datum. Accordingly, the layer assignment was changed. There was a marked reduction in the amount of ceramic material recovered from this level, although a number of features were still apparent. The paucity of ceramics and the nature of the matrix suggested that the surface of the natural substrate had been reached. A test pit in the north east corner of the unit revealed no change in the homogeneity of the matrix down an additional 0.75 m. Layer four was naturally deposited material with no evidence for cultural stratigraphy although it was apparent that the first inhabitants had excavated into the natural mound surface.

In the first spit of layer four several industrial features were encountered (3.16 m below datum). Along the east baulk there was a large greyish brown area (10 YR 5/2), extending some four metres, which was associated with what was thought to be another smithing hearth to the north. This hearth was similar to those previously mentioned in that it was dish shaped in section and had white clay lining the bottom with post holes in close association. Another of these features was found along the north baulk which was circular in plan, 40 cm in diameter, with a post mould on either side of it. A ring of white clay surrounded it which in section was bowl shaped along the bottom of the hearth.

A dark stained area, similar to that along the east baulk, but much smaller, was also noted in the first spit of layer four. As the area was excavated a line of rice silica began to appear identifying this as an interment. The grave cut of burial nine was 2.10 m long. As it was excavated a significant amount of rice silica was revealed. The grave contained a Phimai black shouldered pot, some pigs' teeth, 33 agate beads, 3 drawn Indo-Pacific, and 454 brick-red glass beads, sometimes referred to as *mutisalah* or 'Indian reds' (Dubin 1987) as well as a single carnelian bead. Human remains were observable in the section. Only 30 cm of the burial was exposed along the west baulk, although the orientation of the body could be determined, with the head to the south. The grave had been excavated into natural substrate to a depth of 1.40 m (4.52 m below datum).

Discussion

Based upon the available evidence it appears that Non Muang Kao was continuously occupied for a period of 4-500 years.

The site seems to have been abandoned sometime during the Early Historic period.

Although we await radiocarbon confirmation, the initial occupation of the mound, at least in the area excavated, appears to have occurred during the Iron Age based upon the ceramic styles found at the deepest levels, including Phimai black wares in the earliest burials. It is, however, possible that other areas of Non Muang Kao contain evidence for Bronze Age occupation. A nearby site, Noen U-Loke, excavated by Wichakana (Wichakana 1991) contained Bronze Age burials, yet no evidence of these was found in the areas excavated by Higham (pers. comm.).

Non Muang Kao was probably selected for settlement based upon its strategic location next to a major waterway (Boyd pers. comm.), which partially surrounded it. The natural mound was an estimated four metres higher than the surrounding flood plain which would have afforded the occupants some protection against flooding, as well as being an ideal defensive position.

The area excavated had seen a variety of uses, including habitation, industrial activity and disposal of the dead. Eleven burials and grave cuts were identified during the excavation of Non Muang Kao. The paucity of interments makes it very difficult to assess accurately the nature of the mortuary regime and the chronological sequence. The stratigraphic proximity is perhaps the best indicator of contemporanaeity, although the nature of the interment is also useful in this regard. Five periods may be identified on the basis of stratigraphic location. The type of interment is also variable through the stratigraphic sequence at Non Muang Kao. Burials one, three, four, five, 2:6 Feature 20, and burial six were all lined and sealed with a layer of thin white clay, most containing evidence for rice. The burials found below 2.45 m below datum were not clay lined, rather they were pits filled with rice. Initial impressions in the field suggest a recurring grave assemblage of whole pots, often shallow, streak burnished, Phimai black bowls, pot sherds and copper alloy artefacts such as bangles. The artefacts from these interments await analysis which may refine the differences between the phases. All but one of the burials and features interpreted as burials were oriented in the same direction, north-south. This continuity would suggest a limited time span and is congruent with the mortuary behaviour at several other nearby Iron Age sites. Considering this, the different type of interment facility may indicate status differences within the mortuary population.

Perhaps the most interesting component of the site was the discovery of successive clay floors. The preservation of this type of feature in archaeological contexts is uncommon in Thailand and merits considerable attention.

A total of ten clay floors in varying states of preservation were uncovered. The first eight were constructed successively on top of one another. The earliest two floors, one intact and the other burnt remains, were in a different position from the succeeding clay surfaces. The size of the structures is difficult to determine as they extended beyond the excavated area. The earlier floors (3:6 Feature 2 and 3:9 Feature 3) were approximately 3.80 m across and at least 3.70 m along the other two walls where they ran into the baulk. Some of the later floors (2:11 Feature 1) extended beyond the limits of the excavated area. Internal structural features were noted, including an interior wall running *c.* two m and several post moulds with clay packed around them for support.

The construction of these clay features appears to have been the same throughout the occupation and involved the excavation of about ten cm of earth to form a lipped edge, followed by the plastering of this area with a thin coating of white clay or plaster. The foundation for the interior walls appears to have been substantial, over 0.5 m in one instance.

Comparable features were found at Non Yang, Amphoe Chumphonburi, Changwat Surin, Thailand (Nitta 1991). Nitta describes irregularly shaped clay floors, the north and south walls of which measure 2.3 m and 2.6

m respectively. At both Non Yang and Non Muang Kao, a shallow pit was excavated to facilitate construction of the floor. The walls in the structures at both sites are of a similar size in section, 12-16 cm across. Nitta found the remnants of half split logs which he interpreted as a foundation for the structure, an aspect not encountered at Non Muang Kao. Other notable parallels between Non Yang and Non Muang Kao include the discovery of complete ceramic vessels, laid atop one another, lip to lip. This practice has been noted also at Noen U-Loke (Higham pers. comm.) and Ban Prasat (F.A.D. 1992). Three such features were encountered at Non Muang Kao, in which two Phimai black bowls were placed in a close fitting hole. The purpose of these depositions remains enigmatic. It is possible they were ceremonial, foundation offerings as suggested by Nitta (1991), or related to a mortuary ritual.

Ban Takhong is a 'moated' site located on a tributary of the Mun river which had similar features to those described at Non Yang, including clay derived from walls or floor features (Higham 1996). It is notable also that no pattern burnished Phimai black pottery was recovered from this site.

There are several possible explanations for the intriguing clay floors at Non Muang Kao. They may represent work areas, perhaps for rice threshing. In modern Thailand threshing floors are constructed by clearing a suitable area approximately 15 m in diameter, and coating it with a mixture of buffalo dung and water (Thompson 1996). In the past, threshing was conducted closer to the fields to minimise grain loss in transport and handling (Chung and Lee 1978). Grain loss may have been more apparent in antiquity because the rice was more prone to shatter (Thompson 1996). It seems unlikely that the prehistoric inhabitants would have brought the harvested rice to the top of the mound for threshing. There was also very little evidence of rice remains on the floors themselves although it was found in other contexts.

It is also possible that the clay floors may represent domestic occupation. The presence of interior walls and repeated plastering of the floors in the same location could indicate the floor was part of a dwelling successively occupied. A possible association with interments must be considered. Several of the graves are lined with white clay, similar to that of the floors. The clay floors were frequently found in close association with burials, a relationship being very difficult either to confirm or dismiss.

Conclusion

The Iron Age of Northeast Thailand is little understood. The excavation of Non Muang Kao represents a significant contribution toward an understanding of a period which saw the rise of complex political entities such as Dvaravati and Angkor. The analysis of the ceramic and other artefactual material from Non Muang Kao will lead to a fuller understanding of the events there and allow a finer definition of the cultural chronology of the site. However, Non Muang Kao must not be viewed in isolation. A more complete comprehension will only evolve by placing this site within a regional, synthetic model, encompassing propinquent sites, such as Ban Lum Khao, Ban Prasat, Ban Tam Yae, and Noen U-Loke. For a more comprehensive understanding of the prehistoric period in the Mun River valley, further excavations are needed, especially at sites ringed by ditches or moats. Although small, the burial assemblage will prove invaluable in assessing the prehistoric mortuary sequence, especially with regard to the recently excavated cemetery at Noen U-Loke.

Further excavations at Non Muang Kao within the 'Origins of Angkor Archaeological Project' are not planned due to financial and other restrictions. It is clear, though, that this large site constitutes an important component of Iron Age settlement in the Mun River valley and a larger scale excavation in the future would contribute to an enhanced understanding of the enigmatic moated settlements of Northeast Thailand.

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