

THE ORIGINS OF THE CIVILIZATION OF ANGKOR

VOLUME THREE

THE EXCAVATION OF BAN NON WAT

PART ONE: INTRODUCTION



The Fine Arts Department, Thailand

THE ORIGINS OF THE CIVILIZATION OF ANGKOR

VOLUME III

THE EXCAVATION OF BAN NON WAT: INTRODUCTION

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Published by
The Thai Fine Arts Department
Bangkok



The Origins of the Civilization of Angkor
Volume III
The Excavation of Ban Non Wat: Introduction

ISBN 978-974-417-997-5

First Printing 2009: 1000 copies

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Printed by:

Union Ultraviolet Co. Ltd.
66/180 Soi 80 Ladpraow 11,
Ladpraow road,
Wang Tong Lang,
Bangkok 10310

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*National Library of Thailand Cataloguing in
Publication Data*

The Origins of the Civilization of Angkor: the
Excavation of Ban Non Wat. Introduction
Bangkok: The Fine Arts Department, 2009
1. Excavations (Archaeology)-- Thailand.
I. Thailand. The Fine Arts Department. II.
Title 959.3
ISBN 978-974-417-997-5
ISBN ebook 978-1-78297-792-6

FOREWORD

In 1992, a major research project was initiated in the Amphoe Non Sung, Changwat Nakhon Ratchasima, entitled "The Origins of the Civilization of Angkor". It was conceived by Professor Charles Higham of the University of Otago, New Zealand, and Dr Rachanie Thosarat, of the Thai Fine Arts Department. The Fine Arts Department has been pleased to be associated with this research project and to be able to publish this, the third report of a series which promises to contribute a great deal to our understanding of Thai prehistory.

While it might be argued that the upper Mun Valley is relatively remote from the centre at Angkor, two important facts must be stressed. The first is that the Mun Valley, and particularly the area of Phimai, ancient Vimayapura, gave to the kingdom of Angkor its greatest kings in Suryavarman II and Jayavarman VII. These rulers belonged to the Mun Valley dynasty of Mahidharapura. At all times, the Mun Valley was a focus of major cultural developments leading to the early states of Angkor, as seen in the rich prehistoric cultures of the area, the early brick temples of Phimai, Phanom Rung and Phanom Wan, and the number of Chenla period monuments and inscriptions.

It is also noted that in the early 1990s, when this project was being formulated, it was impossible to envisage extensive archaeological fieldwork in Cambodia. The adjacent parts of Northeast Thailand, however, afforded a splendid opportunity to pursue this important topic.

Ban Non Wat is the fourth major excavations undertaken as part of this project, the others being at Non Muang Kao, Ban Lum Khao and Noen U-Loke. It is a site of great importance because of its long occupation period, and the very large area opened by excavation over seven seasons of fieldwork. The site was initially occupied by hunter-gatherers, then by Neolithic rice farmers. By 1000 BC, this community began to cast bronzes, and six centuries later, the first iron was being forged. It is possible at Ban Non Wat, to follow the history of a community over a period of about 100 generations. We can marvel at the princely early Bronze Age graves, with their outstanding painted ceramic vessels, and again at the discovery of an extensive Iron Age cemetery that reveals a remarkable image of the rituals of burial, with its wooden coffins, bimetallc spears and exotic jewellery. I congratulate the research team for completing this volume just one year after the last season of excavations was completed.



Mr Grienggrai Sampatchalit
Director General
Fine Arts Department

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PREFACE

This is the third volume reporting on our research project entitled “The Origins of the Civilization of Angkor”. In 1992, when Dr Rachanie Thosarat was appointed to the Phimai office of the Fine Arts Department, we resolved to consider the enigma presented by the many large, moated and banked settlements that are so prolific in the upper Mun Valley. Our initial model saw these sites as dating to the Iron Age, and as such, the immediate precursors to the early states of this area. Our first concern was that the prehistory of this area had been the subject of a lengthy period of research by David Welch and Judith McNeill, and we did not wish to venture into the area where they had been active. With their goodwill, we therefore selected an area immediately to the west of theirs, and began several seasons of site surveys. The moated sites are densely distributed, and we mapped many. In 1995, we decided to begin our excavations at the site of Ban Lum Khao which is, paradoxically, one of the unmoated settlement so far examined. Our choice reflected the clear field evidence for a Bronze Age cemetery, a period we felt it necessary to consider as the precursor to any cultural changes noted in the ensuing Iron Age. Subsequently, we have excavated at Prasat Phimai and the moated sites of Non Muang Kao, Noen U-Loke and Ban Non Wat.

The purpose of this volume, is to report the results of our seven seasons at Ban Non Wat. It is a further step towards the realisation of our goal, to illuminate the prehistoric societies of the upper Mun Valley during the two millennia of cultural changes that led ultimately to the swift transition to the state as represented at Phimai and beyond, to the civilization of Angkor itself. Future volumes will consider the Neolithic, Bronze and Iron Ages at Ban Non Wat, at which point, we plan to synthesise all our findings made during 12 years of excavations. We are most grateful, therefore, to our colleagues for contributing their current findings in this part of our report series. The identification of the age and sex of the prehistoric individuals whose graves we have excavated has been undertaken by Dr N.G. Tayles, Dr S.E. Halcrow and Ms. H. Cekalovic.

Our research at Ban Non Wat proceeded with a permit issued by the National Research Council of Thailand, for which we are indebted. The backing of the Thai Fine Arts Department was also a vital prerequisite to our research. We are most grateful to all our colleagues who worked with us in the field, and who have contributed to this report. Without the good will of the villagers of Ban Non Wat, we could not have worked in their community, and we thank them for their welcome and cooperation. I (C.H.) formatted this publication using the Indesign II program.

The Fine Arts Department of Thailand has been most supportive of this research programme, and we are most grateful to Khun , the Director-General, for authorising the publication of this volume.

This research was funded by the Marsden Fund of the Government of New Zealand, the University of Otago and Uniforce Sales and Engineering. We offer our thanks to all three institutions for making the research possible. Without the support of the Earthwatch Institute and its Research Corps, we could not have undertaken the excavation described in this volume. To all those listed below, who joined us in the field, we offer our sincere thanks.

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I THE STRATIGRAPHY

H. CAWTE, W.E. BOYD, AND C.F.W. HIGHAM

INTRODUCTION

Ban Non Wat is a village in the valley of the Huai Yai, a tributary of the Lam Prasat, which in turn flows into the Mun River (Figs. 1:1-2). It is located at latitude 15°16.02' and longitude 102°16.35'. Air photographs employed during the site surveys of the region in 1999-2000 revealed it to be one of the moated settlements that comprise such a central feature of the prehistoric settlement of the Mun Valley (Fig. 1:3). As part of the Origins of Angkor research programme, the excavation of Ban Non Wat took place over seven seasons, between the 8th January 2002 and the 1st December 2007. A total of 906 m² were uncovered in three different parts of the site. The main square (A) was located near the centre of the mound. Square Y was opened to the northeast and square X to the south east. Approximately 3,000 m³ of cultural material were removed during the course of the excavation programme (Fig. 1:4).

It was not our original intention to excavate Ban Non Wat but rather to return to open a larger area at Noen U-Loke, which lies only two kilometres to the south-west. However, the headman of the village owning Noen U-Loke refused permission to work there unless we contracted to build an access road and a site museum. We were therefore obliged to work elsewhere, and turned to Ban Non Wat. In retrospect, this was a fortunate turn of events, since the site has revealed a much longer cultural sequence than was identified at Noen U-Loke (Higham *et al.* 2007).

The method of excavation was one typical for sites on the Khorat Plateau. Materials were ascribed to a specific layer or other context be it lens, pit, posthole, floor, or burial. The region is renowned for its homogenous, bioturbated layers and when specific contexts were not definable materials were ascribed to a layer and 10cm unit within the layer. Layers were excavated in 10cm units (spits) until a stratigraphic change was witnessed thus indicating the presence of a new layer. Artefacts were given a unique, sequential catalogue number and recorded in the central register.

The excavation thus provided exposed sediment profiles of the stratigraphic sequence for recording and interpretation. In order to record the stratigraphy the walls were scraped down and cleaned prior to investigation.

Features within the sections were identified, outlined and then transposed onto the scaled section plans, by method of string line and tape measure. Features/horizons were identified based on the following characteristics; colour, texture, cohesion, composition, contact relations, aspects of archaeosediments –eg ashy area, baked

clay, and bioturbation.

Such horizons may be interpreted from many perspectives, whether it be pedologist, geologist or archaeologist. Goldberg and Macphail (2006) note that a large degree of variability exists in the way that stratigraphic information is recorded. Thus, in the case of the stratigraphic sequences and section drawings of Ban Non Wat they have been produced, for the most part, from the perspective of the archaeologist, with further/later specific annotation by the geologist. Information such as colour, texture and density were recorded directly onto the section plans. The section drawings were then correlated with the archaeological material. Where possible, features/horizons identified during the excavation which extended into the baulk were identified on the section plans with the context number they were attributed during the excavation. Such information was obtained from the individual unit spit plans. Data were further correlated within the separate excavation units, in order to correlate archaeological material within the expanding excavation area. Thus similarities in the recorded features of the section drawings and therefore the excavated unit were correlated with the section drawings and spit plans of each other excavated unit. This permitted integration between the three excavated areas. .

THE LAYERS IN THE MAIN EXCAVATION AREA

Layer 1

Layer 1 comprises three units, the uppermost of which is modern fill. Unit 1a (modern spoil and fill) is present throughout much of the area, being thickest in square AA5-7 and thick in A6, and thinning to the south from AA7 to A7 to nearly peter out in the south of B7. It is almost completely absent in the B and C squares, and present again in D. The original topsoil (Unit 1b) is, on the other hand, present throughout the excavated area, undulating in level, and containing numerous cuts and hollows. Likewise, Unit 1c is present throughout the excavated area, reaching maximum thickness in the southern parts of D7 and C7 and thinning towards the north of the excavation area and in various other places. The lower boundary into Layer 2 is often difficult to determine, and, where it is discernible, appears to be a gradational boundary. In AA1, there is mixing between the two layers. Unlike Unit 1b, Unit 1c has few shallow cuts and hollows; there are, however, a number of very large depressions. (e.g. in AA7, A6, B1e, C7 and D7). The AA7 depression is c. 3 m wide,

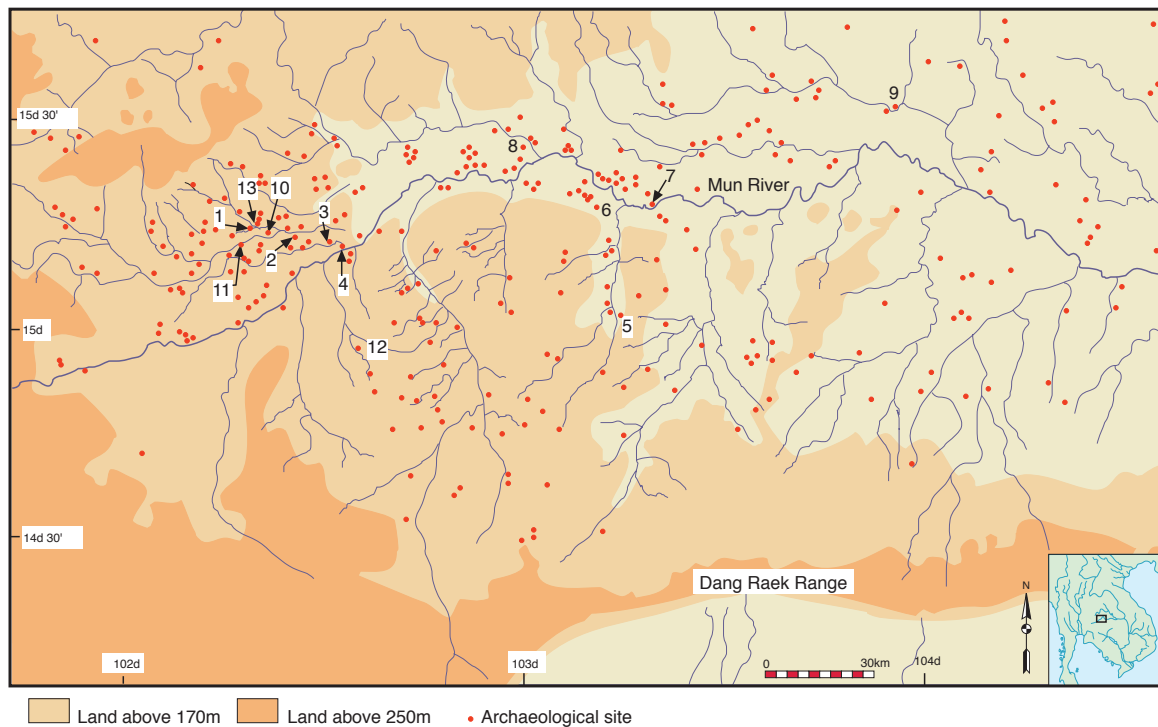


FIG. 1:1 The Mun Valley, showing the distribution of sites. 1. Noen U-Loke, 2. Ban Prasat, 3. Ban Tamyae, 4. Phimai, Ban Suai, 5. Ban Takhong, 6. Ban Don Phlong, 7. Non Yang, 8. Non Krabuang, 9. Non Dua, 10. Ban Lum Khao, 11. Non Muang Kao, 12. Muang Phet, 13. Ban Non Wat

the A6 one is c. 2 m wide, and the B1e one is least 1 m wide. These depressions have distinctive contents: clay lumps and bedded pottery sherds line the base (B1e); and a red-yellow lens of hard clay lines an edge and part of the base, overlain with darker sediment (A6). A very large 4 m-wide depression (southern D7, C7, into B7) is filled with lenses of sherds and hardened clay lumps, with friable inclusions towards the base.

Interpretation of this layer is difficult, especially since bioturbation (there is common evidence for ants' nests and tree roots, for example, and the recent levelling of many areas have, removed what is, possibly, a lot of material. Villagers indicate that as much as a metre of soil has been removed from the top of this mound to level the area for building. Unit 1a, however, is easy to interpret: it is the backfill from previous seasons of archaeological excavation; its spatial distribution reflects the patterns of successive seasons of excavation and locations of spoil heaps. Unit 1b, on the other hand, is the soil in which current villagers plant their crops and on which they construct their various buildings. The removal of sediments reported by the villagers probably explains the thinning of Unit 1c mainly to the north of the excavation area; there appears to be an unconformity between units 1b and 1c.

Layer 2

Layer 2 consists of only a single unit, stiff grey silt, but given the gradational boundary between Layers 1 and 2, is difficult to define clearly; it appears similar to Unit 1c, although it is slightly more compact, and has more pottery inclusions. Its thickness varies across the site. It

is at least 50cm thick in AA1 but dips and thins to the south, to c. 10cm in AA6 and being truncated in AA7 by Layer 1, where the depression described above cuts down through Layer 2. From AA7 through A7 and B7 Layer 2 is present but more friable, and in southern B7 cuts from Layer 1 intrude into the layer. The layer is variably present throughout the A and B squares and B5; in the latter, the layer is thick in both B1e, but thins elsewhere. It becomes well defined in eastern C1-5, although its lower boundary becomes less clear, and by C6-7, the layer has been cut out of the sequence. Layer 2 is non-existent in eastern and southern D7 and C7, where the base of a deep cut from Layer 1 sits directly on Layer 3; D6 east also lacks Layer 2 due to the deep depression from 1c reaching Layer 3; layer 2 reappears beyond this cut

The gradational boundary between Layers 1 and 2 suggests continuous occupation of the mound between the periods represented by these two layers. Where Layer 2 is missing in the sequence, it is clear that it was removed by later inhabitants who constructed deep pits cut down from Layer 1.

Layer 3

Layer 3 is possibly the most readily identifiable archaeological layer on site. The two units within this layer are

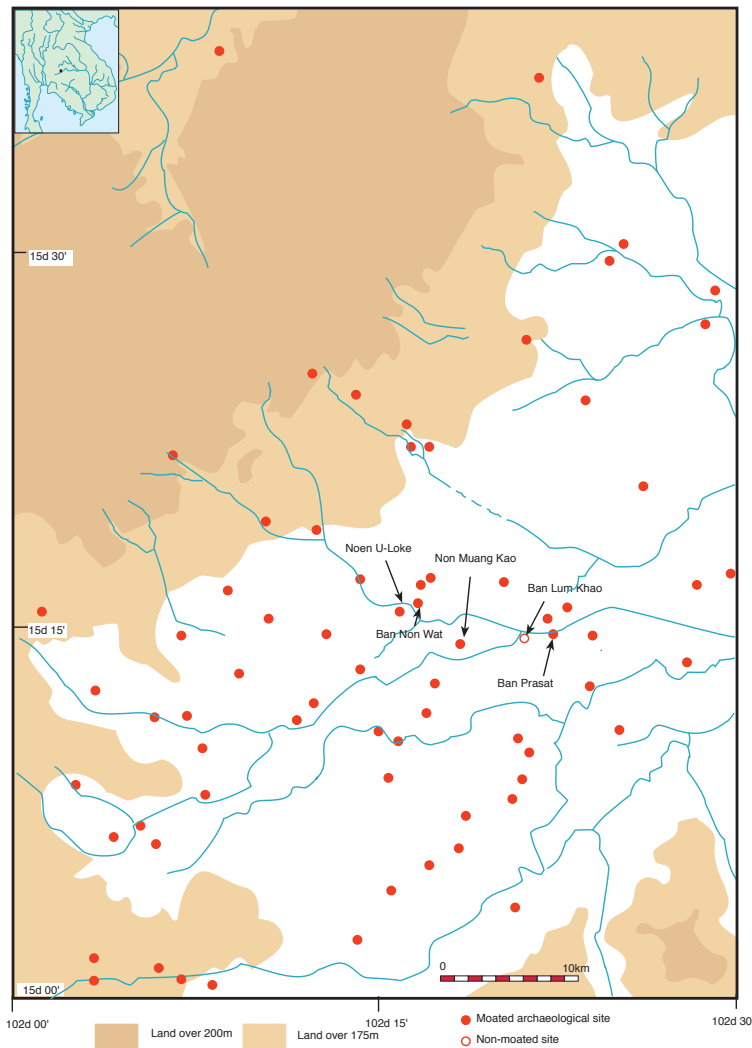


FIG. 1:2 The study area, showing the location of the principal sites

variably present across the site, each overlying the other, or interfingering, in different places. While Unit 3b usually underlies Unit 3a (e.g. in C1 and C2), in some squares it overlies Unit 3a (e.g. in A1-3, where the sherd content also declines notably, and in the southern part of C6) or extends through 3a in patches. Elsewhere, Layer 3 comprises a combination of both (e.g. in A4 and AA4, or C3-4 and 5 and the eastern part of C6, where the layer comprises distinct lenses in a matrix of 3b), or may be dominated by one unit (e.g. in A3, AA3 and C7, where Layer 3 comprises 3a). It is difficult to identify a standard thickness for this layer, as it is highly variable across the site, and its continuity is interrupted by many cuts, hollows, depressions and lenses; the thinner extent (30 cm) of Layer 3 in C7 provides an example of this, in that Layer 1 rests directly on Layer 2 at the base of a broad depression cutting Layer 2 and possibly some of Layer 3 out. Likewise, while 3a is prominent and thick (c. 1 m) in B6 and A6, to the southwest of A6, the layer is cut out and thinned to c.

50 cm by another depression cut from Layer 1, thinning in A5 to c. 20 cm and returning to its normal thickness (c. 1 m) in A4. In C1 and C2, there are numerous deep cuts – largely filled with soft fine pinkish brown silty sand – and depressions through Layer 3; in C3, such cuts are absent, but depressions containing greyish white compact sediment thin the bed to c. 0.40 m.

Possibly the most notable characteristic of Layer 3, besides the dense pottery, is the presence of numerous compacted sediment lenses that extend across the squares, and can be only a centimetre in thickness; they commonly contain ash, which contributes to their hardness, and all contain a distinctive pink sand. C4-5 contain examples, with the pinkish white sand in C4 extending into C5 as a very hard compact thin lens of orange sand; it dips slightly to the south, merging with no less than nine lenses of differing composition. In this example, the basal lens is dark black with charcoal inclusions. In the B squares, a 5 cm thick sandy lens overlies a 10 cm thick clay lens between B2-5; in this case Unit 3a overlies these lenses, which in turn overlie 3b.

There is decreasing pottery in the south from A7 to B7 with a layer of 3a around 20 cm thick in A7 and 40 cm in B7 with and sandy 3b present in solely in A7. In AA7 and AA6 3a is the abundant unit with a very distinct band which is 60 cm thick in the south and is 80 cm thick in northern AA6 which does continue into AA5 but is truncated by a cut from Layer 1. Below and beyond this cut is a very clear band of 3b which lies below a hard, thin lens

which dips down but rises sharply in AA4 and A4. Upon this lens are a number of bones, rocks, and other material. In AA4-5 and to a lesser degree A4, unit 3b is 20cm thick. Part way into AA4 this unit expands to around 60cm and continues into AA3 at a thickness of around 40cm, the difference being that within this expansion through these two squares, there is the addition of abundant pottery sherd inclusions. In these two squares, below this unit, is unit 3a which also contains an abundance of pottery sherds but lacks the pink sandy material. In AA1-2, this pink sand is non-existent, save for a few small patches within the general matrix.

D5 is quite similar to C1-2 in that it displays numerous cuts and depressions but is also similar to C5 in that it displays the continuation of the numerous lenses. Like AA5 it too contains a thin but very hard lenses of material, on which, sit large stones, bone, metal objects and slag. The general matrix of this area is difficult as there are many differing features and fills. However, the layer

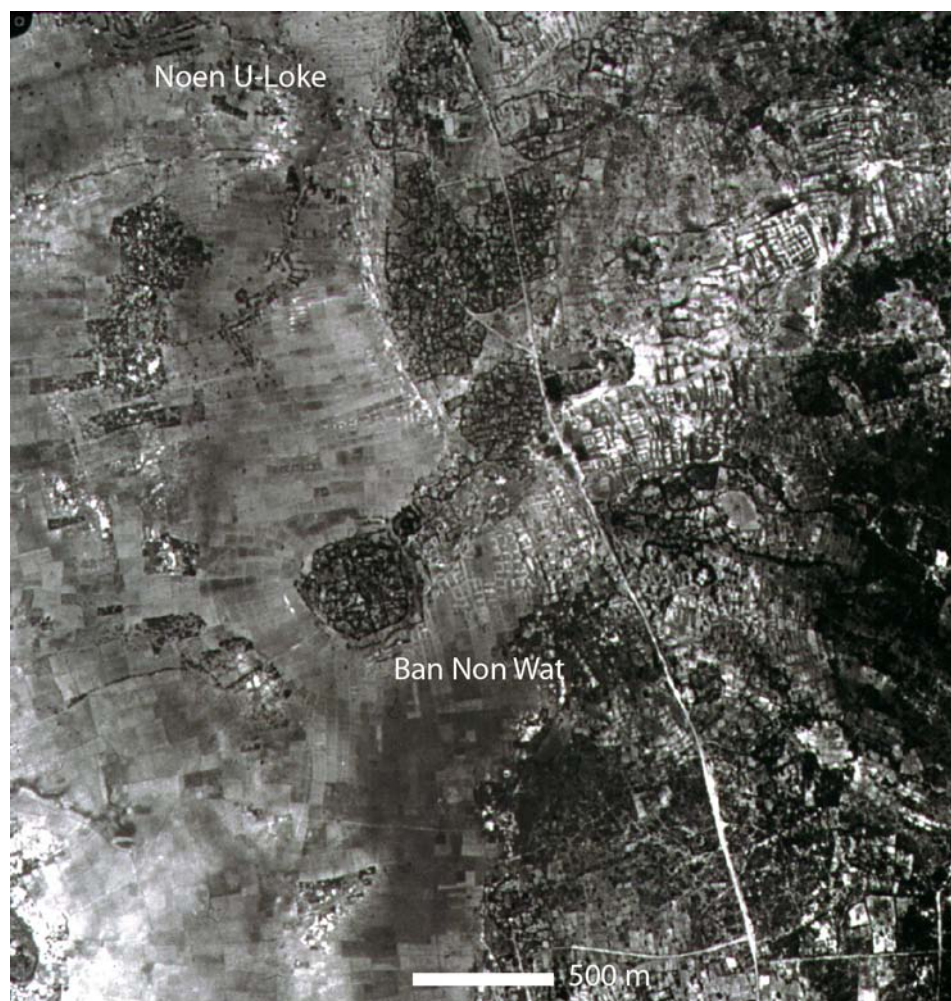


FIG. 1:3 Air view of Ban Non Wat and part of Noen U-Loke

itself is roughly 1 m thick. In D6, there is a change and a distinctive “classic” 3a is present which begins in southern D5 at around 5cm thick then expands in D6 to around 60cm, which, interestingly lacks the cuts, depressions and lenses of D5. There are, however, a few cuts which blur the base of Layer 3 in this square, there are also patches of pink sandy silt, but these are localised. In D7 Layer 3 is slight and has a patchy appearance with a number of cuts. The large depression in Layer 1 of this square has rendered Layer 1 around 20 cm thick in parts and provides the dipping appearance. In the south of C7 there is a small lens of 3b sitting on top of 3a, which has been truncated by the depression that extends from D7 through C7. There are two shell rich lenses of silt and pottery that extend slightly into B7 are bedded below 3a. Layer 3 is roughly 1 m thick in the west of southern C7.

Layer 3 is best interpreted as the result of significant industrial working. The compacted sediment lenses are likely to be working floors and industrial areas, while the dense and thick pottery sherd deposits represent the refuse of, or deposition related to, whatever activity was undertaken on

the site at this time. The pink sand may have been brought onto the site for a particular reason, or is a lag deposit as other sediments are washed away from these work areas. The exclusion of sand and pisoliths, on the one hand, and sherds on the other from horizons suggests that the sand and pisoliths are unrelated to the sherd nature of this layer or to any industry associated. Also the sand and pisoliths are often related to lenses or floors which suggests a working relationship. This may also explain why the two units can be found in different orders of deposition. Where a sandy silt with sherds is encountered, it is more likely to be a spill-off and mixing of the two units possibly at the edge of a working area. An example of this is in AA4 where a very hard sediment surface (“floor”) overlies Unit 3b, to be replaced laterally (i.e. at the edge of the floor) by a mixed 3a-3b body of sediment.

Layer 3 probably represents local industrial activity and refuse. A number of burials have been cut from what appears to be within this layer. Layer three also includes iron slag, hence suggesting industry-related deposition. The large deep depressions in C1, C2, and to a lesser ex-

tent D5 have a pink sandy fill, and include baked clay, iron slag, small iron fragments and laterite nodules. The baked clay is well fired, is around 4cm thick and has a very definite curve, representing an object with a diameter of 50-60 cm. After analysis these baked clay pieces appear to be the remains of furnaces or kilns and therefore these pits are either refuse pits or were involved in the industrial process.

Layer 4

This layer varies greatly in thickness, from 1.4 m in A1, 1.2 m in the northern B squares, and over 1 m in the north of the C squares, to c. 20 cm in AA7; elsewhere, the layer is 0.60-1.00 m thick. The upper surface reaches around 1.5 m below datum in C3, although the layer generally lies below the -2 m level. In places, such as southern A6 and B6, the distinction between Layers 3 and 4 is unclear, while from B1-3 and in B5 the upper boundary is gradational. The composition of the sediments in this layer changes across the site, with, for example, a large concentration of shell in AA5, compacted lenses of dense shell in C1-3, and a thick ashy presence in AA7; elsewhere there are patches of clay and inclusions of bone and shell. The layer also contains numerous cuts and fills, often from within the layer (e.g. in C2 and C4), but some cutting down from Layer 3 (e.g. in C1 and C2); some of the cuts extend down into the

underlying Layer 5 (examples are present in squares A7, B4-7, and C5-7).

In contrast to the strongly industrial nature of Layer 3, Layer 4 contains phases in a cemetery and some evidence for industrial activity in the form of furnaces that were probably used to raise copper alloys to melting point prior to casting.

Layer 5

Layer 5 is the widespread alluvial sediments found across the floodplain surrounding the site. The upper surface of the natural alluvium (Unit 5b) varies from a high point in A7, AA7, AA6 and A6, dipping down again from AA5, to AA1, and A1 through the B squares to its lowest point in C1 and C2. From C3 it begins to rise up again to a higher point in C and D7. While it is possible that some of this topographic variability represents later erosion of the original land surface due to human activity, it seems that most were natural undulations on the original land surface. Overlying the natural alluvium, Unit 5a represents the disturbed sediment land surface and soil of the floodplain. This unit is transitional between the typical alluvium (Layer 5) and is a result of both the occupation of that land surface and cutting and digging that has occurred and the eventual mixing with the overlying layer, during the period of layer occupation represented by

Layer 4. Although, therefore, the extent and thickness of Unit 5a varies across the site, and in places the layer has been removed from the record and replaced by cuts, hollows and depressions from Layer 4, it is typically 30 cm thick. Examples of locations where Unit 5a is absent include B1e, B4, B5, B7, C1, C5, C6, C7 and D7. Likewise, the layer thins across B4 and B5, notably thickening in AA7-AA5 to around 50-60 cm, being particularly thick in the south of AA7 and A7, where there are many cuts and an extensive lens of ashy silt with pottery shell and occasional bone. Such lenses or patches of ash, shell and charcoal are present throughout the excavation area; they typically lie directly on Unit 5b, and probably represent the onset of the occupation of the land surface at this locality.

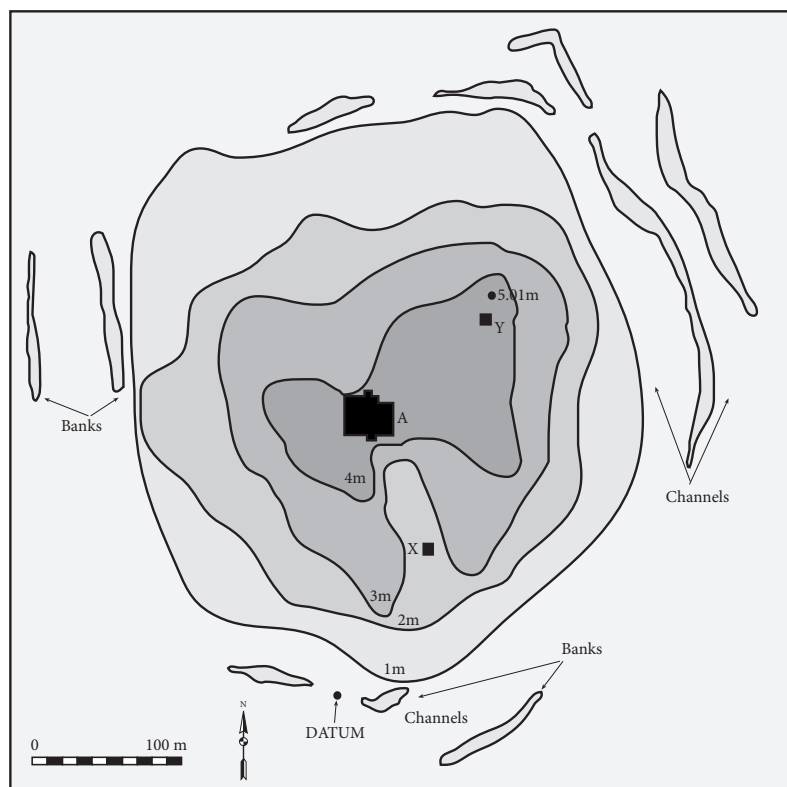


FIG. 1:4 The plan of Ban Non Wat showing the excavated areas

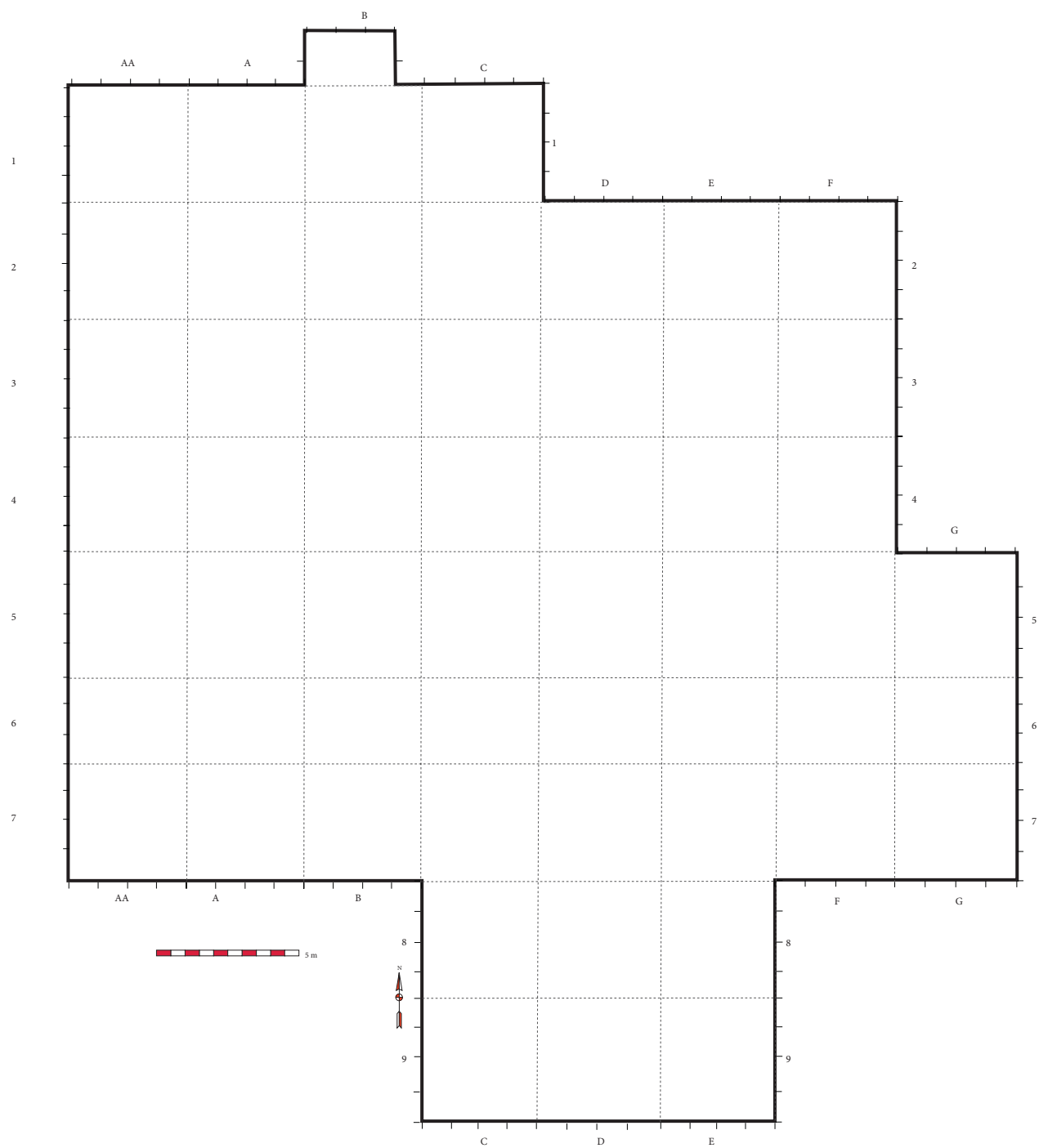


FIG. 1:5 The layout of the excavation in the main square, showing the unit designations

TABLE 1:1 *The stratigraphy of the main archaeological excavation area at Ban Non Wat*

Boundary or surface	Layer and unit number	Description	Comments	Chronology
Land surface		Disturbed from present settlement; both cut/eroded and built up	Up to 1 m removed in places	Historic to modern
	Layer 1	Light sandy silt and pale grey stiff silt, with pottery sherds, and dark humic soil	Present throughout squares A and D; absent in squares B and C	
	Unit 1a	Light sandy silt with pottery	Present throughout squares A and D; absent in squares B and C; recent fill (backfill from previous excavations)	Modern
	Unit 1b	Dark blackish humic soil, with occasional flecks of charcoal and other organic material	Topsoil, present throughout excavated area; 20-40 cm thick; numerous cuts and hollows	Modern
Possible hiatus		Not clear in sequence	Possible gap in record, at least in places, where upper sediments have been removed by present occupants	Modern
	Unit 1c	Very hard compacted pale grey silt with occasional pottery sherds and bone; lenses of hardened clay lump and pottery sherds; pottery includes glazed material	Thickest part of Layer 1, varying across the site (0.60-1.5 m thick), generally thinning to the north; few cuts in this unit, although characterised by large depressions (max c. 4 m diameter)	Historic (including Khmer)
Layer 1-2 boundary		Mainly gradational or exhibiting mixing of sediments	May represent continuous occupation into the historic period	
	Layer 2	Stiff grey clay with pottery sherds (not glazed), with lenses of pale grey stiff clayey silt with abundant pottery, clay nodules, charcoal, pisoliths, bone and shell; Phimai Black pottery present	Similar to Unit 1c but harder or more compact; thickness varies across the site (0.10-1.3 m thick) depending on the thickness of Unit 1c or cuts from higher; pottery and shell rich lenses vary from large continuous beds to patchy layers of pottery and shell-rich sediment.	Late prehistoric, including late Iron Age
Layer 2-3 boundary		Sharp boundary, in places erosional (cuts and depressions in upper surface)		
	Layer 3	Friable silt with, in some layers with very dense concentrations of pottery sherds, and clay block inclusions in places, and layers and lenses of friable fine sand or greyish white; most pottery is Iron Age style, with some Prasat Phase style pottery	This layer comprises variations of units 3a and 3b, both being overlying the other in various locations; the layer is cut often, limiting continuity across the site; 0.10-1.80 m thick; interpreted as an industrial horizon; evidence of possibly working floors, production areas and refuse areas	Iron Age

Boundary or surface	Layer and unit number	Description	Comments	Chronology
	Unit 3a	Friable brown silt with very abundant pottery sherds	This layer is distinct in its very dense concentrations or lenses of often quite large pottery fragments; its distribution across the site is patchy	
	Unit 3b	Friable pinkish brown sandy silt with abundant pisoliths, and pinkish brown sand, or lenses of pinkish brown sand with, variously, charcoal, ash, bone, rock fragments, baked clay, iron slag, small iron fragments and lateritic concretions	Layers and lenses of friable pinkish brown sand lying both above and below unit 3a in different places, inter-fingering unit 3a, or infilling cuts and depressions in the upper surface of unit 3a	
Layer 3-4 boundary		Sharp boundary		
	Layer 4	Soft silt to ashy silt, with ash concretions, and shell and bone fragments, grading to sandy silt towards the base; base with clay, bone and shell in places; shell- and/or ash-rich lenses in places	0.20 – 1.4 m thick, varying across the site; this layer typically comprises cuts and fills, and inter-fingering lenses of, variously, shell- and/or ash-rich silt with pottery, bone, clay, pisoliths and other inclusion; this layer contains Bronze Age burials, some cutting down into Layer 5	Basal: Neolithic Middle; Bronze Age Upper; Iron Age
Layer 4-5 boundary		Reasonably discrete and clear, although less obvious and gradational in some places; often deep cuts from Layer 4 into Layer 5 infilled with both stiff and friable Layer 4 sediments		
	Layer 5	Reddish brown and grey sand and sandy and clayey silt	This is the natural alluvium that overlies the entire floodplain surface, with original land surface being settled and occupied during the Neolithic	Neolithic and mid-Holocene
	Unit 5a	Greyish brown sand and sandy silt, with archaeological materials and lenses of ash, shell (crushed and whole) and charcoal, in places shell and bone middens are present in the upper part of this unit	Transitional horizon between the archaeological sediments overlying the alluvium; disturbed alluvium with archaeological inclusions, cuts and fills, including Layer 4 material; this represents the land surface initially used by the occupants of the site; this unit is generally c. 30 cm thick (10-60 cm); Neolithic burials cut in this unit, possibly form the layer 4-5 surface	Neolithic
	Unit 5b	Reddish brown sand and sandy and clayey silt, with pisoliths	Natural alluvium; base at bedrock surface not reached	

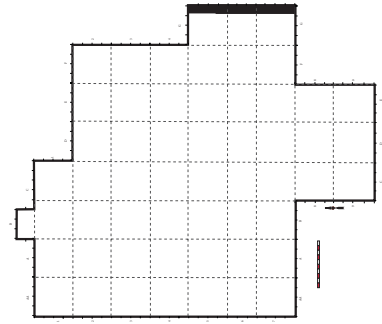


FIG. 1:6 The section through the eastern edge of squares G5-7

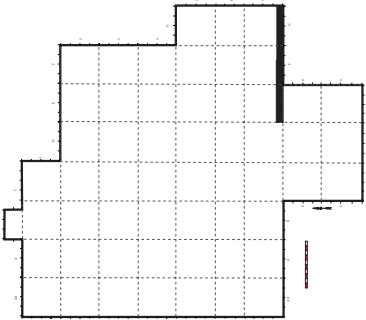
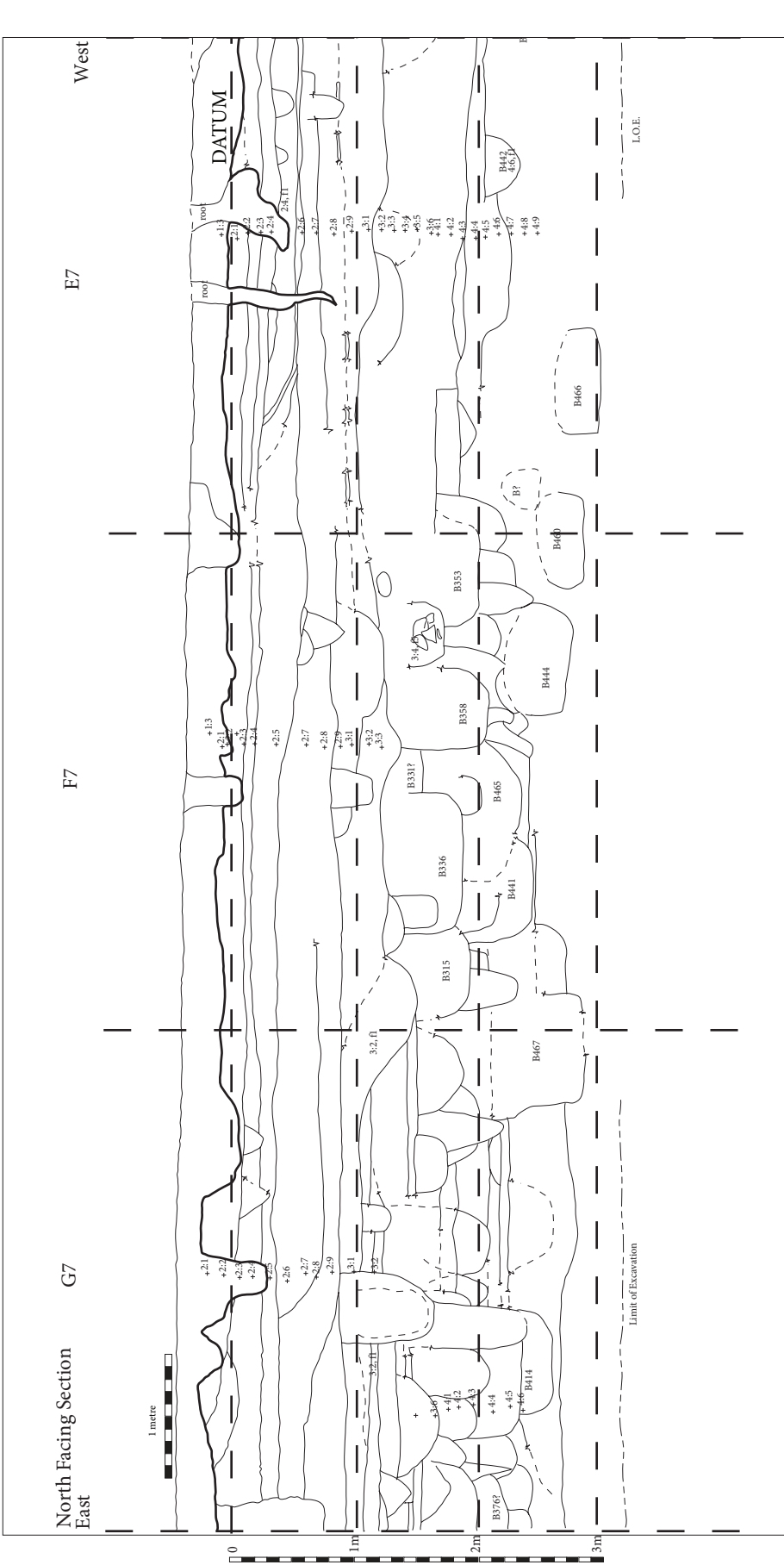


FIG. 1:7 The section through the southern edge of squares G-E 7

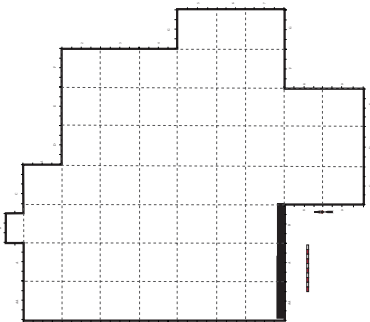
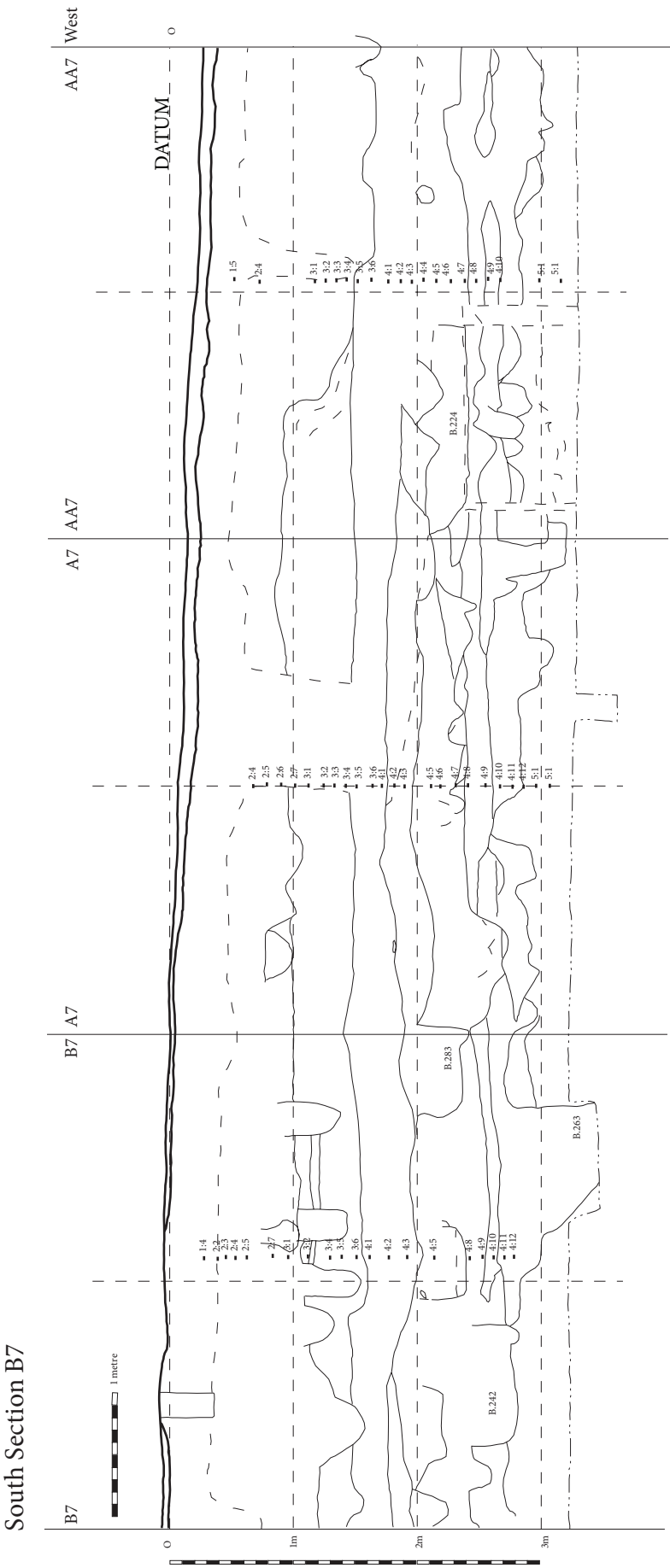


FIG. 1:8 The section through the southern edge of squares AA-A-B7

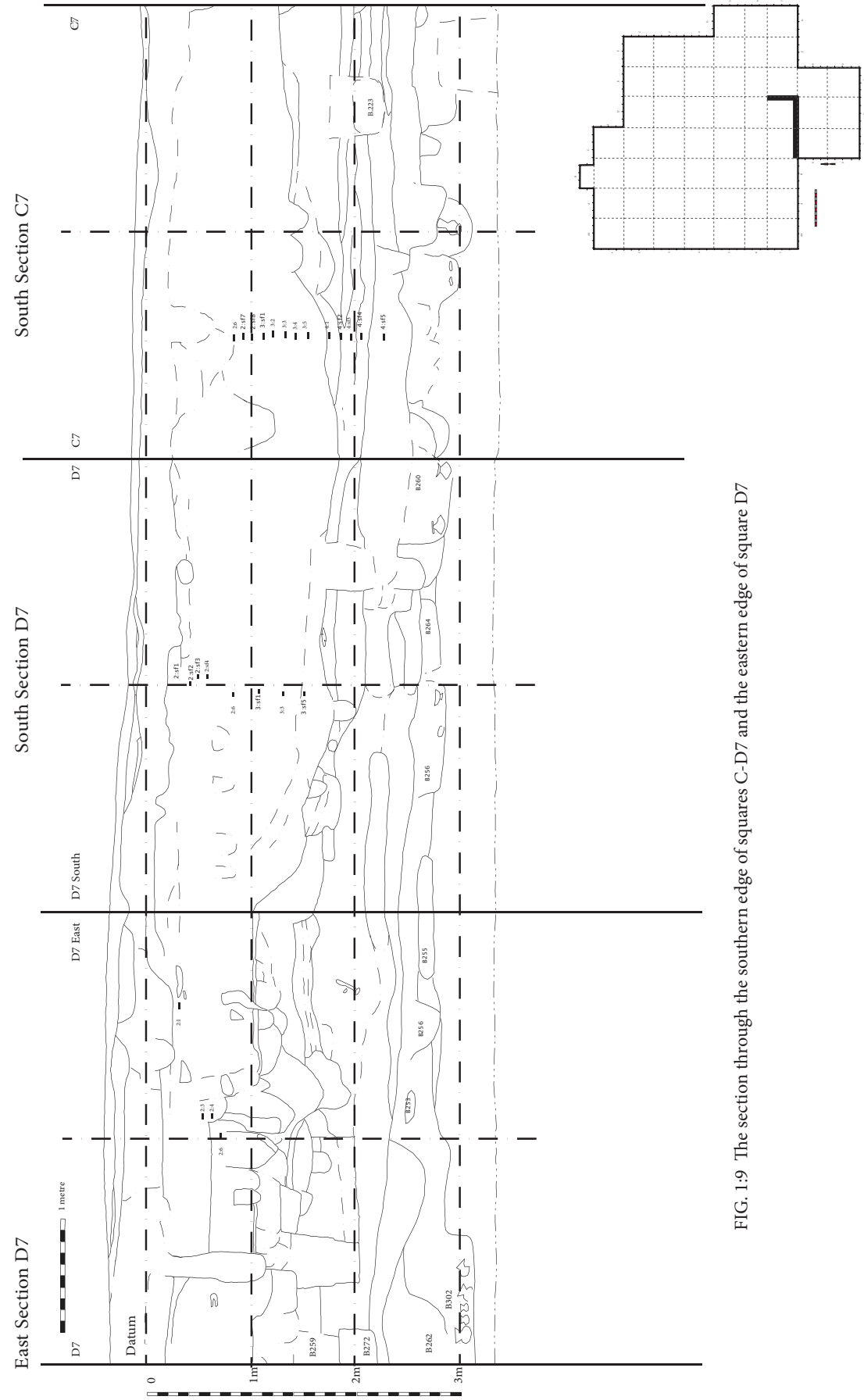


FIG. 1:9 The section through the southern edge of squares C-D7 and the eastern edge of square D7

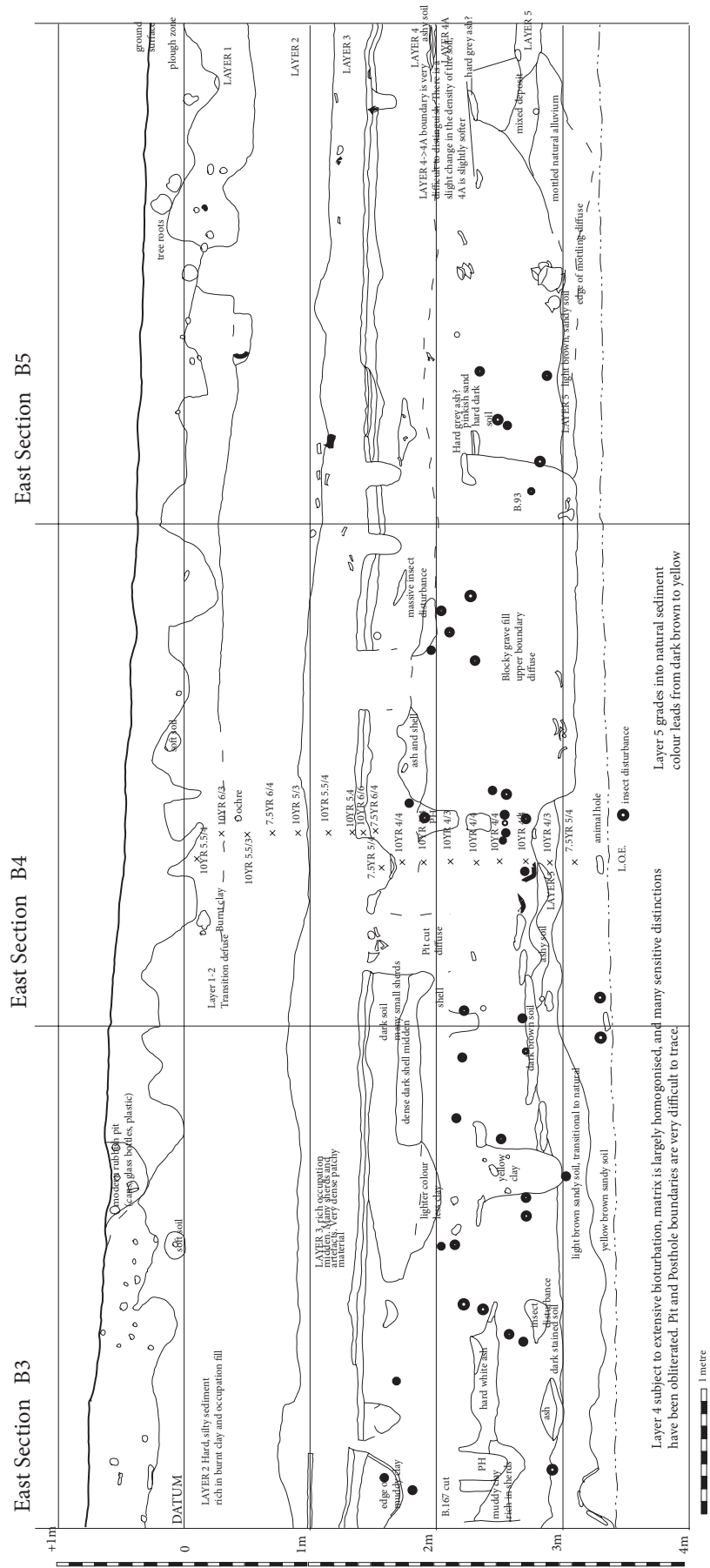


FIG. 1:10 The section through the eastern edge of squares B3-5

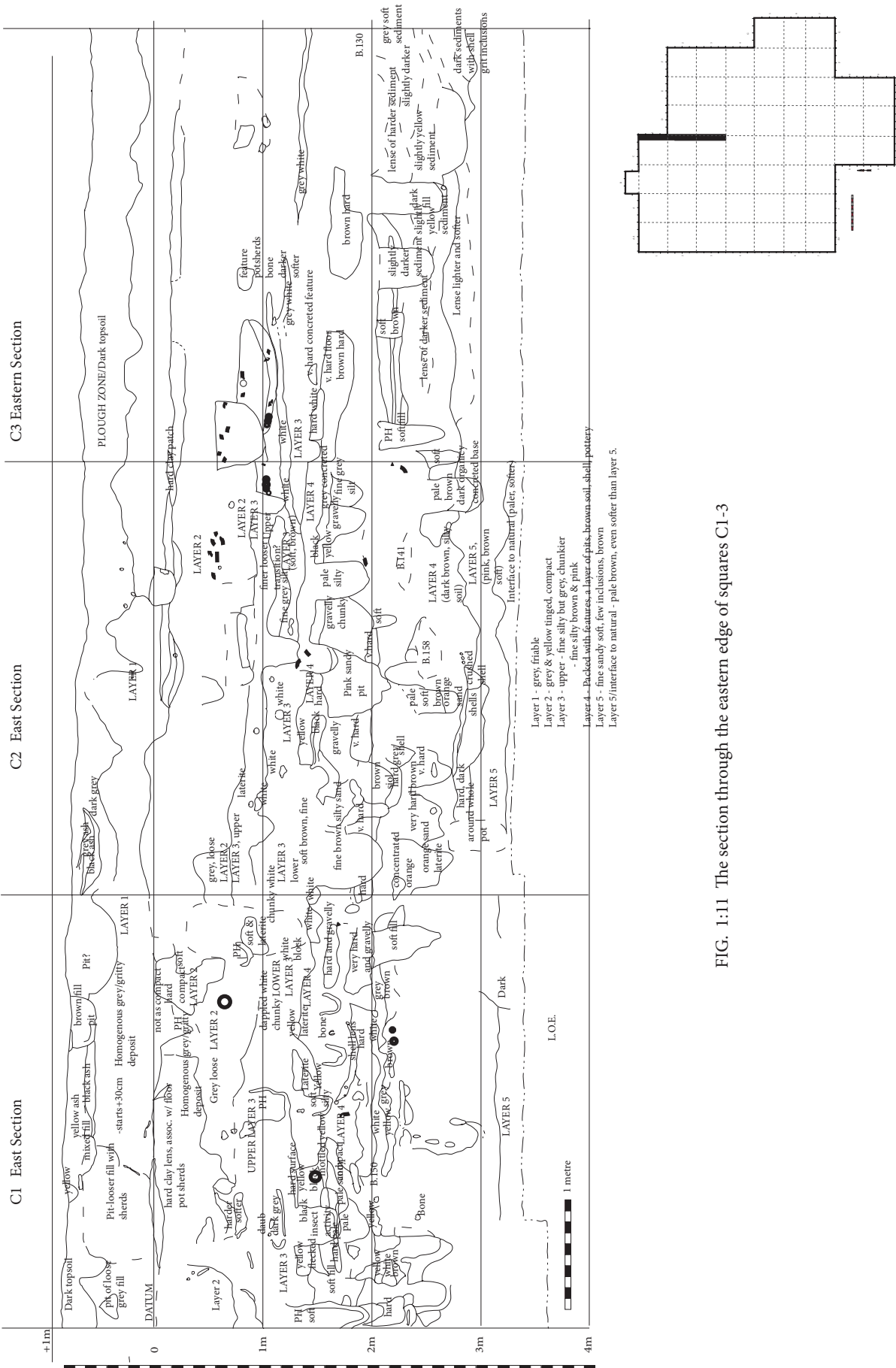
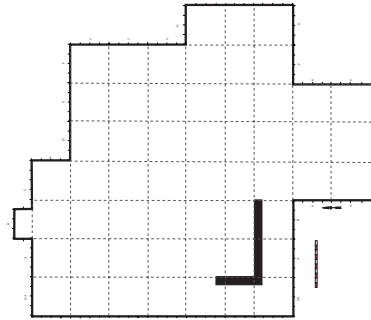
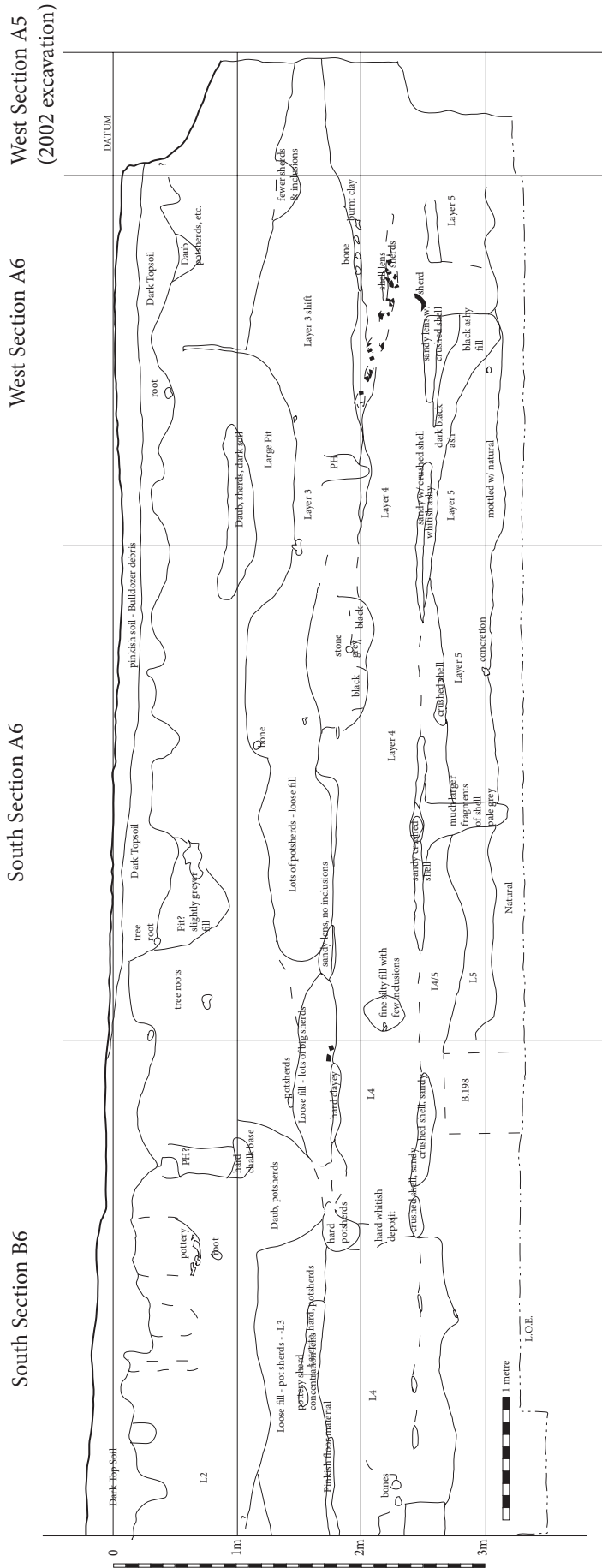


FIG. 1:11 The section through the eastern edge of squares C1-3



II THE CHRONOLOGY OF BAN NON WAT

C.F.W. HIGHAM AND T.F.G. HIGHAM

The cultural sequence of Ban Non Wat falls into at least 12 phases, each characterised by different mortuary and occupational activity, and set apart on the basis of superpositions of interments that validate the relative chronology. We cannot place 13 flexed burials in this sequence precisely, because there is no superposition of any burial over the members of this group prior to the third phase of the Bronze Age. Flexed burials are characteristic of the indigenous Southeast Asian hunter-gatherers and it is possible that the site was used by such a group as a cemetery. The material items placed with these dead are quite distinct from those found with the assuredly Neolithic (Neo) 1 and 2 burials.

The Neo 1 cemetery contains extended supine inhumation graves and lidded jars for containing the corpse. The ceramic vessels found in association fall into a widely-recognised tradition, involving decoration with complex incised designs (Higham 2004; Wiriyaromp 2007; Rispoli 2008). Other grave goods included marine shell ornaments, pig skeletons, and freshwater bivalve shells. When there is a superposition involving Neo 1 and 2, the latter are always later. Neo 2 burials are normally found orientated on an east-west axis, and grave goods are markedly poorer than in Neo 1, comprising in the main, globular cord-marked vessels and the occasional freshwater bivalve shell.

There are six Bronze Age (BA) phases at Ban Non Wat. BA 1 burials were accompanied by a series of small ceramic vessels that have their closest parallels in the late Neolithic graves at the nearby site of Ban Lum Khao. With the exception of an infant jar burial, all five individuals were also interred with one copper base artefact. BA 2 burials fall into four groups, each disposed in a row. The most southerly comprises nine or ten graves. There are seven graves in the second group, 10-11 graves in the third group and a double and a single grave in the far north of the excavated area. BA 2 graves are always stratigraphically later than those of Neo 2 and BA 1, and they display hitherto unrecognized mortuary wealth. The remains of three men and three women had been partially exhumed after interment, and then reburied. We think that this might well reflect their exceptionally high ritual and social status. Mortuary offerings included copper-base socketed axes, chisels and points, anklets and rings. Up to 50 or 60 ceramic vessels were placed with the corpse, which was wrapped in a fabric shroud and contained within a wooden coffin. Some of these pots were decorated with elaborate painted designs, which hearken back to those found on Neolithic 1 ceramics. One vessel, found with an infant, was painted with what looks like a stylised human face (Fig. 10:29).

The dead wore exotic shell and marble ornaments and shell beads over the body might have been stitched onto their clothing. Multiple strands of shell beads were worn as necklaces and belts, and some individuals wore up to 22 shell earrings. By any comparative measure, these individuals can be termed elite, even princely.

BA 3A incorporates 14 very rich burials, set out on a different orientation. Where there is a superposition, they invariably seal BA 2 graves. Most individuals in this phase were buried on a northeast to southwest axis, wearing numerous marine shell and marble bangles, and associated with well-crafted ceramic vessels. Some people were also buried with socketed bronze axes, while one infant wore bronze anklets embellished with 30 bronze bells. Bronze Age 3B graves are by contrast, relatively poor.

BA 4 involves many graves, set out in rows with the head usually orientated to the northwest. Where there is physical relativity to BA 1-3, they are always later. While the ceramic vessels are clearly derivative from earlier forms, they are generally smaller and lack painted designs. The burials are markedly poorer in terms of mortuary wealth, and bronzes are very rare. However, one man, surely a bronze founder, was buried with 29 clay bivalve moulds for casting bangles and axes. These burials are always sealed by those of BA 5. The latter reveal further developments in the form of ceramic vessels. The dead during this phase were often accompanied by spindle whorls and grey clay that may well have been used in dying cloth. One BA 5 individual was accompanied by a crucible for casting bronze.

On the basis of horizontal stratigraphy, BA 5 developed seamlessly into the early Iron Age (IA 1). Indeed, it is only on the basis of the presence of iron artefacts that on occasion one can distinguish the two, for the ceramic vessels are virtually identical. The Iron Age burials contain sets of iron tools; there are both iron and bimetallic (bronze hafts) spears, glass earrings, carnelian and agate ornaments and pots filled with fish skeletons.

The few burials of the last prehistoric phase, IA 2, are distinguished by ceramics that include vessels of the so-called Phimai Black tradition. Their distribution lies mainly to the west of IA 1 burials, but where there is a superposition, they are always later. Exotic hard stone and glass ornaments are found but most of these burials are not far below the present ground surface, and are badly disturbed by more recent activity.

RADIOCARBON DATING

Table 2:1 shows the radiocarbon determinations for the

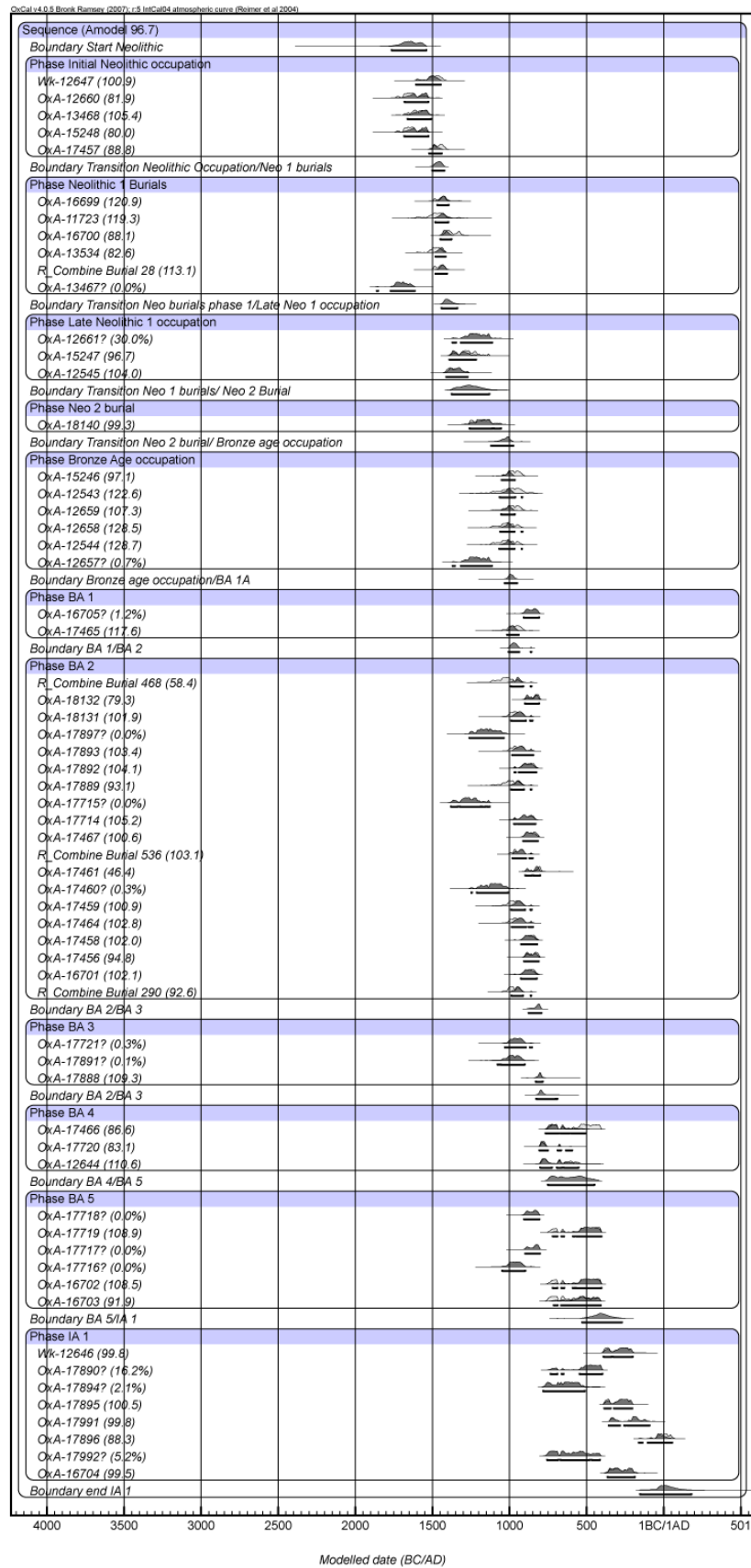


FIG. 2:1 The radiocarbon determinations from Ban Non Wat

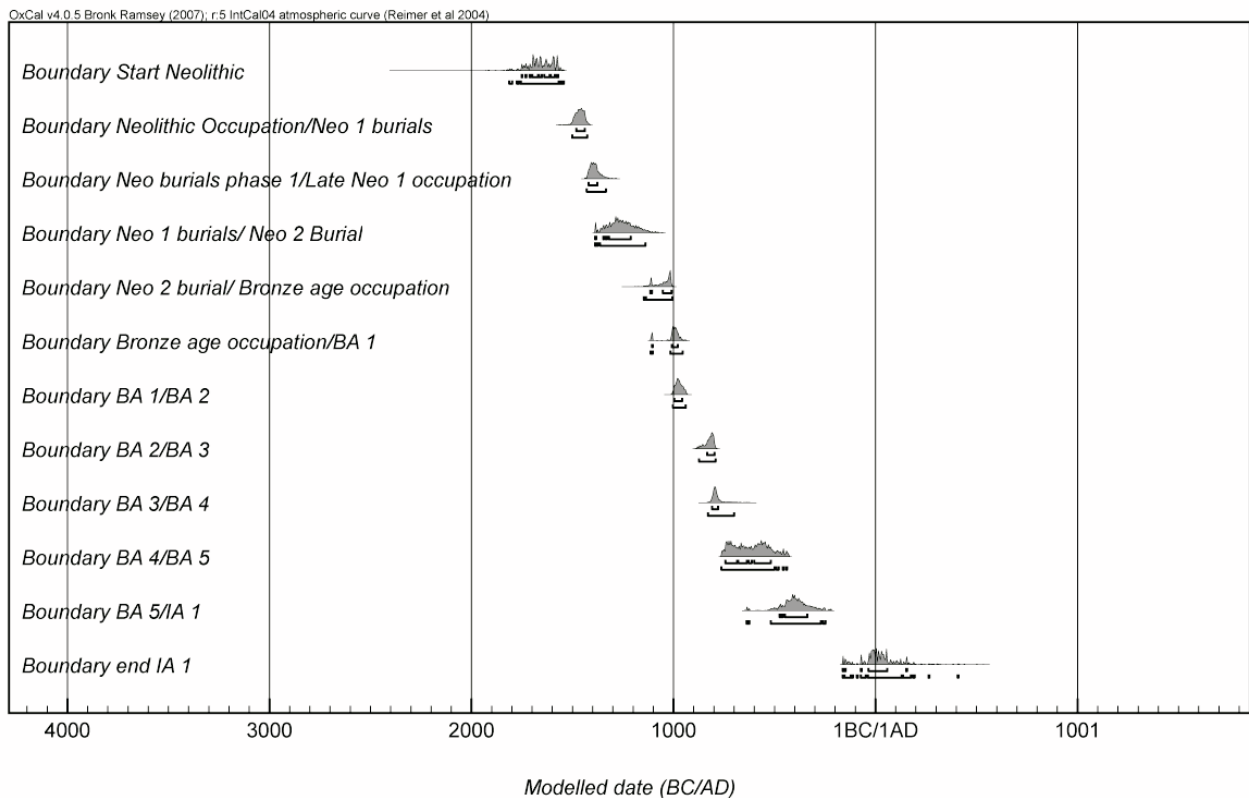


FIG. 2:2 The boundaries between the cultural phases at Ban Non Wat

cultural phases at Ban Non Wat. Further determinations for the surrounding Iron Age moats and embankments are also available but are not incorporated below (McGrath *et al.* 2007). Samples submitted from the first three seasons comprised charcoal and human bone from *in situ* contexts. We have not been able to rule out inbuilt age associated with the former while the human bone had no remaining collagen for dating. Given our deep scepticism over the validity of a handful of dates from charcoal or organic temper in ceramics as a basis for determining the timing of cultural changes, we sought an alternative method. In our view, a more attractive option for constructing a radiocarbon chronology from this site is to date freshwater shell. Such shells were placed with the dead throughout the prehistoric occupation of Ban Non Wat, their location probably reflecting a high ritual or spiritual value. There are two genera: *Hyriopsis* and *Pseudodon*. These shells may have been valued as heirlooms and have inbuilt age. However, this seems less likely than is the case for charcoal, and their association with specific individuals is held to be a more reliable index of date than charcoal derived from either grave fill or non-mortuary contexts.

Given the ubiquity of well-provenanced freshwater bivalve shells within burial contexts at Ban Non Wat, we investigated their utility for direct AMS radiocarbon determinations. A modern individual collected live in 2006 from the vicinity of the site yielded a measurement of

106.8 ± 0.3 pMC. When compared with modern terrestrial post-bomb radiocarbon records and a charcoal standard regularly measured in the Oxford laboratory, the result is indistinguishable, suggesting there is no significant reservoir effect, at least in the modern era. Further comparisons between freshwater shell and well-provenanced charcoal from the same contexts yielded good agreement between the results (eg burial 290, Table 2:1). Again, the results are indistinguishable at 68.2%. Changes in the reservoir from which these shells originate could influence their utility as a chronometer, but in terms of comparison with the contemporary atmospheric ^{14}C levels at the time, this would only make the results older than their 'true age'. The absence of a limestone-based catchment within the hydrological system makes a hard water effect unlikely. Taken together, our initial data suggest that freshwater shell ought to be reliable for dating, provided that no recrystallisation has occurred which could introduce exogenous carbon of a potentially younger or older age. This was carefully checked at ORAU prior to AMS dating. None of the shells showed any evidence for recrystallisation.

The problem with inbuilt age of charcoal is, however, illustrated by considering the two samples from burial 28, a Neo 1 jar burial. The first determination, based on charcoal within the vessel, is 3680 ± 30 BP. A second determination based on a freshwater bivalve shell artefact found as a

mortuary offering is 3170 ± 27 BP, a 510 year difference. This finding illustrates the pitfalls of relying on a small sample of charcoal-based dates. In the case of the late Iron Age, a handful of determinations were processed in Arizona on the basis of rice chaff found as a ceramic temper.

BAN NON WAT AND THE HERMENEUTIC SPIRAL

Buck *et al.* (1996) have described the procedures for constructing Bayesian chronologies using radiocarbon dates and archaeological prior beliefs. In the context of Ban Non Wat, the problem, encapsulated in standardised beliefs, is that the date range for the Neolithic settlement of Thailand has in recent times variously been set anywhere from the 5th to the late 3rd millennium BC, while the inception of the Bronze Age might fall in a range from the late 3rd to the late 2nd millennium BC (Higham 1996; White & Pigott 1996; White 1997, 2008). The new data comprise 75 radiocarbon determinations for the cultural sequence at Ban Non Wat and five for the nearby settlement of Ban Lum Khao (Higham T.F.G. 2004). The analysis of these results in a Bayesian approach will, in due course, generate our posterior beliefs. Since these become tomorrow's prior beliefs, we are setting in train the first step in a hermeneutic spiral.

The prior information incorporated in the chronological model is set out in figure 2:4. The dates for the flexed burials are excluded for lack of stratigraphical information on relations with other groups. The first phase employed in the Bayesian analysis, therefore, represents radiocarbon determinations for Neo 1 that come from charcoal associated with occupation middens at the base of the site containing ceramic sherds matching those from Neo 1 burials. The Neo 1 burials are dated by charcoal found within lidded mortuary vessels and freshwater bivalve shells placed as mortuary offerings. Phase 3 Later Neolithic 1 occupa-

tion determinations come from charcoal in occupation contexts. As a check, we considered five determinations from the nearby site of Ban Lum Khao taken on charcoal found in the initial Neolithic occupation phase that underlie and thus predate the burials there that are virtually identical with Neo 2 graves at Ban Non Wat (Higham and Thosarat 2005). Dating material from the Neo 2 burials themselves is difficult because the inclusion of freshwater bivalve shells became infrequent. The fifth phase is early Bronze Age occupation. These determinations come from *in situ* hearths located at the base of the square Y1, which underlie all subsequent Bronze Age graves in that area of the site. Phase 6 represents BA 1, and phase 7 incorporates the very rich BA 2 graves containing bronze artefacts. This is followed by phase 8 (BA 3). Phase 9 involves BA 4 graves and phases 10 -12 are described as BA 5 and Iron Age (IA) 1-2.

OBJECTIVES AND DISCUSSION

Our specific questions concerning this archaeological sequence were:

1. The date and duration of the flexed burials
2. The date of the initial settlement of the site by Neolithic rice farmers
3. The date and duration of the Neolithic 1 cemetery
4. The date and duration of the Neolithic 2 cemetery
5. The date of the initial Bronze Age occupation phase
6. The date and duration of the five Bronze Age mortuary phases
7. The date of the transition to the Iron Age and the duration of the Iron Age 1 cemetery

We used OxCal 4.0 (Bronk Ramsey 1995) to analyse the radiocarbon determinations, which are set out in figure 2:1. Initial runs of the model disclosed some obvious outliers denoted by low agreement indices, variation which might,

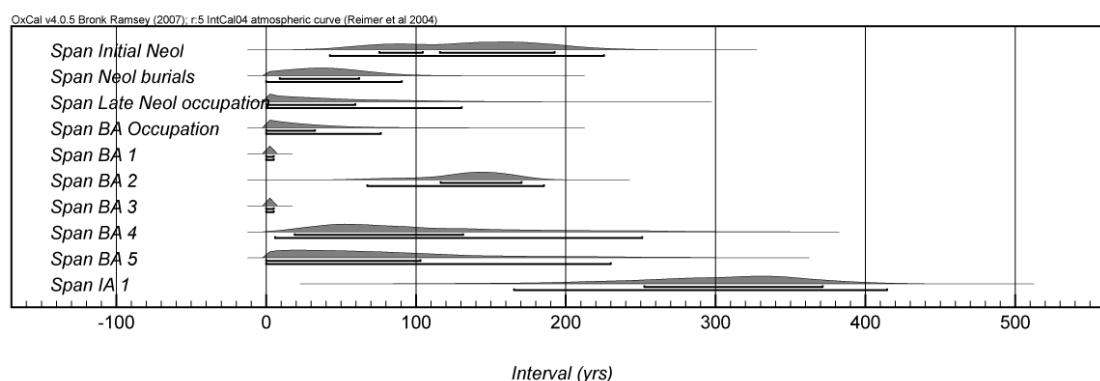


FIG. 2:3 The spans of the cultural phases at Ban Non Wat

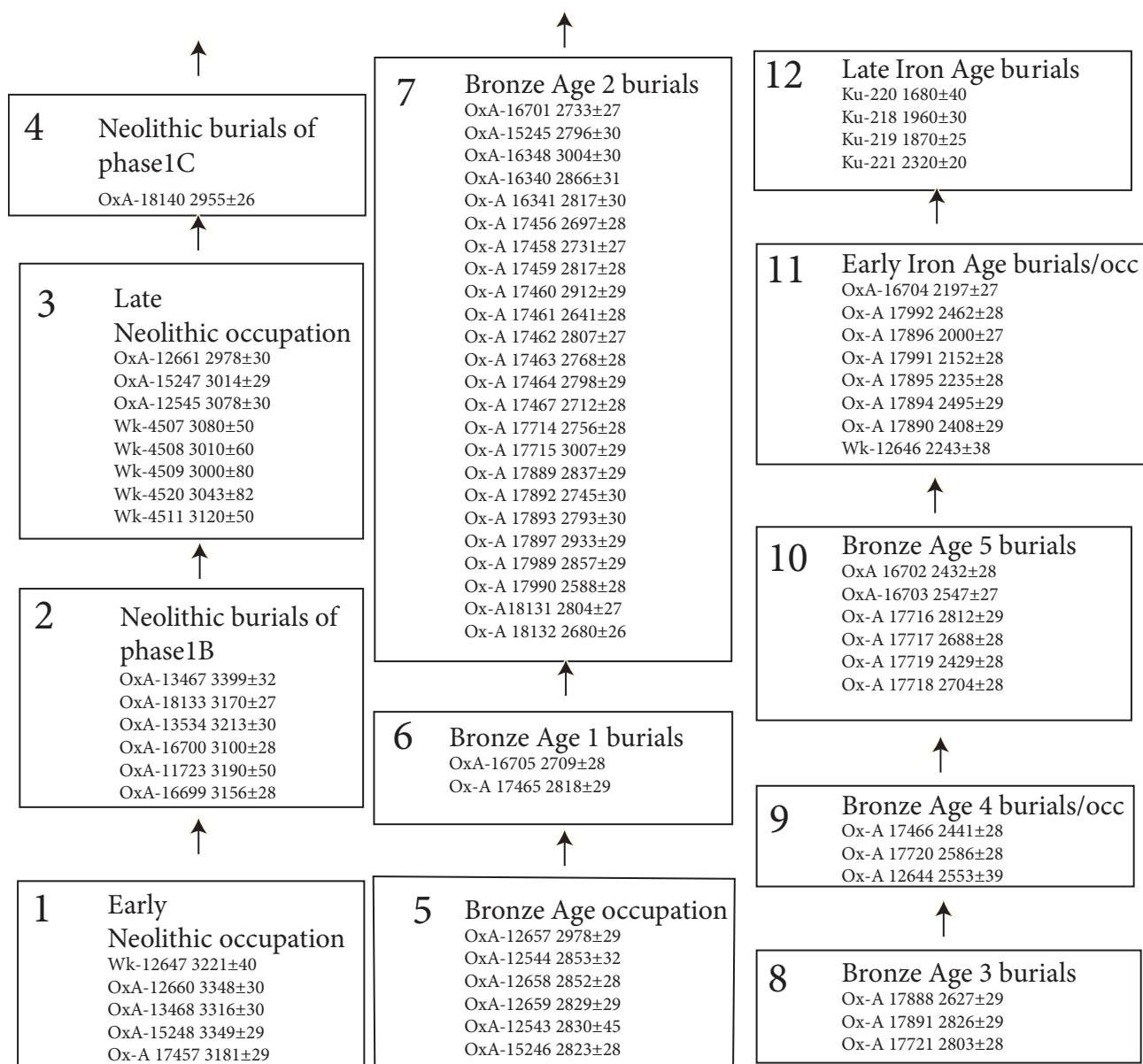


FIG. 2:4 The prior information on the sequence at Ban Non Wat incorporated in the Bayesian analysis of the radiocarbon determinations

TABLE 2:1 *The radiocarbon determinations for Ban Non Wat and Ban Lum Khao*

Laboratory code	Sample	delta 13C(‰)	Radiocarbon age (BP)	Calibrated date (95% confidence)	Posterior density estimate (95% probability)
Period 1. Flexed Burials					
OxA-18141	Burial 454, bivalve shell	-4.61	3362±27	1741-1537 cal. BC	
OxA-18142	Burial 461, bivalve shell	-5.12	3204±27	1521-1423 cal. BC	
OxA-15942	Burial 438, bivalve shell	-5.00	2948±29	1262-1055 cal. BC	
Boundary, initial Neolithic Occupation 1765-1540 cal. BC					
Initial Neolithic occupation					
Wk-12647	B3 layer 4:9 feature 1, charcoal from Neolithic hearth	-27.2	3221±40	1610-1400 cal. BC	1606-1446 cal. BC
OxA-12660	B2 4a:8 feature 35, charcoal from Neolithic shell midden	-25.6	3348±30	1689-1601 cal. BC	1685-1526 cal. BC
OxA-13468	C1 4:15 feature 1, charcoal from Neolithic shell midden	-27.3	3316±30	1682-1582 cal. BC	1661-1517 cal. BC
OxA-15248	AA1 5:3, charcoal from Neolithic shell midden	-26.5	3349±29	1694-1601 cal. BC	1688-1525 cal. BC
OxA-17457	E2 5:2 feature 1 charcoal	-4.5	3181±29	1505-1409 cal. BC	1522-1440 cal. BC
Boundary transition, Neolithic occupation to Neolithic 1 burials 1501-1424 cal. BC					
Neolithic 1 burials					
OxA-11722	Burial 28, charcoal	-24.3	3680±45	2150-1935 cal. BC	1489-1402 cal. BC
OxA-18133	Burial 28, bivalve shell	-6.10	3170±27	1499-1407 cal. BC	
OxA-13467	Burial 179, charcoal	-26.2	3399±32	1772-1616 cal. BC	1866-1609 cal. BC
OxA-13534	Burial 195, charcoal within infant jar burial	-25.7	3213±30	1524-1412 cal. BC	1487-1415 cal. BC
OxA-16700	Burial 86, bivalve shell <i>Pseudodon</i>	-6.74	3100±28	1434-1304 cal. BC	1442-1377 cal. BC
OxA-11723	Burial 32, charcoal within mortuary vessel	-28.7	3190±55	1603-1373 cal. BC	1481-1391 cal. BC
OxA-16699	Burial 32 bivalve shell	-5.5	3156±28	1497-1392 cal. BC	1472-1394 cal. BC
Boundary transition, Neolithic 1 burials to late Neolithic occupation 1442-1340 cal. BC					
Later Neolithic occupation					
OxA-12661	B4 5:1 feature 4, charcoal from a hearth	-25.9	2978±30	1316-1114 cal. BC	1372-1059 cal. BC
OxA-15247	D5 4:11 to 5:1 charcoal from late Neolithic pit	-27.6	3014±29	1316-1114 cal. BC	1391-1217 cal. BC
OxA-12545	B2 4A:5 feature 34, late Neolithic charcoal	-24.8	3078±30	1362-1314 cal. BC	1407-1273 cal. BC
Wk-4507	BLK B1:B 3:3 pit 1	-26.9	3080±50	1435-1209 cal. BC	
Late Neolithic occupation at Ban Lum Khao					
WK-4508	BLK A1:C 3:2	-27.0	3010±60	1394-1068 cal. BC	
Wk-4509	BLK A1:C 3:2 feat. 1	-25.7	3000±80	1410-1019 cal. BC	
Wk-4510	BLK B1:A 3 surf. 3 pit 1	-26.1	3043±82	1449-1019 cal. BC	

Laboratory code	Sample	delta 13C(‰)	Radiocarbon age (BP)	Calibrated date (95% confidence)	Posterior density estimate (95% probability)
Wk-4511	BLK A1:A surf. 3 lens 1	-25.9	3120±50	1461-1255 cal. BC	
Boundary transition, Neolithic 1 to Neolithic 2 burials <i>1377-1133 cal. BC</i>					
Neolithic 2 Burial					
OxA-18140	Burial 31	-2.89	2955±26	1266-1055 cal. BC	<i>1263-1056 cal. BC</i>
Boundary transition, Neolithic 1 burial to Bronze Age initial occupation <i>1126-844 cal. BC</i>					
Early Bronze Age occupation					
OxA-12657	Y1 9:2 feature 5, charcoal	-26.4	2978±29	1316-1112 cal. BC	<i>1310-1120 cal. BC</i>
OxA-12544	Y1 9:2 feature 1, charcoal	-24.3	2853±32	1126-966 cal. BC	<i>1116-974 cal. BC</i>
OxA-12658	Y1 8:4 feature 2, charcoal	-26.3	2852±28	1117-927 cal. BC	<i>1116-976 cal. BC</i>
OxA-12659	Y1 8:4 feature 3, charcoal	-26.9	2829±29	1056-905 cal. BC	<i>1116-979 cal. BC</i>
OxA-12543	Y1 8:4 feature 1, charcoal	-25.0	2830±45	1127-895 cal. BC	<i>1118-973 cal. BC</i>
OxA-15246	AA5 4:7 feature 4, charcoal	-25.6	2823±28	1060-900 cal. BC	<i>1116-972 cal. BC</i>
Boundary transition, Bronze Age occupation to Bronze Age 1 burials <i>1114-955 cal. BC</i>					
Bronze Age 1 burials					
OxA-16705	Burial 446, bivalve shell	-4.0	2709±28	907-809 cal. BC	<i>909-811 cal. BC</i>
OxA-17465	Burial 569, bivalve shell	-7.1	2818±29	1051-901 cal. BC	<i>1039-938 cal. BC</i>
Boundary transition, Bronze Age 1 to Bronze Age 2 burials <i>1003-940 cal. BC</i>					
Bronze Age 2 burials					
OxA-16340	Burial 290, bivalve shell	-7.80	2866±31	1130-926 cal. BC	<i>1988-916 cal. BC</i>
OxA-16341	Burial 290, bivalve shell	-7.40	2817±30	1056-896 cal. BC	
OxA-15245	Burial 290, charcoal adhering to a femur	-25.4	2796±30	1020-890 cal. BC	
OxA-16701	Burial 90, bivalve shell	-7.50	2733±27	926-816 cal. BC	<i>930-827 cal. BC</i>
OxA-17456	Burial 571 bivalve shell	-11.3	2697±28	902-806 cal. BC	<i>906-813 cal. BC</i>
OxA-17458	Burial 550 bivalve shell	-8.10	2731±27	925-815 cal. BC	<i>925-823 cal. BC</i>
OxA-17459	Burial 555 bivalve shell	-9.4	2817±28	1047-904 cal. BC	<i>1004-844 cal. BC</i>
OxA-17460	Burial 522 bivalve shell	-8.8	2912±29	1248-1010 cal. BC	<i>1248-1010 cal. BC</i>
OxA-17461	Burial 532 bivalve shell	-6.8	2641±28	889-785 cal. BC	<i>897-801 cal. BC</i>
OxA-17462	Burial 536 bivalve shell	-7.4	2807±27	1041-898 cal. BC	<i>991-843 cal. BC</i>
OxA-17463	Burial 536 bivalve shell	-7.0	2768±28	997-837 cal. BC	
OxA-17464	Burial 543 bivalve shell	-8.3	2798±29	1021-846 cal. BC	<i>997-846 cal. BC</i>
OxA-17467	Burial 570 bivalve shell	-10.7	2712±28	909-810 cal. BC	<i>911-816 cal. BC</i>
OxA-17714	Burial 105 bivalve shell	-7.7	2756±28	976-828 cal. BC	<i>975-831 cal. BC</i>
OxA-17715	Burial 106 bivalve shell	-8.2	3007±29	1380-1130 cal. BC	<i>1380-1130 cal. BC</i>
OxA-17889	Burial 197 bivalve shell	-8.7	2837±29	1112-914 cal. BC	<i>1006-908 cal. BC</i>

Laboratory code	Sample	delta 13C(‰)	Radiocarbon age (BP)	Calibrated date (95% confidence)	Posterior density estimate (95% probability)
OxA-17892	Burial 293 bivalve shell	-6.7	2745±30	975-818 cal. BC	973-825 cal. BC
OxA-17893	Burial 302 bivalve shell	-7.9	2793±30	1014-845 cal. BC	998-842 cal. BC
OxA-17897	Burial 458 bivalve shell	-7.2	2933±29	1261-1029 cal. BC	1260-1041 cal. BC
OxA-17989	Burial 468 bivalve shell	-7.4	2857±29	1122-929 cal. BC	1007-912 cal. BC
OxA-17990	Burial 468 bivalve shell	-7.4	2588±28	815-601 cal. BC	
OxA-18131	Burial 455 bivalve shell	-7.23	2804±27	1040-860 cal. BC	1000-846 cal. BC
OxA-18132	Burial 456 bivalve shell	-10.98	2680±26	896-802 cal. BC	898-810 cal. BC
Boundary transition, Bronze Age 2 to Bronze Age 3 burials 874-793 cal. BC					
Bronze Age 2 burials					
OxA-17888	Burial 196 bivalve shell	-6.00	2627±29	835-774 cal. BC	831-787 cal. BC
OxA-17891	Burial 263 bivalve shell	-6.00	2826±29	1073-902 cal. BC	1067-906 cal. BC
OxA-17721	Burial 154 bivalve shell	-5.60	2803±28	1039-855 cal. BC	1041-845 cal. BC
Boundary transition, Bronze Age 3 to Bronze Age 4 burials 830-701 cal. BC					
Bronze Age 3 burials					
OxA-17466	Burial 564 bivalve shell	-8.00	2441±28	752-407 cal. BC	769-502 cal. BC
OxA-17720	Burial 145 bivalve shell	-7.90	2586±28	814-599 cal. BC	806-596 cal. BC
OxA-12644	Y1 7:7 feature 1, charcoal	-25.5	2553±39	730-520 cal. BC	803-550 cal. BC
Boundary transition, Bronze Age 4 to Bronze Age 5 burials 764-439 cal BC					
Bronze Age 5 burials					
OxA-16703	Burial 241 bivalve shell	-4.70	2457±27	750-404 cal. BC	720-410 cal. BC
OxA-16702	Burial 241 bivalve shell	-4.70	2432±28	754-413 cal. BC	717-406 cal. BC
OxA-17716	Burial 124 bivalve shell	-8.10	2812±29	1048-899 cal. BC	1048-901 cal. BC
OxA-17717	Burial 126 bivalve shell	-6.8	2688±28	898-804 cal. BC	901-802 cal. BC
Ox-A 17718	Burial 133 bivalve shell	-6.60	2704±28	906-807 cal. BC	906-810 cal. BC
OxA-17719	Burial 135 bivalve shell	-2.7	2429±28	749-403 cal. BC	720-407 cal. BC
Boundary transition, Bronze Age 5 to Iron Age 1 burials 639-249 cal. BC					
Iron Age 1 Burials					
OxA-16704	Burial 360 bivalve shell	-6.0	2197±27	370-189 cal. BC	361-180 cal. BC
OxA-17992	Burial 476 bivalve shell	-6.2	2462±28	756-415 cal. BC	747-414 cal. BC
OxA-17896	Burial 386 bivalve shell	-3.4	2000±27	51 BC- cal AD 66	167AD-54 cal. BC
OxA-17991	Burial 473 bivalve shell	-7.4	2152±28	356-93 cal. BC	356-96 cal. BC
Ox-A 17895	Burial 383 bivalve shell	-4.2	2235±28	388-206 cal BC	382-202 cal. BC
OxA-17894	Burial 341 bivalve shell	-1.7	2495±29	782-512 cal BC	775-516 cal. BC
OxA-17890	Burial 237 bivalve shell	-6.2	2408±29	734-399 cal BC	734-400 cal. BC
Wk-12646	Y2 5:5 f. 3, charcoal	-25.4	2243±38	400-200 cal. BC	388-203 cal. BC
Boundary transition, end Iron Age 1 burials 411 cal. BC-AD 164					
Iron Age 2 Burials					
Ku-221	Burial 100, rice chaff	-23.8	2320±30	410-230 cal. BC	
KU-218	Burial 102, rice chaff	-24.7	1960±30	40 BC-cal AD 120	
KU-219	Burial 102, rice chaff	-24.0	1870±25	80-220 AD	
KU-220	Burial 95, rice chaff	-17.5	1680±40	250-430 AD	

in part, be due to some of the issues raised earlier (principally inbuilt age and reservoir variability) but could also be influenced by statistical variation (statistically speaking, 5% of the dates would be expected to fail this test). In subsequent runs, these were questioned in the sequence. The final iteration of the model produced acceptably high agreement indices, which act as a measure of the reliability and reproducibility of the model. Posterior probability distributions are shown in figure 2:1, and ranges are listed in table 2:1 at the 95.4% confidence interval. Individual probability distributions were obtained for the span of each phase (Fig. 2:3).

Our results show that the flexed burials were among the earliest encountered, and lasted until the 12th century BC. The initial Neolithic settlement of Ban Non Wat began in the mid 17th century BC and lasted in the vicinity of 150 years, while the Neo 1 burials date from about 1460 cal. BC, and lasted for two generations or about 50 years. The later Neolithic occupation is dated to about 1400 cal. BC, with a very brief time span. This was followed by the Neo 2 burial, which is dated to 1259-1056 cal. BC. The transition from the late Neolithic to the Early Bronze Age settlement took place between 1053-996 cal. BC, with the highest probability being 1000 BC. At virtually the same time six BA 1 burials were laid out, followed very soon by four spatially discrete sets of outstandingly rich burials, three containing the graves of men, women, infants and children. The span for these burials lies between 135-185 years at 68.2% probability with a most likely period of 160 years or about six generations. This is consistent with the number of burials and their disposition.

BA 3A burials seal one group of BA 2 graves. Equally

TABLE 2:2 *A summary of the prehistoric chronology for the upper Mun Valley, based on the radiocarbon determinations for Ban Non Wat, Ban Lum Khao and Noen U-Loke*

Cultural Period	Date in Calibrated Radiocarbon Years (BC)
Flexed burials	1750-1050
Neolithic 1	1650-1250
Neolithic 2	1250-1050
Bronze Age 1	1050-1000
Bronze Age 2	1000-900
Bronze Age 3	900-800
Bronze Age 4	800-700
Bronze Age 5	700-420
Iron Age 1	420-100
Iron Age 2	200-AD 200
Iron Age 3	AD 200-400
Iron Age 4	AD 300-500
Early Historic	500-

wealthy, this group is dated to the ninth century BC with a span of only a few years. Perhaps they were only one generation later than those they overlie. Bronze Age 3B burials were probably slightly later. The transition from BA 3 to BA 4 took place between 810-780 cal. BC with 790 cal. BC being the most likely date. Numerous BA 4 graves were laid out in long rows and were interred over a period of between 20-133 years with a highest probability of 50 years. It is considered probable that the rows formed at the same period, perhaps reflecting a rise in the population. Individuals were distinctly poorer than their predecessors. Now only a handful of ceramic vessels were placed beyond the head and feet, and bronzes were rare almost to the point of being absent. However, local casting was undertaken, evidenced by one man interred with multiple sets of bivalve clay moulds for the casting of bangles and socketed axes. Some individuals wore shell and marble bangles or beads, but never in the former abundance.

By the 8th century, we enter the region of the radiocarbon calibration curve known as the Hallstatt Plateau (Zaitseva *et al.* 2005). This has affected the establishment of a tight chronology for the BA 5 cemetery. The burials, while including ceramic vessels derived from BA 4 prototypes, present a new configuration. Graves were tightly grouped in rows and many contained spindle whorls that probably reflect specialist weavers. Again, no burial remotely matches the wealth of those found four centuries earlier during BA 2 and 3.

As one progresses eastward, some burials incorporated iron offerings, in the form of large spears, three at least being bimetallic with bronze hafts and iron blades. The *terminus post quem* for the Iron Age burials lies between 464-347 cal. BC at 68.2% probability, with 410 cal. BC the most likely date. There were sets of iron tools, and iron bangles. Some rare glass ornaments were encountered: earrings and beads. This horizontal stratigraphy with a merging between the late Bronze Age and the use of iron suggests that we have encountered the very beginnings of iron technology at this site, dated in the late 5th century BC. Graves were tightly packed in rows and superimposed in a palimpsest of skeletons. No individuals stood out on the basis of mortuary wealth or display. However, at the site of Noen U-Loke, only three kilometres distant, we identified a surge in mortuary wealth in the later Iron Age, a phase only poorly represented as yet at Ban Non Wat. It was probably during this slightly later juncture, that the water control measures in the form of banks and moats were constructed round these settlements. These were substantial engineering works that would have entailed much labour. Their construction implies a high degree of social control over resources.

III LAYER FIVE

LAYER 5:3

This context represents the basal layer of the site containing the remains of cultural activity. Postholes and pits were excavated down to this depth, as were some particularly deep graves. Burial 306 in the northwestern

corner of the square has been assigned to Bronze Age 4. Burial 630 is that of an infant, on an east-west orientation. It is not possible to be sure of its cultural affinities but it has been grouped with the early hunter-gatherers

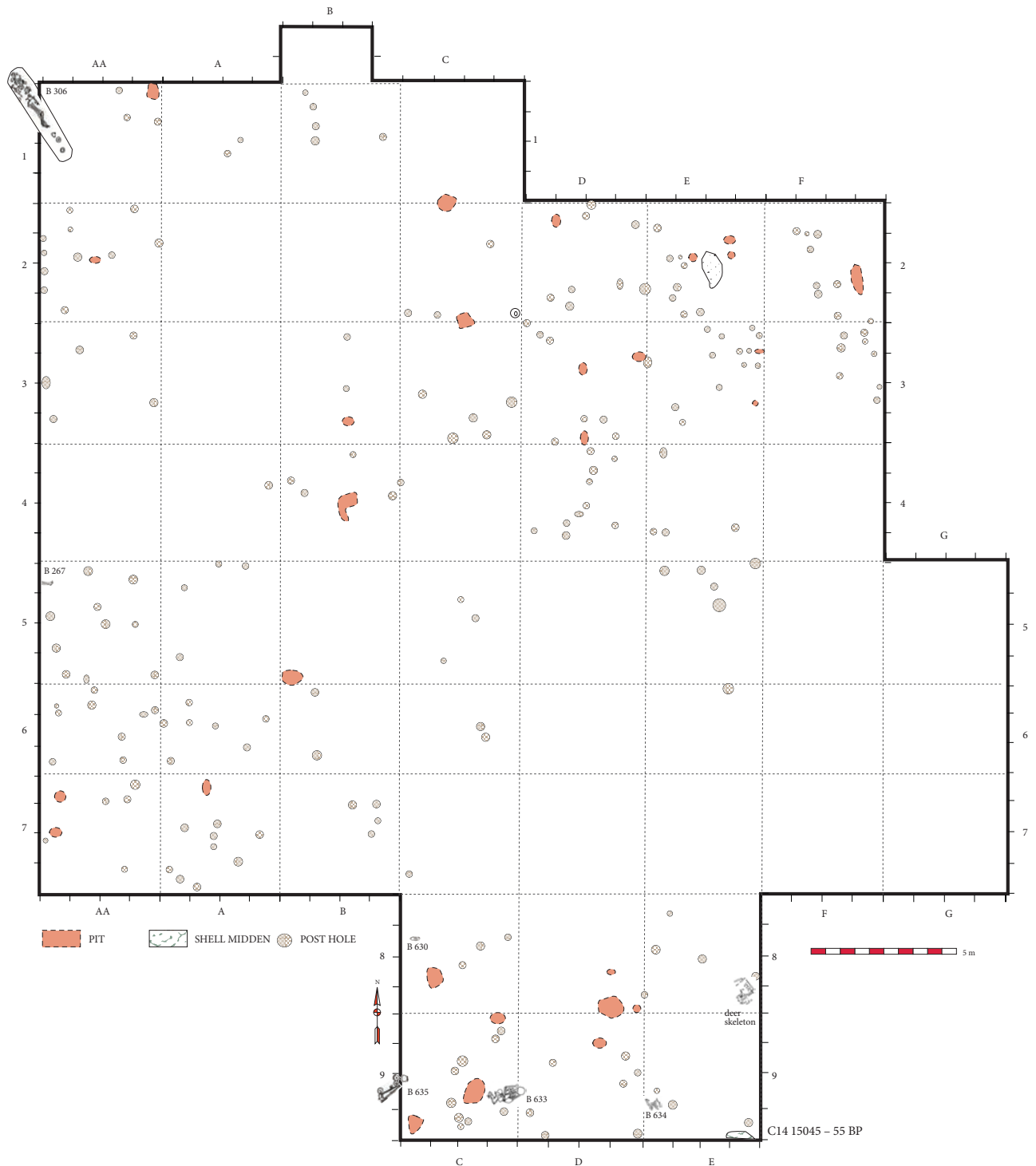


FIG.3:1 The distribution of features on the surface of layer 5:3

on the basis of its depth. On the grounds of orientation, it might belong to Neolithic 2. A complete deer skeleton was found in square E8, and a shell deposit in square E9 may be of natural origin, given its radiocarbon determination

of 15045±55 BP (OxA-18496). Alternatively, there might have been a very early presence of hunter-gatherers at the site. The artefacts found in this earliest context are rare, and numerically dominated by stone adzes



FIG. 3:2 Square D2 layer 5, showing Neolithic potsherds, and a complete adze. Scale 10 cm

TABLE 3:1 *The artefact frequencies in layer 5*

Context	5:1	5:2	5:3		5:1	5:2	5:3		5:1	5:2	5:3
Marble bangle	6	0	0	Spindle whorl	3	0	0	Clay anvil	9	6	2
Crucible	1	0	0	Clay pellet	25	2	6	Stone adze	32	19	14
Mould	0	1	0	Worked bone	10	4	0	Shell bangle	4	2	0
Burnishing stone	1	2	0	Clay counter	2	0	0	Whetstone	5	4	2
Ivory bangle	1	0	0	Bronze artefact	2	2	0	Cowrie shell	2	0	0
Iron artefact	1	0	0	Conical roller	1	0	0				



FIG. 3:3 The distribution of features on the surface of layer 5:2
LAYER 5:2

Layer 5:2 included the graves of several phases in the mortuary sequence. In the extreme northwest of the excavated area, there lay a series of Neolithic 2 burials, while nearby, a Neolithic 1 jar burial was identified. Further south, there were graves of Bronze Age 4, and a series of flexed interments. Burial 197, a very rich grave of Bronze Age 2, was found in square C6-7. To the northeast, there is a

series of four Bronze Age 1 and one Bronze Age 2 burials. Burial 569 of Bronze Age 1 was first identified as a grave cut, the burial itself being one of the deepest encountered. The body had been interred in a wooden coffin with a boat-shaped prow. One extensive shell midden dating to Neolithic 1 was located in square E2. Otherwise, the features in the layer comprised postholes and pits. The artefacts were dominated by stone adzes and clay anvils.

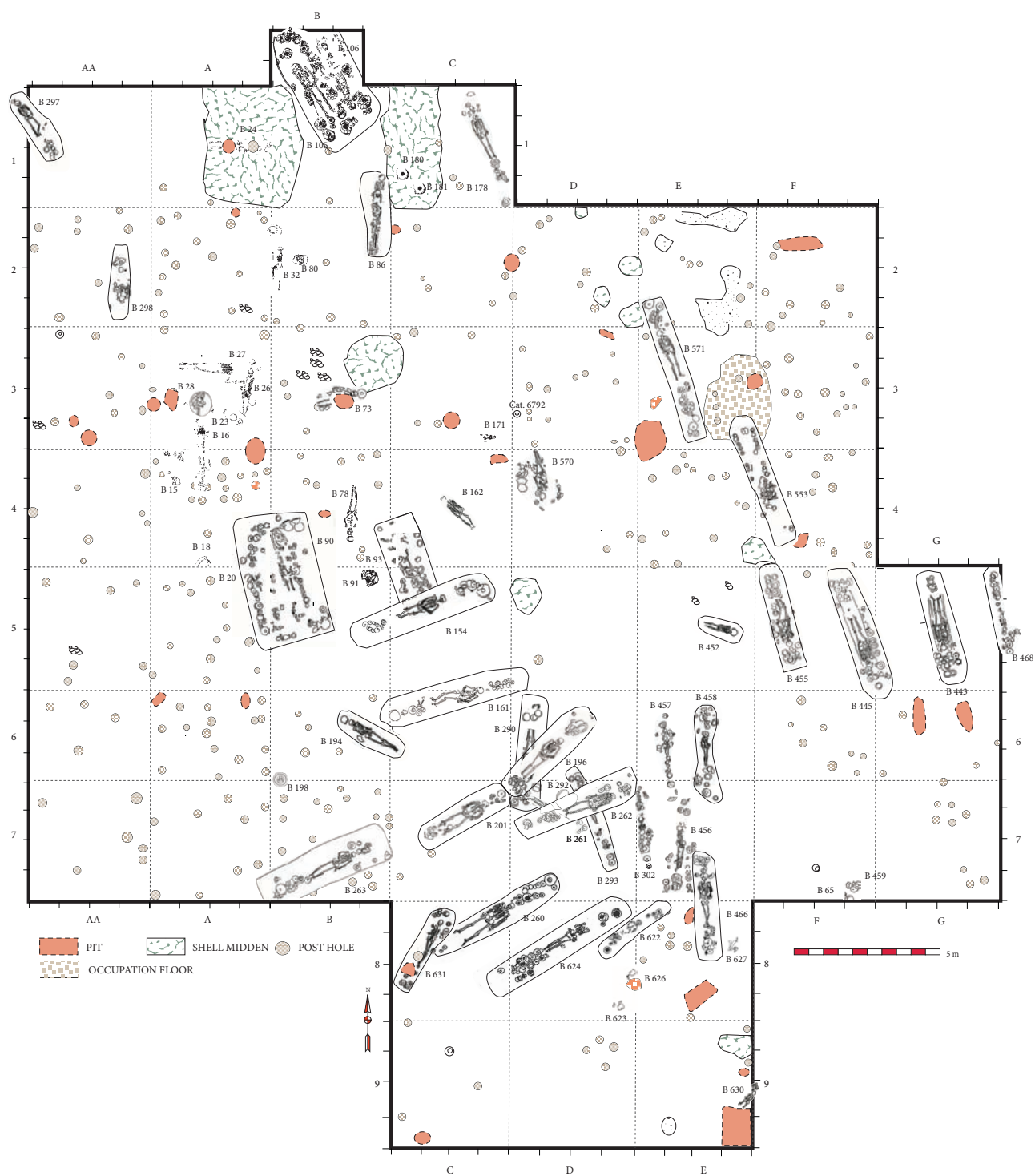


FIG. 3:4 The distribution of features on the surface of layer 5:1

LAYER 5:1

There are burials cut into the surface of layer 5:1 from at least four periods of occupation. Burials 180-1 are infant jar burials found resting on a Neolithic 1 shell midden. They also belong on typological grounds to Neolithic 1.

Dominating the mortuary remains in this context, however, are the sets of large and very wealthy Bronze Age 2 graves, such as burials 20, 90, 105 and 106. These burials, cut through layer 5 and deeply into the natural substrate, were laid out in orderly groups. Detecting grave cuts was not always possible on the surface of layer 5, but the dif-

ference in the texture and colour of the deposits made this possible in the case, for example, of burial 571 (Fig. 3:5). This is seen with particular clarity in squares F-G 5. A similar pattern is seen in the layout of Bronze Age 3A burials, which overlie the Bronze Age 2 graves in squares D6-7.

The number of pits, postholes and burials cut into layer

5 would have been responsible for the removal of artefacts from their original contexts. Thus bronzes, a fragment of iron and casting mould well below the Bronze and Iron Age layers stress the importance of not making assumptions on date or cultural affiliation of such items unless the relationship is beyond reasonable doubt.



FIG. 3:5 The grave cut for burial 571, seen to the right of the scale above, was identified well before the exposure of human remains. A Neolithic 2 grave is seen in the foreground

C.F.W. HIGHAM

There is no doubt that basal layer 4 was laid down during the Neolithic occupation of Ban Non Wat. Several Neolithic 2 burials were found within this context, usually in small groups of graves aligned parallel with each other and on an east to west axis. Each was accompanied by one or two ceramic vessels beyond the cranium, and little else in terms of offerings. There are also several intact middens within this layer, containing Neolithic 1 potsherds and stone adzes. There was an increase in the number of cowrie shells, some of which found their way into these middens. Cowrie shells on at least two occasions, had been employed as Neolithic 1 ear ornaments. Two jar burials for infants were found within layer 4:8, their style indicating Neolithic 1 affinities. Burials 250 and 264 are clearly Neolithic 1. There are also, however, other mortuary phase burials in question. Burials 93 and 553 have been assigned to Bronze Age 2. Burials 154, 161, 196 and 260 belong to Bronze Age 3. Burials 438, 454 and 556 belong to the unusual group of flexed interments.

contexts, however, is the number of stone adzes or flakes derived from such adzes. Many of these were located *in situ* within Neolithic midden deposits. Many more may well have been located in such contexts, but Bronze Age burials cut into the Neolithic layers would have disturbed their original resting places. Indeed, the adzes found in higher layers very probably derived from lower down. A corollary to this situation is that in digging graves and disturbing the Neolithic cemetery and occupation contexts, bronzes, crucible fragments, moulds and even the very occasional item of iron found their way down into the Neolithic horizon. This is a warning for the unwary in attempting to derive cultural meaning from sites such as Ban Non Wat where disturbance through the digging of pits, graves and postholes renders precise ascription of some artefacts to their actual origin virtually impossible.

There was a reasonable complement of spindle whorls and clay anvils for shaping ceramic vessels in this layer, but the caveat just outlined must be cited. The whetstones might well have been associated with stone adzes and the constant need to hone them. Shell and marble bangle fragments surely come from disturbed Bronze Age graves, for none are found with Neolithic burials.

[illegible]



FIG. 4:1 The distribution of features on the surface of layer 4:8



FIG. 4:2 The surface of a Neolithic midden in D3 4:9 showing sherds and shellfish



FIG. 4:3 The surface of a Neolithic midden in square E3 4:9, showing shell, bone and potsherds

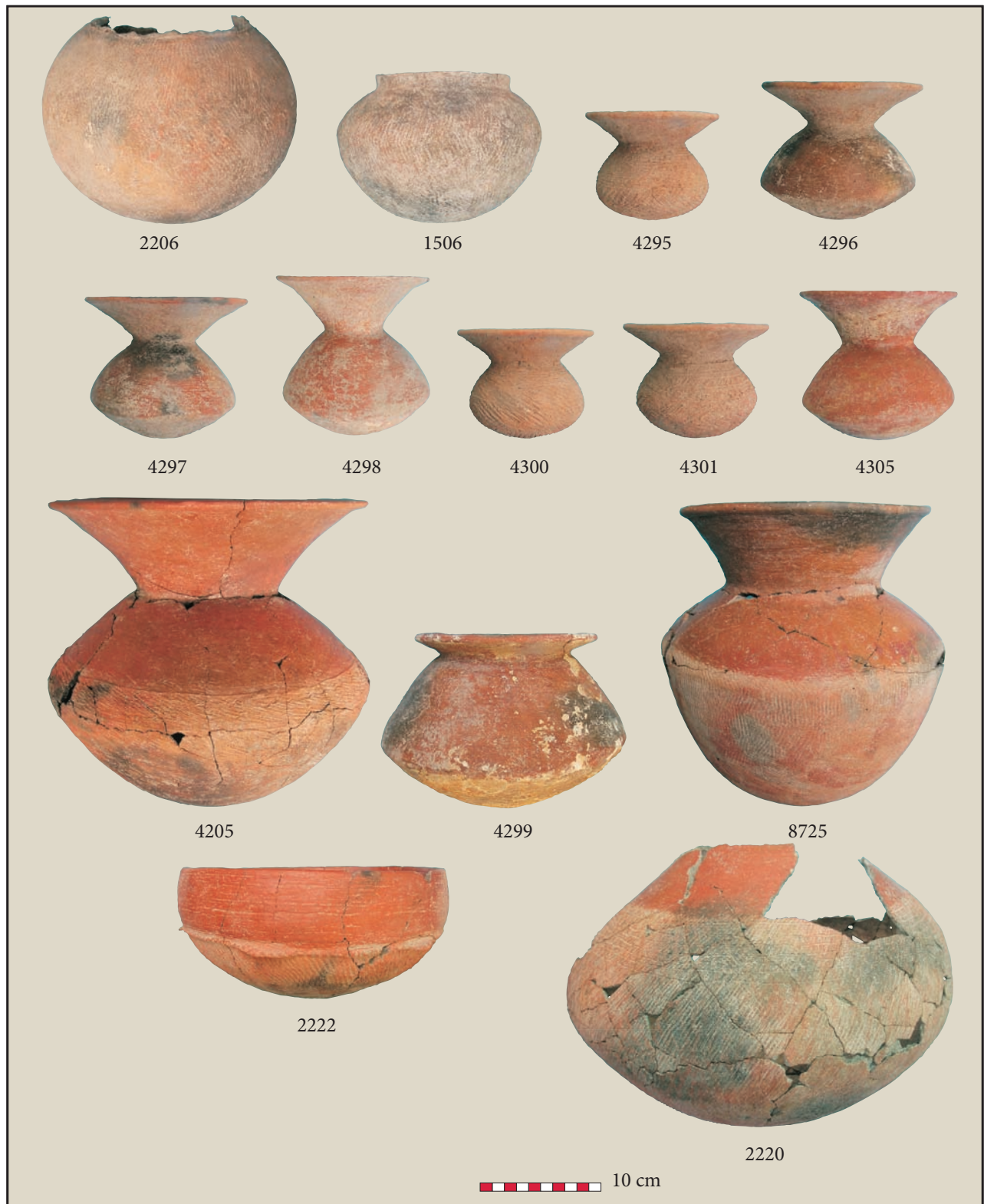


FIG. 4:4 Ceramic vessels from layer 4:8. Cat. 2206 B1 4A:7 feat. 2, cat. 1506 A5 4:19 feat. 37, cat. 4295-4305 B5 4a:6 feat. 3, cat. 4205 B5 4A:6, cat. 4299 B5 4A:6 feat. 3, cat. 8725 B6 4:8, cats. 2222, 2220 B1 4a:9 feat. 6

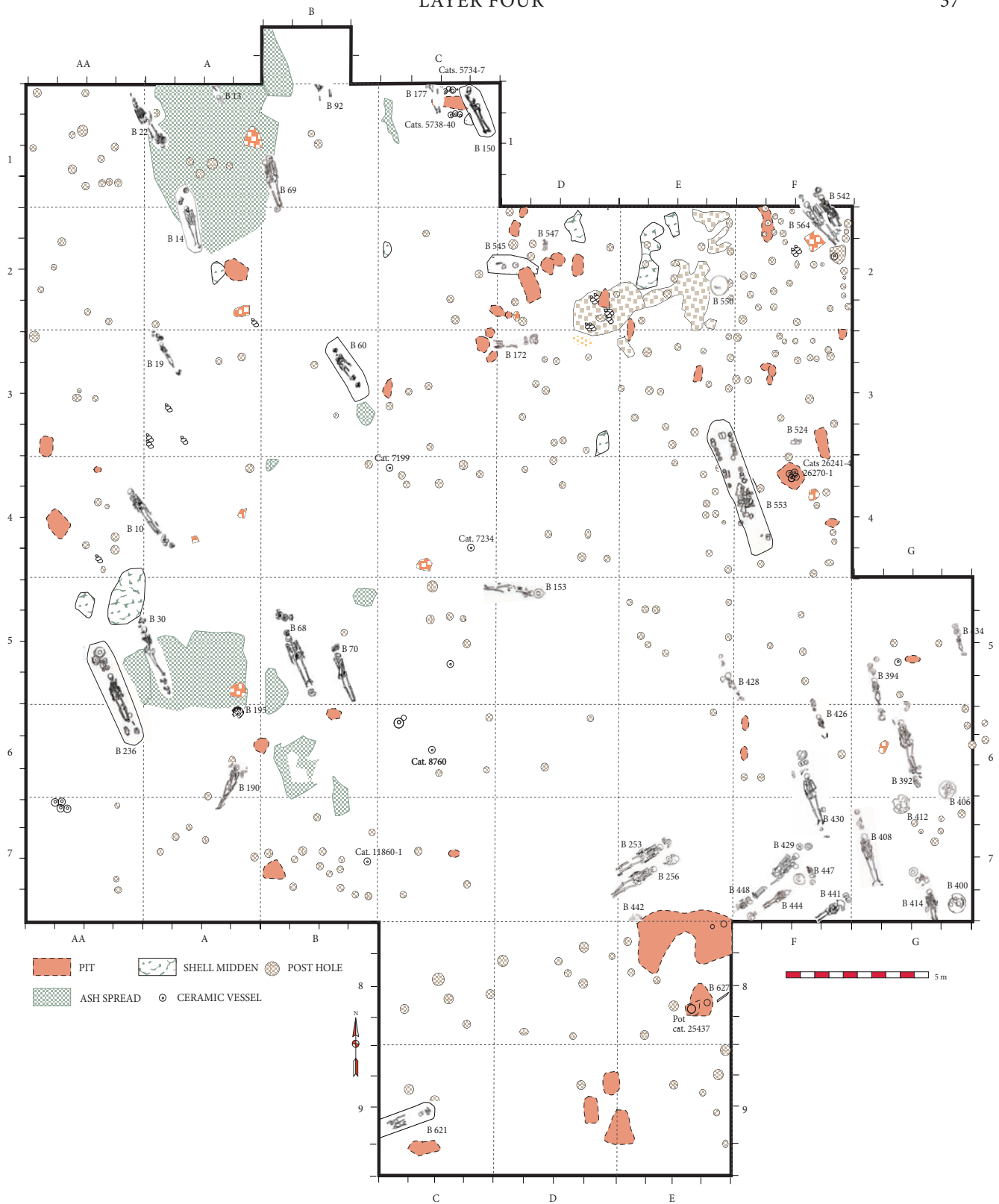


FIG. 4:5 The distribution of features on the surface of layer 4:7

LAYER 4:7

With layer 4:7, further Neolithic 2 graves were encountered. Burials 153, 172, 545 and 547 were found on an east

to west orientation. In contrast to the Bronze Age graves, mortuary offerings were confined to one or two ceramic vessels placed beyond the head. There are, however, many Bronze Age burials identified in this context. Most were

orientated with the head directed to the northwest, but some were found with the head to the northeast. The grave cut for burial 553, ascribed to Bronze Age 2, was identified in this layer, but the human remains were found at a lower level. In this instance, most of the skeleton had been exhumed, along with many ceramic vessels, and then replaced in the grave. In some parts of the excavated area, particularly towards the north and west, vestiges of intact surfaces were found. These ashy floors and shell middens survived only where Bronze Age burials had not disturbed them. The digging of such graves has clearly affected the artefacts found in this context. Stone adzes are now more abundant than bronzes, and along with the collapse in

the number of bronzes, moulds and crucibles were now very rare compared with earlier levels. Iron was virtually non-existent. Other artefacts to show considerably reduced numbers include the conical rollers and spindle whorls. Some anvils and two burnishing stones suggest that pottery making continued. The broken shell and marble bangles probably belong to disturbed Bronze Age graves, since neither has been found in association with a Neolithic burial. There were several cases where clusters of Bronze Age pottery vessels were found, but not in direct association with a burial. These, again, seem more likely to have been offerings placed as part of mortuary rituals.



FIG. 4:6. Ceramic vessels from layer 4:7. Cat. 5739 C1 4:10 feat. 2, cat. 5737 C1 4:10 feat. 2, cat. 5735 C1 4:10 feat. 2, cat. 25437 E8 4:7 feat. 6, cat. 5740 C1 4:10 feat. 2, cat. 5738 C1 4:10 feat. 2, cat. 11684 B7 4:8, cat. 7234 C4 4:8, cat. 25440 E8 4:7 feat. 7, cat. 5734 C1 4:10 feat. 2, cat. 26270 F4 4:7 feat. 8, cat. 26241 F4 4:7 feat. 8, cat. 26271 F4 4:7 feat. 8, cat. 5736 C1 4:10 feat. 2, cat. 8760 C6 4:7

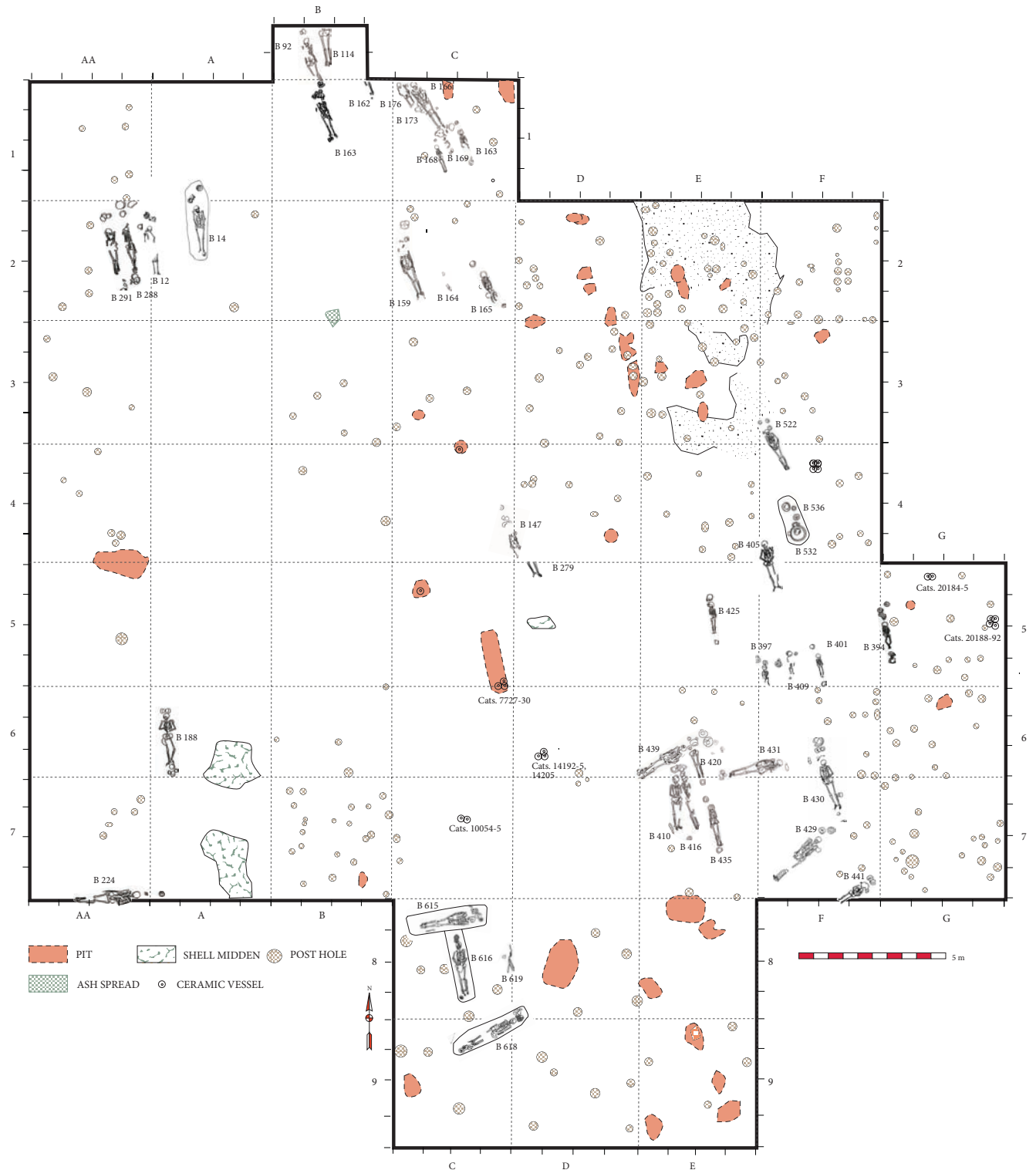


FIG. 4:7 The distribution of features on the surface of layer 4:6

LAYER 4:6

Compared with higher levels, there was a steep decline in iron, indeed iron was absent from this context. Fragments of bronze, crucibles and moulds declined in frequency,

while the number of stone adzes and whetstones increased. The complete pottery vessels from this context on several occasions were found in sets, as if placed as an offering associated with a lower-level grave (Fig. 4:14). The forms once again suggest placement during Bronze



FIG. 4:8 Ceramic vessels from layer 4:6. Cat. 2132 B1 4A:5 feat. 1, cat. 7728 C5 4,7 feat. 1, cat. 14195 D6 4:6 feat. 2, cat. 1548 B1 4A:5, cat. 25444 E8 4:6 feat. 3, cat. 25445 E8 4:6 feat. 3, cat. 10054 C7 4:6 feat. 3, cat. 7727 C5 4,7 feat. 1, cat. 14193 D6 4:6 feat. 2, cat. 7730 C5 4,7 feat. 1, cat. 7234 C4 4:8, cat. 7199 C5 4,7 feat. 1, cat. 7729 C5 4,7 feat. 1, cat. 14192 D6 4:6 feat. 2



Age 4. Fewer conical rollers and spindle whorls were found compared with higher levels. The burials uncovered in layer 4:6 belong to Bronze Age 4. Burial 236 is relatively more wealthy than the others. These burials are found over much of the area excavated. Mortuary offerings comprise ceramic vessels placed beyond the head and feet, and shell and marble bangles. Shell disc beads were also found with some of the dead.

FIG. 4:9 A furnace base, found in square F2 layer 4:5. Scale 10 cm



Layer 4:5 witnessed a steep decline in the number of iron artefacts but a continuation in the frequency with which bronzes, crucibles and moulds were present. A small furnace, probably for raising copper alloy to melting point, was found in square F2 (Fig. 4:9). This layer also contained many complete pottery vessels. These were often found as

sets, with no associated human remains. It is likely that these represent mortuary offerings over a burial found at a lower level. As may be seen in figure 4:11, the form of these vessels suggests that they were placed during the Bronze Age 3 phase. Spindle whorls show a continuing decline in numbers compared with the higher contexts in layer 4 as do the enigmatic conical rollers. A notable feature, however, is the quantity of broken shell and marble bangles.

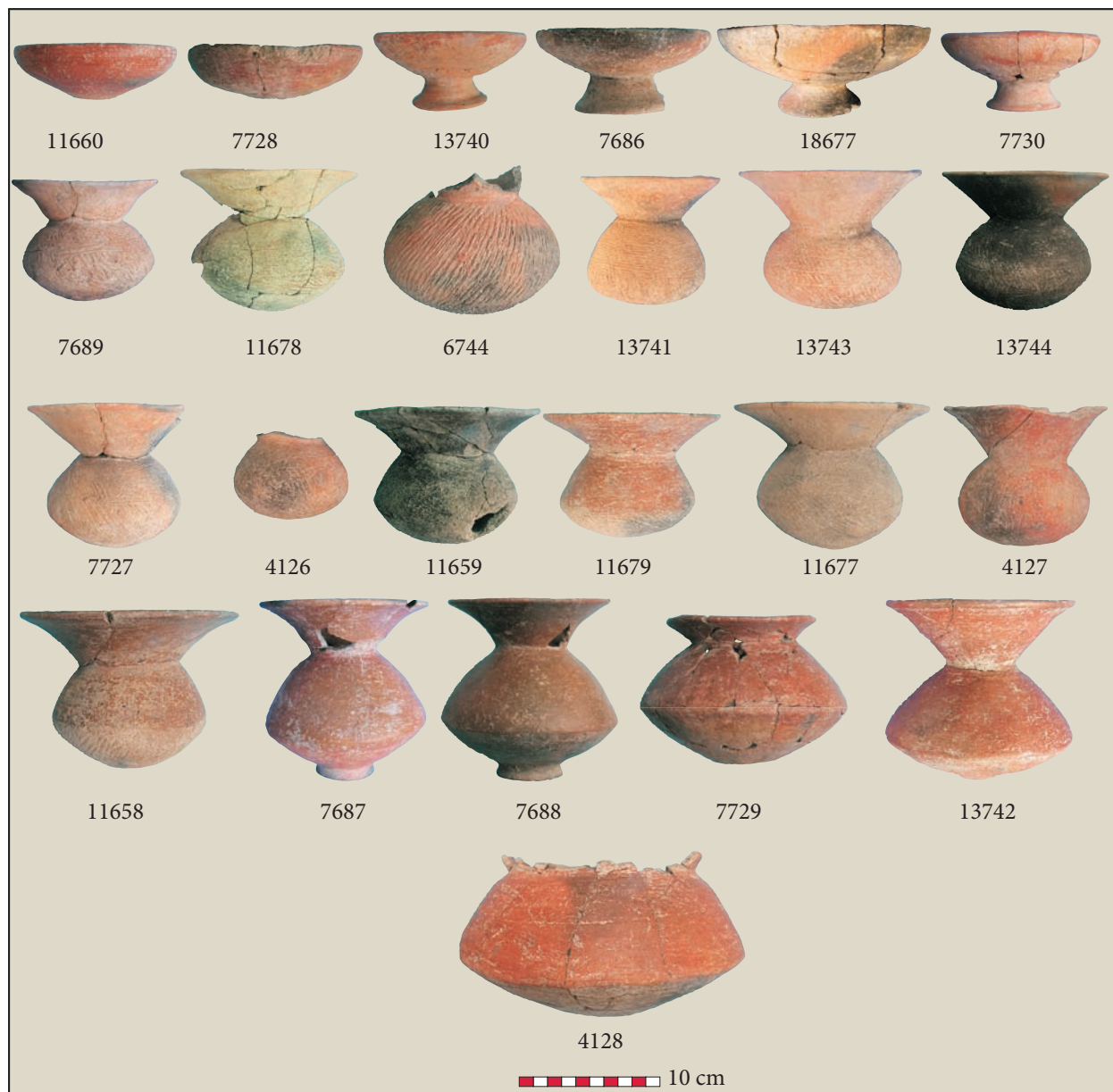


FIG. 4:11 Ceramic vessels from layer 4:5. Cat. 11660 B7 4:6, cat. 7728 F1 4:7, cat. 13740 D5 4:6 f.1, cat. 7686C5 4:6 f.1, cat. 18677 F3 4:6, cat. 7730 C5 4:7 f.1, cat. 7689 C5 4:6 f.1, cat. 11678 B7 4:6, cat. 6744 C3 4:8, cat. 13741-3-4 D5 4:5 f.1, cat. 7727 cat. C5 4:7 f.1, cat. 4126 B5 4:8 f.3, B7 4:6, c at. 11659 B7 4:6, cat. 11679 B7 4:6, cat. 11677 B7 4:6, cat. 4127 B5 4:8, cat. 11658 B7 4:6, cat. 7687-8 C5 4:6 f.1, cat. 7729 C5 4:7 f.1, cat. 13742, D5 4:5 f.1 cat. 4128 B5 4:8 f.3

Complete or fragmentary stone adzes are more frequent than in the later contexts.

The burials that lie in this layer belong almost exclusively to the fourth phase of the Bronze Age. Virtually all were orientated with the head slightly to the west of due north. The burials are not wealthy in terms of mortuary offerings, most having a handful of ceramic vessels beyond the head and feet, and some shell and/or marble bangles.

There are also small shell disc beads and the distal limb bones of pigs. The distribution of these graves, unlike the Iron Age cemetery, extends to the far west of the excavation, where burial 280, that of an infant, does stand out as being rather more wealthy than the norm. In square F5, there is an intriguing row of infant inhumations.

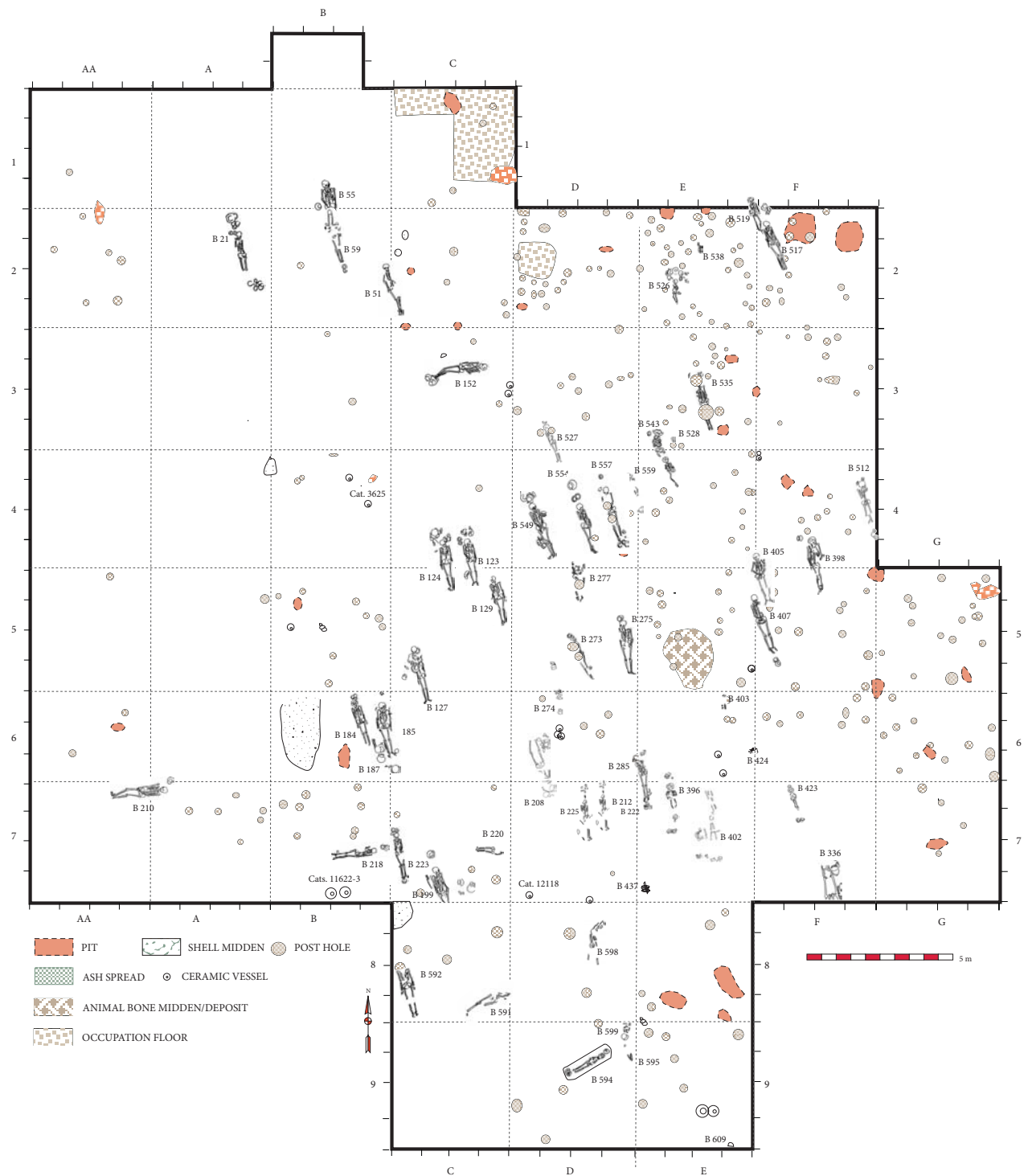


FIG. 4:12 The distribution of features on the surface of layer 4:4
LAYER 4:4

Layer 4:4 saw again, a concentration of activity in the eastern half of the excavated area. This layer, based on the artefacts recovered, belongs to the Bronze Age. There was a sharp decline in the presence of iron artefacts, while bronzes, casting moulds and crucibles continued to be abundant (Table 4:1). The many spindle whorls probably reflect local weaving. There are relatively few anvils and

burnishing stones used in the production of pottery vessels. The complete vessels are of later Bronze Age affinities (Fig. 4:13). There are many shell and marble bangle fragments in this context, perhaps partially due to the disturbance of earlier graves with the digging of pits and postholes.

In terms of inhumation graves within this context,



FIG. 4:13 The complete ceramic vessels from layer 4:4. Cat. 12218 D7 4:5, cat. 7683 C5 4:5 feature 4, cat. 7141 C4 4:5, cat. 7682 C5 4:5 feature 4, cats. 1162-3 B7 4:5



FIG. 4:14 A cluster of Bronze Age vessels in F4, 4:7 feature 6. Scale 10 cm

there remain a few deeply-cut Iron Age burials. However, we also find some Bronze Age 4 graves, again indicating that this layer accumulated during the Bronze Age.

LAYER 4:3

There are many deeply-cut Iron Age burials in this context at the site, but also several new developments. In square C3 there is the first concentration of Bronze Age 5 graves. These display several changes from those of Bronze Age 4, seen in the form of the ceramic vessels and their placement in the grave. Grey clay, bivalve shells, spindle whorls and red ochre pellets were regularly placed with the dead. There are also some burials of Bronze Age 4 in this context, in squares B1, E9 and AA 6-7. These might have been cut to a shallower depth than the other Bronze Age 4 graves. Alternatively, there may have been some local erosion, leading to the planing of the surface of the site and redeposition of material at a lower level.

The floors, so characteristic of the Iron Age occupation and industrial activity above 4:3, are no longer found except for one possible example in square C1. However, industrial activity is documented in A1, where a clay-lined furnace was identified, surrounded by fragments of bronze and ceramic moulds (Fig. 4:16).

There is no doubt that this context accumulated during the Bronze Age. The presence of Bronze Age graves, which must have been excavated down to this layer, confirms

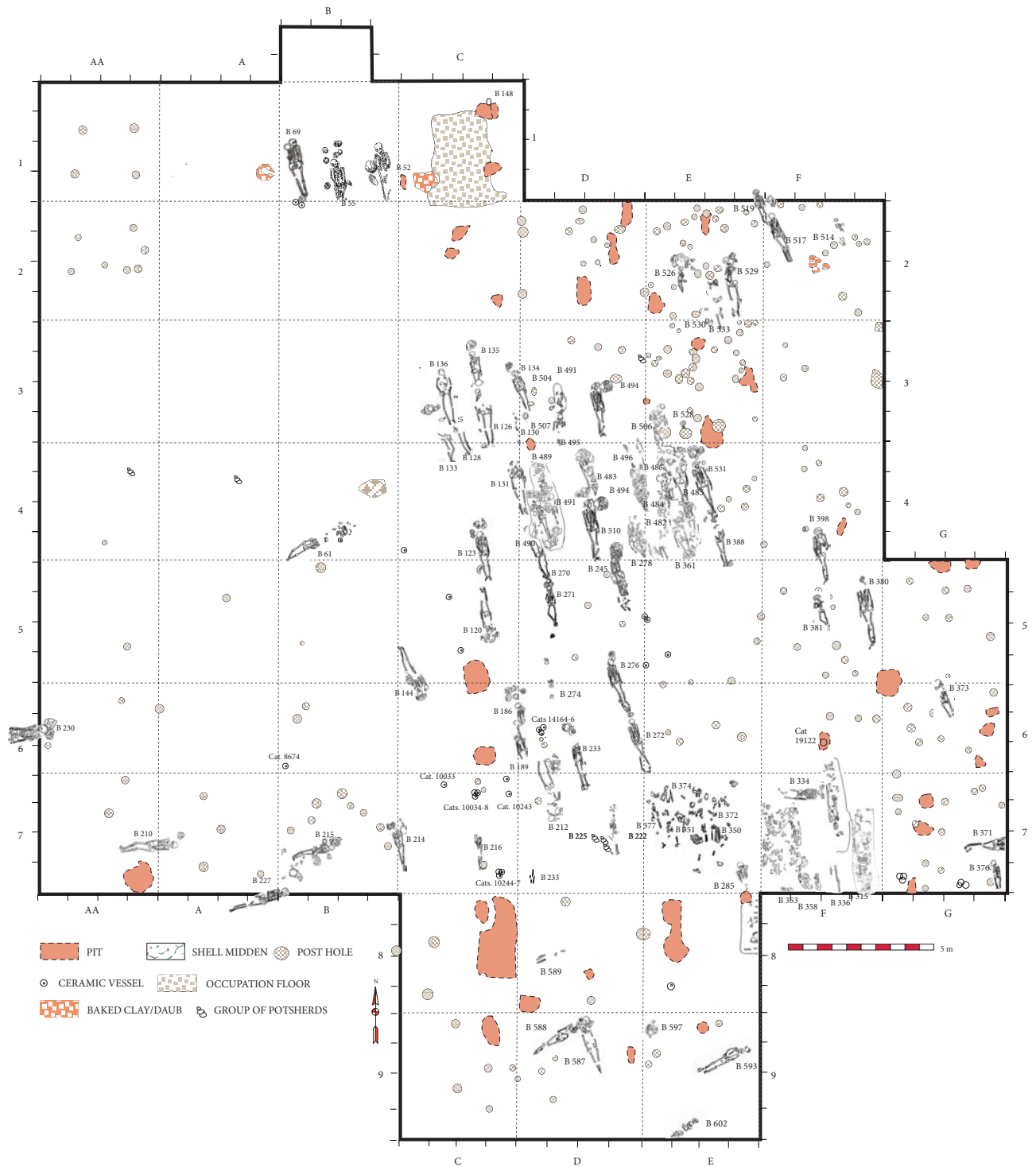


FIG. 4:15 The distribution of features on the surface of layer 4:3

this. Moreover, the ceramic vessels that could be reconstructed from these layers are of Bronze Age 4 forms (Fig. 4:18). In terms of the artefacts, it is found that fragments of bronze are more abundant than those of iron, nine of the 15 iron artefacts coming from one possibly disturbed part of square A4. Spindle whorls, anvils, moulds and cruci-

ble fragments all indicate the local manufacture of cloth, ceramics and the casting of bronzes. There are also many fragments of shell and marble bangles. These might have been distributed from disturbed burials. The enigmatic conical rollers continued in abundance.



FIG. 4:16 A furnace for heating crucibles containing bronze to melting point before casting from 4:3 A1. Scale 20 cm

LAYER 4:2

The second context in layer 4 retained deeper Iron Age 1 burials in the eastern half of the excavated area. In squares E2-3, further infant burials of the early Iron Age were found in what was evidently a preferred area for interring the young. Again, the western part of the square was de-

void of burials, and only some pits and postholes, together with a shell midden in square AA6 were encountered. In the southernmost area, a very clear floor was uncovered, littered with the butchered bones of large domestic animals including cattle, water buffalo and pigs. Artefact remains on this floor included iron knives. Further floors concentrated in squares D-F 2-3. In square C1, there was a group of clay furnaces that may have been involved in casting copper-base artefacts. The outlines of the graves of burials 233 and 257 were found in D6 at a depth of 1.97 m below datum, while the skeletons were finally identified at a depth of 2.27 m below datum. These two burials have been ascribed to Bronze Age 5.

The artefacts found in this context reflect the physical remains of the floors and furnaces. Most of the iron artefacts were found on the butchering floor in squares C-D 8-9, while the increase in the number of crucibles and moulds is probably due to the recovery of a bronze-casting area denoted by the clay furnaces that brought the metal to a molten condition. Spindle whorls and conical rollers remained abundant. The number of shell and marble bangle fragments is a possible result of the fact that burials of Iron Age date as well as pits and postholes were now reaching the depths of Bronze Age burials, and therefore these items might have been relocated.



FIG. 4:17 The Iron Age butchering floor in square D9 4:2

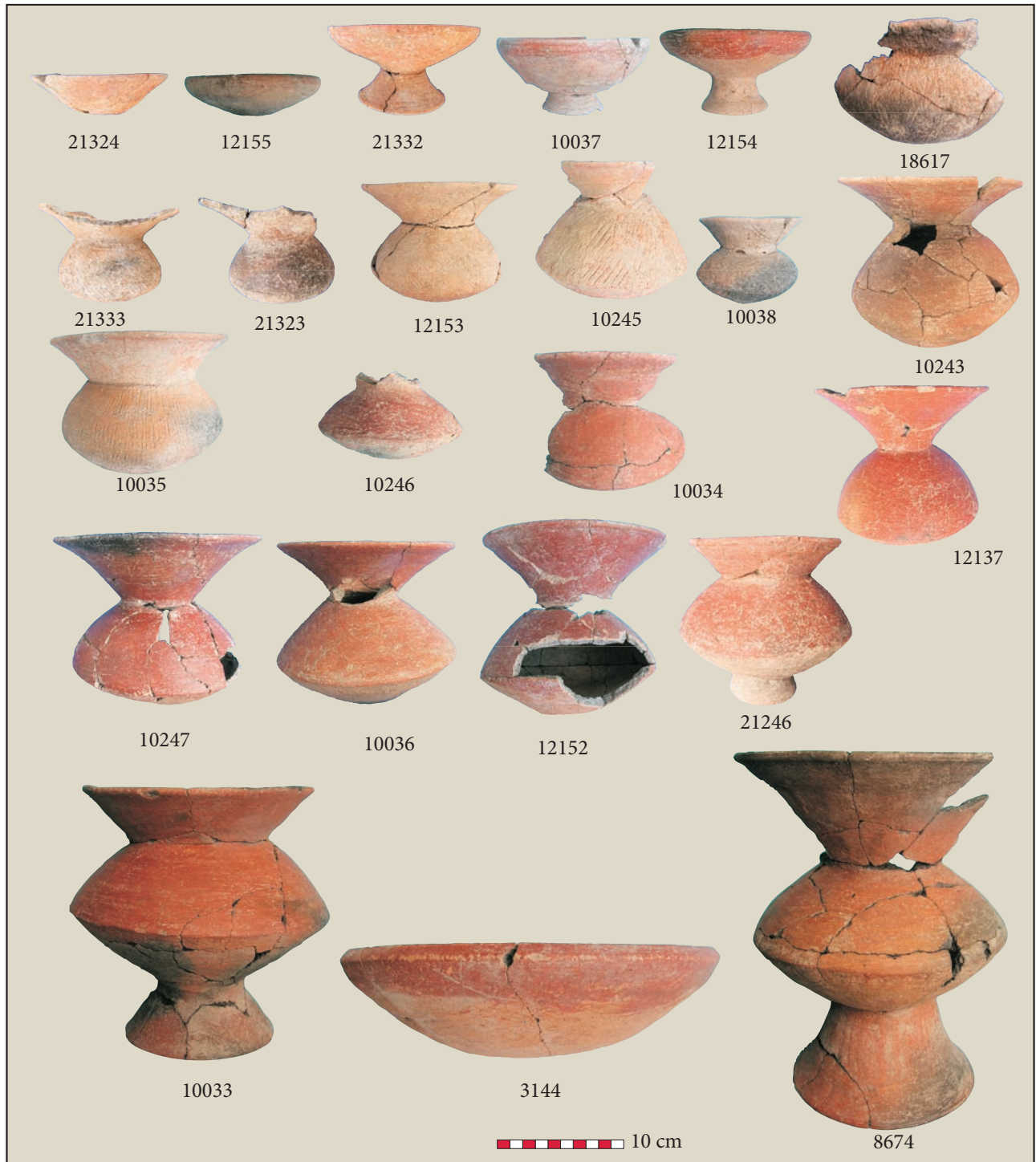


FIG. 4:18 Ceramic vessels from non-mortuary contexts in Layer 4:3. Cat. 21324 G7 4:3 f.4, cat. 12155 D7 4:4, cat. 21332 G7 4:4 f.3, cat. 10037 C7 4:4 f.2, cat. 12154 D7 4:4, cat. 18617 F5 4:4, cat. 21333 G7 4:3 f.4, cat. 21323 G7 4:3 f.4, cat. 12153 D7 4:4, cat. 10245 C7 4:3 f.3, cat. 10038 C7 4:4 f.2, cat. 10243 C7 4:4 f.2, cat. 10035 C7 4:4 f.2, cat. 10246 C7 4:3 f.3, cat. 10034 C7 4:4 f.2, cat. 12137 D7 4:4, cat. 10247 C7 4:3 f.3, cat. 10036 C7 4:4 f.2, cat. 12152 D7 4:4, cat. 21246 G7 4:3, cat. 10033 C7 4:4 f.2, cat. 3144 B3 4a:2 f.1, cat. 8674 B6 4:3

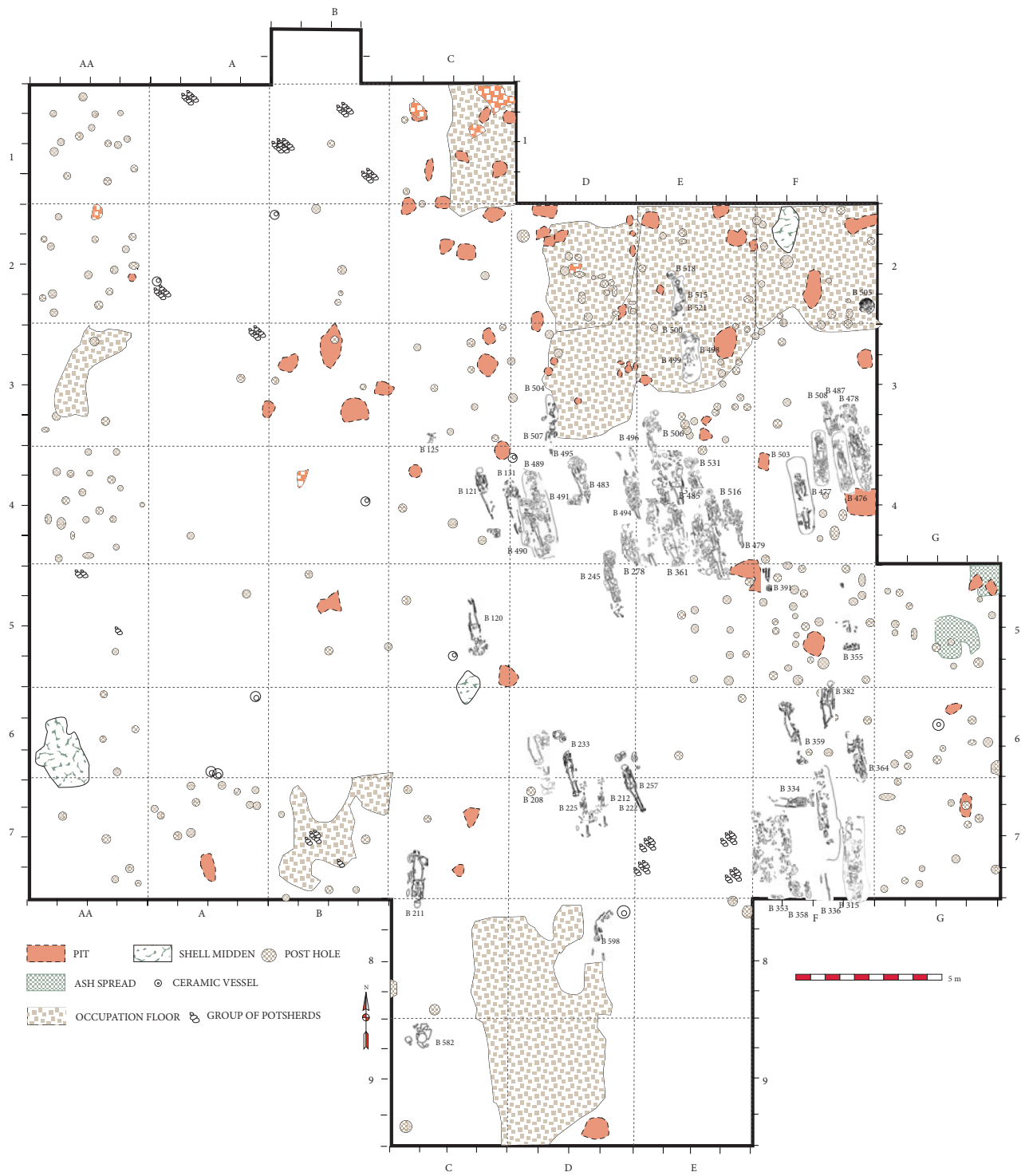


FIG. 4:19 The distribution of features on the surface of layer 4:2

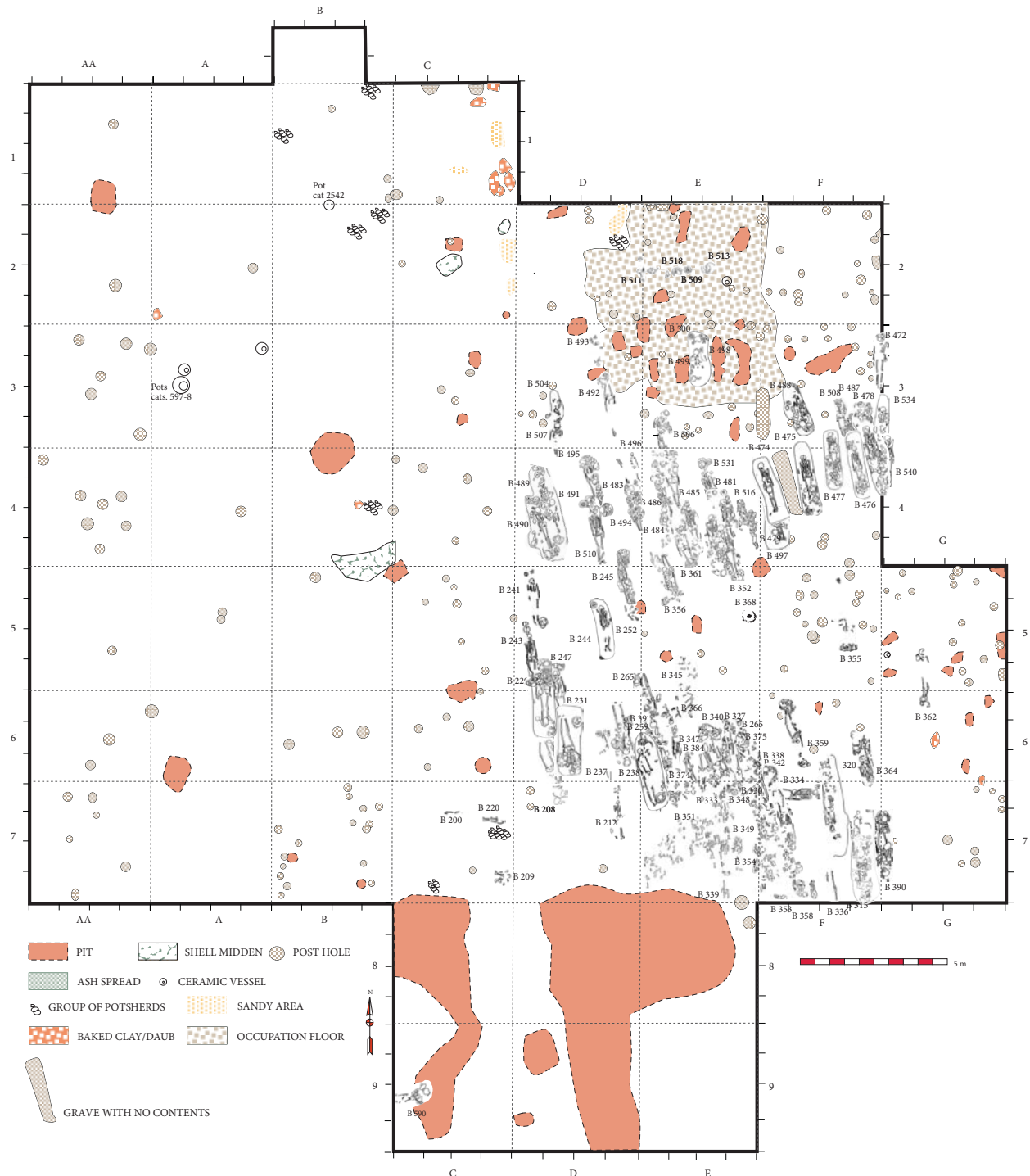


FIG. 4:20 The distribution of features on the surface of layer 4:1

LAYER 4:1

The surface of layer 4 provides a remarkable picture of an early Iron Age cemetery dominating the eastern part of the excavated area. The graves were cut down into this layer from layer 3. The western half of the excavated area contained very little in terms of structural remains: there are

a few post holes and pits, and one or two concentrations of pottery sherds. In the northeastern area, in squares D and E 2-4, there is a hard floor through which postholes and pits were cut. Such floors do not necessarily reflect a residential structure, many were in fact working surfaces where animals were butchered or industrial activities were pursued. In squares C-D-E 8-9, there are several large pits

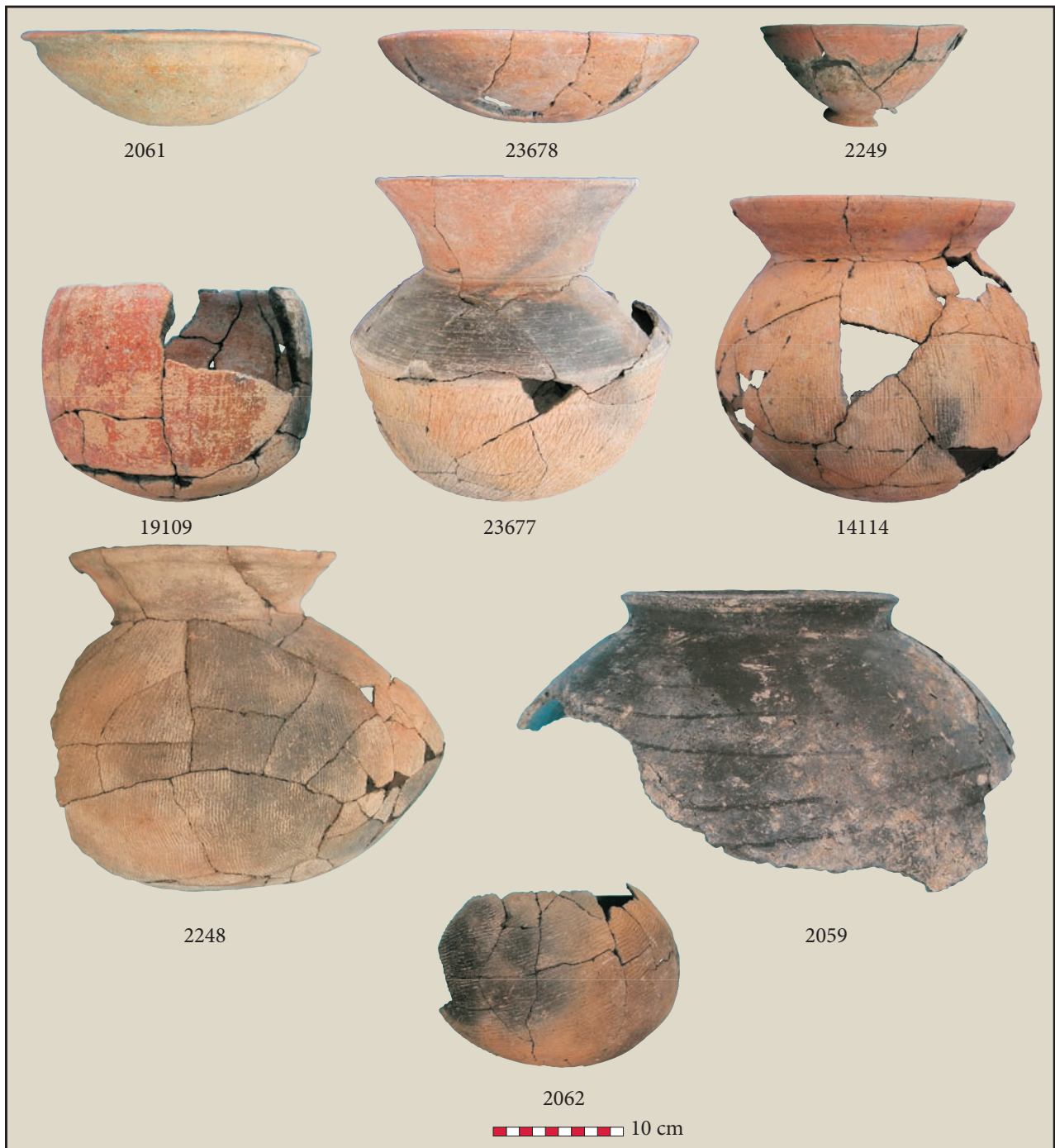


FIG. 4:21 The ceramic vessels from non-mortuary contexts in layer 4:1. Cat. 2061 B1 4:3 feature 1, cat. 23678 E2 4:1 feature 17, 2249 B1E 4:4 feature 1, cat. 19109 F6 4:1, cat. 23677 E2 4:1 feature 17, cat. 14114 D6 4:1 feature 1, cat. 2248 B1E 4:3, cat. 2059 B1 4:3 feature 3, cat. 2062 B1 4:3 feature 2

containing refuse in the form of potsherds, shellfish and faunal remains.

The artefacts found in this context include iron implements and slag. Bronze artefacts are twice as abundant as are those of iron. Spindle whorls attest to local weaving and are very commonly found, but numerically, the

anomalous conical rollers predominate. Clay anvils and burnishing stones suggest that there was a local ceramic industry. Glass, ivory and marble are rare.

The ceramic vessel forms have early Iron Age affinities, except for cat. 23677, which is more typical of Bronze Age 5 (Fig. 4:21).

V LAYER THREE

C.F.W. HIGHAM

LOWER LAYER 3

All contexts below layer 3:4 are combined into a unit labelled lower layer 3. This phase in the site's occupancy is dominated in the eastern part of the excavated area by an early Iron Age cemetery. In square F4, this is seen with particular clarity due to the recognition of graves through soil disturbance at a considerably higher level than the skeleton within. Naturally, these graves could have been cut down from a still higher level, but in this case the up-

occupation. Rather, they represent activity areas. That in E2-3, for example, was identified on the basis of its hard crust covered with the remains of butchered animals. The presence of iron implements alongside the faunal remains leaves no doubt that it dates to the early Iron Age (Fig. 5:4). In the case of this particular floor, there are also two caches of the clay inserts that are possibly mould components to create the socket of a cast bronze axe (Fig. 5:6)

TABLE 5:1 *The artefact frequencies in layer 3*

Context	3:1	3:2	3:3	3:4	3:5	3:6		3:1	3:2	3:3	3:4	3:5	3:6
Marble bangle	3	3	3	3	3	10	Pottery vessel	16	30	21	14	10	46
Crucible	12	7	12	9	10	33	Worked bone	16	12	11	24	11	8
Mould	13	5	11	7	4	34	Agate	3	0	2	1	0	0
Burnishing stone	4	0	4	3	0	5	Clay counter	12	8	2	5	1	8
Ivory bangle	4	3	2	1	1	1	Clay anvil	8	1	3	4	2	14
Iron artefact	45	28	37	55	24	26	Net sinker	0	2	0	0	0	0
Iron slag	48	30	30	20	19	18	Glass ornament	3	3	7	1	1	1
Spindle whorl	43	31	31	50	43	88	Stone adze	3	4	8	5	3	8
Red ochre	0	1	1	1	1	3	Shell bangle	41	42	38	48	35	33
Clay pellet	22	24	17	22	10	46	Marble bangle	3	3	3	3	3	10

per part of the grave would be lost through erosion or another source of disturbance. An intriguing feature of this part of the site is the presence of at least two clearly-defined grave cuts, but in neither case was a burial found. As one progresses westward along this row and into squares D-E 4, the graves cease to have a recognizable grave cut, and the burials were interred in close conjunction, both alongside other burials and over earlier ones. These graves were relatively easily identified because the ceramic vessels that had been placed with the body were found in a broken condition, vertically placed in a straight line one each side of the skeleton. This reflects the fact that the dead were placed in wooden coffins, probably hollowed tree trunks, some of which survived as mineralised wood. In terms of identifying the demography of this Iron Age community, it is noted that there were no infants among this row of adult and child inhumations, but to the north in square E3, there was a nucleus of infant jar burials. This further confirms the importance of opening a large area of a pre-historic cemetery to avoid biased conclusions.

In squares E2-3 and D5-6, there are superimposed clay floors through which some of graves have been cut. These floors are not interpreted as the remains of dwellings, or

However, the thin coating of lead on two of these items makes this interpretation unlikely. In square C1, just to the northwest of these features, there are two concentrations of burnt red clay that represent the top of furnaces used to bring bronze to a molten state. A similar furnace was found in square E3 (Fig. 5:1).

Further west, however, evidence for cultural activity other than the presence of potsherds, is very sparse. In the southernmost six squares, there are large pits and a continuation of the early Iron Age burials, and there are two ash lenses and a midden containing animal bones, this lying at the junction of squares A/AA 5-6. Typically for this period, some pits contained fractured ceramic vessels.

In terms of material culture, there were numerous spindle whorls and conical rollers. There are also many broken crucibles and clay casting moulds for working bronze, and both iron and iron slag are commonly encountered.

A selection of the ceramic vessels found with the graves found in this layer, or cut from it to a deeper level, is illustrated in figure 5:2. They reveal a close similarity with each grave set, incorporating open bowls, cylinder-necked vessels and large globular jars. The last two have in common a red-slipped upper part of the body, with cord marking

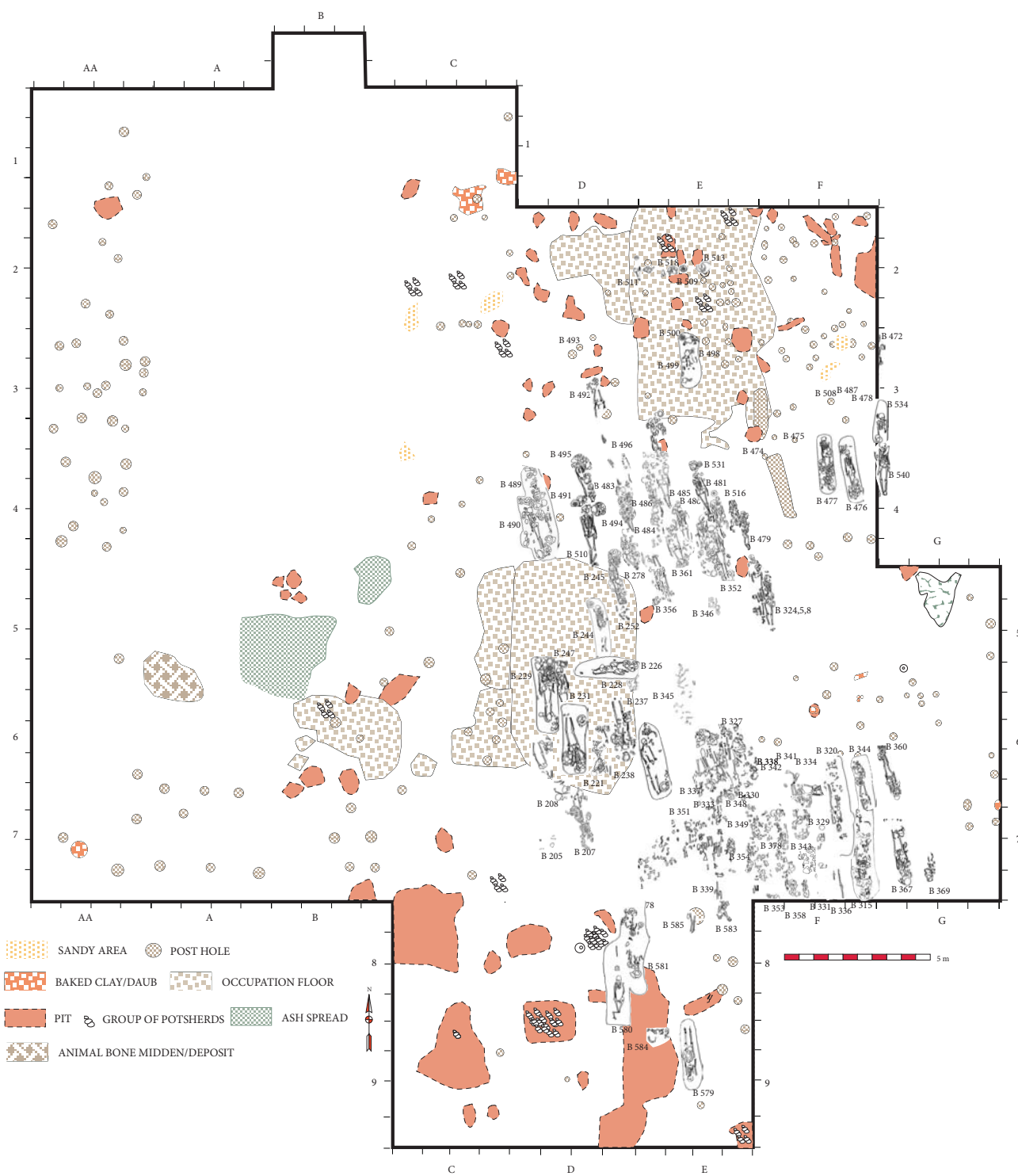


FIG. 5:1 Lower layer 3

below. Two of these vessel forms have also been recovered from non-mortuary contexts in lower layer 3 (Fig. 5:5). These, together with the many iron artefacts and iron slag found in the same horizon, show that the accumulation of layer 3 took place during the early Iron Age, and that from this layer, the dead were interred. These burials were interred from the late 5th century BC. The grave goods were recurrent between burials to the point of being virtually standardised. Ceramic vessels dominated and many of

the large examples contained complete fish skeletons. Iron included sets of tools, bangles and spears some of which had an iron blade and a bronze haft. Bronze bangles were found rarely. Glass earrings were also rare, as were agate and carnelian beads. Spindle whorls and deposits of grey clay that was possibly used as a fabric dye were commonly placed with dead, along with formed pellets of red ochre.

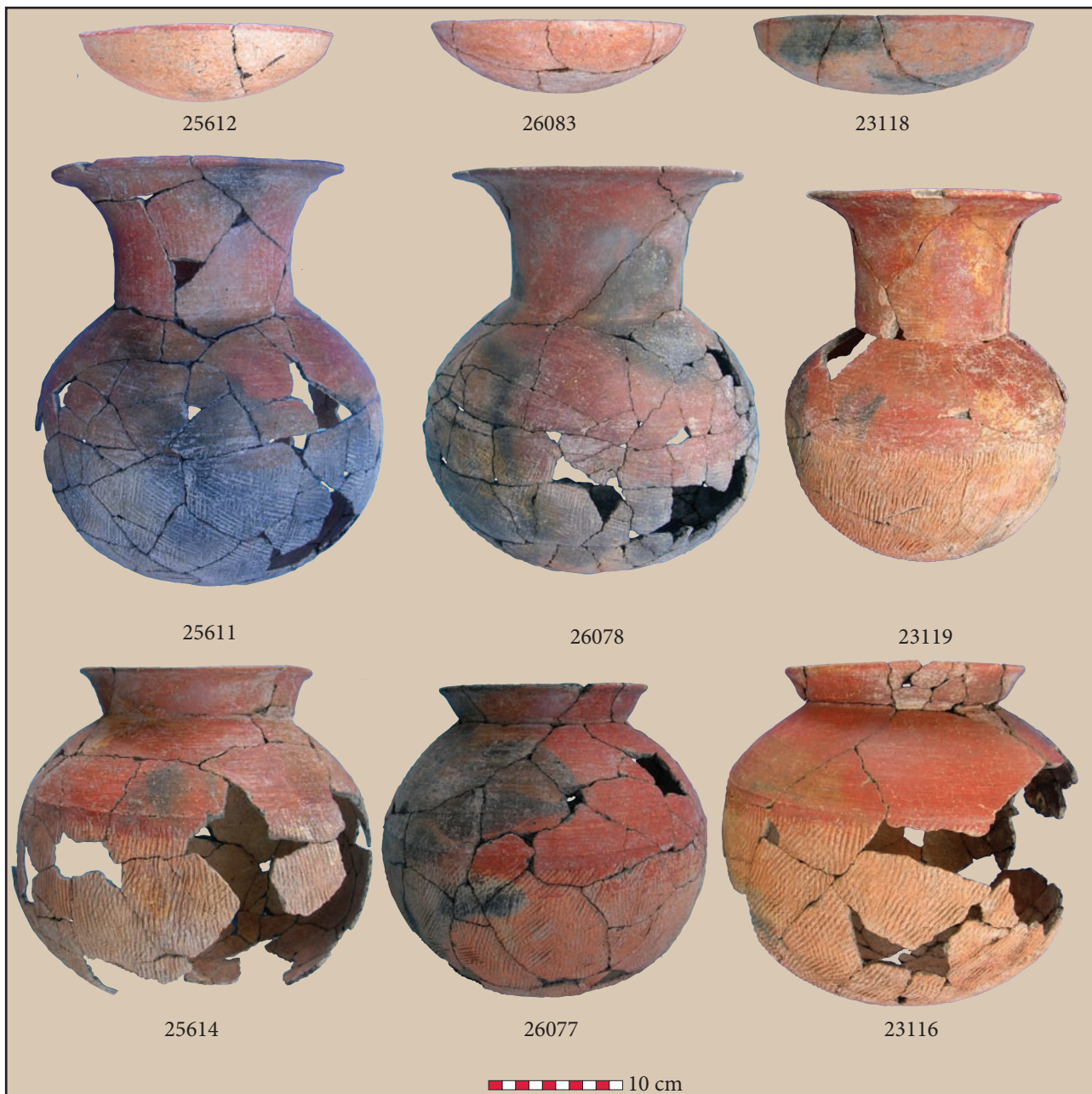


FIG.5:2 Ceramic vessels from early Iron Age burials in lower layer 3. Cats. 25611, 25612 and 25614, burial 487; cats. 26083, 26078 and 26077, burial 477; cats. 23118, 23119, 23116, burial 491



FIG. 5:3 A dense group of Iron Age burials in squares E-D4, looking south



FIG. 5:4 The surface of an Iron Age floor in E-F4 layer 3:5. Note the remains of large butchered animals

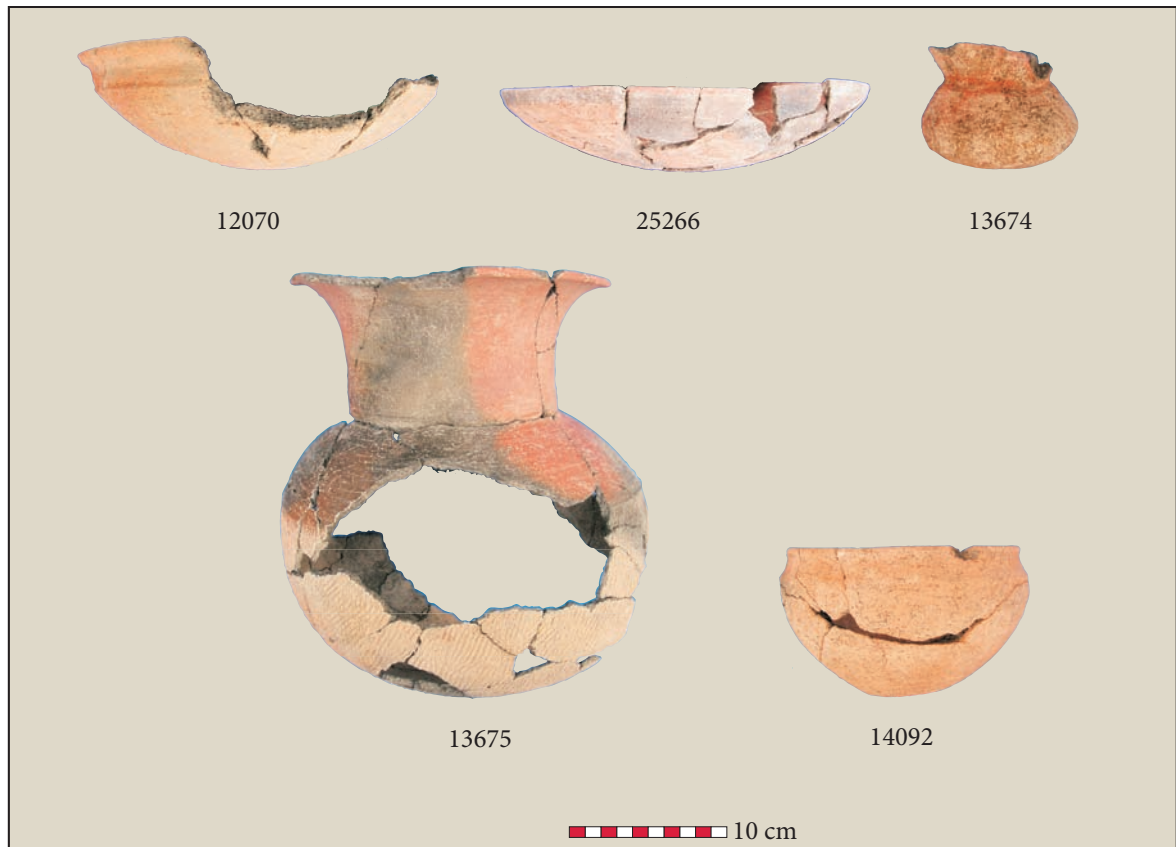


FIG. 5:5 Ceramic vessels cut from lower layer 3 occupation contexts. Cat. 12070 D7 3:6 feature 1; cat. 25266 F2 3:9 feature 3; cat. 13674 D5 3:7 feature 1; cat. 13675 D5 3:7 feature 1; cat. 14092 D6 3:6



FIG. 5:6 A pit containing clay mould inserts possibly for the casting of socketed axes, from E2 3:7 feature 3. Scale 10 cm

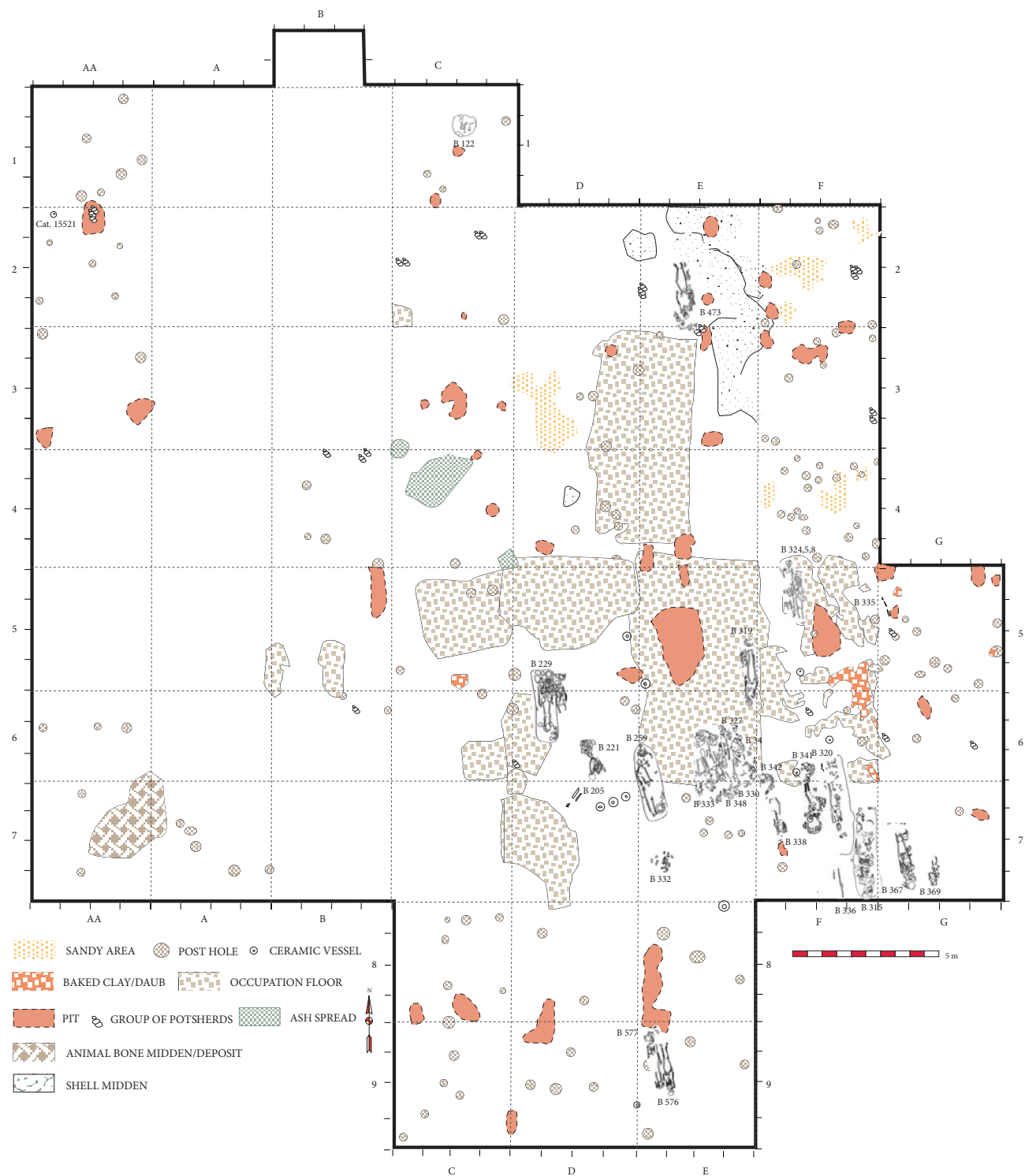


FIG. 5:7 Features associated with Layer 3:4

MIDDLE LAYER 3

Cultural activity in layer 3:4 was concentrated in the eastern part of the excavated area. Several clay floors were traced there. These might represent occupation activity, but the floors are so disturbed that firm conclusions are not possible since no patterns are evident. To the west, there are several refuse pits and one floor containing the thickly-distributed bones of butchered animals. There are also burials cut from at least this layer or higher in the sequence, depending on the degree to which erosion and other disturbances have removed any indication of the grave on its original surface. There are also burials found within this layer which must belong to a higher level. In square E6, there is a dense concentration of inhumation burials, and it is clear from the proximity of the skeletons and their often disturbed nature, that this area was often revisited to inter further bodies. The ceramic vessels illustrated in figure 5:9 present a selection of the pots found

UPPER LAYER 3

Layer 3 was identified across the excavated area as a series of living surfaces that incorporate clay floors. These floors were disturbed, and no complete examples were traced. They concentrate in the eastern half of the area exposed and potsherds with the occasional complete ceramic vessel were found on their surfaces (Fig. 5:11). These almost invariably belong to the local later Iron Age in form and decoration, some being pattern burnished in the Phimai Black tradition. Two or three however, are of a form not found in any burials of this period, and might well represent industrial wares. A particularly dense concentration of broken potsherds was found in the far west of the square.

Burial 174, found on the surface of layer 3, was associated with bronze bangles and finger rings typical of the late Iron Age. Two of the ceramic vessels found with burial 574 are of a form typical of the later Iron Age, lending



FIG. 5:8 Ceramic vessels cut from layer 3:4 occupation contexts. Cat. 14098 D6 3:4 feature 10; cat. 21164 G7 3:4 feature 1; cat. 14060 D6 3:4 feature 3; cat. 23557 E2 3:4 feature 6

with interments that were cut down from at least layer 3:4. Thus, burial 229 was found at a depth of 1.92 m below datum, but the grave silhouette was recognized in layer 3:4 at a depth of 1.44 m. For burials 320 and 367, the figures are 1.71 and 1.33 m. In the case of burial 369, the cut seen at 1.33 m below datum contained a skeleton almost 50 cm deeper. Burial 259 was found 1.60 below datum, and 24 cm below the first indication of a grave cut. The vessels comprise globular jars with cylindrical necks, open shallow bowls and cord-marked bowls, all of which are typical of the early Iron Age in this region. The same conclusion is drawn from the forms of the vessels found in occupation contexts in layer 3:4 (Fig. 5:8).

There remains a large complement of iron artefacts and slag, while bronzes are also abundant. Crucibles and moulds evidence local bronze casting activities. Spindle whorls reflect the local weaving activity, while clay anvils and burnishing stones are relatively rare. The anomalous conical rollers are abundant.

further support to the chronological and cultural contexts of layers 2 and 3.

Iron artefacts and iron slag predominate among the artefacts found in layer 3:1. Spindle whorls are also abundant. Casting moulds and crucibles attest to local bronze casting. Three glass ornaments were found, together with a small number of agate beads and fragments of marble bangle. The presence of eight clay anvils and four burnishing stones suggests that pottery vessels were locally manufactured. Bronze artefacts were relatively abundant.

In squares E/F2-3, a clay floor overlies a discrete accumulation of broken pottery vessels associated with animal bones and iron artefacts. This deep accumulation contains ceramics of the Phimai Black tradition, and dates to the later Iron Age (Fig. 5:15).

Proceeding downward through layer 3, there is further evidence for floors being concentrated in the eastern part of the excavated area, with little evidence for occupation or mortuary activity to the west. In squares F-G 6-7, at

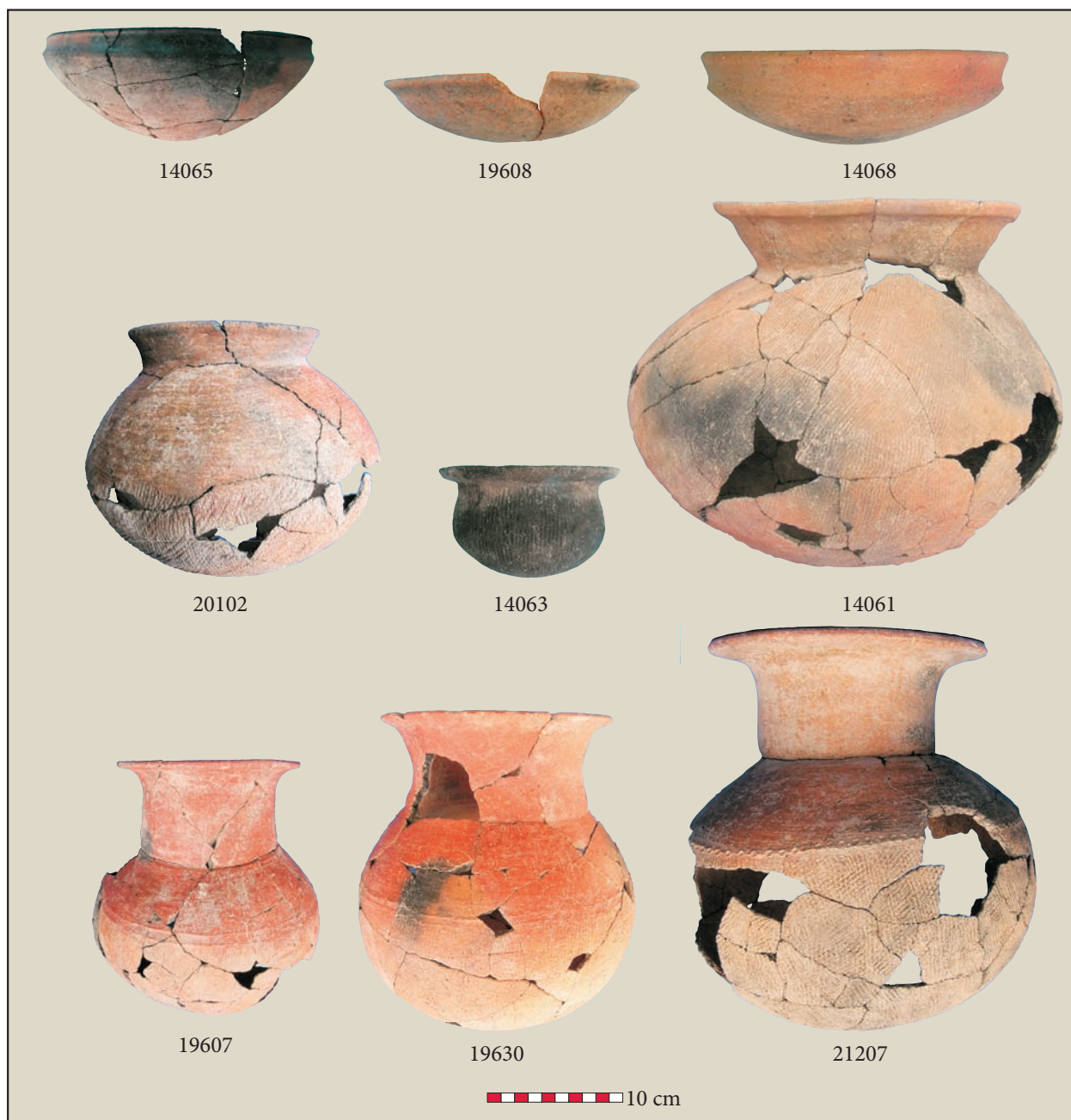


FIG. 5:9 Ceramic vessels from burials cut from at least layer 3:4. Cat. 14061-3-5-8, burial 229; cat. 19608, 7, burial 320; cat. 20102 burial 367; cat. 19630 burial 341; cat. 21207 burial 369

least two superimposed clay floors revealed rectangular cuts containing softer and disturbed fill (Fig. 5:20). These were found to be Iron Age graves. The surface of the cutting for burial 314 was recognized at a depth of 1.15 m below datum, while the remains of an infant lay at a depth of 1.60 m. Again, the cutting for burial 318 was seen 1.26 m below datum while the skeleton lay at a depth of 1.7 m. It is evident that these Iron Age graves were cut down to a depth of at least 45 cm, and probably more, since we have no guarantee that the first sighting of a grave cut was nec-

essarily the depth from which the grave was actually dug. In terms of mortuary goods, these graves contain ceramic vessels of a form that precedes the Phimai Black tradition at nearby Noen U-Loke (Fig. 5:9). The level from which they were cut, being at the least middle to upper layer 3, is thus in all probability of early Iron Age date. Most of the reconstructed ceramic vessels from non mortuary contexts belong to the same tradition in terms of their form and finish.

There is a group of four very badly disturbed burials

in square B6. Burial 203 is the most informative, because, although only the left part of the skeleton survives, the dead person wore multiple bronze bangles and a set of bronze finger rings that relate most closely to the later phases of Iron Age at Noen U-Loke. There were also two agate pendants, an agate bead and blue and orange glass beads that clearly relate to the later Iron Age. It is evident that this grave was cut down to the layer from occupation that occurred during the accumulation of layer 2 above. Orange glass beads were also found in association with burial 202.

Layers 3:2-3 contains many items of iron, as well as iron slag. Spindle whorls were abundant. Crucibles and moulds together with bronze artefacts attest to the continuation into the early Iron Age of a local copper-base industry. Ceramic manufacture is indicated by the anvils and burnishing stones.

Cat. 25532 (Fig. 5:19) is a large ceramic jar of a form that was often used to contain an infant burial during the later Iron Age. It might well have been such a burial cut down to this layer, but the base and any contents were not found. Cats. 17537 and 19577 are forms of vessel not commonly found at Ban Non Wat.



FIG. 5:10 A clay furnace from square E3 layer 3, possibly for bronze casting. Scale 10 cm



FIG. 5:11 The surface of layer 3 in squares F5-6 and G5-6, looking north. Burial 311 from layer 2 can be seen in the top right. Note the pits, postholes and the concentrations of potsherds

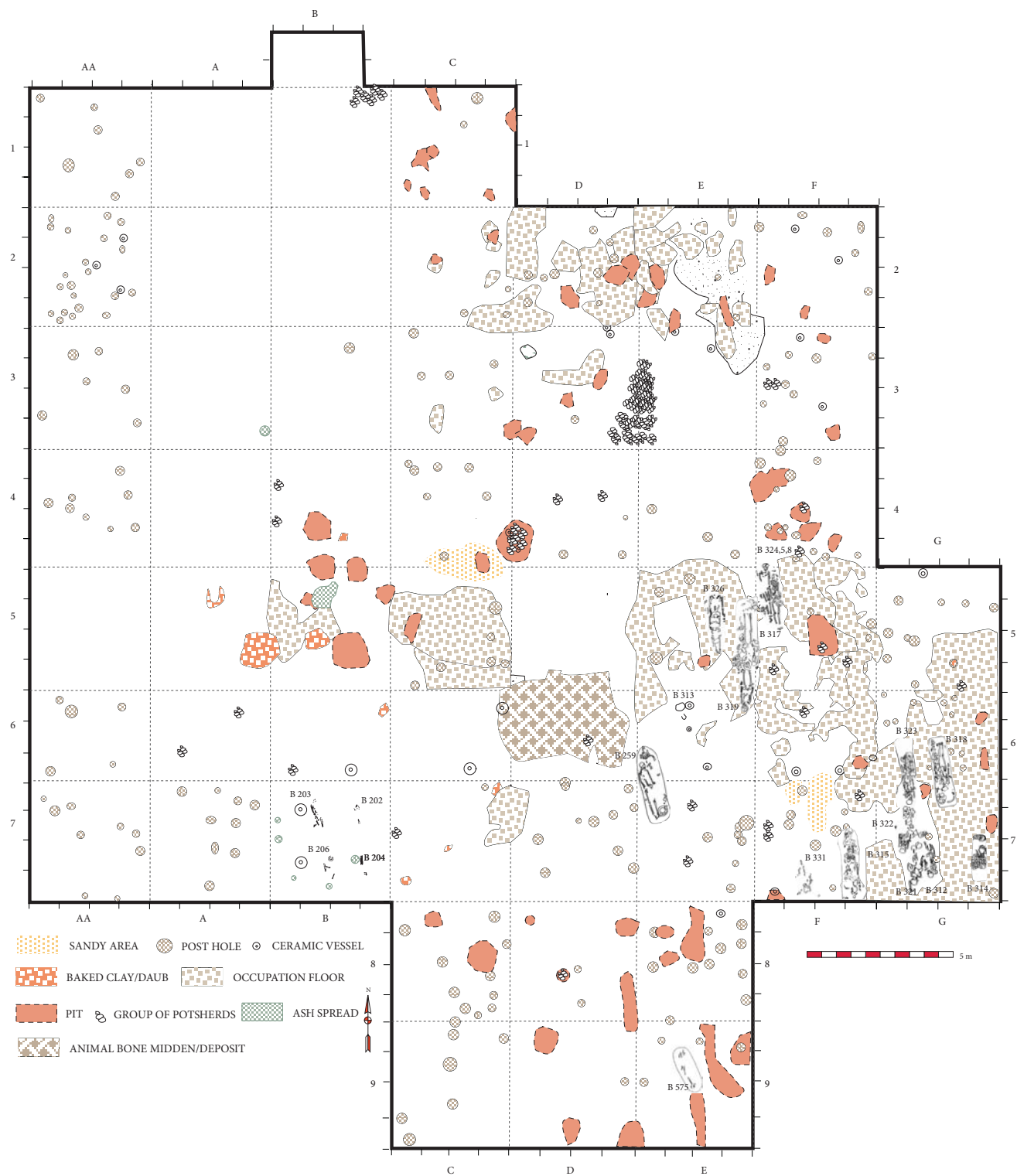


FIG. 5:12 The features on the surface of layer 3:2

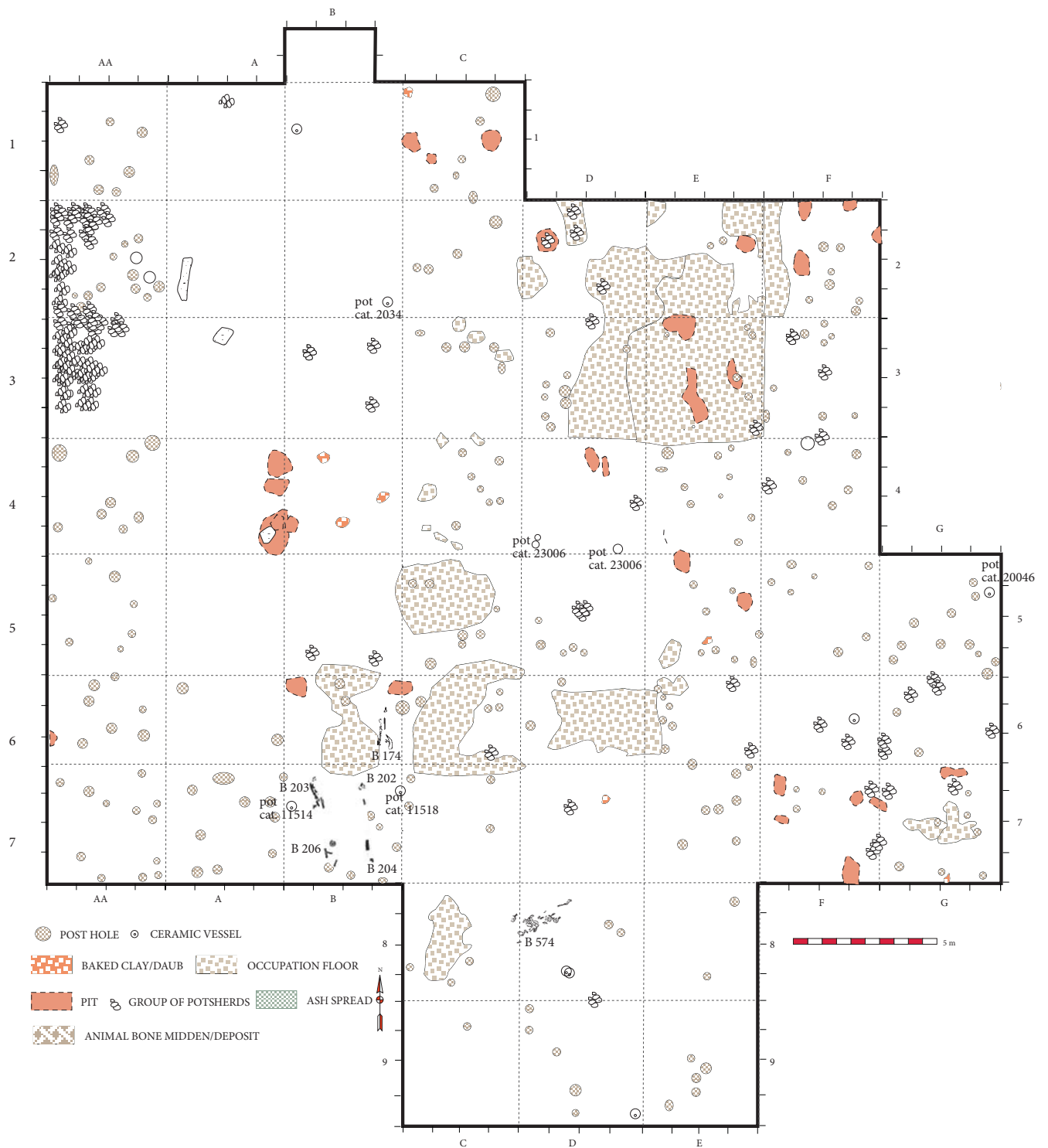


FIG. 5:13 The features on the surface of layer 3



FIG. 5:14 A shell midden in E2 layer 3:4 feature 1, contains a cache of clay artefacts (bottom right) thought to have been employed in bronze casting. Burial 473 was cut into this midden.
Scale 10 cm



FIG. 5:15 The surface of a clay floor in E3:1 in the foreground, overlying a thick lens of Phimai Black late Iron Age potsherds seen beyond



FIG. 5:16 The ceramic vessels from layer 3:1. Cat. 14617 D5 3:1; cat. 19513 F7 3:1 feature 3; cat. 17376 E5 3:1 feature 1; cat. 11518 B7 3:1; cat. 20046 G5 3:1 feature 1; cat. 11514 B7 3:1; cat. 14044 D6 3:1 feature 2; cat. 20421 D8 3:1; cat. 19514 F7 3:1 feature 3; cat. 20422 D8 3:1; cat. 19514 F7 3:1 feature 1; cat. 19521 F7 3:1 feature 3



FIG. 5:17 Open bowls from burials cut through floors found on layer 3:2. Cat. 21092 burial 321, cat. 19579 burial 315, cat. 19545 burial 315, cat. 21076 burial 312, cat. 20645 burial 323, cat. 20603 burial 323, cat. 21054 burial 314, cat. 21116 burial 322 cat. 21115 burial 322, cat. 18525 burial 324, cat. 21084B burial 312, cat. 21161 burial 321, cat. 21085 burial 321, cat. 21045 burial 314, cat. 21108 burial 321, cat. 21094 burial 321

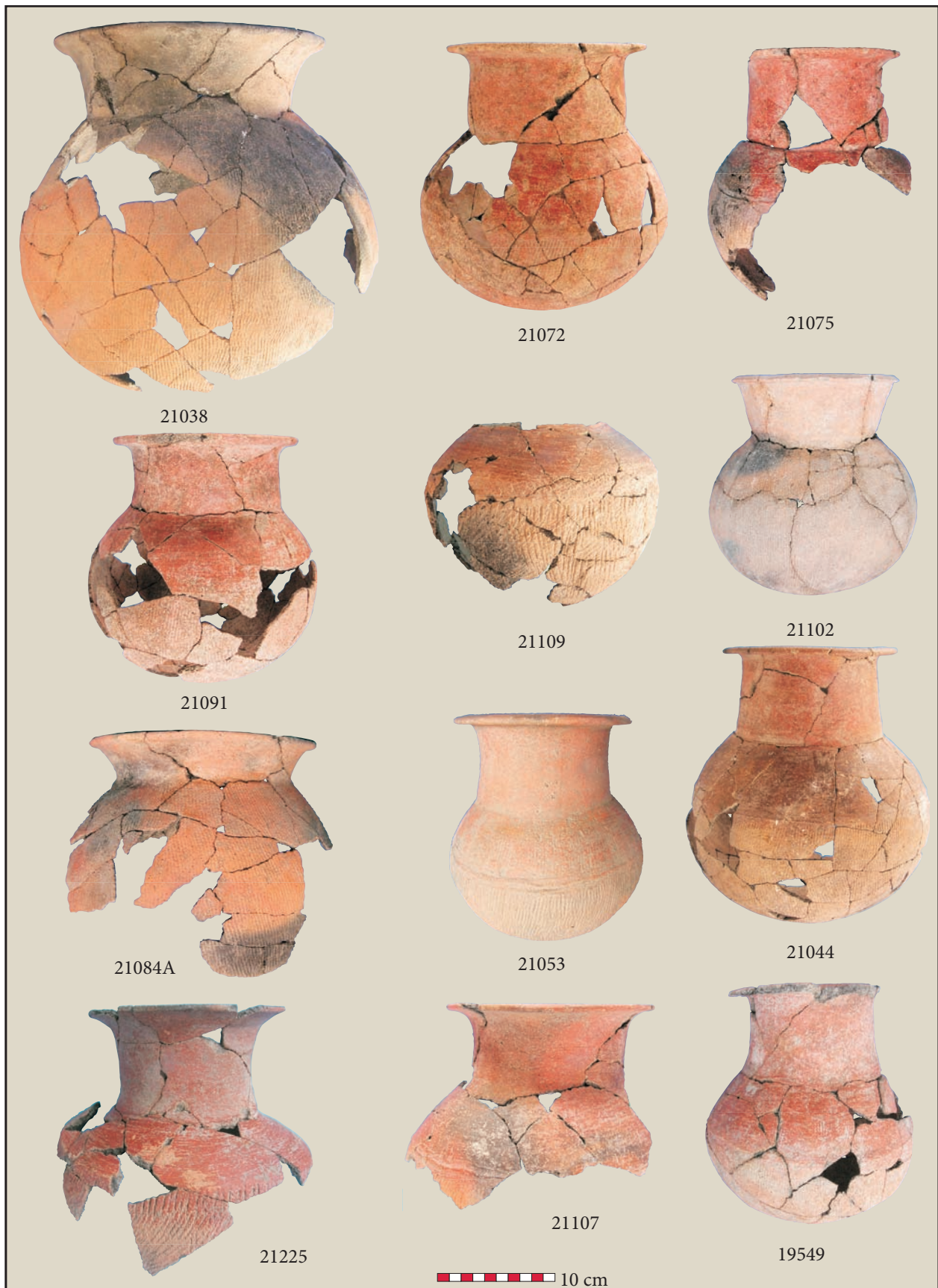


FIG. 5:18 Globular jars from burials cut through floors found on layer 3:1 Cat. 21038 burial 314, cat. 21072 burial 312, cat. 21075 burial 312, cat. 21091 burial 321, cat. 21109 burial 321, cat. 21102 burial . 312, cat. 21084A burial 312, cat. 21053 burial 314, cat. 21044 burial 314, cat. 21255 burial 321, cat 21107 burial 321, cat. 19549 burial 315



FIG. 5:19 Globular jar cat 21093 from burial 321 and vessels from layer 3:2-3.



FIG. 5:20 G7 layer 3:2, looking north and showing a floor through which the grave of burial 314 was cut, with further grave cuts to the left and beyond

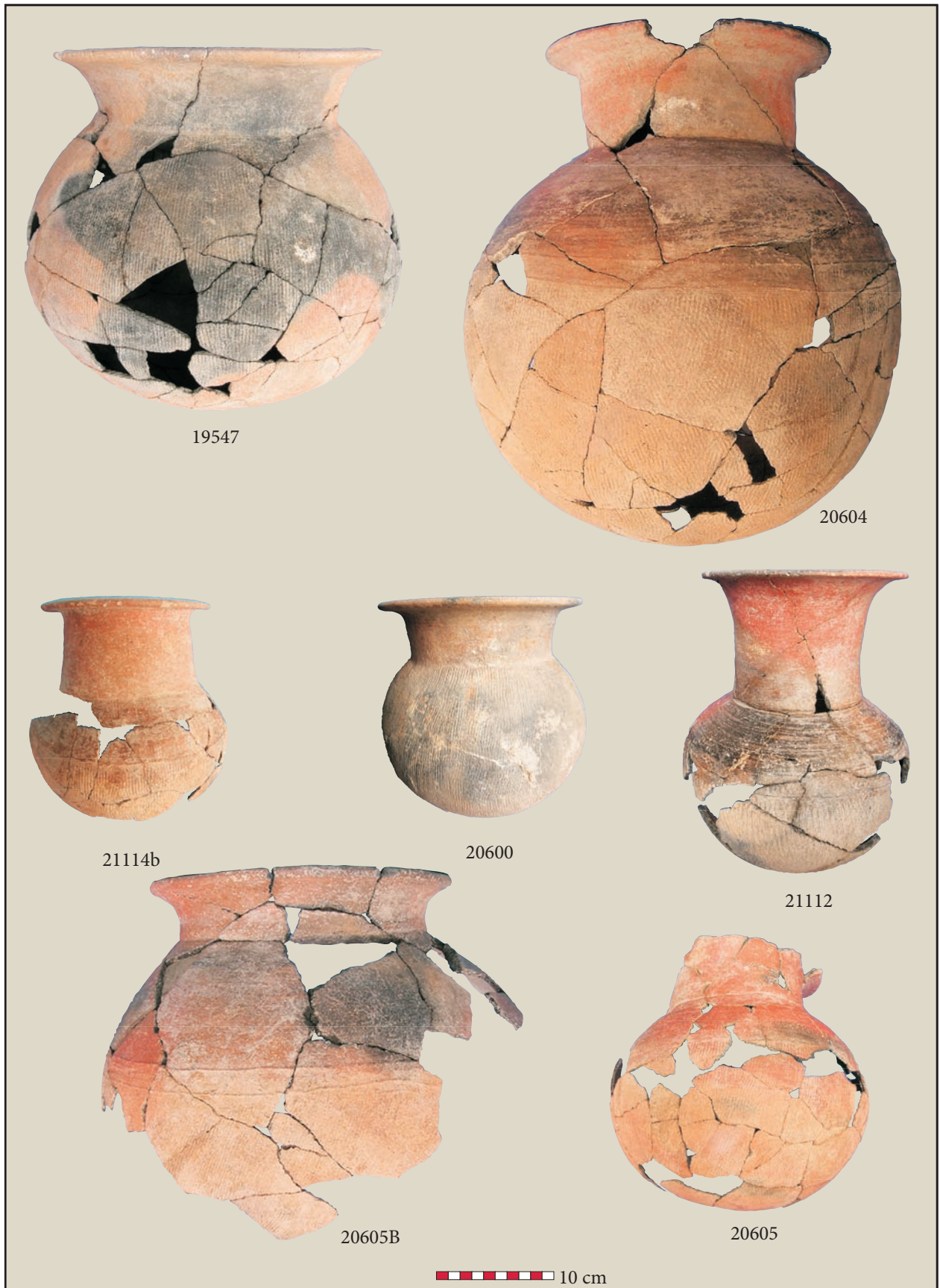


FIG. 5:21 Globular jars from burials cut through floors found on layer 3:2. Cat. 19547 burial 315, cat. 20604 burial 323, cat. 21114b burial 322, cat. 20600 burial 323, cat 21112 burial 322, cat. 20605b burial 315, cat. 20605 burial 323

VI LAYER TWO

C.F.W. HIGHAM

LOWER LAYER 2

Lower layer 2 incorporates a series of clay floors dating to the later Iron Age (Fig. 6:1). These floors were littered with potsherds, and on occasion, complete ceramic vessels. On reconstruction, these fall into the Phimai Black tradition, characterised by bowls decorated with burnished patterns (Figs. 6:2-3). Cat. 5525 is a form often employed as an infant jar burial. There are also several large cord-marked vessels found in Iron Age burials and used there to contain complete fish. There are many concentrations of broken potsherds. The impression gained from the location of the floors, is that they concentrate in the eastern part of the excavated area. Many refuse pits were encountered, containing broken ceramic vessels and animal bones. A small number of late Iron Age burials were cut down into the

living surfaces. There are two instances where burnt clay disposed in two narrow parallel strips were identified. We cannot at present explain their purpose or origin.

In terms of material culture, lower layer 2 contained much iron slag and iron artefacts. The slag was particularly abundant in squares A1-3 and G5-7. Crucibles and moulds suggest that bronze casting was undertaken during the later Iron Age at this site. There are also numerous spindle whorls attesting to a weaving industry, but few clay anvils and the burnishing stones used in the manufacture of ceramic vessels. Marble, shell, ivory, glass and agate ornaments, usually found in a fragmentary condition, were present.

TABLE 6:1 *The artefact frequencies in layer 2*

Context	2:1	2:2	2:3	2:4	2:5	2:6	2:7	2:8		2:1	2:2	2:3	2:4	2:5	2:6	2:7	2:8
Marble bangle	0	1	1	0	0	0	2	0	Pottery vessel	9	21	8	10	28	19	14	37
Crucible	0	2	1	1	4	0	6	8	Worked bone	7	4	2	5	9	7	16	12
Mould	1	7	0	2	3	2	3	2	Agate	1	0	1	1	2	0	0	1
Burnishing stone	1	0	0	1	1	0	3	2	Clay counter	2	4	3	8	4	4	2	9
Bimetallic ring	1	0	0	0	4	1	0	0	Bronze artefact	2	9	6	17	26	18	19	13
Skin rubber	1	0	1	1	2	2	1	0	Conical roller	2	1	5	5	6	3	10	1
Ivory bangle	0	1	3	2	3	4	3	8	Clay anvil	2	1	1	0	2	3	10	1
Iron artefact	9	11	9	15	19	13	37	24	Net sinker	1	0	0	0	0	0	0	0
Iron slag	6	2	9	9	13	21	37	78	Glass ornament	2	1	7	5	13	6	10	8
Spindle whorl	4	6	15	10	19	9	23	17	Shell bangle	1	1	1	2	4	10	22	15
Red ochre	3	4	3	6	8	7	8	16	Stone adze	0	2	0	1	2	2	3	2
Clay pellet	11	5	7	5	9	7	16	12	Skin rubber	0	0	1	1	2	2	1	0



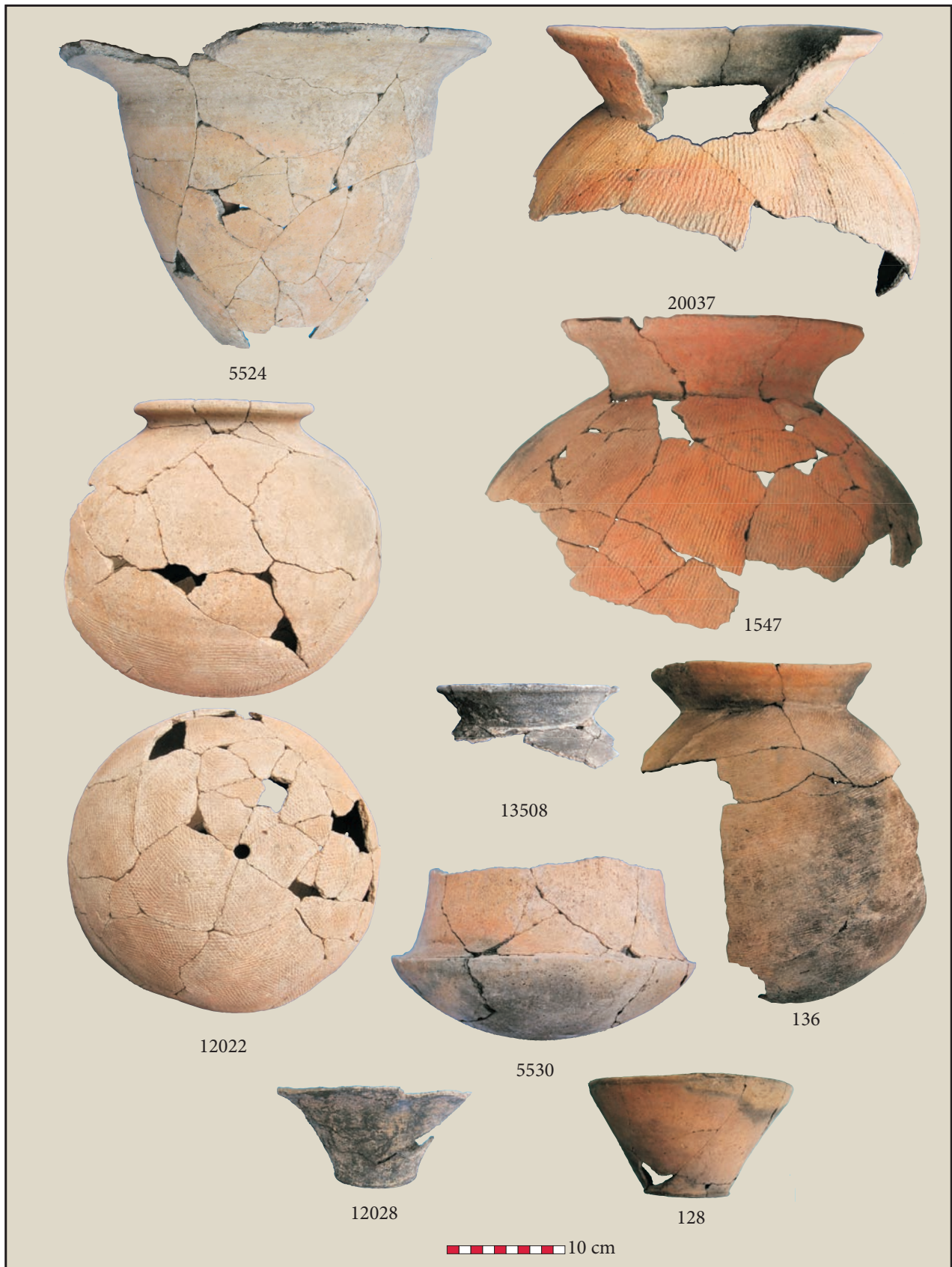


FIG 6:2 Ceramic vessels from lower layer 2. Cat. 5524 C1 2:5 feature 1; cat. 20037 G5 2:9 feature 1; cat. 12022 D7 2:5 feature 1; cat. 1547 A3 2:6 feature 6; cat. 13508 D5 2:6 feature 1; cat. 136 A2 2:6 feature 3; cat. 5530 C1 2:7 feature 3; cat. 12028 D7 2:7 feature 3; cat. 128 A2 2:6 feature 3

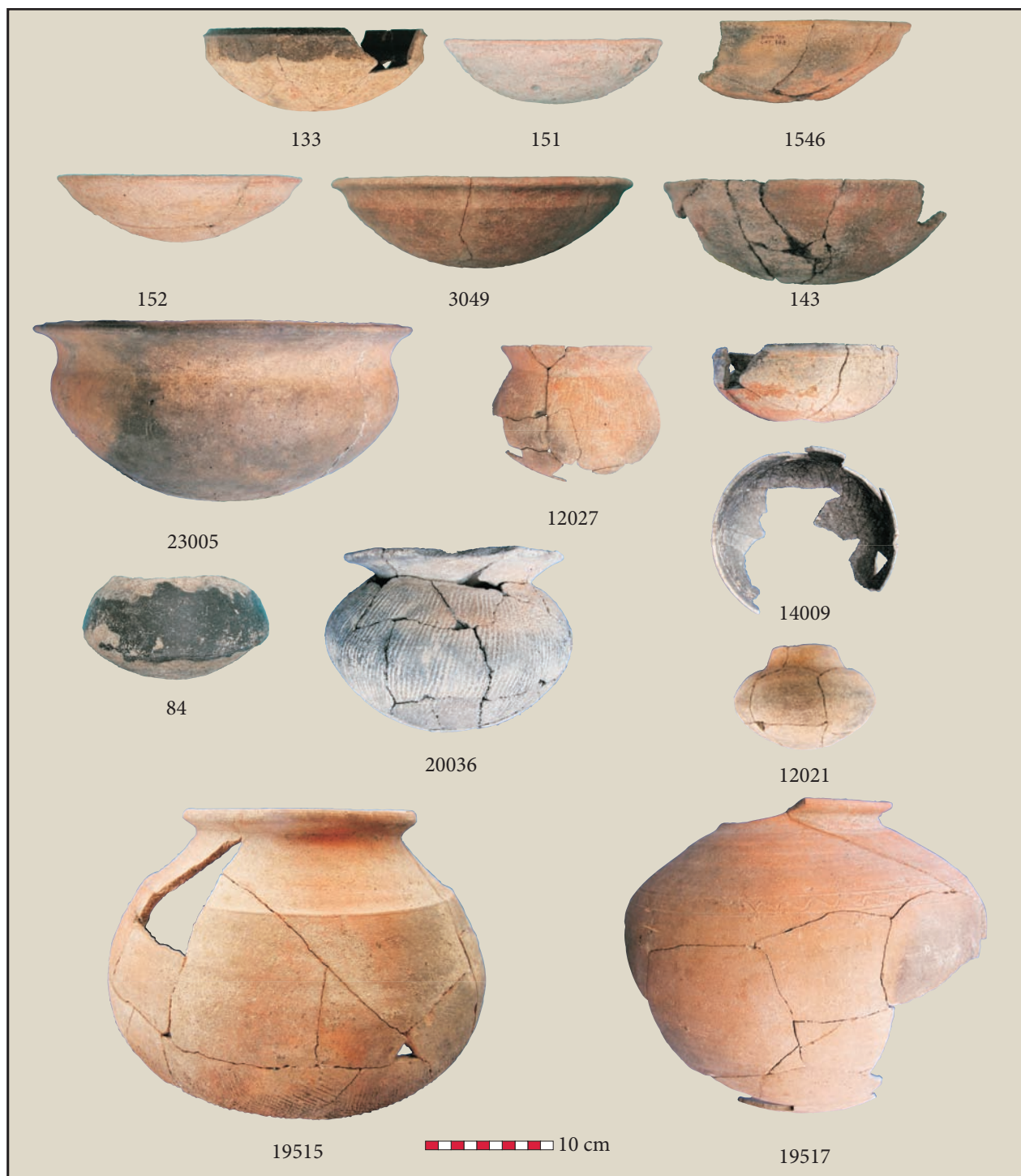


FIG 6:3 Ceramic vessels from lower layer 2. Cat. 133 A2 2:6; cat. 151 A4 2:6 feature 4; cat. 1546 A2 2:7 feature 9; cat. 152 A4 2:6 feature 4; cat. 3049 B2 4:7; cat. 143 A2 2:7 feature 9; cat. 23005 D4 2:5; cat. 12027 D7 s:6 feature 3; cat. 14009 D6 2:6; cat. 84 A2 2:5; cat. 20036 G5 2:9 feature 1; cat. 12021 D7 2:5 feature 2; cat. 19515 F7 2:9 feature 1; cat. 19517 F7 2:9 feature 2



Fig. 6:4 Ban Non Wat square D7 2:5, a floor on the surface of which lie pottery vessel cat. 12024 and an iron knife (at left of the pot)



Fig. 6:5 Ban Non Wat square F7 2:9 feature 2, showing the broken ceramic vessel cat. 19517



Fig. 6:6 Ban Non Wat square G6 2:9 feature 1 showing part of a clay floor, with ceramic vessel cat. 20535



Fig. 6:7 Ban Non Wat square A3 2:5 feature 10, showing a concentration of pottery and an agate pendant at top left

THE CULTURAL CONTEXT OF UPPER LAYER TWO

The cultural context of upper layer 2 may be determined on the basis of the nature of the burials within this part of the mound, the artefacts identified, and the distribution of pits, postholes, and other signs of occupation. Two burials are particularly informative. Square B4 contained burial 36, a very disturbed adult, but with a wide range of associated mortuary offerings that included agate and carnelian beads, orange glass beads, and ceramic vessels. This burial relates chronologically to the final mortuary phase at Noen U-Loke. Burial 119 in square C3 was very fragmentary. It was associated with bronze ear, finger and toe rings compatible with a late Iron Age date. In square AA2, burial 266 lay at a depth of 0.45 m below datum

in layer 2:2. An infant was interred within two ceramic vessels placed mouth to mouth. Grave goods included a small bowl, bronze bangles, yellow, red and blue glass beads and an agate pendant. The mortuary vessels are identical in form to those belonging to the fifth and final Iron Age mortuary phase at nearby Noen U-Loke, dated there within the period 300-500 cal. AD. Square B2 layer 2 included burial 40, an Iron Age infant interred in a large ceramic vessel. Several other later Iron Age vessels were found in this context. Square B5 contains burial 37, an infant in a large, globular cord-marked jar. A further burial, no. 39, was found in B3 layer 2:3. The infant mortuary jar was globular and cord marked, and has all the characteristics of the local Iron Age. Four other vessels of similar affinities were also found in this same square and context. Burial 3 is found in squares A3-4 and burial 4, an infant

jar burial is located in A3. Burials 1 and 2, Iron Age infant jar burials, were found in square A1.

The uppermost layer 2 contexts in squares C-E 8-9 include a series of pits lying adjacent to an ashy floor or occupation surface. One of the pits contains glazed blue and white ceramics of Sawankhalok style. In E2-3, there is evidence for pyrotechnic activity in the form of baked clay concentrations. D2 has two pits, one containing a pig's skeleton, the other large quantities of pot sherds and animal bones. Part of a clay floor is present in the south-western part of this square. It incorporates two parallel lines of baked clay. A very large shallow pit containing animal bones and pot sherds was found in the eastern part of squares G5-6. Many postholes indicated on the plan might be of recent origin, a square example in unit F7 being known to belong to the rice store demolished to make way for the excavation.

AA5 and 6 incorporates a floor, the surface of which contains blue and white potsherds and green glazed ware. To the south in AA7 however there is a complete ceramic vessel cat. 10506 which is of late Iron Age form (Fig. 6:10).

The ceramic vessels from the mortuary contexts are illustrated in figure 6:8. They are precisely paralleled in the late Iron Age cemetery at nearby Noen U-Loke as well as in square X at Ban Non Wat. At Noen U-Loke, late Iron Age layers also contained complete ceramic vessels. This is also matched in upper layer 2 at Ban Non Wat (Fig. 6:8), most of the vessels again falling into forms characteristic

of the late Iron Age. However, in AA6 layer 2:3 there is a pit containing a set of complete vessels that have affinities with the early historic Dvaravati ceramics in Central Thailand. It is considered likely that this pit was excavated into upper layer 2 during a subsequent occupation phase at the site.

The artefacts found within upper layer 2 are set out in Table 6:1. There are several iron artefacts, while the presence of iron slag suggests local smithing operations. Iron artefacts include knives and a spearhead. Bronze bangles and bells are also present while moulds and crucible fragments suggest that casting was still practised at the site. Weaving was undertaken, as seen in the number of spindle whorls. Clay anvils and burnishing stones would have been used in the manufacture of ceramic vessels and it is noted that some of the pots were enhanced by streak burnishing of the so-called Phimai Black style. Clay pellets are still used with slings to bring down small birds and mammals. Glass and agate ornaments are present in small quantities. It is noted that three skin rubbers were recovered. These are particularly abundant in Central Thai Dvaravati sites. These, taken in conjunction with the few glazed ceramics found in upper layer 2, certainly attest to occupation of the mound during the early historic period. On balance, however, the layer is assigned to the late Iron Age and the historic period artefacts probably found their way into this layer as a result of later disturbances, such as the digging of pits and postholes.



FIG. 6:8 The ceramic vessels found in association with upper layer 2. Cat. 75, burial 3; cat. 15508 burial 266; cat. 66 burial 4; cat. 15501 burial 266; cat. 15502 burial 266; cat 3516 burial 36; cat. 3515 burial 36; cat. 3525 burial 36; cat. 4012 burial 37

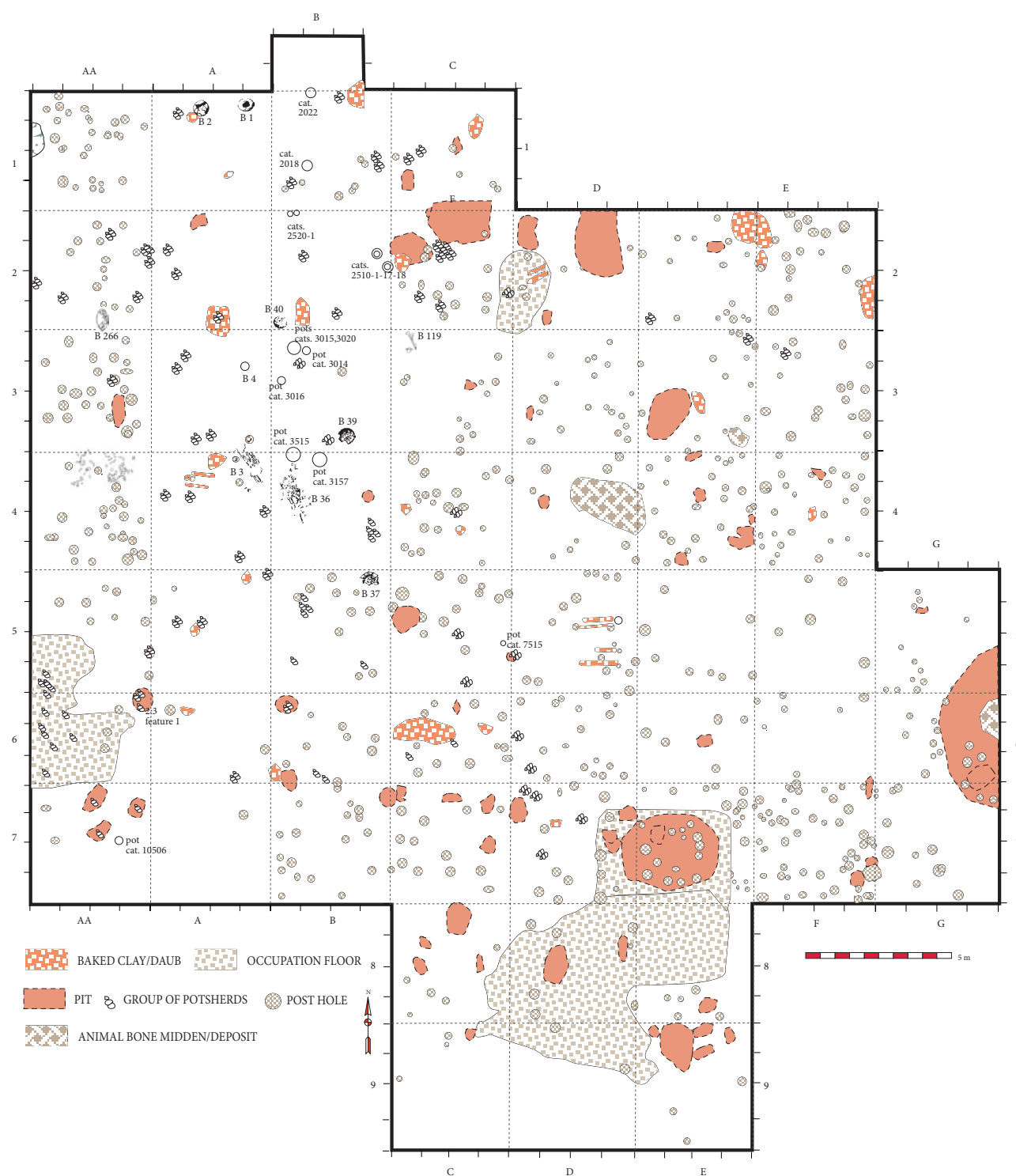


FIG. 6:9 The distribution of features and cultural contexts in upper layer 2

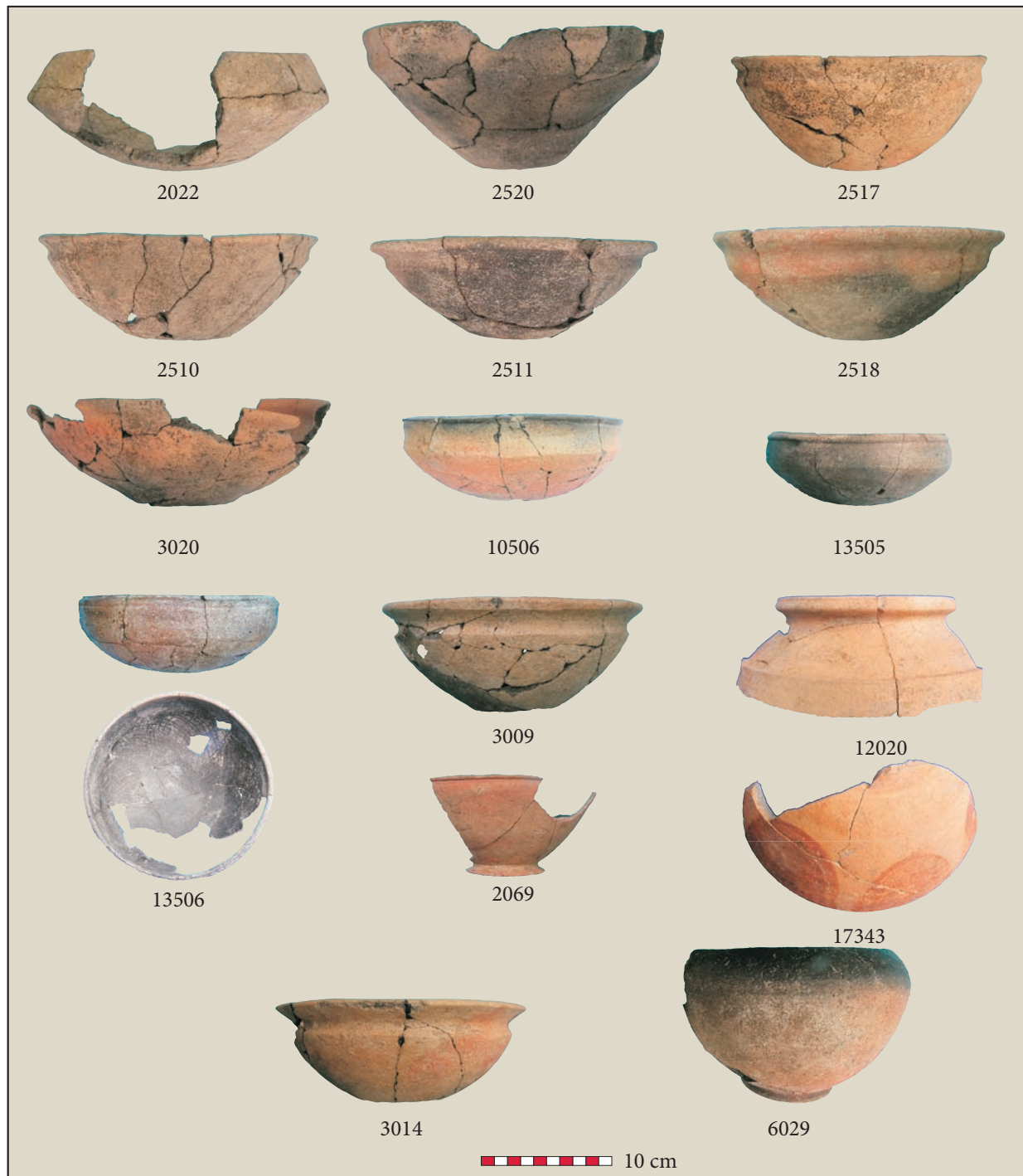


FIG. 6:10 The ceramic vessels found in upper layer 2 contexts. Cat. 2022 B1 2:3 feature 1; cat. 2520 B2 2:4 feature 18; cat. 2517 B2 2:3; cat. 2510 B2 2:2 feature 15; cat. 2511 B2 2:2 feature 17; cat. 2518 B2 2:2; cat. 3020; cat. 10506 AA7 2:4 feature 3; cat. 13505 D5 2:4 feature 5; cat. 13506 D5 2:4 feature 5; cat. 3009 B3 2:2 feature 2; cat. 12020 D7 2:3 feature 6; cat. 2069 B2 2:2 feature 1; cat. 17343 E7 2:3 feature 6; cat. 3014 B3 2:2 feature 2; ; cat. 6029 C2 2:3 feature 1

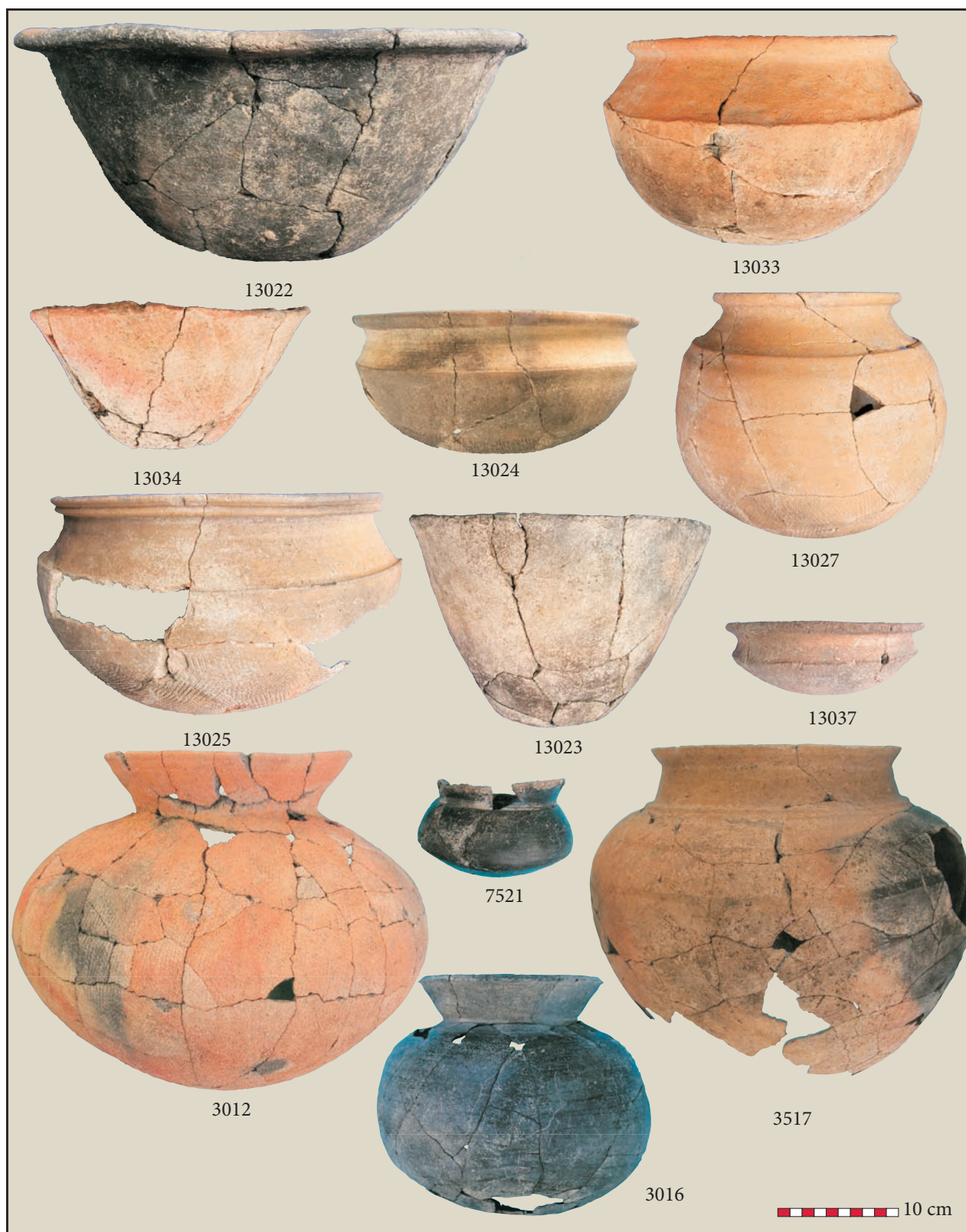


FIG. 6:11 The ceramic vessels from AA6 2:3 feature 1 (top three rows) and from upper layer 2. Cat. 3012 B3 2:3 feature 1; cat. 3517 B4 2:2 feature 3; cat. 3016 B3 2:4; cat. 3016 B3 2:4; cat. 7521 2:3 feature 1

VII THE EXCAVATION OF SQUARE Y

C.F.W. HIGHAM

INTRODUCTION

The excavation of square Y, an area of 8 by 4 metres, was undertaken in order to ascertain the extent of the Neolithic and Bronze Age cemeteries and occupation remains hitherto identified in the main square. We encountered a quite different depositional sequence, which covers a period from the early Bronze Age to the late Iron Age and into the Historic period. The stratigraphy was very complex, and was unravelled and recorded due to the

skill of Drs Jeremy Habberfield-Short and Hayden Cawte. The following description of the sequence begins at the base, which was reached at a depth of 6 m below datum, where coincidentally, we also reached the water table. The cultural remains at this part of the site are therefore considerably thicker than in the centre, and it is apparent that the initial occupation under the Neolithic was focussed on a naturally elevated mound.

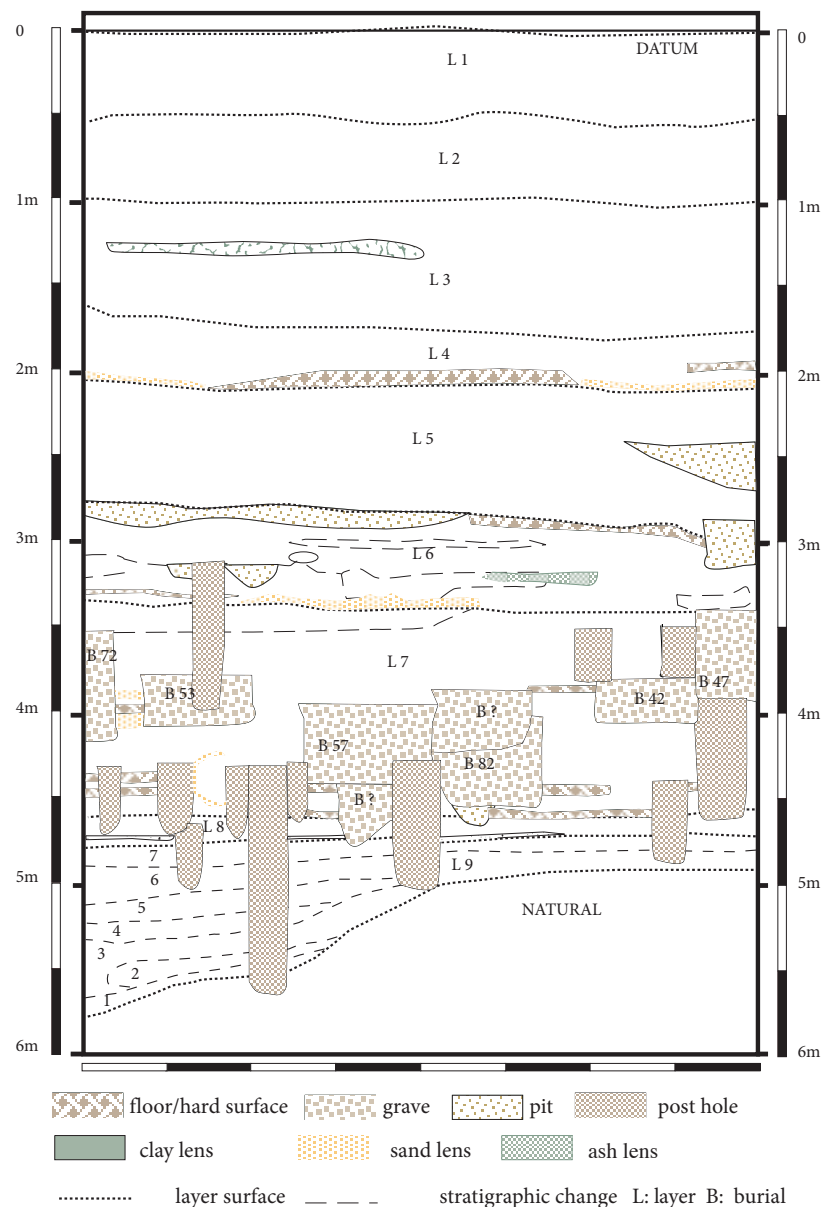


FIG. 7:1 The south section of square Y. The channel infill of layer 9 comprises: 1. dark grey stiff clay 2. orange sand 3. dark clays 4. light sandy clays 5. dark clays 6. sandy clays 7. dark clays

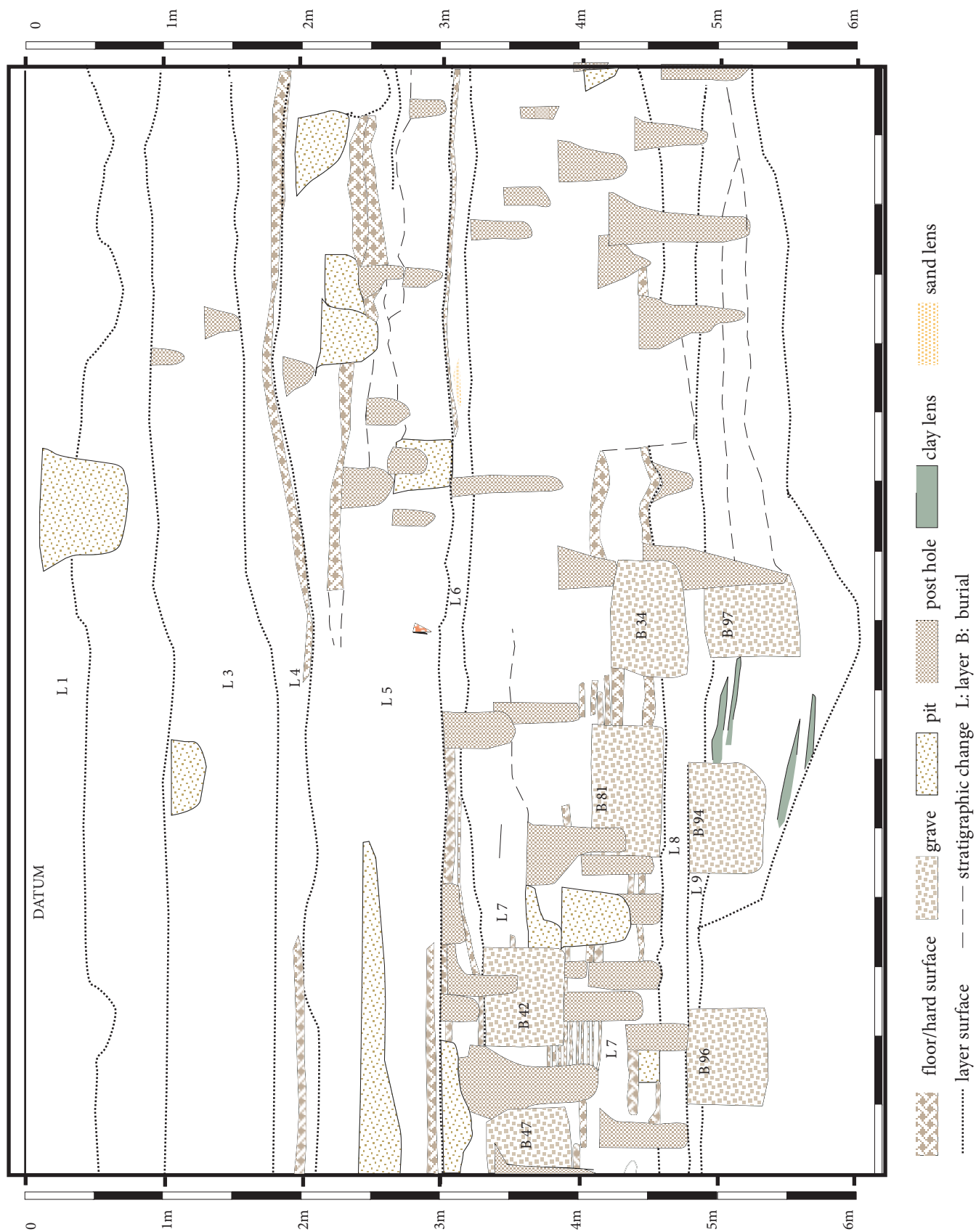


FIG. 7:2 The west section of square Y

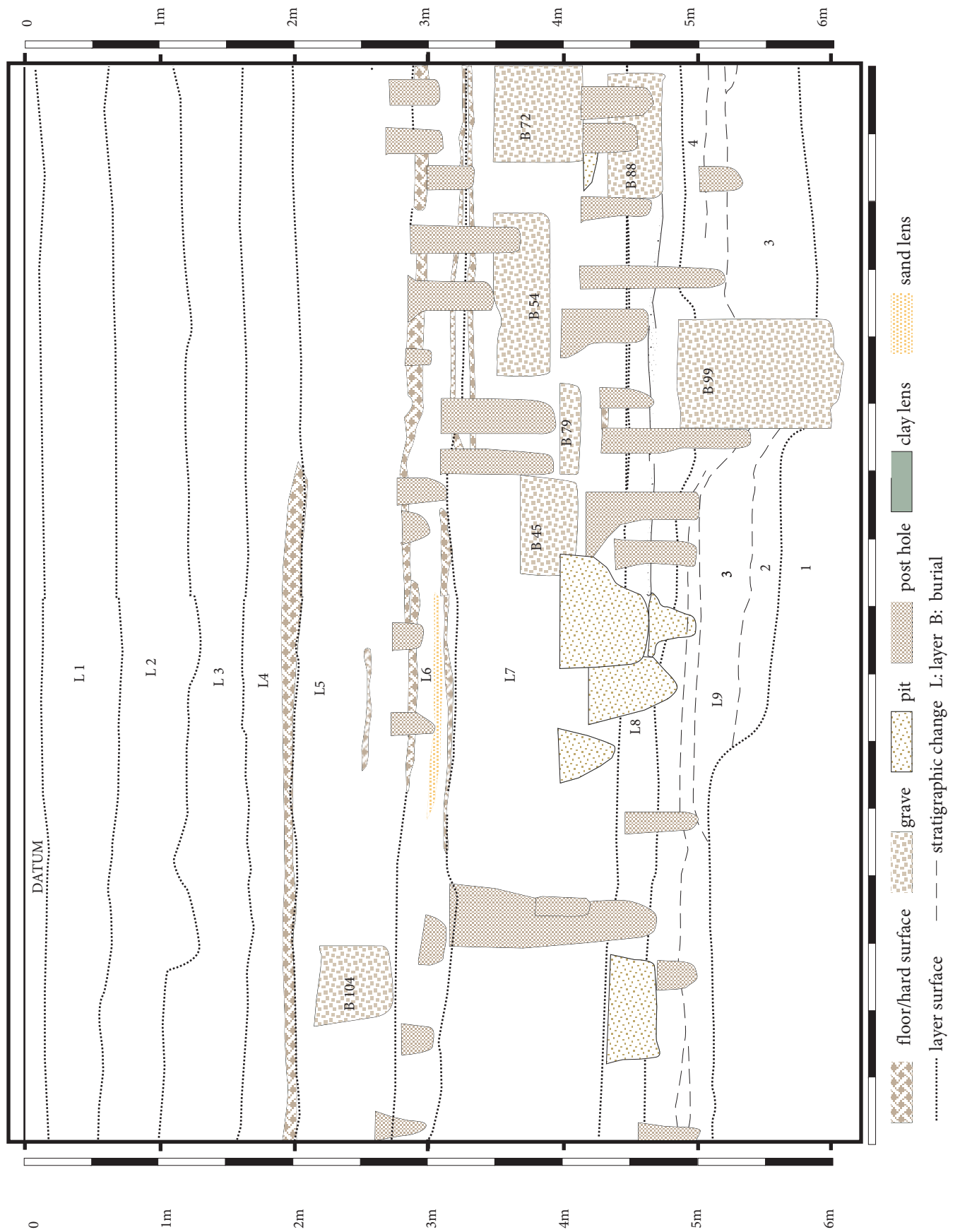


FIG. 7:3 The east section of square Y. The channel infill of layer 9 comprises: 1. Yellow orange alluvium, the natural substrate 2. dark brown clay 3. light-dark brown sandy clay 4. laminated sandy clays

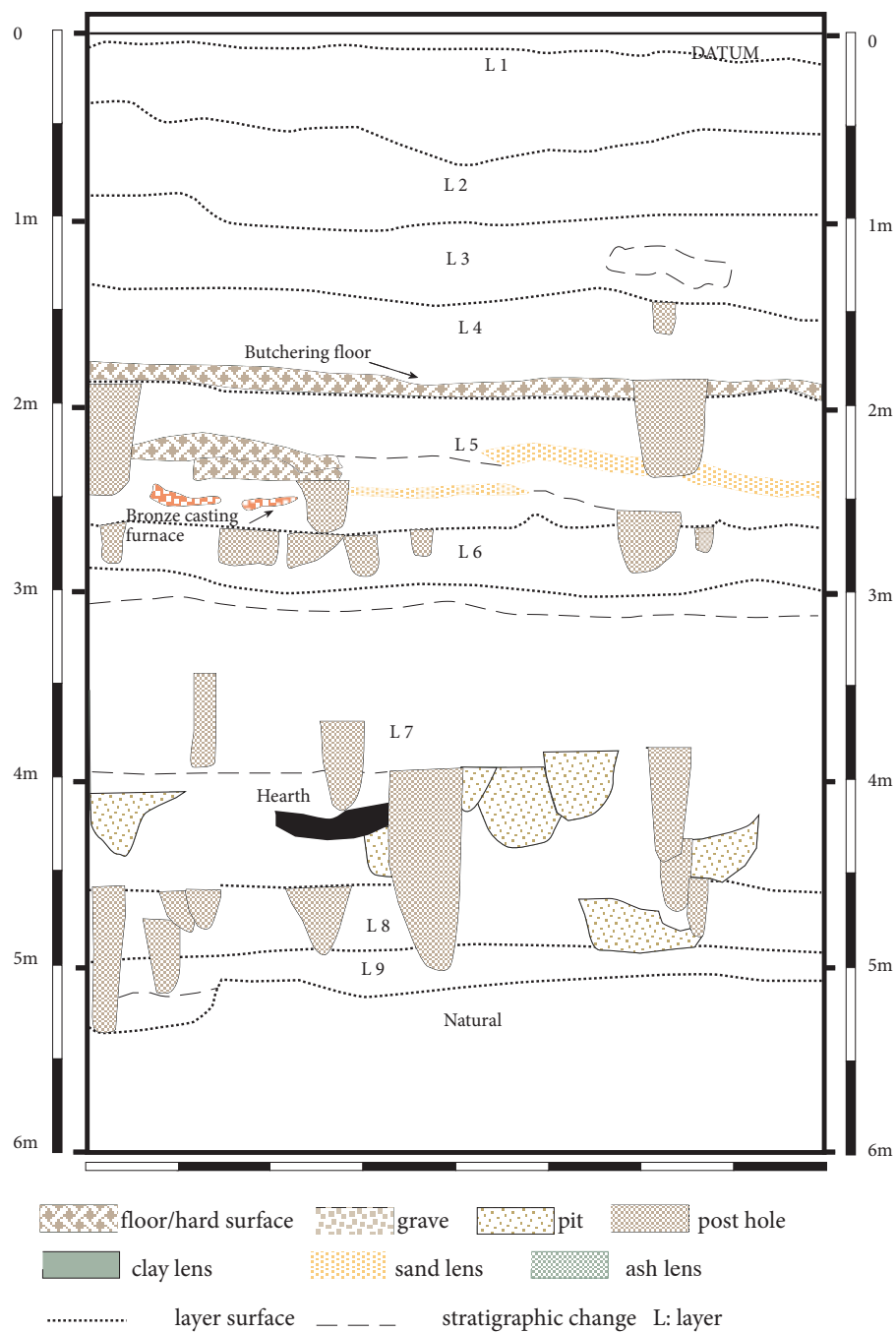


FIG. 7:4 The north section of square Y

LAYER 9

Basal layer 9 comprises two steep clayey banks shelving down into the infill of an old stream channel. The sediments become clayier with increasing depth. Two deeply-cut burials were excavated into the clay banks. In the case of burial 99, no human remains were found, but these must surely lie to the east of the excavated area. On the southern bank above this stream channel, there is a series of post holes, and these might represent some form of palisade. Only one artefact was found in this layer, a fragment of shell bangle. It is evident that when the initial Neolithic settlement of Ban Non Wat took place in the central part of the mound, at least one stream flowed past the occupied area.

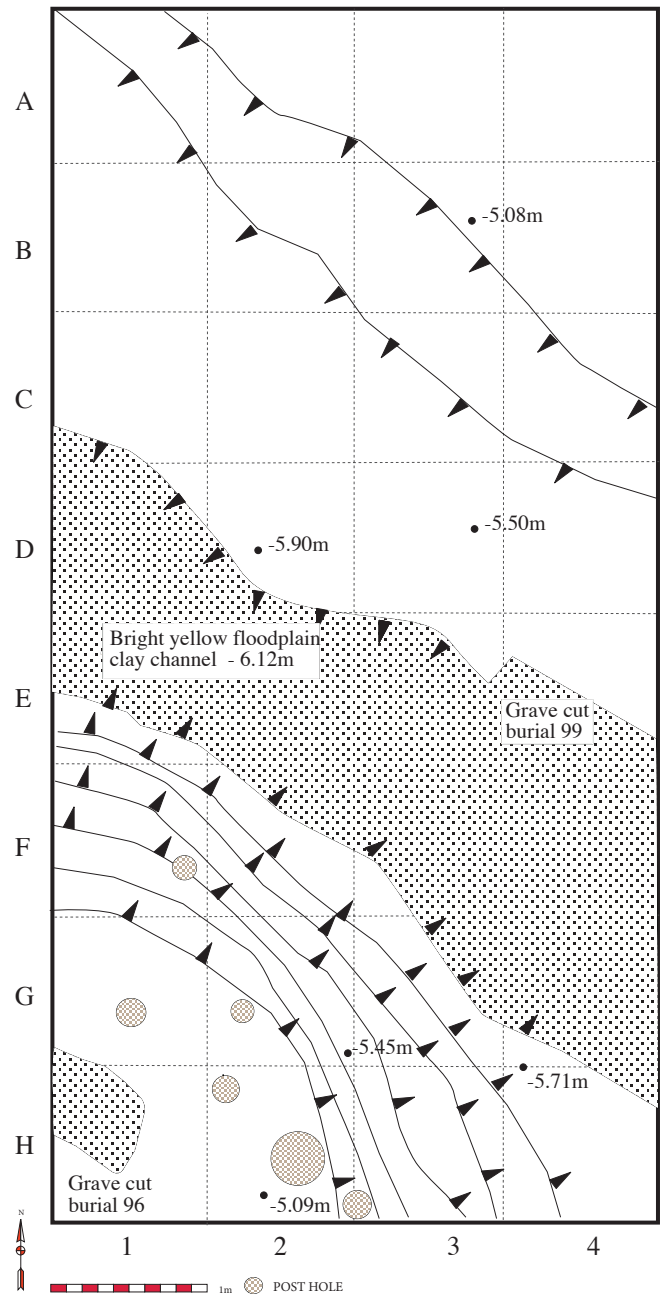


FIG. 7:5 The plan and section of the basal deposits in square Y, layer 9-9



FIG. 7:6 Square Y, looking down on the stream bed, with postholes on the top of the bank



FIG. 7:7 Square Y, looking to the south, and showing the clay bank sloping down to a stream bed. The grave cut for burial 96 is seen on the right, and a vessel belonging to burial 90 is visible in the foreground

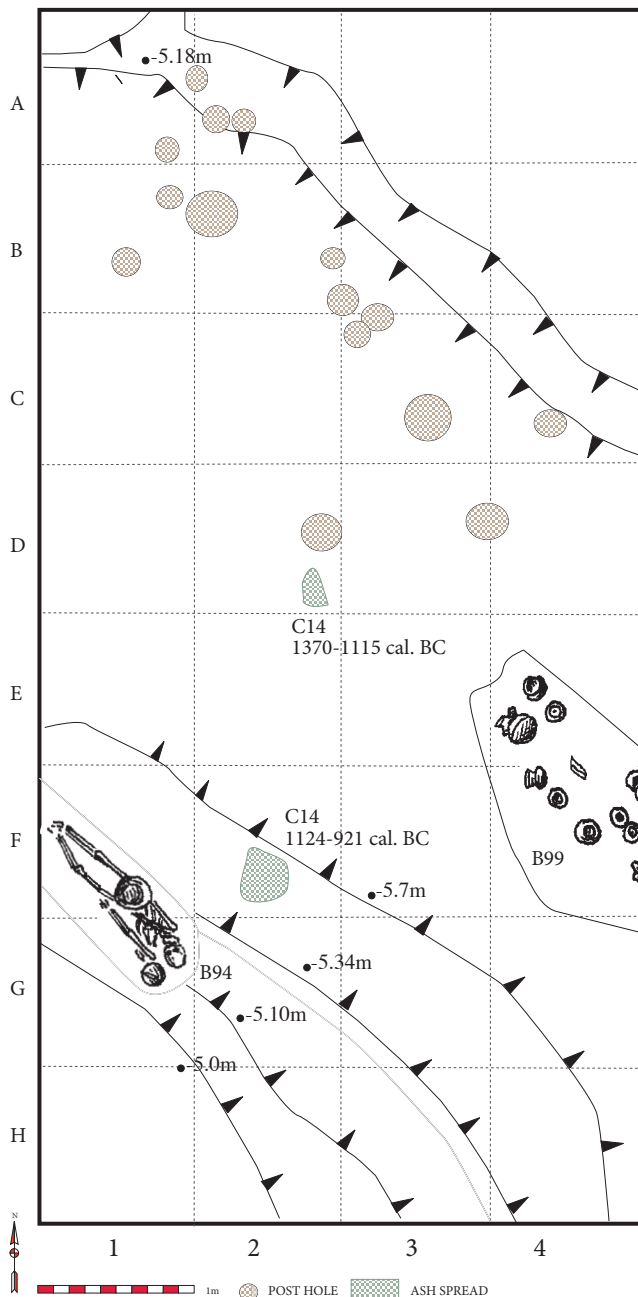


FIG. 7:8 The features on the surface of Y1 layer 9:2

LAYER 9-2

Layer 9-2 saw the uncovering of the surface of a clay bank leading down to a stream bed. Numerous post holes had been dug into the northern part of this stream infill. The water table now made excavation difficult. However, a clear grave cut was followed, and within it, several Bronze Age ceramic vessels were revealed. These are burial 99. No human remains were found, the skeleton presumably lying to the east of the square. This burial contained at least 12 ceramic vessels, as well as a whetstone. The base of the grave lay at a depth of 5.96 below datum (bd), and the grave fill contained fragments of a crucible for casting a copper base artefact, worked shell and half a shell bangle.

Burial 94 was found complete on the western edge of the square. This individual was interred with at least two Bronze Age vessels, and a remarkable artefact of mineralised wood in the form of a bandolier running across the chest. Two bivalve shells were associated, one placed in a ceramic vessel beyond the head, the other to the left of the left humerus. The grave cut, capped by grey clay, was identified at a depth of 4.79 m bd, the bones resting on the base of the grave at a depth of 5.15 m bd.

Two hearths had been cut down into upper layer 9. The radiocarbon determinations are 1370-1115 and 1124-921 cal. BC.

This layer contained three fragments of bronze, an artefact of worked bone, a clay casting mould fragment and the horn of a clay bovid figurine.

LAYER 9-1

Layer 9:1 saw the initial recognition of the surface of the natural clay bank that formed such a feature of the basal context in this excavation. Evidence for occupation at this depth, was seen in the two hearths and the ash spread (Fig. 7:9). These were contained in layer 8-4, but lay on the surface of layer 9-1. The ash spread comprised a very hard, whitish grey lens flecked with numerous large pieces of charcoal. The hearths were circular and distinct, being filled with charcoal. Three radiocarbon determinations have been processed from each of these features. They indicate early Bronze Age occupation in the 11th century BC (Table 2:1). Burials 97 and 99 were cut from at least layer 8:4 to this depth. The former was accompanied by four ceramic vessels placed beyond the head, and no fewer than six bivalve shells. Two were found to the left of and beyond the head. Two lay at the left shoulder, one was found under the cranium, and the last one had been placed under the left arm.

There are three radiocarbon determinations from this context. They are designated early Bronze Age occupation in terms of their cultural affiliation (Higham and Higham 2009). The set of dates indicates that the Bronze Age burials cut down to this layer are later than 1114-955 cal. BC. The ceramic vessels found with the three earliest graves are similar to those from Bronze Age 2-3 burials in the main square, although no bronzes have been found interred with them.

TABLE 7:1 *The artefacts from area Y layer 9*

Layer	9.9	9.8	9.7	9.6	9.5	9.4	9.3	9.2	9.1
Bronze	0	0	0	1	0	0	11	3	3
Shell bangle	1	1	0	0	0	1	1	0	0
Stone Adze	0	0	1	0	1	0	0	0	0
Crucible	0	0	0	0	0	0	2	0	3
Mould	0	0	0	0	0	0	0	1	1
Clay Anvil	0	0	0	0	0	0	0	0	1
Clay bangle	0	0	0	0	0	0	0	0	1
Whetstone	0	0	0	0	0	0	1	1	1
Worked bone	0	0	0	0	0	0	0	1	0
<i>Bos</i> figurine	0	0	1	0	0	0	1	1	0
Marble bangle	0	0	0	0	0	0	1	0	0

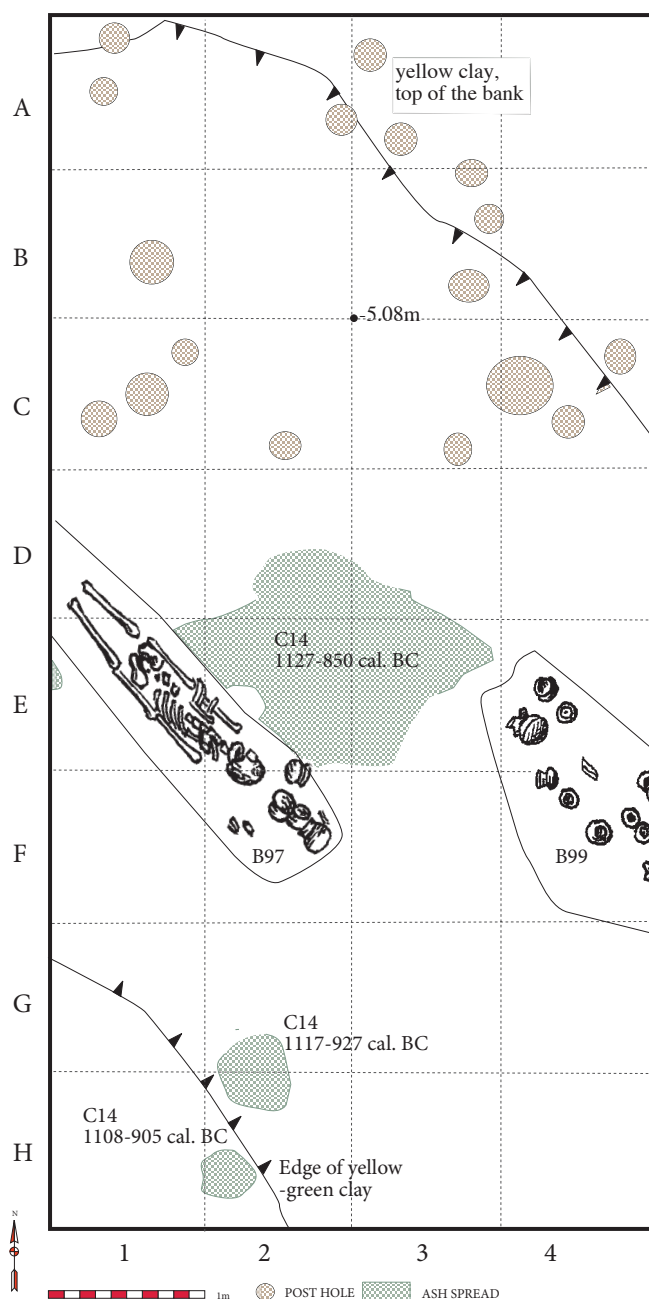


FIG. 7:9 Plan of layer 9:1

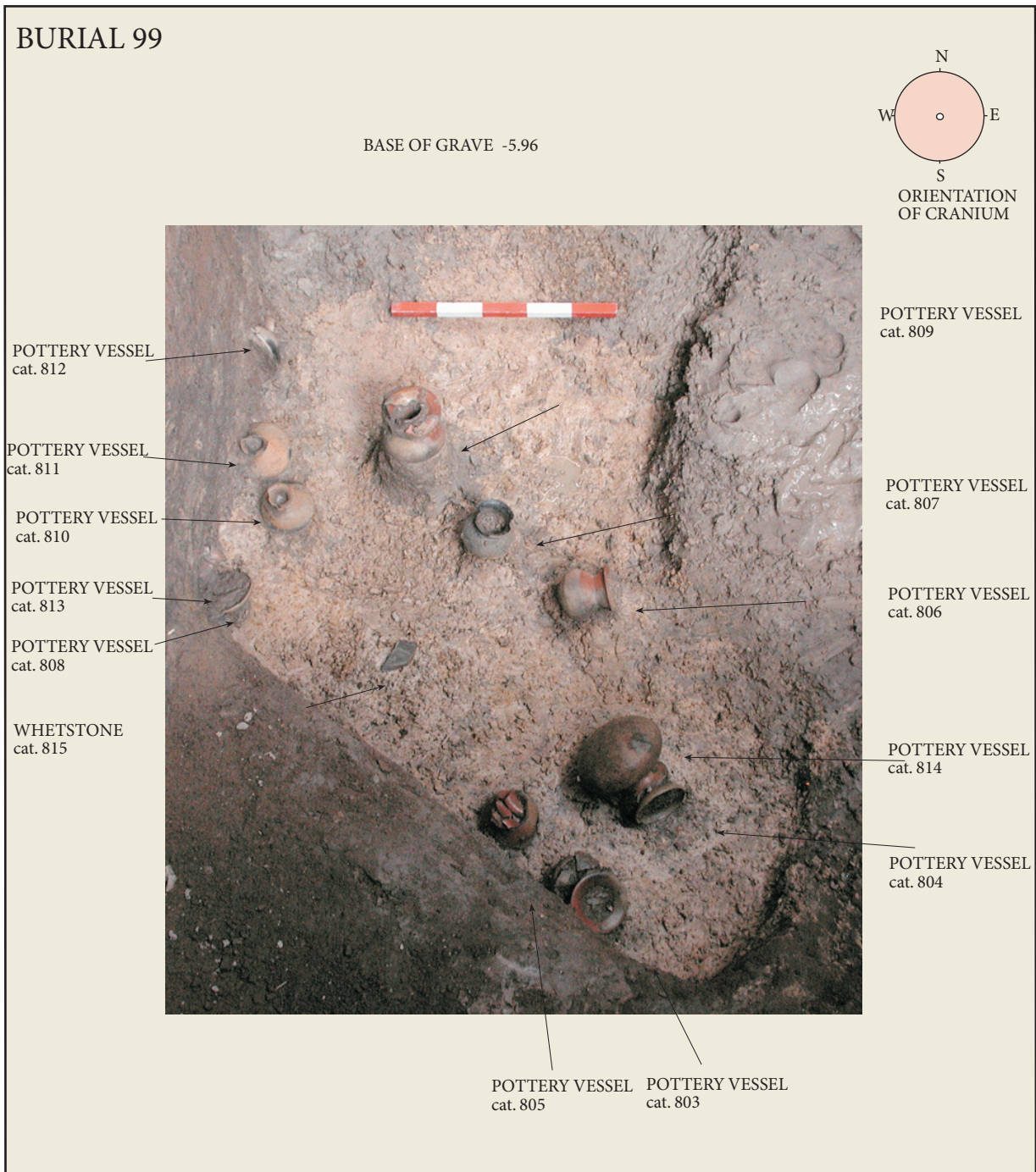


FIG. 7:10 Burial 99

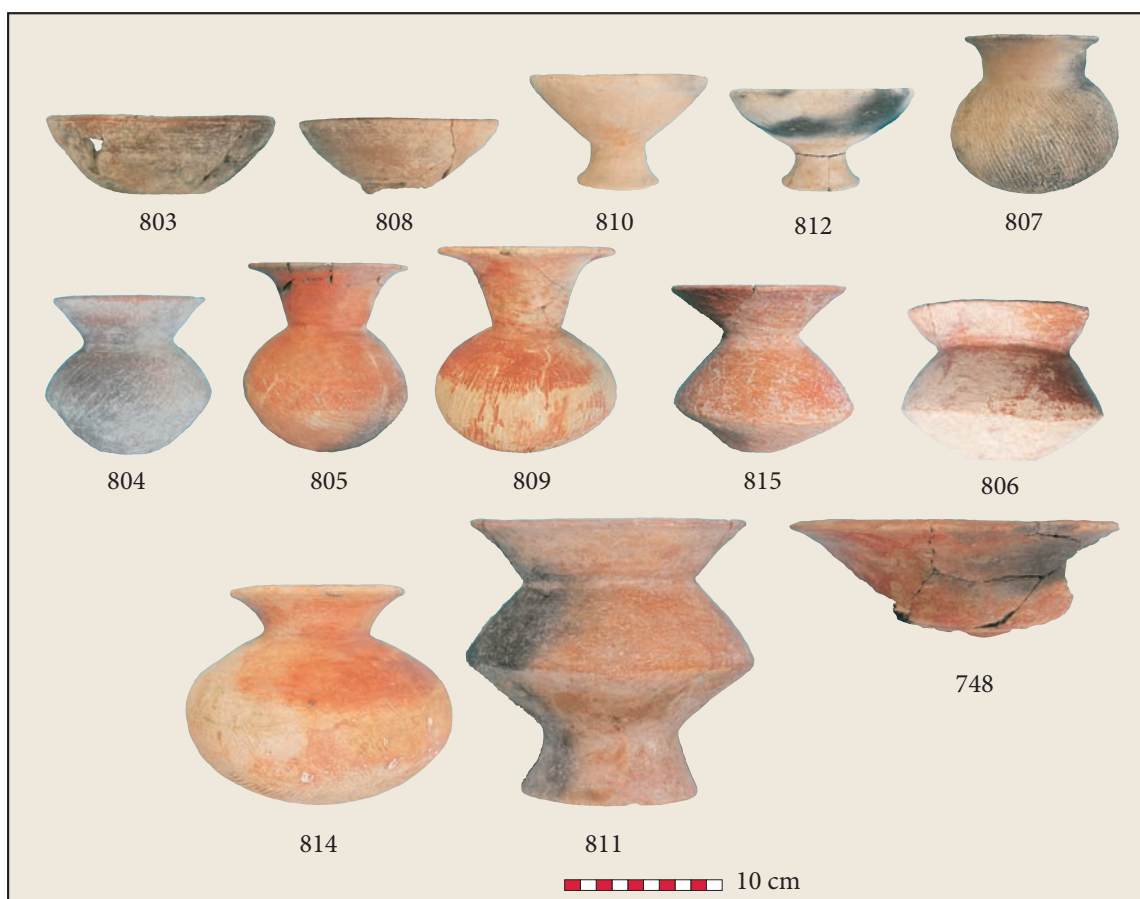
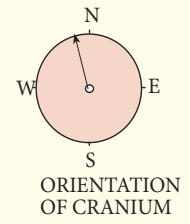


FIG. 7:11 Ceramic vessels from burial 99



FIG. 7:12 The ceramic vessels from burial 96

BURIAL 94
ADULTCRANIUM
- 5.15 mPOTTERY VESSEL
cat. 737POTTERY VESSEL
cat. 740

10 cm

POTTERY VESSEL
cat. 737BIVALVE SHELL
cat. 738"BANDOLIER"
cat. 739BIVALVE SHELL
cat. 19341

scale 20 cm

FIG. 7:13 Burial 94

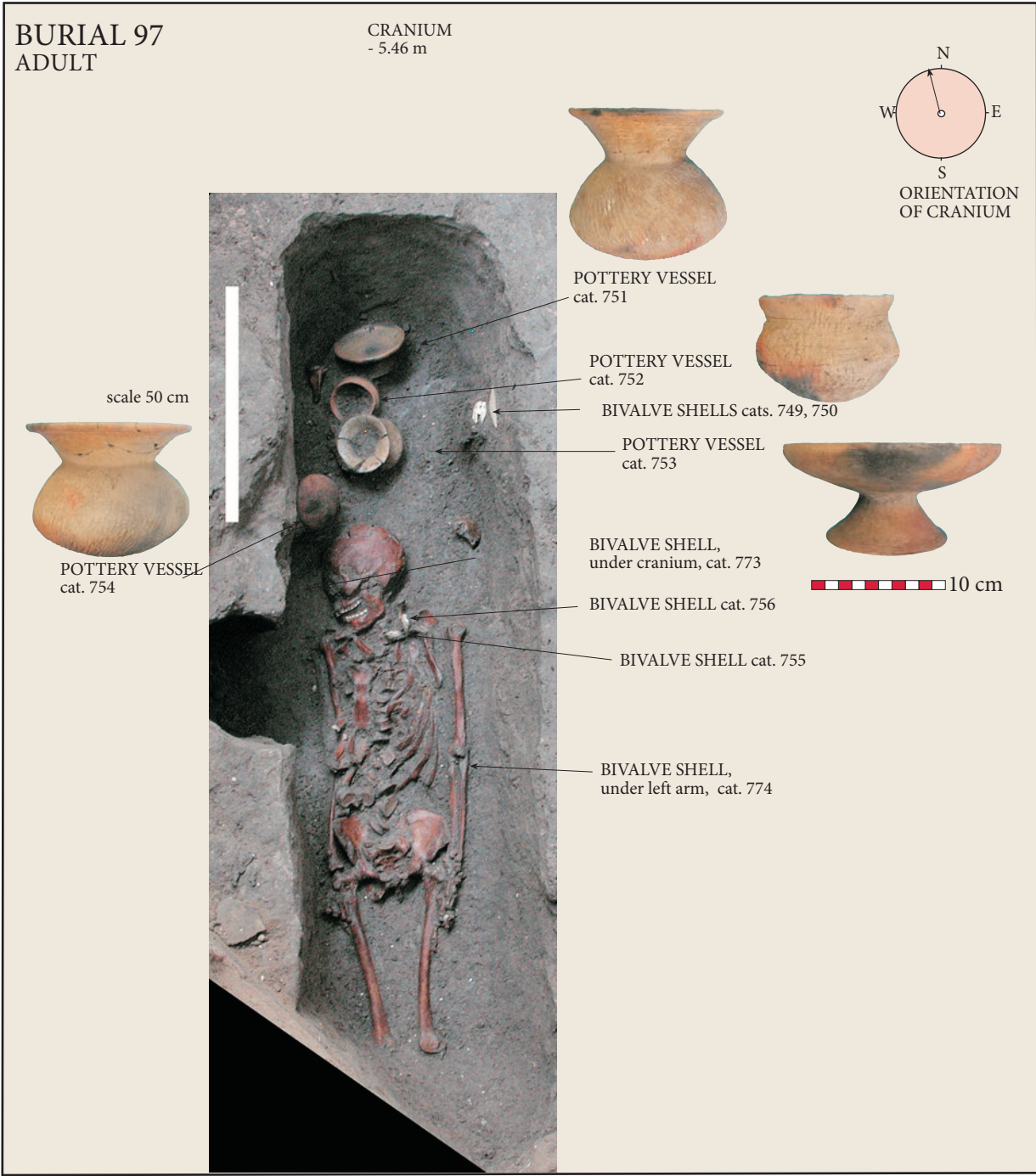


FIG. 7:14 Burial 97

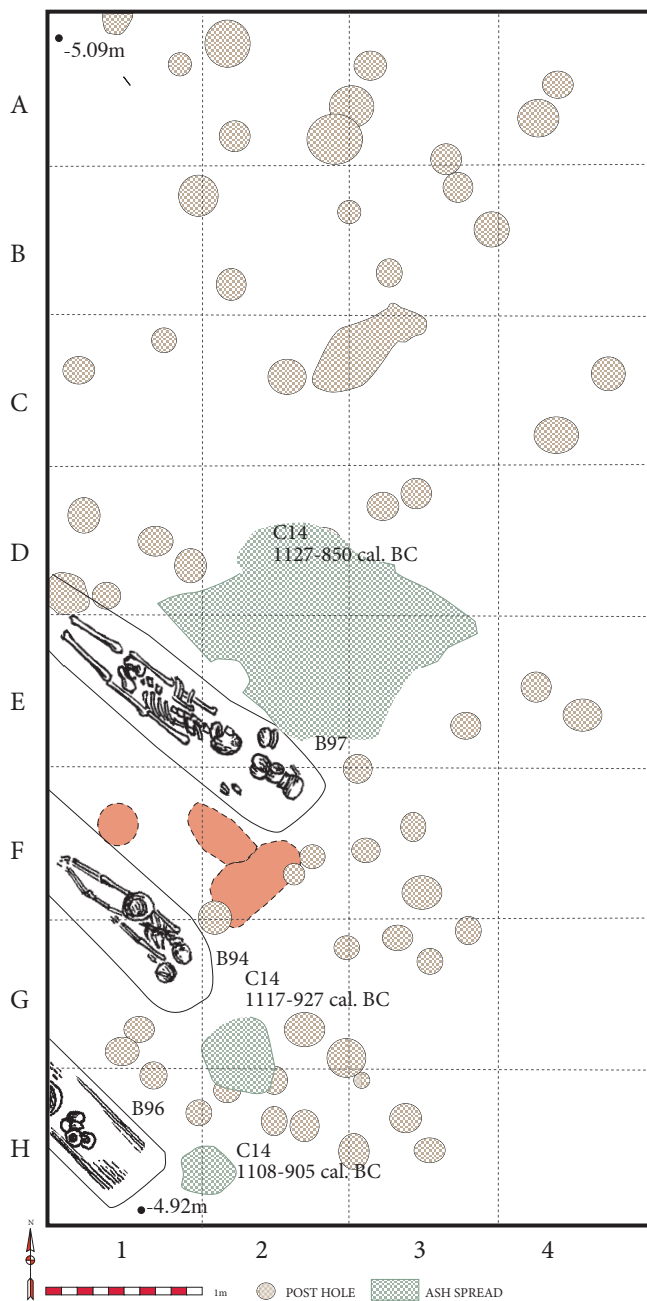


FIG. 7:15 The features on the surface of layer 8:4

TABLE 7:2 *The artefacts from area Y layer 8*

Layer	8.4	8.3	8.2	8.1
Conical roller	0	0	0	2
Bronze	2	8	3	3
Spindle whorl	0	0	0	1
Shell bangle	0	0	2	0
Stone adze	1	2	1	0

LAYER 8:4

This layer contains many postholes and a small number of pits. Three hearths have provided radiocarbon determinations that provide a *terminus post quem* for burials 94, 96 and 97. These burials are assigned to Bronze Age 2-3, and have been dated to the 10th century cal. BC. They were disposed in row with the head directed to the southeast or the northwest. Only the feet of burial 96 were located within the excavated area. The mineralised wooden coffin was well preserved.

Five ceramic vessels lay beyond the feet of this individual. Typologically they lie within Bronze Age 2-3. One was decorated with a series of red painted bands on the lower half of the body (cat. 728). When compared with funerary offerings in the main square, this vessel is most similar to those of Bronze Age 2. In the case of cat. 725 (Fig. 7:16), the interior reveals a design made up of incised cross-hatched lines. These too are found in Bronze Age 2 contexts.

Two fragments of bronze, and parts of one clay mould and a crucible were found in this layer. Three crucible fragments were found in the grave fill of burial 99, together with a whetstone.

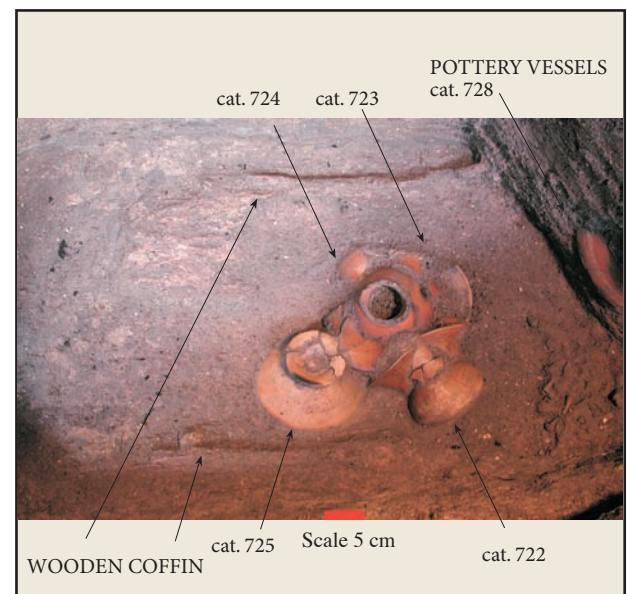


FIG. 7:16 Burial 96

Layer	8.4	8.3	8.2	8.1
Crucible	1	0	0	0
Clay anvil	0	2	0	1
Clay bangle	1	2	0	1
Whetstone	0	0	0	1
Worked bone	0	0	0	1
Marble bangle	0	0	0	2
Clay pellet	0	0	1	0

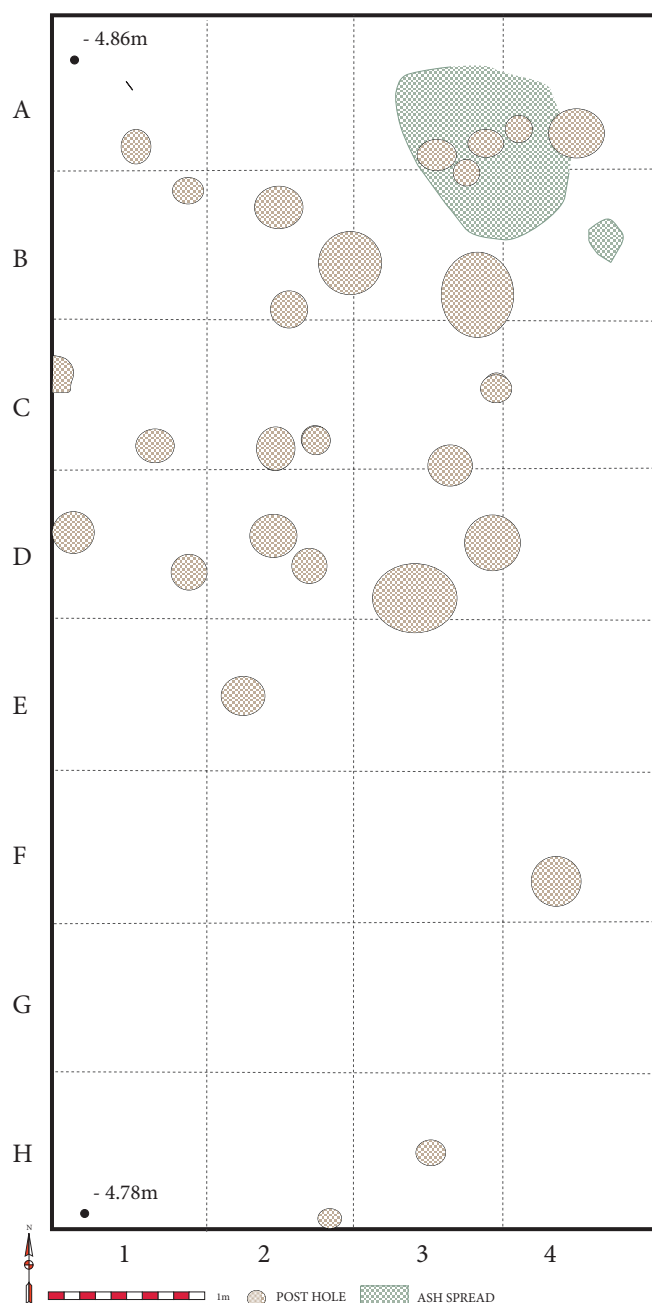


Fig. 7:17 The features on the surface of layer 8:3

Layer 8:3 contains a concentration of post holes in the northern area, where there is overall, a thin lens of sand. Eight fragments of bronze were recovered in this layer, together with two stone adzes, two clay bangles and two clay potters' anvils.

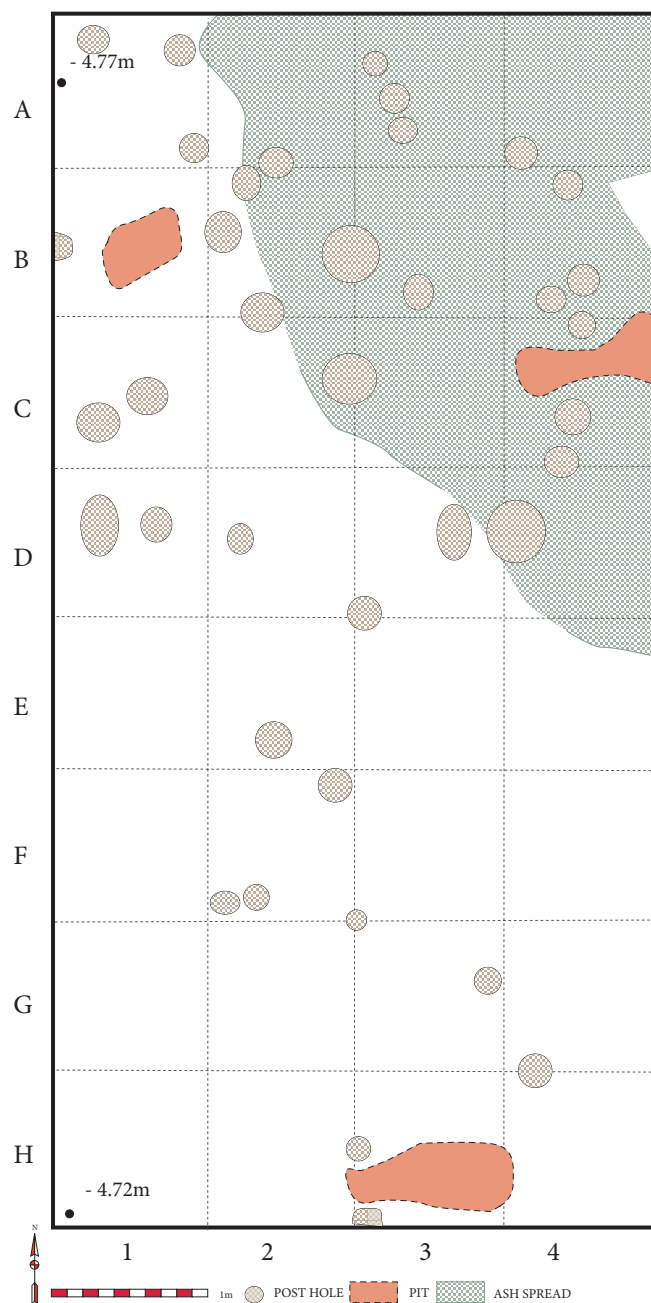


Fig. 7:18 The features on the surface of layer 8:1

Layer 8 is characterised by an abrupt transition from dark brown to light grey clays. The surface in the northeast of the excavated area is covered by an ashy lens. Overall, the surface contains many shell fragments, potsherds and charcoal. There is a possible grave cut in area B4. Layer

8:2 (not illustrated), only contains two postholes but remains rich in fragments of shell and potsherds. Layer 8:1 contains the earliest conical rollers and a spindle whorl from this part of the site (Table 7:2).

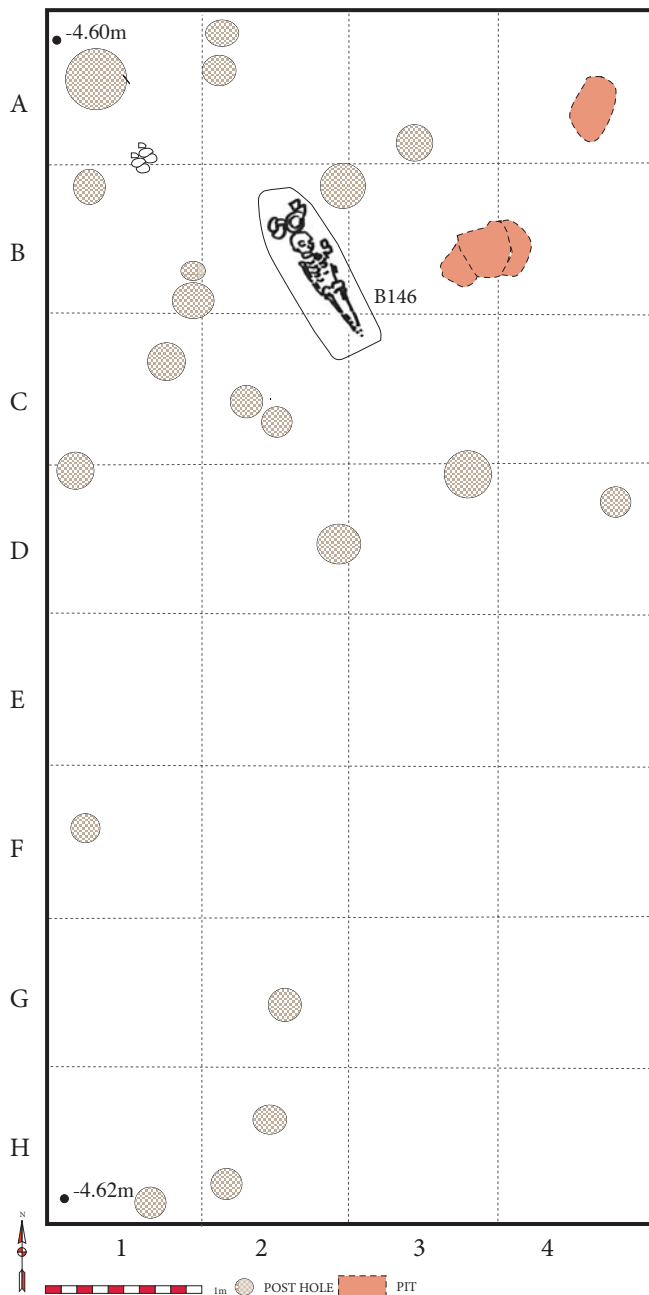


Fig. 7:19 The features on the surface of layer 7:14

LAYER 7

Layer 7:14 contains a series of post holes, and two pits. The grave of an infant who died when between 1 and 2 years of age was found in this level.

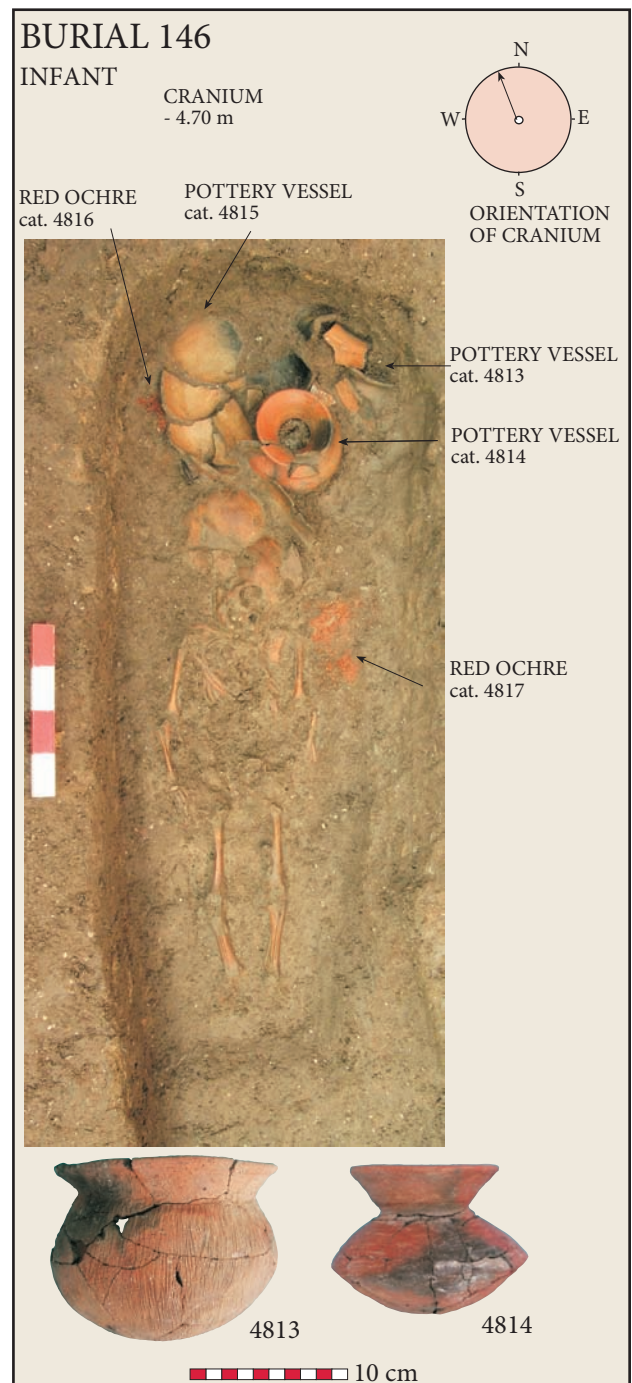


Fig. 7:20 Burial 146

This infant was interred with the head orientated to the northwest. Three ceramic vessels and two areas of red ochre were placed with the corpse. The vessels belong to the early Bronze Age.

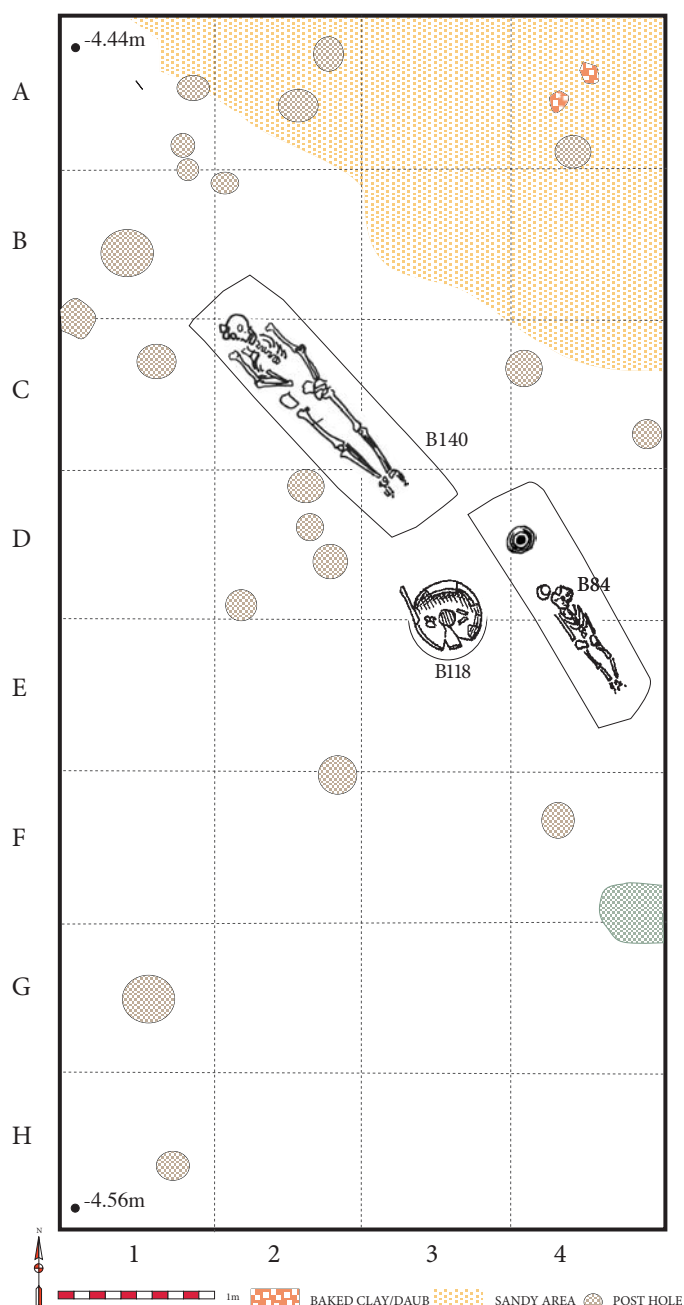


FIG. 7:21 The features on the surface of layer 7:13

Layer 7:13. In the northeast corner of the excavated area, there is a mottled sandy lens, on top of which there are two areas of burnt clay. Several postholes were cut down from this layer. There are also three Bronze Age graves, cut down to this depth. The adult burial 140 contained no grave offerings. Beyond its feet lay the graves of two infants. Burial 84 involves an infant aged approximately two years at death. It lies on the same orientation as burial

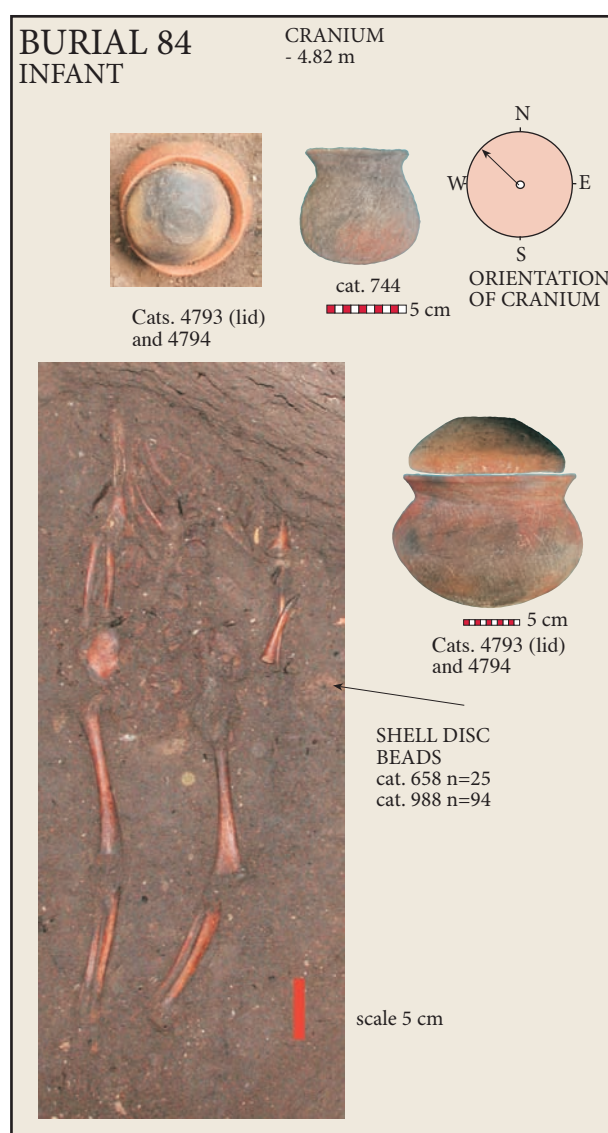


FIG. 7:22 Burial 84

140, and was associated with three ceramic vessels, and six shell disc beads found in the region of the pelvis. The form of the pots is generalised and it is not possible to place them with confidence into any of the Bronze Age periods defined in the main square. Burial 118 is a jar burial containing the skeleton of a neonate. The form of the large vessel containing the human remains has not been matched elsewhere on the site, or indeed in the region (Fig. 7:23).

Four of the enigmatic conical rollers were found in this layer. There was also a crucible fragment and three pieces of bronze.



FIG. 7:23 Burial 118

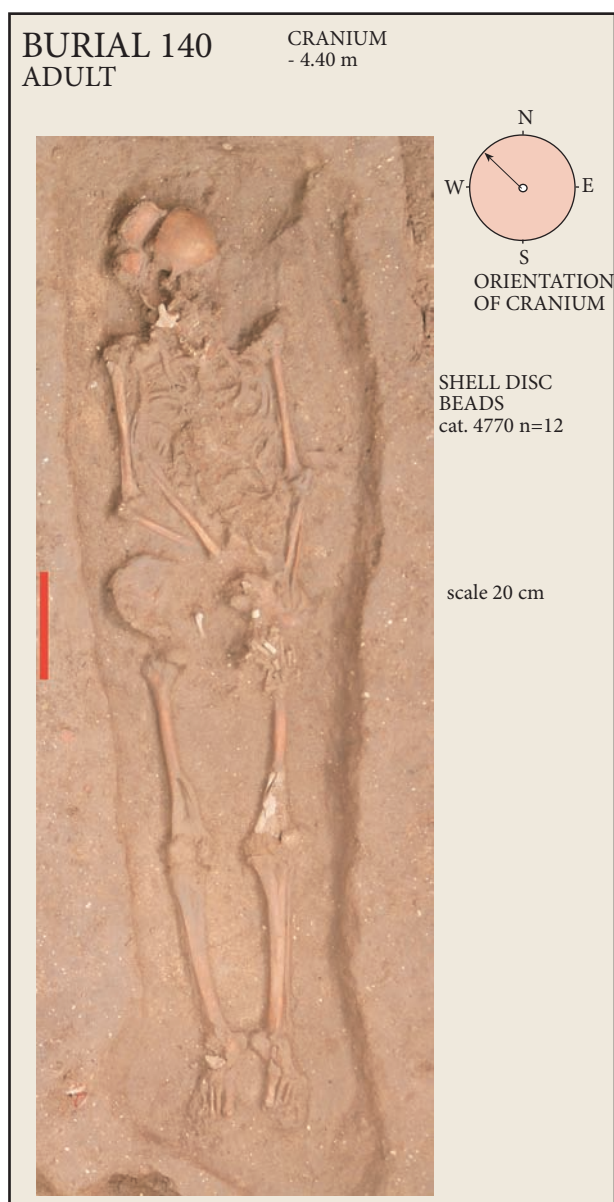


FIG. 7:24 Burial 140

With layer 7:12, the pattern of a Bronze Age cemetery can be identified. Burials were placed with the head pointing to the northwest, and involved adults and infants. Compared with the sequence in the main square, these burials correspond with Bronze Age 4. They were not well endowed with mortuary offerings. In the case of burial 85, an adult, two pots were found in the area of the cranium, and half a cowrie shell lay in the region of the feet. The partial remains of two other adults, burials 82 and 88, were also associated with one to three pots beyond the head, while the latter person also wore a marble bangle. The infant in burial 87 wore two shell bangles on each wrist, and ceramic vessels had been placed beyond the head and feet.

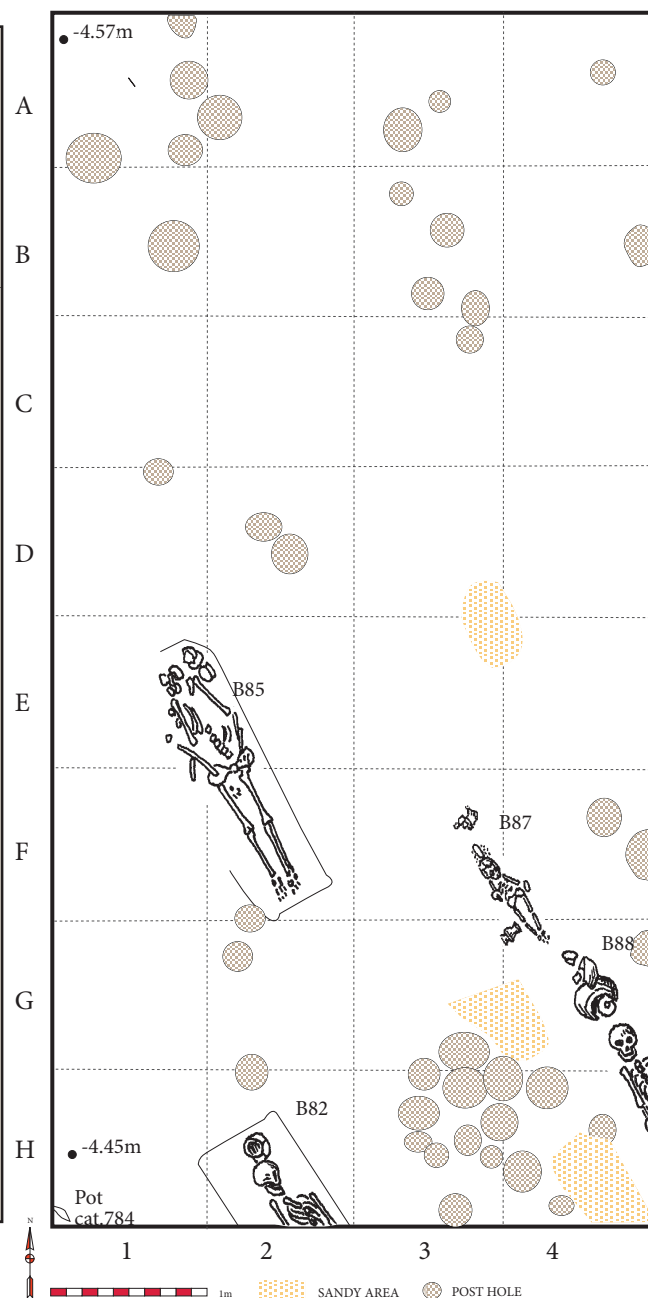
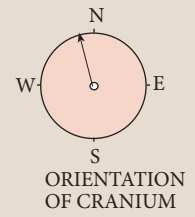


FIG. 7:25 The features on the surface of layer 7:12

A bivalve shell lay by the head, and there was also a patch of red ochre in the same region. Half a cowrie shell had been placed over the right thigh.

A complete ceramic vessel in the extreme southwest corner of the square suggests that a further burial lay just outside the excavated area. Several post holes and sandy lenses lay on the surface of this context, which also saw a marked reduction in the number of potsherds recovered from the general level. There was, however, a further increase in the number of conical rollers, and plentiful remains of bronze. Clay anvils, crucible fragments and shell bangles were also recovered.

BURIAL 82
ADULTCRANIUM
- 4.33 m

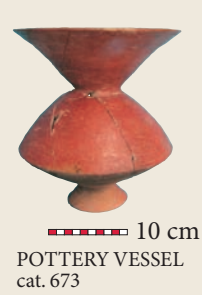
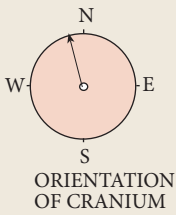
scale 10 cm

CLAY PELLET
cat. 645POTTERY VESSEL
cat. 644TROCHUS BANGLE
at right elbow
cat. 727 10 cm

FIG. 7:26 Burial 82

BURIAL 88
ADULT

CRANIUM
- 4.56 m



SHELL DISC
BEADS
cat. 656 n=20

MARBLE BANGLE
cat. 676



POTTERY VESSEL
cat. 673



POTTERY VESSEL
cat. 674

POTTERY VESSEL
LID cat. 675



scale 2 cm

FIG. 7:27 Burial 88

BURIAL 87 INFANT



1544

10 cm

CRANIUM
- 4.59 m



POTTERY VESSELS cats. 685 and 1544

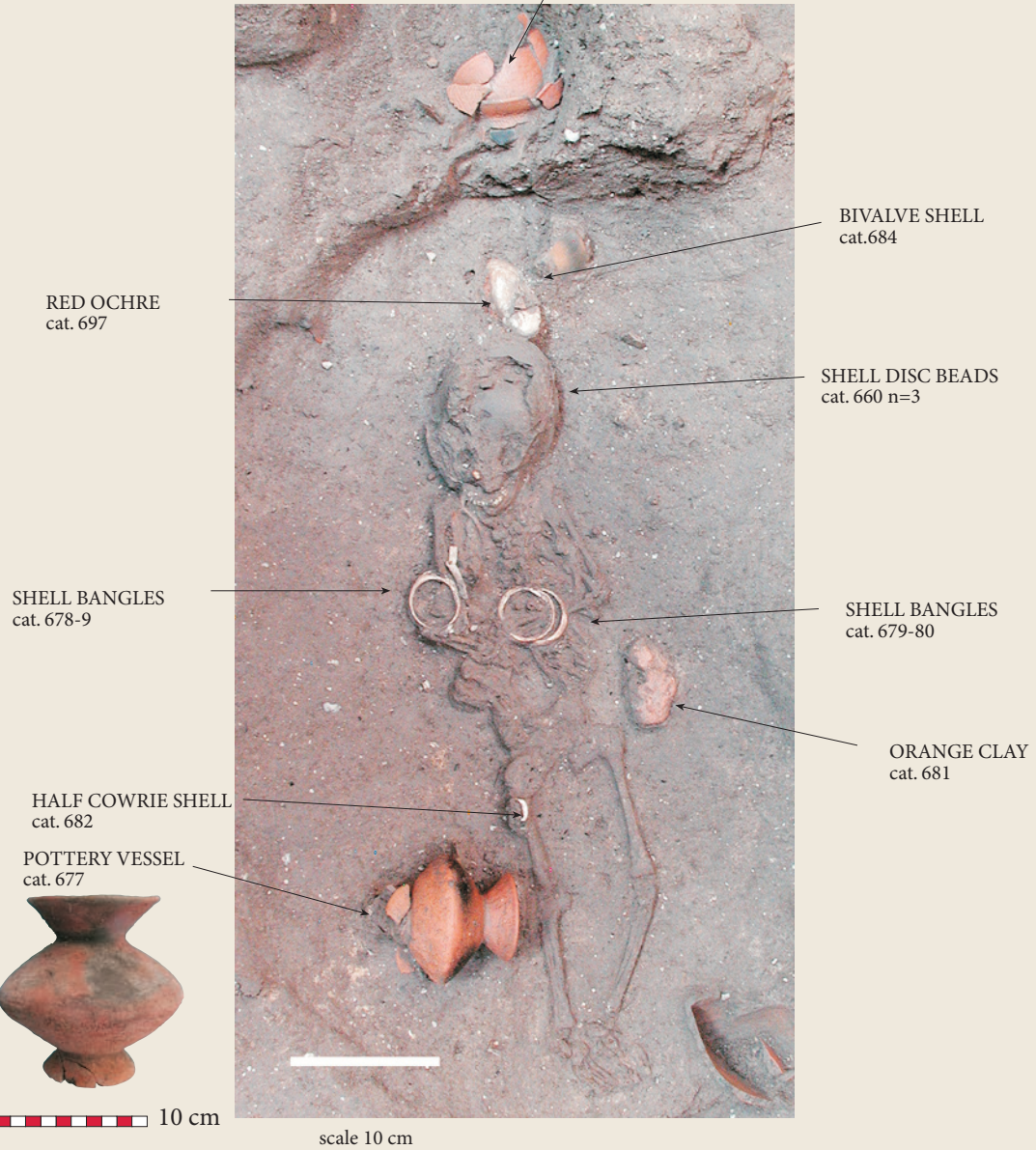
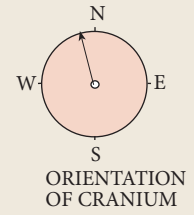


FIG. 7:28 Burial 87



FIG. 7:29 Burial 85

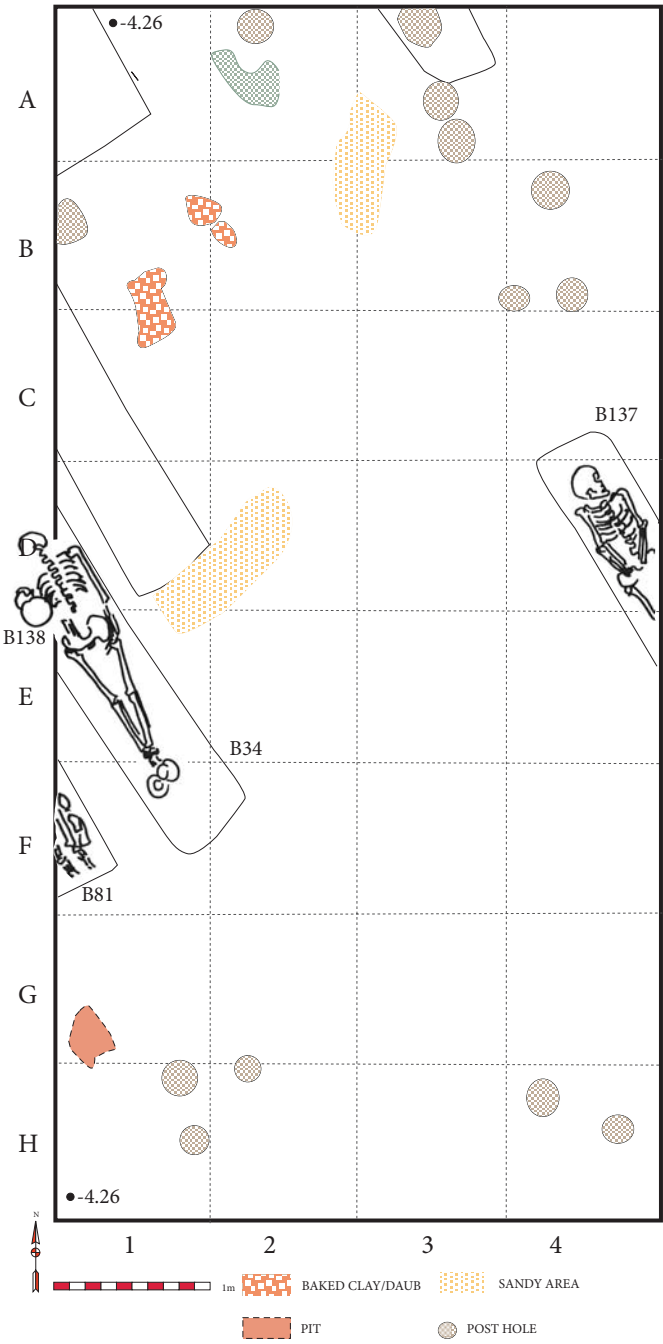


FIG. 7:30 The features on the surface of layer 7:11

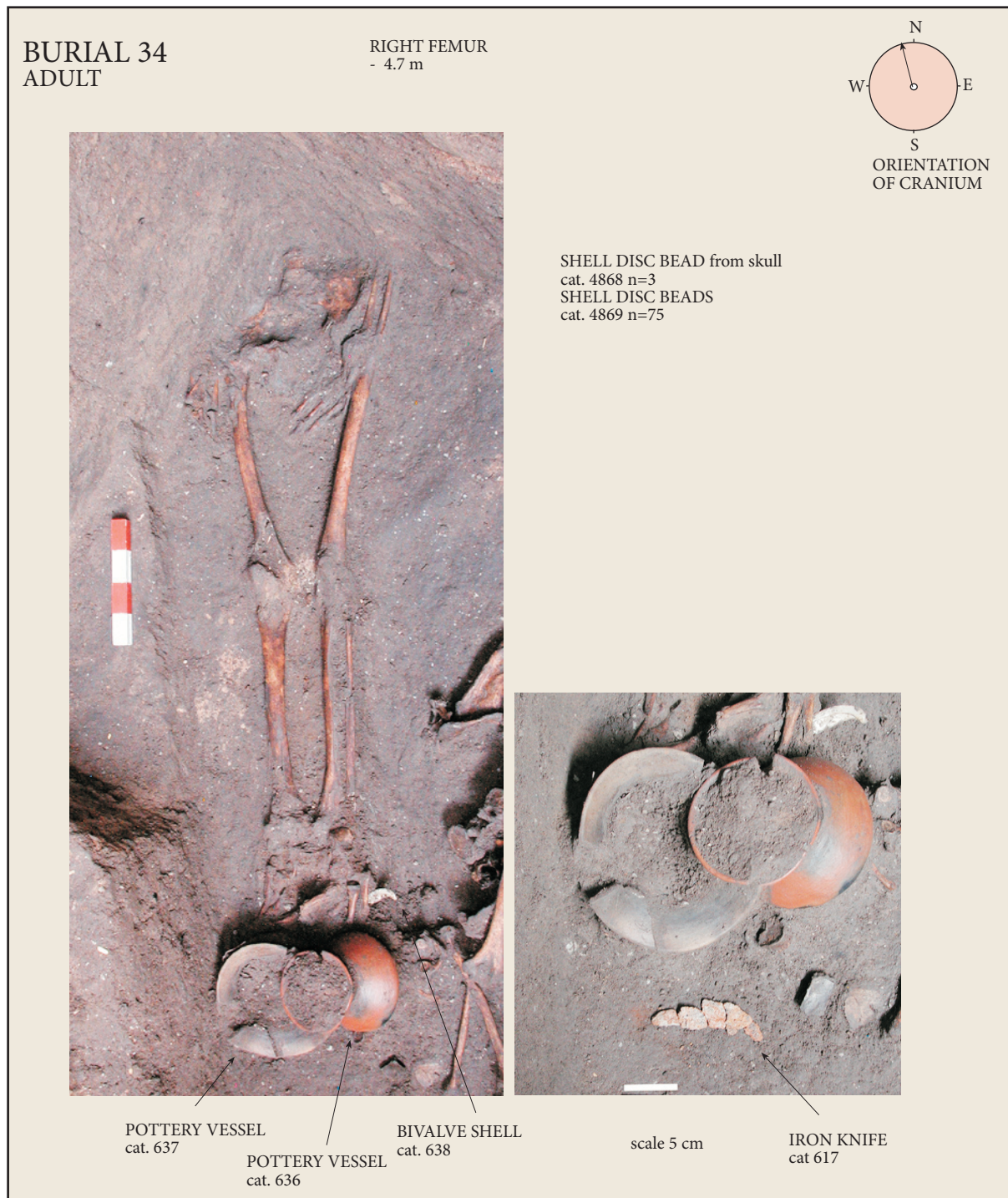


FIG. 7:31 Burials 34 and 138

Layer 7:11 continues to incorporate post holes and Bronze Age 4 burials. There are also features that have the form of grave silhouettes, but the interments would be found beyond the excavated area.

Burial 34 was only partially located in the excavated area (Fig. 7:31). The cut for this grave was identified at a depth of 4.17 m below datum, the femur lay 4.7 m below

datum. This burial seems to have disturbed burial 138, the skull of the latter lying beside the right arm of burial 34. Two standard Bronze Age 4 ceramic vessels were found at the ankles, adjacent to a bivalve shell. Three shell disc beads were found on the skull, and a further 65 on the upper body. A fragmentary shell bangle might have belonged to this person as well.



FIG. 7:32 Burial 81



FIG. 7:33 Burial 137

Only the foot bones of burial 81 were found in the excavated area. A bowl was present beside the left ankle. This grave was cut from 4.00 m below datum down to a depth of 4.47 m.

Burial 137 was found at a depth of 4.34 m below datum. The upper body alone was found in the excavated area. No grave goods were associated with this part of the burial.

In terms of cultural items found in layer 7:11, the number of bronze items rose to 17, while four crucible fragments and eight conical rollers were also recovered. The first iron artefact was found, in the form of a possible knife, but this must be viewed in the light of its presence in a cemetery area with much disturbance being involved.

Layer 7:10 incorporates several areas of compact shelly orange lenses, and three hearths. Burials 75-6 are cut down to this level. This is a double burial, containing the remains of a man (burial 75) and a woman. The latter wore two shell bangles on her left wrist, and both were buried with a bivalve shell under a knee. Otherwise, these two individuals had no mortuary offerings. Conical rollers and fragments of bronze dominate the artefacts from this context.

Layer 7:9 contains a series of postholes, and three small pits. Fifteen conical rollers and nine fragments of bronze were present.

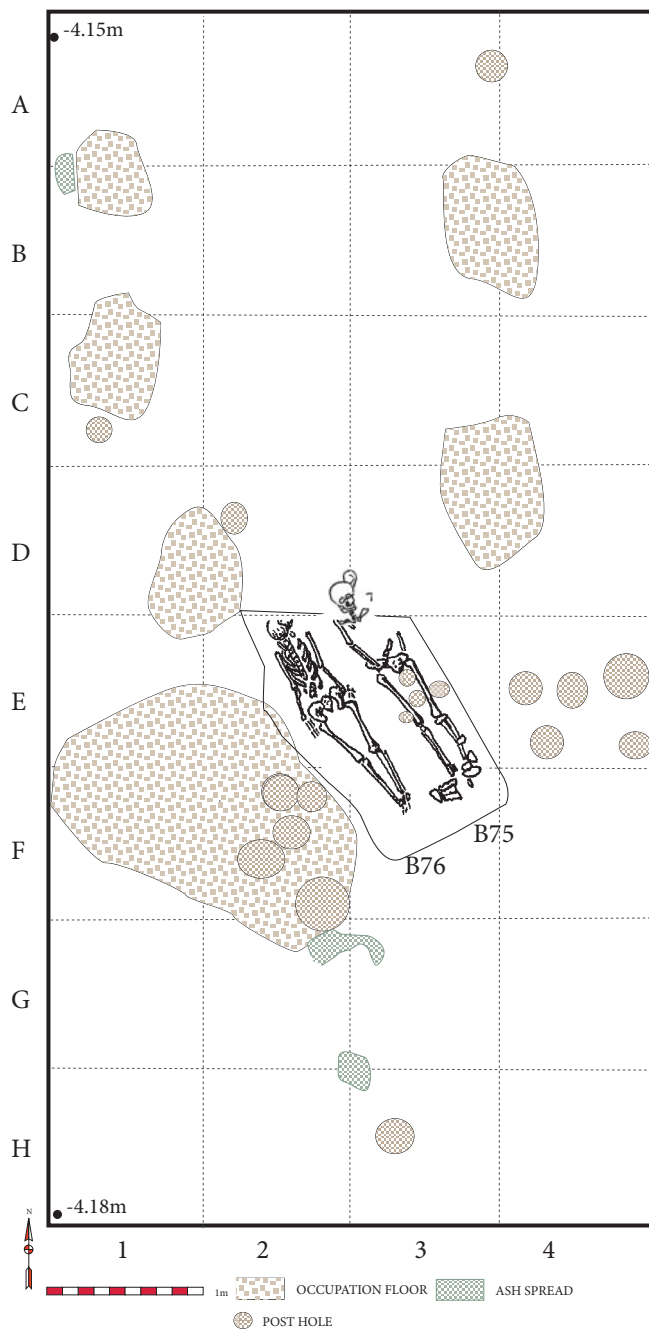


FIG. 7:34 The features on the surface of layer 7:10

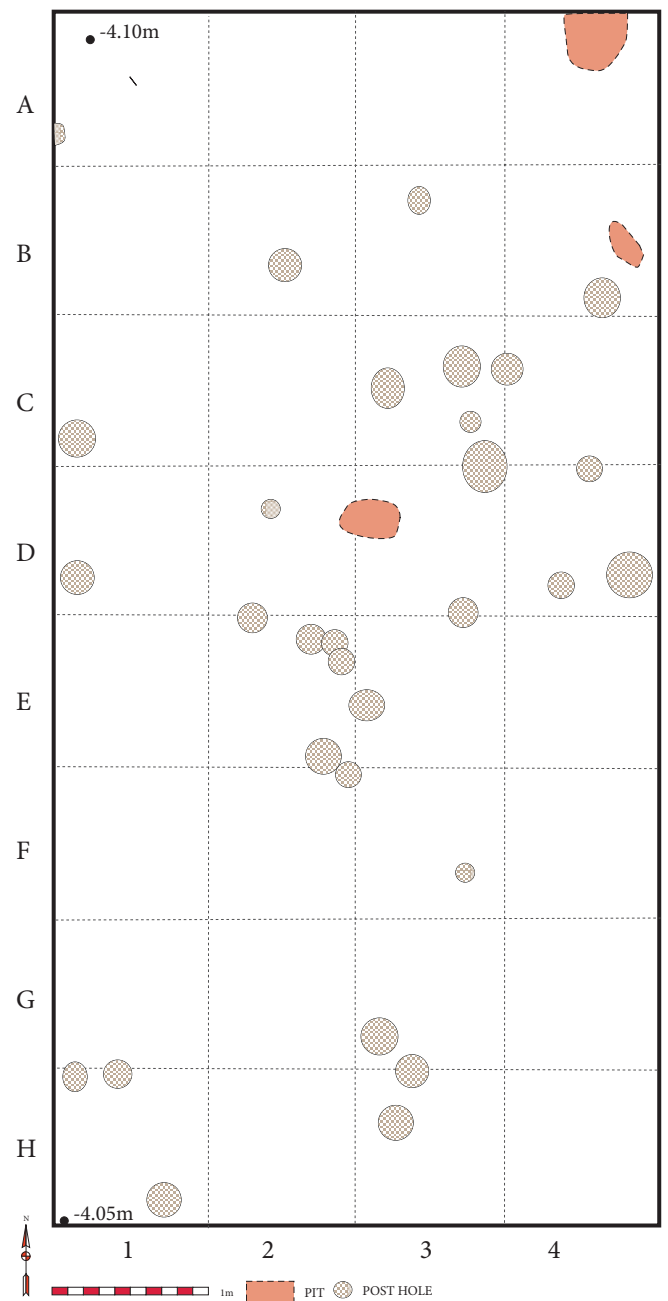


FIG. 7:35 The features on the surface of layer 7:9



CRANIUM
- 4.42 m

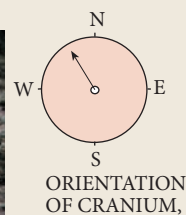


FIG. 7:36 Burials 75 and 76

[illegible]

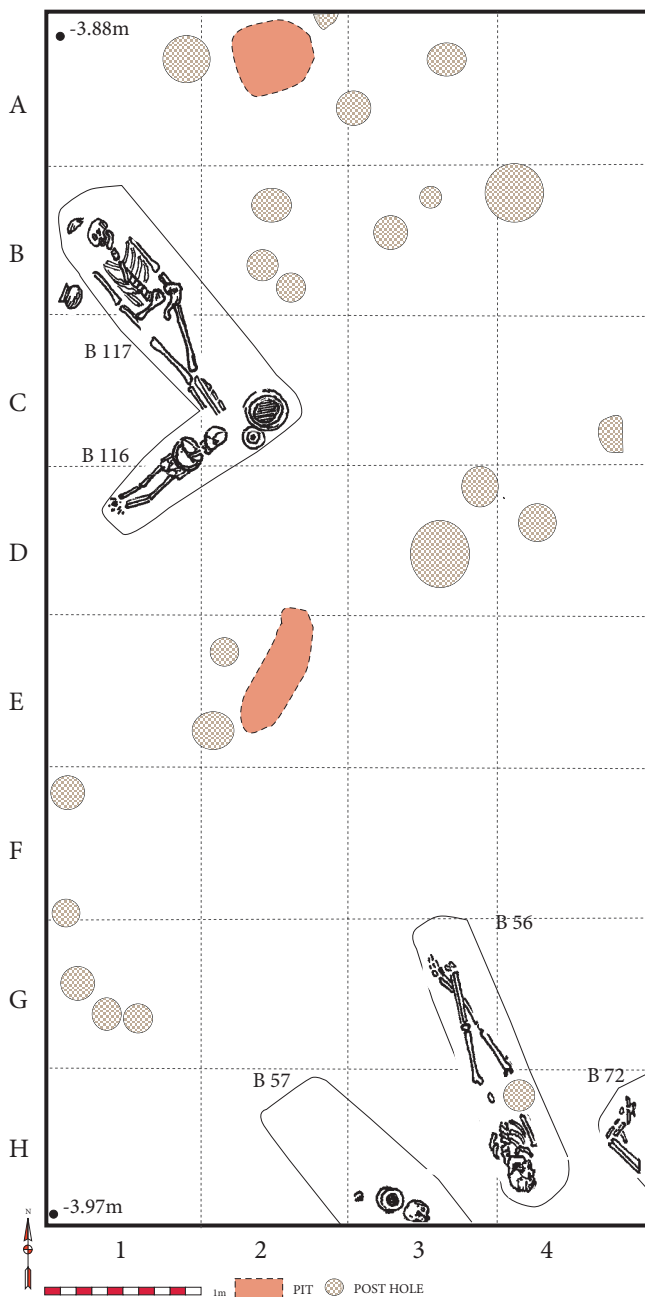


FIG. 7:37 Layer 7:8

Layer 7:8 contained further Bronze Age burials, orientated to the northwest with one exception, that of an infant in burial 116, which was placed with the head to the northeast. These individuals were all very poorly endowed with offerings. Burial 56 had no grave goods. Burial 57 was only present to the neck area, but one ceramic vessel alone was found beyond the cranium. Only the foot bones of burial 72 were recovered, but there were no pots in association. Burial 117, an adult, had no associated grave goods, but



FIG. 7:38 Burial 56

the infant, burial 116, placed later over the feet of this individual, was associated with two ceramic vessels one of which has the form of Bronze Age 5 pots in the main square. In terms of artefacts found in this context, conical rollers, bronze fragments, spindle whorls and shell bangle fragments dominate.



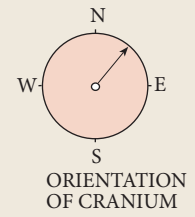
FIG. 7:39 Burial 57



FIG. 7:40 Burial 117

BURIAL 116
CHILD

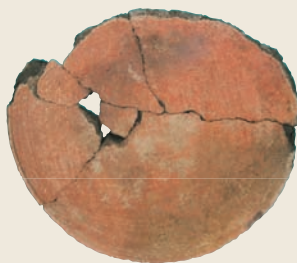
CRANIUM
- 3.87m



POTTERY VESSEL
cat. 4688

scale 20 cm

POTTERY VESSEL
cat. 4681



4689



4689

10 cm



4688

FIG. 7:41 Burial 116

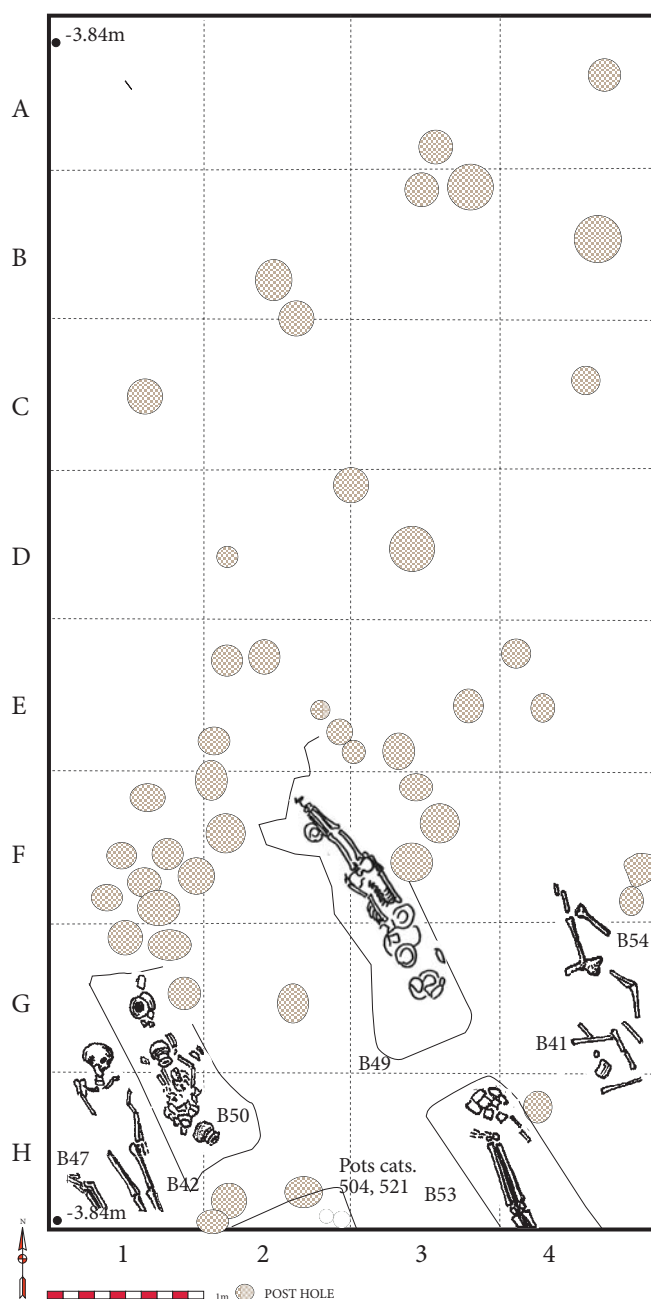


FIG. 7:42 The features on the surface of layer 7:7

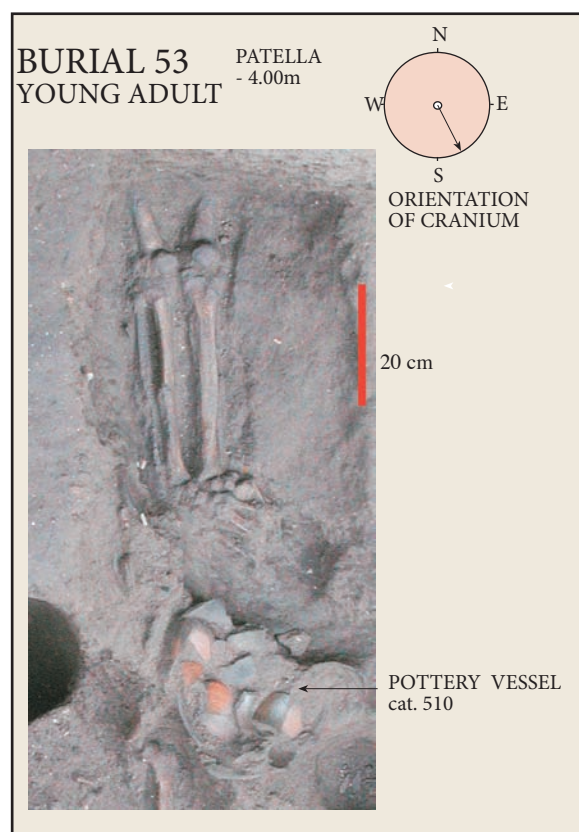


FIG. 7:43 Burial 53

Layer 7:7 contained seven inhumation burials, disposed on a similar orientation in a row. The heads were directed either to the northwest or the southeast. Burial 42 is represented only by the leg bones, and no artefacts were found in association. Burial 47 lay alongside it to the east, and it too lacked any mortuary offerings. In contrast, infant burial 50, positioned adjacent to burial 47, was associated with four ceramic vessels, a spindle whorl and a bivalve shell. The pots with this individual belong to Bronze Age 5. Similar vessels were found with burial 49, and again this grave contained a spindle whorl and a bivalve shell. A possible whetstone was also found beside the pelvis. Burial 53 was only partially found within the square, the pottery vessel found beyond the feet falling clearly into Bronze Age 5 forms. Burial 54 disturbed burial 41. It was associated with a Bronze Age 5 pot, a bivalve shell, a spindle whorl and a whetstone. The regular presence of spindle whorls is matched by the large assemblage of Bronze Age 5 burials in the main square. Two further vessels, which are probably associated with a burial to the south of the square, are also of Bronze Age 5 form (cats. 504, 521).

As with the previous contexts, bronze, conical rollers and spindle whorls are numerically dominant.

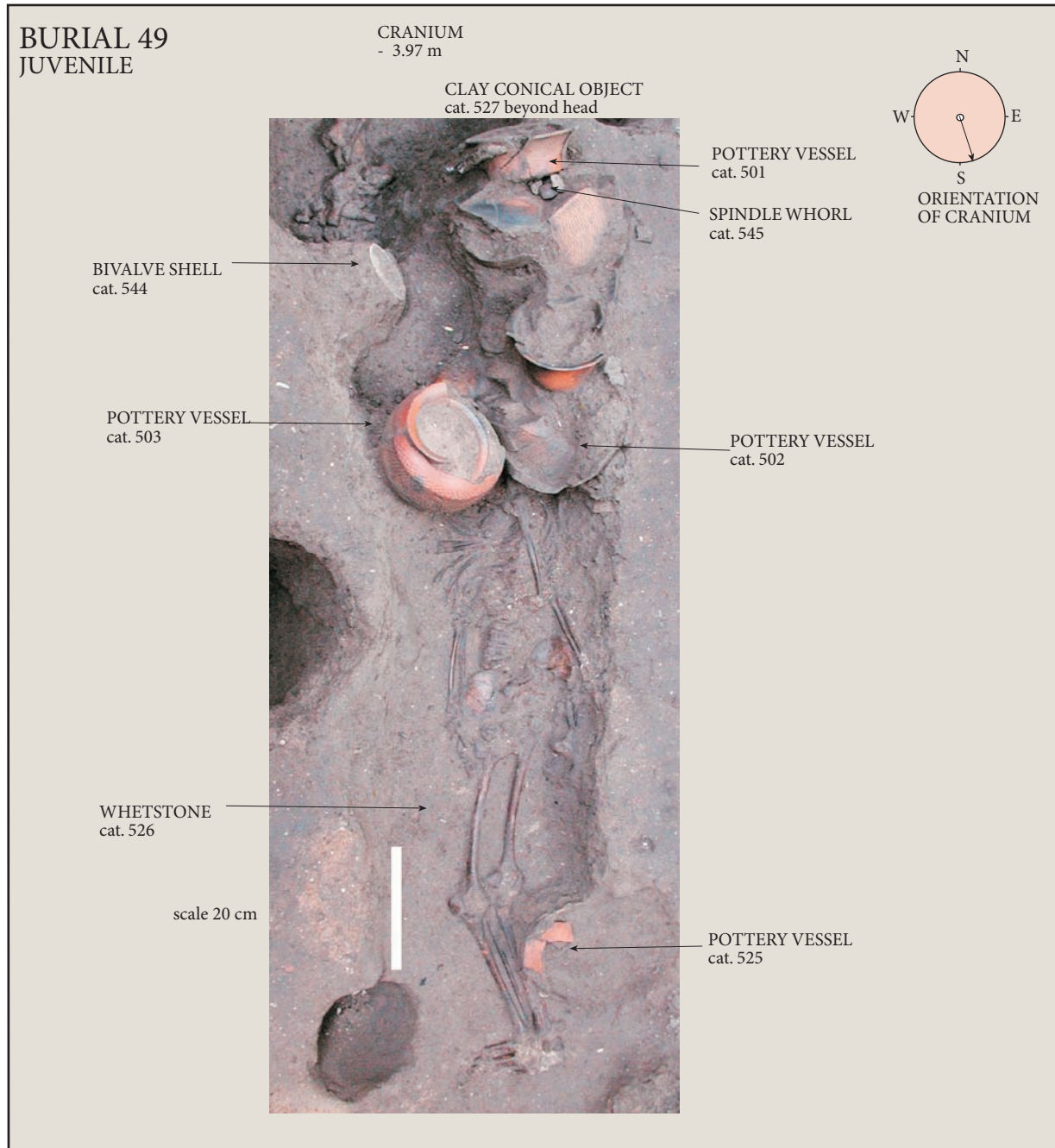


FIG. 7:44 Burial 49



FIG. 7:45 The ceramic vessels from burial 49 (top row), burial 50 (second row) and cat. 1543, burial 53 cat. 510, burial 54 cat. 542, Y1 layer 7:7 cat. 504

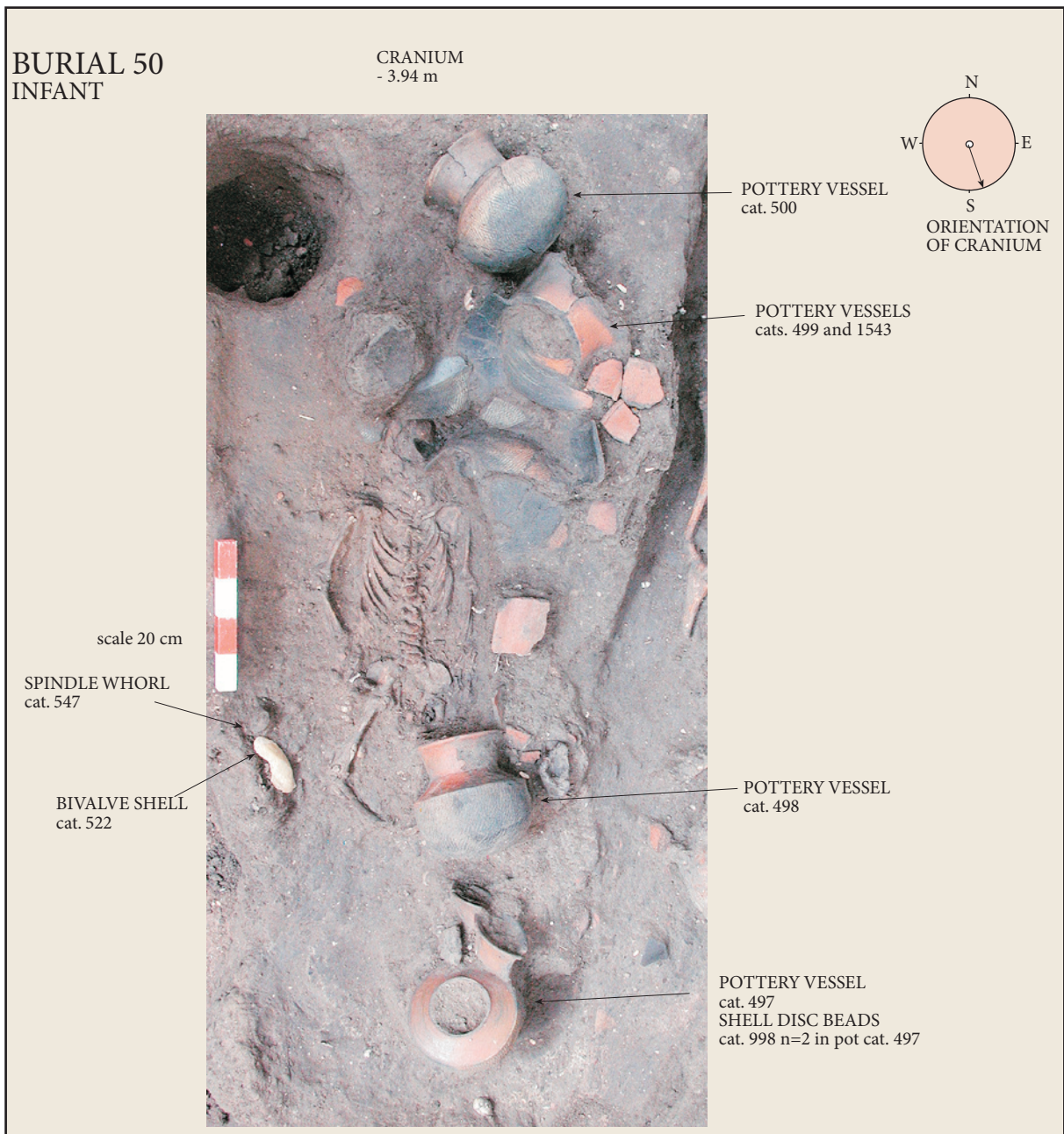


FIG. 7:46 Burial 50



FIG. 7:47 Burial 54



FIG. 7:48 Burial 47, right and burial 42

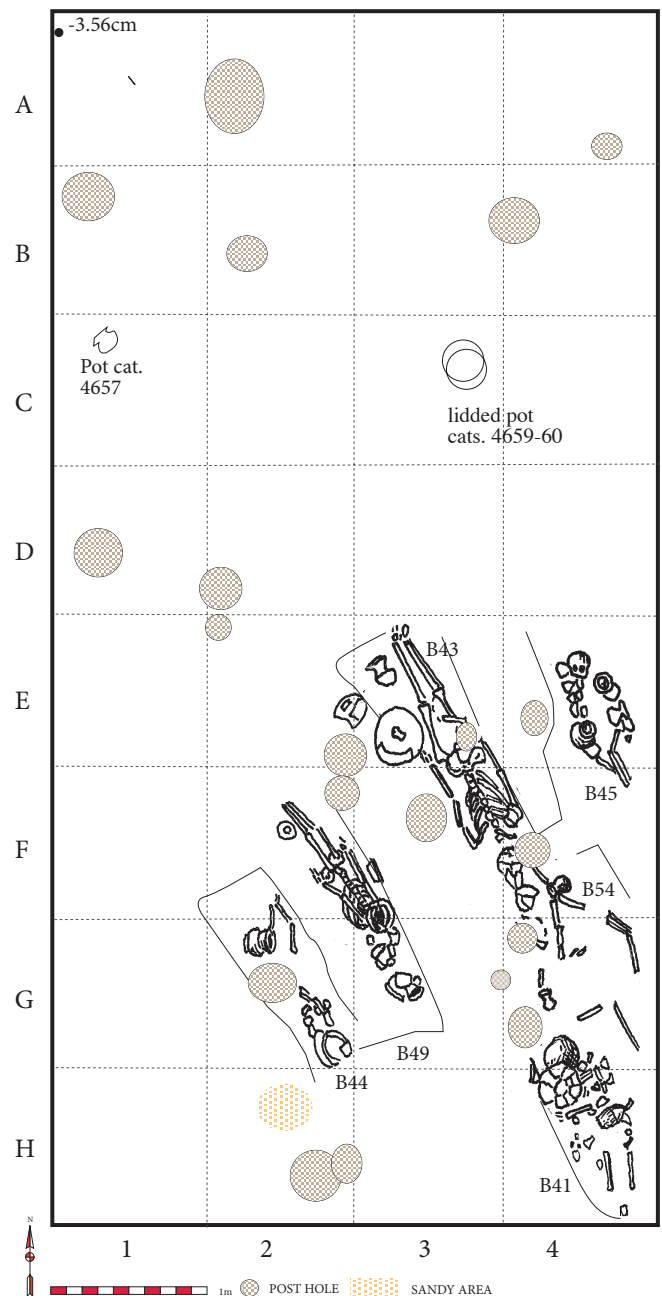


FIG. 7:49 Layer 7:6

Layer 7:6 saw further Bronze Age 5 burials. Burial 44, a 3-5 year old, lay adjacent to burial 49 and on the same orientation, with the head directed to the southeast. Two ceramic vessels are placed with this individual, one over the head and the other beside the left knee. There was also a spindle whorl and a bivalve shell beside the head, and half a bronze bangle might have been associated, but it was not found on the body. A similar set of offerings was

found with the adult burial 43, which was also laid out on the same orientation. Three pots were found beyond or beside the head, with another beside the left knee. There was also a spindle whorl and a bivalve shell, the former above the knees, the latter at the left shoulder. A patch of red ochre was uncovered at the left shoulder. A second spindle whorl was found in the grave fill and might not be associated with this individual.

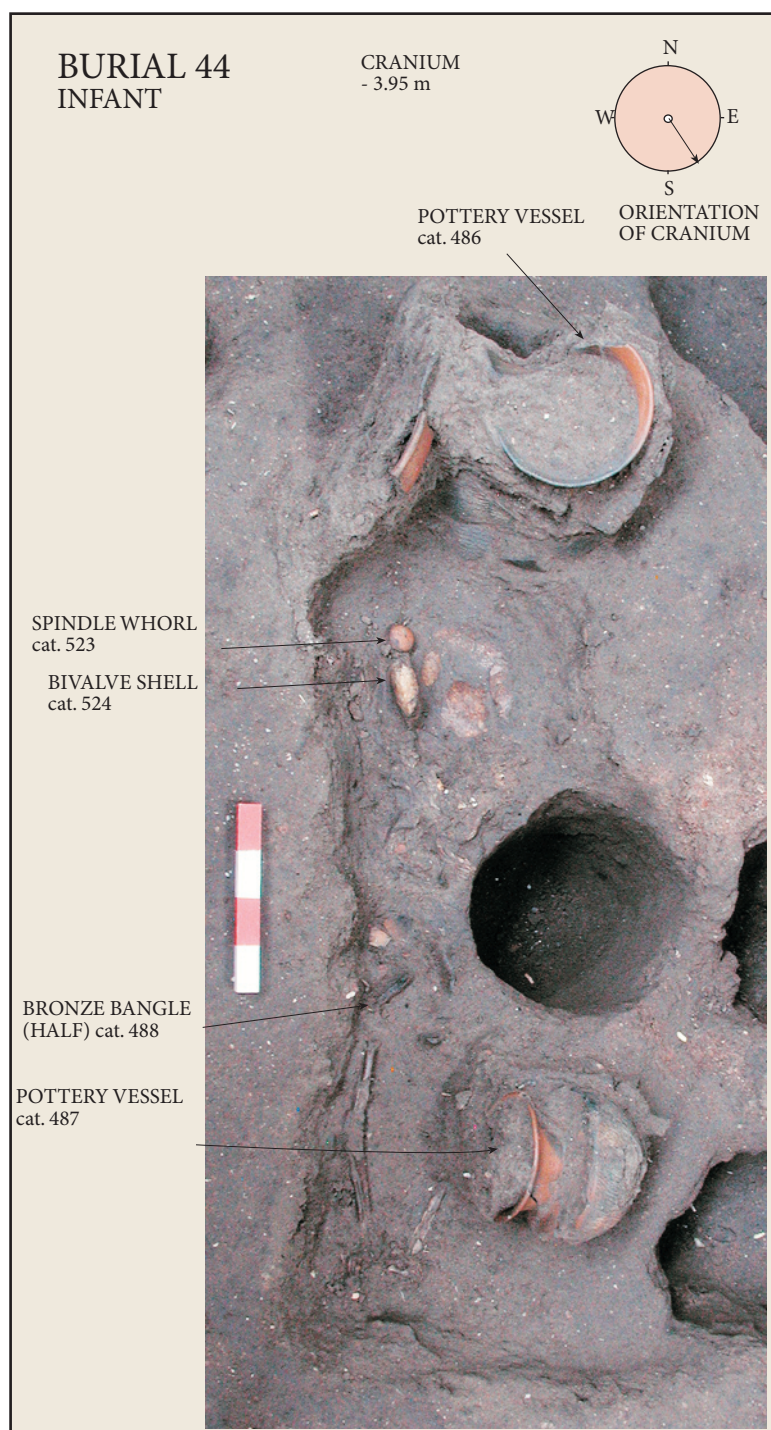


FIG. 7:50 Burial 44

Burial 45 contained the skeleton of a child aged about five years at death. The head was orientated to the northwest. Five ceramic vessels were associated, three in the area of the knees, and the other two over the shoulders. A spindle whorl lay beside the left thigh. Burial 41 was heavily disturbed. The tibia was found positioned vertically within a posthole. It is not possible to place the possible mortuary offerings found in the vicinity of the disturbed bones. There were the fragmentary remains of three ceramic vessels, as well as fragments of a shell and a bronze bangle.

Twenty-two conical rollers were found in this context, more than in any other. There were also three complete pottery vessels, of Bronze Age 5 form, that might have been part of the mortuary offerings in this cemetery. Bronze fragments and spindle whorls were relatively abundant.

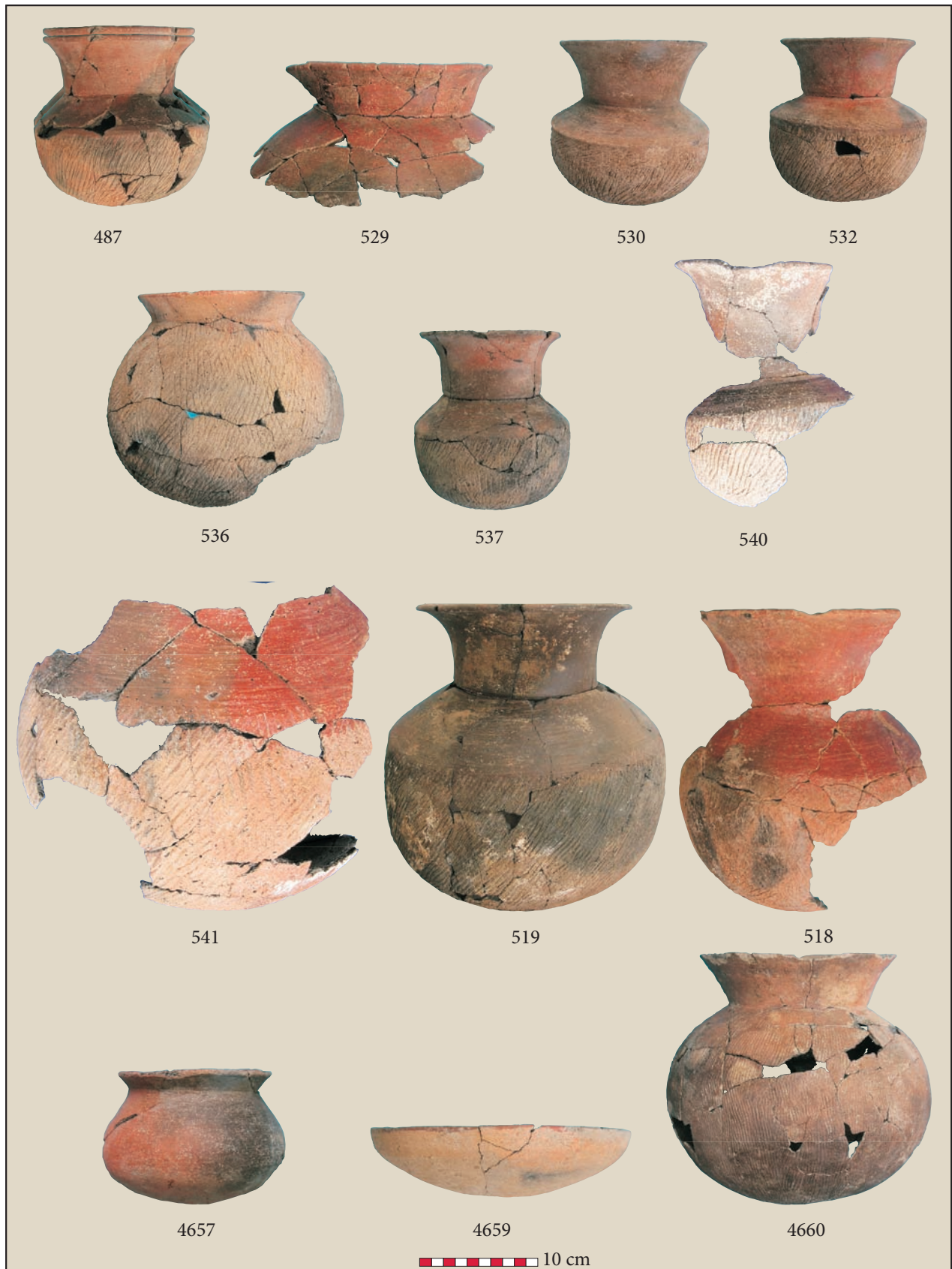


FIG. 7:51 Ceramic vessels from layer 7:6. Cat. 487, burial 54; cats. 529, 530, 532 burial 43; cats. 536, 537, 540 and 541 burial 45; cats. 518-9 burial 41; cats 4657, 4659-60 layer 7:6



FIG. 7:52 Burial 43

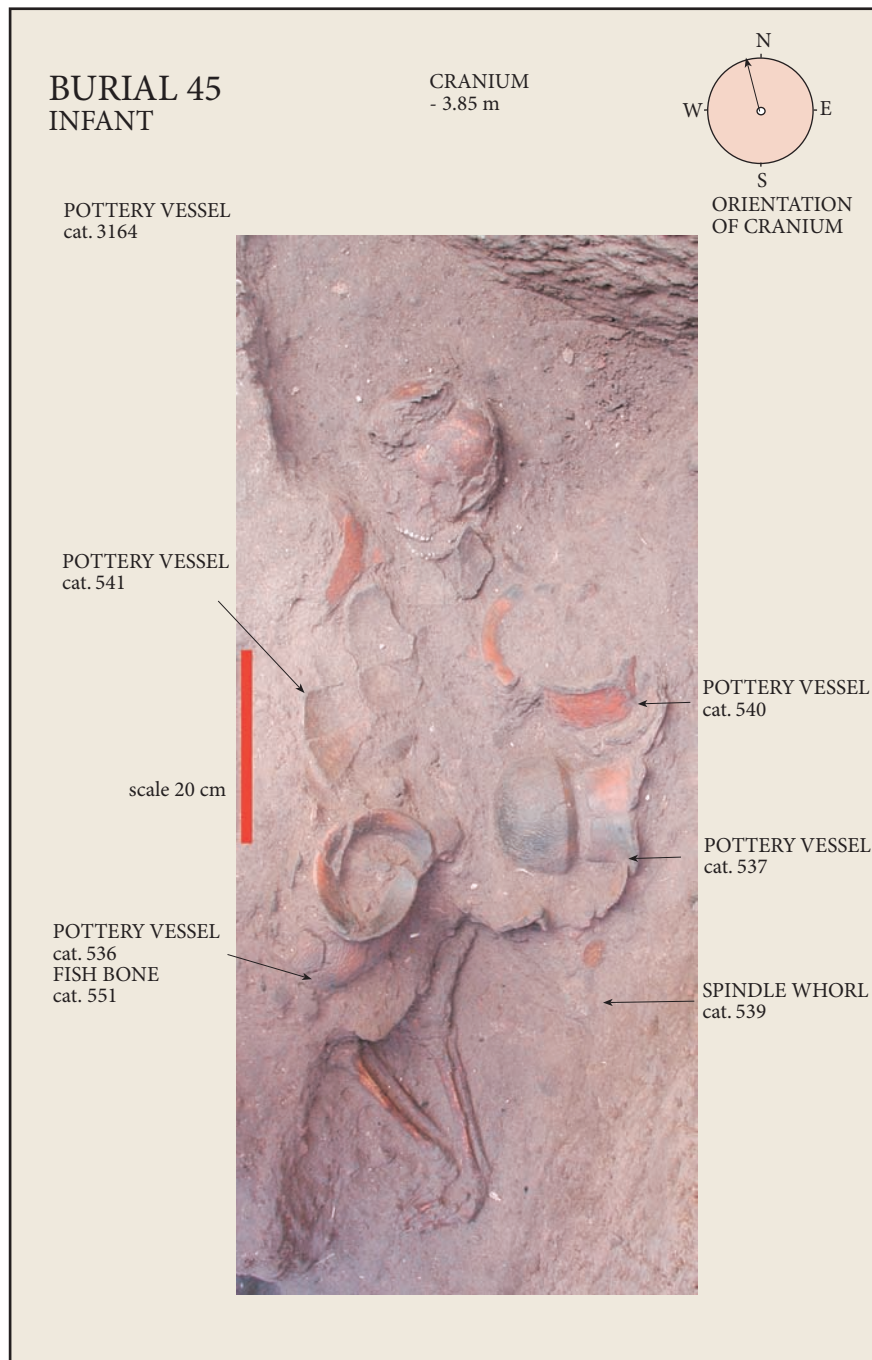


FIG. 7:53 Burial 45

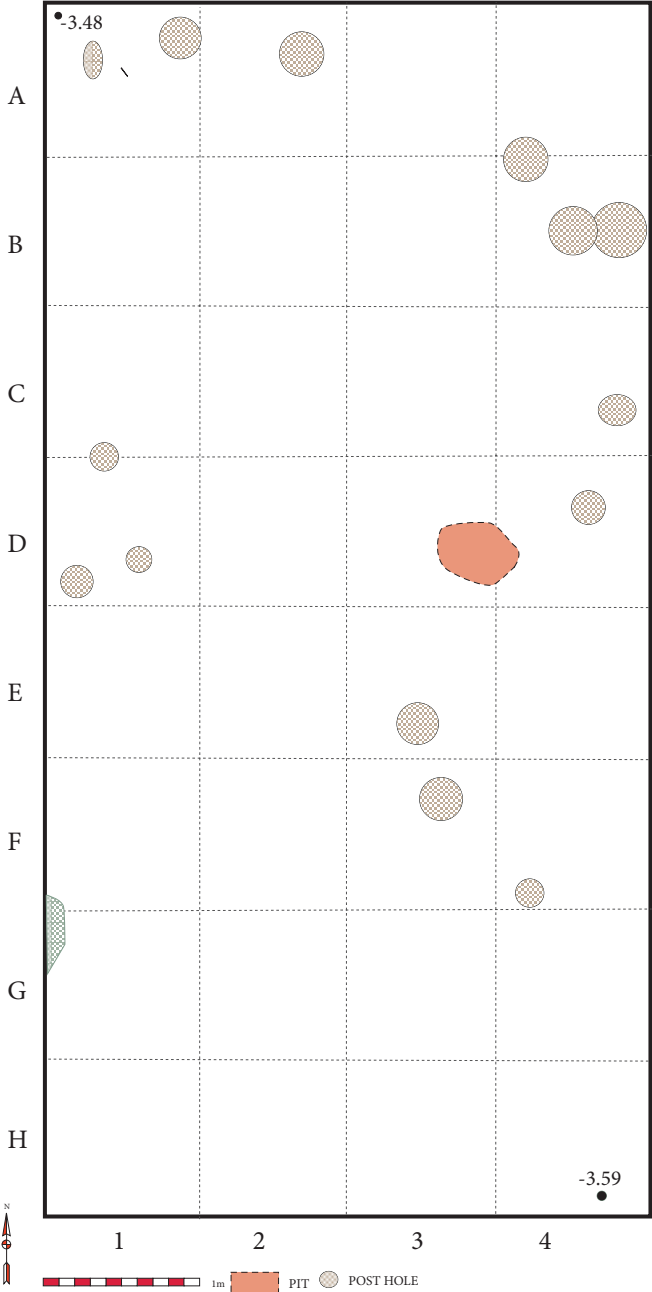


FIG. 7:55 The features on the surface of layer 7:5

Layer 7:5 contained a collection of postholes, a hearth and a pit. Conical rollers, bronze fragments and spindle whorls continued to dominate the assemblage of artefacts.

FIG. 7:54 Burial 41

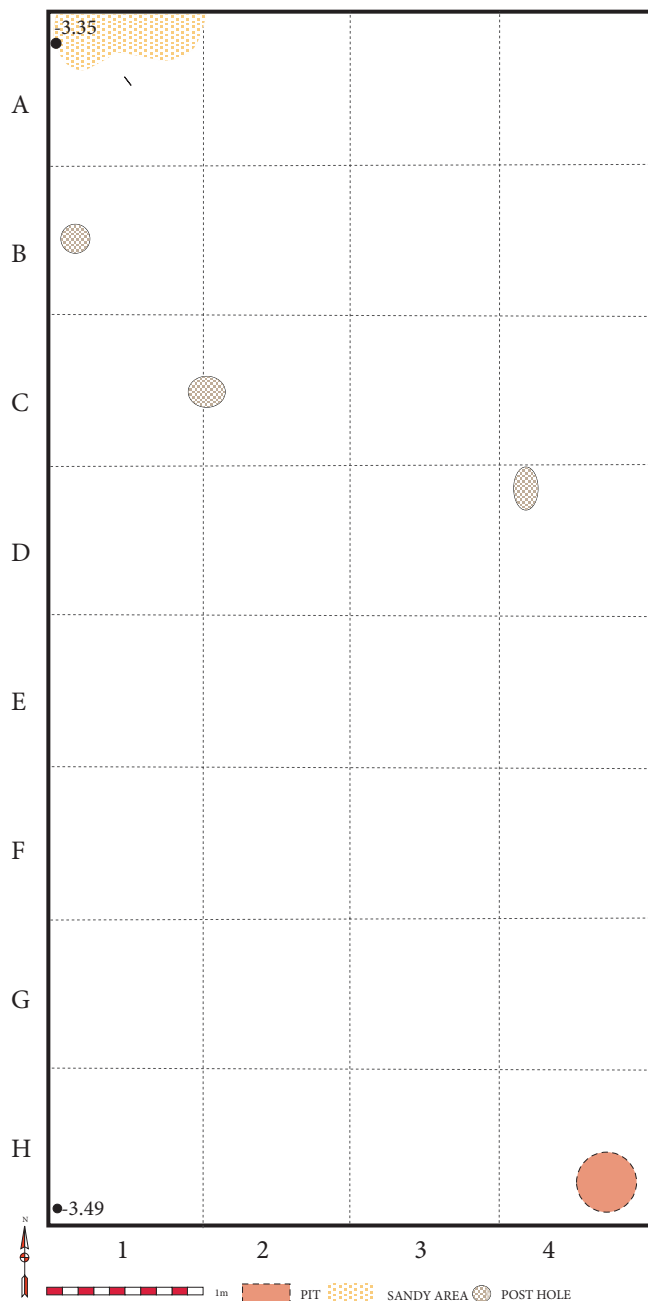


FIG. 7:56 The features on the surface of layer 7:4

Layer 7:4 contains few features: a pit, a sandy lens and three post holes. Conical rollers, bronzes and spindle whorls dominate the sample of artefacts recovered.

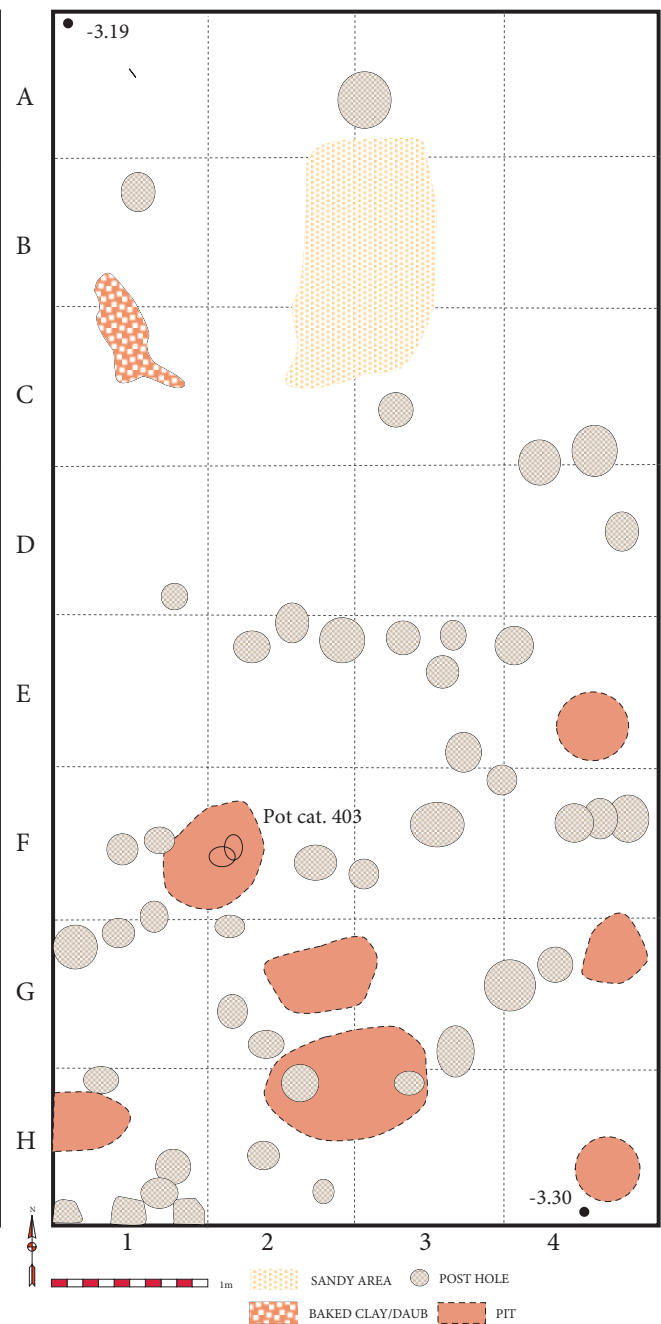


FIG. 7:57 The features on the surface of layer 7:3

Layer 7:3 incorporates a series of pits, postholes and a sandy lens. There is also an area of burnt clay in area B1. Conical rollers, bronzes and spindle whorls dominate the artefacts from this context.

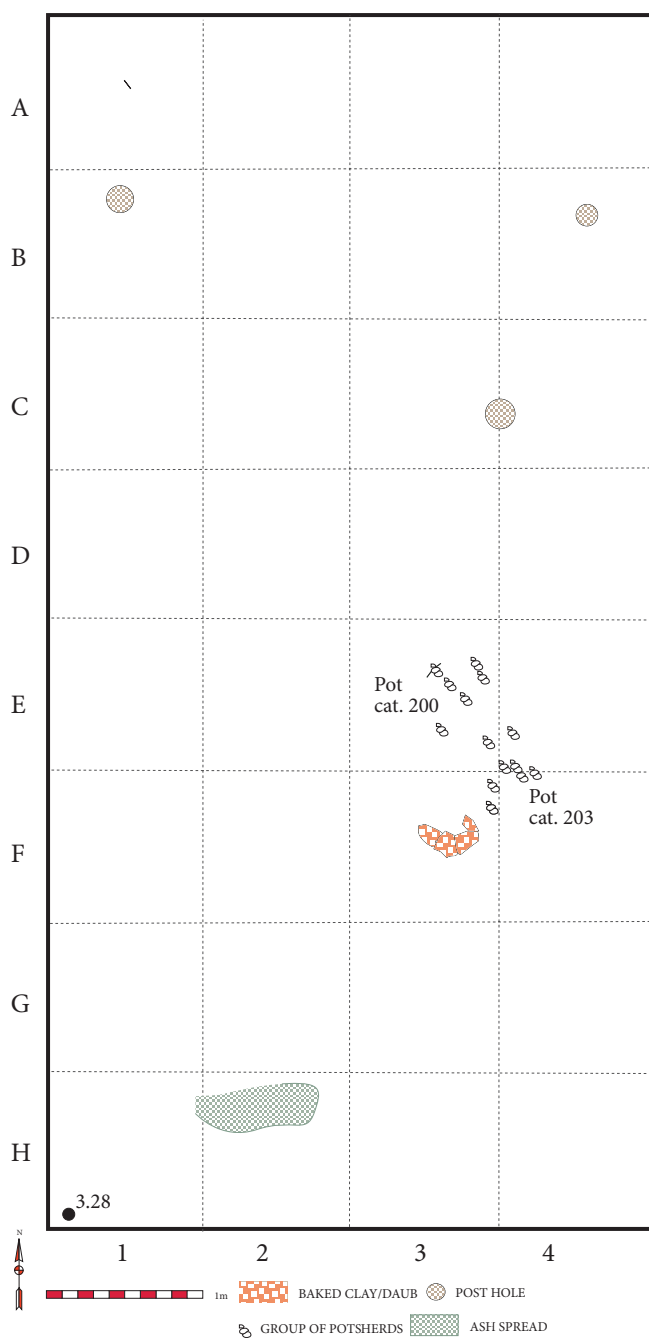


FIG. 7:58 The features on the surface of layer 7:2

Layer 7:2 contains very little, other than areas of horizontally bedded potsherds as if redeposited by water action. There are two concentrations of potsherds representing complete pottery vessels. The number of artefacts, particularly conical rollers, declines sharply compared with preceding layers.

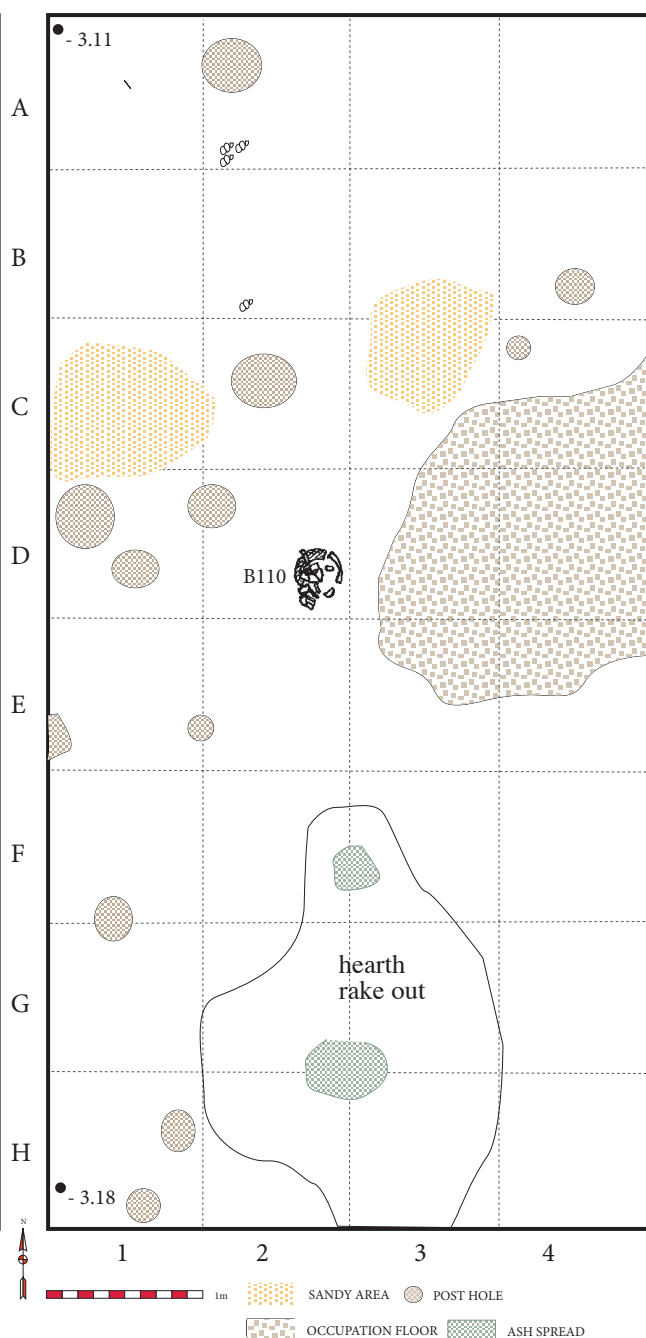


FIG. 7:59 The features on the surface of layer 7:1

LAYER 6

Layer 6 is recognised by its increasingly clayey nature compared with higher contexts. The surface contains a hard yellow clay floor, and a hearth or small furnace of baked orange clay surrounded by charcoal-rich rake out. Burial 110 was interred down to this layer. An infant aged between seven months *in utero* to newly born was found in a lidded ceramic vessel. At least one additional pot was placed within it, as well as a spindle whorl. The form of the pots suggests either Bronze Age 5 or Iron Age 1.



FIG. 7:60 Burial 110

Bronze fragments and spindle whorls predominate among the artefacts. There are no conical rollers.

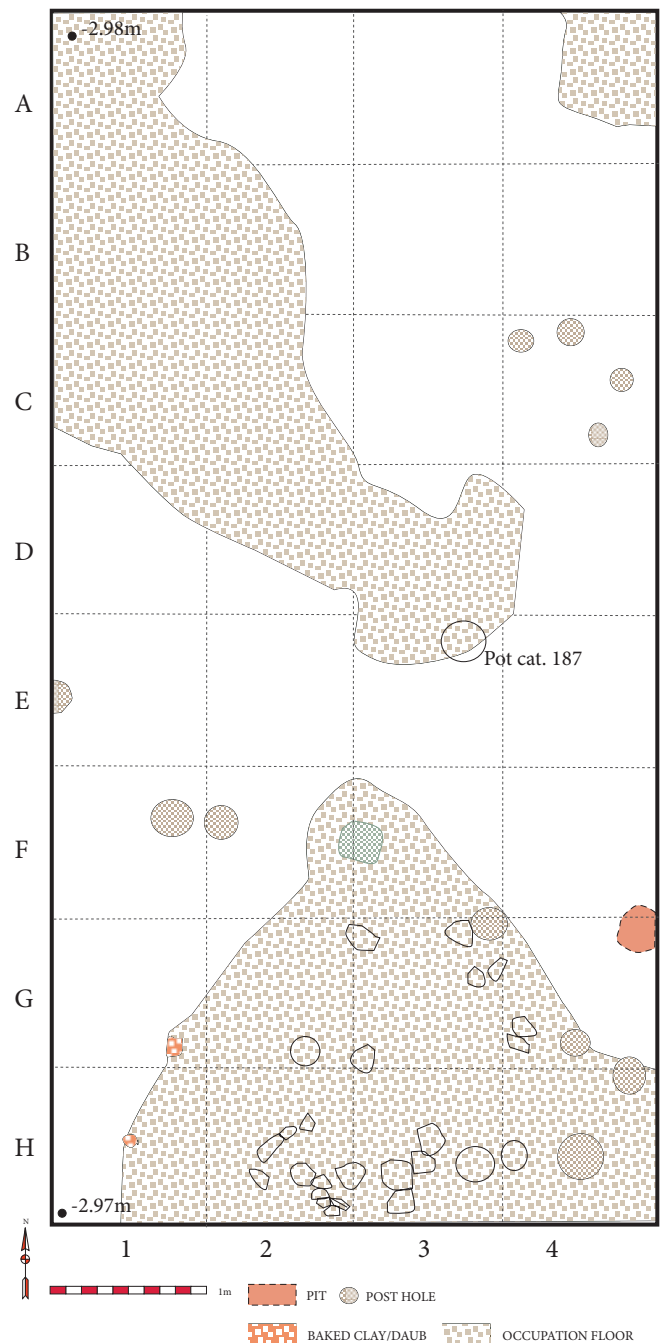


Fig. 7:61 The features on the surface of layer 6:3

LAYER 6

Layer 6:3 contains two floors. The southern floor has on its surface a hearth with much charcoal rake-out surrounding it, together with a large assemblage of broken ceramic vessels (Fig. 7:61). The form of these vessels suggests a Bronze Age 5 origin. The floor also contained a whetstone, spindle whorls, a pellet bow pellet, and crucible and mould fragments. The northern floor is very hard, and the surface is liberally covered with potsherds, and one complete vessel, cat. 187. These vessels have their affinities, in terms of form, with Bronze Age 5 or Iron Age 1 (Fig. 7:62).



FIG. 7:62 Ceramic vessels from layer 6:3, southern floor

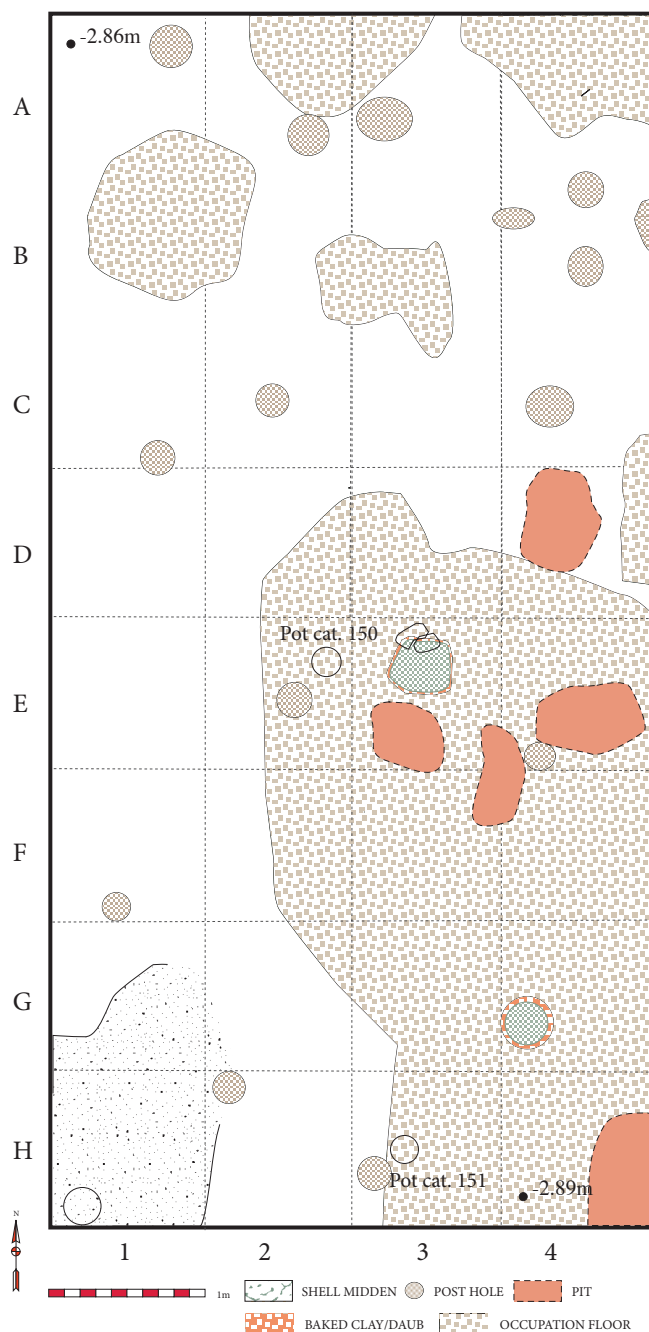


FIG. 7:63 The features on the surface of layer 6:2

A hard occupation lens or floor of grey clay lies over much of the square, with a shell midden in the southwestern corner. Pits puncture the floor, and two ovens or hearths ringed with baked clay are found on the surface. Both have fragments of a ceramic vessel within. Pot cat. 151, found on the surface of this floor, is typologically either Bronze Age 5 or Iron Age 1. Bronze fragments and spindle whorls predominate among the artefacts found on the floors.



FIG. 7:64 Ceramic vessels from a layer 6:2 floor (cat. 151) and from a pit in layer 6:1

Layer 6:1 incorporates a substantial hard white-grey clay floor. A large pit lies in the southwest corner of the square. It contains several broken pottery vessels of Bronze Age 5 or Iron Age 1 form (Fig. 7:64). At least one set of postholes forms a straight line. There are two hearths surrounded

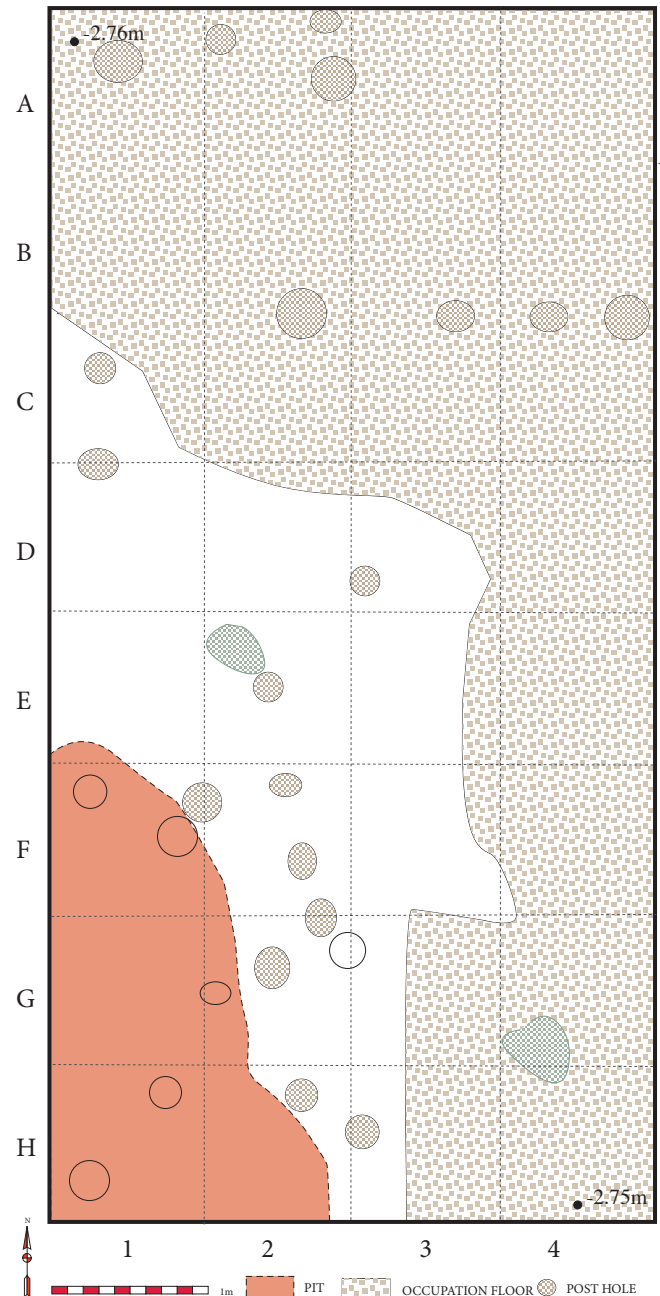


FIG. 7:65 The features on the surface of layer 6:1

by charcoal-rich rake out. Artefacts from this clear living context include fragments of bronze, a spindle whorl and one piece of iron. There is also a fragment of shell bangle.

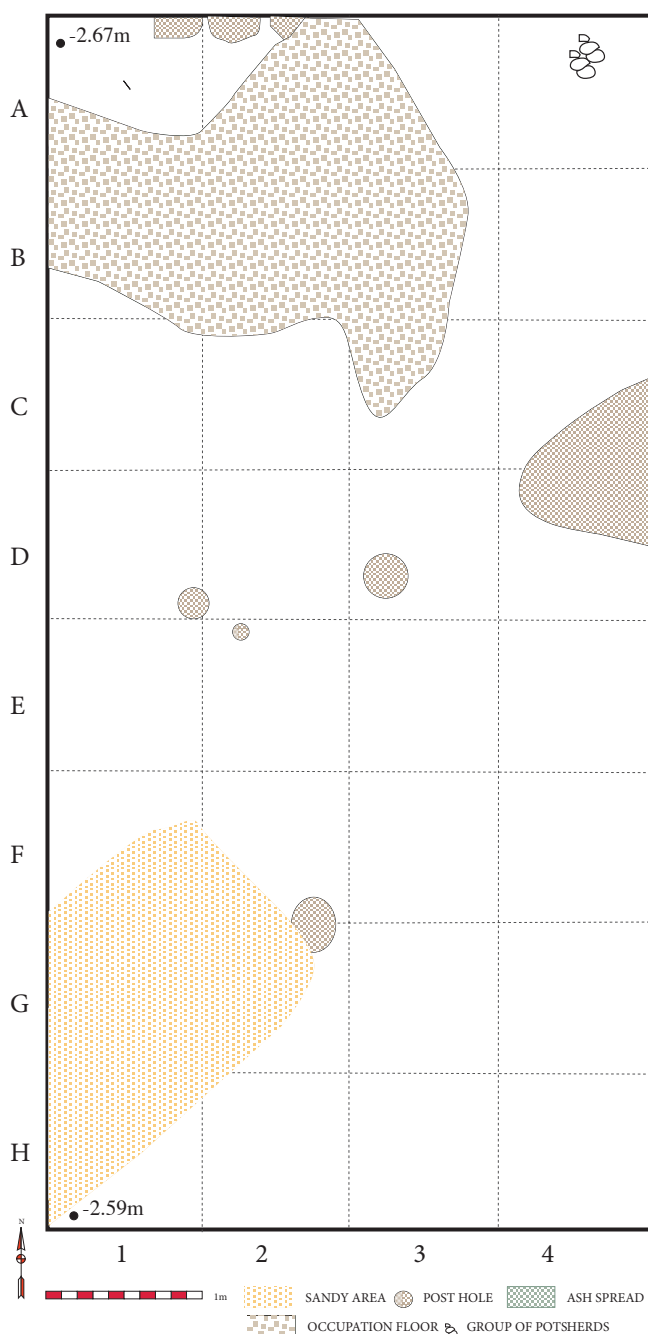


FIG. 7:66 The features on the surface of layer 5:6

LAYER 5

Layer 5:6 contains fewer features than in upper layer 6. There is part of a floor in the northern part of the square, and a sand lens in the southern. Bronzes and spindle whorls predominate among the artefacts recovered. Two pieces of iron slag hint that this layer may belong to the early Iron Age.

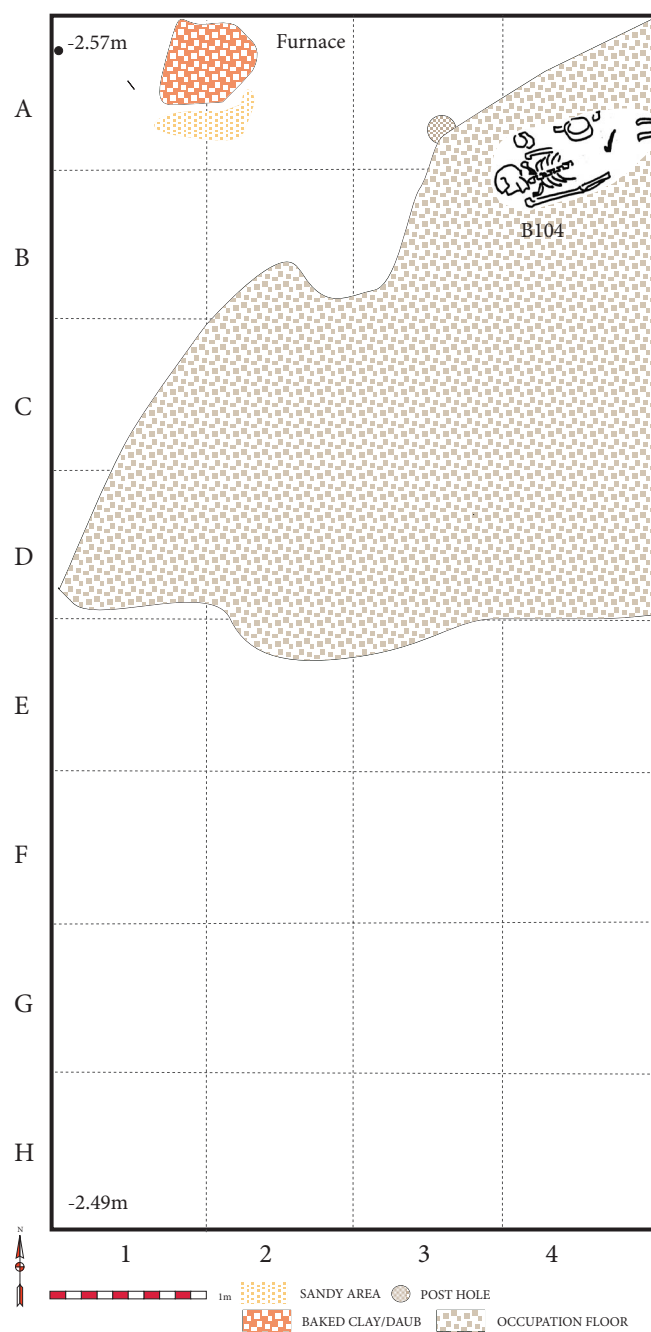


FIG. 7:67 The features on the surface of layer 5:5

Layer 5:5 contains an extensive area of hard whitish clay interpreted as a floor. To the north, there is a furnace fringed by very dark charcoal-rich soil, and a sandy lens. The presence of three broken crucibles suggest that it was used to bring bronze to melting point prior to casting. Burial 104 is cut through the floor. It is a poorly preserved grave of an adult, associated with three pottery vessels that probably equate with Iron Age 1 in the main square. Artefacts in this context include fragments of bronze, iron, a spindle whorl,

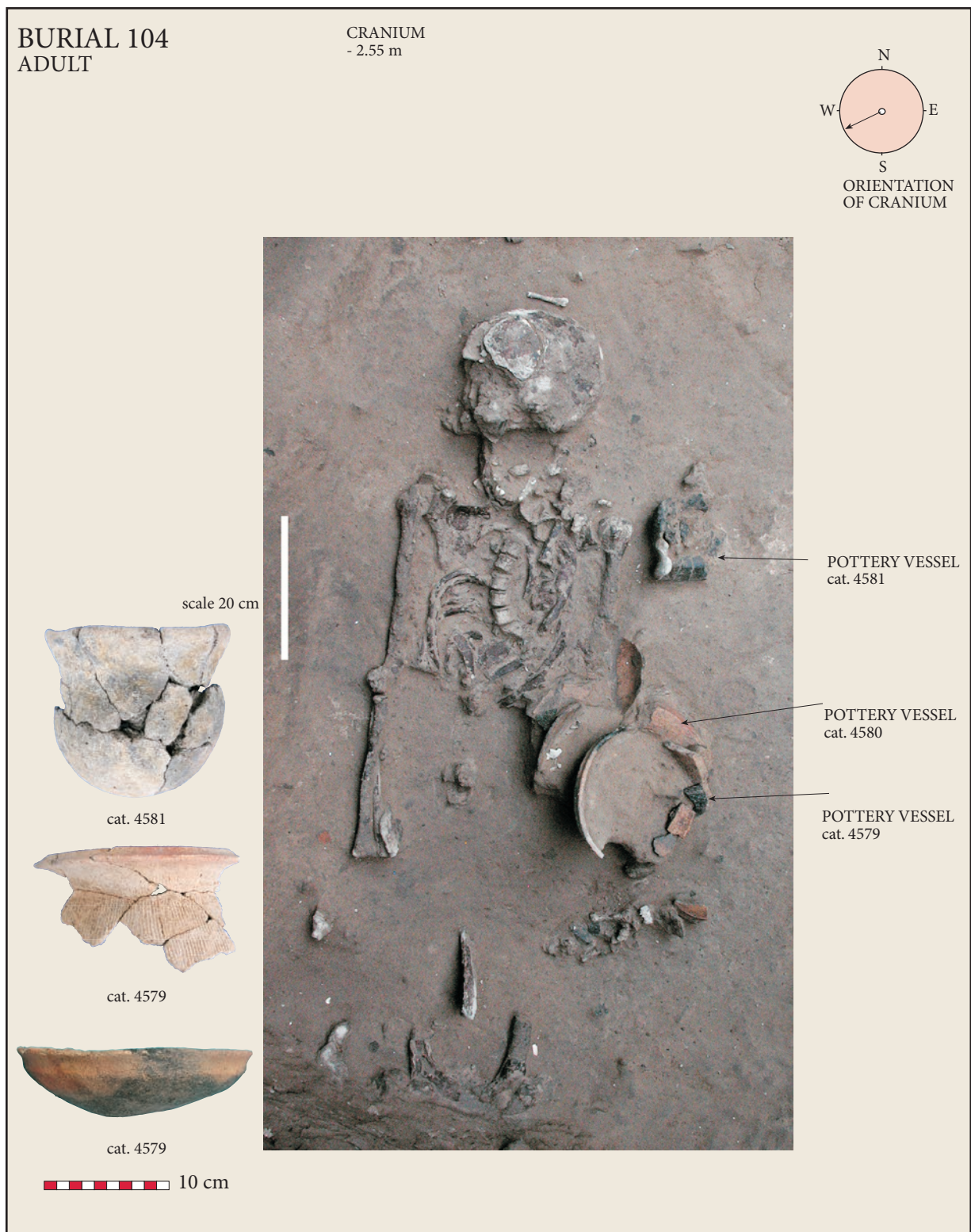


FIG. 7:68 Burial 104

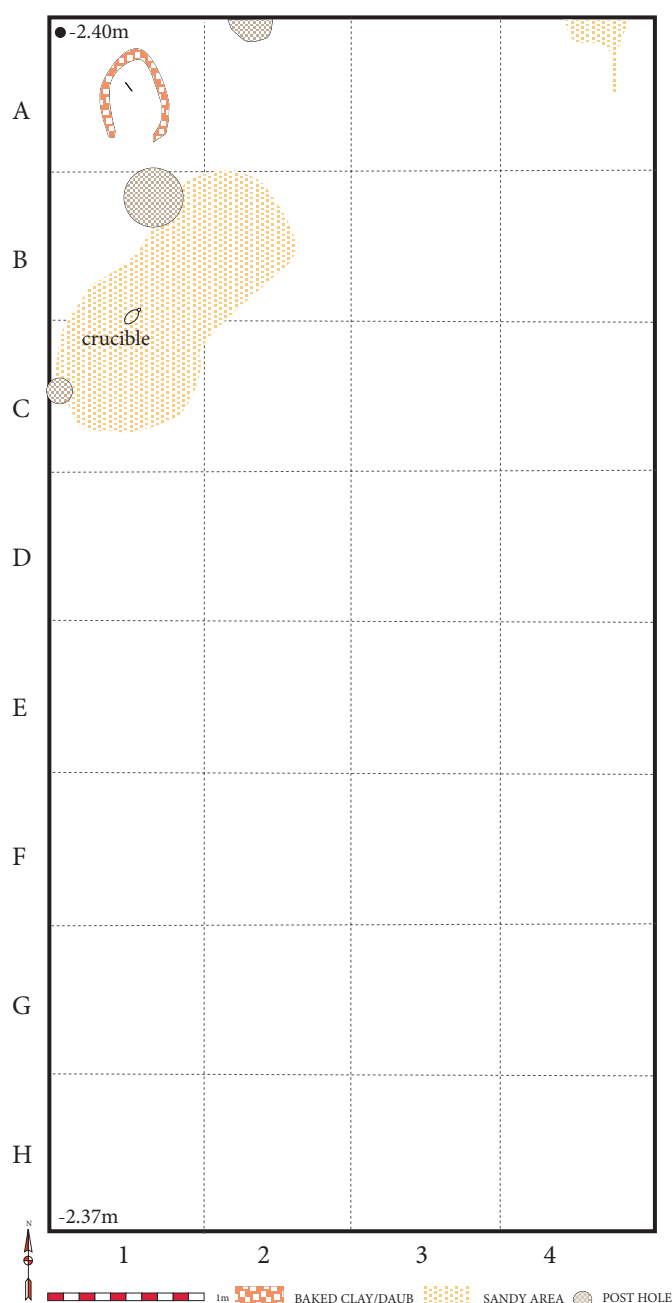


FIG. 7:69 The features on the surface of layer 5:4

Layer 5:4 contains the lower part of a furnace associated with a sandy lens and broken crucibles. It is likely that this was used to raise bronze to a molten state prior to casting. Artefacts from this context include a bronze fragment, five pieces of iron, a spindle whorl and two fragments of shell bangle.

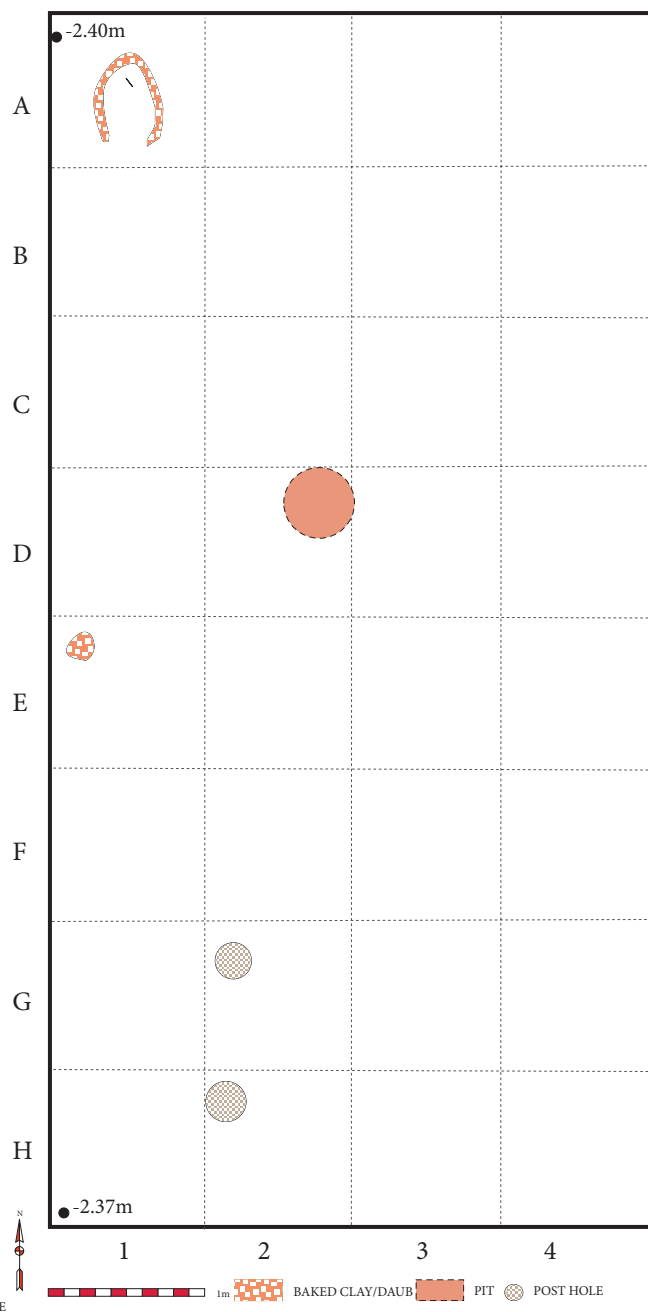


FIG. 7:70 The features on the surface of layer 5:3

Layer 5:3 reveals a furnace in the northwest corner of the square, and a pit, two postholes and some red burnt clay. Artefacts are dominated by bronze and iron fragments.

[illegible][illegible]

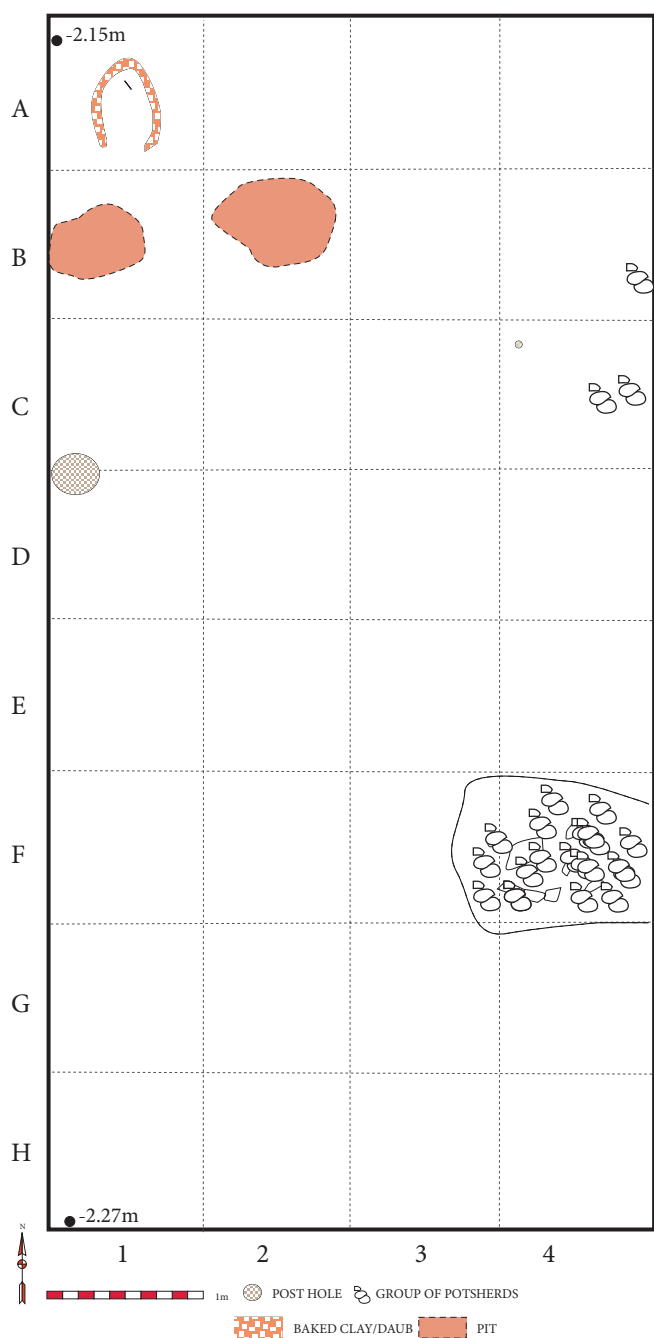


FIG. 7:71 The features on the surface of layer 5:2

There is a deeply-seated furnace in area A1, associated with two pits. Areas of increased density of potsherds are noted, but this context is extremely rich in such sherds overall. There is a definite rise in the quantity of iron artefacts and in bronze fragments from the vicinity of the furnace.

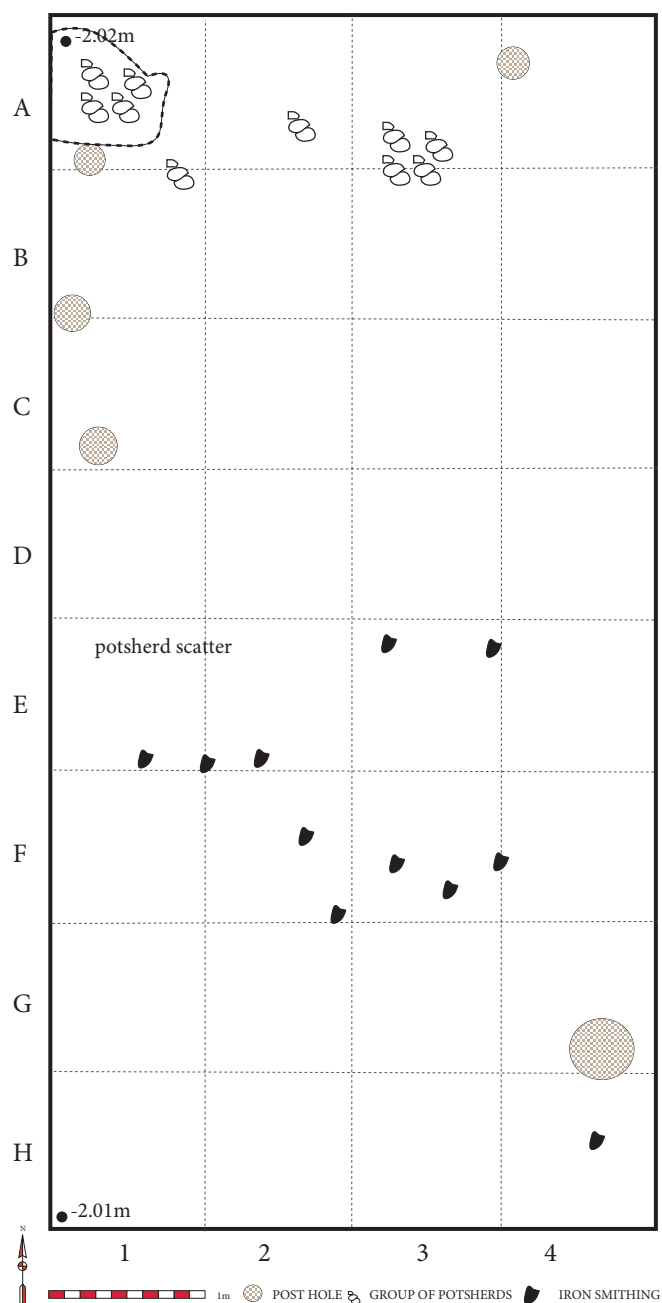


FIG. 7:72 The features on the surface of layer 5:1

Layer 5 presents as an abrupt stratigraphic change seen in soft pinky-yellow sand littered with large fragments of pottery and what looks like the residue of iron smithing. Bronze is now very rare, with only one recorded fragment.

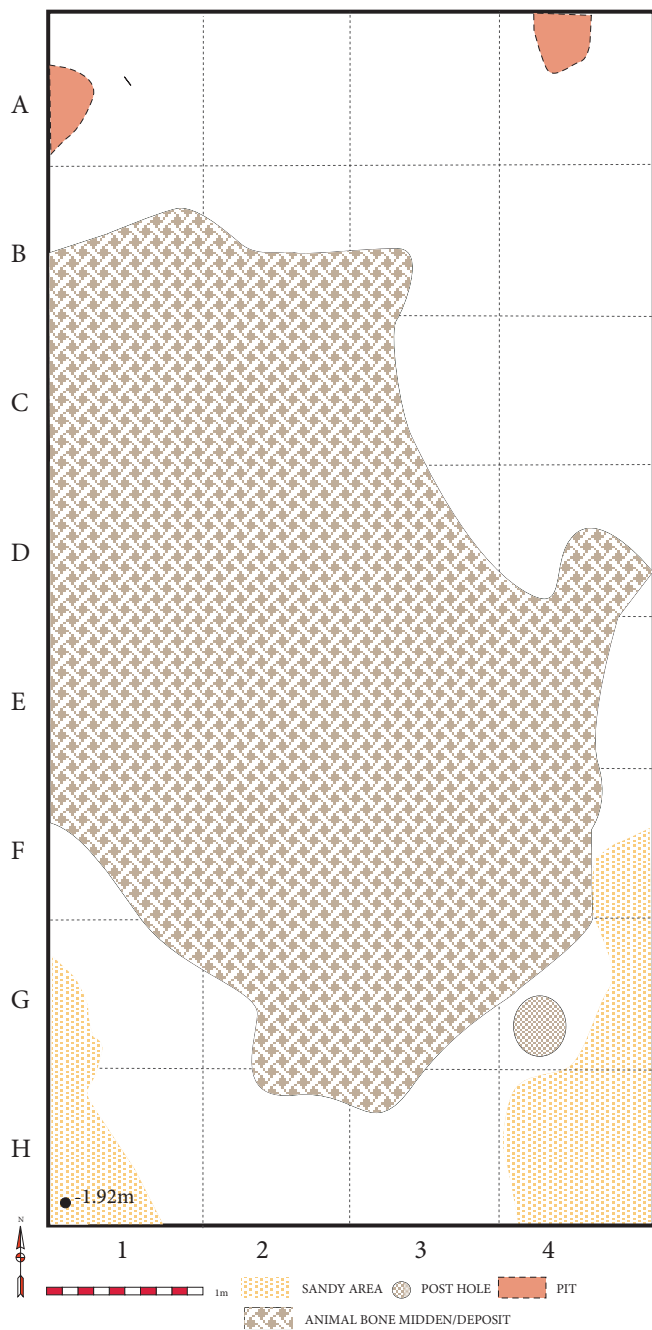


FIG. 7:73 The features on the surface of layer 4:5

LAYER 4

The surface of this context is largely covered by an Iron Age butchering floor. Such floors were also found in the main square. They are recognized by many fractured large mammal bones, the number of iron knives, and the large stones that might have been used as anvils. This floor is

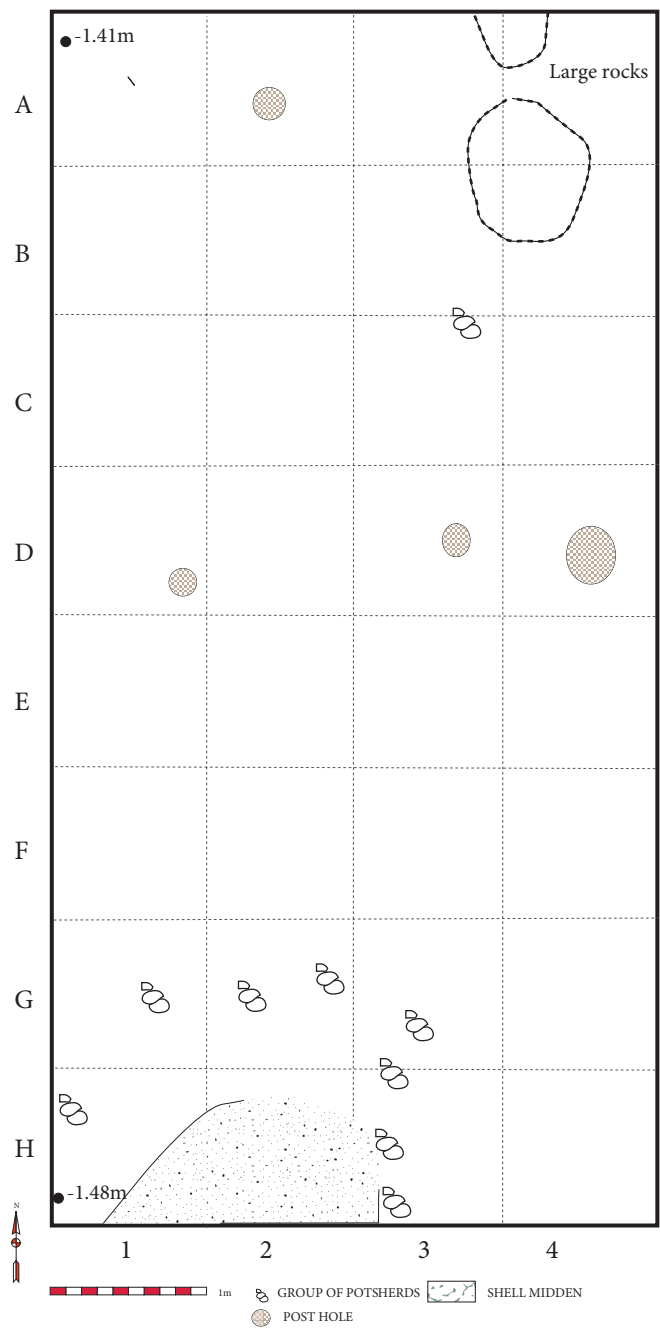


FIG. 7:74 The features on the surface of layer 3:5

illustrated in figure 7:75. The two areas of sandy fill are found on the surface of layer 5:1. Layers 4:1-4 are largely devoid of any structural evidence and indeed, it seems that the area was abandoned other than for the accumulation of potsherds. With layer 3:5, re-occupation took place with the accumulation of a shell midden and the presence of an assemblage of large rocks. Artefacts continued to be rare.



FIG. 7:75 The surface of layer 4:5 looking to the north. It is an Iron Age butchering floor littered with large animal bones, iron artefacts and stones that were probably uses as anvils



FIG. 7:76 A shell midden on the surface of layer 3:5. The potsherds represent the later Iron Age "Phimai Black" ceramic

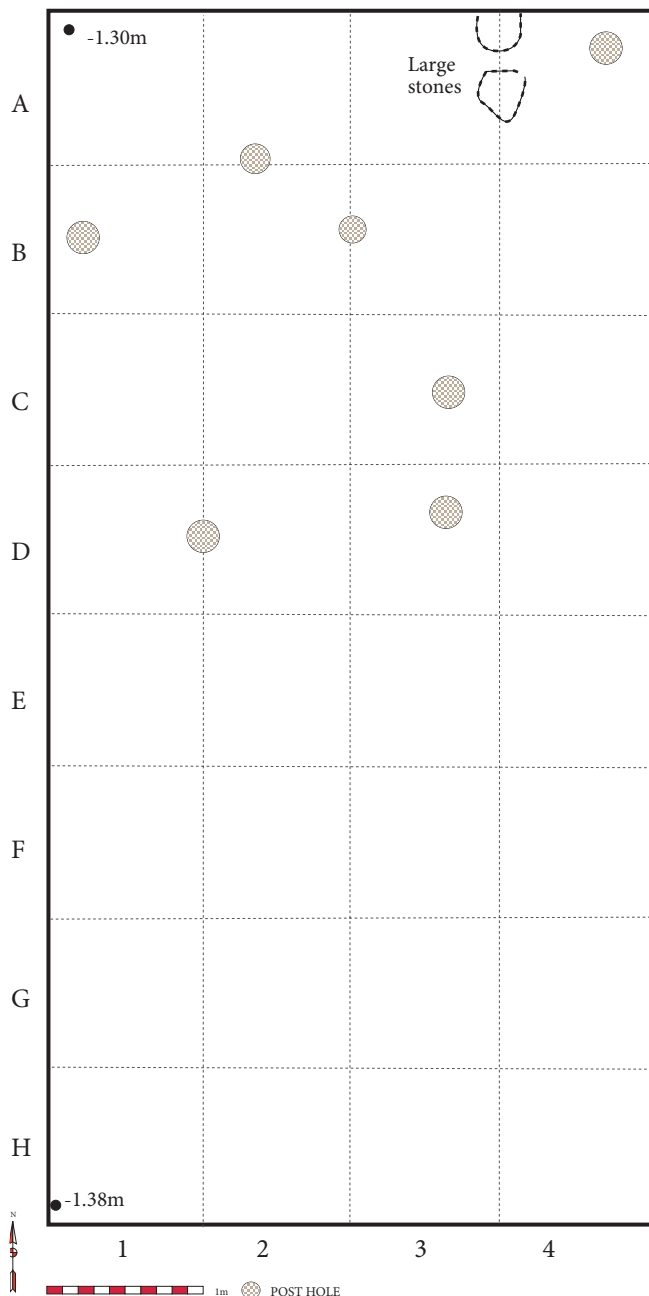


FIG. 7:77 The features on the surface of layer 3:4

LAYER 3

Layer 3:4 incorporates only a series of postholes and accumulations of large stones in the northern part of the excavated area.

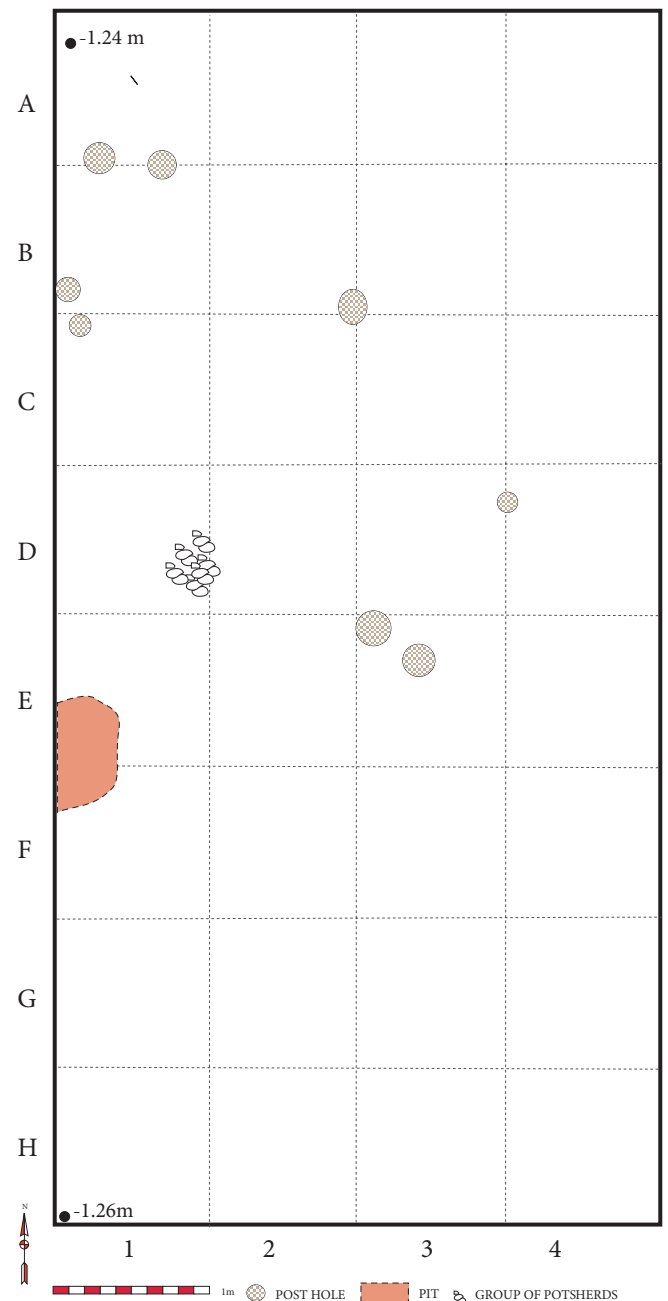


FIG. 7:78 The features on the surface of layer 3:3

Layer 3:3 contains only a series of postholes, a pit and an accumulation of potsherds. Layer 3:2 similarly is almost devoid of features, containing only a pit and two postholes.



FIG. 7:81 Burial 95

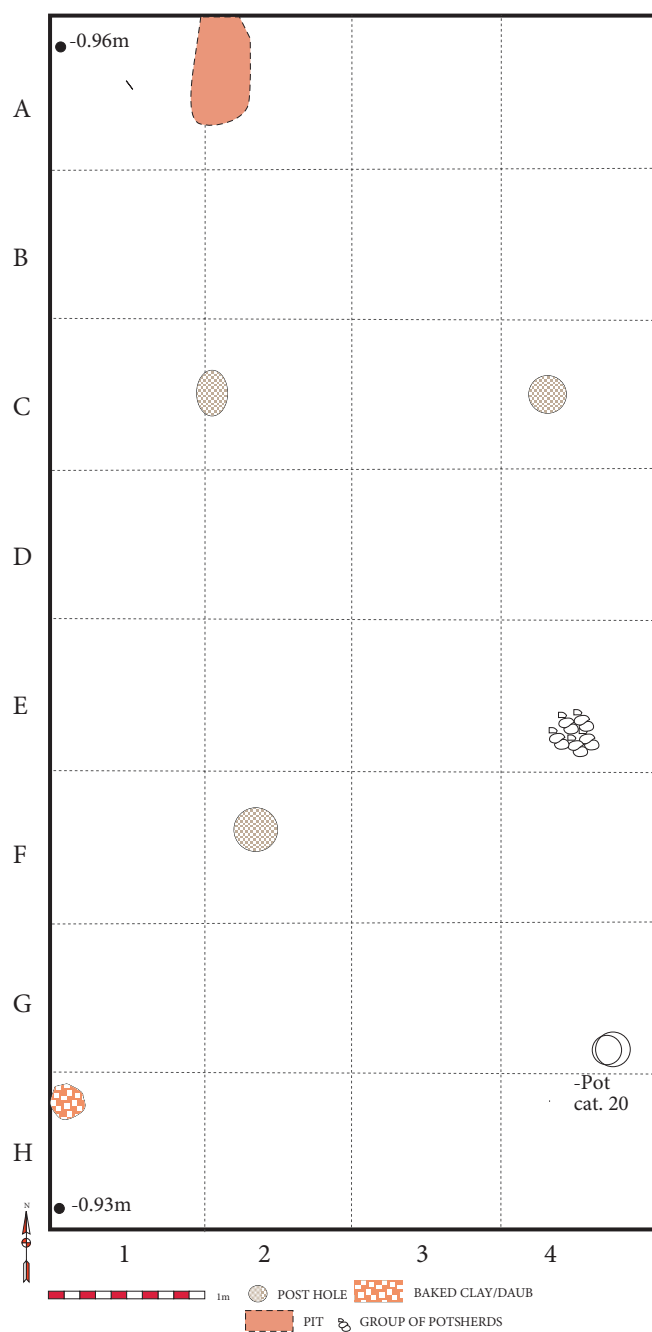


FIG. 7:82 The features on the surface of layer 2:5

layer 2 incorporates only a few postholes, concentrations of potsherds and a patch of burnt red clay. It was also disturbed in places by recent pits.

CONCLUSIONS

The sequence of cultural activity represented in this part of Ban Non Wat began when a series of hearths were laid down on the surface of the natural deposits that comprise layer 9. These deposits comprise in part, the sediments that filled a stream bed. The transition from layer 8 to 9 is clear stratigraphically, the latter being characterised by an increase in orange sandy deposits intercalated with dark brown clays indicating a sedimentary process.

The radiocarbon determinations from these hearths indicate a date of approximately 1000 cal. BC. Four inhumation burials were cut from layer 8 down into layer 9. Burial 97 severed one of the dated hearths and is therefore later than c. 1000 BC (Fig. 7:83). The dead were interred with ceramic vessels which in terms of form, match those found with the 2nd and 3rd Bronze Age mortuary phases. The orientation of the graves is also similar to that found in the early Bronze Age in the main square. None of the graves in Y area, however, matched the wealth of those found in the main square. Only further excavations in Y would reveal whether or not there is a poor lobe of the early Bronze Age cemetery contemporaneous with the wealthy burials to the southwest.

Layer 8 itself is seen as an abrupt transition from dark

brown to light grey clays incorporating many shell fragments, potsherds and charcoal. This layer is ascribed as an occupation deposit to the earlier phases of the Bronze Age.

Layer 7 is an occupation deposit that reaches a thickness of up to 1.4 m. The date and cultural affiliations of this layer are anchored by a series of burials that, on the basis of the associated mortuary offerings, can be assigned to Bronze Age 4 and 5 in the overall sequence of Ban Non Wat. The lower group incorporates graves found at a depth of 4.32 to 4.82 m below the datum. In some cases, the recognition of grave cuts at a higher level leads to the conclusion that Bronze Age 4 can be associated at least with layer 7:6 downward, and possibly a little later still.

The Bronze Age 4 cemetery plan (Fig. 7:84) reveals that the graves were laid out on a northwest to southeast axis in a series of rows. This is a common disposition for the Bronze Age at this and related sites. The ceramic vessels are similar to those found in the main square, and the associated mortuary offerings are relatively poor. No bronzes were found, there were few shell or marble bangles.

The next anchor point in dating and relating the layers to the overall sequence, is a group of burials containing ceramic vessels of Bronze Age 5 form. These lie centrally within this layer, and were cut from upper layer 7 and or



FIG. 7:83 The surface of layer 8:4, showing the relationship between the early Bronze Age burials and hearths that have provided radiocarbon determinations. A. The grave cut for burial 97. B. Hearth 8:4 feature 1 (1127-850 cal. BC). C. Burial 94. D. Hearth 8:4 feature 2 (1127-927 cal. BC). E. Burial 96. F. Hearth 8:4 feature 3 (1108-905 cal. BC)

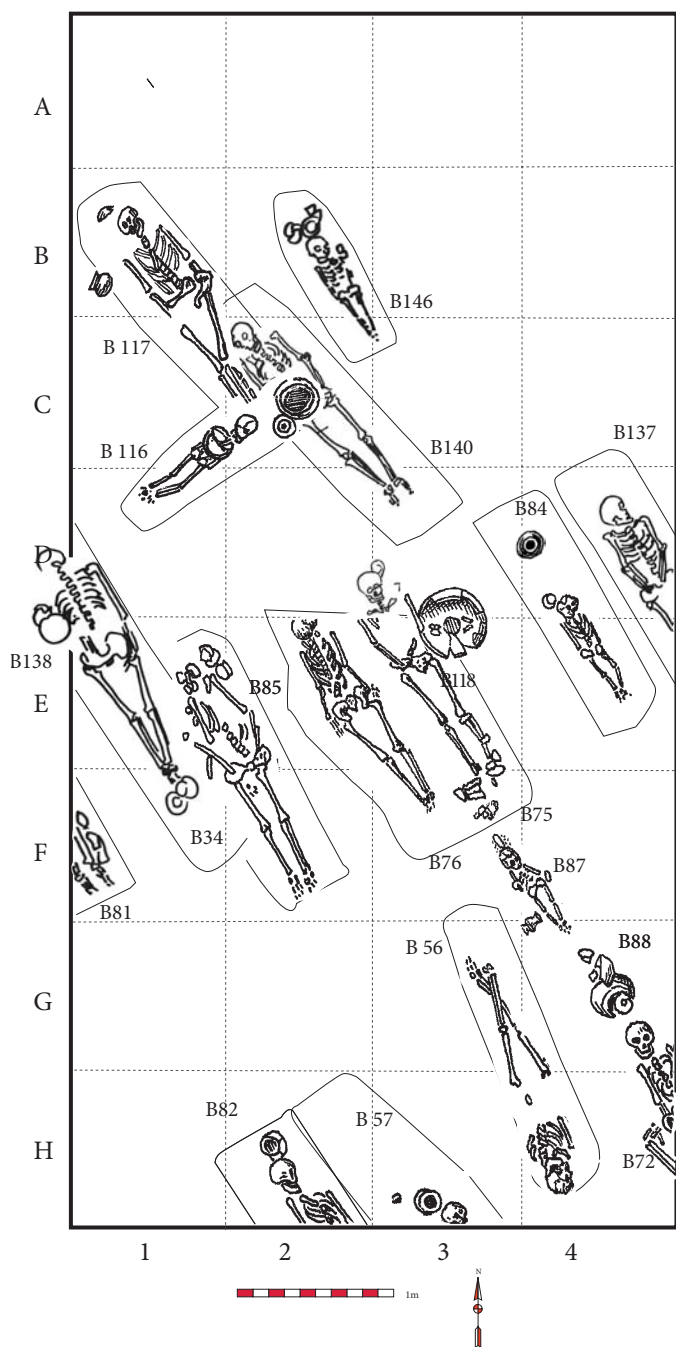


FIG. 7:84 The layout of the second phase of Bronze Age burials in square Y. These belong to Bronze Age 4 in the overall sequence

layer 6. As with the Bronze Age 5, the dead were now interred often with spindle whorls and red ochre, but unlike the contemporary burials in the main square, there is no evidence for the inclusion of grey clay. The layout and orientation of these burials is so similar to that of the preceding interments, that continuity from the one phase to the next is considered highly likely (Fig. 7:85).

Layer 6 incorporates a series of superimposed hard clay floors, associated with partial or nearly complete ce-

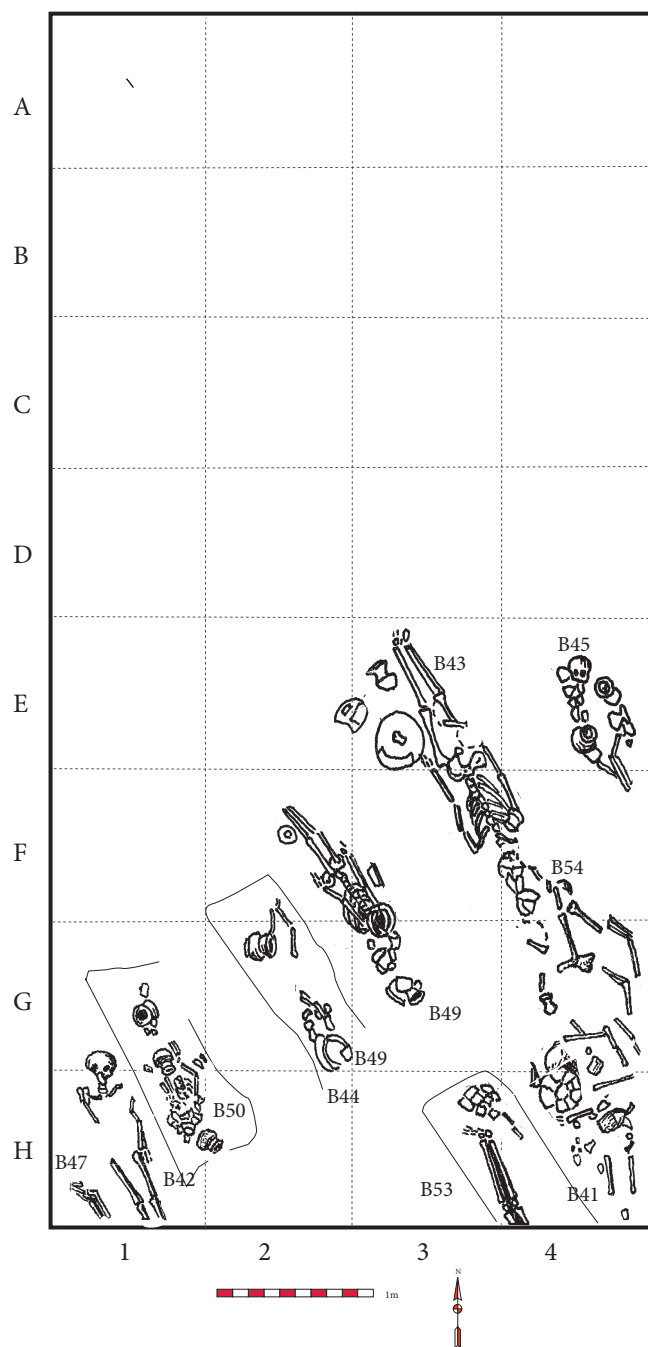


FIG. 7:85 The layout of the third phase of Bronze Age burials in square Y. These belong to Bronze Age 5 in the overall sequence

ramic vessels. These are of Bronze Age 5 form, though the similarity between these and early Iron Age vessels makes it hard to be precise. The increase in iron and slag that might have resulted from smithing in layer 5 is compatible with this layer being ascribed to the early Iron Age. This layer also contains a clay lined furnace that was probably employed to raise bronze to a molten state prior to casting. Burial 104 was contained within this layer, and was cut from upper layer 5. The vessels associated with

this burial are probably of Iron Age 1 origin. There is no doubting the affinities of the layer 4-5 transition. As with the main square, this part of the sequence is dominated by a surface bearing the butchered remains of large mainly domesticated animals, together with the iron tools and stone anvils used in this procedure (Fig. 7:73). This floor accounts for the spike in the number of iron implements seen in figure 7:91.

Layer 4 contained few structures but was rich in potsherds. With layer 3, we encounter burial 97, which was presumably placed in a grave cut down from layer 3, We are confident in the cultural context of layers 2 and 3 due to the presence of Phimai Black or later Iron Age pottery, while burial 97, an infant, was interred in a lidded vessel characteristic of the last Iron Age phase at nearby Noen U-Loke. It is assigned in Ban Non Wat to Iron Age 2.

THE DISTRIBUTION OF ARTEFACTS

The distribution within the above sequence of different artefacts is particularly useful, given the relative clarity of the stratigraphic sequence in this part of the site. Although there were many burials, and consequent cutting down into early layers, the grave cuts were usually identified at a considerably higher level than the contents because they often severed floors and other features. Bronze was very rare as a mortuary offering in any of the burial phases. However, fragments were relatively common in the occupation deposits during the accumulation of layer 7. The bronzes found in layer 9 probably did reach that depth as a result of disturbance due to human activity. There is a rise

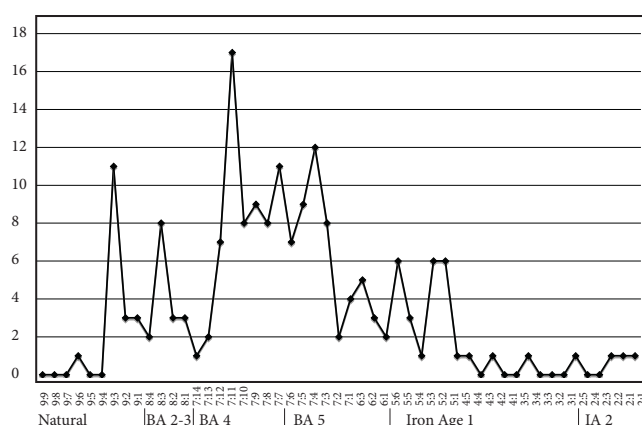


FIG. 7:86 The distribution of bronze artefacts

during the initial use of the site during the early Bronze Age, and a much greater rise in frequency with Bronze Ages 4 and 5 occupation. This was followed by a decline in the early Iron Age, and a near absence of bronze during Iron Age 2 occupation.

Spindle whorls indicate the preparation of yarn, and the probability of a weaving industry. In Bronze Age 5



FIG. 7:87 Square Y layer 3:2, an Iron Age pit containing a Phimai Black ceramics.

times, they were regularly found as mortuary offerings. Over a thousand have been recovered from all excavated areas at Ban Non Wat. They were very rare during Bronze Age 2-3 contexts in square Y, followed by a slight rise during BA 3 and a dramatic surge with BA 5 before falling

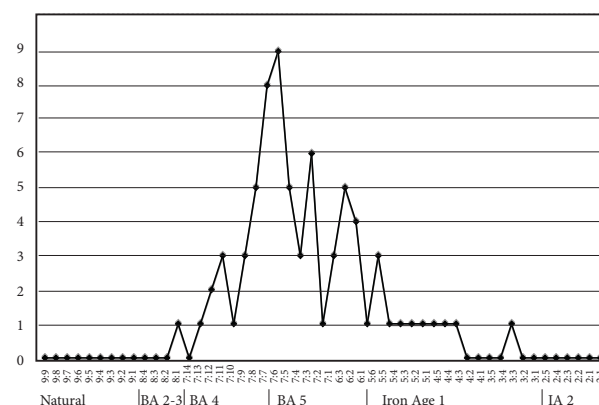


FIG. 7:88 The distribution of spindle whorls

away in frequency with the Iron Age.

The so-called "conical rollers" are of unknown purpose. They are distinctive artefacts of clay, with a small handle attached to a rounded triangular end that was often carefully decorated with cord impressions (Fig. 7:89). They might represent fertility through their similar form to a human phallus, in which case they could be an intriguing forerunner to the popularity of the *linga* cult during the later periods of statehood in this region. However this is pure speculation. In square Y, they clearly belong to the Bronze and 4 and 5 periods, being virtually absent before or after (Fig. 7:90).

The distribution of fragments or artefacts of iron is seen in figure 7:91. As has been noted there is a marked rise in frequency with lower layer 4, reflecting the number found on the Iron Age butchery floor. As might be expected, some iron items found their way into later Bronze Age contexts through the many instances of disturbance into



FIG. 7:89 Conical rollers. Left to right, cat. 7700 C5 4:7, 509 Y1 7:6 burial 41 and 17125 E5 4:1

lower layers. Apart from the butchery floor, iron items were relatively rare in this part of the site.

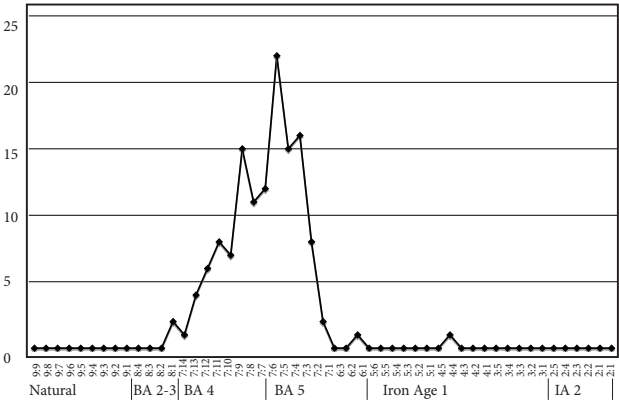


FIG. 7:90 The distribution of conical rollers

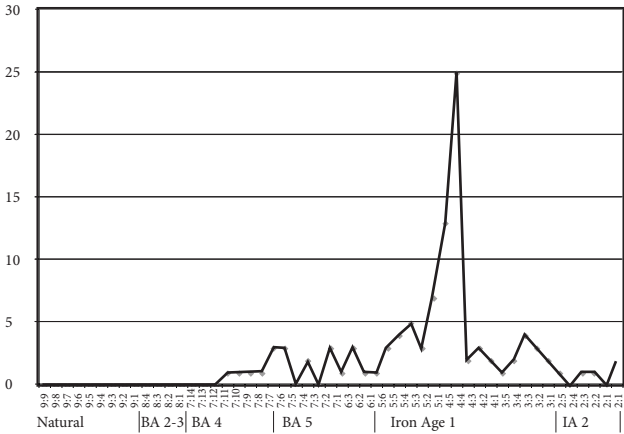


FIG. 7:91 The distribution of iron artefacts

VIII SQUARE X

C.F.W. HIGHAM

INTRODUCTION

Square X is located on the southern margin of Ban Non Wat. An area of 4 by 4 m was opened in order to ascertain the cultural sequence in this peripheral area. The basal context, layer 5, revealed a series of features incised into the natural substrate. As with area Y, a stream bed or infilled channel was identified in the northeastern part of the opening. A remarkable structural feature ran almost parallel with this stream, comprising a trench with vertical walls. Three large postholes lay within, the two complete examples associated with adjacent pits or depressions. This is an unique feature at this site, or indeed at any comparable site known to the author. It has all the appearances of a foundation for a substantial building. Whether it be part of a defensive palisade wall, or a stand-alone building, can only be determined by a major excavation to trace its limits. Several postholes are found on the western side of this trench.

There are two radiocarbon determinations relating to this feature. The first is based on charcoal found within one of the wall postholes (3010±29; 1320-1185 cal BC). The second is again on charcoal, from the flood deposit seal-

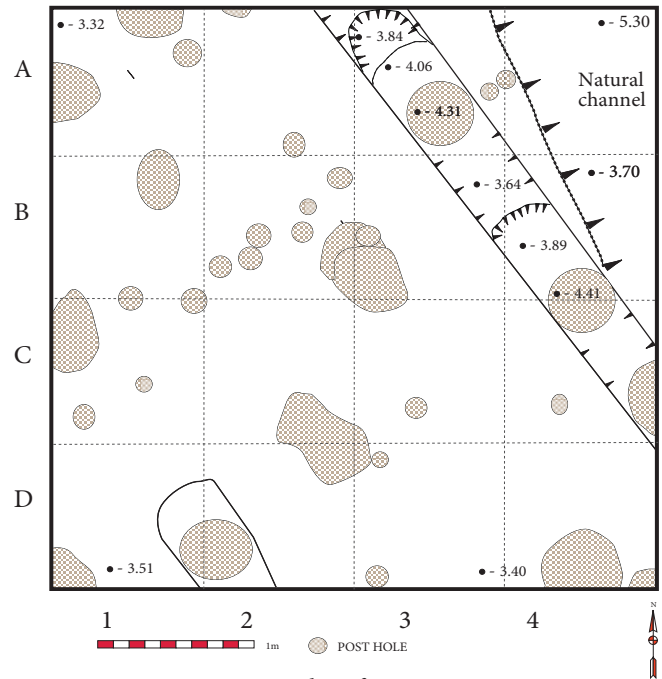


FIG. 8:1 Plan of square X 5:1



FIG. 8:2. A view of X layer 5:1

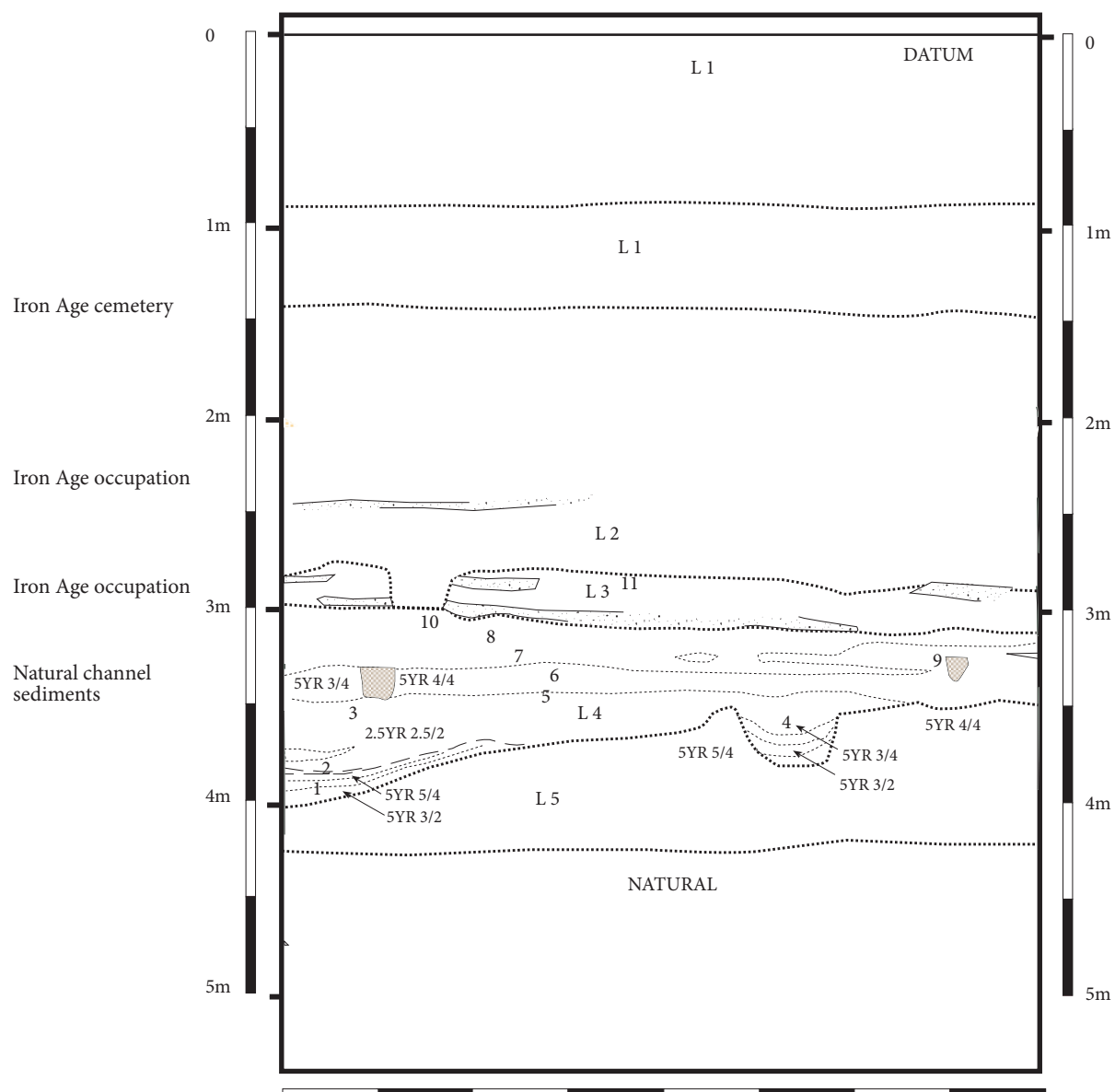


FIG. 8:3 The eastern section of square X. 1. laminated sand lens. 2. lenses of orange pisolithic gravel. 3. dark grey clay and red sand. 4. alluvial infill. 5. coarse base of fine gravel. 6. red alluvial sand and occasional pottery. 7. sharp boundary. 8. grey sandy clay and fine lenses of red sand. 9. Mixed red sand and some grey clay. 10. slight dark soil at top. 11. Light grey ashy silt and shells

ing this linear feature (2070 ± 28 ; 170–20 cal. BC). It is suggested that the former sample might have comprised old wood from the original post that stood there, and that the structure probably belongs to the Iron Age occupation of Ban Non Wat. No artefacts were found in this layer.

Layer four comprises an alluvial deposit, probably the result of water transgressions over this part of the site. It incorporates lenses of ripple-bedded red sand, grey sandy

clays and lenses of red sand. These natural deposits include many small fragments of re-deposited potsherds. Some postholes were dug down into this layer.

Layer 3 represents a period of occupation. The actual surface of layer 4 is impregnated with a series of shell middens and areas of charcoal concentration. The occupation deposits contain many potsherds, other artefacts and faunal remains.

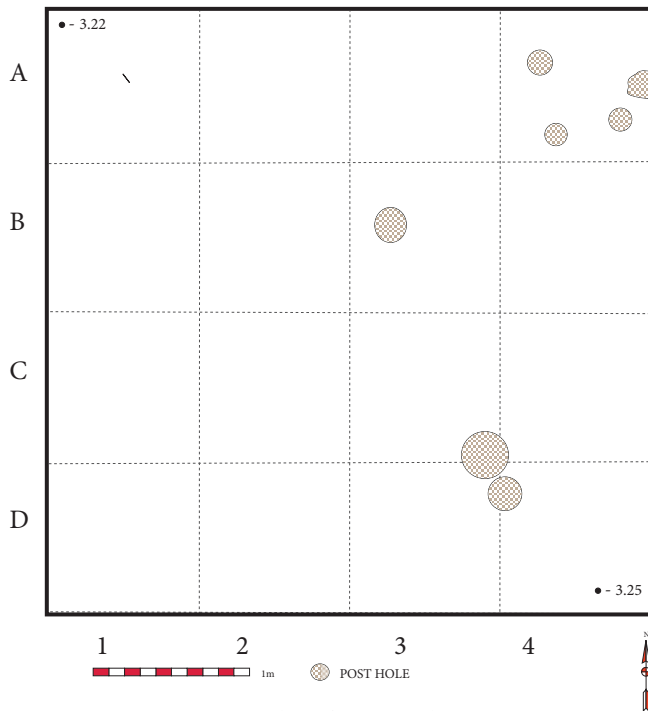


FIG. 8:4 Plan of square X layer 4:6

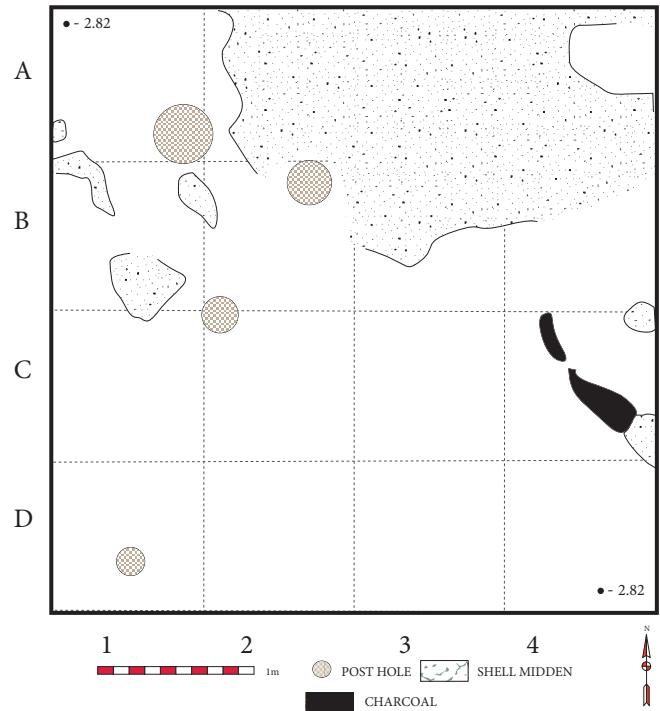


FIG. 8:6 Plan of square X, occupation remains on the surface of layer 4:1

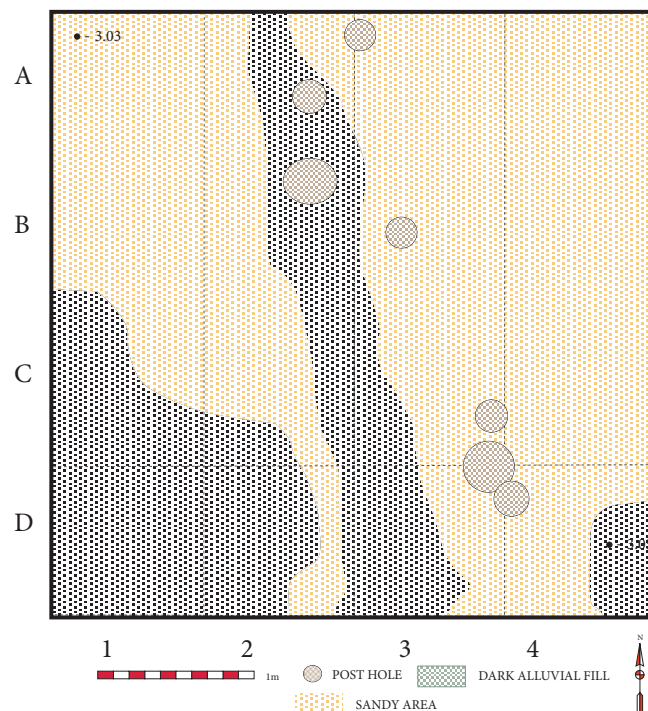


FIG. 8:5 Plan of square X layer 4:3

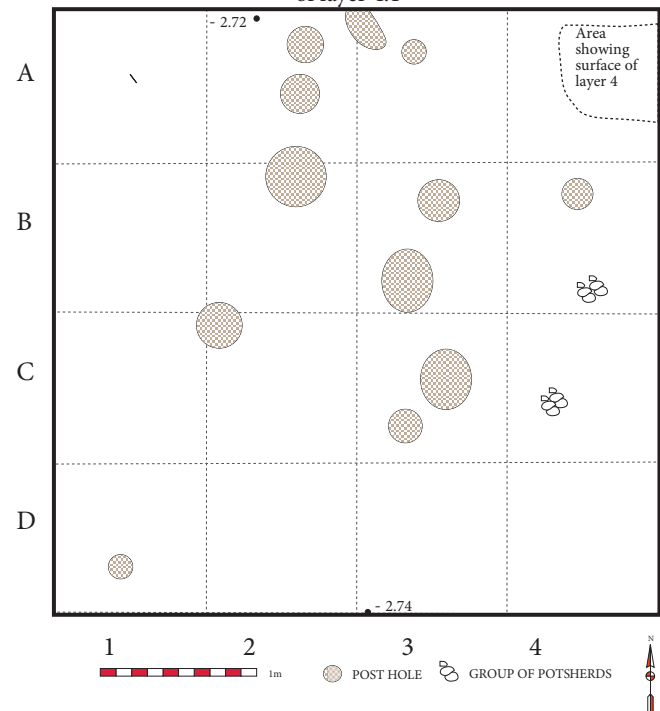


FIG. 8:7 Plan of square X layer 3:2



FIG. 8:8 The surface of layer 4:3 in square X. This layer comprises a series of naturally deposited sand and clay lenses. Postholes were dug through it at a later period. The artefacts found were redeposited, probably through water action



FIG. 8:9 The surface of layer 4 in square X. Occupation remains in the form of shell middens predominate

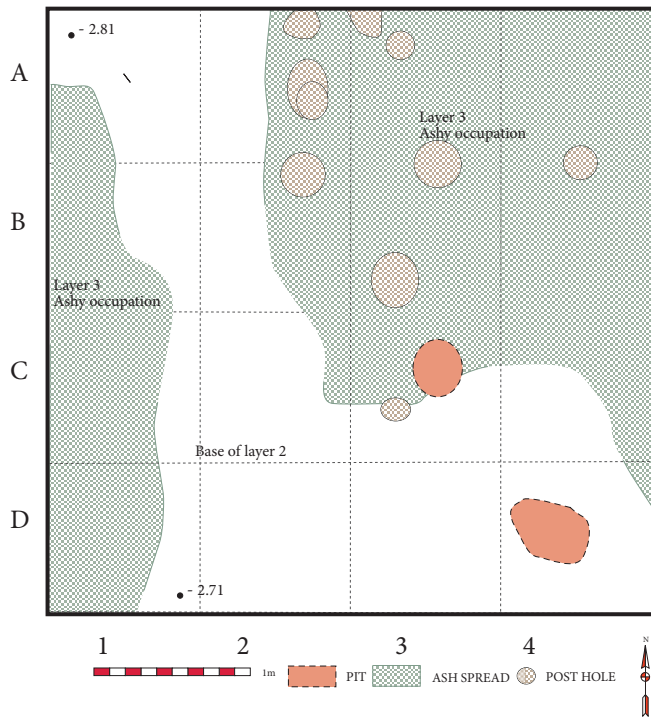


FIG. 8:10 Plan of square X layer 3:1

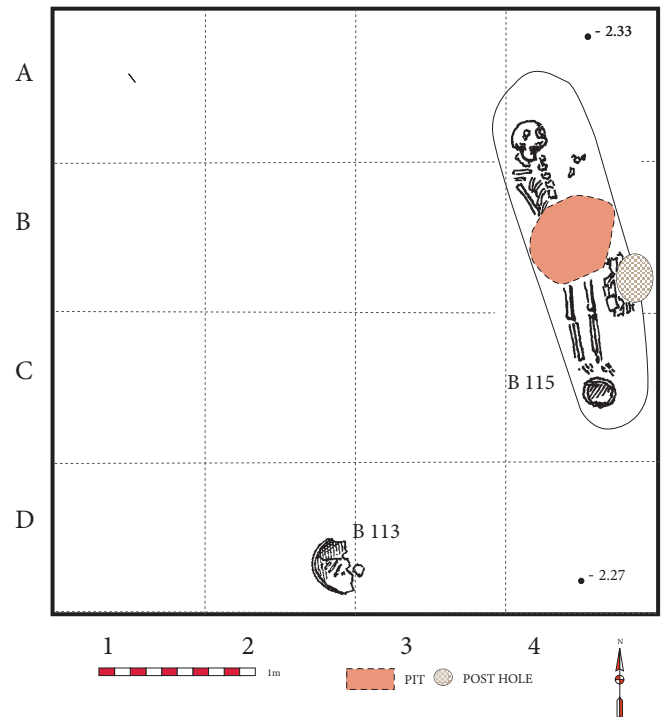


FIG. 8:11 Plan of square X layer 2:11

Layer 3 was recognised as a distinct change from the dark base of layer 2. The former is ashy occupation, the latter is dark and rich in charcoal fragments and the remains of shellfish.

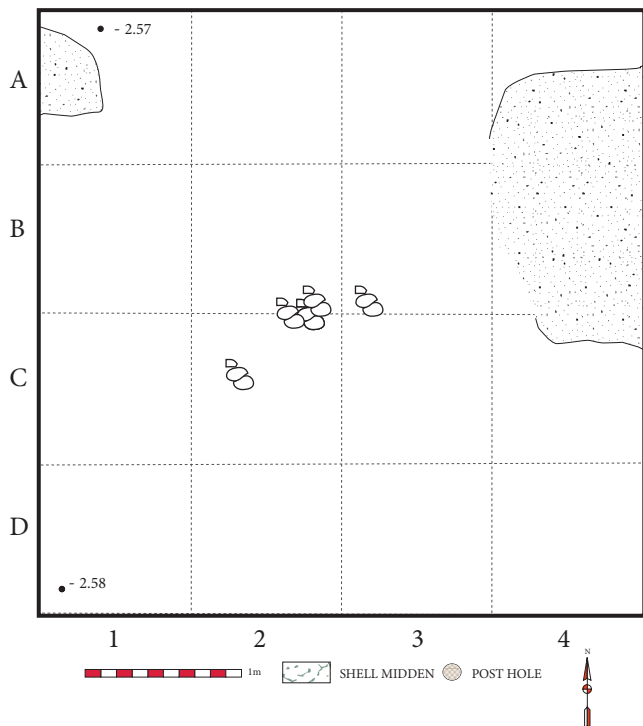


FIG. 8:12 Plan of square X layer 2:15

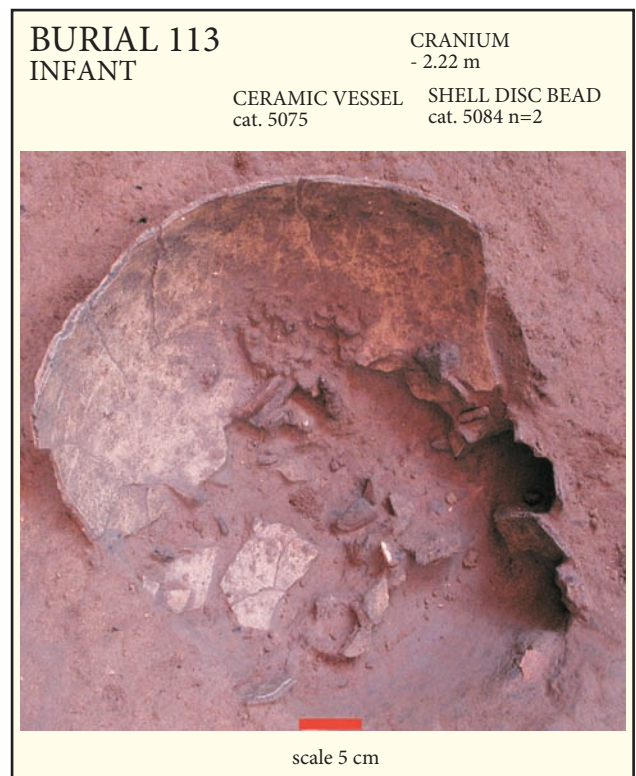


FIG. 8:13 Burial 113

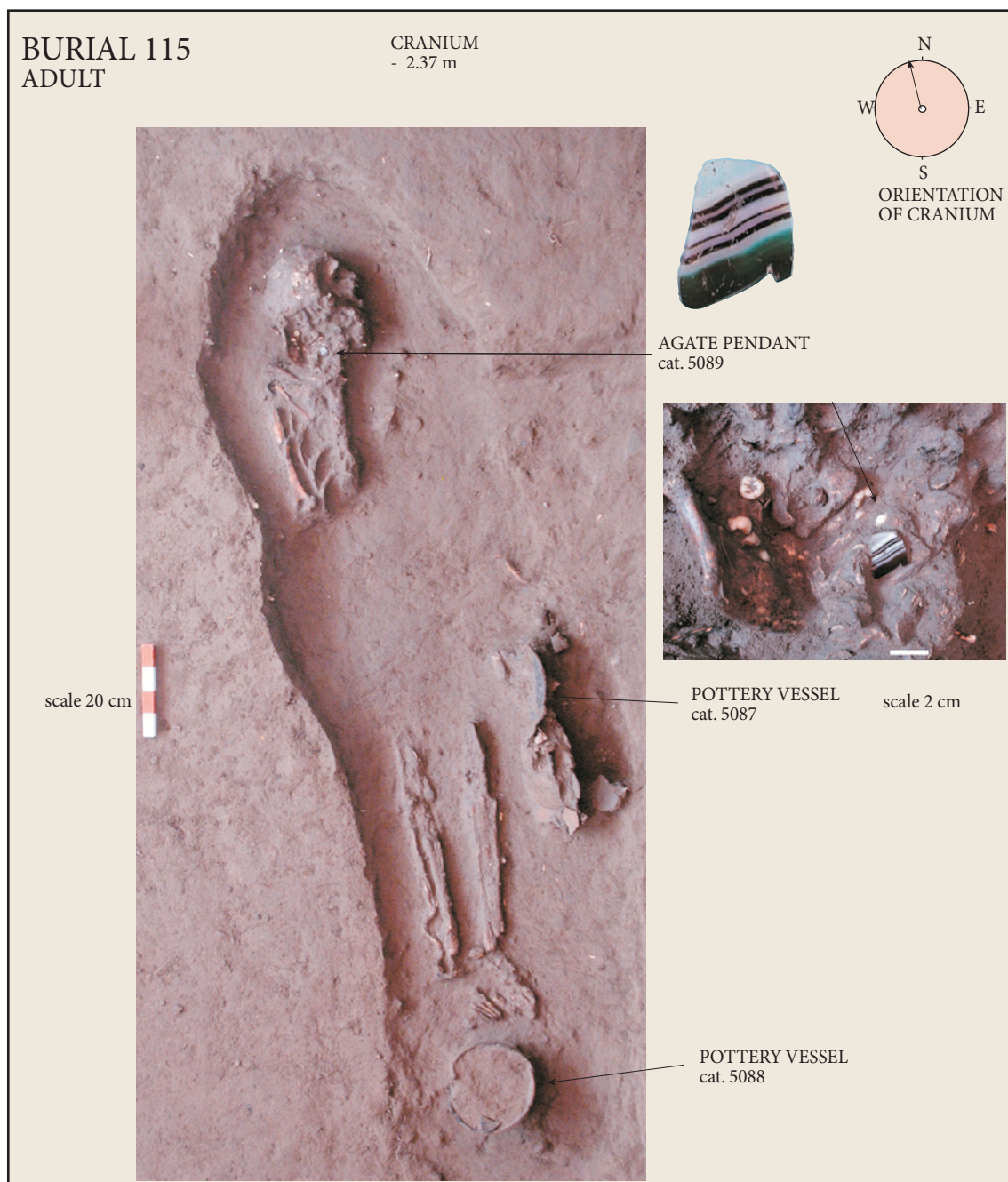


FIG. 8:14 Burial 115

Lower layer 2 contains two burials dating to the Iron Age. One is a newly-born infant, found in a fragmentary mortuary jar. Burial 115 is an adult, interred with a single

ceramic vessel beyond the feet, and an agate pendant at the neck. These pendants at Noen U-Loke were found in mortuary phases 3-5.

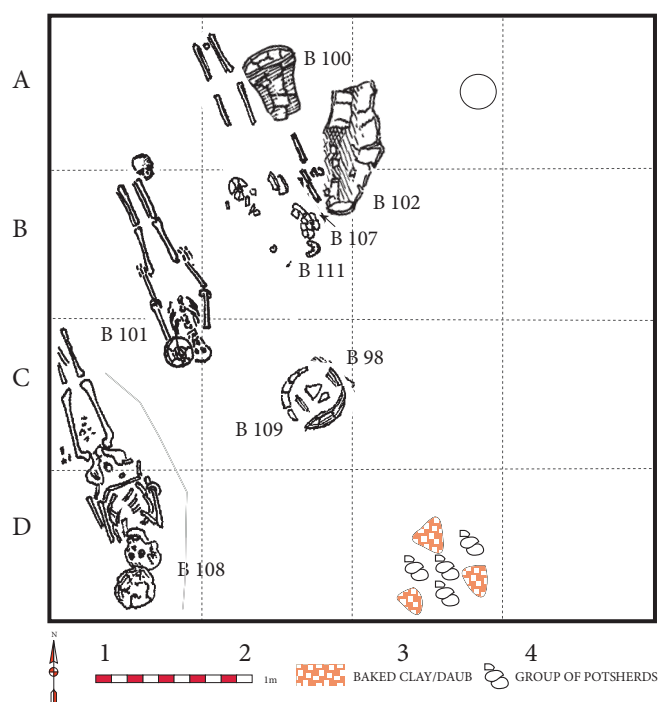


FIG. 8:15 Plan of square X upper layer 2 and lower layer 1

The upper part of layer 2 and lower layer 1 contain the burials of a late Iron Age cemetery. At Noen U-Loke, the final Iron Age mortuary phase 5 included infant burials within a distinctive form of ceramic vessel, and these are precisely matched in those from square X. Burial 102 involved two such pots. Burial 109 had been placed directly over burial 98. These were accompanied by four adults, orientated on a northeast-southwest axis and forming a row. One of these, burial 107, had been disturbed in antiquity. In an experimental programme, rice chaff from the tempering material used in the pots of burials 100 and 102 was radiocarbon dated. The results are: burial 100 cat. 5014, AA-60665 2320 $\pm$ 30 BP (480-230 cal. BC); burial 102 cat. 5016 AA-60662 1960 $\pm$ 30 BP (40 cal. BC-AD 120) and burial 102 AA-60663 1870 $\pm$ 25 BP (80-220 cal. AD). Only the last of these three is likely to reflect the true age.

The adults, while containing mortuary offerings that match those from the late Iron Age, are markedly poorer than those from Noen U-Loke.

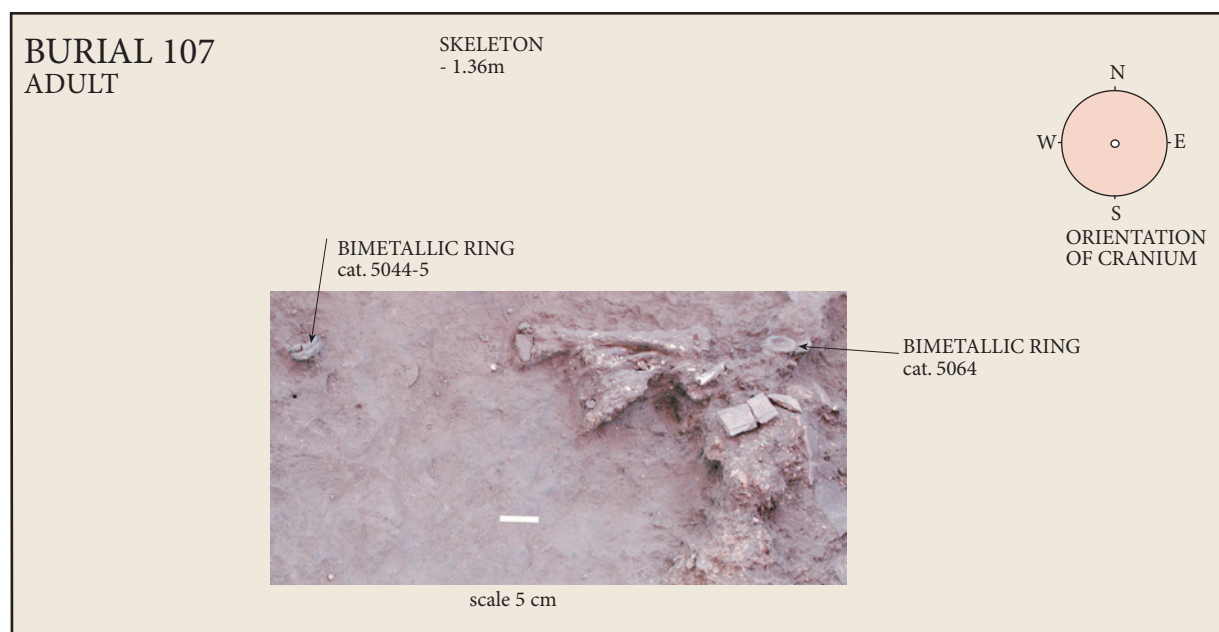


FIG. 8:16 Burial 107

Burial 107, that of an adult, had been disturbed in antiquity. Two bimetallic (bronze and iron) rings were found in the vicinity of the bones.

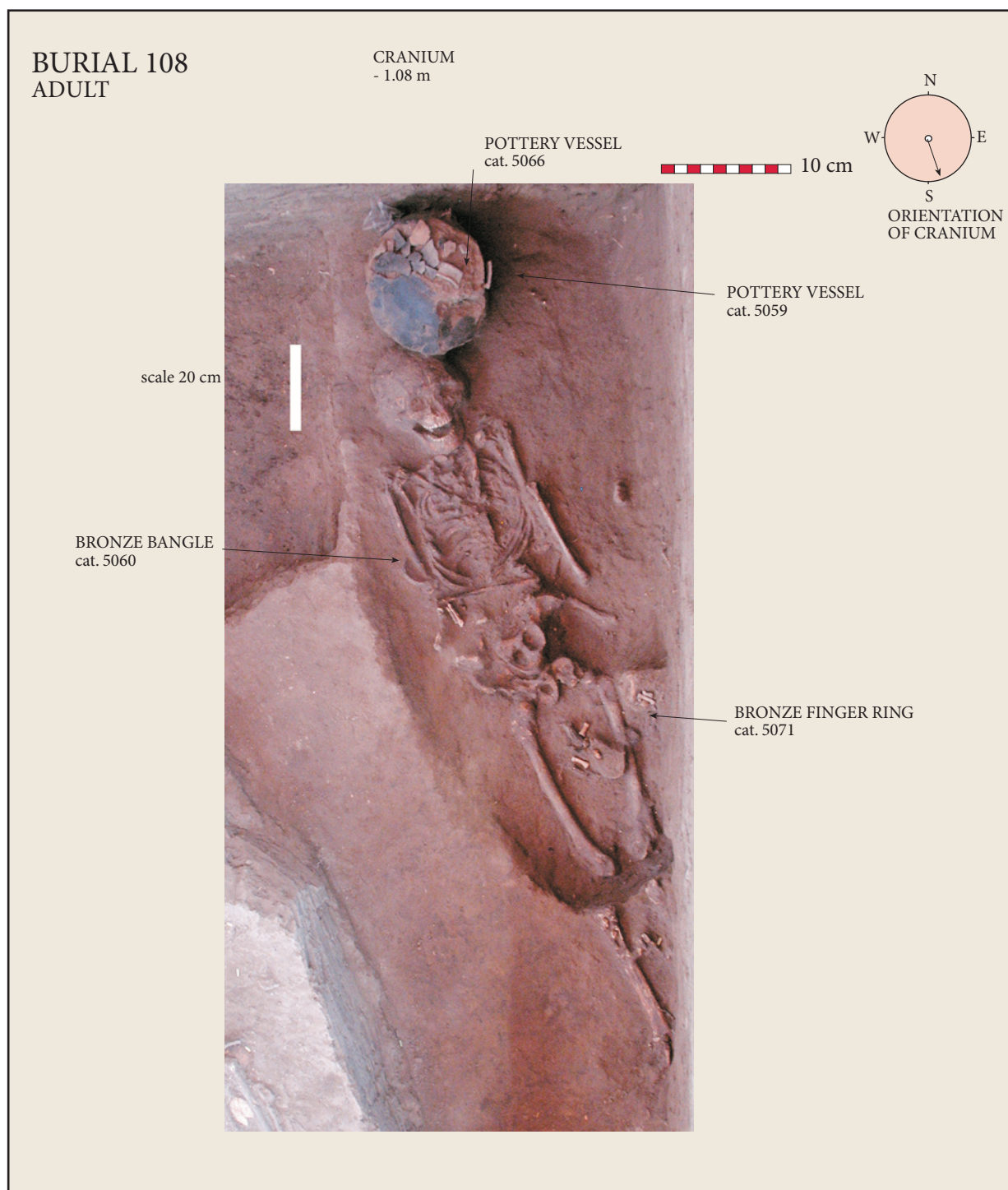


FIG. 8:17 Burial 108

Burial 108 is an almost complete grave of an adult, orientated with the head directed to the southeast. Two Phimai Black pots lay beyond the head, and this individual wore a bronze bangle on the left wrist and a bronze finger ring

on the left hand. Half a red glass bead and two further fragments of bronze bangle were found in the vicinity of the skeleton.

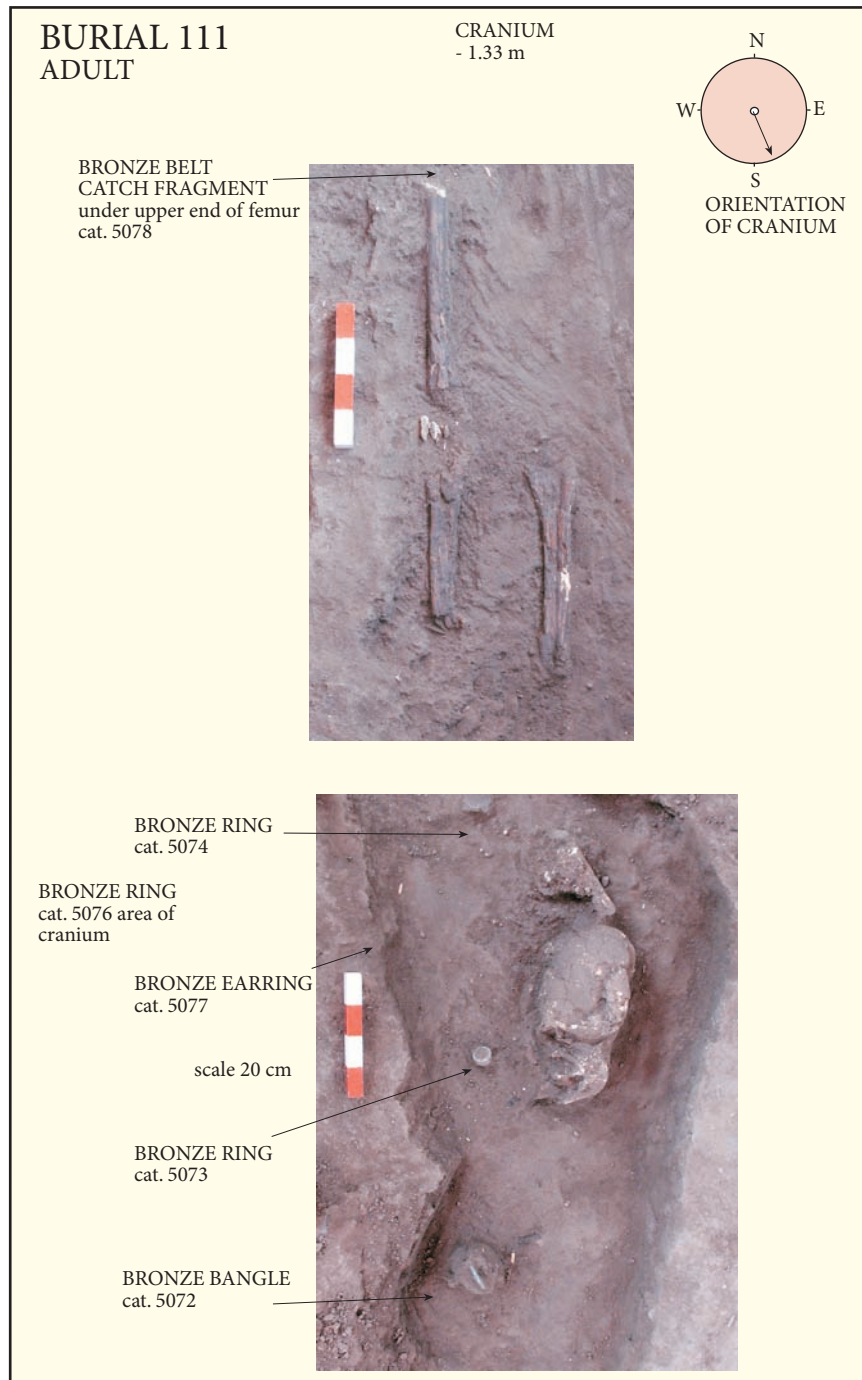


FIG. 8:18 Burial 111

Burial 111 contained the partial remains of an adult, with the head orientated to the southeast. This person had been interred with a set of bronze ornaments, including a belt,

represented only by the catch, a bronze bangle and a set of rings that appear to have been used as earrings.

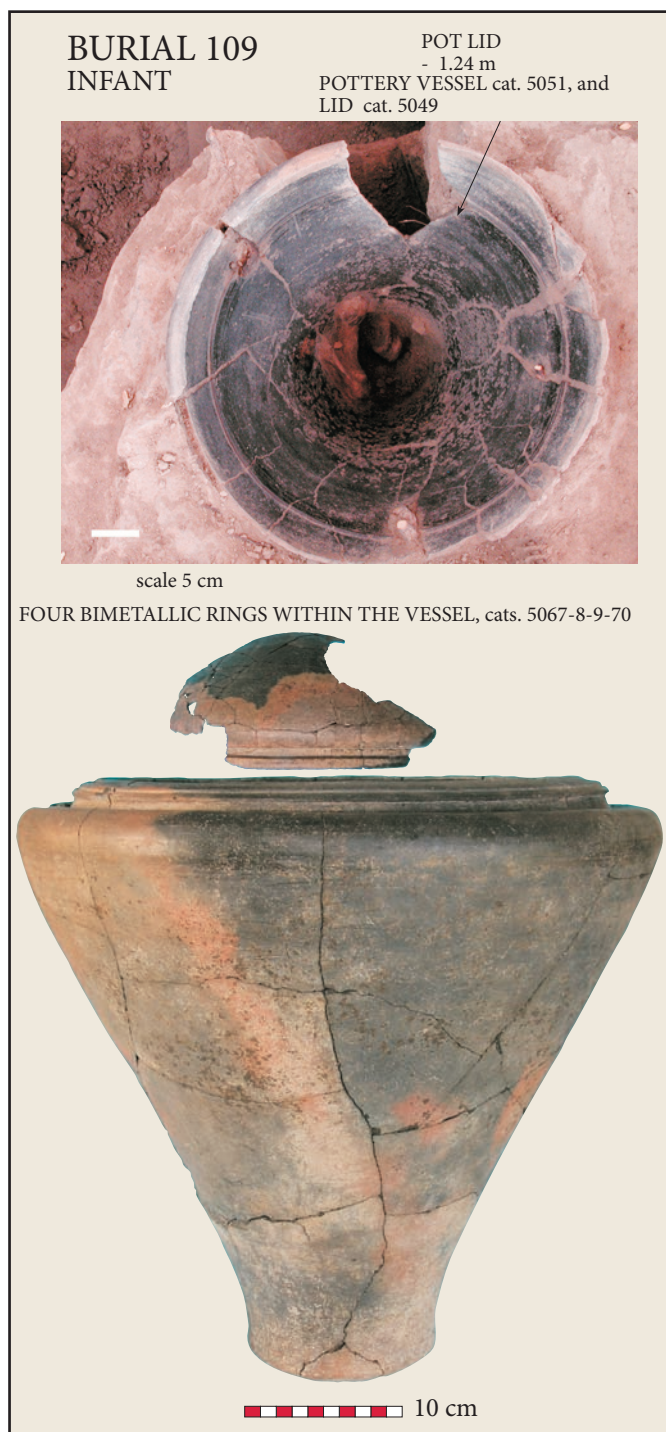


FIG. 8:19 Burial 109

Burial 109 is a lidded jar containing the remains of an infant who died at or soon after birth. Four bimetallic bronze-iron rings were found within the vessel.

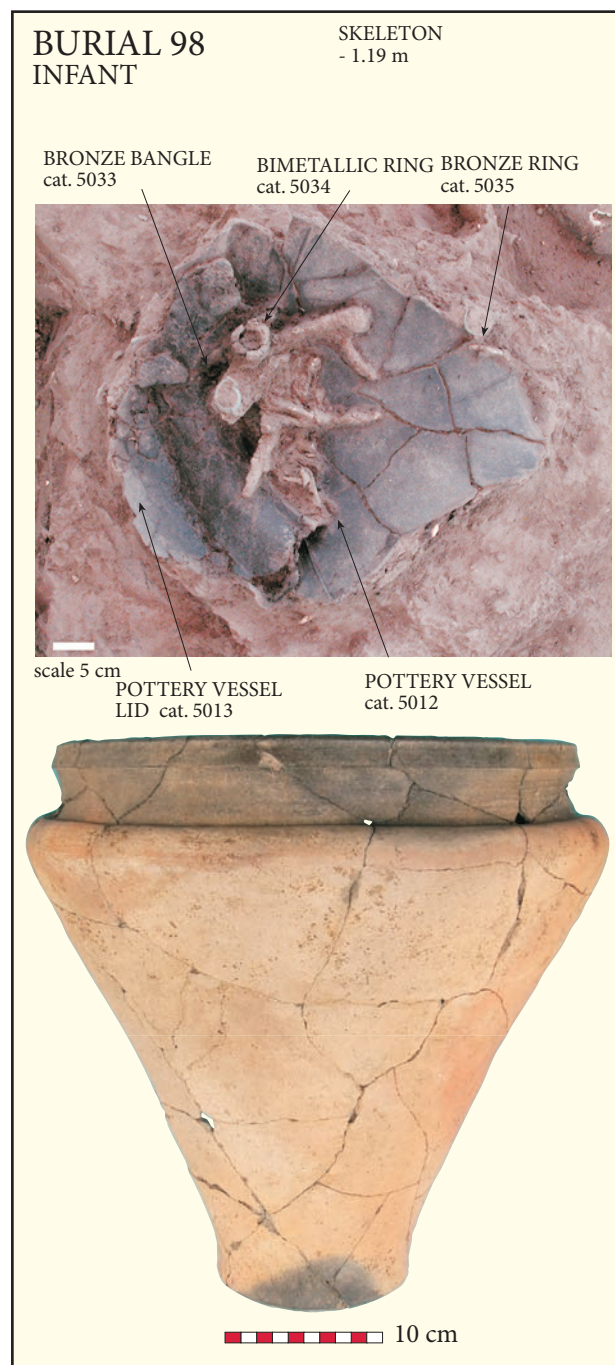


FIG. 8:20 Burial 98

This jar burial contained the remains of an infant who died at or soon after birth. It was accompanied by a bimetallic ring and two bronze rings.

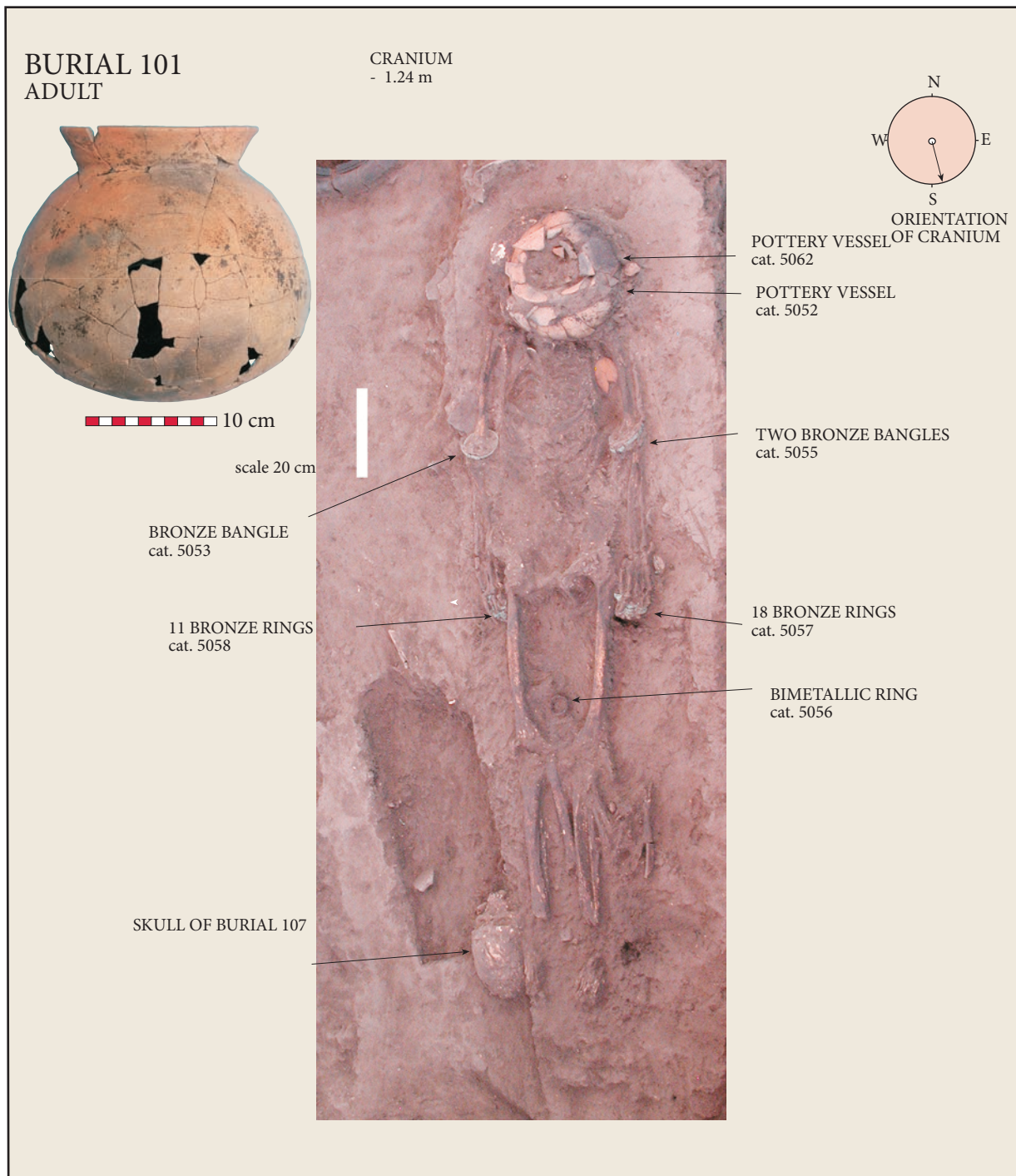


FIG. 8:21 Burial 101

Burial 101 involved an adult with the head orientated to the southeast. Two pottery vessels lay beyond the head. This person wore 29 bronze finger rings and three bronze

bangles. A bimetallic ring had been placed between the femora. It is very similar to burials from mortuary phase 5 at Noen U-Loke

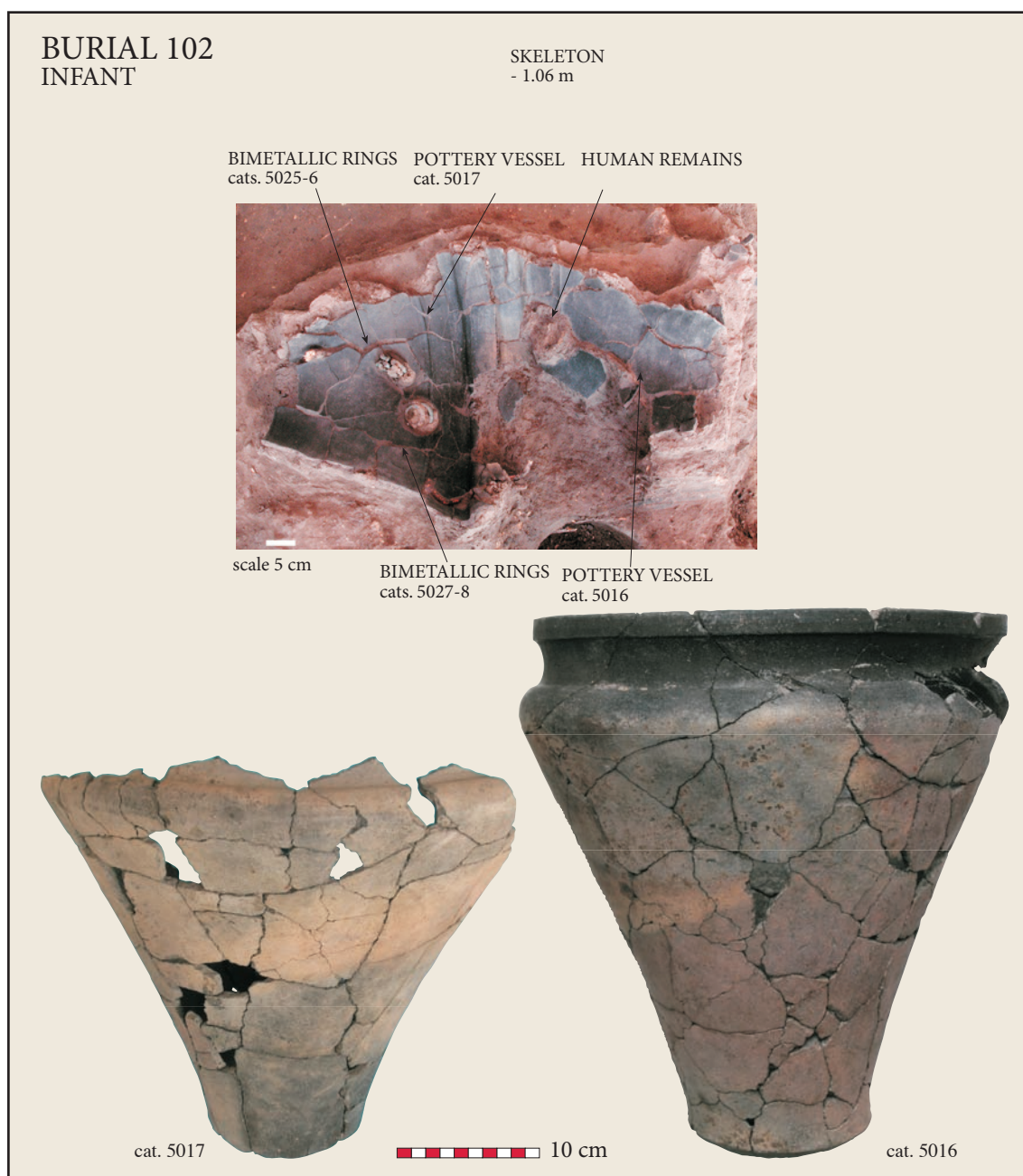


FIG.8:22 Burial 102

Burial 102 unusually involved two mortuary jars placed mouth to mouth, rather than one lidded vessel. Four

bimetallic rings accompanied the infant, the remains of whom are too poorly represented to be assigned an age.

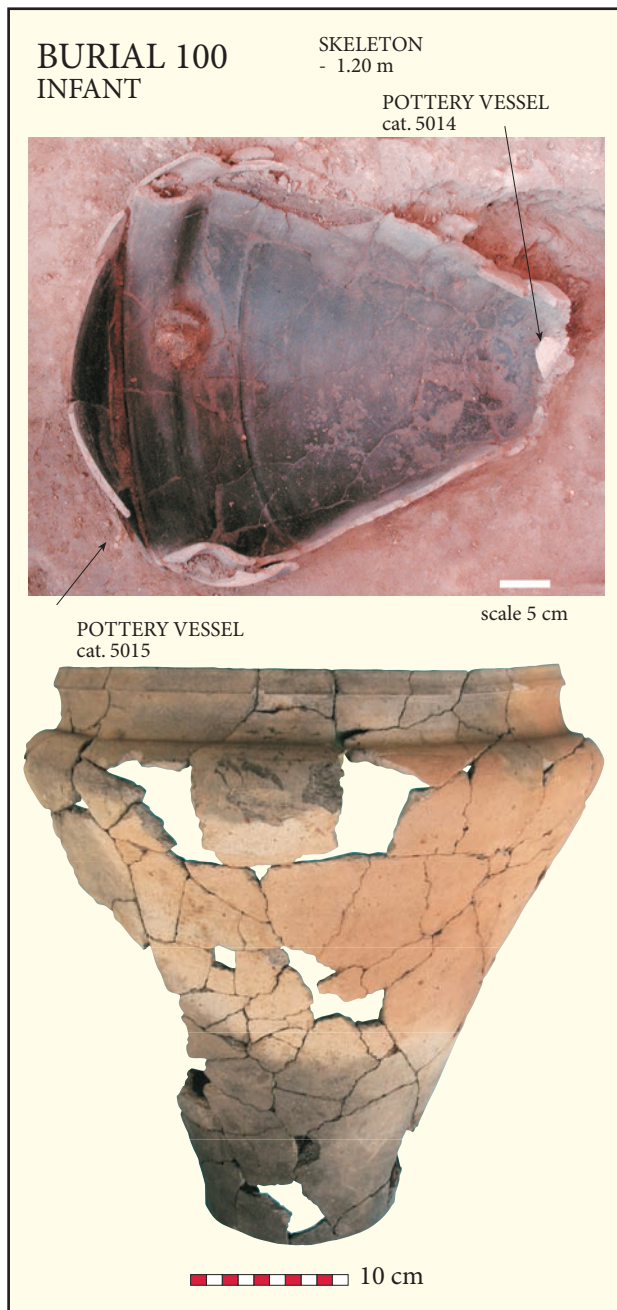


FIG. 8:23 Burial 100

The infant interred in this burial jar died when aged about 6 months. No offerings were found in association.

SUMMARY

Square X lies towards the southern edge of Ban Non Wat. It was chosen for investigation because villagers identified this area as one where agate and carnelian beads appeared on the surface after rains, and therefore, might be an Iron Age burial area. Until we opened this square we had not found a concentrated area of Iron Age burials. This prediction was confirmed with the uncovering of a group of late Iron Age burials just over a metre below the present ground surface. They belong to the final or fifth mortuary phase represented at nearby Noen U-Loke. None is wealthy, but the bronze finger rings, bangles and bimetallic rings match those from Noen U-Loke. The form of the infant jar burials also confirms this equivalence.

The cemetery covers a layer of Iron Age occupation, and this in turn seals a series of deposits representing water transgressing with some energy over the area. These lenses in turn cover a remarkable wall foundation that was positioned adjacent to a stream bed. The wall comprised a parallel sided trench containing pits lying alongside very large and deep postholes. The structure evidently incorporated large wooden posts, and it probably dates to the late Bronze or the early Iron Age.

IX THE MORTUARY RECORD

C.F.W. HIGHAM

INTRODUCTION

The mortuary sequence at Ban Non Wat falls into ten phases determined on the basis of superpositions, grave form, location and the range of mortuary offerings. The most important criterion is the presence of superpositions that reveal the relative chronology. It is possible that the earliest burials contained flexed skeletons, associated

with a limited range of mortuary offerings that are not paralleled in this site or indeed, in any other known to the author. Since these do not underlie any burials prior to the fourth phase of the Bronze Age, their actual relativity remains enigmatic. They are described below as the group of flexed burials.

There are then two Neolithic phases, known as Neo 1

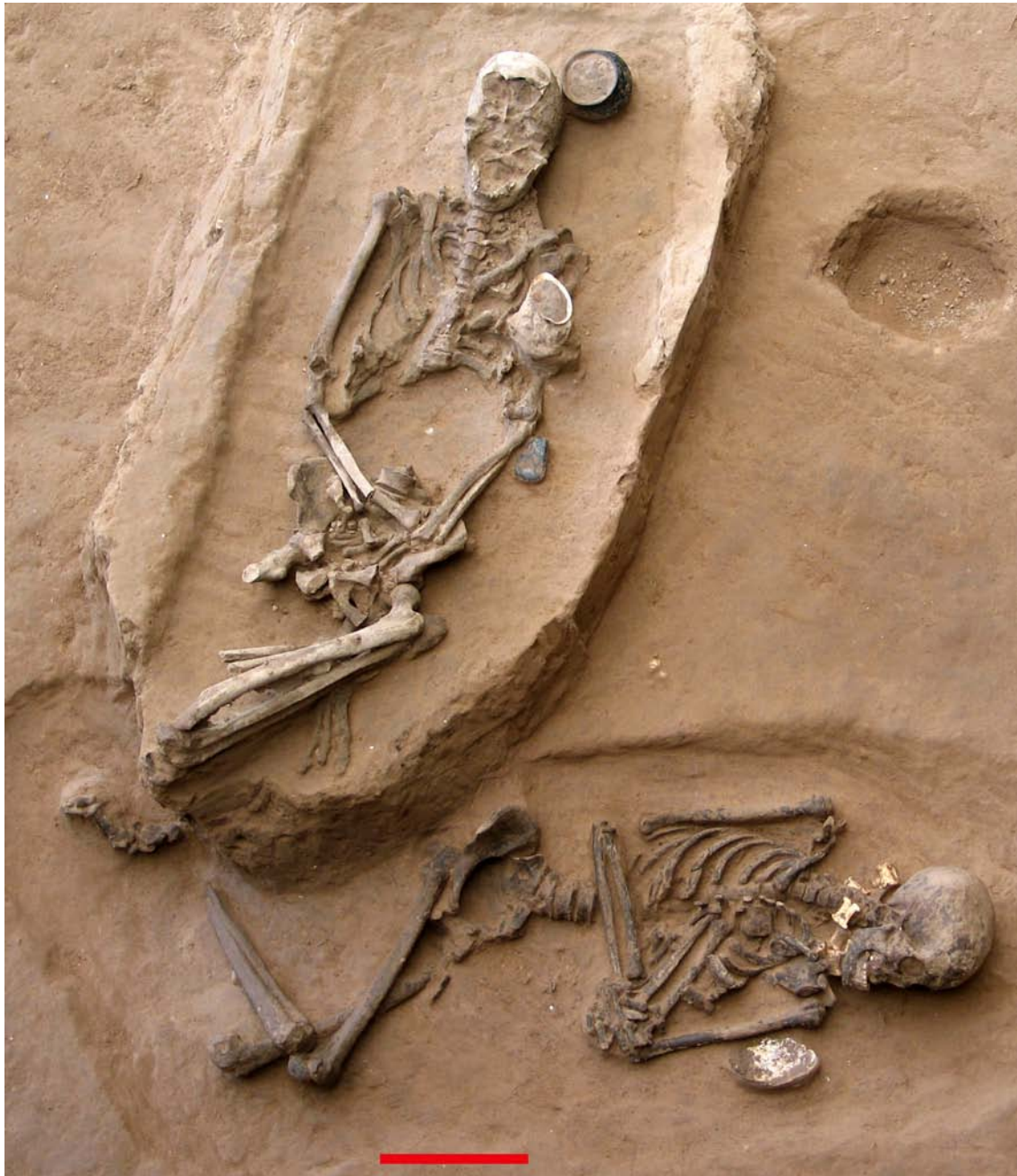


FIG. 9:1 Burials 438 (above) and 454. Scale 20 cm

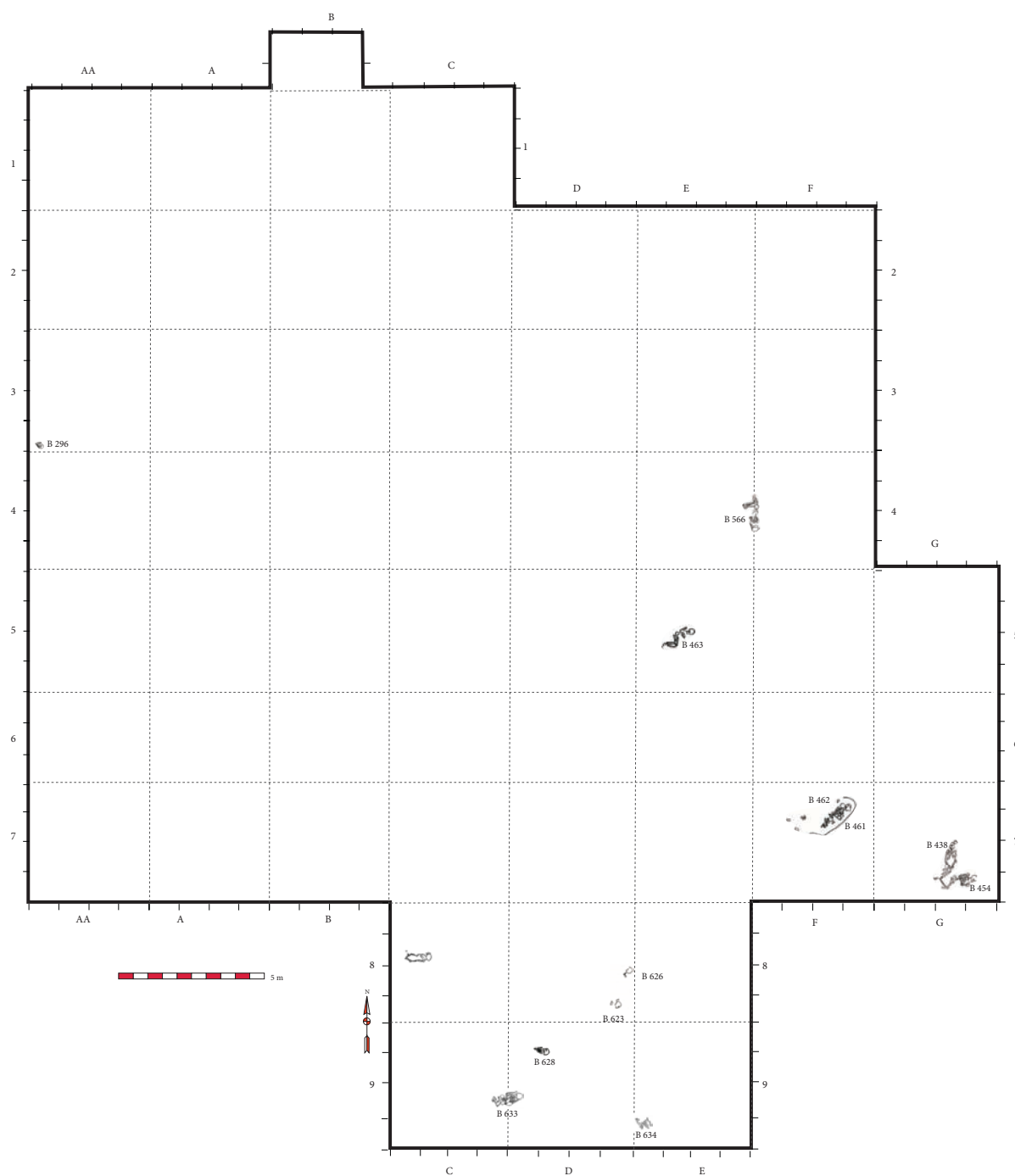


FIG.9:2 The distribution of flexed burials

and 2, followed by five Bronze and two Iron Age groups. The description of each will comprise a brief summary, with a complete review planned for subsequent volumes.

FLEXED BURIALS

The flexed burials are distributed across much of the site with no grouping evident. In two cases, however, burials were paired: a woman with an infant, and a man and

woman (Fig. 9:2). Burial 454 lay on the left side, with the knees flexed and the right arm placed over the chest. The head pointed almost to the west. The left arm was bent such that the forearm pointed towards the head with the hand adjacent to the skull. This person wore a necklace of shell beads. The size of the beads suggests that they were fashioned from the tridacna shell, thus indicating a marine source. The shape is rectangular, with the hole bored lengthwise. The large beads were linked with small

shell disc beads, some of which were found still in place in the threading holes for the large specimens. A bivalve shell had been placed at the left shoulder. Burial 438 lay to the north of burial 454 with the head pointing just east of due north. The knees were flexed and the hands were linked over the lower abdomen. The skull was incomplete. A small globular pottery vessel lay adjacent to the skull. It has a maximum diameter of 11.2 cm, and the surface is plain and smoothed. A bivalve shell was found over the left upper arm. This person wore a shell bead necklace of at least 228 beads. Unlike those from burial 461, they were carefully finished. A stone adze head lay at the left elbow.

In order to refine the chronology of the cultural sequence at Ban Non Wat, freshwater bivalve shells that were placed as mortuary offerings have been radiocarbon dated. Three such dates have been obtained from the flexed burials as follows:

OxA-18141 Burial 454 3362 ± 27 BP 1741-1537 cal. BC
 OxA-18142 Burial 461 3204 ± 27 BP 1521-1423 cal. BC
 OxA-15942 Burial 438 2948 ± 29 BP 1262-1055 cal. BC

It is possible that the flexed interments cover a lengthy timespan that overlaps with the Neolithic cemetery.

NEOLITHIC PERIOD 1

Neolithic 1 burials are defined on the basis of the manner of burial and the associated mortuary offerings. Wherever there was a stratigraphic relationship, these burials are earlier than Neolithic 2 graves. The adult dead were interred in a supine position, usually with the head pointing to the north. A few burials were orientated to the east or the south. Two adults were placed in a seated position in large, lidded mortuary vessels. Infants were also buried in lidded mortuary vessels. Ceramic vessels were the principal mortuary offering. There is a notable rarity of shell

jewellery. One person wore a multi-strand shell necklace, and another was found with a single shell bangle. Two individuals were accompanied by cowrie shells. In the case of burial 86, these were pierced and worn as ear ornaments. No such associations suggesting use as jewellery were identified with the four cowrie shells associated with burial 292. Animal offerings were found in the form of pig's bones. Two stone adzes were also placed with burials.

Burial 86 is one of the richest and most complete of the Neolithic 1 graves (Fig. 9:4). The corpse of a young adult male had been laid out on the back, with the head facing upwards and the arms beside the body. The left ulna was not in anatomical position and the jaw was slightly open. Two cowrie shells, both pierced, were found to the left of the skull, and had presumably been ear ornaments. There were also three bivalve shells associated with the mortuary ritual, one under ceramic vessels beyond the head, the other to the left of the left ankle and the third by the right hand. Four ceramic vessels were recovered. One of these, cat. 2233, is an open bowl, again bearing red painted designs. There are broad red bands over cord marking on the exterior, while the interior bears thinner parallel red-painted lines in a curvilinear pattern.

Cat. 2230 is a footed vase. The base, as is normally the case with this form, carries the principal decorative motifs. Essentially there are five panels, demarcated by horizontal incised lines. The lowest of these was painted red. A relatively thin burnished band followed, under a series of infilled semi-lunate motifs. This in turn lay under a broad band of impressed circles. The uppermost panel was burnished. The upper body was likewise burnished, and there are faint indications of at least one horizontal band of impressed lines. The interior of the base was painted with a series of broad red bands, but no particular pattern is evident.

The third vessel, cat. 2231 is a vase. The base was decorated with a distinctive incised motif the horizontal component again resembling the outline of a whale or a wing. This motif, also seen on the burial 28 and 103 mortuary jars, was repeated three times. It was highlighted in red paint to a burnished background. The junction between the base and the upper body was accentuated by a band of red paint. The interior of the base was also painted with curved bands of red paint. The fourth vessel survived only in fragments. It is probably of form 3. The base is cord marked with mainly vertical impressions, while the shoulder, above a cordon, was burnished and then decorated with curvilinear motifs executed as red painted, paral-

TABLE 9:1 *The radiocarbon determinations for Neolithic 1 burials*

Lab. code	Burial	Source material	Date BP	Cal. date
OxA-11722	Burial 28	charcoal	3680 ± 45 BP	2150-1935 cal. BC
OxA-18133	Burial 28	bivalve shell	3170 ± 27 BP	1499-1407 cal. BC
OxA-13467	Burial 179	charcoal	3399 ± 32 BP	1862-1616 cal. BC
OxA-13534	Burial 195	charcoal	3213 ± 30 BP	1598-1419 cal. BC
OxA-16700	Burial 86	bivalve shell	3100 ± 28 BP	1434-1304 cal. BC
OxA-11723	Burial 32	charcoal	3190 ± 55 BP	1611-1321 cal. BC
OxA-16699	Burial 32	bivalve shell	3156 ± 28 BP	1497-1392 cal. BC

lel lines. It was located beyond the skull.

One particularly interesting aspect of this burial, is that it was the focus of five infant jar burials, located in an arc around the head area. At least two young pigs were interred with this individual. One cranium was found over the right tibia, and a second over and beyond the ankles. The

pelvis of a pig was also found beyond the head. Finally, a sheet of gastropod shellfish had been placed over the body, a practice that was to be matched in a handful of rich Bronze Age burials at a later date. This burial, which extended over 3.6 metres, reveals a complex and ritualised tradition of treating the dead during the Neolithic occu-

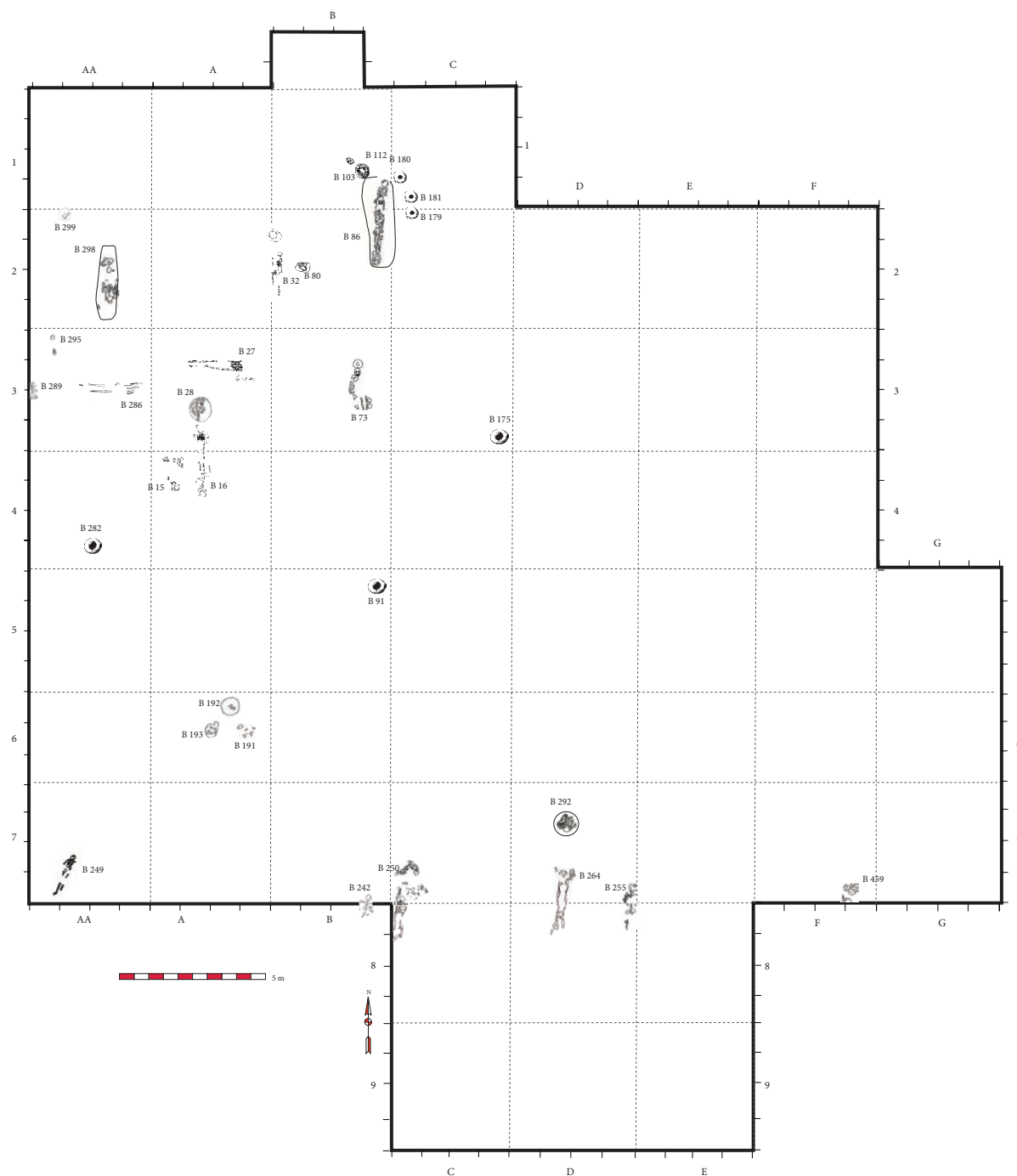


FIG.9:3 The distribution of Neolithic 1 burials

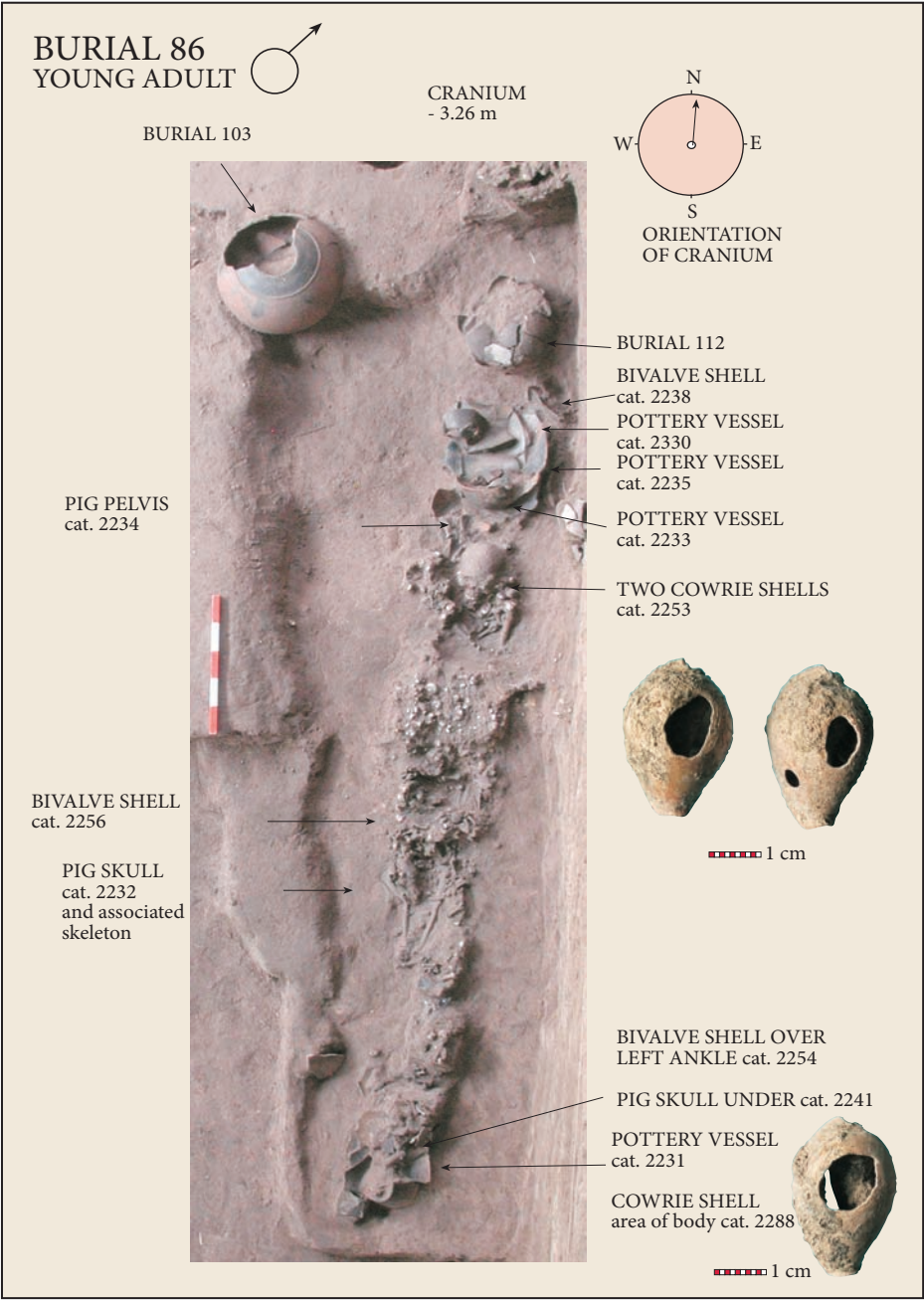


FIG.9:4 Burial 86

pation of Ban Non Wat. The radiocarbon determinations for Neolithic 1 burials were obtained from either charcoal

found within ceramic vessels, or associated bivalve shell-fish.



FIG. 9:5 Ceramic vessels from burial 86. A, cat. 2231, B, cat. 2230, C, cat. 2233

NEOLITHIC PERIOD 2

Neolithic 2 burials are characterised by graves with few mortuary offerings. These normally comprise one or two ceramic vessels that are globular in form, and cord marked. One of these vessels, however, bore red painted ornamentation and another had a burnished upper body. Where there is a stratigraphical relationship, these are later than Neolithic 1 burials, and earlier than those confidently ascribed to the Bronze Age on account of the presence of

bronze mortuary offerings. In almost every respect, these burials contrast with those from Neolithic 1. They were usually interred on a different orientation and the ceramic vessels are distinct in form. A similar series of burials was encountered at the nearby site of Ban Lum Khao, where they were dated slightly later than 1280-1300 BC. At Ban Non Wat, a radiocarbon determination was obtained from a bivalve shell associated with burial 31. The result is OxA-

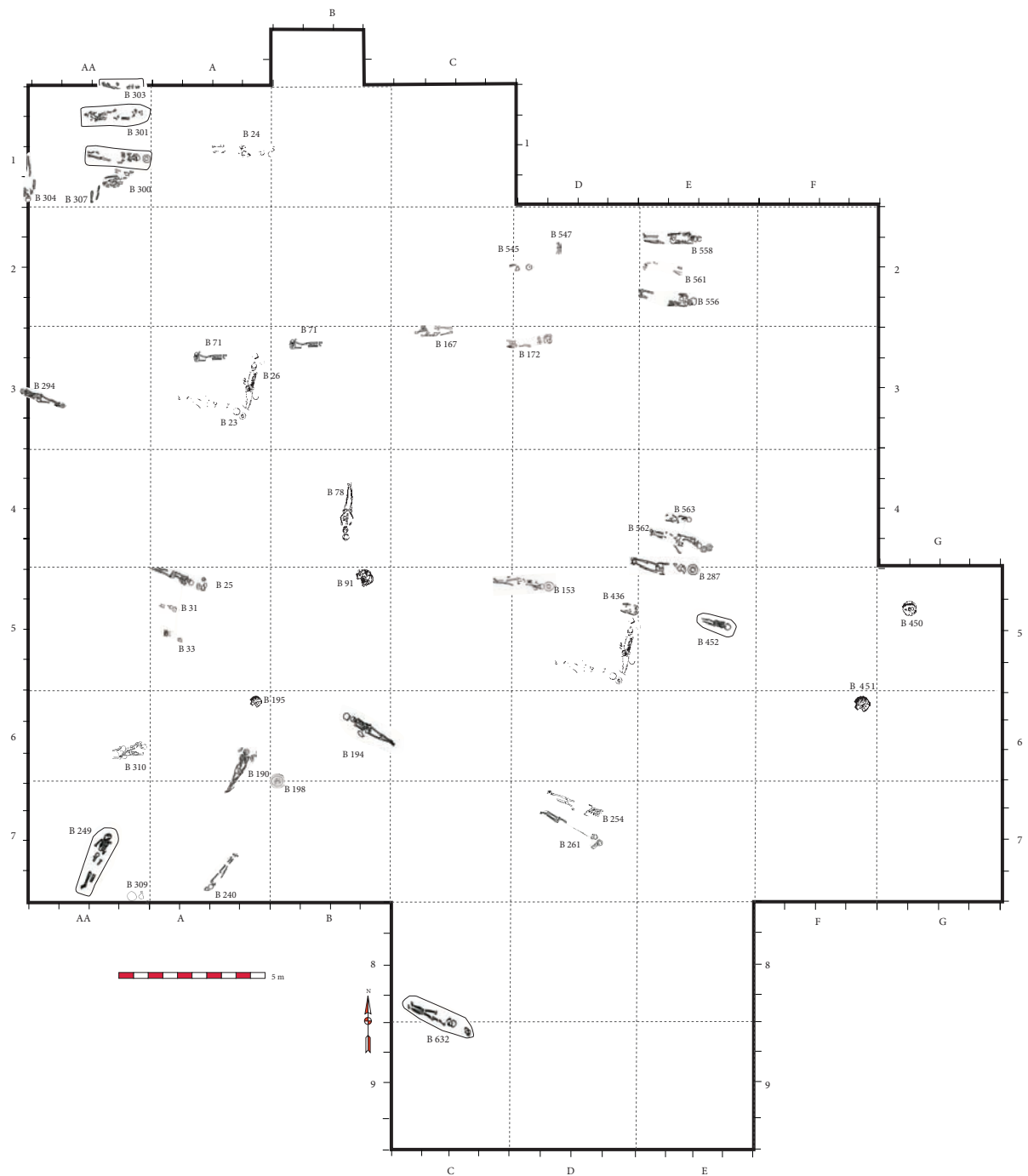


FIG. 9:6 The distribution of Neolithic 2 burials

18140 2955 ± 26 BP (1266-1055 cal. BC).

The preferred orientation of the corpse was with the head to the east, although some burials were oriented to the south, west or north. There appear to be groups comprising a handful of burials, lying parallel with each

other. Apart from one or two cord-marked vessels placed beyond the head or feet, one adult was interred with pig bones in the head area and two others were associated with bivalve shells. Two further individuals wore waist-bands fashioned from long shell beads.

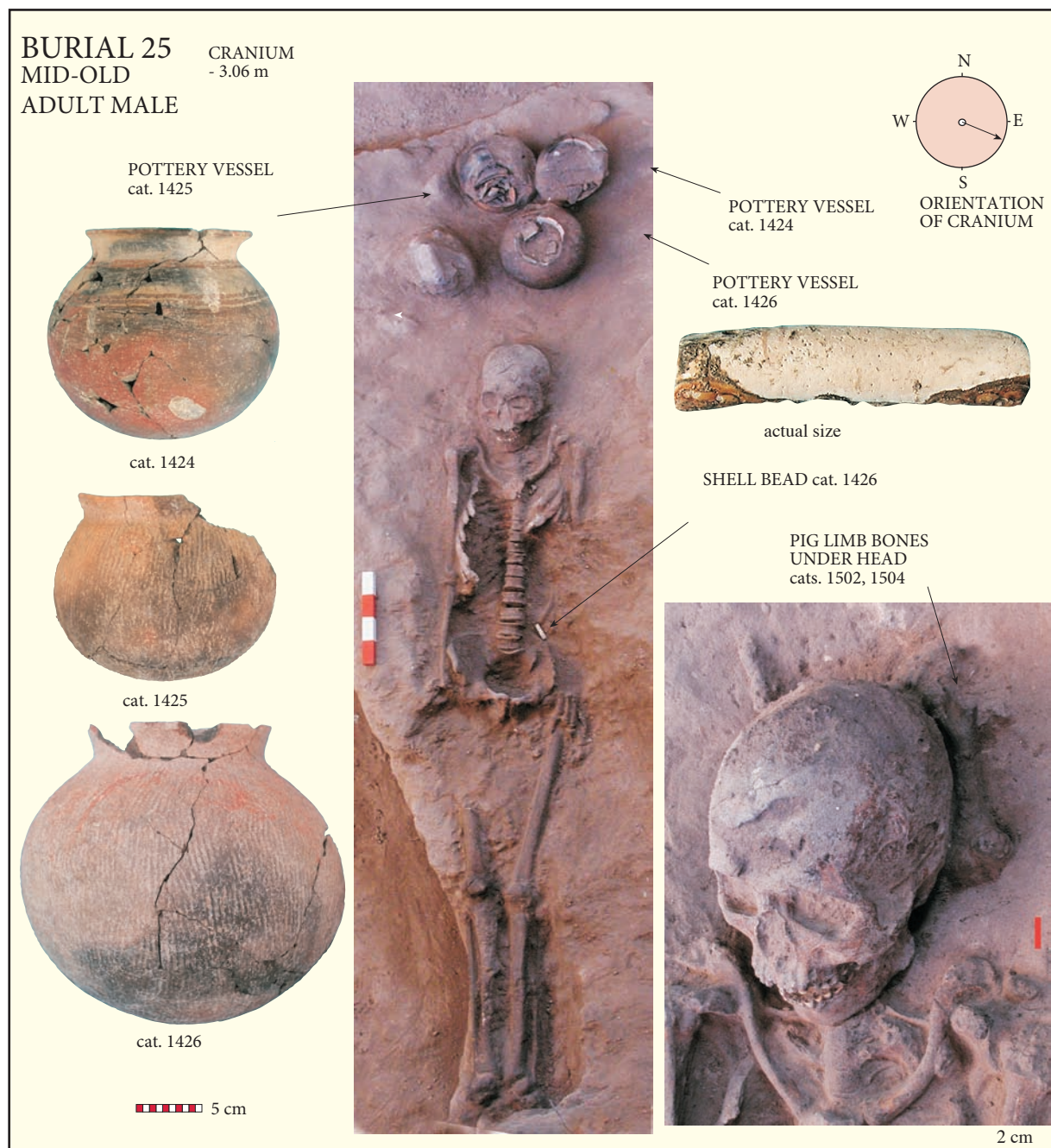


FIG. 9:7 Burial 25, a Neolithic 2 grave, showing the associated ceramic vessels and shell bead

BRONZE AGE PERIOD 1

The six graves belonging to Bronze Age 1 were found at the eastern part of the excavated area. Burial 470 had been severed with the interment of burial 443 of Bronze Age period 2. These burials are distinctive for their mortuary offerings. Three contain a socketed bronze axe, and two others include a bronze artefact. The ceramic vessels comprise small, globular cord-marked jars with cylindrical necks,

and footed open bowls. They are most closely matched in the late Neolithic burials from the nearby site of Ban Lum Khao (Higham and Thosarat 2004). The Bronze Age 1 graves, however, are the more elaborate. Burial 569, for example, is very deeply cut into the natural substrate, and the body was interred in a wooden coffin in the form of a boat with a pointed prow. The associated pots were

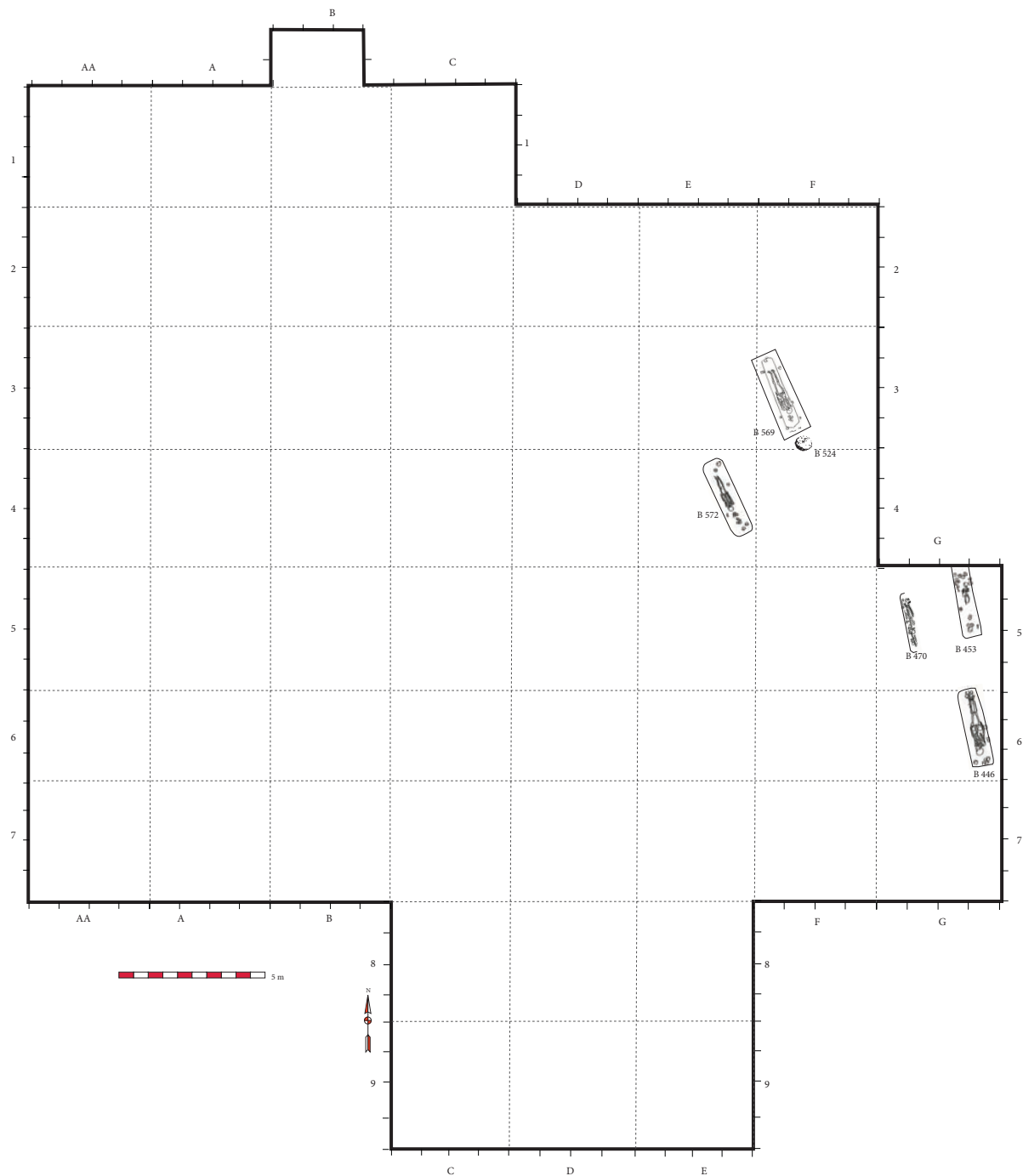


FIG. 9:8 The distribution of graves belonging to Bronze Age period 1

found both within the coffin and outside it. The skeleton of burial 446 was covered by a carpet of gastropod shells, a ritual found in some of the Neolithic graves. Two of the six Bronze Age 1 burials have supplied radiocarbon

determinations on the basis of associated bivalve shells. They are:

OxA-16705 Burial 446 2709 ± 28 BP 907-809 cal. BC

OxA-17465 Burial 569 2818 ± 29 BP 1051-901 cal. BC

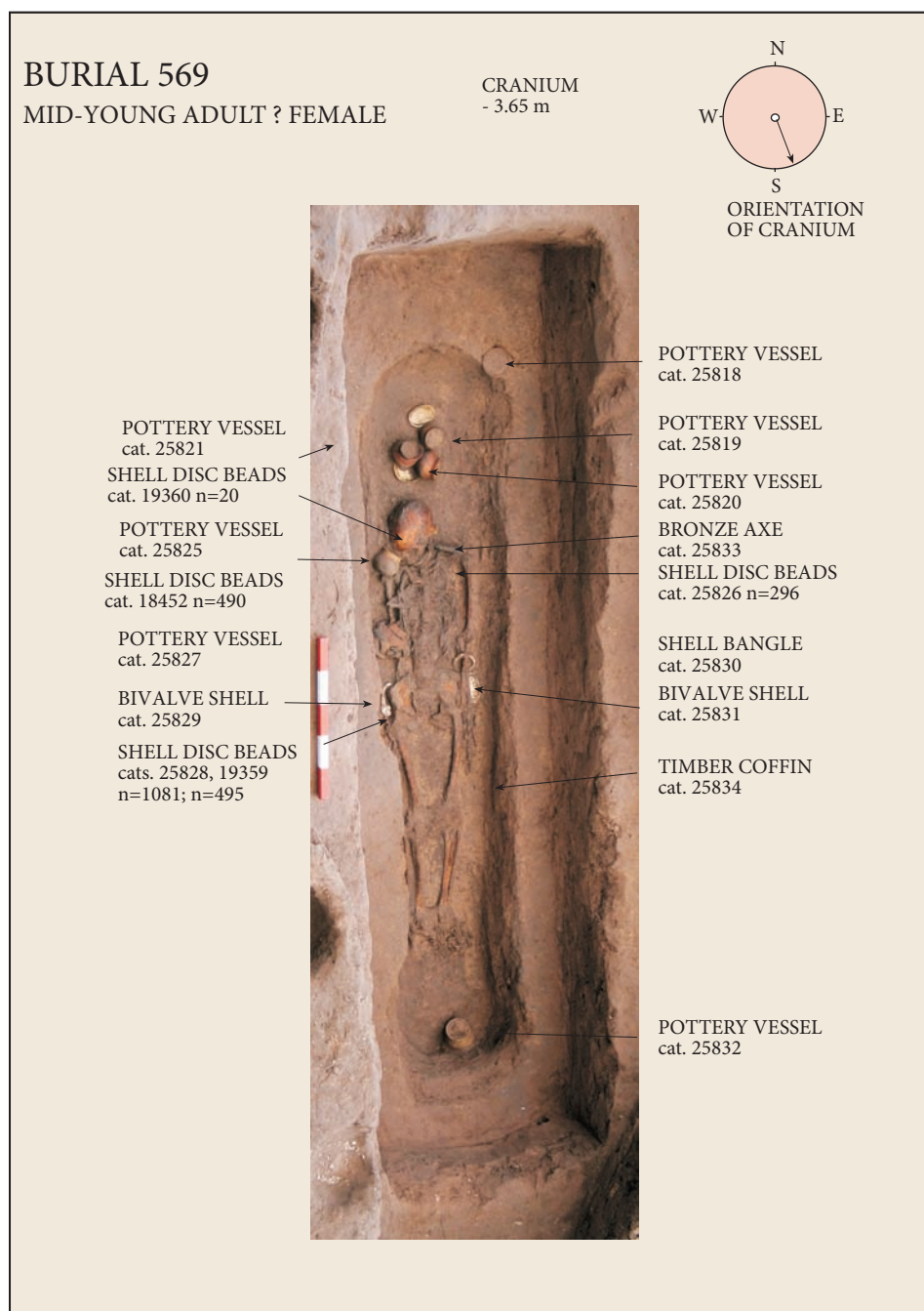


FIG. 9:9 Burial 569

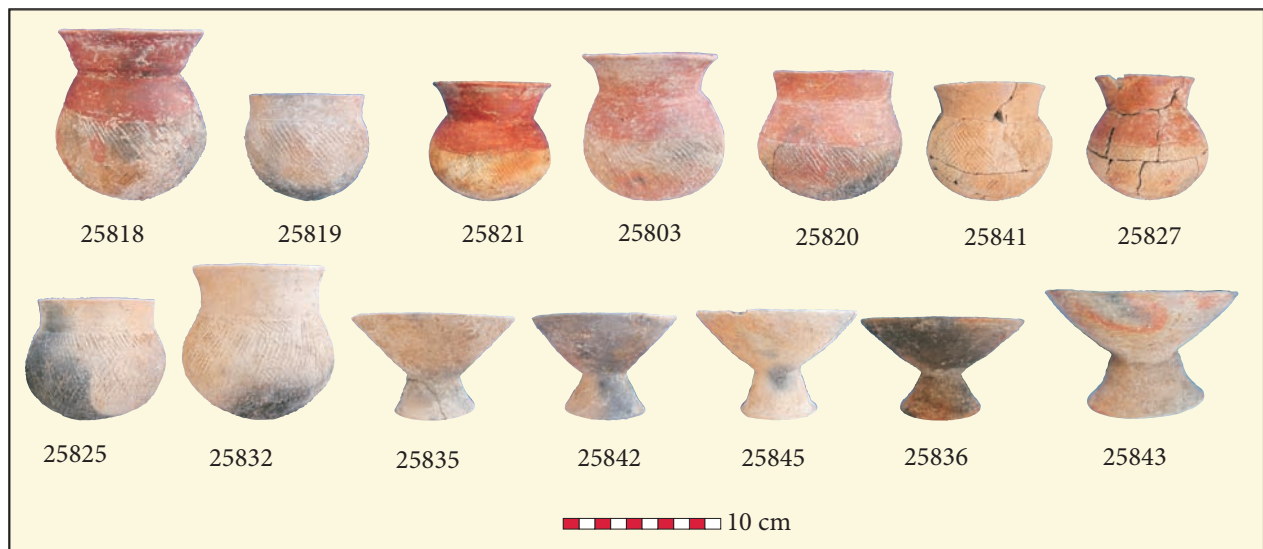


FIG. 9:10 Pottery vessels associated with burial 569

BRONZE AGE PERIOD 2

The burials ascribed to Bronze Age 2 appear to fall into a series of rows (Fig. 9:11). Wherever there is a relative chronology based on superpositions, they are always later than Bronze Age 1 and precede Bronze Age 3 graves. The men, women, infants and children of this phase are invariably interred with considerable wealth, measured in ceramic vessels of distinctive form and decoration, marble and marine shell bangles, shell beads and bronzes. In five cases, the skeleton had been partially exhumed and the bones

then replaced in an orderly group. The graves for young and old individuals were large, the longest being almost 5 m long. Indeed, a particular feature of this group is the size and wealth of infant burials. On several occasions, mineralised wood indicated the use of a coffin, and in one instance, a clay coffin was encountered.

Most individuals were buried with large bivalve shells, and the radiocarbon dates obtained are set out in table 9:2.

TABLE 9:2 *The radiocarbon determinations for burials of Bronze Age 2*

Lab. no.	Burial	Date BP	Calibrated date	Lab. no.	Burial	Date BP	Calibrated date
OxA-16340	290	2866±31	1130-926 cal. BC	OxA-16341	290	2817±30	1056-896 cal. BC
OxA-15245	290	2796±30	1020-890 cal. BC	OxA-16701	90	2733±27	926-816 cal. BC
OxA-17456	571	2697±28	902-806 cal. BC	OxA-17458	550	2731±27	925-815 cal. BC
OxA-17459	555	2817±28	1047-904 cal. BC	OxA-17460	522	2912±29	1248-1010 cal. BC
OxA-17461	532	2641±28	889-785 cal. BC	OxA-17462	536	2807±27	1041-898 cal. BC
OxA-17463	536	2768±28	997-837 cal. BC	OxA-17464	543	2798±29	1021-846 cal. BC
OxA-17465	569	2818±29	1051-901 cal. BC	OxA-17467	570	2712±28	909-810 cal. BC
OxA-17714	105	2756±28	976-828 cal. BC	OxA-17715	106	3007±29	1380-1130 cal. BC
OxA-17889	197	2837±29	1112-914 cal. BC	OxA-17892	293	2745±30	975-818 cal. BC
OxA-17893	302	2793±30	1014-845 cal. BC	OxA-17897	458	2933±29	1261-1029 cal. BC
OxA-17989	468	2857±29	1122-929 cal. BC	OxA-17990	468	2588±28	815-601 cal. BC
OxA-18131	455	2804±27	1040-860 cal. BC	OxA-18132	456	2680±26	896-802 cal. BC

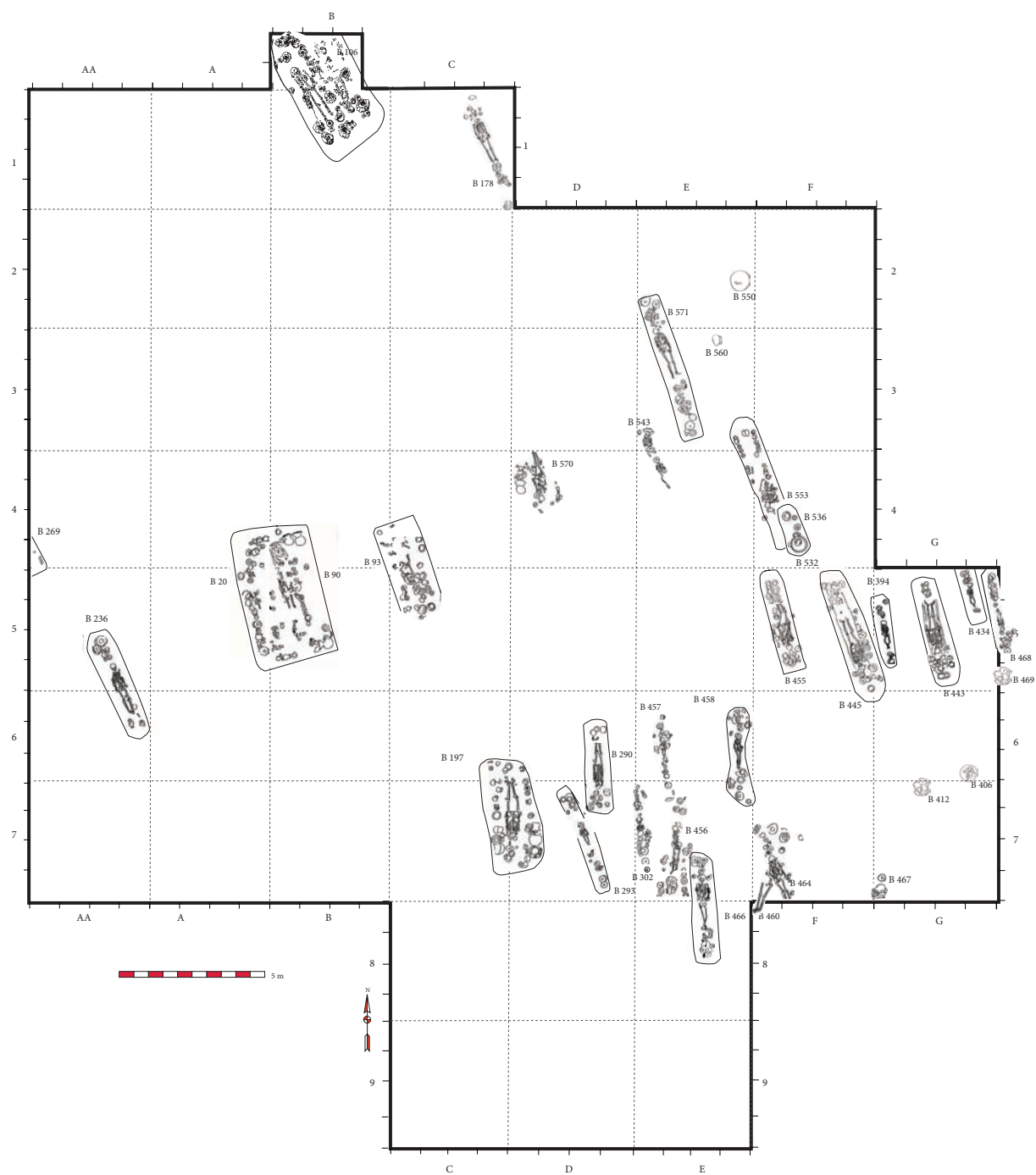


FIG. 9:11 The distribution of Bronze Age 2 burials

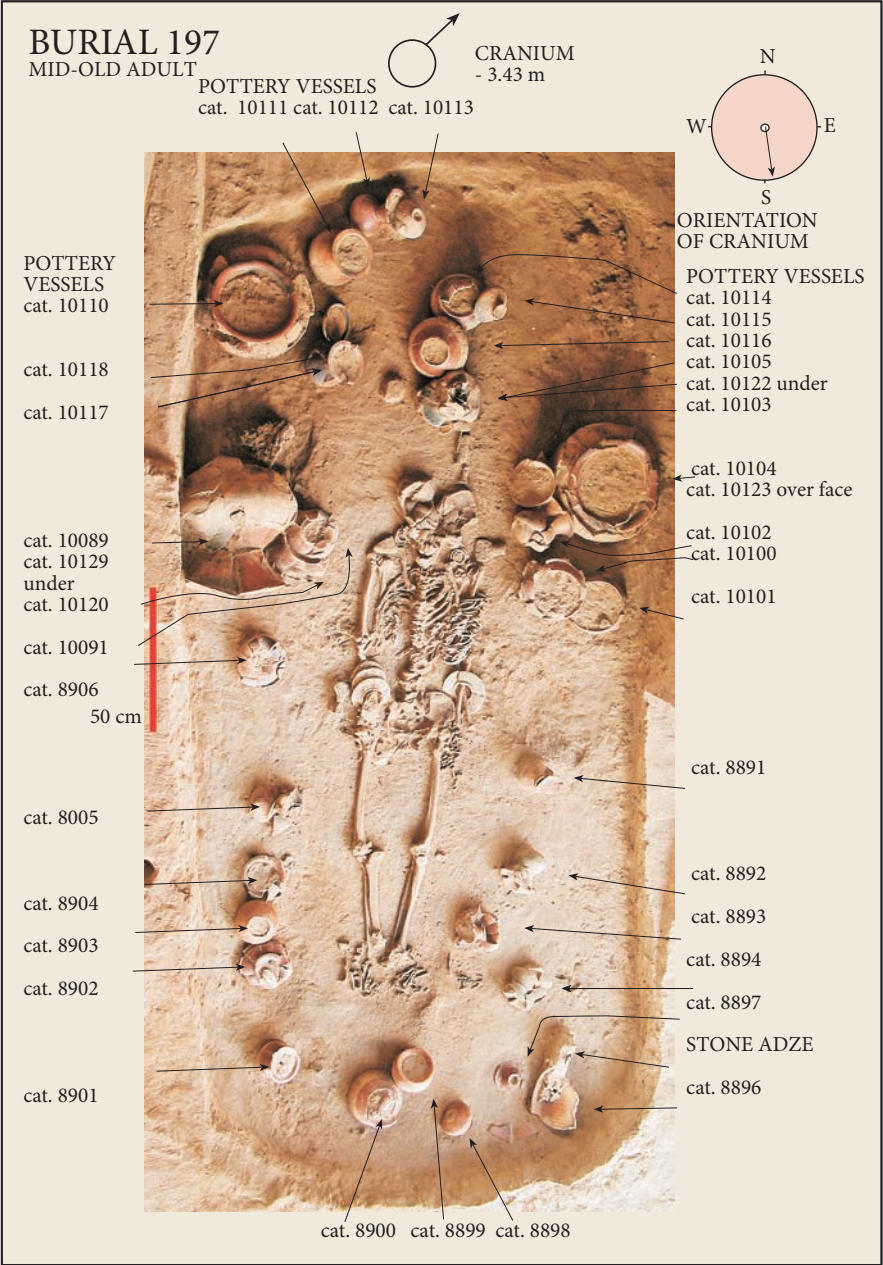


FIG. 9:12 Burial 197



FIG. 9:13 A selection of the principal forms of ceramic vessel from burial 197, Bronze Age 2



FIG. 9:14 Bronze axes from Bronze Age 2 graves. Cat. 18398 burial 458, cat. 18817 burial 445, cat. 24267 burial 571, cat. 4265 burial 90, cat. 2340 burial 106, cat. 18367 burial 457, cat. 18801 burial 455, cat. 12305 burial 290, cat. 5799 burial 178, cat. 12209 burial 290, cat. 10098 burial 197, cat. 12306 burial 290, cat. 8907 burial 197

BRONZE AGE PERIODS 3A AND B

There are two phases in Bronze Age 3. The graves belonging to Bronze Age 3A were found superimposed over those of Bronze Age 2. The preferred orientation of the body was to the northeast. These individuals present similarities and differences to their predecessors. On the one hand, the mortuary wealth continued to be high, measured in terms of the number of ceramic vessels and exotic shell and marble bangles worn. The infants also continued to be buried in large graves with rich offerings. In the case of

burial 622, the infant wore bronze bells round the ankles. No burial had been partially exhumed, and the ceramic vessels placed with the dead were located beyond either the head or the feet. None of the large and painted pots found with Bronze Age 2 individuals were encountered. Bronze Age 3B burials to the south are markedly smaller and poorer. The radiocarbon dates from bivalve shells associated with Bronze Age 3A burials are:

OxA-17888 Burial 196 2627 ± 29 BP 835-774 cal. BC

OxA-17891 Burial 263 2826 ± 29 BP 1073-902 cal. BC

OxA-17721 Burial 154 2803 ± 28 BP 1039-855 cal. BC

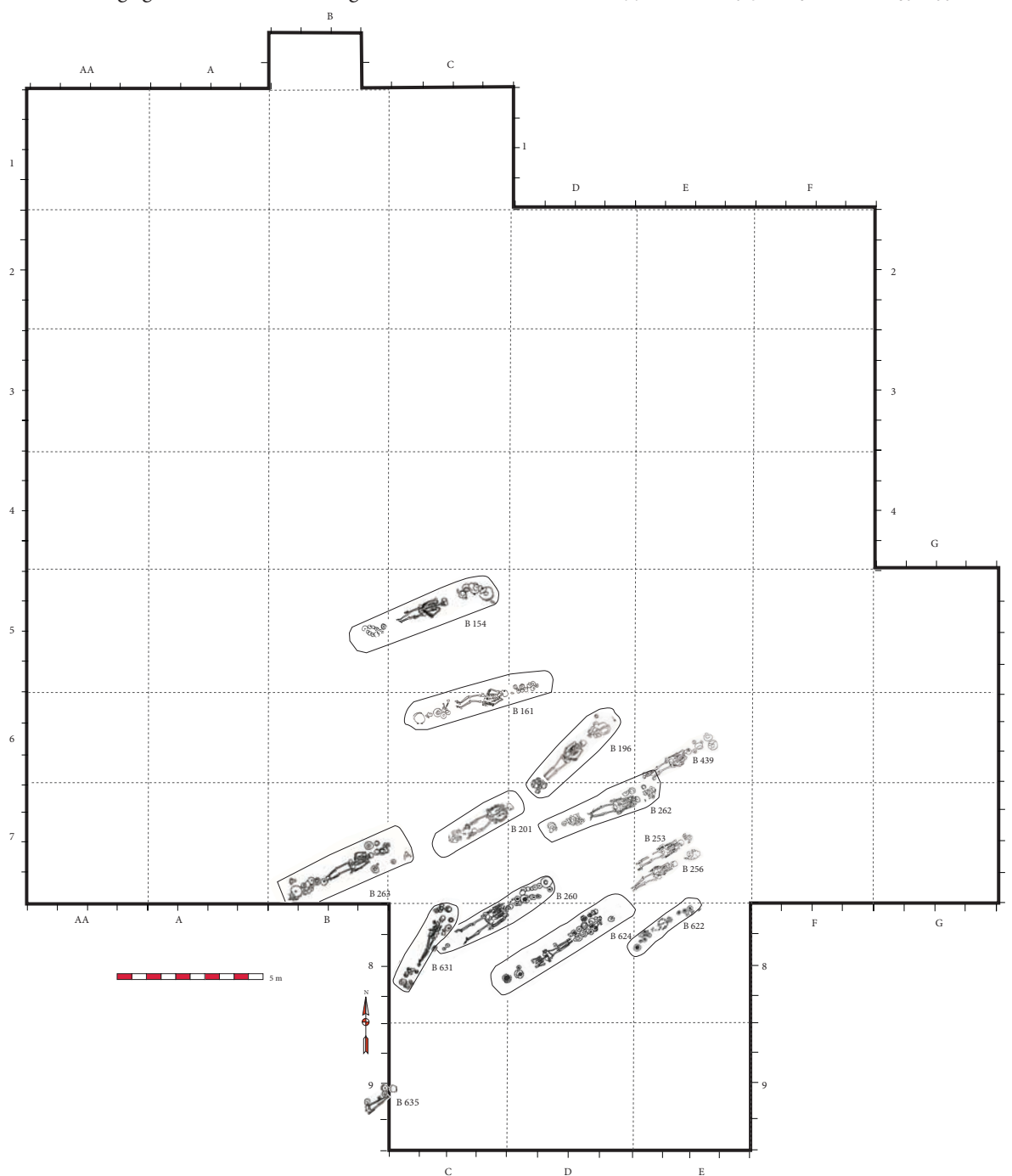


FIG. 9:15 The distribution of Bronze Age 3A burials

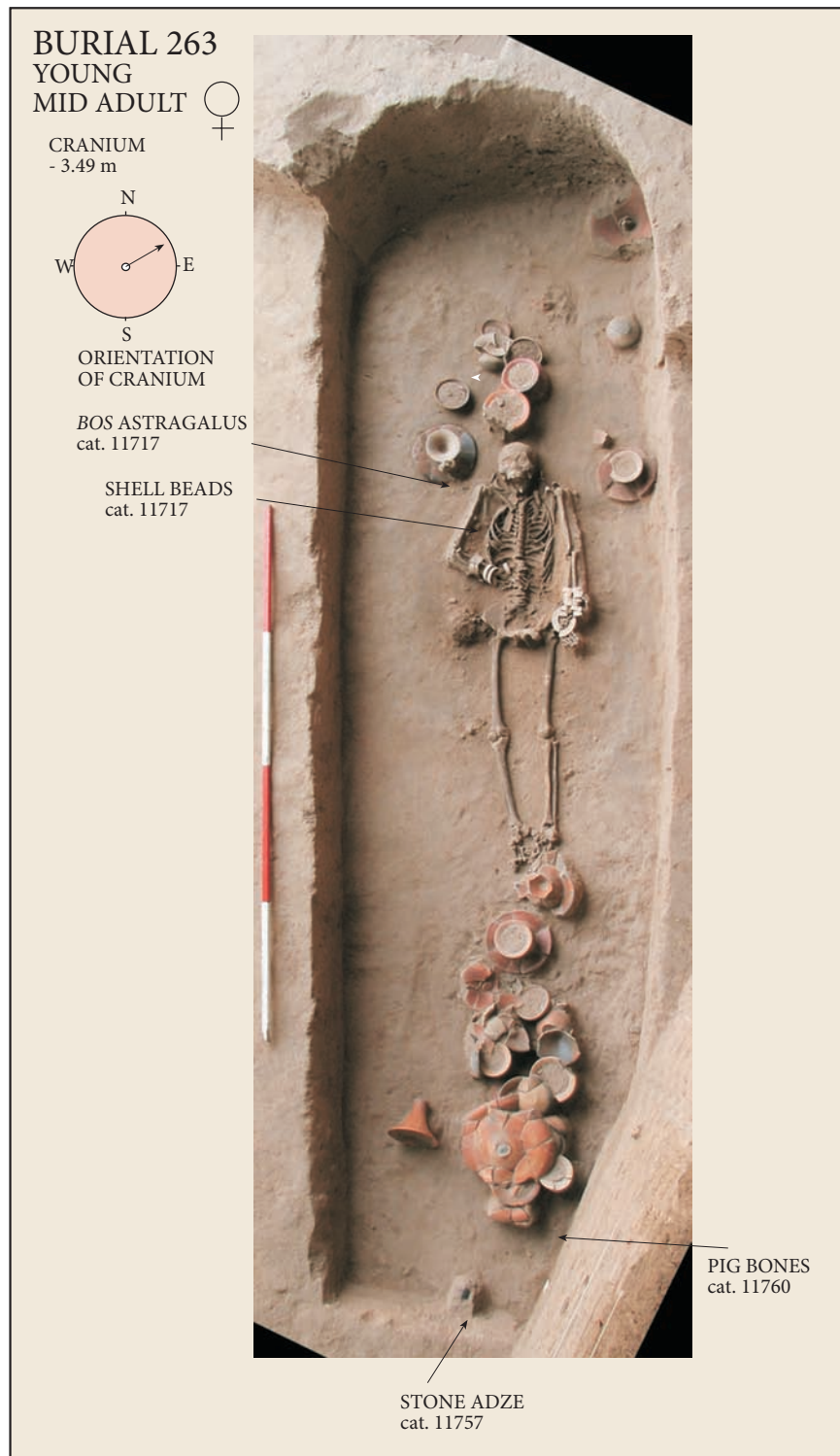


FIG. 9:16 Burial 263, representing Bronze Age 3A

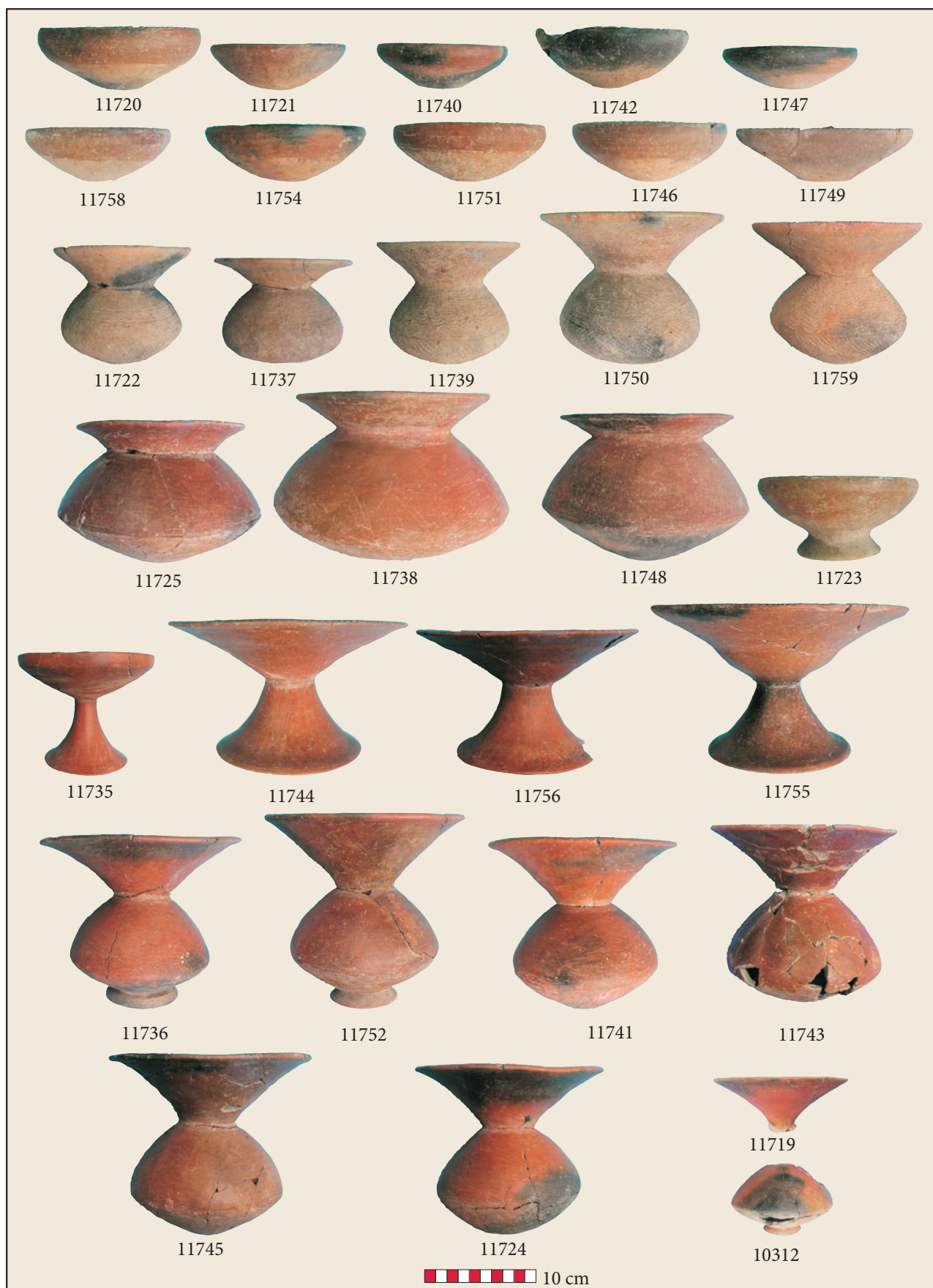


FIG. 9:17 The ceramic vessels from Burial 263, Bronze Age 3A

BRONZE AGE 3B

Bronze Age 3B is validated by the fact that in all cases where there is a stratigraphic relationship, the burials underlie those of Bronze Age 4. In the one instance where there is also a relationship with burials of Bronze Age 3A, the Bronze Age 3B burial covers that for Bronze Age 3A. The burials of both phases were orientated with the head directed to the northeast. Those for Bronze Age 3B are markedly poorer. There was a sharp reduction in the number of marble bangles and shell jewellery of any form. Apart from five bells with one individual, bronzes are absent. Some forms of ceramic vessel persisted, but

the variety seen in phase 3A fell away in 3B. The graves were smaller, with less room to accommodate the many pots that had formerly filled the areas beyond the head and feet. The graves were also dug to a shallower depth. However, with one exception, the distribution of the burials integrate, with most of the 3B graves lying adjacent and to the south of the 3A group. This poses an important issue. Was there a chronological development from 3A to 3B, which witnessed a rapid and sharp reduction in mortuary wealth. Or are the two groups contemporary, with one being of higher social standing? This will be addressed in detail in volume 3 of this report series.

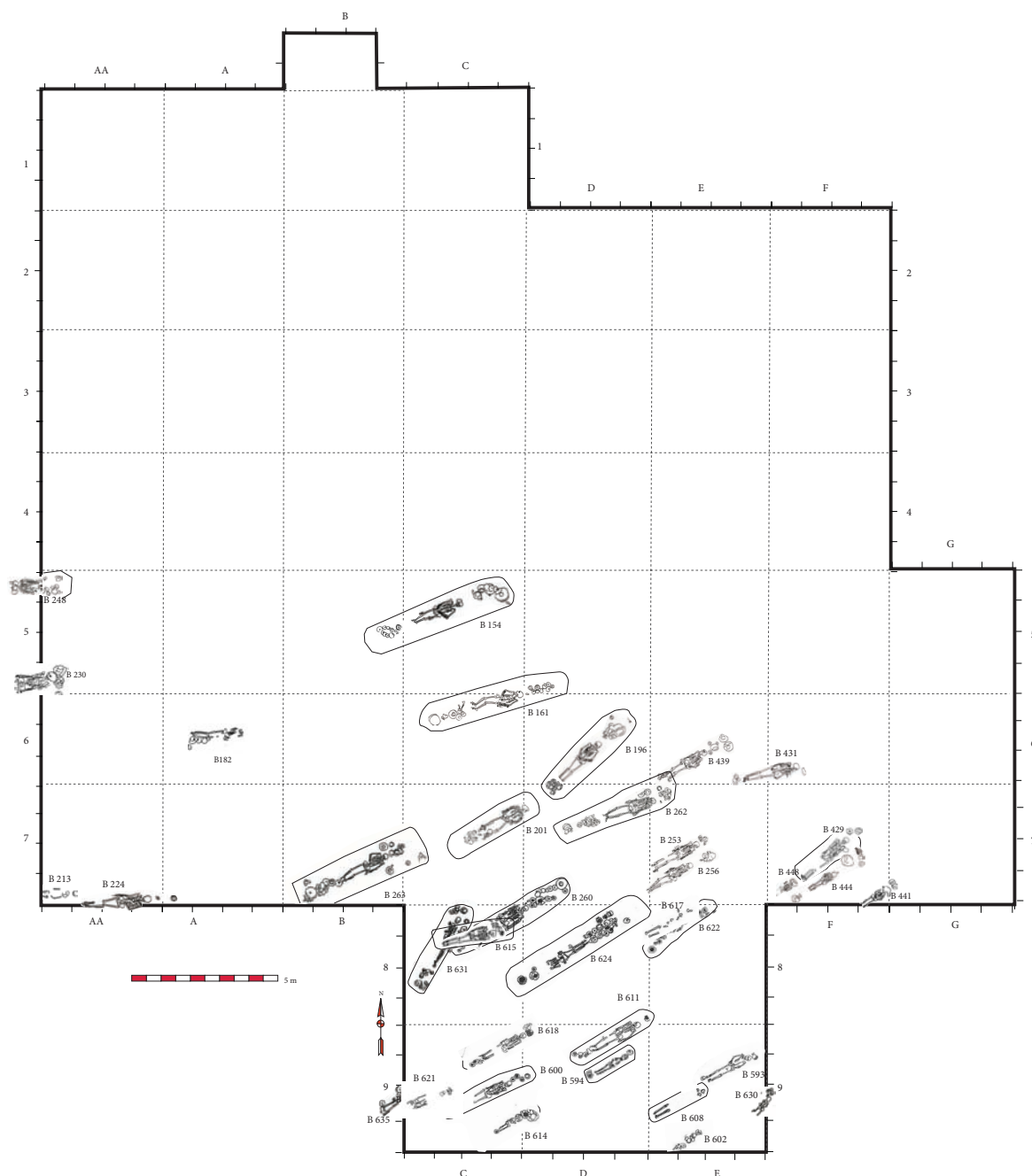


FIG. 9:18 The distribution of Bronze Age 3A and 3B burials



FIG. 9:19 The ceramic vessels from Bronze Age 3B burials

BRONZE AGE 4

The fourth phase of the Bronze Age reveals rows of burials distributed across much of the excavated area. Individuals were now buried with fewer grave goods. Bronzes were very rare. There was also a sharp fall in the quantity of exotic shell and marble jewellery. The ceramic vessels are

derived in form from the preceding Bronze Age 2-3 phases but lack the variety and fine decoration. The radiocarbon determinations from burials and of this phase are:
OxA-17466 Burial 564 2441 ± 28 BP 752-407 cal. BC
OxA-17720 Burial 145 2586 ± 28 BP 814-599 cal. BC

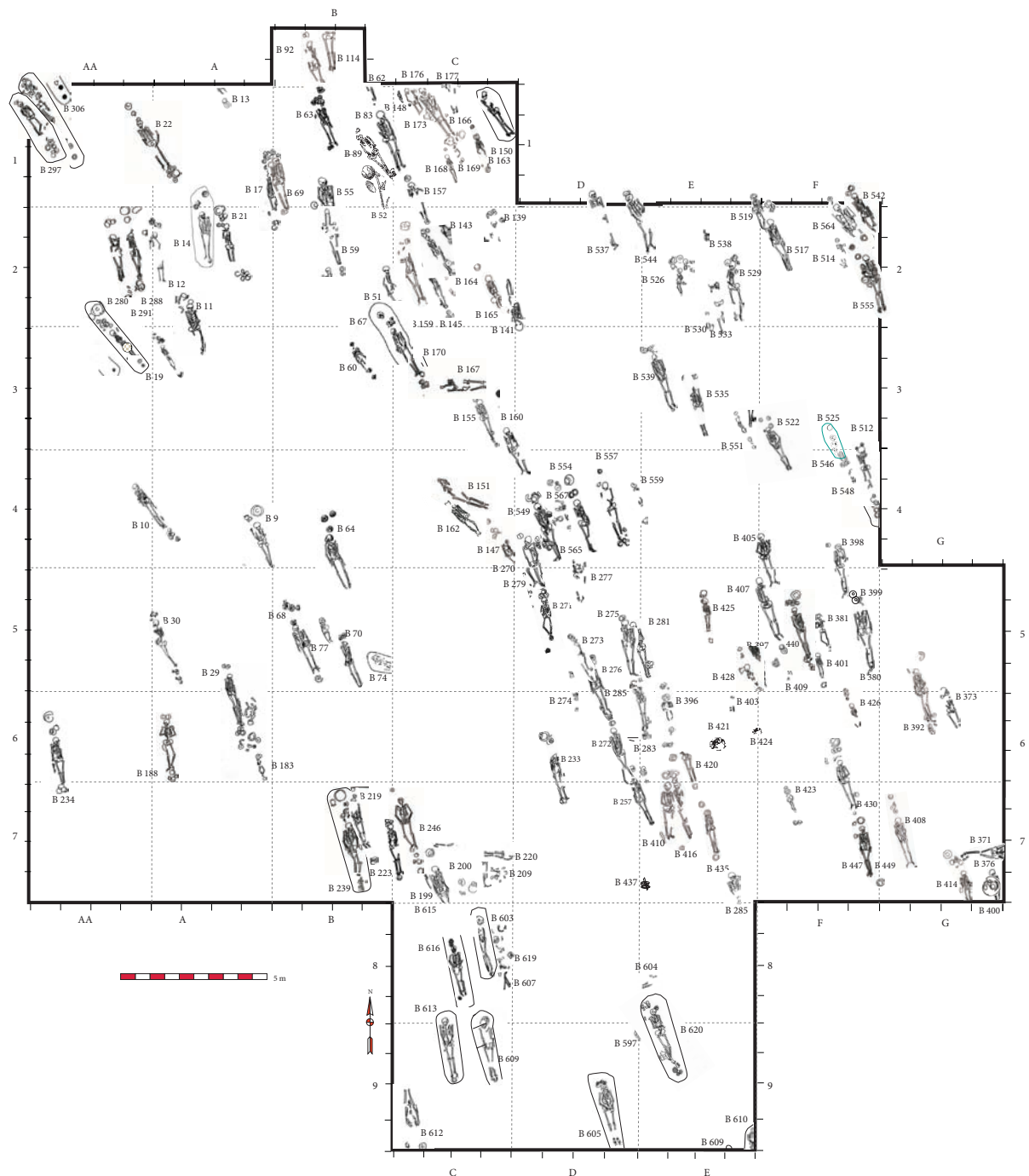


FIG. 9:20 The distribution of Bronze Age 4 graves

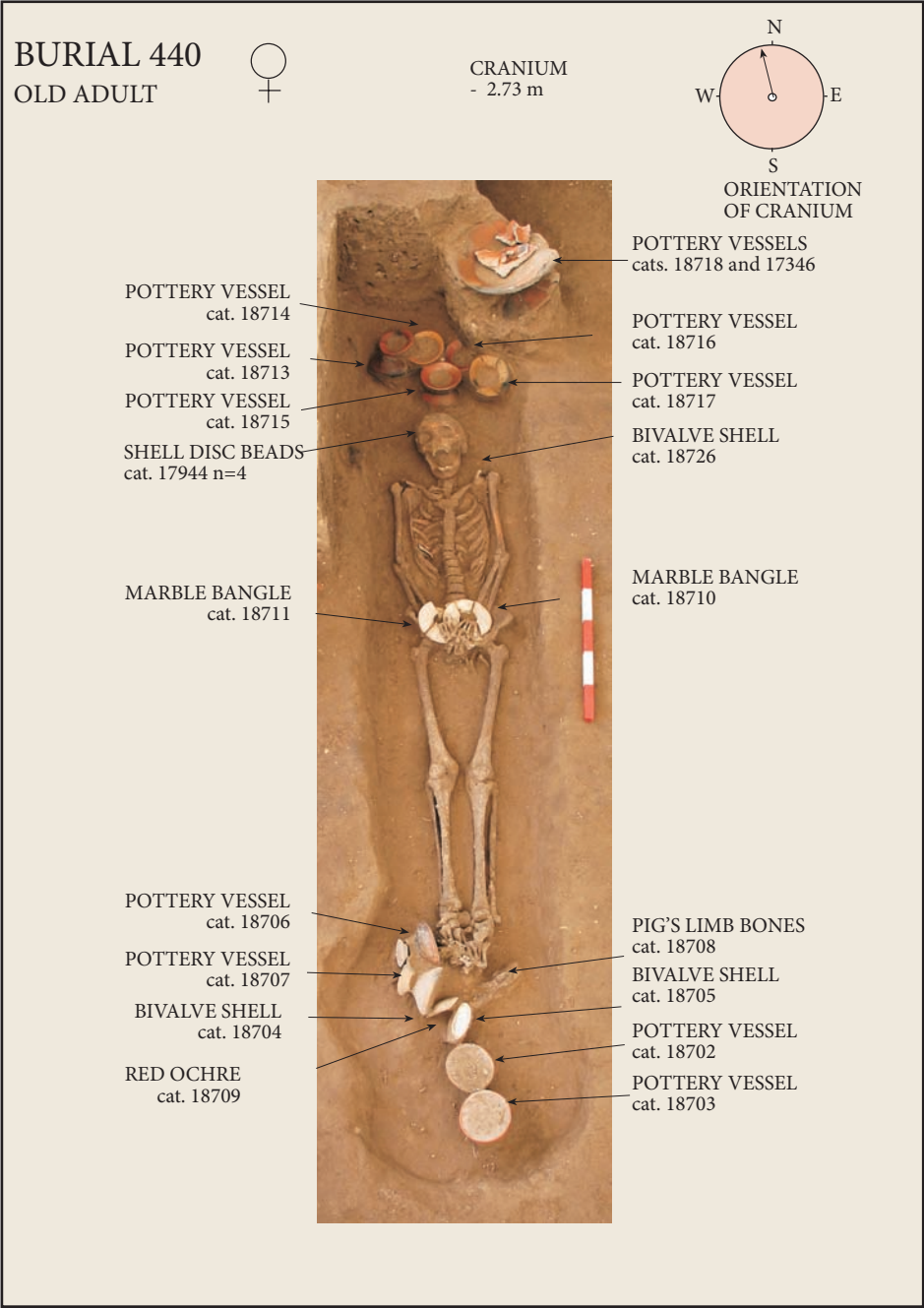


FIG.9:21 Burial 440, representing the graves of Bronze Age 4

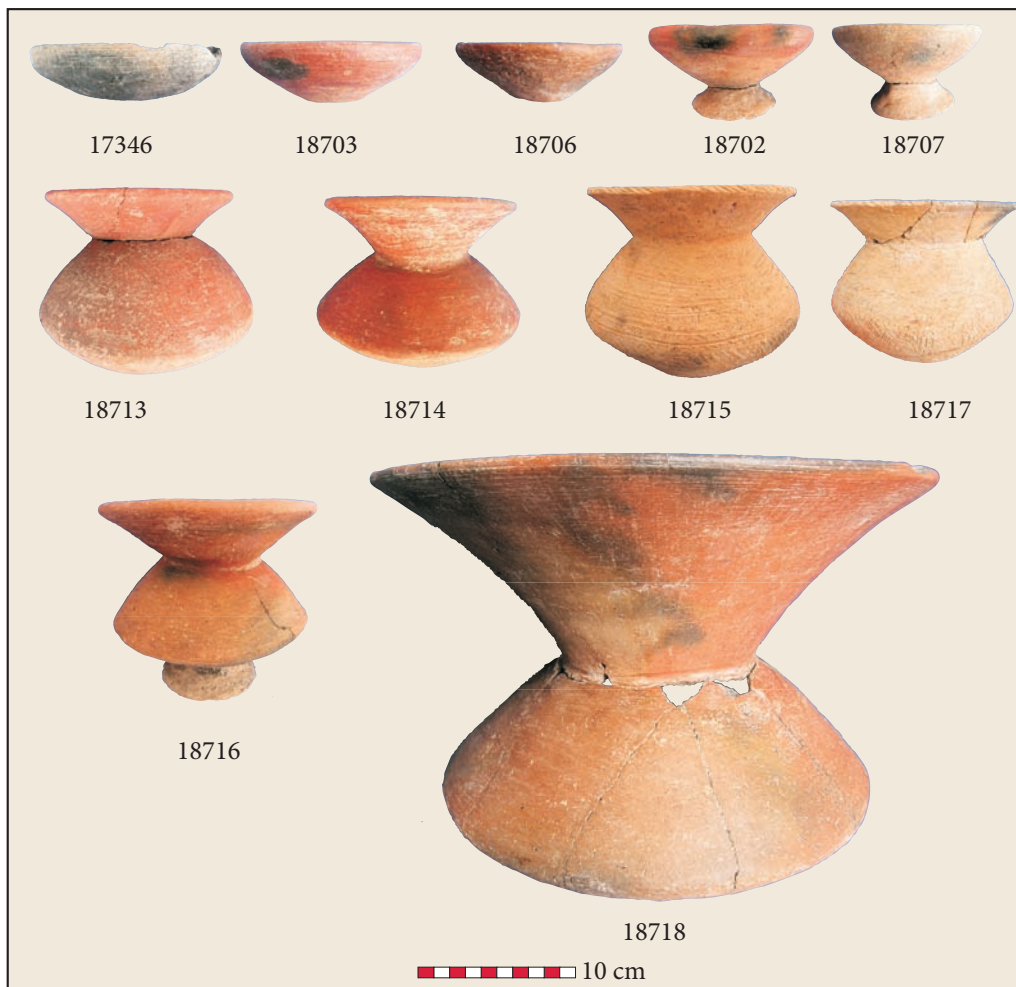


FIG. 9:22 Ceramic vessels from burial 440, Bronze Age 4

BRONZE AGE 5

Where there exist superpositions, the burials of Bronze Age 5 are always lie over those of Bronze Age 1-4. As with Bronze Age 4, the graves were orientated to the northwest, and formed rows. At the eastern margins of these rows, they merge with burials of Iron Age 1. There are some cases where ceramic vessels are of intermediate form between Bronze Age 4 and 5, but in the main, the latter are distinct. There are large open bowls and globular jars with a cylindrical neck. The vessels were often placed round and beyond the cranium. A new set of mortuary offerings was encountered in addition to the pots and bivalve shells. We often encounter spindle whorls and deposits of a grey clay that may have been used in dying fabric. It seems that weaving was now an entrenched activity at the site. Many people were also buried with offerings of red ochre. Personal jewellery and bronzes were now rare. The radiocarbon dates for Bronze Age 5 burials are not easy to interpret due to the Hallstatt Plateau effect on calibration.

They are as follows:

TABLE 9:3 *The radiocarbon determinations for Bronze Age 5 burials*

Lab. no.	Burial	Date BP	Cal. date BC
OxA-16703	241	2457±27	754-413
OxA-16702	241	2432±28	750-404
OxA-17716	124	2812±29	1048-899
OxA-17717	126	2688±28	898-804
Ox-A 17718	133	2704±28	906-807
OxA-17719	135	2429±28	749-403

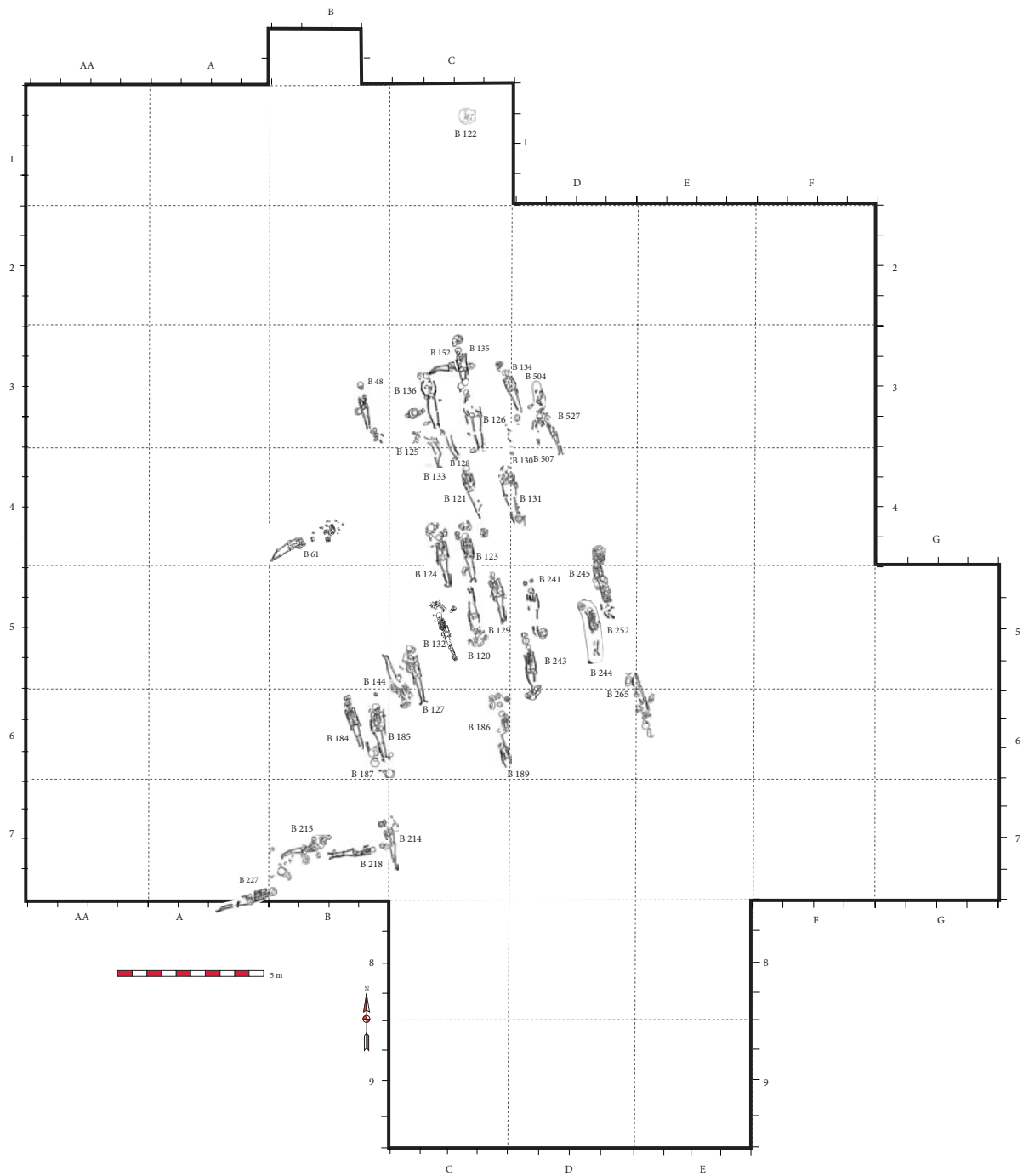
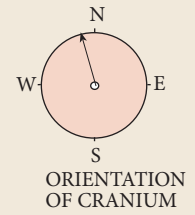


FIG. 9:23 The distribution of Bronze Age 5 burials

BURIAL 127 ADULT

MANDIBLE
- 2.36 m



POTTERY VESSEL
cat. 7636
SPINDLE WHORLS
cats. 7617, 7619

BOS MANDIBLE
cat. 7655

POTTERY VESSEL
cat. 7638
FISH SKELETON
cat. 7638, within vessel
cat. 7677
POTTERY VESSEL
cat. 7641

POTTERY VESSEL
cat. 7634
POTTERY VESSEL cat. 7633
SHELL DISC BEAD within
cat. 19375
POTTERY VESSEL cat. 7635

BIVALVE SHELL cat. 7637

POTTERY VESSEL cat. 7639

POTTERY VESSEL cat. 7640

RED OCHRE cat. 7656
within vessel cat. 7633

RED OCHRE cat. 7643, over the
cranium
RED OCHRE cat. 7644, in
grave fill
STONE ADZE cat. 7624, in
grave fill
CLAY PELLET cat. 7623,
in grave fill
SPINDLE WHORL cat. 7625,
in grave fill
PIG TIBIA cat. 7657, in
mouth of pot cat. 7636



FIG. 9:24 Burial 127 representing Bronze Age 5 graves

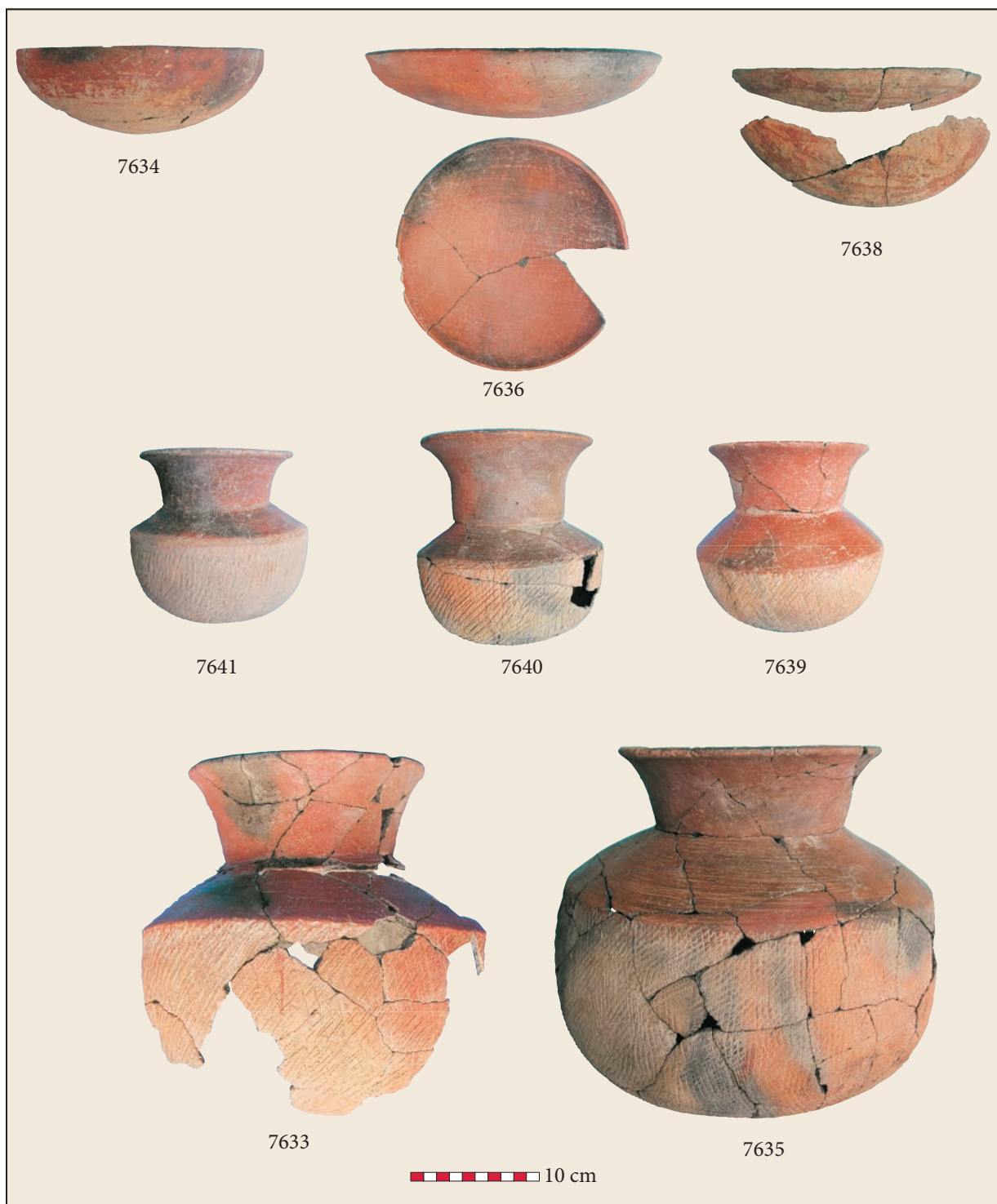


FIG. 9:25 Ceramic vessels from burial 127, Bronze Age 5

IRON AGE 1

Most graves of Iron Age 1 lie in two large groups, to the east of the Bronze Age 5 cemetery. Given the identical orientation of the graves, and similarity in the ceramic vessels in association, it seems highly likely that we witness a transition into the early Iron Age in the form of a horizontal stratigraphy. These Iron Age burials, particularly in the central part of the site, are densely packed next to and

over each other, and contain the remains of men, women, infants and children. Despite the close proximity and intercutting of these graves, it was possible to trace individuals because as surviving mineralised wood showed, they were originally interred in wooden coffins that were probably hollowed out tree trunks. This meant that the broken ceramic vessels followed a circular contour. Towards the

east, however, graves thin out and we find rows of self contained burials often first identified as a grave outline before further excavation revealed the skeleton.

The dead were interred with sets of ceramic vessels that include large, globular cord-marked pots containing complete fish skeletons. There are also cylinder-necked forms with a round base, and open bowls. Ornaments are varied. There are glass ear rings and occasional beads of agate, carnelian and glass. Iron bangles are relatively rare. Some individuals wore bronze bangles. There are sets of thin iron tools, including knives. Three bi-metallic spears were found, with socketed bronze hafts and iron blades. Iron spears were also present. Pellets of red ochre were placed with the dead, as were bivalve shells. The presence of grey clay and spindle whorls suggest that weaving continued to be undertaken. Some individuals were interred with the foot bones of the water buffalo, while pigs' limb bones were placed with the dead.

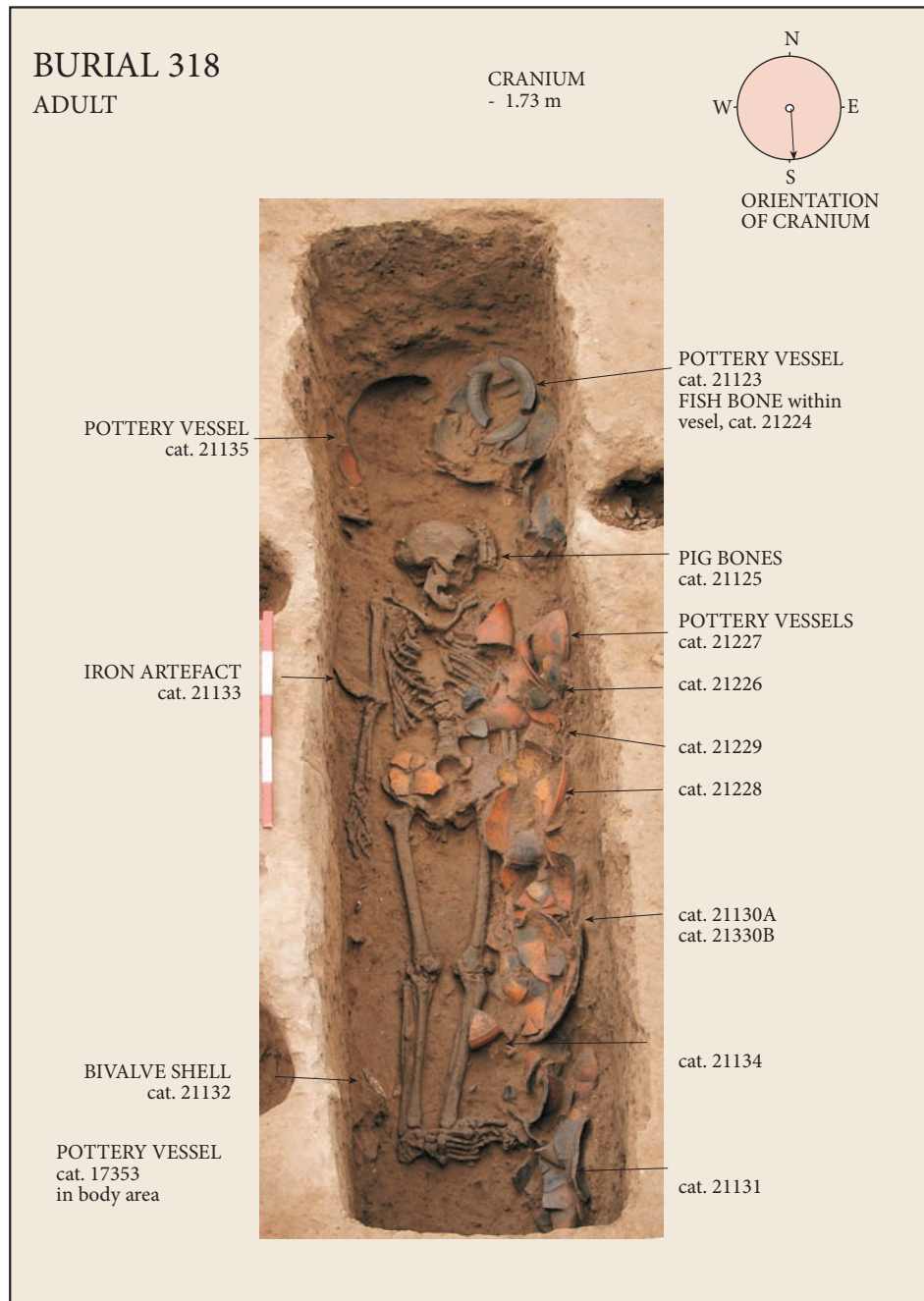


FIG. 9:26 Burial 127 representing Iron Age 1 graves

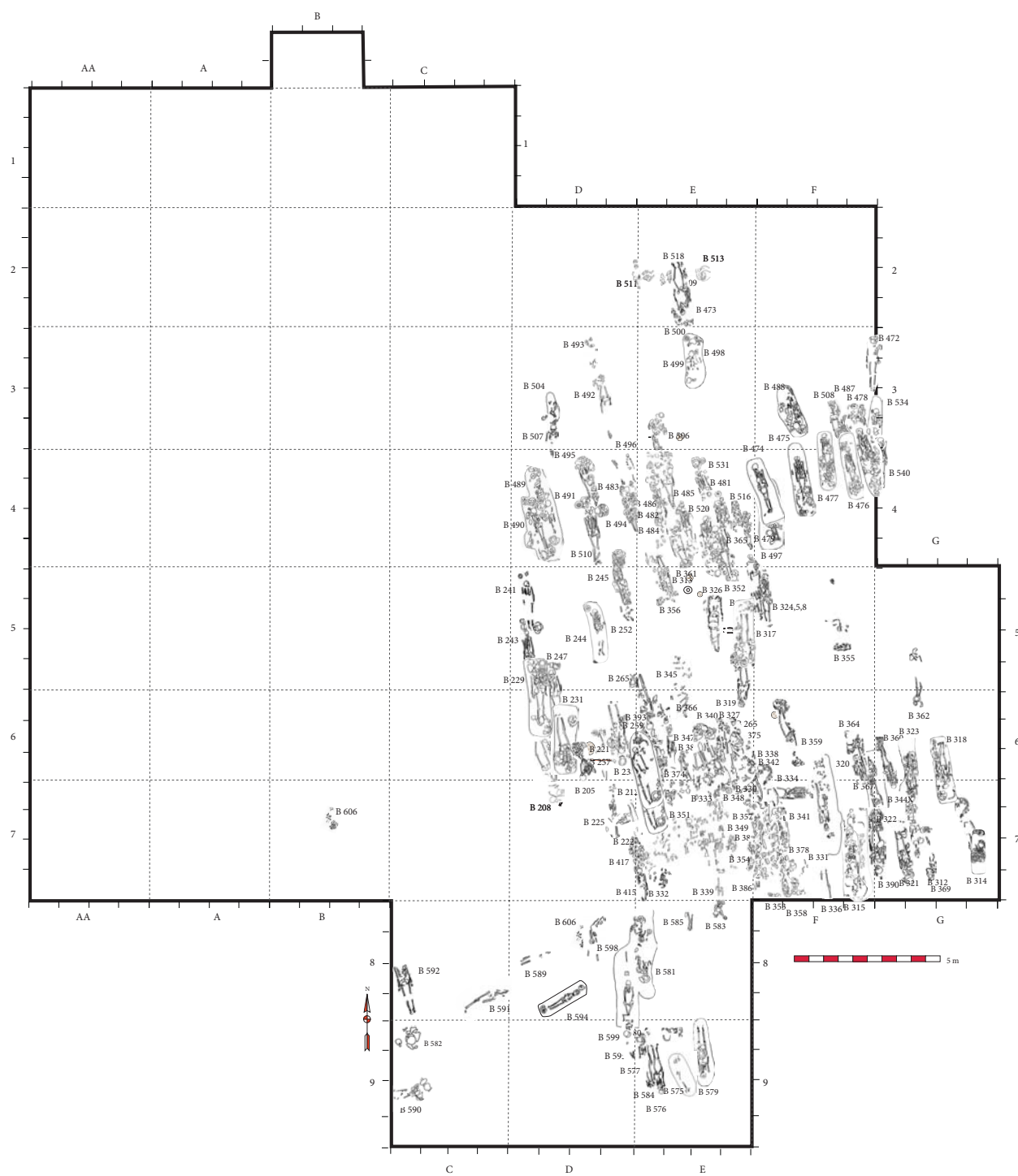


FIG. 9:27 The Iron Age 1 cemetery

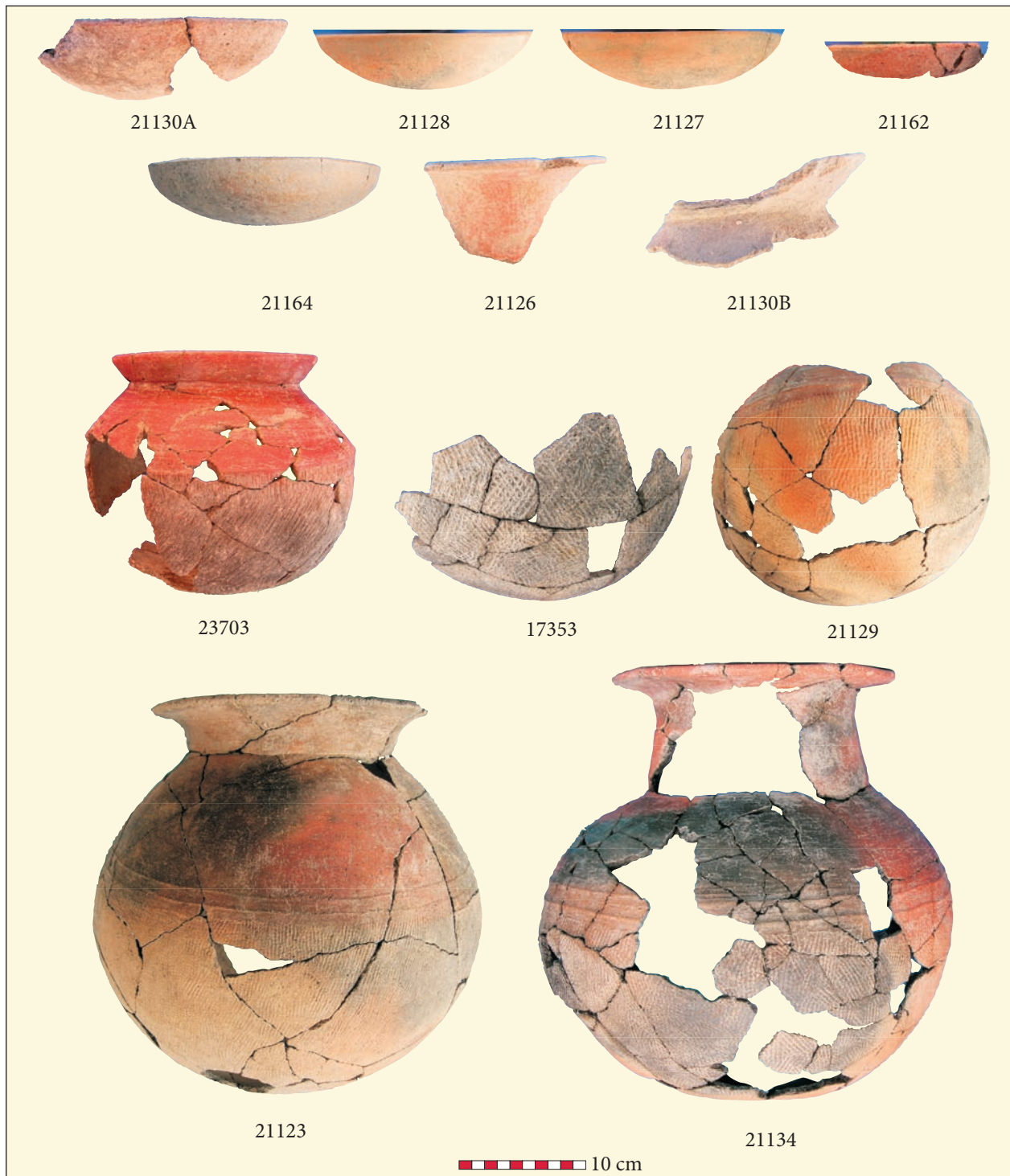


FIG. 9:28 The Iron Age 1 ceramic vessels from burial 318

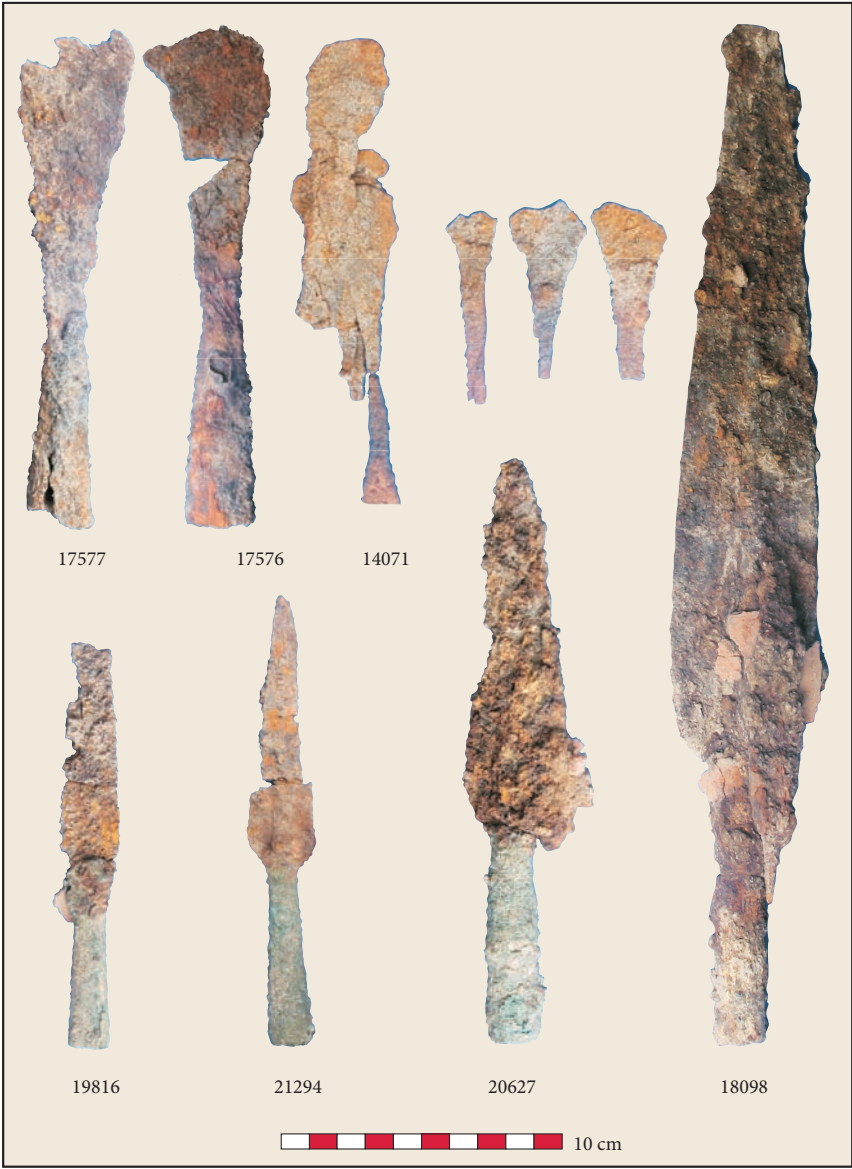


FIG. 9:29 Iron and bimetallic artefacts from Iron Age 1 graves. Cats. 17576-7 burial 348, cat. 14071 burial 229, cat. 19816 burial 417, cat. 21294 burial 390, cat. 20627 burial 360, cat. 18098 burial 374

TABLE 9:4 *The radiocarbon determinations for Iron Age1 burials and occupation*

Laboratory code	Sample	Radiocarbon age (BP)	Calibrated date (95% confidence)
OxA-16704	Burial 360 bivalve shell	2197±27	370-189 cal. BC
OxA-17992	Burial 476 bivalve shell	2462±28	756-415 cal. BC
OxA-17896	Burial 386 bivalve shell	2000±27	51 BC- cal AD 66
OxA-17991	Burial 473 bivalve shell	2152±28	356-93 cal. BC
Ox-A 17895	Burial 383 bivalve shell	2235±28	388-206 cal BC
OxA-17894	Burial 341 bivalve shell	2495±29	782-512 cal BC
OxA-17890	Burial 237 bivalve shell	2408±29	734-399 cal BC
Wk-12646	Y2 5:5 f. 3, charcoal	2243±38	400-200 cal. BC

IRON AGE 2

There are few graves of the later Iron Age in the main square, and apart from the infant jar burials, they are all badly disturbed. However, in square X, a group of Iron Age 2 burials were uncovered, and one or two burials of this phase were found in square Y2. The adult burials were accompanied by pots of the Phimai Black tradition, while some infants were contained in distinctive forms of mortuary jar found associated with mortuary phase 5 at Noen U-Loke.

The mortuary goods also match those of the late Iron Age at the well-documented site of Noen U-Loke, Burial 174, although badly mutilated, wore a set of bronze finger rings. Burial 203 contained bronze bangles, an agate pendant, agate beads and green, blue and orange glass beads. The infant interred in a lidded jar, burial 266, was associ-

ated with an agate pendant, bronze bangles and rings and glass beads.

In the absence of bivalve shells from secure Iron Age 2 burials, an attempt was made to date rice chaff found as a ceramic temper from infant jar burials found in square X. The results are as follows:

TABLE 9:5 *The radiocarbon determinations from Iron Age 2 burials*

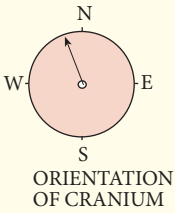
Lab. no.	Burial	Date BP	Cal. date
Ku-221	100	2320±30	410-230 BC
Ku-218	102	1960±30	40 BC-AD 120
Ku-219	102	1870±25	80-220 AD
Ku-220	95	1680±40	250-430 AD



FIG. 9:30 Ceramic vessels from Iron Age 2 burials. Cats. 15501, 2, 8 burial 266, Cats. 20030, 5, 36 burial 311, cats. 23019, 21, 30 burial 471

BURIAL 266

VESSSEL CAT. 15501
- 0.47 m



POTTERY VESSEL
cat. 15501

POTTERY VESSEL
cat. 15508

BRONZE BANGLES
cat. 15511

BAKED CLAY
cat. 15509

BRONZE RING
cat. 15510

BRONZE BANGLES
cat. 15503

BRONZE BANGLES
cat. 15504

BRONZE BANGLES
cat. 15505

POTTERY VESSEL
cat. 15502



GLASS BEADS cat. 15506

FIG. 9:31 Burial 266, an Iron Age 2 infant jar burial

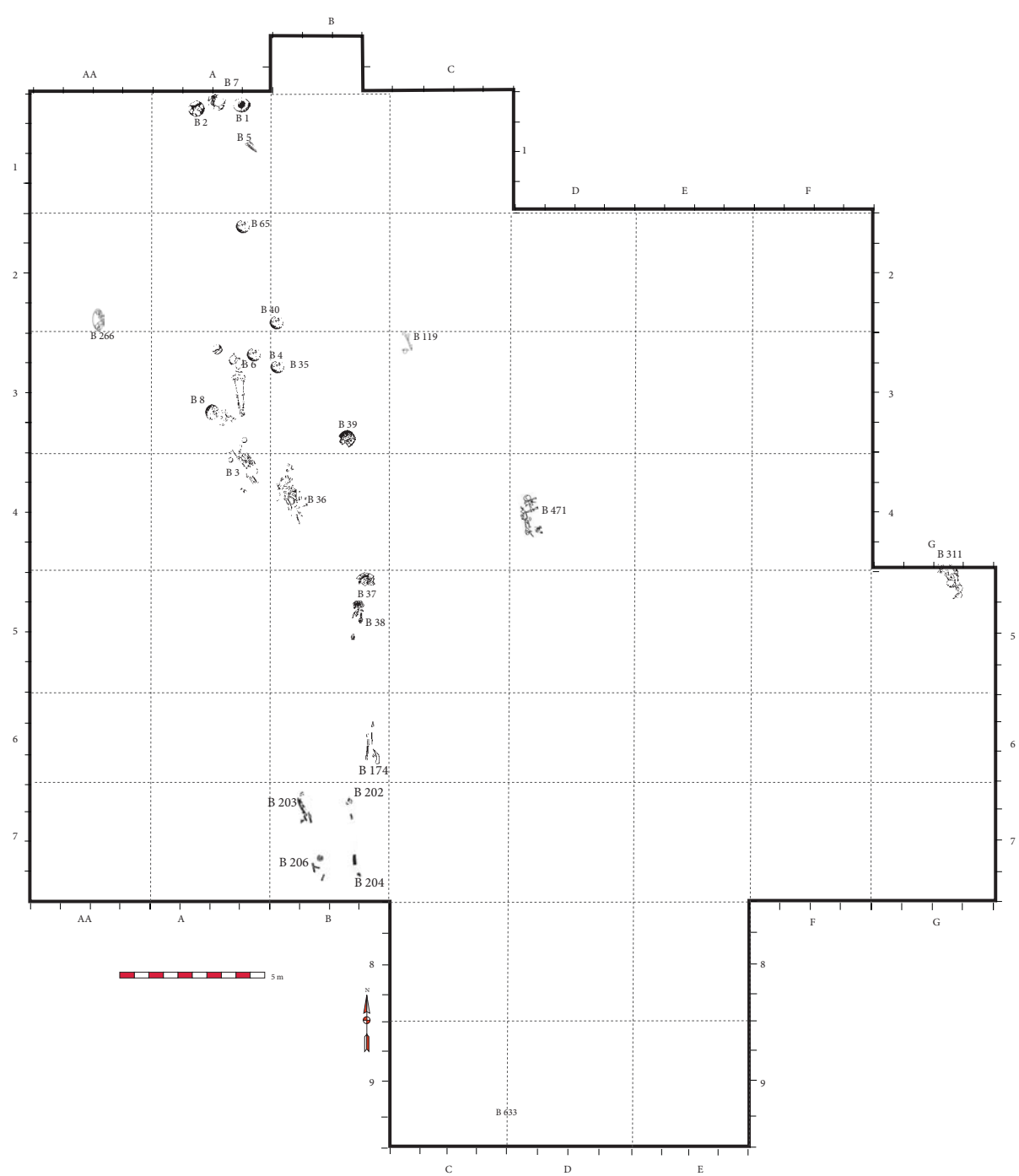


FIG. 9:32 The distribution of Iron Age 2 burials

X THE MATERIAL CULTURE

C.F.W. HIGHAM

This chapter presents a preliminary overview of the relationship between the principal artefact categories and the cultural sequence at Ban Non Wat. It is emphasised that a final report on these items will appear in a later volume in this series. The main square has the longest sequence, beginning at least in the early Neolithic, possibly earlier still, and continuing until Iron Age 2. The deposits in this central part of the site however, were often disturbed during prehistory and some artefacts would, it is suggested have been relocated from their original context. In Square Y, the deposits were less disturbed, and cover the period from the early Bronze Age to the present. Square X was only occupied during the Iron Age.

It is also recognized that taphonomy is a factor in the distribution of artefacts in occupation deposits. Thus the incidence of iron artefacts spikes where butchering floors were littered with iron knives, and the concentration of bronze fragments, broken moulds and crucibles rose in the vicinity of casting furnaces. Caches of clay moulds for casting lead contained tens of such artefacts. However, it is also the case that the distribution of artefact frequencies over time will still show a realistic account of their place in the complete cultural sequence at the site.

STONE ADZES

TESSA BOER-MAH

Ground stone adzes at Ban Non Wat were recovered predominantly from Neolithic contexts; although they also occur in low frequencies throughout the Bronze Age, Iron Age and later prehistoric-historic period. This section pro-

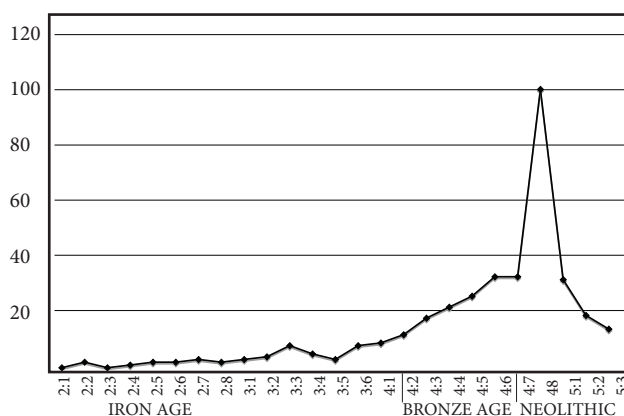


FIG. 10:1 The chronological distribution of stone adzes in the main square

vides an overview of ground stone adze material recovered from Ban Non Wat between 2002 and 2006 and analysed in Boer-Mah (2008a). The purpose of this section is to provide a brief overview of the adze assemblage, focussing on raw materials, adze form and adze dimensions. More broadly, observations from the Ban Non Wat assemblage have revealed that the processes of reduction and reworking have an effect on adze form (Boer-Mah 2008b) and will be further explored in a later volume.

Two hundred and eighty-one artefacts were analysed including 140 complete adzes and 141 fragments. Non-Shouldered adzes (n=94) were more frequent in the assemblage, than Shouldered adzes (n=36). This section will describe the adze recording methodology used, as well as provide some preliminary results of the analysis. Methods for describing adze form will be outlined as they differ from previous typological frameworks commonly used for Southeast Asian adze assemblages.

RECORDING ADZES

Adze Raw Materials

To provide an accurate identification of the adze raw materials, a sample of broken adzes was submitted for thin-sectioning. This technique was selected over other methods, on the basis of appropriateness, accuracy and expense. Rock textures and minerals can be identified using thin-section petrography and this technique was considered to be the most informative for characterising the Ban Non Wat adze assemblage. A small sample of stone was removed from a section of broken adze fragments, which was then attached to a slide and ground down to 30 microns. The thin-sections were then analysed under a transmitted light microscope under plain polarised light (PPL) and crossed polarised light (UXP). Thin-section analysis and stone identification was assisted by Dr Ian Graham (University of NSW, Australia).

Adze Form

An attribute based approach was adopted for recording adzes at Ban Non Wat, as typologies devised by scholars such as Duff (1970) and Heine-Geldern (1932), were inadequate for addressing changes in adze form due to reduction and/or reworking, as detailed in Boer-Mah (2008b). In addition, the theoretical links made by Duff (1970) and Heine-Geldern (1932) between adze types and the ancient migration of people to Southeast Asia have not been supported by archaeological evidence recovered subsequently (Bellwood 1978).

The adzes at Ban Non Wat were manufactured using

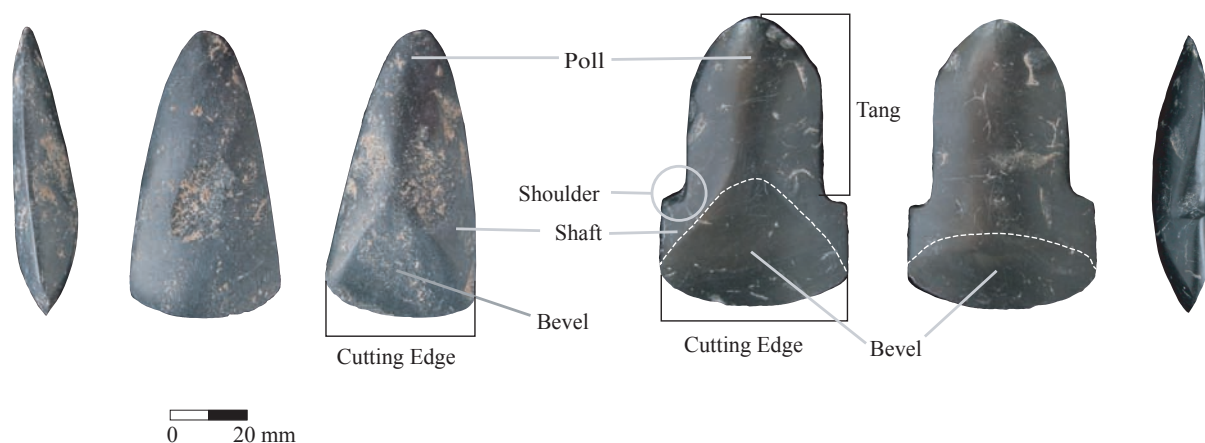


FIG. 10:2 Typical Adzes from Ban Non Wat. Non-Shouldered adze (left), longitudinal, dorsal, ventral view, Shouldered adze (right), dorsal, ventral, longitudinal view

grinding techniques. Almost all adzes were also polished, with the exception of artefacts which had severe surface weathering, thus preventing the identification of surface polish. It is unclear whether the polish on the adzes was intentionally produced by the adze makers or whether such polish results from adze use, and/or from friction with the haft bindings. For clarity 'ground stone' has been used to identify the manufacturing process by which the adzes were made.

The description of adze form was based on three levels of classification. The first made the distinction between Non-Shouldered and Shouldered forms. Non-Shouldered adzes have continuous, uninterrupted lateral margins (Fig. 10:2), whereas Shouldered forms comprised adzes where material had been invasively removed from the lateral

margins. Such removal demarcated the poll from the shaft so that the lateral margins were discontinuous separated by the shoulders and the tang (Fig. 10:2).

The second level of classification involved examining the nature of the planar sections and lateral margins. For Non-Shouldered adzes this involved recording the orientation of the lateral margins; for Shouldered adzes the shape of the shoulder was recorded. The orientation of the lateral margins on Non-Shouldered adzes was classified according to whether they were convergent, or parallel. This was assessed by imagining a line extending along each lateral margin. If these lines converged, then this was a convergent form and if these lines did not converge then it was classed as a parallel sided form (Fig. 10:3). Adzes with convergent lateral margins were then classed

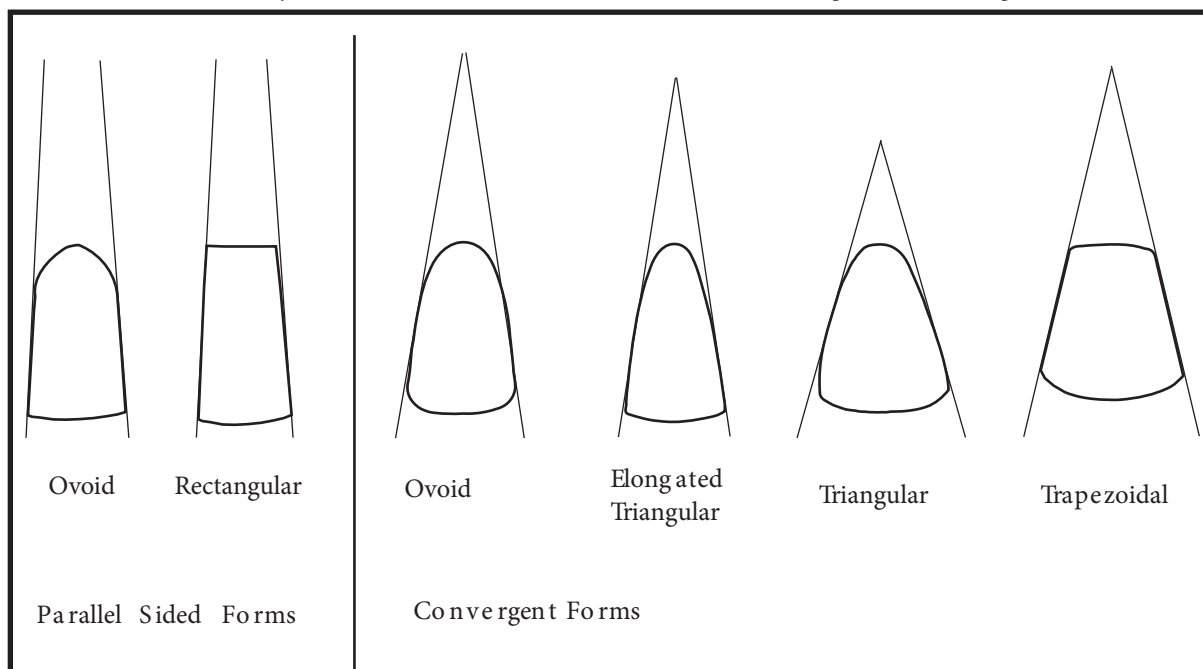


Fig. 10:3 Parallel sided and convergent forms of stone adze

according to planar form (shape of poll and lateral margins) and included the following: Ovoid (O), Trapezoidal (Z), Triangular (T), Elongated Triangular (E) and Sub-Rectangular (S). The planar shape of parallel sided adzes could be Sub-Rectangular (S), Rectangular (R), or Ovoid (O).

Adze shoulders were classified according to the level of invasiveness of the shoulder (shallow, or deep) as well as shoulder shape. Shoulders were classed either shallow, or deep, by comparing the tang width to the shoulder width (Fig. 10:4). Where the tang width was 70 percent or greater in proportion to the shoulder width it was classed as shallow and if it was less than 70 percent it was classed as deep. The following categories were used to describe shoulder shape; Manufactured Flaked Shoulder (M), Flaked Modification Shoulder (F), Gradual Sloping (G), Slight (S), Curved (C), Defined Sloping (D) and Square (S) (Table 10:1 and figure 10:6). Although not all these shoulder shapes were identified at Ban Non Wat, they are represented in other assemblages from Thailand.

For Shouldered adzes, cross-section was recorded on the shaft and at the base of the tang. On an individual

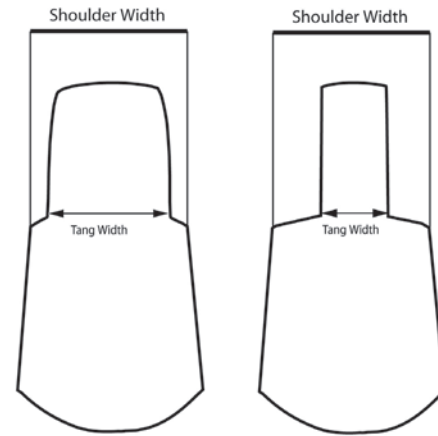


Fig. 10:4: Shallow shoulder (left), deep shoulder (right)

TABLE 10:1. *Definitions of shoulder forms*

Shoulder Form	Shoulder Descriptions
Manufactured Flaked Shoulder	Shoulder has been added during the process of adze manufacture by removing flakes from the adze blank and was initiated before the surface of the adze was ground.
Flaked Modification Shoulder	A flaked shoulder is a shoulder which has only been added to the adze by the removal of flakes. For a Flaked Modification Shoulder, it has been added by the removal of flakes after the adze was ground and is a later modification to the ground stone adze. There is a clear junction between the edge of the negative flake scar and the ground surface which indicates the flake was removed after the surface was ground. Duff's typology included a similar shoulder form which he labelled a pseudo-shoulder Grip (Duff 1970:8).
Gradual Sloping Shoulder	Gradual sloping shoulders form only a very shallow tang on the adze, with only a small distinction between shaft and tang.
Slight Shoulders	Slight shoulders were formed by the removal of a small amount of stone from the lateral margins, have a distinct junction between shaft and shoulder, and have a curved and roughly perpendicular junction between the shoulder and the tang.
Curved Shoulder	Curved shoulders are more invasive than slight shoulders. Curved shoulders involve a greater amount of stone removal (than slight shoulders) and have a curved and roughly perpendicular junction between the shoulder and the tang.
Defined Sloping Shoulder	A defined sloping shoulder is a shoulder that slopes at an obtuse angle to the tang. Unlike a gradual sloping shoulder, the junction between the shoulder and tang can be easily discerned.
Square Shoulder	In a square shoulder the junction between the tang and shoulder is perpendicular, and highly defined. It is likely that in some regions square shoulders were created by a sawing technique (Duff 1970:14).

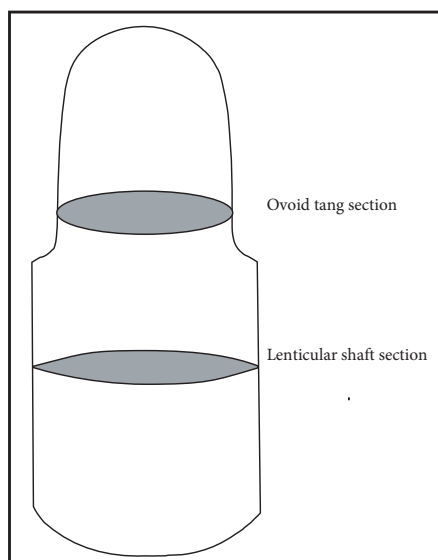


FIG. 10:5 Cross-section shape at tang may be different from cross-section shape on shaft of Shouldered adzes

Dimensions

Adzes which had a blade and a poll were classed as complete. These adzes were not necessarily in their original or pristine condition, as many had damage along the poll or

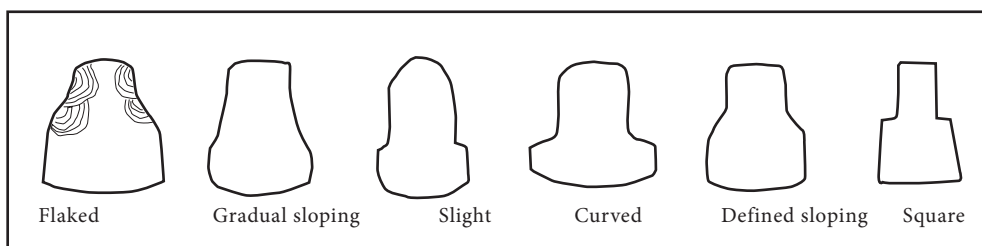


FIG. 10:6 Adze shoulder forms

cutting edge. Maximum length, width and thickness were measured as well as the length of the cutting edge (as this differs from maximum width for some adze forms) (Fig. 10:7). For Shouldered adzes, shoulder width, as well as the length and width of the tang were measured. Comparison between the width of the shoulder and width of the tang was important for quantitatively defining shallow shoulders from deep shoulders.

PRELIMINARY RESULTS

Raw Materials

Forty-eight broken adze fragments were subjected to analysis using thin-section petrography. The majority of adze fragments were metamorphic in origin ($n=46/48$, 96%) (Table 10:2). The surface colour of these artefacts included various shades of black, grey or green. Across the entire adze assemblage (including complete adzes) these colour

raw materials are most common and it is considered that the thin-section sample analysed is broadly reflective of the stone used for adzes at the site. Only two thin-section samples analysed were not metamorphic in origin; one sample was identified as Cenozoic olivine basalt (cat. 6012) and the other calcite (cat. 7777). The exterior surface of cat. 6012 was substantially weathered and pale grey in colour, the cut section of this fragment revealed that the interior colour of the stone was dark grey. Although the surface colour of this artefact is similar to the surface colour of some metamorphic adze materials, the low representation of this raw material within the 48 to be common within the whole assemblage. The calcite adze fragment was mottled white in colour and was distinct from all other stone materials identified; as such, this material could be easily separated macroscopically from the other materials in the assemblage.

Of the metamorphic materials identified, meta-andesitic tuff was most common, followed by meta-basalt and meta-andesitic lava. The textures and mineralogy of these materials are briefly described along with the calcite and cenozoic olivine basalt.

Meta-Andesitic Tuff (29 samples)

The textures of these samples ranged from granoblastic to reworked volcanoclastic (Fig. 10:8A and B).

In general these samples were dominated by plagioclase (around 80%). Hornblende was present in most samples and was commonly altered to actinolite-tremolite or actinolite-tremolite-chlorite (Fig. 10:8C). Alteration to actinolite-tremolite is indicative of upper greenschist facies metamorphism of the rock

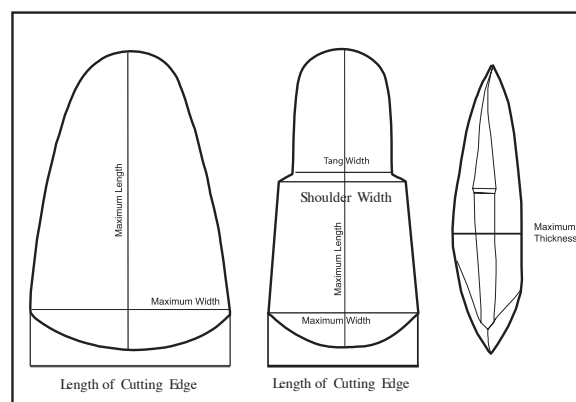


FIG. 10:7 Adze dimensions measured

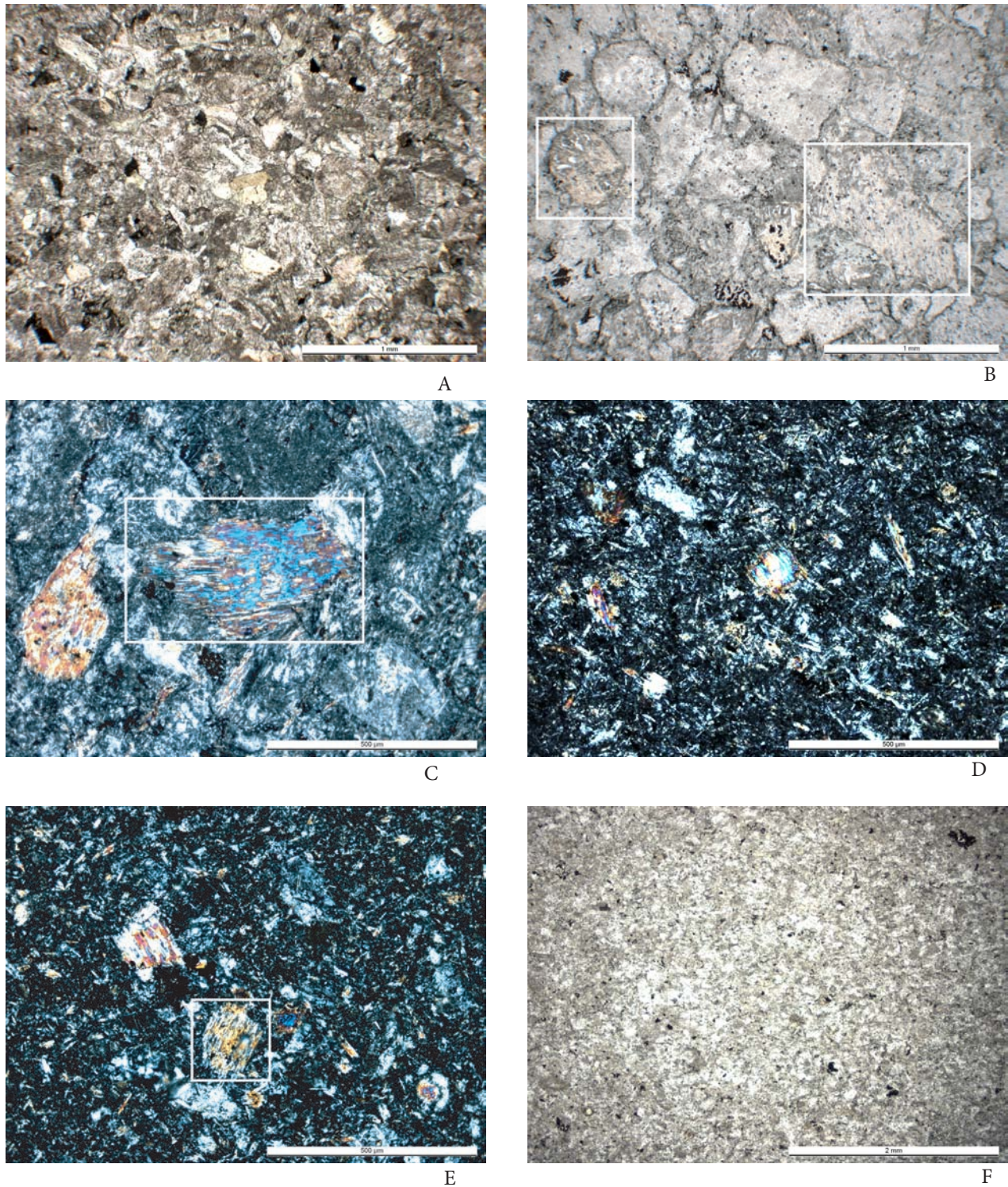
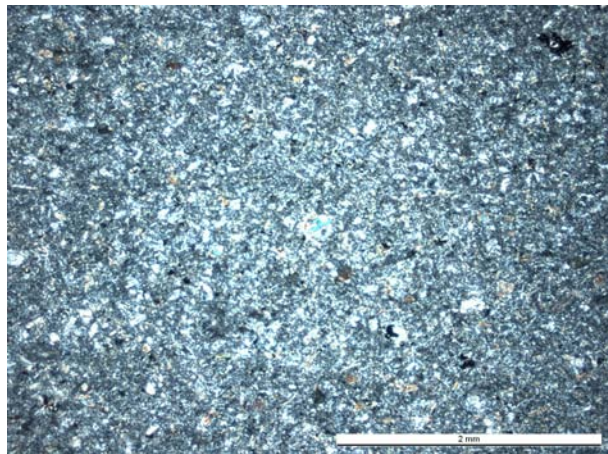
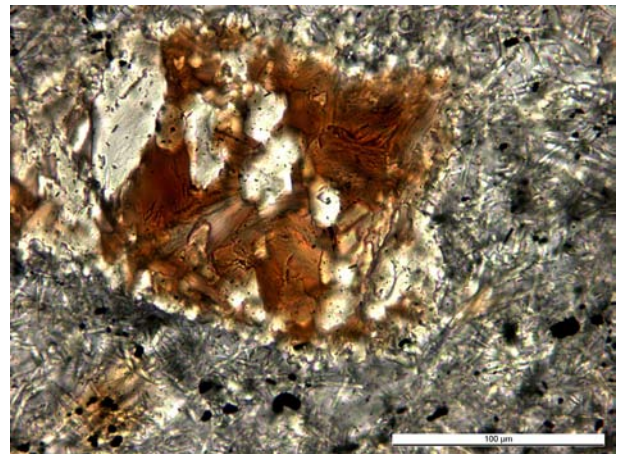


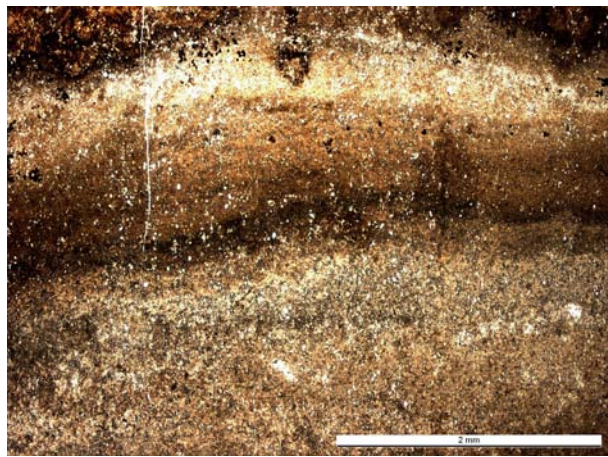
FIG. 10:8 Photomicrographs of meta-andesitic tuff adzes. A. Overall granoblastic texture (PPL), cat. 1469 A5 4:18. B. Overall reworked volcanoclastic texture (PPL), cat. 3168 B3 4A:6 feature 7. C. Hornblende replaced by actinolite-tremolite (mineral within the white triangle), D. Photomicrographs of meta-basalt adze, quenched, cat. 20210 G5 4:9 (UXP). E. Photomicrographs of meta-andesitic lava, pyroxene replaced by amphibole in white square cat. 2144 B1 4A:7 (UXP). F. Overall texture, cat. 6777 C3 4:12 (PPL)



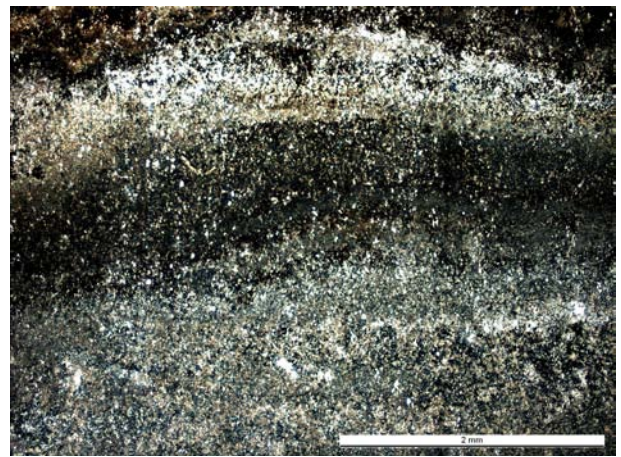
A



B



C



D



E



F

FIG. 10:9 A. Photomicrographs of meta-andesitic lava, overall texture cat. 6777 C3 4:12 (UXP). B. Phlogophyte (large brown grain) (PPL), cat. 2144 B1 4A:7. C. Photomicrograph of the calcite adze (stalagmite or stalagmite). Overall texture (PPL), D. Overall texture (UXP), cat. 7777 C5 3:3. E. Photomicrograph of the adze made from Cenozoic olivine basalt. Overall texture, (PPL), cat. 6012. F. Photomicrograph of the adze made from Cenozoic olivine basalt. Overall texture, (UXP), cat. 6012 C2 1:5 feature 1

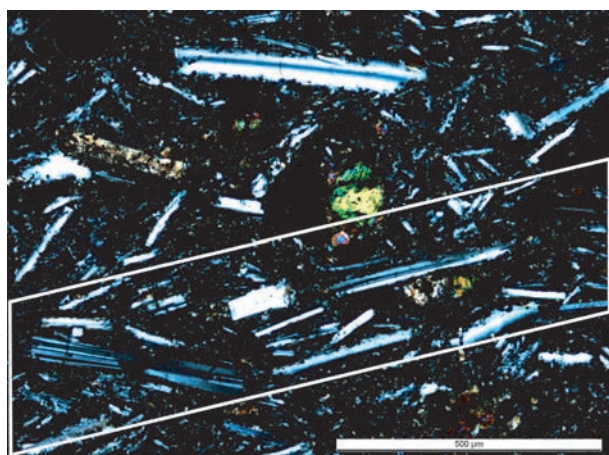


FIG. 10:10 Photomicrograph of the adze made from Cenozoic olivine basalt cat. 6012 C2 1:5 feature 1. Alignment of feldspar grains shows the direction of flow of the basalt (within white parallelogram (UXP).

(Blatt and Tracey 1996:379,430).

Meta-Basalt (6 samples)

Modal percentages were 60-85% amphiboles, usually altered to actinolite-tremolite, 15-30% plagioclase, commonly altered to albite, and smaller percentages of other minerals. The textures of the samples varied and included nematoblastic, spilitic, porphyroblastic and quenched textures (Fig. 10:8). Altered pyroxene and hornblende minerals were detected in some samples, as well as epidote, actinolite and amphiboles.

Meta-Andesitic Lava (5 samples)

The adzes made from meta-andesitic lava were extremely fine-grained (Fig. 10:9A). Plagioclase was dominant accounting for around 80% in most samples. Often the plagioclase had been altered to albite and/or quartz. Hornblende was present in most samples and had often been altered to actinolite-tremolite or chlorite, indicating that the metamorphic grade was upper greenschist facies (Blatt and Tracey 1996:430). Phlogopite, a distinctly metamorphic mineral, was observed in Cat. 2144 (Fig. 10:9B).

Calcite (Stalactite or Stalagmite) (1 sample)

The concentric banding in this sample (Fig. 10:9C-D) suggests that the calcite was precipitated inside a limestone cave; the raw material thus may have been procured from a stalactite or from a stalagmite. The rim of the sample is weathered containing a number of oxide phases including recrystallised calcite, goethite and magnese.

Cenozoic Olivine Basalt (1 sample)

The dominant mineral in this sample was plagioclase feldspar. The overall composition of the sample was approximately 40% phenocrysts and 60% groundmass, of which

the phenocryst comprised about 20% plagioclase, 15% augite and 5% olivine. The groundmass comprised similar proportions of plagioclase, augite and olivine, with some opaques (likely spinels). The alignment of feldspar grains shows the direction of basalt flow (Fig. 10:9E).

Thin-section petrographic analysis revealed that the majority of adzes were made from metamorphic materials. Outcrops of similar metamorphic rock occur in the Petchabun range, approximately 130 kilometres to the west of Ban Non Wat. However, secondary cobble sources have also been reported approximately 25 kilometres to the east of Ban Non Wat (Parry 1996). Further, analysis is currently being undertaken to identify which source, or sources were used at Ban Non Wat.

TABLE 10:2 Identification of stone raw materials used for adzes

Rock Identification	Count	Percent
Meta-Andesitic Tuff	29	60.4
Meta-Basalt	6	12.5
Meta-Andesitic Lava	5	10.4
Meta-Tuff	1	2.1
Meta-Dacitic Lava	1	2.1
Meta-Dacitic Tuff	1	2.1
Meta-Sedimentary	1	2.1
Meta-Volcanic	1	2.1
Meta-Volcanic Siltstone	1	2.1
Calcite	1	2.1
Cenozoic Olivine Basalt	1	2.1
Total	48	100.0

95.8%
Metamorphic

4.2%
Not metamorphic

ADZE FORM

Convergent Non-Shouldered adzes were most frequent in the assemblage and commonly had lenticular cross sections (Table 10:3 and figure 10:11). Common planar forms for Non-Shouldered adzes included ovoid (NS[CO-L]), trapezoidal (NS[CZ-L]) and triangular with lenticular cross-sections (Table 10:3).

All the Shouldered adzes had shallow shoulder forms; that is, had shoulders which required minimal removal of raw material from the lateral margins. These data suggest that either only small modifications of the lateral margins were required to fit such adzes to the haft, or that such shoulder forms were used to economise the stone raw material. The majority of shoulders were slight forms, followed by gradual sloping forms (Table 10:4 and figure 10:11). There were five examples of flaked modification shoulders, that is, shoulders which were added to the adze after the completion of the gridding process. Such shoulder forms are probably indicative of reworking practices. Of

TABLE 10:3 *Attributes of Non-Shouldered adzes*

Basic Form	Lateral Margins	Planar Form	Shaft	Cross-section	Attribute aggregate group	Count
1	Non-Shouldered	[C]onvergent	[O]void	[L]enticular	NS[CO-L]	22
2	Non-Shouldered	[C]onvergent	Trape[z]oidal	[L]enticular	NS[CZ-L]	17
3	Non-Shouldered	[C]onvergent	[T]riangular	[L]enticular	NS[CT-L]	16
4	Non-Shouldered	[C]onvergent	[E]longated Triangular	[L]enticular	NS[CE-L]	9
5	Non-Shouldered	[C]onvergent	[O]void	[O]void	NS[CO-O]	8
6	Non-Shouldered	[C]onvergent	Trape[z]oidal	[S]ub-Rectangular	NS[CZ-S]	5
7	Non-Shouldered	[P]arallel	[S]ub-Rectangular	[L]enticular	NS[PS-L]	3
8	Non-Shouldered	[C]onvergent	[O]void	[S]ub-Rectangular	NS[CO-S]	2
9	Non-Shouldered	[C]onvergent	Trape[z]oidal	[O]void	NS[CZ-O]	2
10	Non-Shouldered	[I]ndeterminable	[I]ndeterminable	[L]enticular	NS[II-L]	2
11	Non-Shouldered	[C]onvergent	Trape[z]oidal	[P]lano	NS[CZ-P]	1
12	Non-Shouldered	[C]onvergent	[T]riangular	[O]void	NS[CT-O]	1
13	Non-Shouldered	[C]onvergent	[T]riangular	[P]lano	NS[CT-P]	1
14	Non-Shouldered	[C]onvergent	[E]longated Triangular	[P]lano	NS[CE-P]	1
15	Non-Shouldered	[I]ndeterminable	[I]ndeterminable	[O]void	NS[II-O]	1
16	Non-Shouldered	[I]ndeterminable	[I]ndeterminable	[P]lano	NS[II-P]	1
17	Non-Shouldered	[I]ndeterminable	[I]ndeterminable	[S]ub-Rectangular	NS[II-S]	1
18	Non-Shouldered	[P]arallel	[S]ub-Rectangular	[O]void	NS[PS-O]	

TABLE 10:4. *Attributes of Shouldered adzes*

Basic Form	Lateral Margins	Shoulder Invasiveness	Shoulder Shape	Shaft Cross-section	Tang Cross-section	Aggregate Form	Count
1	Shouldered	[S]hallow	[S]light	[L]enticular	[O]void	SH[SS-OR]	17
2	Shouldered	[S]hallow	[G]radual Sloping	[L]enticular	[O]void	SH[SG-LO]	10
3	Shouldered	[S]hallow	Flaked [M] odification	[L]enticular	[O]void	SH[SM-LO]	5
4	Shouldered	[S]hallow	[S]light	[L]enticular	[R]ectangular	SH[SS-LR]	1
5	Shouldered	[S]hallow	[S]light	[P]lano	[O]void	SH[SS-PO]	1
6	Shouldered	[S]hallow	[S]light	[S]ub- Rectangular	[O]void	SH[SS-SO]	1
7	Shouldered	[S]hallow	[S]light	[S]ub- Rectangular	[S]ub- Rectangular	SH[SS-SS]	1



FIG. 10:11 The main adze forms from Ban Non Wat, Shouldered adze forms (top three), Non-Shouldered adze forms bottom

the five adzes recorded with flaked modification shoulders, three had been previously broken, suggesting that shoulders were added to adze fragments so that they could be refitted to the haft for further use (eg. SH [SM-LO] in figure 10:11).

ADZE SIZE

The mean length of complete adzes was 54 mm and mean weight 50 g (Table 10:5). Of the adze dimensions, length is the most variable, followed by width. Non-Shouldered and Shouldered adzes are similar in dimensions and weight. Shouldered adzes tend to be slightly larger and heavier (Table 10:6), but there is no statistical difference between

the Non-Shouldered and Shouldered adzes (Table 10:7).

SUMMARY

Adzes from Ban Non Wat were mainly made from metamorphic igneous rock, and particularly from meta-andesitic tuff. Such rock types occur as outcrops in the Petchabun ranges over 100 kilometres west of the site, but secondary cobble sources are also available within 25 kilometres of the site. Non-Shouldered adze forms were dominant in the assemblage and generally had lenticular cross-sections. Shouldered adzes comprised approximately one quarter of the assemblage and all shoulder forms recorded

comprised relatively shallow modifications to the lateral margins. Adzes from Ban Non Wat had a mean length of 53 mm and many appeared to have been reworked.

TABLE 10:5 *Dimensions and weight of complete adzes (n=130)*

Size	Mean	Standard Deviation	Minimum	Maximum
Length (mm)	53.8	11.6	28.3	95.3
Width (mm)	42.1	7.8	27.1	60.6
Thickness (mm)	15.1	2.2	9.8	23.0
Weight (g)	49.5	21.6	9.7	119.6

TABLE 10:6 *Size of complete Non-Shouldered (n=94) and Shouldered adzes (n=36)*

Size	Adze Form	Mean	Standard Deviation	Minimum	Maximum
Length (mm)	Non-Shouldered	53.7	10.8	28.3	81.9
	Shouldered	54.1	13.6	34.1	95.3
Width (mm)	Non-Shouldered	42.4	7.7	27.1	58.1
	Shouldered	41.3	8.0	28.8	60.6
Thickness (mm)	Non-Shouldered	14.9	2.0	9.8	19.0
	Shouldered	15.5	2.5	11.6	23.0
Weight (g)	Non-Shouldered	49.0	20.3	9.7	112.5
	Shouldered	50.7	24.8	19.7	119.6

TABLE 10:7 *Statistical comparison reveals no difference in size between Non-Shouldered and Shouldered adzes*

Dimension	t	df	P value	Result
Length	0.1754	128	0.8610	Not Significant
Width	0.5900	128	0.5563	Not Significant
Thickness	1.4250	128	0.1566	Not Significant
Weight	0.4011	128	0.6890	Not Significant

BRONZE ARTEFACTS

Most of the copper-base artefacts from non-mortuary contexts are represented by indeterminate fragments. A substantial number appear in the Neolithic layers, but this was surely the result of prehistoric disturbance. Many early Bronze Age burials were cut through Neolithic layers into the substrate. This is a caution against ascribing a Bronze Age context on the basis of such a distribution (White 2008). There is a sharp rise in the quantity of copper-base artefacts as expected in layers confidently ascribed to the Bronze Age, followed by a decline during the Iron Age. However, it is evident from mortuary offerings that bronze continued to be employed during the latter period.

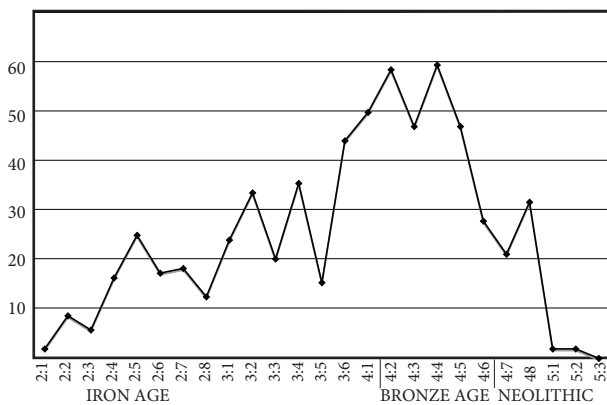


FIG. 10:12 The chronological distribution of bronze artefacts in the main square

MOULDS AND CRUCIBLES

With very few exceptions, the casting moulds at Ban Non Wat were made of clay, the remainder were fashioned from sandstone. There was a decided peak in casting activity during layers ascribed to the Bronze Age, with a sharp fall in the early Iron Age. Thereafter, casting seems to have been continued but at a lower level of activity at this part of the site. As might be expected, the frequency



Fig. 10:13 The base of two moulds from burial 571 shows marks to ensure proper alignment prior to casting

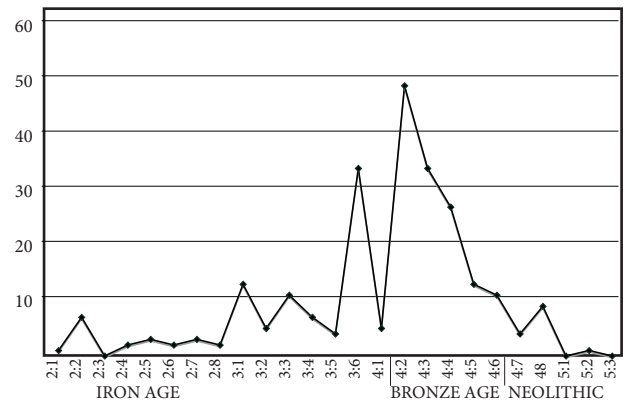


Fig. 10:14 The chronological distribution of casting moulds for bronzes in the main square

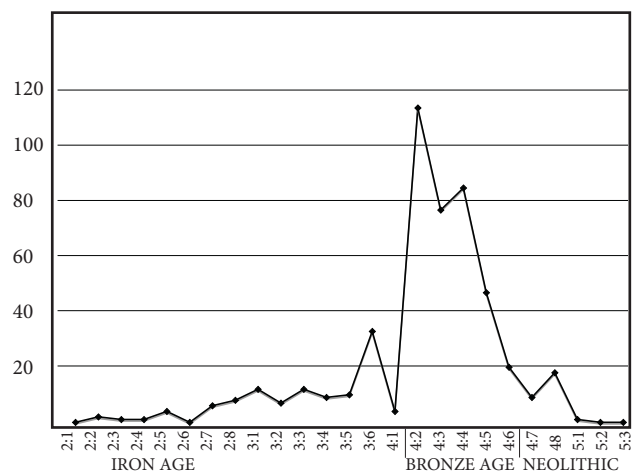


FIG. 10:15 The chronological distribution of crucible fragments in the main square

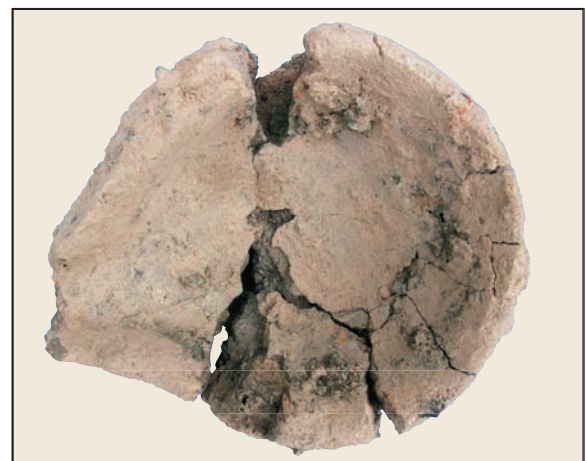


FIG. 10:16 A complete Bronze Age casting crucible cat. 16040, from AA3 4:3. Scale 50% with which crucibles were recovered presents a virtually identical pattern.

There are two principal forms of mould. The thin and flat form were employed in casting bangles, while the



FIG. 10:17 Bronze artefacts from Bronze and Iron Age contexts. Cat. 11599 burial 215 Bronze Age 5, cat. 5630 C1 4:3, cat. 21340 burial 414 Bronze Age 4, cat. 14131 D6 4:3, cat. 12297 burial 290 Bronze Age 2, cat. 5799 burial 178 Bronze Age 3, cat. 18800 burial 455 Bronze Age 2, cat. 21294 burial 390 Iron Age 1, cat. 19658 burial 343 Iron Age 1, cat. 24775 burial 482 Iron Age 1, cat. 21151 burial 314 Iron Age 1, cat. 5077 burial 111 Iron Age 2, cat. 24860 burial 486 Iron Age 1, cat. 21077 burial 312 IA 1. Scale 50%

thicker form with a convex outer surface were used to cast axes and spears. Both were found placed in the grave of a presumed bronze founder. The two large moulds with a curved surface were used to cast large socketed axes. The technique for casting bangles employed a set of moulds

each with a flat surface. The space to receive the molten metal was incised on one surface only, thus obviating the need for a matching pair of bivalves. These were then bound together and in one pouring, multiple bangles could be cast. Some of these moulds were incised with



FIG. 10:18 One of the bangle moulds from burial 549 shows, on one side, the vent for pouring liquid bronze at the top, and the outline of the two bangles. The hole in the centre indicates the use of a compass to describe the circular bangles into the clay mould. On the right is the exterior of the same mould, which was the book end of a row of such moulds for simultaneous casting



FIG. 10:19 The two halves of a clay bivalve mould cat. 23227 for casting a large socketed bronze axe from burial 549



FIG. 10:20 Casting moulds from Bronze Age contexts. Cat. 5687 C1 4:8, cat. 1613 A5 4:11, cat. 2251 B1E 4:3, cat. 3214 B3 4:8, cat. 3268 B3 4:7, cat. 8175 C4 4:8, cat. 8180 C4 4:3, cat. 8203 C4 4:11, cat. 8387 C2 4:6, cat. 8429 A6 4:4, cat. 8458 C 4:4, cat. 8824 C6 4:5, cat. 11778 B7 4:4, cat. 11794 B7 4:7, cat. 12351 D7 4:4, cat. E6 4:7, cat. 21825 G5 4:6, cat. 21230 G7 4:4, cat. 21748 F6 4:2, cat. 5455 A2 4:12, cat. 12351 D7 4:4, cat. 2251 B1E 4:3, cat. 14558 C7 4:2, 17780 E6 4:7



FIG. 10:21 Bronze casting moulds from Iron Age contexts. Cat. 21176 G7 4:1, cat. 5560 C1 3:4, cat. 8361 C2 3:1, cat. 11774 B7 3:3, cat. 14524 AA7 4:1 cat. 14579 B7 2:5 cat. 14602 C7 3:5, cat. 14814 C6 3:7, cat. 19082 F6 3:5, cat. 21636 F5 4:1

IRON ARTEFACTS

A very few iron artefacts found their way into the Neolithic layers, and there is a lesser peak at the junction of the Iron and Bronze Age contexts. Layer 3, with its series of Iron Age working surfaces and butchering floors yielded the highest concentration of iron items. Thereafter the number fell with the deposition of the layers dating to the last millennium.

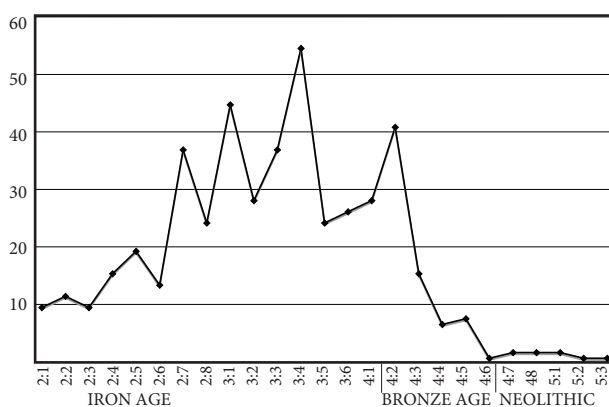


FIG. 10:22 The chronological distribution of iron artefacts in the main square

IRON SMITHING

The remains of iron "slag" which is thought to reflect on-site smithing reveal a different pattern to that seen for finished iron artefacts. There is very little smithing residue in the Bronze Age contexts, but a sharp rise with the initial Iron Age layers. Thereafter, the evidence for smithing rose to a peak in the later phases of the Iron Age before falling again sharply in upper layers.

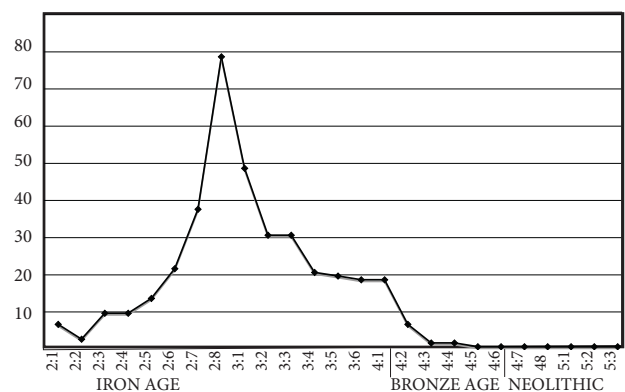


FIG. 10:23 The chronological distribution of evidence for iron smithing in the main square



FIG. 10:24 Iron Artefacts. Cat. 19682 hoe from burial 341, cat. 3339 socketed implement B3 3:1, cat. 24036 sickle E3 3:3, cat. 35 tanged curved knife or small sickle, Y 3:2, cat. 12024 large tanged knife D7 2:5, cat. 18098 socketed spear from burial 374, cat. 4518 point Y 3:6, cat. 3567 point B4 3:3, cat. 78 point Y 4:5, cat. 17576-7 chisels from burial 348, cat. 19640 socketed spear burial from burial 341, cat. 14071 a set of chisels from burial 229, cat. 177071 bangle from burial 348. Scale 50%

LEAD CASTING

Clay insert moulds

A remarkable series of artefacts employed in metallurgy were identified in Iron Age contexts. These comprise clay shaped into an axe form that were found on several occasions as caches containing many tens of examples (Fig. 10:25). Their purpose remains enigmatic. Initially, it was thought that they were inserts into a mould in order to form the socket of a bronze axe. However, an example from burial 340 was found within a thin metallic film. A

fragment of this metal was analysed by an XRF spectrometer, and found to comprise lead (Fig. 10:27). A second example with lead sheathing comes from C3 3:2. The purpose of these moulds is not known. Two cast lead winged and socketed implement was recovered from Iron Age layers (Fig. 10:26). They lack the clay socket mould, and the value or purpose of such artefacts only adds a further unanswered question to the Iron Age interest in lead castings. Burial 417 furnished a socketed lead artefact in the form of a cutting implement.



FIG. 10:25 Clay insert moulds. Cat. 6569 C3 3:2cat. 18182 comes from burial 340. It is sheathed in a thin layer of lead. C at. 17407 F3 4:3, cat. 22437 F2 3:1, cat. 22954 F2 3:3, cat. 23610 E2 3:7 feature 3. Actual size

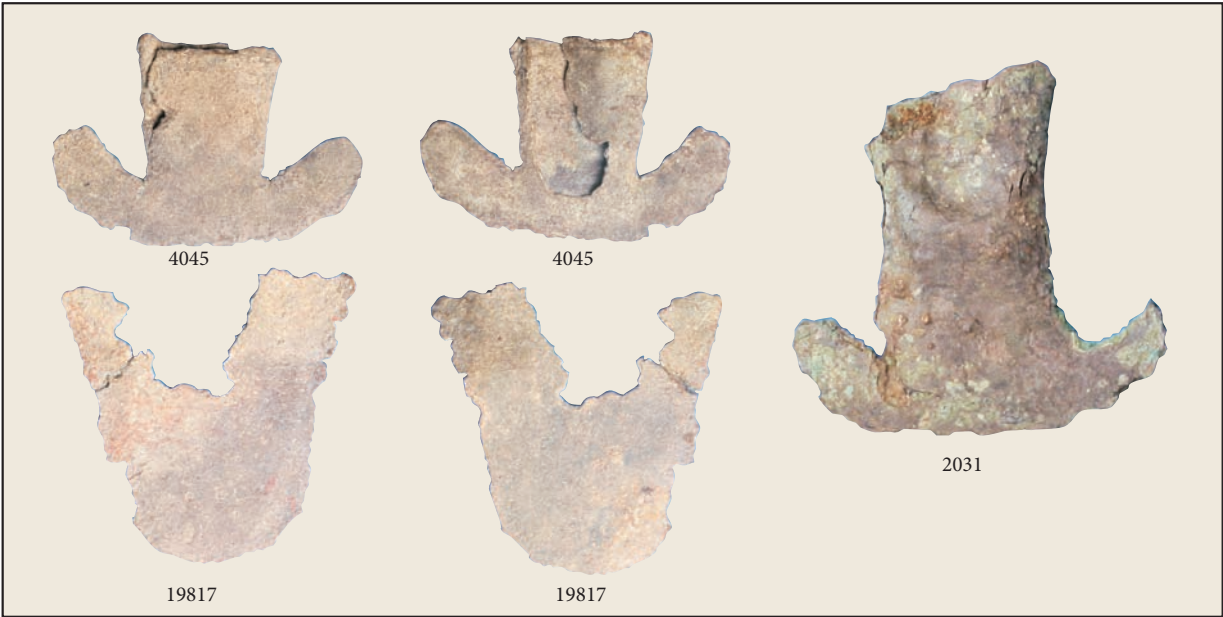


FIG. 10:26 Cat. 4045, a lead winged and socketed implement from B5 3:4, cat. 19817 burial 417, cat. 2031 B1 4:2 feature 1. Actual size

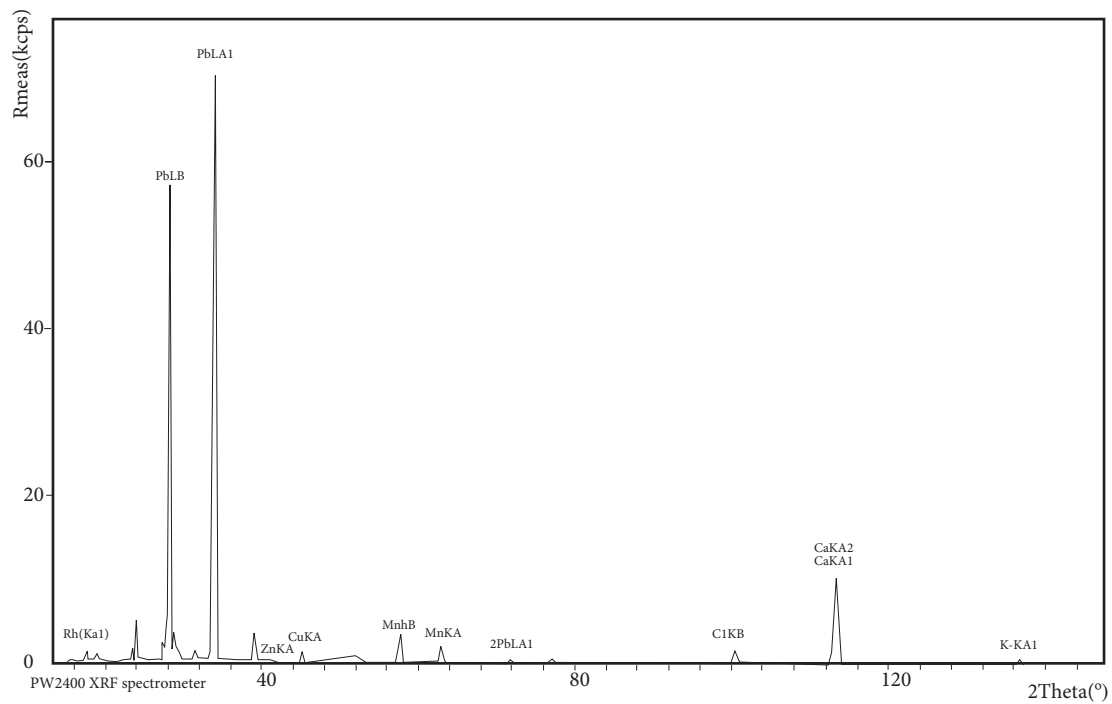


FIG. 10:27 The result of an XRF analysis of the metal on the clay insert mould cat. 18182, burial 350, showing the lead composition

THE CERAMIC VESSELS

Clay of high quality is locally available, and it was employed for many different artefacts. Vessels were the most abundantly represented. We find clay anvils to shape pots, and the burnishing stones used to decorate and polish the surface of the vessel before firing. Nearly 4,000 ceramic vessels have been recovered during the excavations being reported. Most were found as offerings with the dead over all ten mortuary phases. According to the analyses of the fabric in those belonging to the Bronze and Iron ages, the vast majority were locally manufactured. This is supported by the number of clay anvils recovered.

The crouched burials

Just one complete vessel was found with this enigmatic group of graves. It comes from burial 438, and is a small, round and undecorated pot (Fig. 10:28).



FIG. 10:28 The ceramic vessel cat. 21354 from burial 438

Neolithic 1 ceramic vessels

The ceramic vessels from Neolithic 1 contexts have been divided into seven principal forms. Form 1 vases have a cylindrical base, constrained waist and large, flaring upper body. The exterior of the base was decorated with bands usually infilled with punctate or impressed patterns, red paint and burnishing. The upper body was often left burnished and plain, although some vessels had further geometric motifs incised along the rim. Three sub-forms are suggested. Form 1A has a slightly concave base and a relatively straight contour to its flaring upper body. Form 1B is broader both in the base and the upper body, the latter being very slightly convex while form 1C has a narrow base and a broad flaring upper body.

Ceramic form 2 is an open bowl-shaped vessel, usually found employed as a lid to a mortuary jar. The bowls are commonly embellished with designs painted in broad

red bands on the exterior, over a cord-marked surface. Interior surfaces are usually painted with a design of parallel, and thinner red bands. The rims are plain but again, enhanced by a red painted band.

Ceramic form 3 is a globular mortuary jar (Fig. 10:31 cat. 2209). Five of the specimens, one to accommodate an adult and the other four for infants, were cord marked over most of the body, and the shoulder, demarcated by a raised cordon, was decorated with incised and red painted designs on a burnished panel. The surface of the largest was also painted in large, red, curvilinear designs. Three vessels were cord marked and had a plain everted rim.

Form 4 comprises a globular cord-marked vessel with everted rim. These are found in a variety of sizes. Two, for example, were found placed within adult mortuary vessels, and are small enough to qualify as drinking cups. (Fig. 10:31 cat. 2233). Others were larger and come in several slightly differing shapes.

Form 5 is a unique mortuary jar found containing burial 292. It is very large and deep relative to its width. The shoulder curves in to a small cylindrical neck and the body is cord marked with a preference for vertical strokes. As with burial 28, the side of the vessel was broken in antiquity, presumably to allow the cadaver to be inserted.

Form 6 is a large lid for placing over an adult mortuary jar. The surface finish in the sole example, found with burial 28, is plain.

These pottery vessels reflect a mature and expert tradition of manufacture that incorporate a range of design motifs which will be set out in more detail in a later volume.

Neolithic 2 ceramic vessels

Ceramic vessels interred with the later Neolithic burials are globular in form, and cord marked. One of these vessels, however, bore red-painted ornamentation and another had a burnished upper body (Fig. 10:32).

Bronze Age 1 ceramic vessels

As may be seen in figure 10:33 there are some elements of continuity between the forms and surface decoration of the late Neolithic and the early Bronze Age vessels. Both include globular and cord-marked pots, but the later ones are smaller and more finely made. There are also vessels with a red burnished upper body. The Bronze Age 1 repertoire, however, also included a footed pot with an everted rim that is not matched among the Neolithic assemblage.

Bronze Age 2 ceramic vessels.

While there are some parallels in form and surface finish between Bronze Ages 1 and 2 vessels, the latter also reveals major developments. Some pots were now very large (Fig. 10:34). We also encounter painted curvilinear designs of considerable sophistication. One large vessel from burial 197 bears the imprints of human hands. The infant in burial 302 was accompanied by a vessel in the

form of a raised fruitstand with a painted design on the interior surface that looks like a stylised human face (Fig. 10:29). The commonest form found in Bronze Age 2 has a flared rim over a narrow waist, giving way to a small and round body often but not always sitting on top of a pedestal base. Several such vessels from burial 553 were painted with a range of curvilinear designs (Fig. 10:30).

Bronze Age 3 ceramic vessels

The assemblage of ceramic vessels from Bronze Age 3 graves reveals a strong element of continuity, seen in the flared rims, the red finish and the stemmed fruitstands. Small bowls are often found placed as lids. However, the very large and decorated pots are no longer encountered, and there is very little evidence for the complex painted designs found on some of the Bronze Age 2 wares (Fig. 10:35).

Bronze Age 4 ceramic vessels

While again showing elements of continuity with preceding forms, the flared rims were now less prominent, and painted decoration virtually ceased. Burials now tended to have one large vessel placed in an elevated position beyond the head. Those found beyond the feet and near the head included globular cord-marked pots, shallow lids and footed cups (Fig. 10:36).

Bronze Age 5 ceramic vessels

There were a number of clear developments in preferred forms during this period. We now find large vessels with a globular cord-marked body under a cylindrical neck and slightly everted neck. Open bowls were often embellished with patterned burnishing strokes that clearly herald that found on the so-called Phimai Black vessels of the late Iron Age in this region (Fig. 10:37).

Iron Age 1 ceramics

There is a seamless horizontal stratigraphy linking Bronze Age 5 and Iron Age 1 graves, and the ceramics likewise show little change. The same cylinder-necked and large vessels are found, together with the open burnished bowls. Large cord-marked globular pots often contained many fish skeletons (Fig. 10:38).

Iron Age 2 ceramics

Iron Age 2 vessels belong to the Phimai Black tradition. Large infant mortuary jars are typical of this phase, as well as open bowls, often black or dark grey in colour, that bear quite complex burnished designs. Many complete pots were found in occupation deposits, particularly those placed in pits (Fig. 10:39).



FIG. 10:29 A reconstruction of the face motif on a ceramic vessel cat. 18294 from burial 302. Diameter, 36.5 cm. Painting by Dr Warrachai Wiriyaromp



FIG. 10:30 Painted vessels from burial 553, Bronze Age 2. Reconstructions and painting by Dr Warrachai Wiriyaromp



FIG. 10:31 Neolithic 1 vessels. Cat. 2230 burial 83, cat. 19904 burial 459, cat. 2209 burial 103, cat. 918 burial 27, cat. 2233 burial 86, cat. 11641 B7 4:7, cat. 1414 burial 32



FIG. 10:32 The ceramic vessels from Neolithic group 2 burials. A. Cat. 915 burial 23, B. cat. 916 burial 23, D. cat. 884 burial 24, E. cat. 793 burial 26, F. cat. 917 burial 26, G. cat. 1424 burial 25, H. cat. 1425 burial 25, I. cat. 1426 burial 25, J. cat. 1343 burial 3, K. cat. 3690 burial 78, L. cat. 11072 burial 240, M. cat. 12253 burial 261, N. cat. 13762 burial 153, O. cat. 16141 burial 294, P. cat. 15098 burial 300, Q. cat. 12254 burial 261

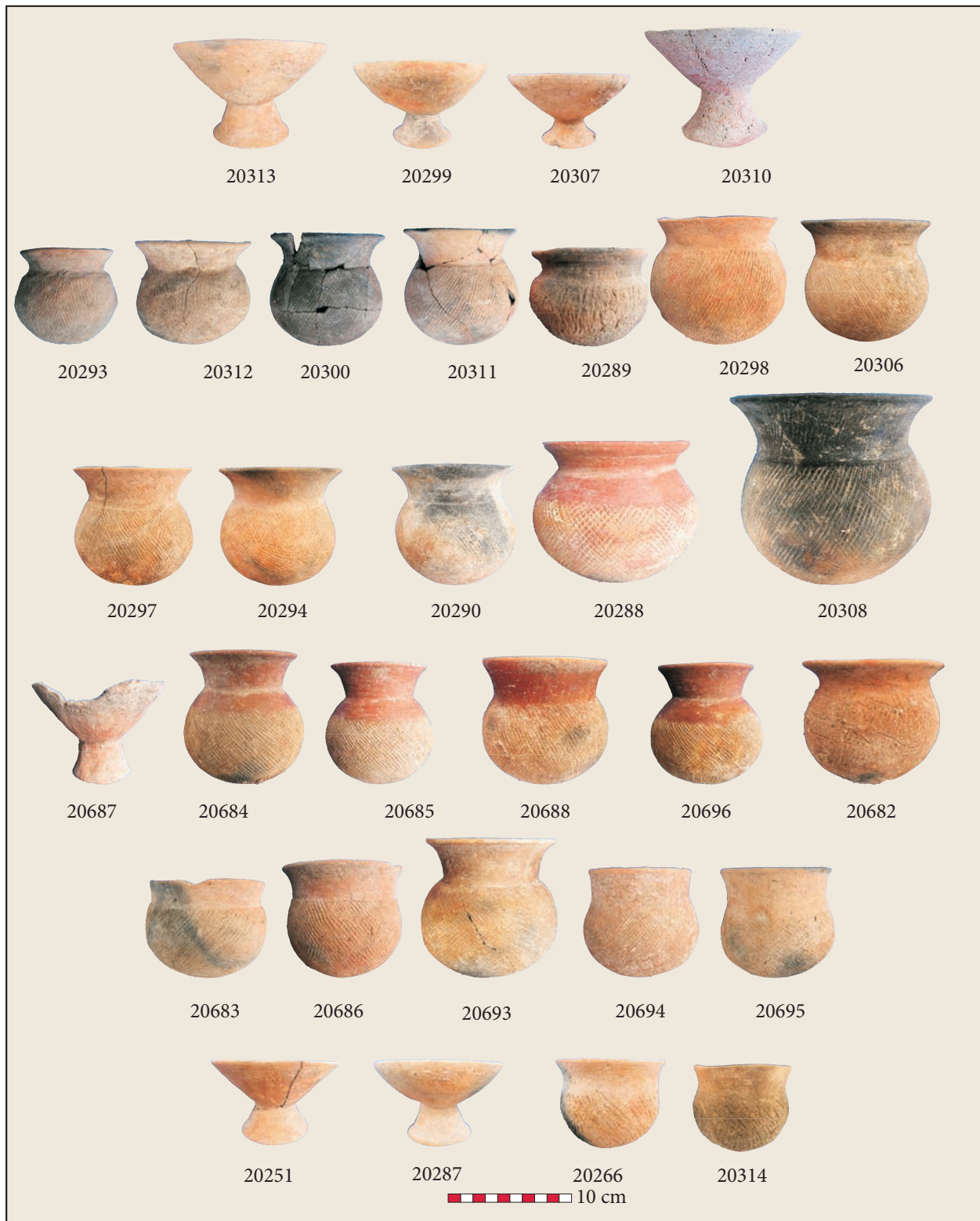


FIG. 10:33 Ceramic vessels from Bronze Age 1 burials. Rows 1-3, burial 453, rows 4-5, burial 446, row 6, burial 470

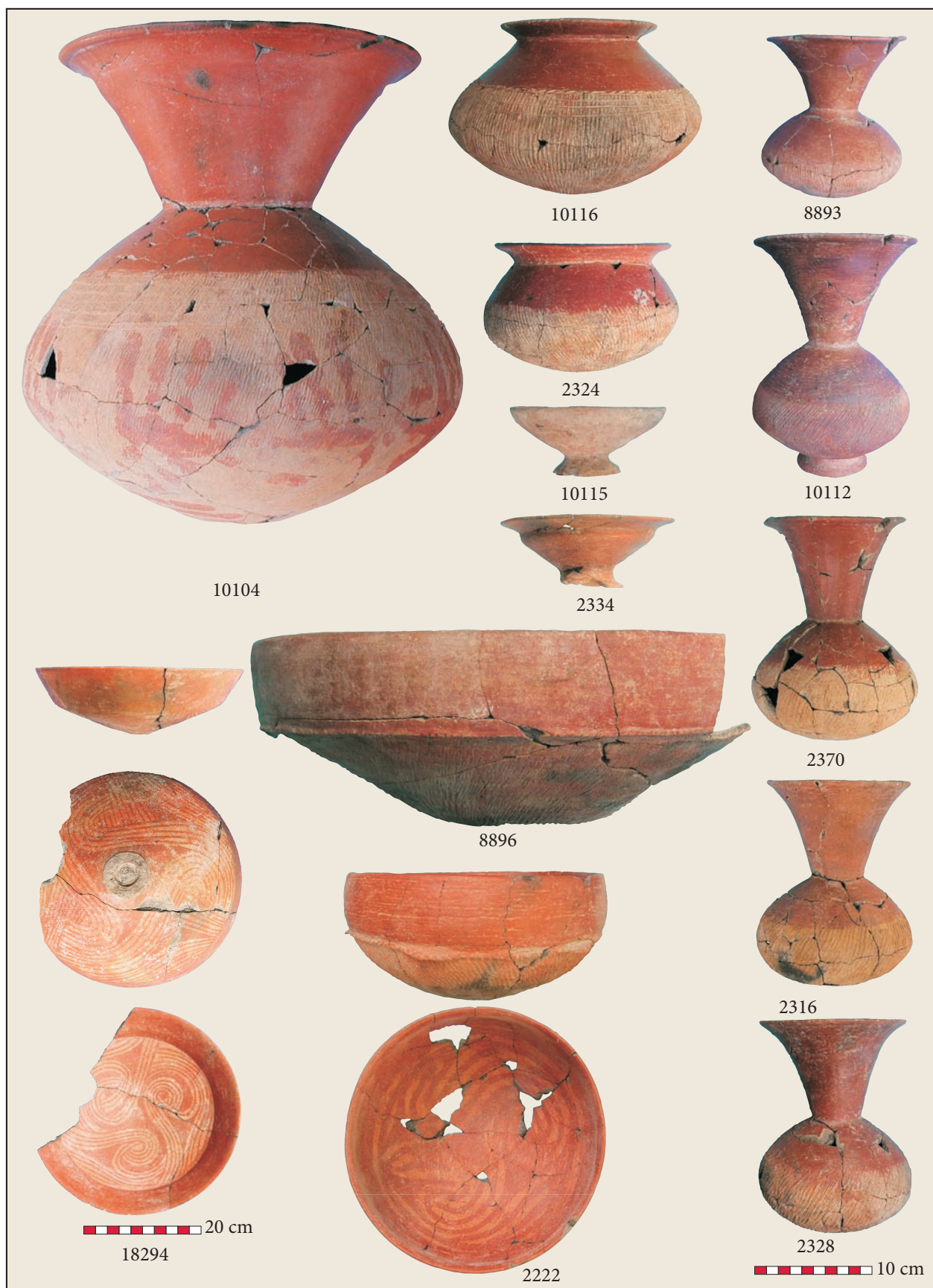


FIG. 10:34 Ceramic vessels from Bronze Age 2 burials. Cats. 10104, 10115, 10012, 8896 burial 197, cat. 18294 burial 302, cats. 2222, 2324, 2370, 2316, 2328, 2222, 2334 burial 105

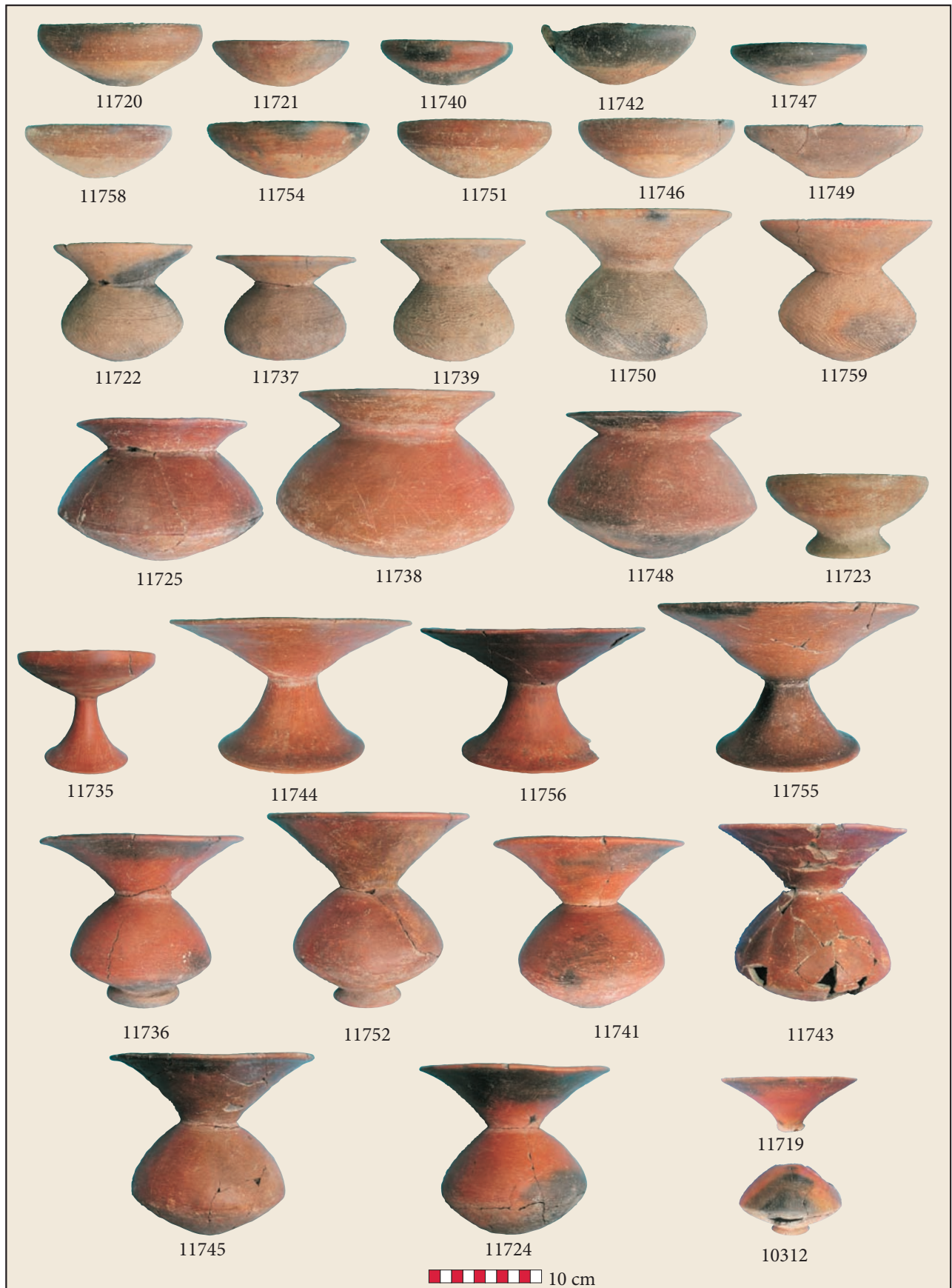


FIG. 10:35 The ceramic vessels from burial 263, Bronze Age 3

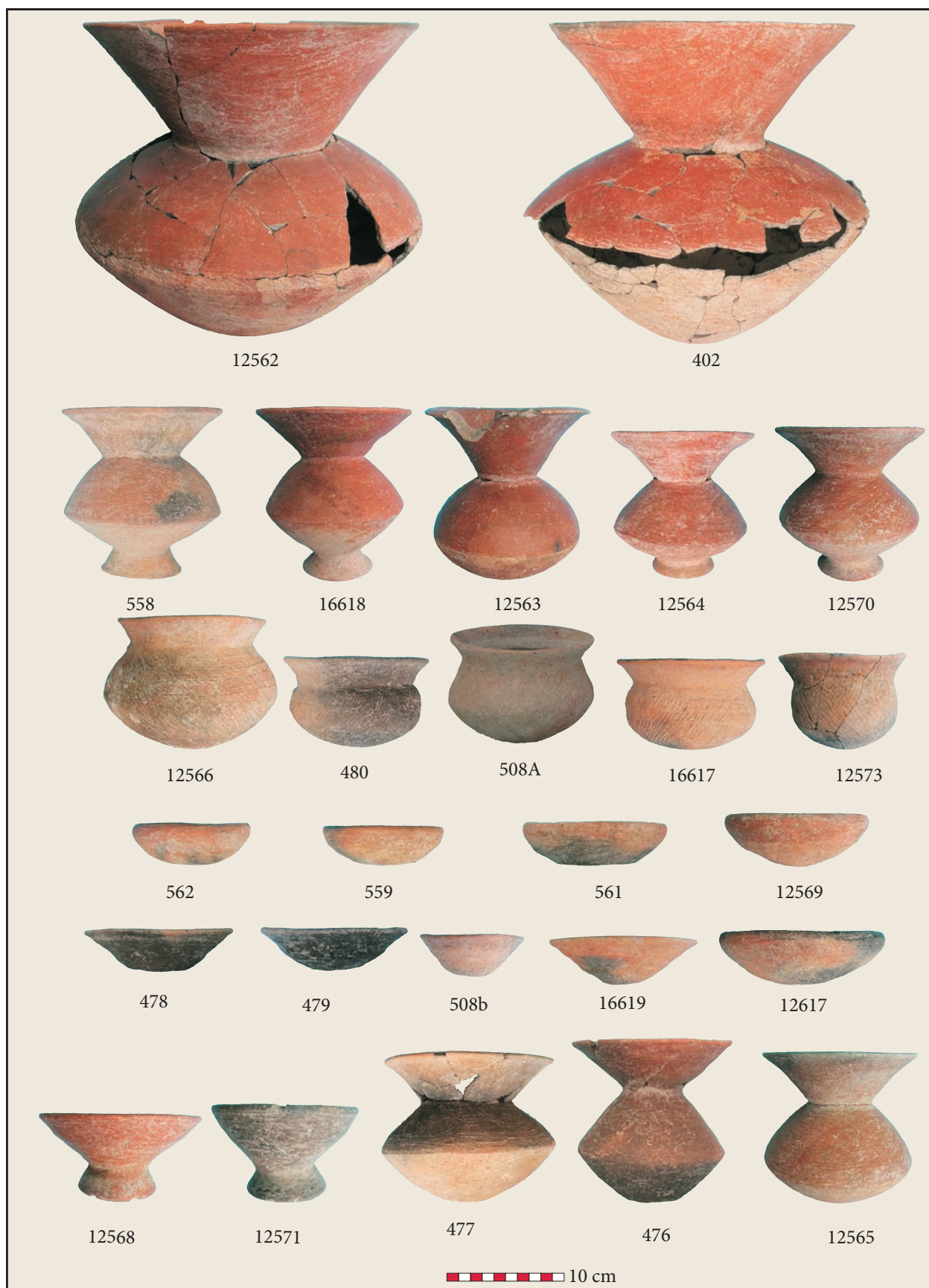


FIG. 10:36 The ceramic vessels from Bronze Age 4. Cat. 12562-71, 12573, 12617, burial 236, cat. 402, 558, 561-2, 559, 561-2, burial 9, cat. 16617-9, 476-80, 508A-B, burial 10



FIG. 10:37 The ceramic vessels from Bronze Age 5. Cat. 8819, 21, 8870, burial 186, cat. 7634- 6, 8-9, 40-1, burial 127, cat. 6675 burial 135

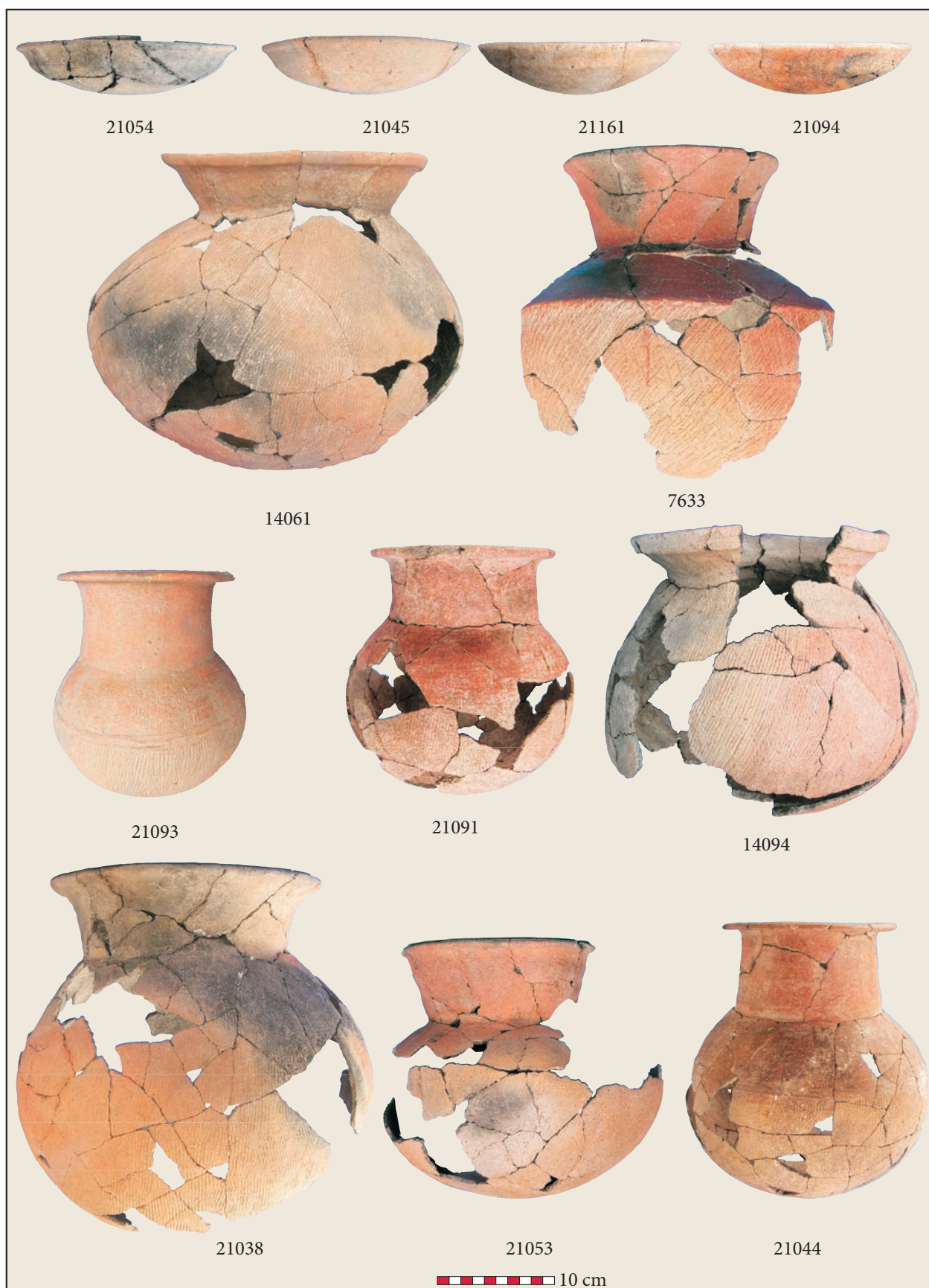


FIG. 10:38 Ceramic vessels from Iron Age 1. Cat. 21038, 21044-5, 21053-4 burial 314, cat. 21161, 21091, 3-4, burial 321, cat. 14061 burial 229, cat. 7633 burial 127, cat. 14094 burial 231



FIG. 10:39 Ceramic vessels from Iron Age 2. Cat. 24022. 24025, 24046-7, 24791, E3 3:3 feature 1, cat. 20724 E9 3:5 feature 2, cat. 20702 D8 3:4 feature 4, cat. 5014 burial 100, cat. 5016 burial 102

BURNISHING STONES

Burnishing stones are recognised by a wear facet where the stone had been consistently employed to rub over the surface of green-hard ceramic vessels in order to impart a polished surface. This technique was applied throughout the cultural sequence, but such stones are notably absent from the Neolithic contexts. They rise sharply in frequency during the Bronze Age, and once again during the Iron Age. During the latter period, when the distinctive Phimai Black ceramic style was in vogue, burnishing was used to apply decorative patterns to the interior and exterior of the vessels. The adult in burial 373, BA4, was interred with a clay anvil beyond the head and a burnishing stone at the left shoulder. The infant burial 483, IA1, contained one burnishing stone by the head, the other between the thighs. The BA4 young woman in burial 188 had a stone beside the pots beyond the feet. Burial 227 of BA5 was an older adult female.

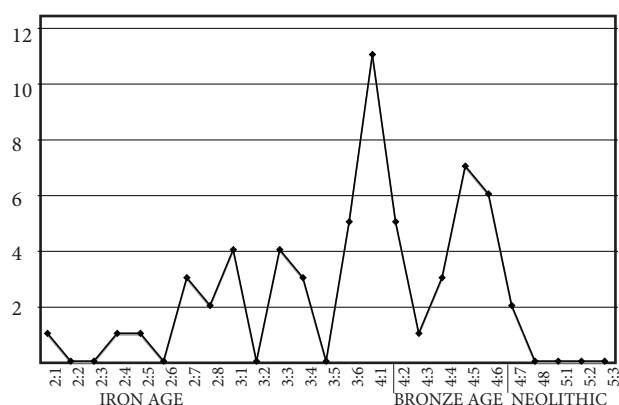


FIG. 10:40 The chronological distribution of burnishing stones in the main square

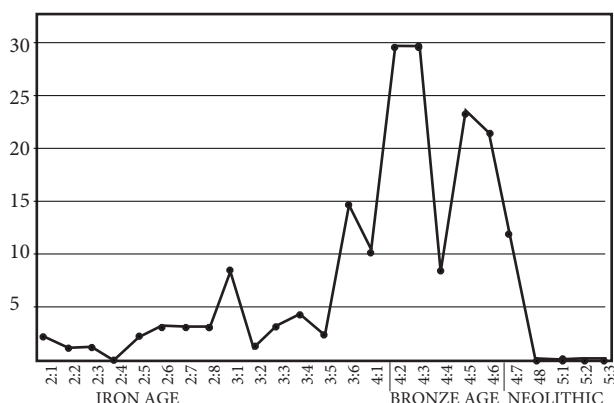


FIG. 10:41 The chronological distribution of clay anvils in the main square

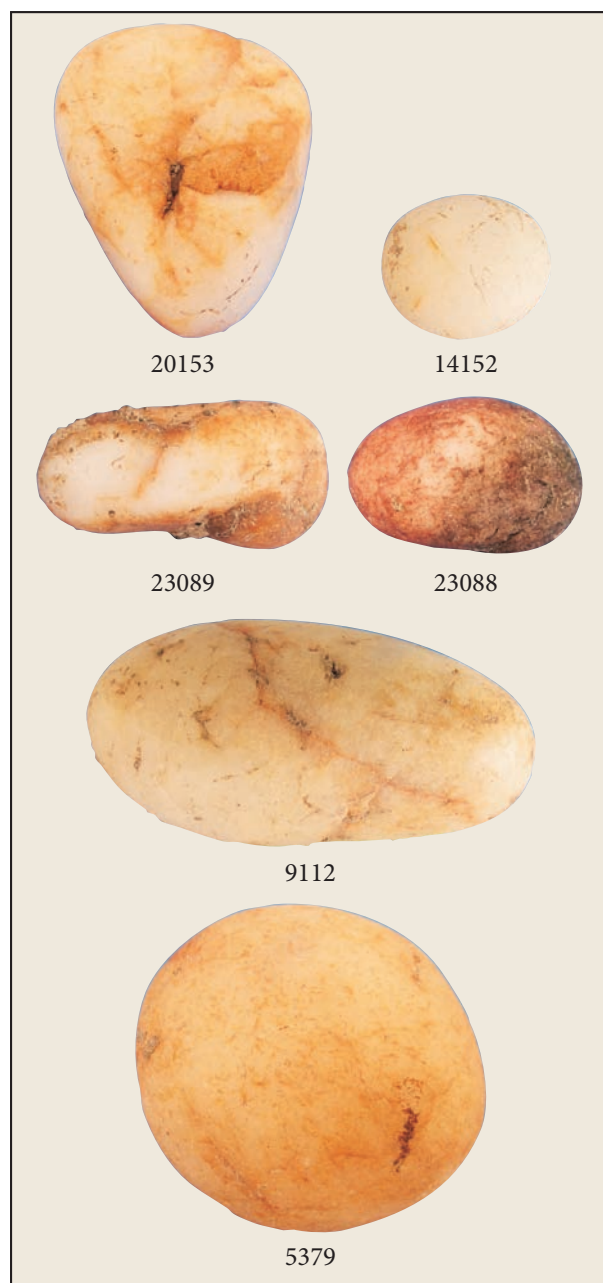


FIG. 10: 42 Burnishing stones found in mortuary contexts. Cat. 20153 burial 373, cat. 14152 burial 257, cats. 23088-9 burial 483, cat. 9112 burial 188, cat. 5379 burial 227. Actual size

CLAY ANVILS

Clay anvils, like the burnishing stones, are virtually identical with the implements used in Thailand today in the manufacture and decoration of ceramic vessels. As might be expected, their distribution at Ban Non Wat over time is similar, with a peak in the Bronze Age, and a second, smaller rise during the early Iron Age. It is however, noted that the rise in burnishing stones during the Iron Age was the more marked. This might well reflect the increasing



FIG.10:43 Neolithic and Bronze Age anvils. Cat. 26547 (Neolithic) E5 5:2. All the rest come from Bronze Age contexts. Cat. 1363 burial 22, cat. 21348 burial 414, cat. 1206 A2 4:16, cat. 643 A3 4:6, cat. 3179 B3 4A:9, cat. 25661 F3 4:5, cat. 4713 Y 7:8, cat. 26327 F4 4:10, cat. 15126 burial 306, cat. 20137 burial 373, cat. 2088 B1 4:6, cat. 6610 C3 4:2, cat. 10540 A7 4:4, cat. 21000 C8 4:4, cat. 23726 E2 4:3, E9 4:2, cat. 18690 F5 4:8, cat. 13667 burial 268, cat. 25644 F3 4:3

popularity of the burnished decoration.

The form of the anvils during the Bronze Age is varied, and at least two, possibly three, shapes were employed. One is large with a rounded and flared surface. The second

has a long handle with a smaller working surface, while the third is small and has a narrow convex end. This variety may reflect adaptation to the forming of different sizes and shapes of vessel.

Few anvils were associated beyond doubt with a deceased as a mortuary offering and many were broken in antiquity and discarded. The manufacture of ceramics within the Ban Non Wat community is assured, not only

on the basis of the recovery of the instruments used by the prehistoric potter, but also by the analysis of the clays used, the great majority of which can be identified as local to the site.



FIG.10:44 Bronze and Iron Age anvils. A. Bronze Age. Cat. 11032 A7 4:3, cat. 16035 AA3 4:2, D5 4:2, cat. 10538 burial 210, cat. 25255 F2 4:7, cat. 24973 E4 4:6, cat. 2212 B1 4A:7, cat. 1153 A5 4:10, cat. 2174 burial 89, cat. 21388 D8 4:4, cat. 18646 F5 4:6, cat. 18613 F5 4:4, cat. 25775 F4 4:9. Iron Age. cat. 17794 burial 375, cat. 7049 C4 2:7, cat. 23551 E2 3:4, cat. 12650 AA5 3:6, cat. 19325 burial 390, cat. 10526 AA7 4:1, cat. 20786 burial 583, cat. 18018 E7 2:9, cat. 4051 B5 3:5

SPINDLE WHORLS AND A WEAVING INDUSTRY

Spindle whorls were very rare in Neolithic contexts. They then rose in frequency during the early stages of the Bronze Age to reach a peak in the late Bronze Age. There was then a sharp fall in their numbers during the Iron Age, a fall that steadily increased over time. A total of 1118 spindle whorls were recovered. Most come from occupation deposits, but 118 burials also contained at least one. A close examination of each of these graves indicates that at least 54 burials contained a spindle whorl as a primary mortuary offering, the remainder being recovered in grave fill and therefore likely to be present fortuitously through redeposition. Table 10:8 presents data currently available on those individuals interred with a spindle whorl, and a full consideration of these artefacts will be presented in a later volume when they have been fully analysed by Dr J. Cameron. The range of forms is seen in figure 10:49. At present, it is clearly evident that the spindle whorl became a valued item in mortuary rituals during Bronze Age 5 and Iron Age 1. Whether or not they were largely restricted to females is not yet known pending the complete analysis of the human remains. However, it is clear that they were placed with young as well as mature individuals. There was no preferred location relative to the body. Some were found in the area of the head, others by the hands or feet. They were often found in association with a set of offerings, that included pellets of red ochre, a grey clay and bivalve shells. The grey clay may have been a component of a dye for colouring cloth.

The plan of the early Iron Age cemetery suggests that there were two sets of burials, a northern and a southern. Figure 10:48 highlights the distribution of spindle whorls in this cemetery. As may be seen, both sets or groups contain many burials associated with spindle whorls.

Given the absence of these artefacts in the earlier Bronze Age graves, it is suggested that there was a sig-

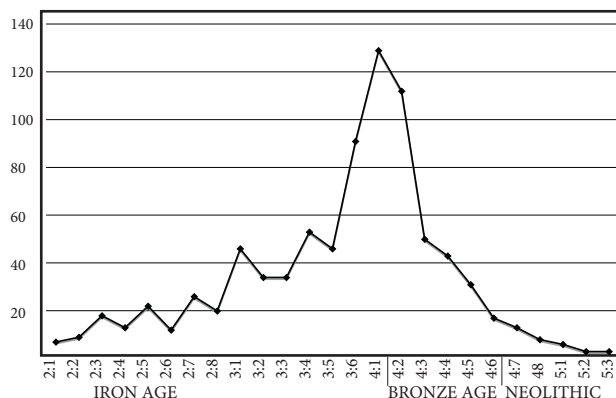


FIG. 10:45 The chronological distribution of spindle whorls in the main square

nificant development of creating yarn and probably weaving during BA5 and IA1. It is evident from the survival of pseudomorphs on the surface of metal corrosion, that woven containers were employed to contain artefacts placed with the dead (Fig. 10:51). These are found on Bronze Age axes and chisels and Iron Age tools in the form of plaited material.



FIG. 10:46 Burial 44, showing the placement of a spindle whorl adjacent to a bivalve shell beside the head of a 3-year-old infant. Scale 5 cm



FIG. 10:47 Located beyond the head of burial 241, BA5, the spindle whorl was positioned alongside grey clay, red ochre pellets and bivalve shells. Scale 5 cm

TABLE 10:8 *The distribution of spindle whorls places as mortuary offerings*

Burial	Phase	Placement	Age	Sex	Burial	Phase	Placement	Age	Sex
43	BA5	between knees	adult		44	BA5	beside head	infant 3Y	
46	BA5	above head	adult		49	BA5	beyond head	child c. 11Y	
50	BA5	by right knee	infant 9M		54	BA5	over red ochre in chest area	over 15Y	
61	BA5	right of head	adult		110	BA5	in mortuary vessel by the head	7m <i>in utero</i>	
120	BA5	beyond head	adult		124	BA5	at right shoulder	adult	
126	BA5	beyond head	mid adult		127	BA5	2 over and near head	adult	
131	BA5	by right knee	adult		136	BA5	by right knee	adult	
144	BA5	left of head	adult		215	BA5	by left shin	mid adult	F
227	BA5	beyond head	older adult	F	241	BA5	beyond head	adult	
380	BA5	between shins	mid adult	F	504	BA5	by right arm	infant 2-4Y	
225	IA1	by right ankle	adult		581	IA1	by head	adult	
235	IA1	4 in the head area	10Y		312	IA1	by right ankle	adult	
331	IA1	by right arm	2Y		333	IA1	by right hand		
338	IA1	by feet	adult		341	IA1	beyond head and by right ankle	adult	
342	IA1	in chest area	over 15Y		344	IA1	by left hand	adolescent/adult	
347	IA1	by left knee	adult		352	IA1	2 over chin	adult	
356	IA1	by right ankle	adult		357	IA1	by head	adult	
364	IA1	by head	adult		365	IA1	by right ankle	adult	
367	IA1	by right hand	young adult	F	375	IA1	by right hand	adult	
383	IA1	by left arm	mid adult	F	417	IA1	by right hand	adult	
475	IA1	beyond feet	adult		478	IA1	right shoulder	adult	
482	IA1	by left hand	adult		483	IA1	between knees	infant 3Y	
485	IA1	over mandible	adult		486	IA1	by left ankle	adult	
488	IA1	by right knee	infant 2.5Y		489	IA1	on neck area	adult	
490	IA1	by right hand	subadult 15Y		494	IA1	by right toes	adult	
495	IA1	over left toes	adult		36	IA2	by right thigh	infant	

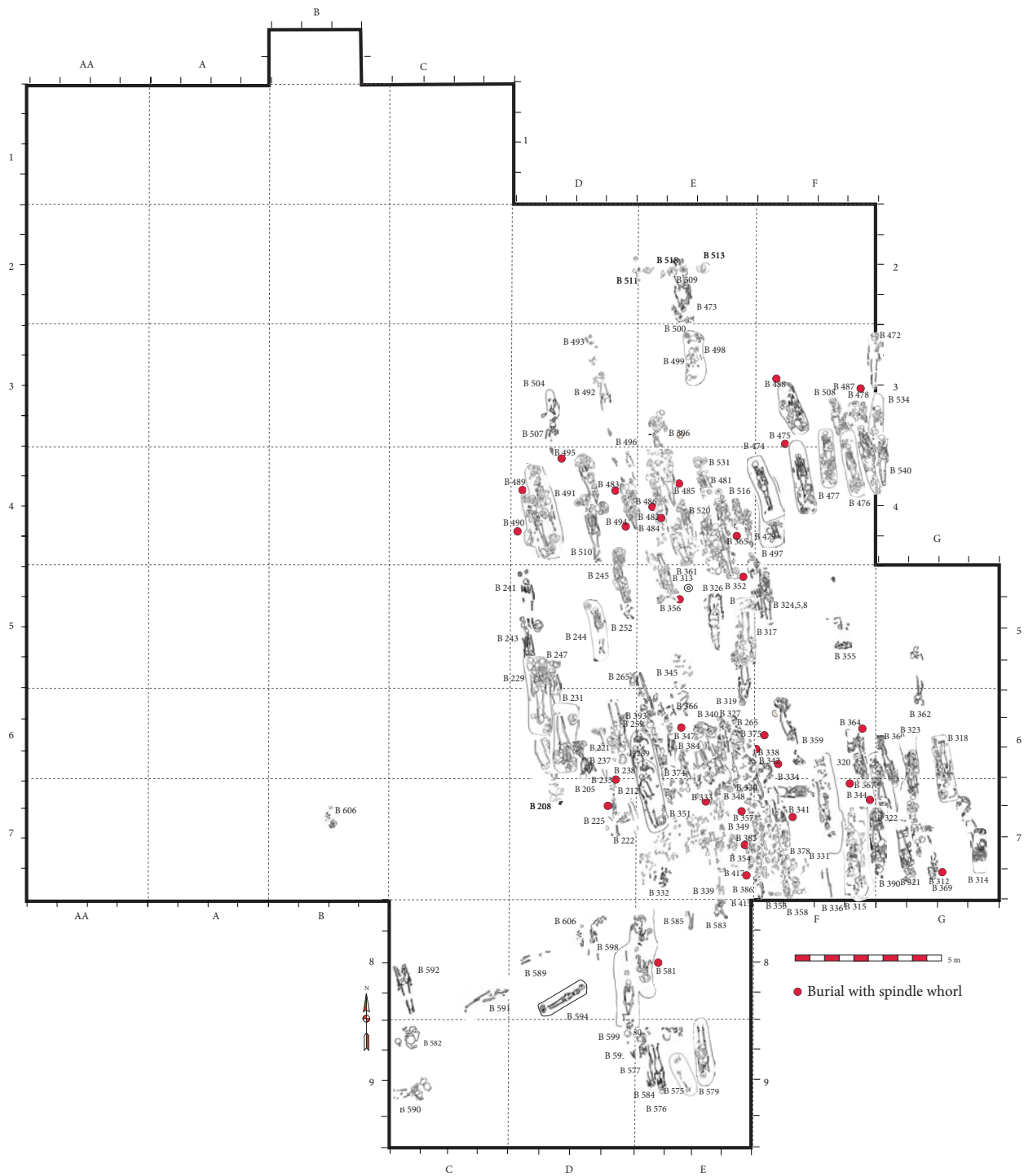


FIG. 10: 48 The distribution of Iron Age graves with spindle whorls as mortuary offerings



FIG. 10:49 Spindle whorls from burials. Cat. 469 burial 43, cat. 524 burial 44, cat. 630 burial 46, burial 545 burial 49, cat. 547 burial 50, cat. 624 burial 54, cat. 3456 burial 61, cat. 4625 burial 110, cat. 7671 burial 120, cat. 7156 burial 124, cat. 6691 burial 126, cat. 7617 burial 127, cat. 7619 C5 4:4, cat. 7286 burial 131, cat. 6669 burial 136, cat. 8704 burial 14. Scale 90%

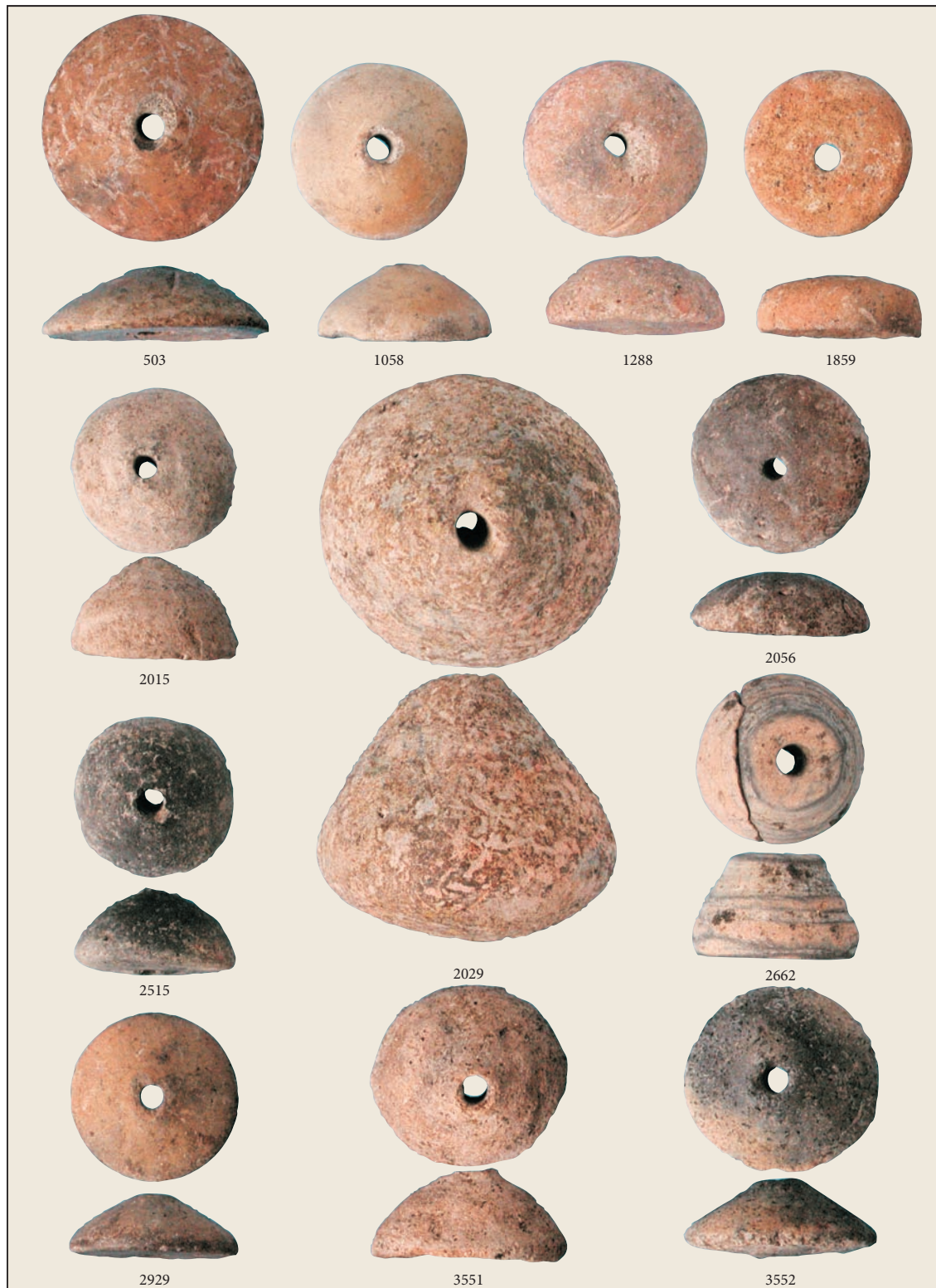


FIG. 10:50 Spindle whorls, showing the variety of forms. Cat. 503 A2 4:7, cat. 1058 A5 3:5, cat. 1288 A2 4:6, cat. 1859 A3 4:3, cat. 2015 B1 2:3, cat. 2056 B1 4:4, cat. 2515 B2 2:3, cat. 2029 *, cat. 2662 B2 1:5, cat. 2929 B4 4A:1, cat. 3551-2 B4 2:5. Scale 90%

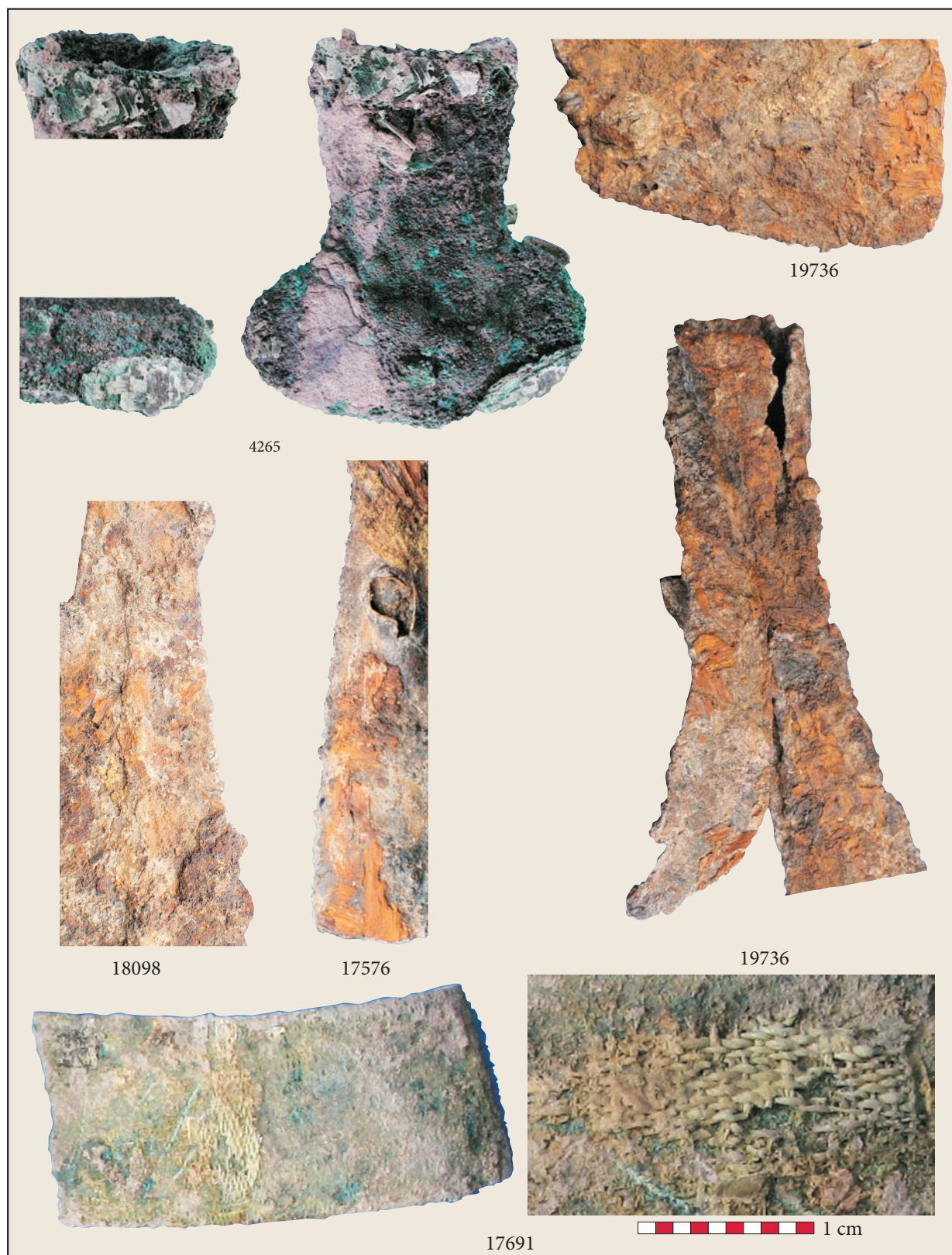


Fig. 10:51 Examples of woven material and fabric. Cat. 4265 burial 90, cat. 19736 burial 383, cat. 18098 part of a spear, burial 374, cat. 17576 part of a chisel or hoe, burial 348, cat. 19736 socketed iron blades burial 383, cat. 17691 fabric pseudomorph on the surface of a bronze bangle, burial 382. Scale actual size

PERSONAL ORNAMENTS

Interring the dead clothed and with ornaments was practiced during the Bronze and Iron Ages, and probably during the Neolithic as well, but in the case of the earlier phases, the absence of metal offerings ruled out the survival of fabric pseudomorphs. The range of jewellery is great, from the cowrie shells and shell beads of the Neolithic to the marble, shell and bronze of the Bronze Age and the carnelian, agate, glass and gold of the Iron Age.

MARBLE BANGLES

Marble bangles with a T cross section were commonly found worn by the dead during the Bronze Age 2-4 periods. They were found either complete in burials, or represented as broken fragments. The latter are most abundant in layers ascribed to the Bronze Age, though some found their way into Iron Age contexts, probably fortuitously.

Many wealthy individuals of both sexes, wore one on each wrist, in association with shell bangles on the fore and upper arms. They are also found with infants and children. The source of the marble itself and the manufacturing site or sites are not known, but marble is said to outcrop on the Petchabun range to the west of Ban Non Wat. The value attached to these ornaments is particularly well expressed at Ban Na Di in Udorn Province, where broken specimens were repaired by boring holes adjacent to the break and pouring through them molten bronze to act as tie wires. This practice also took place at Ban Non Wat, and is found both in burials and occupation layers (Fig. 10:54 cat. 686).

SHELL BANGLES

Shell bangles were very abundant as jewellery worn by the dead at interment, and as fragments in non-mortuary contexts. The latter as with marble ornaments, concentrate in the Bronze Age layers. They were manufactured from at least two genera of marine shell, *Trochus* and *Tridacna*. The former are the more abundant. In the case of *Tridacna* bangles, they were on occasion massive, as seen in the set found on the arms of the female burial 105 (Fig. 10:52). Some of the richer Bronze Age 2 and 3 individuals wore up to 40 of the *Trochus* bangles on each arm. The recovery of *Tridacna* shell cores taken from the centre of the bangle indicates that at least some of the bangles could have been locally fashioned from imported raw material.

The woman interred in burial 105 wore a very impressive set of *Tridacna* shell bangles on each forearm. Cats. 2345-9 were found on the right arm, and they comprised



FIG. 10:52 Burial 105 showing the shell bangles *in situ*. Scale 5 cm

a set of carefully matched ornaments that increased in size from the wrist to the elbow. Those on the left arm were all found in a broken condition, but they too, on reconstruction, increased in size the closer to the elbow. The former had a thicker cross section (Fig. 10:55).

Bronze Age 2-3 graves, and to a lesser extent Bronze Age 4 individuals, often wore multiple sets of *Trochus* shell bangles (Fig. 10:57). These again indicate a major exchange network that reached down to the coralline seas beyond the Gulf of Siam. Broken fragments of such bangles were frequently recovered in non-mortuary contexts.

A rare form of shell bangle with parallel ridges on the exterior surface was found with burials 52 and 114, both of Bronze Age 4 (Fig. 10:59).

SHELL AND MARBLE EARRINGS

Earrings fashioned from shell are rare, and confined to particularly rich individuals. Marble earrings are very rare. Eleven individuals were found with shell earrings. Those from Bronze Age 2 involved burial 197, a male, who wore eight. Other men with earrings were burial 443 and 445. Bronze Age 2 women in burials 105, 106, and 464 wore earrings when interred. For Bronze Age 3, Only women in burials 178, 161, 196 wore earrings and many were split, presumably to aid attachment to the ear. Burial 210, a male of Bronze Age 4 wore shell earrings of a different form to the earlier specimens.



FIG. 10:53 Marble bangles. Cat. 676 burial 88 adult, cat. 2350 burial 105 female, cat. 3732 burial 90 male, cat. 11732 burial 263 female, cat. 18248 burial 256 female, cat. 18368 burial 457 infant, cat. 2351 burial 105 female, cat. 18377 burial 458, cat. 19876 burial 449 female, cat. 10071 burial 201 male, cat. 18319 male, cat. 25304 burial 555 male, cat. 24996 burial 543 infant, cat. 18711 burial 440 female, cat. 18317 burial 466 male, cat. 779 burial 10 adult



FIG. 10:54 Marble bangle fragments. Cat. 828 A1 4:15, cat. 686 A3 4:8, cat. 679 A3 4:8, cat. 602 A1 4:10, cat. 1865 A3 4:14, cat. 1796 A3 4:9, cat. 586 A1 4:9, cat. 535 A4 4:13, cat. 368 A4 4:9, A4 4:11, cat. 447 A4 4:11, cat. 488 A2 4:7, cat. 3394 A1 4:12, cat. 1106 A2 4:13, cat. 1107 A2 4:13, cat. 1605 A5 4:10. Scale actual size.

SHELL BEADS

Shell disc beads were found in very considerably quantities, particularly with the rich Bronze Age 2 and 3 individuals. With this group, they were found in three distinct locations relative to the body. Firstly, they were often found lying on the cranium. Some of the dead wore multiple strands of shell bead necklaces, while there were also many strands of shell beads round the waist as belts. In some cases, shell beads were found all over the body, as if they had been sewn onto a garment or shroud.

Burial 624 of Bronze Age 3 contained the skeleton of a woman who wore a belt of shell disc beads in at least seven strands. It is noted that each strand contained beads of the same size, though the size varied markedly between the strands themselves. Similar beads were found adhering to her arm and rib bones. The woman in burial 105 of Bronze Age 2 wore at least 12 shell disc bead necklaces (Fig. 10:56) as well as a multi-stranded shell belt, and beads were found over her skull.

The presence of beads on the skull is nearly always indicative of a rich early Bronze Age individual. Whether these beads were part of a cap or headdress, or the remains of a shroud is not known.



FIG. 10:55 The *Tridacna* shell bangles from burial 105 reconstructed. Scale 50%



FIG. 10:56 The shell earrings worn by the woman in burial 105. Scale 5 cm



FIG. 10:57 The *Trochus* shell bangles on the arms of the male burial 260. Scale 5 cm



FIG. 10:58 *Trochus* shell bangles from burial 30. Scale 50%



FIG. 10:59 The ridged shell bangles from burial 52, cats. 2154-7. Scale 50%



FIG. 10:60 The *Tridacna* bangles from burial 90. Scale 50%

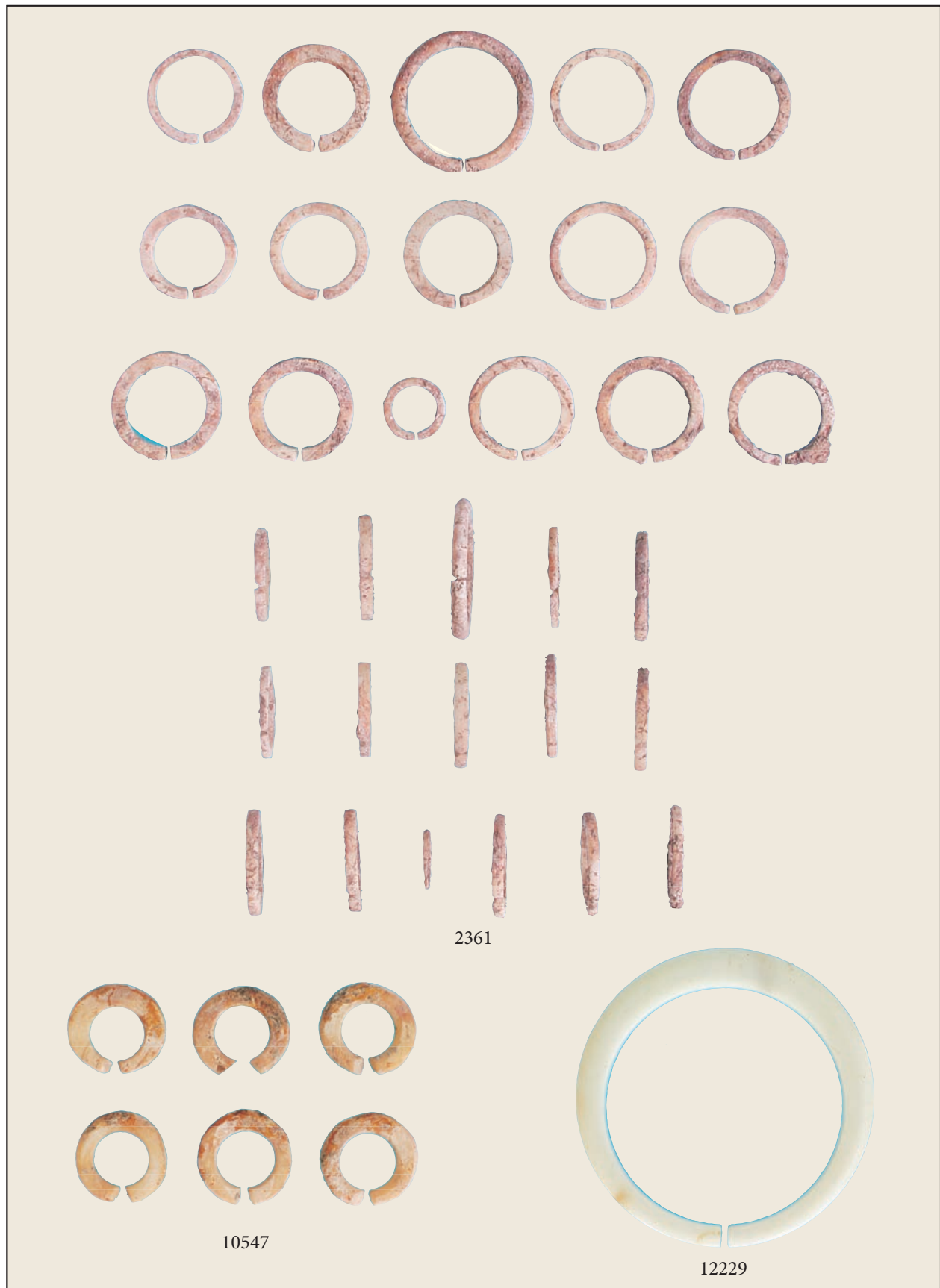


FIG. 10:61 Cat. 2361, shell earrings from burial 105, scale 50%. Cat. 10547 shell earring from burial 210, scale 100%. Cat. 12229, marble earring from burial 262, scale 100%



FIG. 10:62 The skull of burial 293, a Bronze Age 2 infant, showing the shell disc beads over the skull and upper body. Scale 5 cm



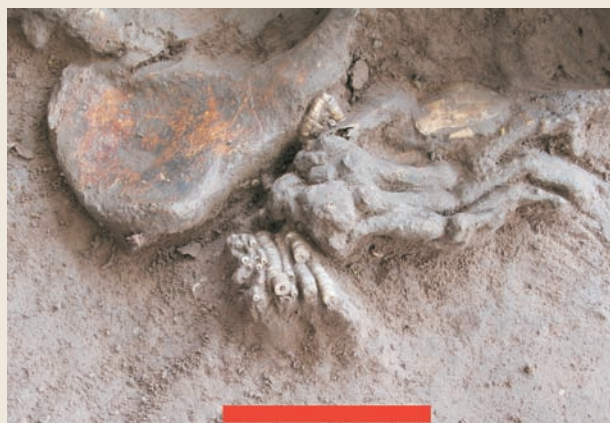
FIG. 10:63 The cranium of burial 466, a man of Bronze Age 2, showing the shell disc beads over his head. Scale 5 cm



FIG. 10:64 Burial 195, a woman of Bronze Age 2, showing necklaces of shell disc beads. Scale 5 cm



FIG. 10:65 Burial 624 of Bronze Age 3, a woman, showing her shell disc bead multi-stranded belt. Scale 5 cm



BRONZE ORNAMENTS

No bronze ornaments were found with Bronze Age 1 burials. They were very rare in Bronze Age 2 burials. Burial 93, a woman, had been disinterred and then replaced. A fragment of bronze bangle was found among her bones, but not in definite association. The only bronze ornaments associated with Bronze Age 2 individuals comprised sets of bells, found with burial 468, an infant, and burial 455, a young adult male. Bells were also found with Bronze Age 3 burial 622, a second infant. Burial 201 of the same phase contained the skeleton of a man wearing bronze anklets on each leg. These anklets comprised



FIG. 10:66 The bronze anklets of burial 201, Bronze Age 3, *in situ*. Scale 5 cm

several strands, each in the form of twisted cordage. They were further embellished with small rings. This type of ornament early in the Bronze Age is not known elsewhere in Northeast Thailand (Fig. 10:66).

Bronze ornaments were virtually absent from burials belonging to Bronze Ages 4 and 5. A bell was found by

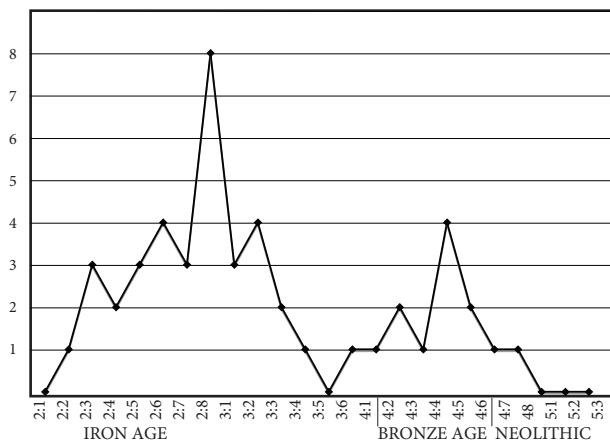


FIG. 10:67 The distribution of ivory artefacts by layer

the left hand of burial 236 of Bronze Age 4, a young person aged 15 or slightly older. Only with the Iron Age 1 do bronze ornaments proliferate. Bangles predominate, but there are also bells and anklets. With Iron Age 2, there are toe rings, finger rings and bangles.

While the majority of the bangles and anklets found in Iron Age 1 burials are relatively plain, there are examples of a greater complexity in casting, leading to large and impressive ornaments. One such comes from burial 314, an infant aged just under a year at death. Two identical anklets were hollow, the exterior being decorated with a series of knobs. Within, there was a set of clay balls which would have resonated as the infant moved (Fig. 10:71). These bronzes were particularly corroded and could not be restored.

Burial 343, an infant of Iron Age 1, wore two large bronze bangles (Fig. 10:71), as well as three each of ivory on each wrist. The bronze ornaments were cast as a sheet, almost certainly by the lost wax method, and the sheet was then bent into a circular form. The exterior was enhanced with bronze studs, and a pattern that was created by impressing fabric onto the wax before the casting progressed to the next stage. Four holes were cast at the edges in order to secure the bangle, and fragments of fabric were found adhering to the exterior of cat. 19658.



FIG. 10:68 Bronze bells round the ankles of burial 622, an infant of Bronze Age 3. Scale 5 cm



FIG. 10:69 Bronze anklets with rings from burial 201, Bronze Age 2

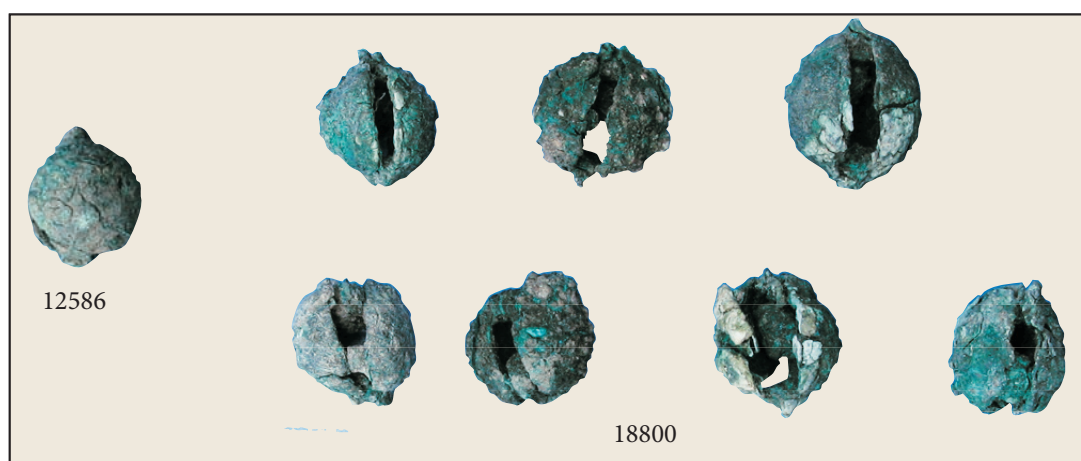


FIG. 10:70 Bronze bells. Cat. 12586 burial 236 Bronze Age 3, cat. 18800 burial 468 Bronze Age 2. Scale actual size



FIG. 10:71 The anklets from burial 314, above, and the bangles from burial 343 (cats. 19658-9). Scale of the latter, actual size

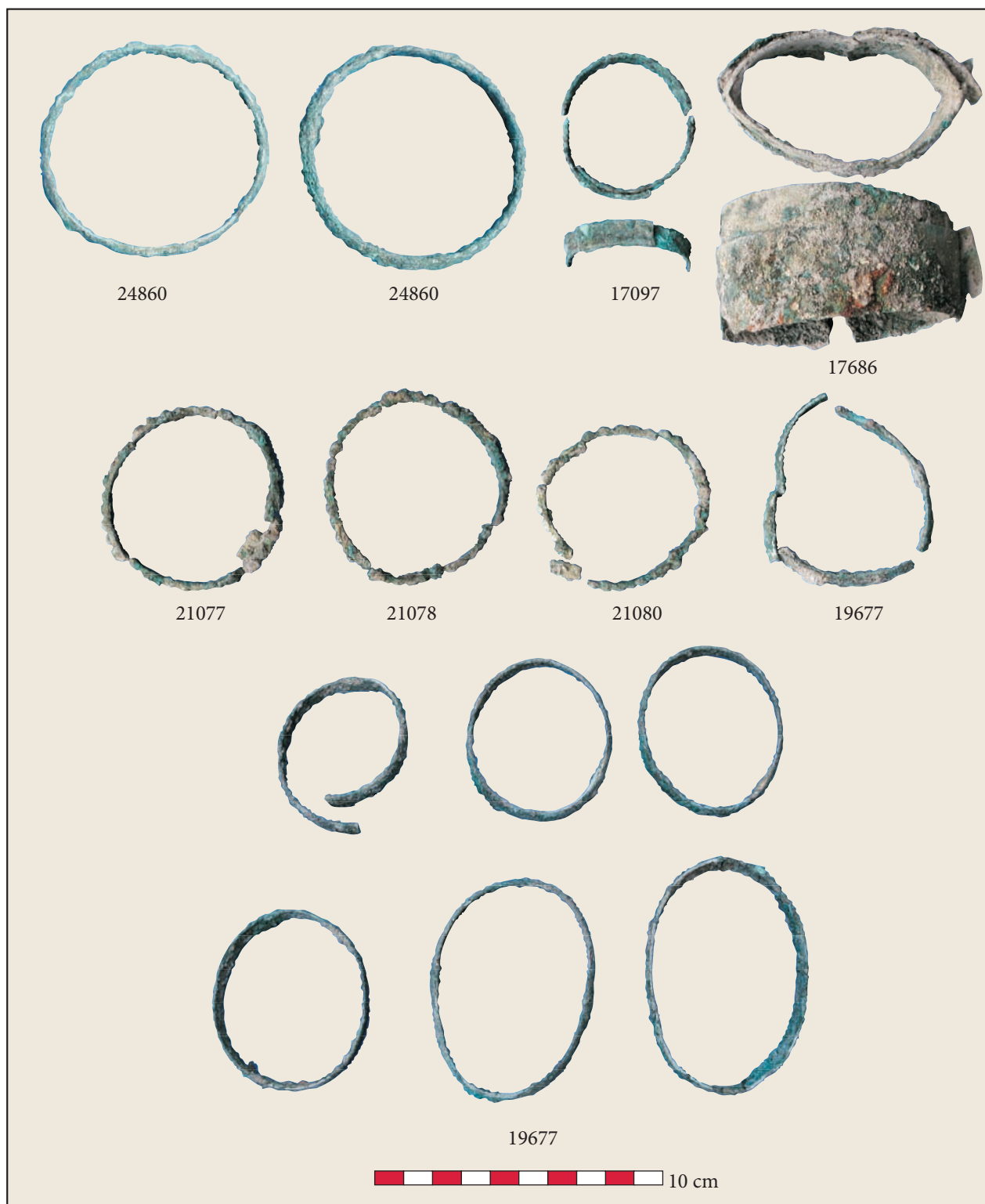


FIG. 10:72 Bronze bangles from Iron Age 1 burials. Cat. 24860 burial 486, cat. 17097 burial 345, cat. 19677 burial 341, cat. 17686 burial 382, cat. 21077-8, 21080 burial 312, cat. 19677 burial 341

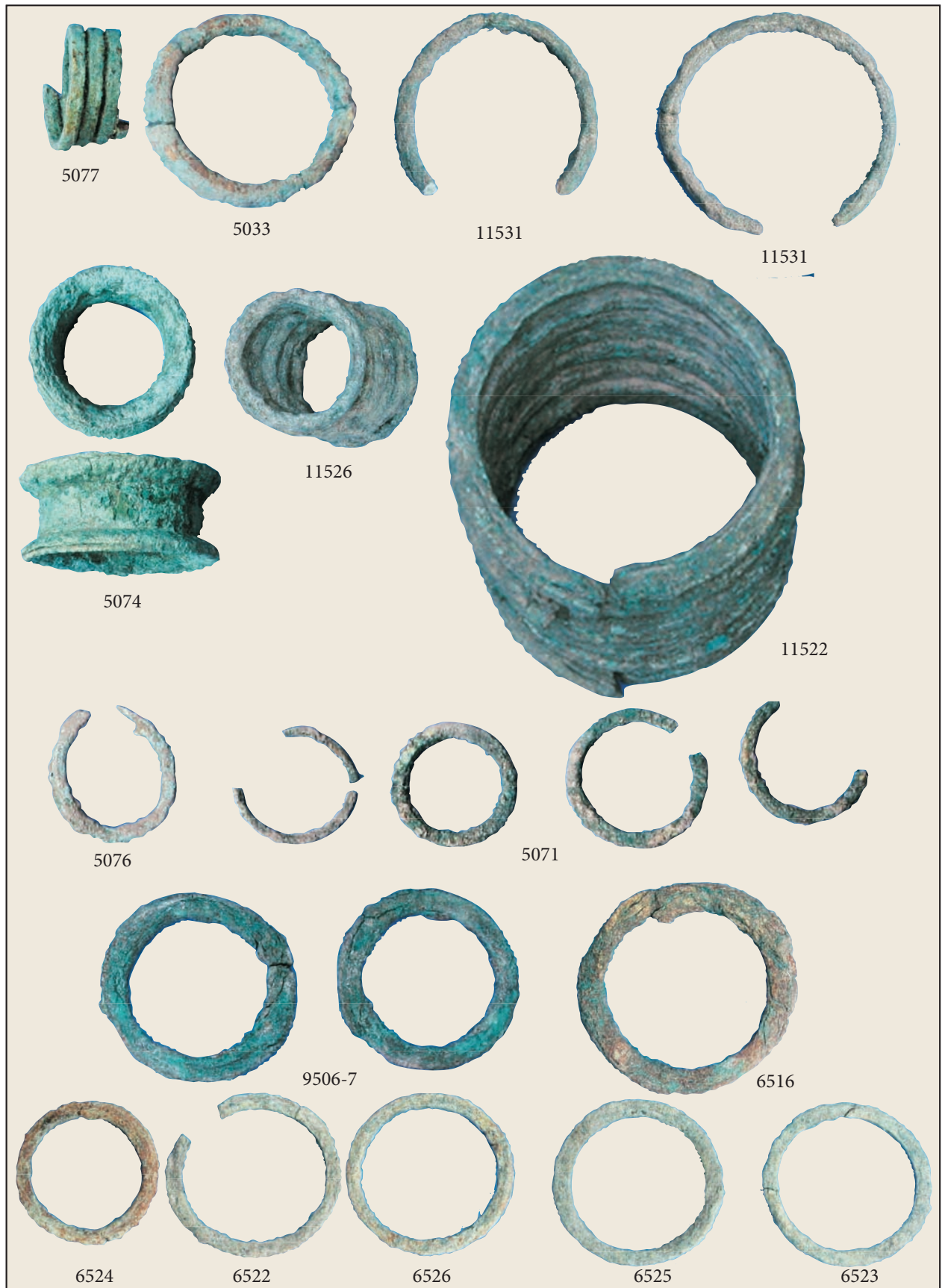


FIG.10:73 Bronze ornaments from Iron Age 2 burials. Cat. 5077 burial 111, cat. 5033 burial 98, cat. 11531 burial 204, cat. 5074 burial 98, cat. 11526 burial 203, cat. 11522 burial 203, cat. 5076 burial 111, cat. 5071 burial 108, cat. 9506-7 burial 119, cat. 6516, burial 119, toe rings, cat. 6522-6 burial 119. Scale actual size

IRON BANGLES

The initial acquaintance with iron led to the forging of bangles in imitation of bronze forms. Several individuals wore such iron bangles at Ban Non Wat (Fig. 10:74).

BIMETALLIC ORNAMENTS

As at Noen U-Loke, later Iron Age individuals were accompanied by rings made of bronze with an outer covering of iron (Fig. 10:75).



FIG.10:74 Iron Age 1 iron bangles. Cat. 17116 burial 356, cat. 17688 burial 382, cat. 17707 burial 348. Scale actual size

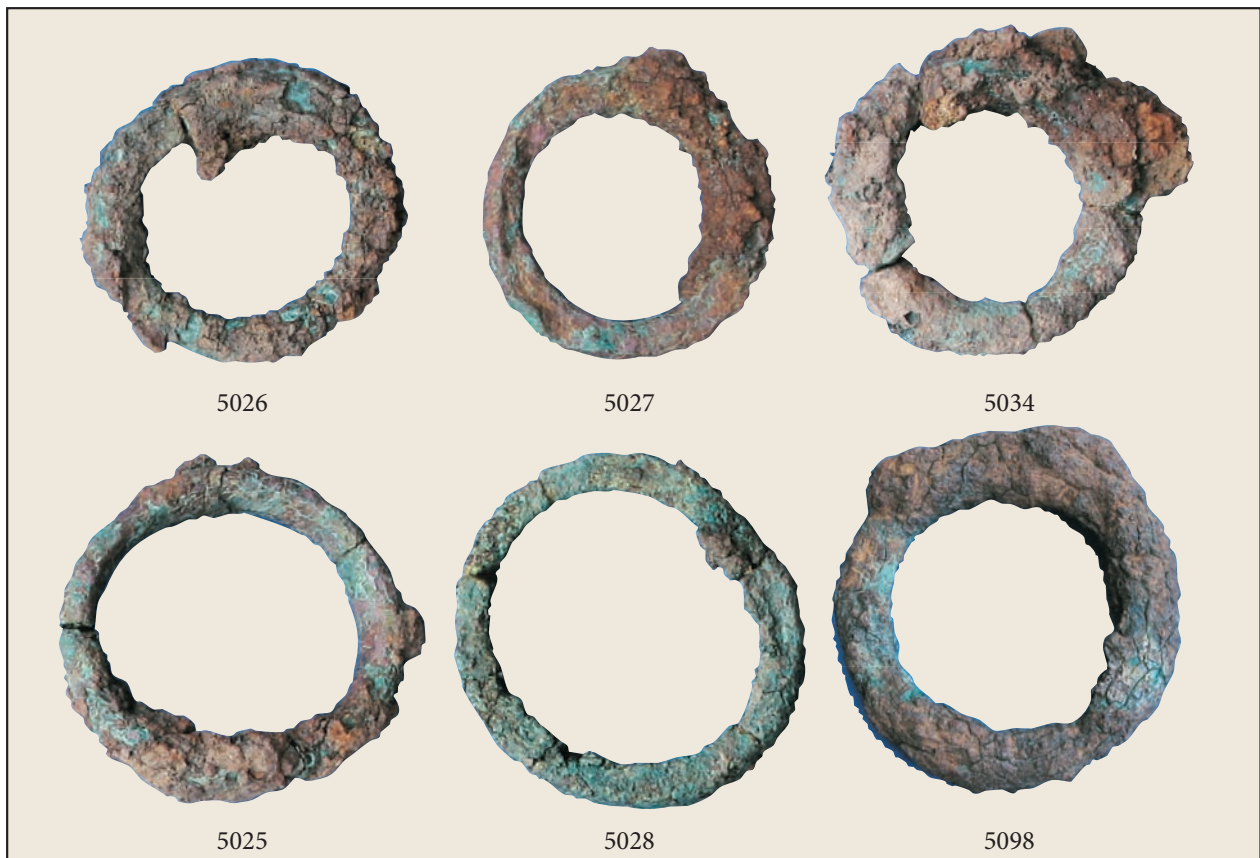


Fig. 10:75 Bimetallic rings from Iron Age 2 burials. Cat. 5025-8 burial 102, cat. 5034, 5098, burial 111. Scale actual size

IVORY BANGLES

Ivory was not commonly found. Its distribution suggests that it was valued during the Bronze Age with an increase during the Iron Age (Fig. 10:78). The infant in burial 343, Iron Age 1, died when aged about 9 months and was interred with seven ivory bangles.

CARNELIAN AND AGATE

Carnelian and agate ornaments characterise the later Iron Age in the upper Mun Valley and Ban Non Wat is no exception. The long carnelian beads found with burial 36 match precisely those found at Noen U-Loke during the third mortuary phase there, while the agate pendants are typical of those from the Noen U-Loke Iron Age cemetery phases 3-5.

GLASS ORNAMENTS

Glass ornaments were worn by some of those interred during Iron Age 1 and 2. In the former group, glass was found in the form of earrings, and in the latter, glass beads predominated. These were usually worn as necklaces. Burial 202 of Iron Age 2 wore a glass bead necklace (cat. 11530) and there were further beads, mainly orange in colour, at

the right wrist possibly in the form of a bangle. The Iron Age 2 infant in burial 266 was interred with a fine set of beads coloured yellow, blue and orange (Fig. 10:80). Glass beads and the occasional scrap of glass were also found in occupation contexts, and again, the distribution reveals a surge during the later Iron Age, while some items clearly found their way out of context and into layers dating to the Bronze Age. One such glass item is a most unusual possible ear ornament cat. 10234 from mid layer 4. Glass beads are currently being analysed in depth.

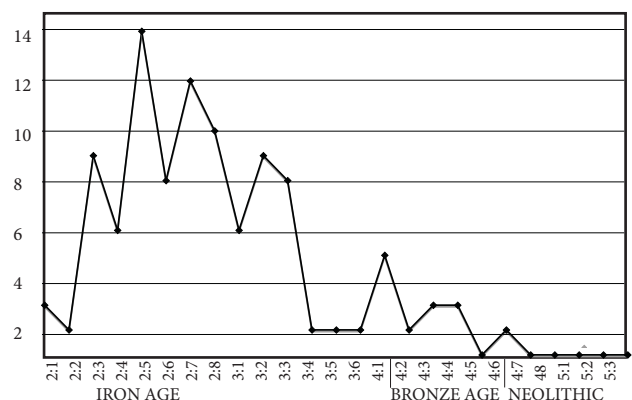


FIG. 10:76 The chronological distribution of glass artefacts in the main square

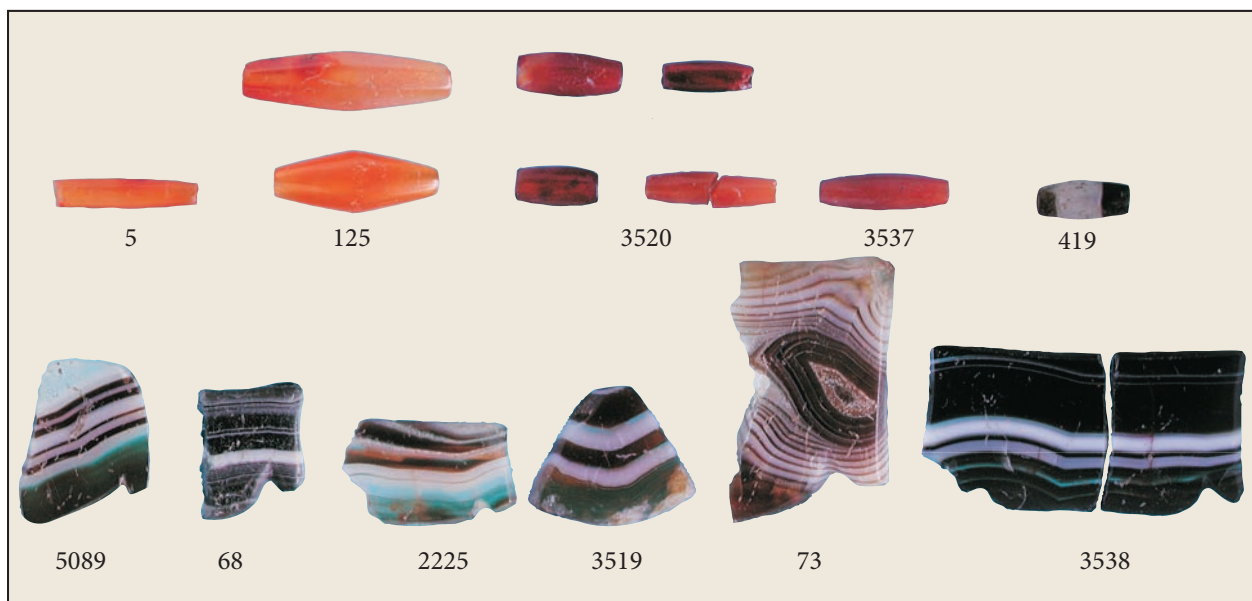


FIG. 10:77 Iron Age carnelian and agate jewellery. Cat. 5 layer 1:2, cat. 125 burial 6, cat. 3520, 3537, 3538, 3519 burial 36, cat. 419 A3 3:1, cat. 5089 burial 115, cat. 68 Y1 4:5, cat. 2225 B1E 2:3, cat. 73 A3 2:5. Scale actual size



FIG. 10:78 Iron Age ivory bangles from burial 343. Scale 50%

GOLD

Gold is very rare at Ban Non Wat. A gold bead was found with burial 36 of Iron Age 2, and a fragment of gold was recovered from square Y 2:13. Burial 471, Iron Age 2, yielded one gold earring. The golden bead is of identical form to those recovered from burial 113 at Noen U-Loke (Fig. 10:79).



FIG. 10: 79 Iron Age gold artefacts. Cat. 2965 burial 36, cat. 5242 Y layer 2:13

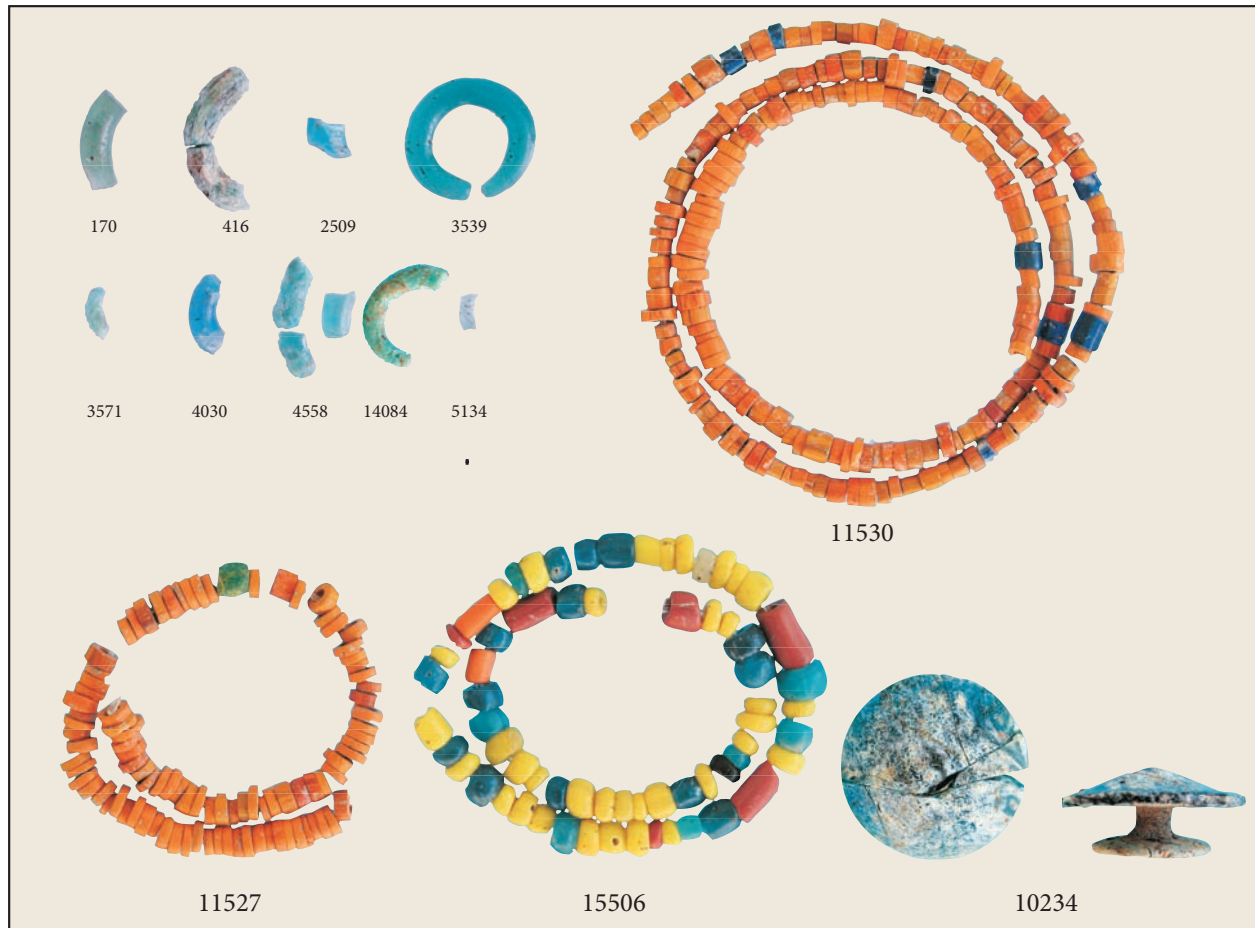


FIG. 10:80 Glass artefacts. Cat. 170 A4 2:7, cat. 416 A1 4:2, cat. 2509 B2 2:3, cat. 3539 B4 2:8, cat. 3571 B4 3:3, cat. 4030 B5 2:3, cat. 4558 Y2 4:2, cat. 14084 burial 237, cat. 5134 burial 101, cat. 11530, 11527 burial 202, cat. 15506 burial 266, Glass ear stud cat. 10234 C7 4:4. Scale actual size

CLAY BANGLES

Many artefacts that look like clay bangles were found at Ban Non Wat, but none was complete, nor worn by any of the dead. In terms of distribution, they clearly belong to the Neolithic and Bronze Age (Fig. 10:81), virtually disappearing with the advent of the Iron Age. Each was carefully formed and fired, and they come with a variety of cross sections (Fig. 10:82). It might be the case that they were worn during life, but were not considered sufficiently impressive or desirable to be placed with the dead.

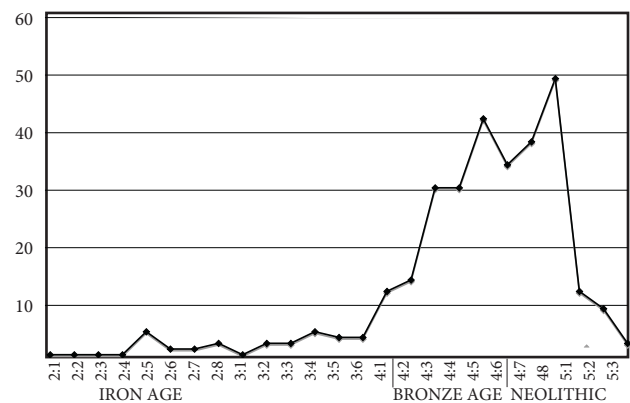


FIG. 10:81 The chronological distribution of clay bangle fragments



FIG. 10:82 Clay bangles. Cat. 1800 A3 2:5, cat. 3260 B3 4a:2, cat. 3269 B3 4A:3, cat. 1471 A4 4:19, cat. 437 A4 4:11, cat. 1158 A4 2:7, cat. 3213 B3 4A:2, cat. 1498 A3 4:12, cat. 689 Y 7:14, cat. 1803 A3 2:5, cat. 1848 A3 4:11, cat. 1365 A5 4:19, cat. 3252 B3 4:8, cat. 3353 B3 4A:5, cat. 1342 A5 4:20, cat. 1413 A1 4:16, cat. 1714 A3 4:15, cat. 4184 B5 4A:6, cat. 882 A1 4:16, cat. 1340 A5 4:20, cat. 1362 A5 4:15, cat. 1621 A5 4:16, cat. 4200 B5 4A:5, cat. 4207 B5 4A:6, cat. 2906 B4 4A:2, cat. 3676 B4 4A:7, cat. 1801 A3 2:5, cat. 1802 A3 2:5, cat. 3207 B3 4:8, cat. 2438 B1 4A:8

COWRIE SHELLS

During the Neolithic 1 period, cowrie shells were worn as ear ornaments with burial 86, and were interred with the woman in burial 292. Single shells were also found with burial 191 of Neolithic 1, burial 93, a wealthy female of Bronze Age 2 and with four Bronze Age 4 individuals, burials 85, 87, 114 and 414. Twenty-two cowries were also found in occupation deposits. These shells must have originated in clean, coralline seas, and the dating of the Neolithic and early Bronze Age examples from Ban Non Wat were approximately contemporary with the considerable importation of cowries into the Shang state in the Yellow River valley to the north.

CLAY BEADS OR NET SINKERS

About eight artefacts may be clay beads or net sinkers, the former being the more likely on the basis of form and size. These are most represented in Iron Age occupation deposits (Fig. 10:83).



FIG. 10:83 Clay beads or net sinkers. Cat. 12002 D7 1:3, cat. 12007 D7 2:1, cat. 12008 D7 2:1, cat. 14002 D6 2:1. Actual size

FIG. 10:85 (Opposite) Long stone beads. Cat. 11611 B7 4:5, cat. 12590 AA5 4:7, cat. 13540 D5 3:4. Scale actual size



FIG. 10:84 Cowrie shell ornaments from Neolithic 1 burials 292 (top row) and burial 86. Scale actual size

STONE BEADS

Long stone beads were relatively rare and in terms of mortuary offerings, confined to the early Bronze Age. The very young male in burial 443, Bronze Age 2, for example, wore two as part of a necklace. Identifying and sourcing these beads is not yet complete.

DECORATED BONE BANGLES

There is a very small sample of bone bangles decorated with incised circles (Fig. 10:86). These were nearly all recovered from Bronze Age occupation contexts. That from burial 114 was in the grave fill, is very fragmentary and probably was not a mortuary offering or an item worn by the dead person.



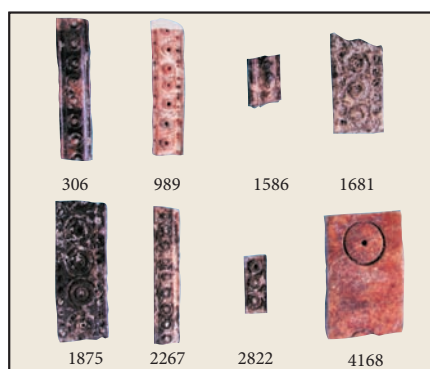


FIG. 10:86 Decorated bone bangle fragments. Cat. 306 A2 4:2, cat. 989 Y1 7:11, cat. 1586 A2 4:2, cat. 1681 A1 4:8, cat. 1875 A3 4:12, cat. 2267 B1 4A:5, cat. 2822 burial 114, cat. 4168 B5 2:5. Actual size

PELLET BOW PELLETS

Round clay pellets were found in all layers at Ban Non Wat. They are one of the commonest artefacts found in Thai prehistoric sites, and were evidently still used in living memory as slingshots to bring down birds and small game. A complete rat skeleton, laid out by the instep of burial 106 (Bronze Age 2), had a clay pellet placed over it.

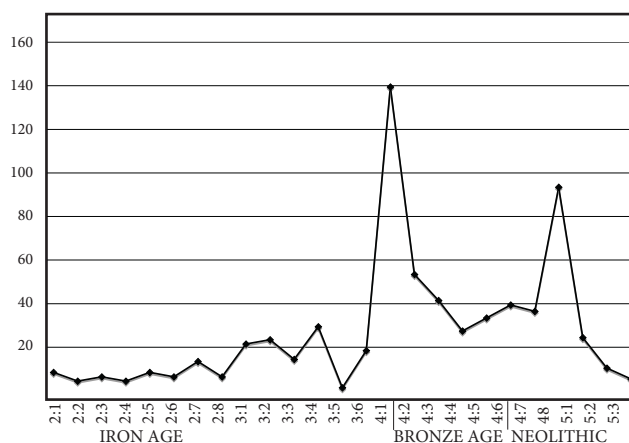


FIG. 10:87 The chronological distribution of clay pellets in the main square

CLAY COUNTERS

The practice of chipping a potsherd in a circular form, often with a central hole, is commonly encountered in prehistoric sites in Northeast Thailand. At Ban Non Wat, there were present in small frequencies throughout the sequence save for the first two Neolithic layers. Their use or purpose is not known.

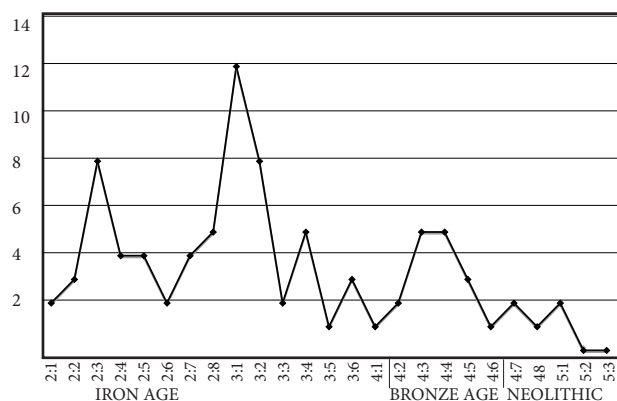


FIG. 10:88 The chronological distribution of clay counters in the main square

WHETSTONES

Sandstone artefacts that with worn concavities or lines are interpreted as the whetstones used to sharpen cutting implements whether they be of stone or metal. Their distribution indicates use throughout the occupation period from the Neolithic to the Iron Age (Fig. 10:89). Their rise in frequency in upper layer 4 is due to the number encountered on Iron Age butchering floors, where they were often found together with iron knives. On occasion,

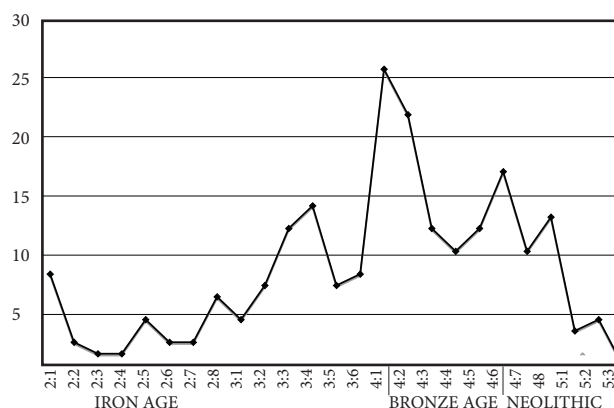


FIG. 10:89 The chronological distribution of whetstones in the main square

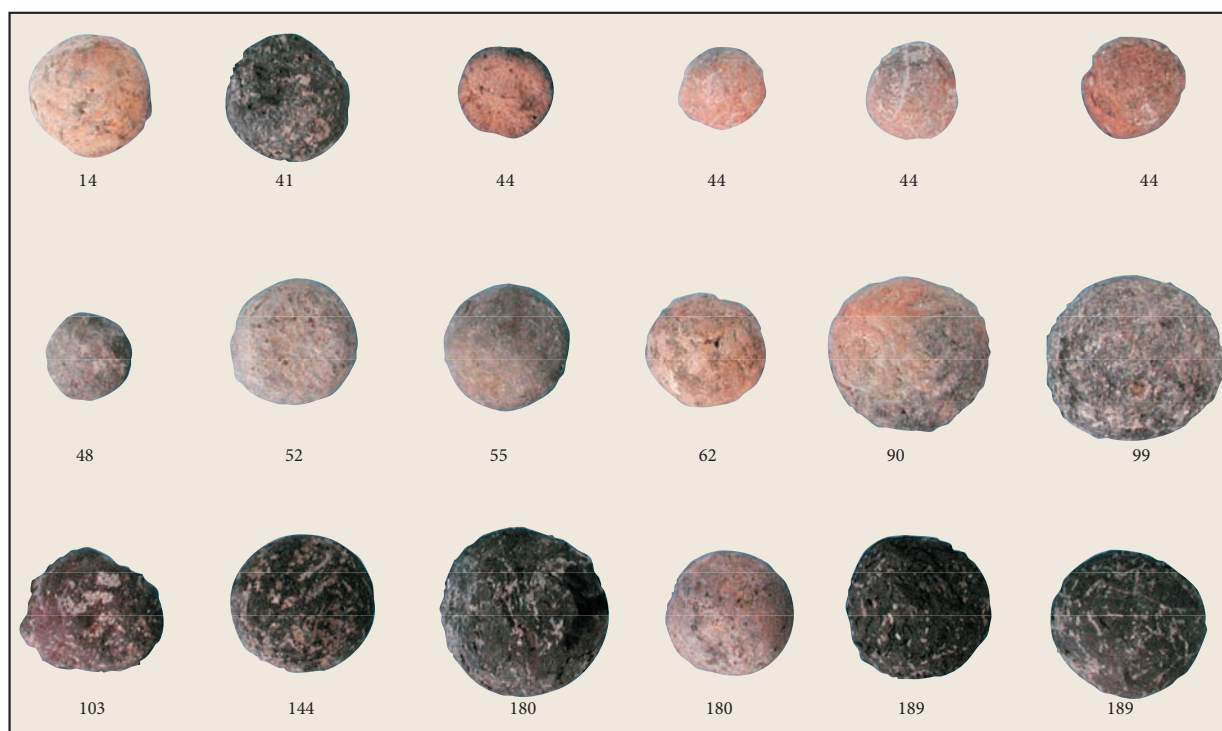


FIG.10:90 Clay pellet bow pellets. Cat. 14 A1 1:3, cat. 41 A2 2:2, cat. 44 A1 2:1, cat. 48 A1 2:1, cat. 52 A3 2:3, cat. 55 A4 2:3, cat. 62 A2 2:4, cat. 90 A3 2:5, cat. 99 A3 2:5, cat. 103 A1 2:6, cat. 144 A2 2:7, cats. 180, 189 A4 2:7. Scale actual size



FIG. 10:91 A close up image of burial 290, showing a whetstone lying to the right of the bronze chisel and axe. Scale 5 cm

SKIN RUBBERS

Clay artefacts with incised lines on one surface are commonly found in Dvaravati sites in Central Thailand. Their presence at Ban Non Wat in the uppermost cultural contexts indicates that the site was occupied during the 1st millennium AD.

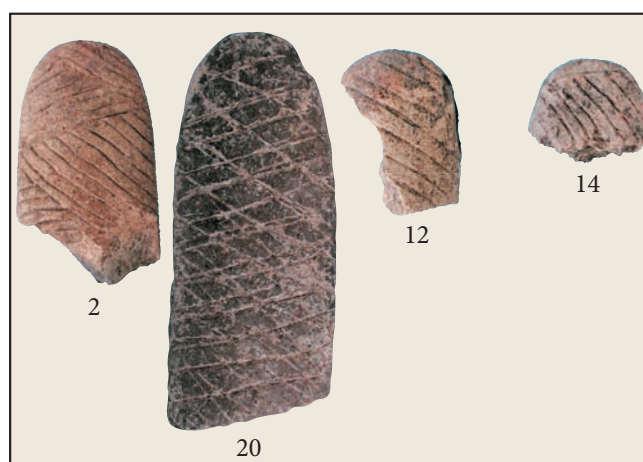


FIG.10:92 Skin rubbers. Cat. 2 A1 1:2, cat. 20 A1 1:4, cat. 12 A1 1:3, cat. 14 Y 2:3. Scale 50%



FIG. 10:93 Clay counters. Cat. 707 A4 4:5, cat. 318 A2 4:2, cat. 843 A4 2:2, cat. 1239 A3 4:9, cat. 1627 A5 4:7, cat. 2134 B1 4A:5, cat. 1886 A4 2:4, cat. 2644 B2 4:3, cat. 2679 B2 1:8, Y 4:5, cat. 143 A2 2:7, cat. 2670 B2 1:6, cat. 1887 A4 2:4, cat. 4 A3 1:2, cat. 10 A3 1:3, cat. 30 A3 2:1, cat. 31 A1 2:1, cat. 2951 B4 2:7, A4 4:2, cat. 1898 A4 4:2, cat. 38 A2 2:2, cat. 56 A3 2:3, cat. 107 A4 2:6, cat. 385 A3 3:1, cat. 3021 B3 2:5, cat. 1900 A3 2:3, cat. 533 A3 4:3, cat. 887 A4 2:5, cat. 888 A4 2:5, cat. 991 A4 4:8, cat. 1882 A4 3:1, cat. 1655 A5 2:3, cat. 993 A4 4:9, cat. 1085 A5 4:6, cat. 1222 A3 2:5, cat. 1272 A3 2:3, cat. 1883 A4 3:1, cat. 1861 A5 2:4, cat. 1884 A4 3:1, cat. 1862 A5 2:4

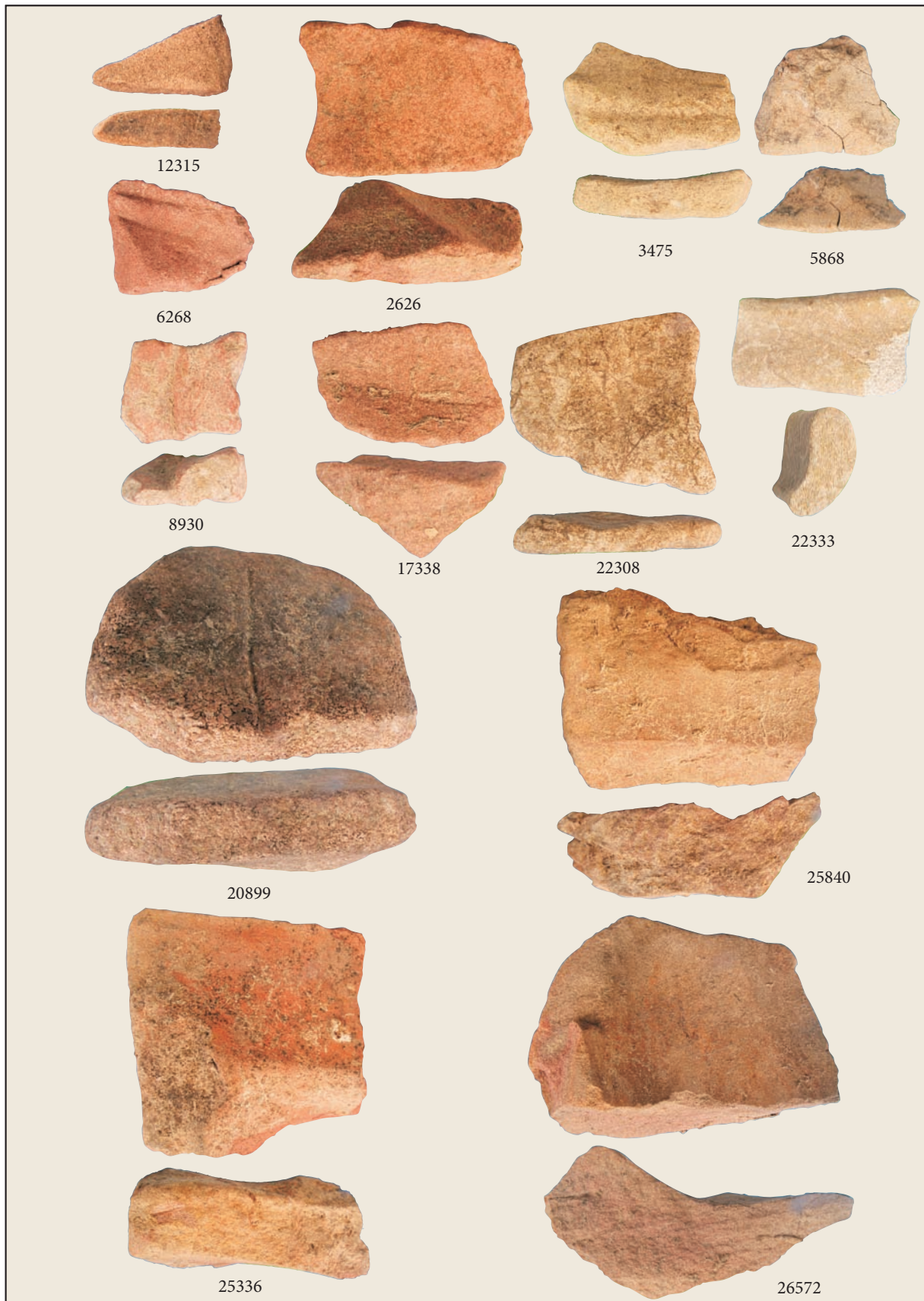


FIG. 10:94 Whetstones. Cat. 12315, burial 290, cat. 2626 B2 4A:9, cat. 3475 C1 4:11, cat. 5868 C1 4:15 feature 1, cat. 6268 C2 4:11, cat. 8930 B6 3:9, cat. 17338 E5 4:10, cat. 22308 E2 3:4 feature 1, cat. 22333 E2 3:4 feature 1, cat. 20899 D9 4:2 feature 1, cat. 25840 F3 5:2, cat. 25336 F2 5:2, cat. 26572 E4 5:3. Scale 45%

TEKTITES

W.E.BOYD

Throughout the excavation at Ban Non Wat a small number of cobbles and pebbles comprising a vitreous or glassy rock, commonly referred to as “tektites” have been recovered. A full report will appear in a later volume of the Ban Non Wat monograph series. Here, I summarise the main points of that report.

Tektites are glassy rocks that were formed as a consequence of meteor impacts on the Earth’s surface. They occur throughout the Quaternary sands of the Lower Khorat Plateau, and are collected as curios at present by local people: it is quite possible that prehistoric people collected tektites in this region for a similar reason.

The tektites are scattered throughout the archaeological sediments at Ban Non Wat, with some evidence for stratigraphic clustering: they are more abundant in the lower spits of Layer 1, the upper spits of Layers 2 and 3, and the lower spits of Layer 4. This hints at collection of tektites at times of change, the early onset of archaeological sedimentation, the Layer 3 closure, and the Layer 2-1 transition. Whether this reflects periods of sedimentary exposure associated with changing environmental conditions, or at some significant human behaviour (such as the collection of culturally-valued ecofacts) at certain periods, remains open to conjecture. Only a few of the tektites are possible artifacts, although most are unmodified. Does lack of modification imply that they served little utilitarian function? Certainly the relationship between tektites

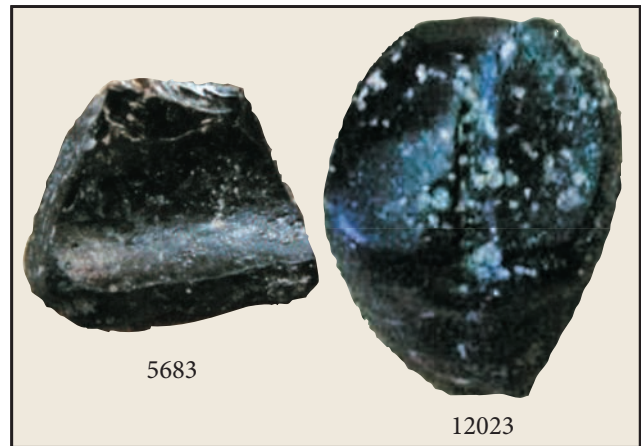


FIG. 10:97 Tektites. Cat. 5683 C1 4:8, cat. 12023 D7 2:6. Actual size

and human behaviour as recorded archaeologically can be problematic. The close association, however, between tektites and the Ban Non Wat archaeological sediments does raise the issue of what socio-cultural function the tektites may have served. Tektites are recorded, globally, as having formal socio-cultural (magical or mystical) or ceremonial significance or informal social (curio) values. Given the chronostratigraphic patterning of tektite abundance, it is tempting to draw parallels between informal social valuing of the tektites and social dynamics at different times in the archaeological history of this site, and suggest such curios were collected at times of social and/or environmental stress.

XI SUMMARY

C.F.W. HIGHAM

The research reported on in this volume has illuminated the history of a prehistoric community over a period of nearly two millennia, or about 100 generations. Ban Non Wat is one of the many moated sites of Northeast Thailand, and commands a strategic position in the upper valley of the Mun River, where access is routine west to a pass over the Petchabun Range into the plains of the Chao Phraya River system, and east to the Mekong. Its environs are devoid of high quality stone resources and tin, copper and lead ores. However, it lies within a region rich in salt deposits, and for much of the prehistoric period, the local fauna and flora would have supplied an abundance of food resources.

One of our objectives was to open a sufficiently large area to evaluate the cultural sequence on the basis of a representative sample. We are convinced that most previous excavations in Northeast Thailand have been too small to enable a full understanding of the complexities of sites as large as Ban Non Wat. This is neatly illustrated by comparing the sequences encountered in each of our three squares. In the largest and centrally positioned area, we identified eleven phases of occupation that covered least two millennia. In our square Y, the sequence began in the fourth of our occupation phases, while in square X, only the Iron Age was encountered.

The size of the excavation, the main square covered 858 square metres, has brought with it a sample of unprecedented scale. We have 635 human burials and over 20,000 artefacts, including in the vicinity of 4,000 complete ceramic vessels and over 1,000 spindle whorls. Again, the large area has allowed us to identify margins and horizontal sequences, as in the edges of the late Bronze Age cemetery, and its transition as one proceeds eastwards into the early Iron Age. Some complete groups of Bronze Age graves have been identified, and these have brought new challenges in terms of their interpretation. Much research remains in progress, some has barely begun. We are for example, looking at the isotopes in the human teeth in order to identify individual life histories, while a pilot programme is planned to seek ancient DNA. However, we feel that Ban Non Wat is a site of such importance, that it is necessary to provide in this volume, a summary of the principal findings.

THE CULTURAL SEQUENCE

One of the critical lessons learned at Ban Non Wat, is not to assume that a sterile substrate is necessarily the end of the excavation. There has been much redeposition of the alluvial soils of the Khorat Plateau, it continues to this

day with every monsoon season. Therefore our resolve to continue into the alleged natural substrate has provided surprises. Among these was a deeply stratified deposit of fresh water bivalve shells at the edge of square E8 which yielded a radiocarbon determination of about 15,000 BC. Only the edge of this deposit was present, and no artefacts were found within it. However, it is possible that this represents the first evidence for late Pleistocene hunter gatherers on the Khorat Plateau. That such groups were present, and continued to live there, is supported by other finds in this part of the square. One was the complete skeleton of a deer, and another was the skeleton of an infant. Moreover, some of the early human burials were interred in a crouched position, with the legs flexed and with mortuary offerings not seen hitherto in Northeast Thailand. Burial 633, for example was found on its back with the knees flexed, holding in the left hand, the skull of a pig. One of the pig's teeth is currently being assessed for radiocarbon dating in the Oxford AMS laboratory (Fig. 11:1).



FIG. 11:1 Burial 633 a crouched burial with a pig's skull as a mortuary offering

The cultural affiliations of this group of individuals is obscure. Moreover, the lack of superpositions between them and any other burial prior to the Late Bronze Age makes it difficult to place them precisely within the cultural sequence. The radiocarbon determinations for the associated shell offerings indicates that while burial 454, with a determination of 1741-1537 cal. BC, is the earliest dated burial at the site, burial 438 dates to 1262-1055 cal. BC and thus overlaps with the Neolithic. Isotopic studies to evaluate the diet of these individuals, and their place of origin may throw some light on a group that on present grounds, may well evidence the use of this site as a cemetery used by hunter-gatherers, since it is recalled that a flexed or crouched position of the dead when buried is typical of hunter-gatherer groups in Southeast Asia.

There is less doubt over the ensuing occupation phases. In the 17th century BC, middens accumulated that contained ceramic sherds decorated with incised and painted designs. These belong to a widespread horizon in Southeast Asia that represents the first Neolithic settlement. There is such a sharp distinction between the material culture and the mortuary practices of this horizon and the inland Hoabinhian hunter-gatherers that the ultimate origin of the Neolithic people has been found by some in the early rice farming groups of the Yangtze Valley (Blust 1996, Higham 2002, Bellwood 2005, Rispoli 2007, Wiriayaromp 2007). There is, however, no doubt that the last word on this model of demic diffusion has not been written. There is a pressing need to enquire into the interactions between the putative immigrant farmers and the long-established local hunter-gatherers. Some hints have been forthcoming from the site of Khok Phanom Di, where some of the women in mortuary phase 3B appear to have been immigrants into a community of coastal hunter-gatherers (Bentley *et al.* 2007). Again, at Man Bac in Vietnam, one individual in the cemetery has been shown to have affinities, in terms of cranial morphology, with the Hoabinhian hunter-gatherers, while the rest of the group is similar to southern Chinese Neolithic people (Matsumura *et al.* 2008).

At Ban Non Wat, we find that the initial Neolithic 1 people grew rice, maintained domestic animals, but also fished, collected shellfish and hunted or trapped the local wild fauna. Their cemetery dates to the late 16th and 15th centuries BC. Two adults were buried in a seated, crouched position within large, lidded ceramic vessels. Identical decorated pots were used to inter infants, but most adults were buried in an extended, supine position, accompanied by very impressive ceramic vessels, bivalve shells, the remains of pigs and rarely, exotic cowrie shells. Some were covered in a layer of freshwater shells.

The second Neolithic period is also represented by a cemetery in which the ceramic vessels accompanying the dead differ markedly in form from Neolithic 1 pots. These however, are closely paralleled at the nearby site of Ban

Lum Khao, and in both sites the period is dated to the 12th to the 11th centuries BC. While the globular form of the associated pots have no matches with those of Neolithic 1, they do resemble those found with a very important group of six burials that represent the initial Bronze Age.

These graves, which are found in the eastern part of the main square, date to the early 10th century BC. The mortuary ritual indicates increased complexity. The corpse, laid out supine, was placed within a wooden coffin, one of which had a pointed prow in the form of a boat. Finely-made small ceramic vessels were placed inside the coffin and along its exterior, and the graves were cut deeply into the natural substrate. Each of these individuals was accompanied by a socketed bronze axe of a form not found in Bronze Age 2 or 3 contexts. There was a beginning interest in wearing shell beads and bangles. Pig bones were placed with the dead, and as with the Neolithic practice, a layer of gastropod shells was placed over at least two of the Bronze Age 1 individuals. It is hard not to see a transition from the late Neolithic into the earliest Bronze Age in these similarities. This could, of course, change were a single bronze artefact found in the presently described Neolithic groups. However, one of our stated objectives has been to open a large enough area to answer such issues, and to date, no such bronzes have been found. This situation has broader implications that will be progressively explored in this report series. It centres on chronology. White (2008) has presented a set of seven radiocarbon determinations that in her view, indicates a date of between 1500-2000 BC for the early Bronze Age at the site of Ban Chiang. Could a millennium intervene between the initial acquaintance of bronze casting at two sites only 280 km apart?

Bronze Age 2 saw a mighty proliferation in mortuary display. Men, women, infants and children were accompanied by intense ritual activity at death, and interred with a degree of wealth unparalleled for the period in Southeast Asia. Ceramic vessels came in a wide variety of new forms and some were painted with complex curvilinear patterns. Bronze axes in new forms were encountered. The wooden coffins contained individuals wearing multiple exotic shell and marble bangles, and shell beads measured in the thousands, worn as necklaces and belts or waist bands. Several men and women were partially disinterred after burial, and then the bones were replaced in a stack. Was this a ritual enacted on the remains of particularly renowned ancestors? In the case of burial 90, the cut marks that severed the femora prior to removal of the upper part of the body were clearly seen, while the shins and feet were left in place. The rows of Bronze Age 2 graves, according to a large set of radiocarbon determinations, were laid down over a period of about six generations in the 10th and early 9th centuries BC.

Bronze Age 3 comprises two phases. BA 3A was of very short duration, and followed immediately from its predecessor. The graves were placed on a new orientation with



FIG. 11:2 In developing the chronology of Ban Non Wat, the sequence of burials was a vital consideration. Here, Bronze Age 3A burials are seen overlying those of Bronze Age 2. A Bronze Age 3A burial also cuts through a Neolithic 2 grave, which overlies a Neolithic 1 jar burial

the head to the northeast. Similar bronze axes were found and the pots followed the same forms, although painted curvilinear patterns were no longer encountered. These individuals wore many exotic trochus shell bangles, that often covered the arms from the shoulders to the wrists. Marble and tridacna shell bangles were also worn, and burial 262 wore a rare marble earring. Bronze Age 3B graves follow the same northeast to southwest orientation and complement those of Bronze Age 3A save for one burial, which overlies two graves of Bronze Age 3A. These burials were markedly poorer. The number of marble and shell ornaments declined sharply. Bronzes were now almost absent as mortuary offerings. Graves were much smaller, with less space being needed beyond the coffin itself for the placement of ceramic vessels. The forms of ceramic vessels was now restricted while retaining strong continuity. It is likely that 3B burials were slightly later, as the cemetery extended to the south. However, it is also possible that at least some of the burials in each group were contemporary. This would suggest that there were two groups of markedly different degrees of wealth during this period of the early Bronze Age.

After a period of ostentatious display of personal wealth during BA 1-3A that lasted for rather less than two centuries, Bronze Age 4 people continued to be markedly poorer than their predecessors. The distribution of the burials provides a remarkable pattern. There are rows of the dead, but also series of graves aligned head to head as columns. A large pot was usually found beyond the head, with a cluster of smaller vessels beyond the head and feet. Their forms derive from Bronze Age 2 and 3 prototypes. Marble and shell jewellery was found in sharply reduced quantities but again, of similar forms to those worn during the preceding two phases. This fourth Bronze Age phase dates from the late 8th century BC and probably came to an end in the 6th century BC.

The 6th century saw the foundation of the Bronze Age 5 cemetery. All evidence suggests a direct continuation from Bronze Age 4, but the rituals of interment underwent some significant changes. In the first place, the pottery vessels again showed distinctive forms, and were placed as a rule round the head. We find that a particular set of offerings was commonplace: one or more spindle whorls, lumps of grey clay and pellets of red ochre. It seems that making yarn prior to weaving was now a significant activity. As one progresses to the east of these graves, one finds the first evidence for iron as an offering and hence, we enter the early Iron Age towards the end of the 5th century BC. Iron bangles were now forged, as were sets of knives and scrapers. Iron socketed spears were relatively common, three of which having a bronze socket but an iron blade. Bronze bangles and anklets were relatively common. Most unusually, one or two burials contained lead castings in the form of little axes or chisels. The first glass was encountered in the form of earrings, while agate

beads were a rarity as the Iron Age cemetery grew over a period of at least two centuries. The graves were densely packed and formed at least two rows. Once again, we find that the corpse had been interred in a hollowed tree coffin. Spindle whorls still accompanied the dead.

By the first centuries AD, the ceramic style developed into the Phimai Black repertoire, characterised by vessels decorated with pattern burnishing and fired to a dark colour in a reducing atmosphere. Bronze jewellery took on new forms, including belts and spirals, as well as bimetallic rings. Glass beads, carnelian and agate jewellery is found, along with one or two gold beads.

The cultural sequence incorporated an early and impressive Neolithic society with a sophisticated ceramic industry, that may well have been contemporaneous with indigenous hunter-gatherers. The former shared complex motifs incised on the pots with other groups in Thailand and Vietnam, and they engaged in long distance trade for sea shells.

The 2nd and 3rd stages of the Bronze Age involved a relatively brief but highly impressive burst of mortuary display that is seen as reflecting at least in part, access to a new range of precious valuables that clearly include bronze, but also marine shell and marble ornaments. This initial rise in wealth subsided with the 4th and 5th Bronze Age periods, and even during the early Iron Age, there is no clear evidence for distinctive status based on grave goods. The later Iron Age is not well represented yet at Ban Non Wat, whereas at nearby Noen U-Loke we encountered exceptionally rich later Iron Age individuals. It was probably during this later period, within the first five centuries AD, that social elites initiated the water control measures that are reflected in the extensive banks and moats that ring these settlements.

TRADE AND EXCHANGE

The list of exotic goods that found their way to Ban Non Wat is extensive, and developed markedly over time. Even the flexed burials of possible hunter-gatherer people had access to marine shell for their jewellery. The Neolithic 1 people were interested in cowrie shells, and their contemporaneity with the Shang state in the Yellow River valley, with its interest in southern cowries and turtle shells is noted. The stone for adzes had to be obtained from sources some distance from Ban Non Wat. With the Bronze Age, we can clearly add copper and tin to the list of imported valuables, and the abundance of moulds and crucibles indicates that the some at least of the metal arrived in the form of ingots to be locally mixed and cast. Now, marble and both trochus and tridacna shell came to the site in considerable quantities. Not all of the shell arrived in finished form, for we find some evidence for local manufacture from imported raw materials.

With the Iron Age, the range of exotic imports again in-



FIG. 11:3 Distinguishing between Bronze Age 4 and Bronze Age 3B burials is based on their orientation. Looking north, we see Bronze Age 3B graves with the head directed to the east. These were at a lower level, and partially overlain by Bronze Age 4 graves on a north to south axis



FIG. 11:4 During the Early Iron Age burials were crowded next to and over each other. The disposition of potsherds revealed the former shape of each wooden coffin

creased, for we can add glass, gold, carnelian and agate to the list of materials converted into ornaments. The source of the iron is not known. As Pryce (2008) has shown, the local laterite cannot be seen as a reliable source of ore for smelting although it is noted that there are many prehistoric sites in the upper Mun Valley covered in iron slag. There is little doubt that smithing was carried out at the site. Lead was also obtained through exchange.

No exchange system is durable without reciprocity, and it must be asked what might the occupants have provided from their own resources. Ban Non Wat was site where manufacturing of many products was variously undertaken over time. We know that bronze casting took place, and even have found the grave of one bronze founder interred with his moulds. Iron forging and lead casting were also to be found at the site. It is possible that some of the bronze bangles, bells, arrowheads, anklets and spears entered exchange networks. Early historic records from the Chenla period in Cambodia indicate the important role of cloth in wealth creation. The quantity of spindle whorls uncovered suggests that weaving was undertaken over many centuries at Ban Non Wat. There are also the burnishing stones and anvils used in the forming and decorating of ceramic vessels, some of these might well have been exchanged with other communities. The moated sites of the Mun Valley are often associated with small satellite mounds the formed through salt production. Ban Non Wat is no exception. Excavations in such mounds disclose that salt was being processed at least from the

Iron Age (Nitta 1991). Salt is a vital commodity particularly in a monsoonal environment in which the surplus of fish during the wet season can be preserved for dry season consumption.

FURTHER RESEARCH

The results of the past seven seasons of excavations have added considerably to our understanding of the development of a prehistoric community over a period of at least two millennia. There is a strong thread of evidence that there was marked continuity with no sharp breaks. The foremost break in this chain came with the transition from the Neolithic 1 to 2, when the ceramic tradition and methods of burial underwent considerable change. Thenceforth, there is more evidence for continuity than otherwise. In testing this, the results of isotope analyses of human teeth, together with the analysis of human skeletal material, will be significant. Were DNA to survive, as was the case at Noen U-Loke, then it may be possible to explore in depth the issue of continuity in the basic population of the site.

The presence of outstandingly rich early Bronze Age individuals adds a new dimension to the nature of social organisation as it adapted to the advent of metallurgy. Hitherto there has been little evidence for a marked differentiation in wealth and display that might suggest the elevation of one group to a position of social pre-eminence. This has fostered the notion of a flexible ranking

within and between sites (Higham 1989), formalised in the term heterarchy (White 1995, O'Reilly 2003). A hierarchy cannot be said to exist without a counterbalancing less wealthy group when compared with the putative elite. At Ban Non Wat during Bronze Ages 2 and 3, there is now some evidence for enclaves of very wealthy men, women, infants and children set apart from less wealthy individuals. This is also the case when comparing the elite graves at Ban Non Wat with their markedly poorer contemporaries at nearby Ban Lum Khao.

Nor can the sequence be complete without tracking down the later Iron Age cemetery that equates with the

elite seen in phase 4 in the Noen U-Loke sequence. There, the dead were interred in graves filled with silicified rice, with outstanding quantities of bronze jewellery, agates, gold and silver. It was in the context of such elites that we identify the rise of water engineering and the conflict so well reflected in the rise of iron weaponry. Indeed, warfare, a rapidly rising population and competitive emulation in the ownership of exotic ornaments, linked with the production of salt on an industrial scale are all ingredients of the local transition to early states, which is the theme of the research programme of which this volume represents part.

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