The Late Iron Age of Northeast Thailand and Central-Northwest Cambodia: a tale of two regions

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All content in this thesis is the original work of the author unless specifically stated otherwise.

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Abstract

Grave goods provide an important source of insight into the material and social cultures of past societies. The presented research examines variability in social complexity across Inland Southeast Asia through the analysis of selected mortuary assemblages at late Iron Age (c. 200 – 600 CE) sites in Central-Northwest Cambodia and Northeast Thailand. Phum Sophy, Phum Lovea, and Prei Khmeng form the Cambodian collection while Non Ban Jak (supplemented with published data from Noen U-Loke and Ban Non Wat) provide the data for Northeast Thailand. Analysis of assemblage sizes, the presence or absence of semi-precious material, and the appearance and abundance of ornamental circlets (bangles, rings, earrings, etc.) are used to generate relative wealth values for each burial assemblage. It is argued that, by the late Iron Age, two distinctly different systems of social complexity separated the regions, with a three-tiered, stratified economy in Cambodia compared to a ranked, unstratified economy in Northeast Thailand.

A morphological typology is developed to classify banded circular ornaments, termed circlets, on three levels in order to assess variability in expressions of dress in mortuary populations. The first classification level examines the cross-sectional shape of circlets while the second and third reference the type of band opening and overhead shape respectively. The typology serves as a reference system for recording and analysing the shape and form of circlets and can be applied across Iron Age sites in Cambodia and Thailand. The additional insight gained from examining circlet morphology is used in the assessment of burial wealth, with assemblages featuring a range of designs registering higher than those with few forms.

A conclusion is tendered that, while complexity increased during the course of the Iron Age in both regions, the communities in the Northeast Thailand retained the characteristics of a chiefdom in the late prehistory while Central-Northwest Cambodia appears to have developed to the point of a complex polity.

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Chapter 1 Introduction

The regions of Northeast Thailand and Central-Northwest Cambodia in mainland Southeast Asia are reviewed in this thesis to examine the level of variability in socio-economic complexity between the two regions during late prehistory. This thesis seeks to understand the social systems in place between c. 200 and 600 CE and to examine previous suggestions, largely based on similarities in material assemblages, that the two regions (Figure 1.1) followed parallel courses in the growth of socio-economic complexity in the early to middle first millennium CE through to the appearance of states (Higham 2016). Mortuary assemblages from Phum Sophy, Phum Lovea, and Prei Khmeng in Cambodia and Non Ban Jak in Thailand, as well as supplementary data from previously published excavation reports from Noen U-Loke and Ban Non Wat in Thailand, will be used to determine the distribution of individual wealth at each site, and on a regional scale. Additionally, metallic bangles, rings, anklets, and earrings (collectively termed circlets) will be analysed with the dual aim of providing further insight into wealth and status as expressed through the artefacts placed with burials, and also of developing a standardised morphological typology for the recording and analysing of these important elements of dress during the Iron Age (c. 500 BCE – 500 CE). The results of this thesis will illuminate social organisation in each region and provide a comparative dataset from an important period in Southeast Asian history, prior to the emergence of complex state-level polities.

The late prehistory of Southeast Asia is widely characterised as a time of socio-economic upheaval and population growth in many diverse regions (Higham 2002). This is particularly true for areas with direct access to international coastal trade networks bringing contact with China, India and even, indirectly, with the Mediterranean world as evidenced by a pair of Roman medallions minted under Antoninus Pius (138 – 161 CE) and Marcus Aurelius (161 – 180 CE) recovered at the hypothesised Funan trading entrepot Óc Eo in the Mekong Delta (Malleret 1959; 1960; 1962; Stark & Sovath 2001). It is therefore of interest to examine the development of social systems in inland regions which did not have the benefit of such direct economic stimulus as their coastal counterparts.

Unfortunately, widespread looting and unstable political climates in the past 50 years have meant that archaeological study in many areas of Southeast Asia is still in relatively early stages. Indeed, as recently as 2002, Higham provided the following assessment of the state of archaeological knowledge in the region.

> *There is then, no generally-accepted model which can be employed to explain the origins of the state… Even if there were, it is doubtful if there are sufficient data for a conclusive review of the origins of the state in the lowlands of Southeast Asia*. (Higham 2002:231)

Perspectives on the emergence of state-level polities have shifted during the course of the last half century from a largely external introduction to more reliance on internal structures during late prehistory. Historians, relying on largely outside documents from Chinese delegations, traditionally argued for an 'Indianization' influence leading to the rise of ruling elites (Berg 1929; Moens 1937; Cœdès 1968; Mabbett 1977). However, as more archaeological research has been conducted in the region, these theories have been largely subsumed in favour of internal stimulus during the Iron Age leading to the emergence of states or proto-states such as Funan, Chenla, and eventually Angkor (Stark & Sovath 2001; Stark 2007; Higham & Higham 2009; Higham 2014).

The discussion of potential emergent complex polities in Central-Northwest Cambodia and Northeast Thailand during the late Iron Age utilises existing models of social systems to examine the evidence for the theoretical distinguishing factors of chiefdom and state hierarchies in each region (Service 1962). These two hierarchical systems differ in their mode of governing from a highly personalised, relational flow of power in a chiefdom (Earle 1991) through to a bureaucratic landscape in a state (Flannery 1972; Claessen 1978). In a chiefdom this manifests as a ranked social order in which the population is arranged in minor steps away from the chief gradually incorporating more people until eventually every member of the society is represented (Flannery 1972). States, meanwhile, are arranged in stratified classes or tiers which are each typically distinct from the others with sharp separation between tiers (Kristiansen 1991; Carmichael 1995). These differences should be apparent in mortuary contexts, while other indicators such as urban centres, markets, and warfare can also be examined in the wider archaeological record. This approach to examining systems of social organisation in prehistory is more fully explored in chapter three.

Unfortunately, most of the archaeological projects examining the prehistory of Southeast Asia have largely been restricted to either the Mekong Delta, or the Mun Valley in Northeast Thailand (White 1995; Welch 1998; Stark 1998; Mudar 1999; Stark 2007; Higham 2011; Cox et al. 2011). While this is slowly changing, this sampling bias has led perhaps to great emphasis placed on the chronological sequence in, particularly, Northeast Thailand with an assumption of its applicability to neighbouring regions (White 1995; Higham 2016). This project seeks to allay some of this bias by providing a comparative analysis of the progress of increasing social complexity in the final stages of the prehistory of Northeast Thailand and Central-Northwest Cambodia. The information produced will provide insight into the pathways towards complex polities in these regions, and whether these proceeded in a parallel fashion or developed at differing rates each in its own time.

Research Question and Aims

This thesis seeks to assess increasing socio-economic complexity across inland regions of Southeast Asia in the early-mid first millennium CE. There is one research question with two parts, the first being to evaluate whether there is evidence for differential mortuary ritual between late Iron Age mortuary populations in Northeast Thailand and Central-Northwest Cambodia sufficient to indicate the existence of differences in the social organisation of these regions. The second part of the research question is then to use the evidence to suggest the most likely model of social organisation in each region.

These questions will be answered through a research program with four aims. The first aim is to create a morphological typology for circlets used as grave goods in Iron Age sites and implement this to analyse variability in funerary dress within the sample populations. The abundance of these ornaments in the late prehistory ensures that this typology has research applications beyond its immediate implementation as a tool for analysing mortuary assemblages in this thesis. The latter three aims deal directly with interpreting social complexity in Northeast Thailand and Central-Northwest Cambodia. Each of these three aims is accompanied by a hypothesis about the theorised outcome. The aims and the conditions required to meet the hypotheses are outlined below.

Aim 1: To create a morphological typology of circlets in the late prehistory of Southeast Asia to facilitate the assessment of variances in the social dress across wealth and geographical divides.

Aim 2: To create a regional dataset for late Iron Age Central-Northwest Cambodia which allows for examination of markers of social complexity in the mortuary record.

Hypothesis: The mortuary record from late Iron cemeteries across Central-Northwest Cambodia will provide greater insight into the level of social complexity through the distribution of artefacts and burial wealth.

Aim 3: To create a regional dataset for late Iron Age Northeast Thailand which allows for examination of markers of social complexity in the mortuary record.

Hypothesis: The mortuary record from late Iron cemeteries across Northeast Thailand will provide greater insight into the level of social complexity through the distribution of artefacts and burial wealth.

Aim 4: To determine if variances in the mortuary display between contemporary late Iron Age sites in Central-Northwest Cambodia and Northeast Thailand suggest different socio-economic structures between the two regions.

Hypothesis: The distribution patterns of wealth and mortuary artefacts (particularly circlets) in the two regions, as established in aims two and three, will corelate to different socio-economic systems.

Sites

For the purposes of this study a collection of previously excavated settlement sites has been selected from across Northeast Thailand and Central-Northwest Cambodia (Figure 1.1). Prei Khmeng, Phum Sophy, and Phum Lovea in Cambodia and Non Ban Jak in Northeast Thailand contain mortuary populations which have been dated to reflect occupation during the late Iron

Age (Table 1.1). In addition, the extensively published excavations at Noen U-Loke and Ban Non Wat are utilised to provide further supplementary data to achieve greater context for Northeast Thailand. The material context recovered from sites on either side of the Dângrêk mountains is widely noted to contain many similarities (Higham 2014; Carter 2015; Evans et al. 2016). Late Iron Age assemblages in Central-Northwest Cambodia and Northeast Thailand typically contain a selection from coloured glass beads, semi-precious agate and carnelian beads, bronze (or copper-based) ornaments such as bangles, rings and earrings, Iron tools such as sickles and digging implements, and a range of mostly earthenware ceramics (O'Reilly et al. 2006; Higham 2011b; Carter 2015; Carter & Dussubieux 2016). However, little consideration has yet been given to the examination of minor differences in mortuary assemblages between these two regions. The wide spatial distribution of the dataset is vital to understanding the degree to which populations were linked over distances, and how socio-political development may have varied between regions during this period.

Table 1.1 Chronological chart of the settlement period of the sites examined in this project.

Date	**Period**	**Phum Sophy**	**Phum Lovea**	**Prei Khmeng**	**Non Ban Jak**	**Ban Non Wat**	**Noen U-Loke**
802	Angkorian						
700	Proto-Historic						
600							
500							
400							
300							
200							
100							
1 CE	Iron Age						
100 BCE							
200							
300							
400							
500							
600	Bronze Age						
1200							
1300							
1650	Neolithic						
2000							

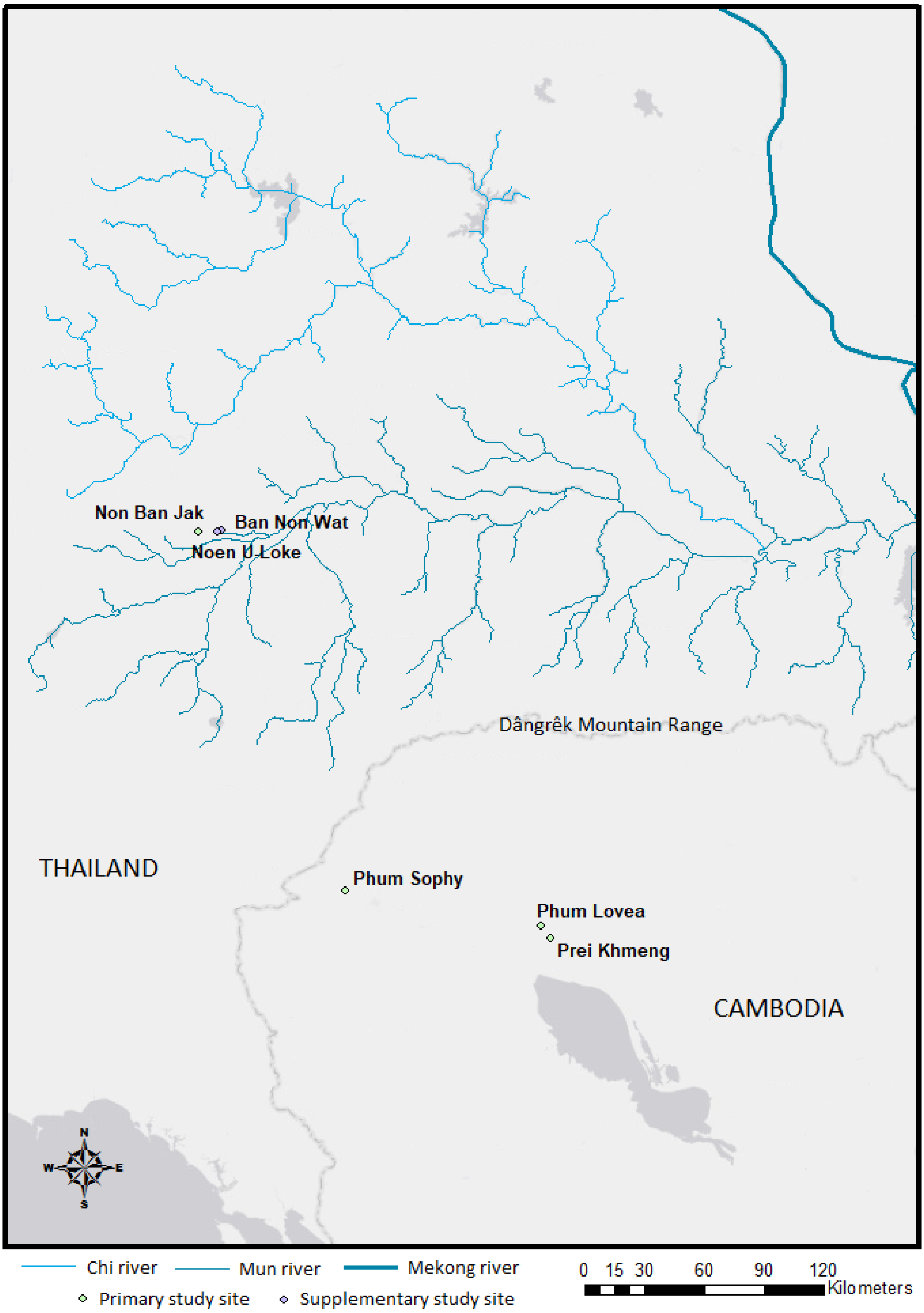

Figure 1.1 Map of the study region in Central-Northwest Cambodia and Northeast Thailand marking the location of the sites used in this study. The mortuary assemblages of primary sites were personally examined while published data were utilised from supplementary sites.

Geography of Northeast Thailand and Cambodia

Northeast Thailand is dominated by the Khorat Plateau, a largely flat landscape spanning 170,226 km^2. The plateau is divided into two major drainage basins, the Sakon Nakhon Basin covering the northern reaches and the Khorat Basin in the south. Elevation in these broad, sloping basins ranges between c. 130 – 250m above sea level (asl) (Meesook 2011: 169). Extensive aerial survey programs have shown that the majority of some 297 recorded Iron Age circular moated sites are located along the two main river valley plains, the Mun and Chi rivers, both of which are located in the Khorat Basin (O'Reilly & Scott 2015). These river plains are subjected to annual flooding following the monsoon season (from May-September) (Supapoj et al. 1998). The receding flood waters deposit fresh silt over the base clay layer prominent on the plateau, making the valleys more fertile and suitable to wet rice agriculture than elsewhere in Northeast Thailand (Scott 2013). On the east, the plateau is bordered by the Mekong River, into which the Mun river flows, while the Phetchabun Mountain Range separates the region from central Thailand on the west. With a maximum elevation of 1780m asl, the mountains create a rain shadow effect on the western regions of the Khorat Plateau (Riethmuller 1988; Scott & O'Reilly 2015).

Evidence retrieved from sedimentary cores from lakes in the Sakon Nakhon Basin have revealed a climatic shift occurred in c. 200-400 CE in the mid-late Iron Age (Wohlfarth et al. 2016). The shift involved increasing aridity with a weakening of the monsoon, which altered the hydrology in Northeast Thailand away from a system dominated by deep perennial rivers into one with many shallow, short-lived streams (Boyd & McGrath 2001). Seasonal variability of rainfall and changes in the hydrological regime in Northeast Thailand during the Iron Age could have had a significant impact of rice agriculture which depends heavily on predictable water availability (Paul 1984; Bruins et al. 1986; Parnwell 1988; Fox & Ledgerwood 1999).

Both rain fed and run-off fed wet rice agriculture require a reliable water source to sustain the crops through to maturity. As Fox and Ledgerwood (1999) have noted in a study of modern day floodwater farming throughout the Mekong Delta, if the annual wet season is not as forthcoming as anticipated, the crops will not receive enough water, however an oversupply of floodwater can be just as devastating as it will wash away and drown crops (Paul 1984). It is interesting then that the construction of the circular moats in Northeast Thailand appears to have occurred around the same time as the climatic shift (McGrath & Boyd 2001) and that, on average, more moats potentially acting as reservoirs were constructed around sites located in regions with lower annual rainfall (Scott & O'Reilly 2015).

Central-Northwest Cambodia is dominated by the Tonlé Sap Lake. Similar to Northeast Thailand, Cambodia is also affected by the summer monsoon (from May to October) which creates its wet and dry seasons (Day et al. 2010). The Tonlé Sap is the largest freshwater body in Southeast Asia and is fed by the increased volume in the Mekong River caused by flooding during the monsoon. As water volumes dip during the dry season the flow reverses, resulting in water leaving the Tonlé Sap and returning to the Mekong and continuing downstream eventually to the South China Sea (Day et al. 2010). This change in the flow direction sees the area of the Tonlé Sap vary greatly from as little as 2,500 km^2 in the dry season up to more than 15,000 km^2 at the height of the monsoon (Day et al. 2010). This therefore creates a very similar situation to the Mun and Chi floodplains where conditions are favourable for wet-rice agriculture.

The southern parts of Cambodia fall within the Mekong Delta, a marshy region heavily effected by annual flooding. Significant survey works conducted by Stark (1998; 2007; Stark et al. 1999) have revealed a large network of canals likely constructed in the Iron Age linking several sites. These canals would have aided in draining the area to allow agriculture as well as allowing passageways for trade routes between major settlements (Stark 2006b; Stark et al. 1999).

Separating Northeast Thailand and Cambodia is the Dângrêk mountain range. The mountain range forms a natural barrier between these two regions which poses a considerable obstacle in certain places, such as the steep escarpment commanded by the c. twelfth century CE Angkorian temple Preah Vihear. However, with a peak altitude of 761m asl and punctuated by multiple passes, the border formed by the mountains is more symbolic than practical for much of the modern frontier between Thailand and Cambodia (Higham 2016)

Conclusion

The degree of differentiation in levels of social complexity during the late prehistory of two neighbouring inland regions in Southeast Asia will be examined through this thesis. Mortuary assemblages dating to c. 200 – 600 CE from sites in Northeast Thailand and Central-Northwest Cambodia will be analysed to generate relative wealth ratings for each burial to allow for an investigation of the distribution of wealth and status among these mortuary populations. Chapter two outlines the background history of the study area in the lead up to the transition to the Historic period. Chapter three then provides a review of the relevant literature which form the theoretical frameworks in this thesis regarding analysis of wealth in mortuary contexts as well as models to assess the level of complexity in prehistoric communities. The methodology of the fieldwork and data processing is then presented in chapter four, before chapter five containing the morphological typology for Iron Age circlets to aid in assessing variability in social dress. The mortuary data from each site are presented and analysed separately in chapters six through ten before all the data are combined and reviewed to determine if the evidence supports a model for divergent levels of social complexity in the study regions in chapter eleven. Finally, chapter twelve provides a summary of the findings regarding the state of social complexity in Cambodia and Northeast Thailand in the late Iron Age. The results of this thesis will provide some clarity into the vital, and still poorly understood, centuries prior to the transition to the Historic Period in Southeast Asia.

Chapter 2 The Prehistory of Cambodia and Northeast Thailand

Despite many advances in our understanding over the past half century, the prehistory of Southeast Asia retains numerous unknowns and points of conjecture. Issues such as the timing of the introduction of bronze technology or the function of circular moats in Northeast Thailand are not idle curiosities but inform us about the human landscape of the past, presenting different pictures depending on the particular model or theory selected. For the purposes of this thesis it is necessary to adopt a historical sequence in which to place the late Iron Age burial assemblages under study. Where the timeline remains debated, evidence is presented to illustrate why one version has been preferred over the other. A firmer grasp of the transient social and economic systems in place across the Central-Northwest Cambodia and Northeast Thailand will be achieved by understanding the prehistoric sequence leading up to the Iron Age. Unfortunately, a paucity of archaeological work conducted on Cambodian prehistory due to the political environment over the last half century (now opening up again in the last two decades), requires that this review of the prehistory be based mainly on evidence uncovered in Northeast Thailand.

The following chapter will outline the history of anatomically modern humans in mainland Southeast Asia in the lead up to the late prehistory. Dating the initial settlement of Southeast Asia by modern humans remains somewhat contentious (Petraglia et al. 2007; Petraglia et al. 2010; Mellars et al. 2013), however, a growing body of evidence suggests earliest occupation between 50K – 60K years ago (Mellars et al. 2013; Higham 2013). Much of the evidence available for these early phases is in the form of cave deposits near modern day coastlines (Harrisson 1958; Anderson 1990; Quang Van Cay 1995; Mijares et al. 2010;). Later hunter-gatherer study is dominated by a people identified by similarities in stone tool assemblages and collectively termed Hoabinhian. The Neolithic in Southeast Asia (c. 2000 – 1200 BCE) is characterised with increasing sedentism and uptake of agriculture as rice and millet pastoralists migrated from southern China (Bellwood et al. 2011; Oxenham et al. 2015).

The Bronze Age in Southeast Asia, especially in Northeast Thailand, continues to generate debate around when the transition from Neolithic took place. As this issue of chronology has wide ranging implications for the cultural and social dynamics in place during the Bronze Age it is important to fully consider the evidence for the short (c.1200-500 BCE), and long (c.2000-500 BCE) chronological models proposed by Higham (2015) and White & Hamilton (2009) respectively. The introduction of Iron technology c. 500 BCE had a profound effect across Southeast Asia. A widespread florescence during the Iron Age is visible from increased differentiation in burial wealth (including a marked increase in rice remains in graves and numerous exotic goods), large scale expansion across the Khorat Plateau, and the construction of circular moat and embankment earthworks at hundreds of sites (Higham 2011c; O'Reilly & Scott 2015). The early first millennium CE also marks the appearance of complex polities such as Funan and Chenla in areas with access to coastal trade networks (Malleret 1959b; Stark 2003; Stark 2006b; O'Reilly 2007). The review of the prehistoric sequence in this chapter will establish the necessary context for analysis of the socio-economic complexity in Central-Northwest Cambodia and Northeast Thailand during the mid-late Iron Age.

Hunter-Gatherers in Southeast Asia

The initial appearance of anatomically modern humans in Southeast Asia is a question still under consideration by archaeologists. Most early dates indicate settlement sometime around 50-60,000 years ago (Higham 2013:22). However new evidence for occupation of Northern Australia c. 65,000 BP (Clarkson et al. 2017) would suggest an earlier settlement of Southeast Asia given that the passage to Australia required transiting through mainland and peninsular Southeast Asia (O'Connell & Allen 2012; Mellars et al. 2013). Elsewhere in Island Southeast Asia, Callao Cave in the Philippines has revealed evidence in the form of a human metatarsal dating to 60,000 years ago (Mijares et al. 2010; Higham 2013).

From initial settlement of the mainland during the Pleistocene, hunter-gatherer populations continued to widely exploit naturally occurring resources on a seasonal basis (Higham 2013). Unfortunately, rising sea levels since the Last Glacial Maximum (LGM) have likely inundated many coastal dwelling sites and the evidence therein. Much of the hunter-gatherer research in mainland Southeast Asia is focussed on the Hoabinhian 'culture'.

Appearing towards the end of the LGM and continuing until the Neolithic, Hoabinhian collections have been identified in Vietnam, Thailand, Cambodia, Laos, Malaysia and Sumatra (Miksic 1980; Cuong 1986; Bellwood 1993; Forestier et al. 2013; Forestier et al. 2015; Patole-Edoumba et al. 2015). These sites are classified as Hoabinhian based mainly on a shared technological suite rather than evidence for a widespread cohesive culture. Hoabinhian sites are identified through a flaked pebble tool assemblage, however the Sumatralith, a unifacially flaked river cobble, is the main tool immediately identified with the Hoabinhian (Reynolds 1993; Marwick 2008). The continued widespread use of this toolset for several millennia eventually ended as contact with migrants from modern-day Southern China introduced agriculture to mainland Southeast Asia (Bellwood 2005; Higham 2013; Lipson et al. 2018). DNA and linguistic evidence suggests that this was a largely peaceful process rather than a domination or invasion from the north (Fuller et al. 2009; 2010; Mormina & Higham 2010). The appearance of domesticated crops and animals, especially rice, in the archaeological record shows that this migration ushered in the start of agriculture in Southeast Asia, marking the onset of the Neolithic.

The Neolithic Period

The origins of agriculture and the Neolithic in Southeast Asia have been extensively traced with a multi-disciplinary approach. Archaeobotanical investigation of prehistoric rice remains has revealed that the prehistoric rice in Southeast Asia is *Oryza sativa* spp. *japonica*, which can be traced to domestication ultimately in the Yangtze valley in China (Fuller et al. 2010; Castillo 2011). Linguistic evidence also firmly places the domestication of rice in China, though while the exact source is still uncertain possibilities include Miao-Yao speakers in Southern-Central China (Blench 2005), Austroasiatic speakers (Sagart 2005) or Austronesian speakers (Higham 1996; Higham, Guangmao & Qiang 2011), the latter two both from the Yangtze valley. Finally, genetic and skeletal morphological evidence from Southeast Asian Neolithic sites indicates a combination of genes from native hunter-gatherer populations with incoming southern Chinese agriculturalists (Shinodo 2010; Dodo 2010; Lipson et al. 2018). On the back of such robust evidence there can be no doubt that agriculture and the Neolithic package did not appear indigenously in Southeast Asia.

Dating of the onset of the Neolithic in mainland Southeast Asia is therefore unsurprisingly linked with a particular region's proximity to China. Settlements of the Phung Nguyen culture in Northern Vietnam such as Man Bac and Xom Ren display evidence for the transition to agricultural practices by at least 2,000 BCE (Higham 2015b; Piper 2017). Agricultural populations appear to have subsequently continued moving south along the coast and also breaking inland via the Mekong drainage basin (Bellwood et al. 2011; Oxenham et al. 2015). Sites such as Ban Non Wat and Non Nok Tha have dated the arrival of the Neolithic in Northeast Thailand and Cambodia at circa 1700 BCE (Higham & Higham 2009; Piper 2017).

Higham et al. (2011a) have suggested a two-layer cultural model for interaction between these two very different communities of native hunter-gatherers and incoming migrants from modern-day China. Peaceful integration of migrants into the established communities appears to have been the most common method of interaction (Bellwood 2001; Higham 2013). Skeletal evidence from Man Bac has revealed Neolithic cemeteries in which some members of the population matched closely with other Southeast Asian groups, while the morphology of others was more consistent with Neolithic populations in the Yangtze Valley. Cranial measurements (Dodo 2010) and haplotype DNA analysis of the Neolithic Man Bac remains (Shinodo 2010) have shown that there was an influx of people from Southern China who appear to have married along matrilineal lines with the indigenous population. A small segment of the hunter-gatherer populations across Island Southeast Asia, such as the Semang people of the Philippines, do not appear to have followed this model, but rather retreated into refuges where they maintained a hunter-gatherer lifestyle (Higham 2013). However, by and large, by the end of the Neolithic the two populations had successfully integrated into a single culture of sedentary farmers.

The Bronze Age

Providing an overview of the Bronze Age in Thailand and Cambodia is not a straightforward task. For the majority of the last half century debate on the timing of the introduction and uptake of bronze technology has been fiercely debated. Proponents of the Long Chronology Model (LCM) argue for a long, gradual uptake of bronze working, first appearing in Thailand c. 2000 BCE (White & Hamilton 2009). Meanwhile those supporting the Short Chronology Model (SCM) claim bronze technology did not appear until some 800 years later c. 1200 BCE, as part of a rapid uptake across Southeast Asia (Higham 2015b). The issue is one of great importance, as the LCM and SCM carry very different implications for societies during this period of prehistory. While the Bronze Age is not the focus of this project, it is of vital importance to understand these issues as they carry repercussions through to the Iron Age and the driving factors for the florescence we see from c. 500 BCE. A review of the cultural packages proposed by the two models will be presented, followed by the evidence. This will illustrate the reasons the author has for favouring the SCM.

The LCM was first proposed in the 1960's (in form if not name) following the excavation of Non Nok Tha in Thailand (Solheim 1968). The excavation of the site spanned from 1965-68 and produced two radiocarbon dates for Bronze Age contexts in the 3rd millennium BCE (Solheim 1968; Higham et al. 2011b). This provided the first evidence of an early Bronze Age in Southeast Asia and sparked a division among archaeologists between those who accepted the dates and those who did not (Higham et al. 2011b). Further evidence was produced the following decade from Chet Gorman's excavation of Ban Chiang (1974-75), the site which has become the central focus for the LCM. The excavation at Ban Chiang encountered several bronze fragments dated to 2100-1700 BCE (White 1997; 2008). White, who took over administration of the Ban Chiang material following Gorman's death, has divided the site into ten phases spanning the Neolithic to Iron Age (Pietrusewksy & Douglas 2002; Higham et al. 2011b). The early bronze fragments occurred several periods prior to bronze becoming common in the burials, a depth of time spanning several centuries according to the LCM (White 2008; White & Hamilton 2009). White and Hamilton (2009) also note that early phase bronze is not only rare, but also appears predominantly in the form of non-utilitarian objects such as jewellery. This is somewhat at odds with perhaps the first concrete evidence for bronze technology at Ban Chiang which is in the form of a bronze spear clearly associated with a burial (several phases after the fragments) (Higham et al. 2011b).

The LCM model paints an interesting picture of a Bronze Age in Northeast Thailand and, by proximity, the rest of mainland Southeast Asia which spans c. 1,500 years. This provides a considerable amount of time for a slow, gradual uptake in bronze technology over several centuries. This is reinforced by White's (1997) dating of the burial phases at Ban Chiang. If it is accepted that the bronze fragments represent *in-situ* evidence for bronze technology then there is a gap of several centuries before bronze becomes a common grave good. Even once this occurs the use of bronze is mainly restricted to ornaments, suggestive of a minimal utilitarian uptake in the metal until late in the Bronze Age (White & Hamilton 2009). This model for uptake of bronze suggests that the introduction of metal working had very little impact, especially economically, on general life during this period. Such a model would make Southeast Asia rather anomalous in global terms, where the appearance of technology for bronze alloying is typically part of a larger suite of innovation (e.g. Renfrew 1967; Gilman 1981; Knapp 1990).

It is important to note this apparent slow uptake and transition to bronze stands in stark contrast to what occurs with the introduction iron from c. 500 BCE, causing widespread transformation and expansion. Should the LCM be accepted then an explanation must be sought for this discontinuity, perhaps in the form of so called *Indianisation* or external contact fuelling Iron Age innovation as opposed to internal structures.

Another important aspect of the LCM is the timing of bronze metallurgy across the wider continent. Traditional views have attributed bronze technology as having reached Southeast Asia through known contact and exchange networks with the Southern Chinese states in the Huanghe and Yangtze Central Plain (Higham et al. 2011b). However, these states only developed bronze technology themselves in the early-mid 2nd millennium BCE. With an initial date of c. 2000 BCE the LCM predates these and must therefore find a different source for bronze metallurgical knowledge to have arrived in Southeast Asia (White & Hamilton 2009). Given that, to date, no evidence has been uncovered for an early experimental metalworking phase which may indicate independent invention on bronze working, the proponents of both the SCM and LCM concur that the technology must have been externally derived (White & Hamilton 2009; Higham et al. 2011b). This leaves the LCM with one option, to find another, earlier source of bronze technology which could have been transmitted into Southeast Asia while bypassing Southern China.

White and Hamilton (2009) have suggested that the answer lies in the Eurasian Steppe. They attribute bronze technology on the basis of apparent similarities in technique, as having been passed by the Seima-Turbino culture, a mobile group of horsemen (White & Hamilton 2009). While there certainly are similarities in the techniques used by this people to those present in the Southeast Asian Bronze Age, notably the use of moulds, the route of exchange between the two vastly separated areas, while bypassing China, is somewhat extreme. First and foremost, the Himalayas lay as a great natural barrier separating the regions, and even if the Seima-Turbino culture did manage to traverse the difficult and dangerous journey around the eastern foothills, there is no evidence of the horse ever making it to Southeast Asia in the Bronze Age. It seems rather unlikely that a people so reliant on horses would abandon their animals for such an arduous journey.

Given the apparent flaws in the LCM it is necessary to consider alternative models for the Bronze Age in Southeast Asia. The SCM provides a contrasting view regarding the timing for the introduction of bronze technology, along with the immediacy and depth of impact it had. Beginning c. 1200 BCE, the SCM spans roughly half the time of the LCM (Higham et al. 2011b). This provides far less time for the complete uptake of bronze both within settlements and the entire Southeast Asian mainland. Where the LCM sees each Bronze Age phase identified at Ban Chiang span several centuries, the shortened timespans of the SCM means that these phases could merely represent decades, or perhaps a single generation. Higham et al. (2011: 236) point to the tightly packed burials rows with interments positioned head-to-feet at the Ban Chiang cemetery as indicative of rapid interment as each new grave is cut with living memory of the previous. They suggest that cemeteries at Ban Non Wat, Nong Nor, Ban Na Di, and Ban Lum Khao in Thailand follow similar patterns (Higham & Kijngam 1984; 2009; Higham & Thosarat 1998; 2005; Higham et al. 2011b).

Accepting the SCM explanation for Bronze Age phases and timing, then bronze not only rapidly becomes common in burials, but also the uptake in its use for tools and non-ornamental objects is greatly hastened. This paints a rather different picture of the period leading up to the Iron Age. Instead of a stagnant culture of minimal willingness or ability to transition and adopt new technology that is presented in the LCM, the shortened model suggests a much more dynamic time of innovation and economic growth (Higham et al. 2011b). This is showcased once again at the extensive Ban Non Wat cemetery where a class of social aggrandizers appears coinciding with metallurgy (Higham & Kijngam 2009; Higham et al. 2011b). This social and economic environment mirrors much more closely the developments seen elsewhere around the world during respective Bronze Ages (Renfrew 1967; Gilman 1981; Knapp 1990).

It must be noted that Ban Non Wat is largely anomalous in regard to differential burial wealth in the Bronze Age in Northeast Thailand. With the exception of Ban Prasat (Monkhonkamnuanket 1992) little vertical differentiation has been identified in contemporary cemeteries excavated in the Khorat Plateau, which has led to suggestions of a heterarchical social system in place during the Bronze Age (White 1995; Wheatley 1995; O'Reilly 2000). The higher degree of socio-economic variation at Ban Non Wat may be due to several factors, not the least of which is that the village is by far the most complete excavation of a site on the Khorat Plateau. However, assuming that this anomaly is not due to the vagaries of sample size, the location of Ban Non Wat controlling a pass in the Petchabun Mountain Range potentially allowed the inhabitants of the site to take full advantage of exotic items arriving from Central Thailand into the Mun Valley.

Another important aspect of the SCM worth considering is the impact of an 800-year delay in the introduction of bronze technology on a wider intra-regional scale. While the LCM predates the bronze working states of Southern China, at c. 1200 BCE the SCM is late enough to be able to attribute the technology to the Huanghe and Yangtze valleys (Higham et al. 2011b). This source is not only significantly closer and devoid of the natural barrier posed by the Himalayas, but also follows a known tradition of contact between Southern China and mainland Southeast Asia (Higham et al. 2011b). Before considering the robustness of the scientific dating methodologies backing the two chronological models, a case for the simplest explanation often being the correct one can be argued.

In examining the dating evidence for the LCM it is necessary to focus on Ban Chiang and issues not just with the dating methodology, but also those encountered by the original excavation team. Referring accurately to the excavation at Ban Chiang is somewhat difficult given no site report has been published; however Higham and Kijngam, both members of the original excavation team, have presented their recollections on the subject (Higham et al. 2011b). According to these two, the two seasons at Ban Chiang encountered numerous problems, starting with the initial reason for the excavation- severe looting occurring at the site. This restricted the possible location for trenches to the few small areas that remained untouched. Even in the unlooted areas the authors note that the site had undergone intense bioturbation and human disturbance (Higham et al. 2011b: 230). Consequently, the potential for material to have moved between layers should be considered high.

The original dating of the site was based on charcoal fragments mainly from grave fill and a few *in-situ* hearths (Higham et al. 2011b). Given the apparent bioturbation at the site (again without a site report this is impossible to evaluate) loose charcoal could very easily have been transported up or down the stratigraphic profile. This indeed appears to be the case, as Higham et al. (2011b) note that the chronological sequence returned from the radiocarbon did not match the cultural sequence (i.e. charcoal fragments from higher layers returning dates claiming to be older than those below).

To overcome this issue, additional dating of Ban Chiang was undertaken in 1997 by White. Using innovative techniques, seven dates were obtained, six from organic temper of burial ceramics and one from rice phytoliths, which matched the LCM (White 1997). However, issues still remain with these dates. As part of the dating process White experimentally trialled two pre-treatments on several vessels, subjecting sherds from each vessel to both pre-treatments in order to determine a preferred method (Higham et al. 2011b). Table 2.1 illustrates the disparity in results from two vessels. According to the treatment 'A' results burial 12 is roughly 1000 years younger than compared to treatment 'B' (conducted on the same vessel). Also worth noting is that while 'A' results indicate that burial 12 is younger than 19/24 (matching the cultural sequence), the opposite is returned by 'B' results. Despite these clear issues with accuracy, precision, and reproducibility, White elected to continue with the technique, accepting results from treatment 'B'.

Table 2.1 Results of pre-treatment experiment conducted by White (1997). Results taken from Higham et al. 2011b.

Organic Temper Dating at Ban Chiang	
TREATMENT 'A'	TREATMENT 'B'
Burial 12	
1970 ± 60 BP	2980 ± 50 BP
Burial 19/24	
2190 ± 70 BP	2545 ± 65 BP

Contrastingly the radiocarbon dating evidence for the SCM is much more robust. Much like the LCM, the case for a short Bronze Age in mainland Southeast Asia comes predominately from a single site, in this case Ban Non Wat. In 2009, Higham and Higham published their AMS dating results for the Ban Non Wat sequence, spanning from the Neolithic to Iron Age. The researchers obtained 76 dates, predominately from bivalve shells placed within graves. This large dataset provides a tightly constrained temporal sequence matching the cultural stratigraphy of the site.

The results of these analyses, utilising a bayesian dating model, provide strong evidence for a later Bronze Age beginning in the late 2nd millennium BCE. However, Ban Non Wat and Ban Chiang are located in different parts of the Khorat Plateau separated by large distances and it is hardly practical to model the chronology of an entire region based on work at one arbitrary site over another. To overcome this issue Higham and his colleagues sought to extend the dating regime to other sites in Northeast Thailand (Higham et al. 2011b, Higham et al. 2015).

In 2011 Higham et al. directly dated bone collagen from Ban Chiang skeletons excavated in 1974-75. By directly dating articulated skeletal remains, issues of stratigraphic movement due to bioturbation are assuaged and one can be sure of dating the exact burial context that is being attempted. Additionally, the extraction and pre-treatment process for bone collagen is well established and enables researchers to view potential diagenetic issues in the sample prior to submitting for dating (Higham et al. 2011b). The researchers found that 44 of the 51 samples obtained passed the percentage yield test and so were submitted for radiocarbon dating (Higham et al. 2015). The results matched those from Ban Non Wat, placing the earliest bronze evidence (a bronze spear in a burial rather than the loose bronze fragments) at c. 1,130 BCE (Higham et al. 2011b). More recently, comparative dating regimes have also been conducted on several other Bronze Age sites including Non Nok Tha, Ban Na Di, and Ban Lum Khao in Thailand. The results have returned chronologies consistent with the SCM (Higham et al. 2015).

Having considered all the evidence, the author believes the last decade of research has produced a strong case for the SCM. Therefore, this project is proceeding utilising the SCM which considers the Bronze Age of Cambodia and Northeast Thailand to have begun around 1200 BCE filtering out of contact with Southern China. The introduction of bronze metallurgy sparked a sharp uptake in the technology, bringing with it a rise in social and economic complexity across the region (Oxenham 2015). This was not a stagnant period but one of change and dynamism.

The Iron Age

The introduction of iron metallurgy in mainland Southeast Asia c. 500 BCE coincided with widespread dynamism across the social and economic landscapes (Stark 2006b; Higham 2011b).

Following on from the Bronze Age, continuous occupation and use of cemeteries at several sites such as Ban Non Wat and Ban Chiang indicate that there was a continuation from one period to the next. Several important additions appear as part of the larger Iron Age technological suite which formed a driving force for economic growth over the next thousand years. Exotic goods such as carnelian, agate, and glass beads, begin appearing in burials throughout Southeast Asia during the Iron Age, indicating contact throughout the region and as well as with neighbouring India and China. There is also considerable evidence for a shift in climate c. 1700 years ago in the Khorat Plateau (and most likely affecting Northwest Cambodia as well) which provided declining rainfall and water availability due to a weakening of the summer monsoon (McGrath et al. 2008; Wohlfarth et al. 2016). That this shift coincides with the construction of large scale earthworks in the form of encircling moat and embankments features at many sites illustrates the ability of elites to harness a large workforce and adapt to increased climatic pressures.

Analysing changes in mortuary practices at Ban Non Wat and Noen U-Loke, Higham (2011b) has separated the Iron Age of Northeast Thailand into four discrete phases which enables an examination of changes in social and economic constructs over time.

This first phase, Iron Age (IA) 1 lasted until c. 100 BCE and while iron was present, bronze objects remain the preferred metal (Higham 2011c). While bronze was most commonly used in ornaments such as bangles and rings, burials during this phase also contain bronze tools, including socketed spears (Higham & Kijngam 2009; Higham 2011b). During this initial phase iron also was used to make both tools (predominately spears and hoes) and ornaments (typically bangles) (Higham & Kijngam 2009; Higham 2011b). At Ban Non Wat (which contained 125 burials dating to IA 1) two distinct groups were identified based on grouping and orientation of burials. There is also evidence for experimentation with metallurgical properties as evidenced by the presence of several spears made with an iron head and bronze socketed haft (Higham & Kijngam 2009). Some burials at Ban Non Wat contained glass, agate and carnelian, though, notably, none are found at Noen U-Loke (Higham 2011b). While this may be due to the vagaries of sample size (Noen U-Loke had very few IA 1 burials), it may also be an indicator that the people of Ban Non Wat retained some vestiges of their increased wealth from the Bronze Age. The mortuary collection associated with the introduction of iron illustrates a large degree of experimentation and innovation as the inhabitants set about discovering uses for the new material.

IA 2 spans from 100 BCE through to 200 CE and sees the spread of exotic exchange goods throughout Northeast Thailand and Northwest Cambodia in the form of glass as well as semiprecious stones including agate and carnelian (Higham 2011b). A tradition of coating the burials in rice also occurs commonly during this period (Higham 2011b). Both these factors may potentially indicate greater crop surpluses, most likely brought on through the introduction of Iron and water buffalo in the preceding phase, allowing for more trade and larger displays of wealth in mortuary ritual. In terms of ornamentation, increases in the diversity and intricacy of bronze jewellery items are visible in burial assemblages, once more indicating an increased knowledge and skill in metal working through innovation. Interestingly iron almost entirely disappears from burial assemblages during this phase (Higham 2011c). This may be due to the increasing availability of the metal making it less desirable as an ornament compared to the more attractive bronze, with iron therefore transitioning in the mind of the population to merely a functional material, something for use by the living, but not necessary for the dead.

The transition to IA 3 occurs c. 200 - 400 CE, coinciding with a vastly shifting hydrological environment where water became scarcer (Boyd & McGrath 2001; O'Reilly & Scott 2015; Wohlfarth et al. 2016). It is during this phase that there is the most evidence for expanding frames of influence and increasing wealth in the Khorat Plateau. At Noen U-Loke, tightly grouped clusters were encountered as the preferred burial layout during IA 3 (Higham 2011b). Higham argues that this is highly suggestive of kinship or family groups and therefore differences, particularly based around wealth, between groups may be indications of hereditary status (Higham 2011b). This interpretation is reinforced by the presence of several infant burials in a cluster which contain wealthy assemblages including numerous ceramic vessels, glass beads, and bronze ornaments (Higham 2011b). Not only is this period recognisable through increasing distinction spatially between groups, perhaps reflecting social separations apparent during life, but also by an increase in mortuary expenditure marked by numerous exceptionally wealthy individuals.

While it is not possible to remark on archaeologically invisible aspects of the mortuary ritual, there is an undeniable increase in the number of burial objects. Indeed, the body of a mature-aged female at Noen U-Loke was interred with 68 gold beads along with numerous bronze rings and bangles (Higham 2011b: 121). This kind of wealth, while not common, is more often encountered in IA 3 than the other phases of the Iron Age, or indeed any other part of the prehistoric sequence. In addition to increasing wealth and boundary definition between groups of people, there is also an expansion of influence, evidenced by increased quantities of exotic goods and moat construction. While the possible reasons for moat construction are discussed below, it is important here to note the significant labour entailed in the construction and upkeep of such extensive earthworks. It is likely that the appearance of these features is indicative of emergent elites capable of focusing a large number of people towards a single task. After disappearing almost entirely from mortuary assemblages in IA 2, iron artefacts reappeared during this phase, mostly in the form of tools such as knives and ploughshares (Higham 2011b).

The final phase of the Iron Age, IA 4, begins c. 400 CE and continues until the protohistoric in the 6th century (Higham 2011b). It is this and the preceding phase that are the focus of this project. IA 4 has previously been considered to break with the pattern found through the preceding phases of increasing hierarchical differentiation and wealth in the mortuary assemblage. This phase is contrastingly bare by comparison. Higham (2011: 128) notes that the tight clustering and clear differentiation of groups at Noen U-Loke during IA 3 is all but invisible in IA 4. There is also a reduction in the tradition of rice-bed burials which, while still present, do not occur as commonly as in previous phases (Higham 2011b). A similar theme applies to most mortuary assemblages during this period. Although the full spectrum of inclusions, including exotic goods, bronze, iron, as well as the occasional gold and silver, are still found in IA 4 burials, these are all found in fewer quantities than compared to the wealth of the IA 3. It is difficult to provide an explanation for the declining displays of wealth particularly as it appears in a time which is typically characterised as one of increasing socio-economic complexity. It is possible that the shift reflects changing funerary rituals in which greater emphasis was placed on archaeologically invisible displays. It is envisaged that the analysis of mortuary assemblages dating to IA 3 and 4 from Central-Northwest Cambodia and Northeast Thailand will help elucidate how growing social complexity in these regions progressed during late prehistory.

Adaption to a Shifting Environment in the Mid-Late Iron Age

Recent research by O'Reilly and Scott (2015) has documented 297 circular moated sites across Northeast Thailand, many of which are thought to have initially been occupied during the Iron Age. These sites are differentiated from those dating before or after by their unique morphology. During the preceding Bronze Age occupations sites are typified as circular or irregularly shaped mounds rising roughly five metres (Moore 1988, Scott 2013). Iron Age circular moated sites are so named due to the encircling moat and embankment network surrounding the raised occupation mound (Figure 2.1). The number of moats varies greatly across the Khorat Plateau from 1-5, though the majority of sites have only one or two moats (O'Reilly and Scott 2015). It must be noted that not all Iron Age sites in Northeast Thailand and Northwest Cambodia necessarily had these earthworks (for example Phum Sophy and Prei Khmeng). Indeed, remote sensing work conducted by O'Reilly et al. (2017) suggests that these moated sites are in the minority of prehistoric habitation mounds in Central-Northwest Cambodia. The moated sites of the Iron Age are clearly differentiated from later protohistoric and historic (Angkorian) moated sites which follow linear designs (Scott 2013). Work by McGrath and Boyd (2001) in AMS dating the moats at several Iron Age sites in Northeast Thailand has revealed that construction of the moat and embankment systems occurred in the mid-late Iron Age.

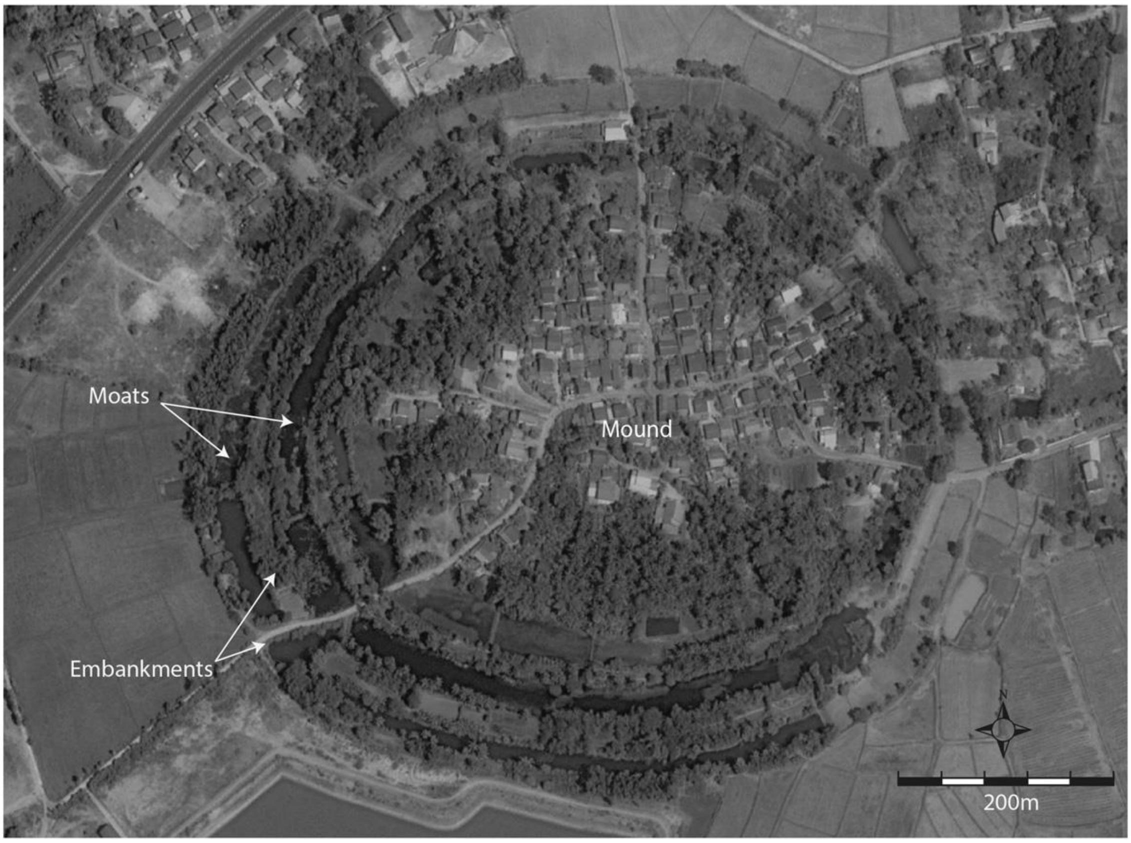

Figure 2.1 Satellite image of circular moated site in Northeast Thailand. Google Earth satellite image originally from O'Reilly & Scott 2015.

Several potential functions for the earthworks have been theorized by researchers since the seminal work by Williams-Hunt (1950). Explanations have included defence (Vallibhotama 1984; Nitta 1991), aquaculture (Vallibhotama 1984; Higham 1998), flood protection (McGrath et al. 2008), symbolism or ritual (O'Reilly 2008), and water storage for domestic and agricultural consumption as well as providing some mitigation for drought conditions (O'Reilly 2014; Scott & O'Reilly 2015). Scott and O'Reilly (2015) recently examined a wide range of aspects of site characteristics including soil permeability, annual rainfall, density of sites, elevation, and number of moats per site. Based on this work a correlation appears to exist between site locations and number of moats, with the availability of water. Such correlations lend support for a functional role of the moats in which they stored water for general consumption in drier times and areas (Scott & O'Reilly 2015). This explanation meshes well with the increasing evidence for climate change occurring in Northeast Thailand and Northwest Cambodia during the mid-late Iron Age.

A considerable body of research has been undertaken attempting to understand the shifting hydrology of the Khorat Plateau (McGrath & Boyd 2001; Boyd 2007; Boyd & Habberfield-Short 2007; McGrath, Boyd & Bush 2008; King et al. 2013). It has been well noted that the current environment is much different to that when agriculturalists who originated in Southern China spread into the region at the beginning of the Neolithic. Despite fluctuations to this system the region generally had a greater availability of water than during the mid-late Iron Age (Boyd & McGrath 2001; Wohlfarth et al. 2016). Boyd and McGrath (2001) describe the hydrology as being based on a system of deep, single-channelled waterways which existed year-round, fed by a rainfall pattern without any particular peaks or troughs. However, during the Iron Age the river systems change to multiple, shallow, short-lived, channels resulting from a decline in the amount of rainfall runoff feeding the systems year-round (Boyd & McGrath 2001). Instead a monsoonal system, which is still in place today, took over in which the vast majority of annual rainfall is delivered over a period of just a few months (Boyd & Habberfield-Short 2007; McGrath Boyd & Bush 2008).

This model has since been further refined in a study conducted by Wohlfarth et al. (2016). The researchers conducted sediment coring from several lakes in northern parts of the Khorat Plateau to examine changes in aridity in the past. According to Wohlfarth et al. (2016) a shift in climate to the more arid, seasonal one occurred c. 300-400 CE, a period that witnessed the construction of moats around many sites on the Khorat Plateau.

Early Complex Polities

Inscriptional evidence from predominantly coastal regions of Southeast Asia details the appearance of several complex polities from early in the first millennium CE (Stark 2006a). Historiographical reconstructions of this period have typically relied upon Chinese documents composed by visiting diplomats and traders that describe these polities as short-lived kingdoms (Briggs 1951; Cœdès 1968). Locally obtained evidence however, both from inscriptions and excavations at sites such as Óc Eo and Angkor Borei, suggests a period of relative social and cultural stability largely unaffected by the power struggles between elite individuals and families (Vickery 1998; Stark 2006a). This section will provide an overview of two prominent early polities in and around Cambodia active around roughly the same period as the sites under consideration in this study; Funan and Chenla.

Funan

The alluvial lowlands of the Mekong Delta in Southern Cambodia and Vietnam provided an ideal spawning ground for one of the earliest polities in mainland Southeast Asia (Stark 2003; O'Reilly 2007). The coastal location served as a way station for maritime traders operating between China and India, and even brought indirect contact with Rome and the Mediterranean world (Malleret 1959b; Ray 1989; Stark 2006a). Descriptions of the extent and level of socio-political organisation of Funan, which appears to have formed during the early first millennium CE, remain difficult as the majority of information is still derived from Chinese dynastic histories (Ishizawa 1995; Stark 2006a). Sources from the third to sixth centuries CE describe a polity comprising multiple competing capitals each with sizeable populations and resources controlled by dominant elites (Pelliot 1903; Malleret 1959b). The impressions of visiting emissaries as recorded in *The History of the Liang Dynasty* (compiled in the seventh century) detail a strong agricultural system which was probably based on flood recession, wet rice farming (Fox and Ledgerwood 1999), a system of taxation, and a local script of Indic origins (Higham 2002). Chinese documents, however, are less forthcoming in defining the territorial expanses of the Funan polity, which some suggest could have extended as far as the Isthmus of Kra in the Malay Peninsula (Hall 1982; Andaya and Andaya 2014). Figure 2.2 illustrates the theorised extent of

Funan influence in mainland Southeast Asia during the early-mid first millennium CE as projected from archaeological and art history evidence.

Large scale canal networks have been identified linking many of the settlements in the delta (Paris 1929; 1931). These extensive works, the largest of which spans nearly 90 kilometres, afforded the capacity to quickly and easily move goods between centres and doubtless aided in facilitating the impact of maritime trade from the port of Ta Kev to the nodal site of Óc Eo and from there into the wider region (Higham 2002).

Alterations in international maritime trade in the sixth and seventh centuries away from the Mekong Delta appear to have been a catalyst for the decline of the Funan polity. The economic stimulus that appears to have fuelled the burgeoning polity evaporated as trade between India and China increasingly passed over the delta in favour of finding port in Island Southeast Asia, particularly in southern Sumatra (Higham 2002; Manguin 2004; Stark 2006b). It appears that the power subsequently shifted away from the coast into more inland areas of mainland Southeast Asia around the middle of the first millennium CE (Malleret 1962).

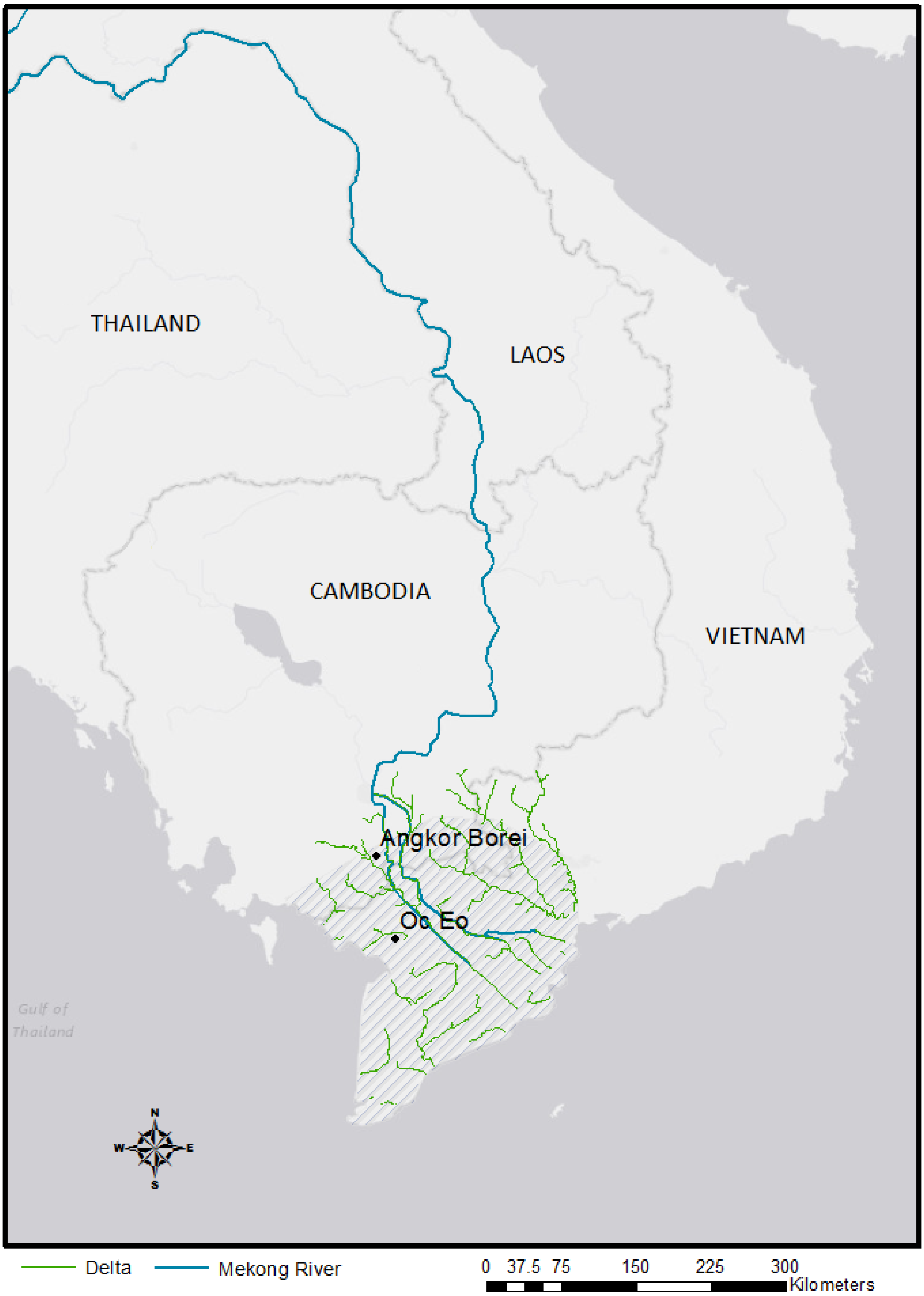

Figure 2.2 Approximate extent of Funan polity. Shaded area in the Mekong Delta outlines the approximate geographical area of Funan.

Chenla

Much like the study of Funan, determining the cultural and political features of the Chenla polity can be complicated by an over-reliance on historical Chinese accounts that overlaid their own perceptions of statehood and kingdoms onto Southeast Asian contexts (Vickery 1998). Chenla (or Zhenla) appears in Chinese records in the early seventh century CE and is presented as the conqueror of Funan thereby shifting the balance of local power inland (Cœdès 1968; Hall 1985). Extending roughly from Phnom Penh in Cambodia to north of the Dângrêk mountains, the Chinese texts detail Chenla as a fully-fledged state (sometimes divided into a Land and Water Chenla) after it rebelled against, and subdued, Funan (Duanlin 1883; Wheatley 1983; Higham 2002). The capital of this inland kingdom was likely the city of Ishanapura (now known as Sambor Prei Kuk located near Kompong Thom, Cambodia) and controlled a further thirty cities mainly in the Tonlé Sap basin, each governed by a local elite in the name of the king (Higham 2002; Kubo et al. 2016).

This picture of a fairly stable monarchy, however, is not borne out in the archaeological or inscriptional records (Parmentier 1927; Vickery 1998; Higham 2016). Local inscriptions in both Sanskrit and Khmer record such aspects as royal lineages, temple dedications, and military campaigns. One such inscription dated to 667 CE links the royal family at Ishanapura to Rudravarman, one of the last kings of Funan (Vickery 1998). This suggests continuity between the two polities more akin to a peaceful transition inland rather than one spurred by military domination (Vickery 1996; Higham 2002; Miksic 2003). Records of military campaigns cast further doubt on the concept of a single, stable kingdom as individual kings appear to have sought power over their rivals. (Vickery 1998; Higham 2016). This cyclical system of growth and dissolution of competing kingships reflects closely the political setting of a complex chiefdom (Redmond & Spencer 2012). Other inscriptions of royal lineages, while not as complete as the one centred at Ishanapura, reveal numerous other seats of power and royal families, such as four generations of rulers at Stung Treng including three queens, with control of local areas (Vickery 1998; Higham 2002).

The end of the Chenla period is not heralded by any dislocation or geographical displacement in power. Rather the transition to the Angkorian state in 802 CE appears to have occurred through the consolidation of power to a single ruler, Jayavarman II, who managed to achieve supremacy over competing rivals (Higham 2002).

Conclusion

The evidence available for prehistoric Central-Northwest Cambodia and Northeast Thailand presents an increasingly clear picture. After initial settlement by anatomically modern humans c. 50-60,000 years ago, a long hunter-gatherer period ensued. While the end of the Last Glacial Maximum saw the widespread appearance of the Hoabinhian culture across mainland Southeast Asia, there is no evidence for an indigenously derived Neolithic. Not until the migration of Chinese agriculturalists, bringing with them domestic rice and millet, out of the Yangtze valley c. 2000 BCE does this shift occur. DNA, skeletal, and linguistic evidence suggests that rather than an invasion from the north, the Neolithic was driven by a slow and steady flow of migrants who integrated and intermarried with the indigenous populations.

After roughly half a century of debate, it now seems clear that the Bronze Age in Northeast Thailand did not begin until c. 1200 BCE. The introduction of bronze from the southern Chinese states was widely adopted in both tools and ornaments and may have triggered a rise in wealthy social aggrandizers at strategically placed sites such as Ban Non Wat. The relatively short chronology of the Bronze Age presents a model of dynamic growth and innovation as the new technology rapidly spread throughout mainland Southeast Asia. This informs our understanding of the Iron Age as smelting pot in which social and cultural change gain momentum, with the introduction of iron and domestic water buffalo driving a rise in productivity which allowed for increased trade and hierarchical institutions. Despite this economically charged landscape, Higham (2014) has described burial wealth as decreasing during the later stages of the Iron Age, even as significant earthworks around sites were being constructed. In contrast to declining burial wealth, the appearance of these circular moats in the mid to late Iron Age has been argued to reflect the ability of elites to mobilise a large body of workers to adapt to a drier environment.

It is clear that current models for social economic change during the Iron Age, much like for the rest of the prehistoric sequence rely too heavily upon a handful of sites predominately from the Mun Valley in Northeast Thailand to provide evidence for all of Inland Southeast Asia. These models present markers for declining complexity for the final phase during the Iron Age, at a time when early complex polities are already appearing on the coast and even in Central Cambodia in the form of Funan and Chenla. This dichotomy stands out as a jarring mis-step for inland regions of Southeast Asia when complexity appears on the rise all around them. This is a vital mystery in attempting to understand how the late prehistory fits with the rise of complex polities in this part of Southeast Asia, and what role inland regions, which would later take their place as strongholds of the Angkorian Empire, played in the formation of complex polities. In order to seek an answer to this issue, it is necessary to no longer focus solely on one geographically limited region and consider the wider trends in inland regions, which is why this project includes sites from Central-Northwest Cambodia as well as those in Northeast Thailand.

Chapter 3 Theoretical Frameworks

As with any archaeological analysis that seeks to understand past cultures, an important consideration is the theoretical frameworks and models that underpin any discussion of results. This chapter covers issues relating to mortuary contexts, particularly in regards to quantifying wealth and potential confounding interpretive issues, and also provides a discussion of chiefdom and state socio-political systems and how these may appear in the archaeological record. Determining wealth and status of individuals from mortuary assemblages can be complicated by cultural practices and views of death and the afterlife during the past. Issues such as potential symbolism associated with artefacts, differential wealth in subadult burials, and the manipulation of funerary contexts by the living are covered as potentially confounding components of the mortuary context. It is suggested that a multi-faceted approach to quantifying burial wealth (Alekshin 1983) provides a robust method for analysing the distribution of wealth from burial assemblages. The latter half of this chapter then outlines the major factors of chiefdom and state socio-political systems with a view to determining how these models apply to late prehistory in Northeast Thailand and Central-Northwest Cambodia. It is suggested that one of the main archaeologically visible differentiating factors is the difference of a ranked hierarchy in chiefdoms compared to a tiered economy in states (Service 1962). The theoretical models outlined in this chapter will provide the framework for an analysis and discussion of the potential for variability in social complexity in Inland Southeast Asia during late prehistory.

Mortuary Archaeology

For over a century, archaeologists have attempted to reconstruct and understand social and economic constructs of past cultures. Critically, unlike fields such as anthropology which have access to living systems for study, archaeology is defined by the study of systems which have ceased to exist in the present (Courbin 1988; Scarre 2009). Consequently, archaeology must look to the traces left by past activities to provide indications of the systems present in previous societies. One of the main tools which has been used and continues to be on the forefront of archaeology, is the study of burials and mortuary practices (Binford 1971; Carr 1995; Parker Pearson 1999; Burchell 2006). This field refers not only to the examination of deceased individuals, but also the goods and artefacts interred in association with a body or cremated human remains. It is important to gain an understanding here of this branch of archaeology as the analysis of mortuary assemblages recovered from Iron Age cemeteries in Cambodia and Northeast Thailand forms the basis of the research in this thesis. However, attempting to draw social and economic links from the funerary context is not straightforward, and the extent to which this can be done has been much debated over several decades (Binford 1971; Hodder 1980; Alekshin 1983; Parker Pearson 1999). Central to this debate has been the shift from processual to post-processual archaeology, bringing with it a radical change in the ways burial contexts have been used to inform about the lives of the deceased (Hodder 1980; Parker Pearson 1982). Universal rules such as a direct relationship with burial wealth and status (i.e. Binford 1971) are no longer considered to hold true, instead a case-by-case approach attempts to avoid erroneous assumptions and preconceptions when interpreting a site or culture. In order to avoid a biased or ignorant interpretation of the mortuary evidence it is necessary to understand the complexity and inherent difficulty involved in studying mortuary practices for evidence of living systems. Considering this, the main issues common in the field of mortuary archaeology are presented in this chapter. Following this discussion an overview of generally applied techniques for evaluating wealth and status of the deceased in mortuary contexts will aid in determining a reasonable methodology for quantifying burial wealth in this project.

The Archaeology of Death

Interred skeletal remains and associated mortuary goods have attracted the attention of archaeologists from as early as the nineteenth century (Chapman 2003). The distinction between academic investigation and grave robbing could certainly be queried during those initial ventures as a primary goal of the early pioneers was to extract valuable objects and rich tombs for export to museums, in many cases destroying much of the site in the process (Bahn 2014). Fortunately, time has seen much progress in fieldwork techniques, with archaeologists now often searching for innocuous objects which are priceless for the information they provide beyond any monetary value (Bahn 2007; Weiner 2010). Part of this continued refining of field practices has its roots in the paradigm shift that was dubbed 'new' or 'processual' archaeology. The emergence of the archaeology of death and burial, and the accompanying social and economic considerations is credited to this movement (Chapman 2003). In 1971 James Brown released an edited volume 'Approaches to the Social Dimensions of Mortuary Practices' which included papers from archaeological luminaries Binford and Saxe (Binford 1971; Saxe 1971; Brown 1971). The volume had an immediate impact on the way archaeologists approached mortuary contexts and inspired much of the work focused on understanding social and economic systems through death and burial since (Chapman 2003). Indeed, the volume provided the basis for models used to analyse and interpret cemeteries in a quantitative way. Brown's (1971) edited volume introduced the use of such techniques as cluster analysis and Principle Component Analysis (PCA) as a way of studying cemeteries to reveal aspects of hierarchy and social status (Shennan 1975; Chapman 2003). The analytical methods in this seminal volume continue to be refined as theoretical frameworks in archaeology have shifted to incorporate greater human agency and social meaning (Tainter 1978; Carr 1995; Parker Pearson 1999).

A common interpretation of a mortuary assemblage by a processual archaeologist followed a line similar to the statement from Binford's (1971) contribution to the Brown volume "*The social scale of the deceased should vary directly with the relative rank of social position held by the deceased*". This left little room for different ideological, religious, economic or political perspectives on death which may result in status not being the key determinant of mortuary practices (Hodder 1980; Parker Pearson 1982; Chapman 2003). While Brown's volume certainly paved the way for interpretative mortuary archaeology, post-processual researchers criticised the heavy focus on hierarchy and status as explanatory factors for variation in the assemblage (Pader 1982; Gillespie 2001; MacDonald 2001; Chapman 2003).

As the processual movement was overtaken with a shift to the post-processual way of thinking, focusing less on universal rules and instead placing more emphasis on human agency, the process of interpreting death also changed. Archaeologists realised that as each culture is different, so too is the way they treat death and burial (Parker Pearson 1999). Consequently, assuming the mortuary practices of one society reflect living social and economic structures the same way as those in another culture is inherently flawed (Stultz 2010). In many cases this is most evident in the researchers' own bias when interpreting a mortuary assemblage. For instance, a grave filled with many associated goods, especially if the items are of apparently high value, the interred individual is immediately considered to have been rich in life (Binford 1971;

Saxe 1971). With the rise of post-processual archaeology, the emphasis has been on understanding the mortuary assemblage in the context of the culture and those burying their dead in such a way (Gillespie 2001; MacDonald 2001). This makes the task of interpretation significantly more complicated as there are many more possibilities that can only be answered by careful analysis of the social context. To illustrate this point, the most prevalent interpretative considerations in mortuary archaeology today are outlined below, accompanied with case studies to illustrate the complexity of the issue.

Interpretative Problems

The interpretation of mortuary assemblages is an inherent problem facing any researcher attempting to understand social and economic practices through the archaeology of death and burial. Few artefacts are mutually exclusive to a single possible interpretation as even strictly functional objects in life may be attributed symbolic meaning upon death (Petré 1993; Parker Pearson 1999; King 2004). For instance, a sword or knife interred with a person is a fairly common occurrence in certain parts of the world (Petré 1993; Whitley 2002; Mantyla 2007). If the artefact is viewed solely by its functional role it may be considered evidence that the individual was a warrior or perhaps a hunter. However, functionality is not the only potential factor determining grave inclusion for an individual. As Parker Pearson (1982) argues, the living are capable of manipulating the dead for their own interests, rather than just reflecting physical relationships. Simply put, the archaeologist is faced with the task of determining whether artefacts associated with the deceased are a true reflection of the individual's life. While this certainly may be the case, there is also the possibility that the mortuary assemblage is an idealistic representation of the deceased or even the society as a whole (Parker Pearson 1982). Given this consideration, the example of a sword or knife interred with a series of individuals can also potentially indicate membership in a particular group in the society, which then raises the question of what bound them together, be it kinship, social status, gender or some other factor all together (Stultz 2010). It is clear, then, that a failure to appreciate the potential for social constructs applied to artefacts may result in a false reconstruction of a past culture. Only by looking at the context of artefacts, not as individual items but as part of an extensive system, may patterns emerge which can inform about the social systems of the past. This fairly simple concept calls into question assumptions researchers may unwittingly make the moment they are met with a particular object.

The Mortuary Assemblage and Social Status

At many archaeological sites variation is often seen in the relative wealth displayed in a proportion of burials compared to the rest. This can occur on a regional scale as well, where the burial practices at a particular township exhibit greater wealth than those at neighbouring sites. As this is, typically, a fairly easy variable to judge – more goods typically synonymous with greater monetary expenditure, the wealth of individuals is one of the main reported aspects of mortuary archaeology (Binford 1971; Alekshin 1983; Barretto-Tesoro 2003). The assumption accompanying many of these reports is that the apparent wealth accompanying burials is an accurate reflection of the wealth and status held by these people in life (Binford 1971). This is no doubt the most common and most empirical interpretation of mortuary evidence in archaeological settings. However, it is important to also note the possible social meanings of artefacts as well as other possible interpretations of burial wealth.

A similar system to relating burial expenditure with wealth in life is the use of burial ceremonies as opportunities to display power. The key differences between the systems are twofold, firstly that the funerary ceremony is perpetuated by the living, which is to say that the objects placed with the body did not belong to the individual during their life but are gifts or offerings by others (Parker Pearson 1999). The second is that this system can be linked not only to those who had power in life and die reflecting this, but the living participants of this system may manipulate it as they wish. The display of wealth and power in providing these grave goods can function as a method of signalling one's power in times of turbulence, or to seek to gain more power in the community (Mantyla 2007; Williams 2007). In the case of the Berawan people of Borneo, large mausolea are constructed to house the deceased (Metcalf & Huntington 1991). However, rather than standing as monuments to the status of those interred within, each mausoleum is constructed with the purpose of ennobling the leader who can harness the required funds, materials and workforce to erect the tombs (Metcalf & Huntington 1991). In this system the associated wealth of a burial does not so much reflect the status of the deceased but rather shows a method for acquiring and retaining power based on a series of cultural constructs.

In a system where burial wealth is not attributed as individual wealth but rather as gifts from mourners, it is perhaps possible to argue that the greatest gifts were given to those who were held in the highest value and therefore Binford's (1971) statement still holds true. The logical question therefore, is what characteristics defined the value of a person in that culture? Possibilities include an individual's place on the economic ladder, the power and fortune they had amassed in their life, or some other factor. This may be different for every society. In the example of the prehistoric Hohokam culture of the North American Southwest, MacDonald (2001) argues that mourners experienced the most grief for those with the most reproductive value. Grave inclusions reflecting the community's grief resulted in young adults routinely receiving the richest assemblages with a few exceptions perhaps on account of poor fertility.

In other social systems it is possible that the wealth of burial goods and furnishing has nothing to do with status or wealth, whether of the deceased or the living. Parker Pearson (1982) points to modern Gypsy groups living in England during the late 20th century. Parker Pearson looked at a sample of 270 out of the recorded 3,000 gypsy and non-gypsy burials in Cambridge in 1977 for signs of wealth and incorporated expense. He found that the burials displayed no correlation between the expenses afforded a funeral and the wealth or rank of the individual (or the mourners). For the most part costs of funerals were randomly distributed across classes, however, one people group was noted to stand out. Parker Pearson noted that the most expensive funerals were organised by gypsies, a people in the lowest class (Parker Pearson 1982). In this example, burial wealth is therefore clearly linked to cultural and social systems and practices rather than economic and hierarchical ones.

Wealthy Child Burials

A further complicating issue in interpreting status from burials is that of wealth among children. Where grave inclusions function as reflections of the deceased's wealth or status achieved in life then it logically follows that juveniles should have very few, if any, grave goods. It should also hold true that, if a culture does provide children with grave goods, then there should be little variability in the wealth between burials to reflect that they have not achieved a rank (Van Gennep 1909; Parker Pearson 1999; Arriagada Rifo 2012). However, in many cultures around the world this is not the case (i.e. Aranda 2007; Oxenham et al. 2008b; Berón et al. 2012), which requires some form of explanation. The most obvious explanation is to ascribe status and rank to the child as an extension of their parents (Bayard 1984b). This solves the twin problems of how grave goods are included in child burials who were too young to have owned items in life (as gifts from their family), and of the variability in the wealth of goods in this subset. Instead of a subset of society which has not attained a rank, ascribing children a status at birth ensures the full spectrum of ranks visible in the adult world is mirrored in subadults. However, this explanation may fail to fully encapsulate the complexity of the mortuary context. In early Anglo-Saxon England for example, furnishings of child burials (there considered as under the age of 15) are considerably fewer than adult burials. They do, however, occur and vary in wealth (Crawford 2004). Less than half of Crawford's sample of children under the age of 11 contain any form of grave goods. That rate increases for children up to age 14, but still remains well short of the adult sample, 70% of whom were interred with some form of burials goods (Crawford 2004: 171). Of those burials containing artefacts, the majority were only furnished with one or two items, yet at least one burial in each subadult age bracket (0-5, 6-10, 11-14 years) contained the sample maximum of 10 artefacts (Crawford 2004: 171). In the case of Early Anglo-Saxon England this dichotomy between rich and poor child burials has widely been interpreted as a sign that children were ascribed status at birth as inherited from their parents (Richards 1987; Timby 1996). However, Crawford (2004: 173) points to the fact child burials are on the whole poorer than their adult counterparts, causing her to suggest that status was only partially attained at birth and partially gained through life experiences.

Further interpretative issues are seen in the example of Early Anglo-Saxon burials. At a cemetery site at Empingham II, Rutland, three child burials were noted by the excavator as being accompanied with a range and quantity of artefacts more akin to adult burials (Timby 1996: 93). While this was originally interpreted as signs of inherited status, upon review Crawford has suggested an ulterior interpretation. Considering that all three appear to be females of c. 12 years of age, she suggests that researchers may be placing their own bias onto the mortuary record regarding the threshold between child and adulthood (Crawford 2004: 172). A reconsideration of this threshold may see these three burials as common adult assemblages.

A final issue is raised from the example of extreme cases of wealthy child burials in Early Anglo-Saxon England. Crawford (2004) notes that the majority of exceptionally wealthy child burials appear to be young girls. While there is documentary evidence to show that elite boys were given adult gifts such as swords at a young age, there is currently no evidence to suggest these followed them to the grave (Crawford 2004: 175-6). While Crawford notes that any interpretation of this trend is little more than speculation, she suggests that wealth accompanying young girls may be symbolic of the bridal gifts or dowry they would have received. As support, Crawford points to the later medieval period where girls as young as 2 years of age could be betrothed (Crawford 2004: 175). While such a claim may be regarded as speculative at best, it serves to illustrate the myriad of possible confounding issues for a researcher.

These cases depict the interpretive problems for mortuary archaeology of child burials as they illustrate that expense does not necessarily reflect an inherited rank or status. Interpretations on a culture based on variations in grave inclusions in child burials must therefore carefully consider all possibilities rather than simply assuming a reflection of rank.

Symbolism of Mortuary Artefacts

Aside from the mere quantity and value of grave goods, a key consideration in any interpretation of the mortuary record is the type of artefacts found with an individual burial. Artefacts such as weapons and tools pose the additional problem that they may have served a strictly functional role in the culture or have been heavily connected with symbology and ritual, or a combination of the two. Jewellery and body adornments as well may, in all likelihood carry a form of social communication intuitively read and understood by members of a society (Fowles 1974; Reinhold 2003; Cougle-Jose 2010). Perhaps one of the most famous examples of symbolically or ritually weighted grave inclusions is Charon's Obol in Ancient Greece. This funerary tradition required the coins be placed with the deceased in order to pay the boatman (Charon) for passage across the river Styx and into the afterlife (Stevens 1991). While the monetary value varied widely from a couple of bronze pieces to piles of gold obols, there is no doubt that these artefacts carried very clear ritualistic meaning beyond simply signs of wealth (Retief & Cilliers 2010).

The potential symbology of funerary contexts leads to a situation where a researcher should not simply take, for example, a weapon to be a weapon. Certainly, a sword may be a sign of a genuine warrior, or perhaps someone who wished to be remembered as fearsome (Jakobsson 1992), but the same weapon may otherwise be an indicator of status or even gender (Petre 1993; Whitley 2002). Complicating the matter further is the potential lack of consistency across regions and time periods as artefacts gain and lose associated symbology and status (Mantyla 2007: 302). In the example of so called 'warrior graves' of the Bronze and Iron Age in the Aegean, Whitley (2002) argues that weapons included in assemblages acted as metaphors for particular identities rather than to indicate that the individual was a warrior. It is only in the Early Iron Age that bioarchaeological evidence for skeletal trauma shows a connection between weapons and probable occupation as a warrior (Whitley 2002). These are just a few examples of the complexity involved in the interpretation of the role played by particular artefacts.

In Finland two late Iron Age cemeteries have been found to yield high numbers of weapons during a time when grave goods were becoming less common. The spread of Christianity into Finland was accompanied by a general lessening in the proliferation of grave goods during the 11th and 12th centuries CE when the cemeteries at Rikalanmäki, Halikko and Kirkkomäki, Turku were in use (Mantyla 2007). The high numbers of interred weapons are therefore an interesting case study to review how researchers have sought to understand the meaning behind the interment of these artefacts. The largely unpublished excavations at Rikalanmäki in 1950-51 uncovered 44 inhumations, including 19-20 males (Mantyla 2007: 303). Of these, at least 14 graves possessed weaponry of some form with ten swords, nine spearheads, and three battle axes recorded (Mantyla 2007: 303). The number of swords especially stands out given that c. 50 % of the sampled males were buried with a prestigious weapon. Mantyla (2007: 306) notes that the sword is considered to have been the main weapon of choice for chieftains and their noblemen in Finland. Interpretation of the concentration of swords has been divided. One side of the debate claims that the fairly short time-span when the cemetery was in use in indicative of a rise of conflict and tension in the area during this period. The graves are therefore explained as swordsmen drawn into an armed guard for the chief (Hirviluoto 1992; Mantyla 2007: 305). While this certainly explains the density of apparently elite weapons in the cemetery it should be noted that there does not appear to be any signs of violent death in the cemetery. Mantyla also stresses that the swords (and other weapons found) were functional tools, not decorative artefacts. She suggests that high cost weapons such as sword would have been required by the living in times of heightened tension and violence (Mantyla 2007: 306).

The other side of the debate considers the inclusion of swords in burials to instead have been centred on symbolism rather than a reflection of warrior status. That half of the male burials in a cemetery spanning only a few generations carry swords greatly diminishes the chances that, in this particular site, swords were confined just to chiefs and leaders of kinship groups (Mantyla 2007). Instead researchers suggest that the weapons served as a show of strength and power of the entire site over or within the wider region. Mantyla (2007: 305) notes that both Kirkkomäki and Rikalanmäki are in wealthy areas and were possibly local centres of power which could have allowed the settlements to put on such a display of strength as a survival strategy. At Kirkkomäki the story is very similar, though the dominant weapon is the battle axe instead of sword (two swords, nine spearheads, seven battle axes) (Mantyla 2007: 305). This site offers the same division in debate despite only two swords found in the assemblage (of 16 male graves). This demonstrates that, during the same time period, in a fairly similar region, two sites which are considered possible power centres may have used two very different weapons to symbolise the same thing. Therefore, making sweeping statements about the role of an artefact in burials, even between contemporaneous sites of the same culture, must be taken with considerable caution.

Quantifying Burial Wealth

Despite the complexities, possible issues and pitfalls which may be encountered in the analysis of funerary assemblages, the potential to generate important socio-economic information on past cultures cannot be discounted. Assuming one also considers potential social factors which may impact the arrangement of artefacts and toolsets, mortuary data often remains the best evidence available to archaeologists for reconstruction of socio-economic patterns across a community, particularly in prehistoric societies where there is no or little written documentation to aid analyses. The theoretical framework used as the basis for quantifying burial wealth into a figure score is presented here.

The first step in any attempt to glean socio-economic patterns from mortuary contexts must be to form a way of quantifying wealth across the dataset. At their core, most attempts at quantifying wealth and status from mortuary contexts, stemming from Binford in 1971 and continuing to the present, use at least one of the following three principles as listed by Alekshin (1983):

1. Individuals with more artefacts in a grave were wealthier in life.
2. Individuals with more different forms of artefacts were wealthier in life.
3. Individuals with materials (or artefacts) that do not appear very frequently in the entire cemetery assemblage were wealthier in life.

These three approaches are certainly not without their issues and limitations, the greatest perhaps being the lack of social, religious or other potential determinants due to difficulty in providing empirical values for such concepts. However, Alekshin's (1983) list still serves as a useful guide in designing a method of mortuary analysis. Utilising more than one approach will naturally provide greater rigor to calculated wealth values. As an example, one may consider the number of artefacts in burial assemblages as directly proportional to a wealth score. The legitimacy of this assumption could be checked by determining whether burials with many different artefacts and included precious material such as gold or silver also rated highly in an analysis of cemetery wealth. A discussion of each of the three approaches to quantifying burial wealth is presented below in which their respective strengths and weaknesses are considered. It is envisaged that, by utilising a combination of all three methods, many of the susceptibilities of the individual approaches will be negated.

Indicator One: Larger assemblages indicate greater wealth

The first indicator employed is the most simplistic method commonly employed for measuring the wealth of burial assemblages. Here, wealth is considered to be directly proportional to the number of 'things' that are found in a burial assemblage. The premise is that individuals with more items possessed greater ability in life to accumulate goods, and thus were buried with more items as a reflection of their wealth (Binford 1971). There is a long history of utilising assemblage size as a rough indicator of burial wealth in archaeological investigations (Binford 1971; Carr 1995; Higham et al. 2019).

However, the lack of nuance built into this indicator leaves this measure of burial wealth vulnerable to several confounding factors, not the least of which are potential social and cultural influences such as those already discussed in this chapter. Leaving those considerations aside, there are still issues in utilising assemblage size as a measure of wealth. This indicator assumes that all artefacts in an assemblage are weighted of equal importance at a one-to-one ratio. There are also question of how one may count collections of items, should a every bead or ornament in a collection receive an individual value, or are they considered components of a single item (Frieman 2012). Similarly, how does size affect the value of an artefact – is a small but intricate broach of equal worth as a large, functional ceramic jar?

Purely on the basis of how one counts the artefacts in a mortuary context then, there are clearly numerous issues to this approach. While consideration should be given to the size of burial assemblages, and indeed this continues to be the primary consideration in wealth analyses (i.e. Higham 2011a; Windler et al. 2013; Higham et al. 2019), indicators two and three are certainly required to ensure a balanced wealth score.

Indicator Two: Greater variety of artefacts indicates increased wealth

This second indicator of wealth takes a more considered approach to judging an assemblage by looking at the variety of items in each context. This operates under the premise that individuals with greater wealth in life will have access to a wider range of objects, whereas those with few means are restricted to a few items (Sempowski 1986). This approach eliminates several of the issues that may disrupt indicator one, notably the problems around counting by weight, and a potential bias from specialised roles – i.e. a full-time agriculturalist may be accompanied by a collection of iron knives and sickles which by weight alone would make the assemblage appear wealthy, but by this indicator would only reflect two different items.

The variety of artefacts does not consider the implications of gift-giving – in which case a wider variety of items should be expected as people provide an item unique to the griever, not the deceased. There is also no consideration that individuals of different roles may have wider spheres of influence/contact, bringing them a wider range of items without necessarily granting them greater wealth. As with indicator one, quantifying the number of different artefacts still considers each type of item to be of equal value.

As outlined above, using the variety of artefacts present in burial assemblages provides a useful second indicator of mortuary wealth. Many of the potential interpretative problems encountered in simply counting the assemblage size are mitigated when also considering differences in the makeup of said assemblages. However, a continued assumption that all artefact types should receive the same weighting continues to hinder the veracity of any wealth score. This problem is addressed by indicator three.

Indicator Three: Rare materials linked to greater wealth

The third and final indicator of burial wealth listed by Alekshin (1983) and used in this study is that of rare materials and objects. This indicator is useful and can be considered impartial as it avoids a bias of the researcher assigning worth to certain artefacts based on an assumed prestige value. Instead the data effectively determines what is a prestigious item. If an item or material appears infrequently across the cemetery population, it may be considered as an artefact of uncommon worth (Burchell 2006). This indicator also serves to highlight artefacts and materials that were common, or potentially those that carry associations with certain groups of people based on factors such as age, sex, occupation, or status.

While it could be possible to extend this indicator to craftsmanship, this is beyond the scope of this thesis. Therefore, it is conceivable that finely-produced artefacts may be classified along with inferior quality items of the same type. At this point in time a far greater knowledge base of artefact typologies would be necessary for the Iron Age Southeast collections in order to extend this indicator to the quality of craftsmanship.

A combined application of the three above approaches for quantifying burials wealth as outlined by Alekshin (1983) will therefore provide a quantified value for the wealth of each mortuary context in the dataset. How this should be employed must be considered on a case by case nature with a clear understanding of the archaeological record at a cemetery. Bangles and rings in the late prehistory of Central-Northwest Cambodia and Northeast Thailand for instance, show considerable variation in forms which may well have carried inherent social meaning (Storm 1987; Arnold 1991; Sorensen 1997). In this case determining the numbers of different shaped bangles in burials could function as a culturally-targeted version of Alekshin's (1983) second method. The exact methodology employed for generating a wealth score given these considerations of the Southeast Asian context is presented in Chapter four. In this way, a 'wealth value' for burial assemblages may be achieved that is not only empirically founded but also contains at its base an understanding of the cultural setting.

Issues around Taphonomy

A potential confounding factor in the interpretation of any archaeological context, and particularly the mortuary setting, is the local taphonomical processes. The issue of preservation is often of paramount importance to accurate reporting and reconstruction of the site context and can be impacted by numerous diagenetic issues including soil composition, local pH levels, temperature and humidity, and modern activity at the site (Wason 1984; Weinner 2010). Two of the major taphonomical processes often impacting on Southeast Asian archaeology are bioturbation and site looting. Bioturbation is the process of burrowing organisms such as worms, insects, and small mammals which may result in the movement of sediment and artefacts between stratigraphic levels (Grave & Kealhofer 1999; Weinner 2010). Without proper identification during excavation this can result in an erroneous cultural sequence at the site as older contexts appear in younger levels or vice-versa. An example of this in Southeast Asia is the excavation of Ban Chiang in Northeast Thailand (Gormon & Charoenwongsa 1976; Higham et al. 2011b). As noted in chapter two, the cultural sequence of Ban Chiang has long been a point of contention for archaeologists, with published dates for early bronze appearing in levels dated to c. 2,000 BCE, several centuries prior to dates produced from other Bronze Age sites in Thailand (White 1997; White & Hamilton 2009). This appears to be an issue of severe bioturbation. Higham and Kijngam, members of the initial excavation team, have noted that the excavation trench encountered considerable traces of disturbed contexts, which could have transported loose bronze into earlier layers (Higham et al. 2011b). This should serve as a warning of the dangers involved in incorporating disturbed contexts in an analysis.

The other leading issue facing Southeast Asian archaeologists in regard to preservation is that of site looting. It is an unfortunate reality that many archaeological sites in the region, and particularly in Cambodia, have been subjected to looting by locals (Thosarat 2001; Davis 2011). While this is readily identifiable in an excavation, a site which has experienced large scale looting may pose an issue of restricted sample size left undisturbed. These issues illustrate the potential for taphonomical processes to alter the archaeological record and the importance of careful excavation and site recording to avoid falling into the potential pitfalls from disturbed contexts.

Summary

For almost half a century, archaeologists have sought to utilise apparent wealth in mortuary contexts to determine individual status and cultural systems in place during the past (Binford 1971). However, analysing grave goods is rarely simple and care must always be taken to ensure the cultural landscape is considered before linking living status to funerary goods. Considerable variability in funerary practices around the world both historically and in modern settings ensures that burial wealth is not always proportional to the status of the deceased in life. The reasons for this can be wide ranging, including: gifts supplied by the living (for example, modern gypsy populations in England), attempts from the living to generate or solidify prestige (as exhibited by the construction of mausolea by the Berawan people of Borneo), or adherence to certain requirements for admittance to an afterlife (such as Charon's Obol in Ancient Greece). Wealthy child burials provide further complications to a direct correlation between wealth and status. Due to their young age at death, children can hardly be the owners of artefacts buried with them. Issues of ascribed status at birth must be weighed against theories of gifts from parents or as a reflection of a community mourning the loss of life prior to reproductive age (MacDonald 2001). Additionally, artefacts themselves may be imbued with a level of social communication that is impossible for archaeological investigation to fully grasp (Flannery 1972). Despite these issues, the investigation of mortuary contexts has the potential to reveal a level of socio-economic trends throughout cemetery populations that is difficult to achieve through any other archaeological technique. This chapter has outlined a methodology for quantifying burial wealth by considering multiple aspects of the mortuary assemblage, incorporating not just the size, but also variability in artefact types and materials (Alekshin 1983). The techniques outlined will be used to form the methodology for quantifying wealth across Phum Sophy, Phum Lovea, Prei Khmeng, Non Ban Jak, Noen U-Loke, and Ban Non Wat.

Social theory: Distinguishing between Chiefdoms and States

Cultural traits revealed in the archaeological record have the potential to inform us about the level and type of social complexity of past societies. It is necessary here to provide a firm understanding of the potential systems which may have been in place in late prehistory of Northeast Thailand and Central-Northwest Cambodia, and how these may be identified in the archaeological record. Much of the research in characterising modern, historical or prehistoric cultures stem from the seminal work of Service (1962) in which he outlined four broad classes of socio-political organisation. Bands, tribes, chiefdoms, and states each maintain order and manage their populations in unique ways, some of which may leave archaeologically visible traces. This review of social systems is focused on the latter two and the characteristics which differentiate them. The research presented here will be integral to determining to what extent, if at all, the social organisation of populations in Northeast Thailand and Central-Northwest Cambodia diverged in the late prehistory.

The models in which societies have, and continue to be, organised was defined by Service (1962) as falling into four general systems. At the least complex end of the socio-political spectrum are *bands* of single kinship groups, followed by *tribes* of small villages incorporating hundreds of people, *chiefdoms* of thousands of people, and finally *states*, with populations increasing over tens of thousands (Service 1962; Flannery 1972). The two social systems examined in this chapter, chiefdoms and states, represent the transition to hereditary inequality and formal hierarchical structures (Flannery 1972). The question therefore is not if there was a hierarchy in either or both Northeast Thailand and Central-Northwest Cambodia by the late Iron Age, but rather what form best described the systems in place in each region. The manner of the distribution of wealth and status differs considerably between chiefdoms and states both on a personal level within a single village and also on an inter-site scale in how villages, towns, and cities interacted with each other (Isla & Reindel 2006; Turchin & Gavrilets 2009). The analysis of differences in socio-economic systems across the study area will therefore not only rely on the mortuary data and results produced in this project. Any conclusions must also consider wider trends in the archaeological record, such as site distribution patterns, from Northeast Thailand and Central-Northwest Cambodia.

A complicating factor in determining the level of social complexity in the late Iron Age of Northeast Thailand and Central-Northwest Cambodia is a lack of clarity around the social system in place during the preceding periods. In recent decades debate has emerged over the classification of the Bronze Age of mainland Southeast Asia. Several scholars have argued against Bronze Age chiefdoms, particularly in Northeast Thailand, in favour of tribal heterarchies (White 1995; O'Reilly 2000). Unlike a hierarchy, a heterarchy does not align the population by vertical status. The two key points that underpin a heterarchical socio-political system are a flexible hierarchy and horizontal, rather than vertical, differentiation (White 1995). The heterarchy model allows for social complexity without a requirement for permanent ranking of the interactive elements (such as roles and tasks within the society: i.e. farming versus craft production) (Crumley 1995; O'Reilly 2000). While the debate is still far from conclusive for a Bronze Age heterarchical or hierarchical model in mainland Southeast Asia, the Iron Age is widely regarded as conforming more readily with a hierarchical social system (Higham and Kijngam 1984; Moore 1988; Welch and McNeill 1991; O'Reilly 2014).

Chiefdoms

Providing a universal definition of the structure of a chiefdom is problematic given a large degree of variation among the category (Earle 1987; 1991). Chiefdoms in China for example, are quite different to those in a Polynesian setting (Kirch 1984; Tong 1991; Drennan & Peterson 2006). It is important to note that this discussion focusses on the characteristics associated with 'simple' chiefdoms. Given that there is no evidence to suggest a 'complex' chiefdom existed in Southeast Asia, the inclusion of these rare and still poorly understood systems would only confound the discussion here (Wright 1984; O'Reilly 2014). It is therefore important to treat the following discussion of chiefdoms as a guide. Many factors may appear in a given chiefdom, while equally many may be missing or align more closely to a tribal or state social system.

Chiefdoms are usually set as marking the introduction of hierarchies in a society (Earle 1991; Flannery 1972). Bands and tribes are described as egalitarian or with very fluid socio-political structures (Service 1962; Flannery 1972). Unlike so-called egalitarian or heterarchical societies, chiefdoms operate with a ranked hierarchy which is maintained by a nodal leader who governs populations of thousands of individuals through personal charisma and relational bonds in place of strict laws and regulations (Service 1962; Stein & Rothman 1994; Wright 1994). Hereditary status also appears for the first time in many chiefdoms, with vertical position in the society determined from birth (Flannery 1972). This connects strongly to the ranked socio-economic structure which is firmly rooted around kinship ties (Flannery 1972). The ranked hierarchical structure in chiefdoms flows in a steady gradient away from the highest status individual (the chief), encompassing increasingly more of the population with each kinship step down until the entire population is connected in a series of small links or steps. The ranked system may be pictured as an increasing exponential graph with the chief at one end with very few others. The poorest farmers, with very diluted connection to the elites, sit at the opposite end where many people are ranked (Figure 3.1).

The relational nature of a ranked system prohibits the formation of large breaks or distinct, stand-alone groups within the society. The manner in which each rank is connected to the one above and below by a small kinship link effectively prevents segmentation or stratification within the society (Service 1962). The lack of segmented groups is also fuelled by an absence of full-time specialists in chiefdoms (Wright 1984). Flannery (1972) states that, despite increasing trade and production in chiefdoms, no classes of specialised craftsmen or occupational groups appear because the individuals carrying out these roles are still required to function as farmers as well. Specialised crafts such as metalworking must occur around the demands of agricultural duties rather than in place of them. This creates relational connections between part-time specialists and full-time agriculturalists ensuring a gradual economic transition between farmers and craftsmen rather than a sharp border.

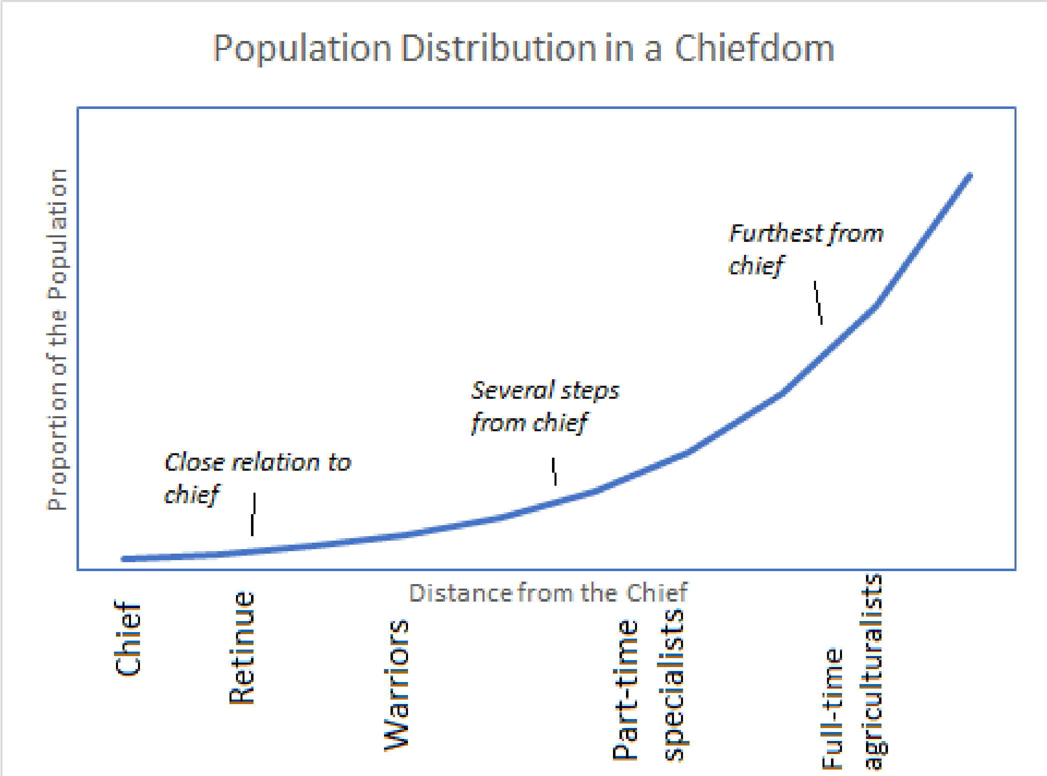

Figure 3.1 Visual representation of the population breakdown in the ranked structure of a chiefdom.

One of the major questions of the past decades has been attempting to understand the evolutionary process of emerging chiefdoms and particularly how chiefs gained hierarchical power coming out of a non-hierarchical tribal setting (Flannery 1972; Earle 1991; Turchin & Gavrilets 2009). Earle (1991) lists ten strategies which have been widely accepted as some of the main ways in which chiefs gain and maintain power. It is unlikely that all these will be present in every chiefdom, and the manner in which each chief used such strategies is likely to vary between cultures.

1. Gifts, including holding community feasts and providing prestation
2. Building and improving local infrastructure
3. Encouraging circumscription
4. Applying force
5. Generating external ties and contacts

6. Expanding the control of the chiefdom (over new areas and people)
7. Utilising existing sources of legitimacy (such as ancestors, and land ties)
8. Creating new rules of legitimacy
9. Controlling the distribution of wealth
10. Controlling sources of external wealth (such as trade, and raiding)

Many of these strategies are difficult to trace archaeologically, however, several points may be potentially identified in Northeast Thailand and Central-Northwest Cambodia during the Iron Age. The construction of encircling moats during the early first millennium CE (McGrath & Boyd 2001), particularly in Northeast Thailand, certainly represents large-scale infrastructure projects (strategy two). The moats may have served primarily as reservoirs to protect against droughts and flooding in the highly variable hydrological environment of the Mun and Chi flood plains (Scott & O'Reilly 2015). O'Reilly (2014) has suggested that the construction of the moats could have been part of a strategy to increase the power of local elites in an increasing hierarchical structure by controlling the supply of water. Whatever the motivation, construction of the sizeable earthworks certainly demonstrates an ability to harness and direct a large workforce (Higham 2011b; O'Reilly 2014).

The degree to which village boundaries (strategy three) could be delimited no doubt was linked to the local environment and so would have been highly variable. In terms of living space, the mounded area of the village as the established design out of the Bronze Age, forms a clear perimeter. With the construction of encircling moats this boundary would only have become more defined. The extent of agricultural lands and strategic resources outside the mound is harder to trace, though probably followed local geological and topographical markers such as hills and rivers.

External ties (strategy five) are visible even earlier in the Bronze Age through trade networks. Copper and tin were likely sourced from the Chao Praya valley in Central Thailand or possibly from Laos (Pryce et al. 2017) and demonstrate significant regional trade and contact. Production of bronze, meanwhile, appears to have occurred at the household level (Bennett 1988), indicating a spread not just of items, but technologies and specialist knowledge of the casting process through all villages. Evidence for external contact increases in the Iron Age as glass beads from India appear in large quantities and bronze becomes common as an ornamental metal (Carter 2015).

Strategies nine and ten focus on the nodal role of the chief as a so called 'tribal banker' (Earle 1991). Effectively, a chief maintains power over the entire society's production by ensuring the distribution of surplus food and goods, whether internally or externally derived, flows directly through them (Wright 1984). While not necessarily archaeologically visible, this system creates and maintains strong kinship rungs as those closer to the chief naturally receive greater allocations of goods compared to those increasingly further away.

Those of Earle's (1991) listed strategies for transforming and maintaining a chiefdom out of a tribal setting that are archaeologically visible appear to begin appearing in the Bronze Age or early Iron Age at the latest. This aligns with the typical, long-held consensus among Southeast Asian archaeologists that chiefdoms appear around the transition to the Iron Age in the mid first millennium BC (Higham and Kijngam 1984; Moore 1988; Welch and McNeill 1991). It is therefore reasonable to focus on identifying chiefdom versus state markers in Northeast Thailand and Central-Northwest Cambodia as the more likely point of difference between the two regions (compared to a chiefdom versus tribe).

A final factor of chiefdoms worth noting here is a degree of centralisation that is absent in less complex social systems. Earle (1991) states that the role of chief has often been viewed by anthropologists as almost a type of glorified tribal banker, responsible for managing the population's wealth and goods to ensure a strong economy and supply for all members. This is in part driven by the need to ensure the entire community benefits from the goods produced by local part-time specialisation in the absence of markets (which typically do not appear until state formation) (Service 1962). However, Earle (1991) notes that this centralisation is often unstable and cyclic in chiefdoms. While the power of a chief remains strong, centralisation is maintained. Yet at the end of the chief's reign political centralisation often fails without the nodal person to keep the system together. Centralisation later returns, beginning a fresh cycle, as a new chief emerges and establishes themselves (Earle 1991).

States

States represent the most complex level of socio-political organisation identified by Service (1962). Increases in agricultural output, craft specialisations, and an ever-expanding list of industries drive complexity in the makeup of societies to the point that states may incorporate countless different groups of highly specialised individuals (Flannery 1972). However, a brief study of statehood, just as chiefdoms, reveals considerable variability from region to region and state to state (Smith 2004). While modern states may certainly display high levels of diversification, burgeoning states may share many characteristics in common with chiefdoms and contain only a few distinct segments. It may therefore be unreasonable to characterise a socio-political system as a state, even though it exhibits greater complexity than expected in a chiefdom. The following section provides a discussion of the main characteristics of states as well as current anthropological theories for the factors which drive the transition from chiefdom to state.

States, like chiefdoms, are hierarchically based social systems which organise large groups of people according to vertical status. It is the manner by which this is achieved that markedly differentiates states and chiefdoms, transitioning from kinship and charismatic bonds to bureaucratic systems of organisation (Claessen 1978; Kristiansen 1991). Increases in complexity which are fuelled by many different industries and communities in a state effectively overwhelms the capacity of the gradual, ranked hierarchy which links each rung closely to the ones above and below (Flannery 1972; Redmond & Spencer 2012). Instead populations within a state are sorted according to distinct groups in a stratified hierarchy (Service 1962; Carmichael 1995).

This segmented arrangement does not apply only to wealth and status but also spheres of interaction. Where the ranked chiefdom system requires close interaction and relational bonds between individuals at neighbouring status rungs, groupings in a stratified society are typically more insular. Flannery (1972) notes that the residential pattern in states is more often based on occupational specialisation than kinship bonds. Many older cities around the world still bear the evidence of such urban patterns in the names of districts which harken back to the original trades and inhabitants of the suburbs (such as the Lambeth district in London which was used as a landing place for lambs during the eleventh century CE (Hooke 2007)) (Smith 2010; Mills 2011).

Tying together the population of many diverse groups requires the emergence of bureaucracy and middle managers (Carmichael 1995; Smith 2004). The level of diversity in industrial sectors, as well as general population size, can theoretically grow indefinitely under a state system so long as it is possible to add a bureaucratic level to deal with increasing complexity (Turchin & Gavrilets 2009). A state relies on bureaucratic agency in which each member is required only to have a relationship with n+1, where n is the maximum number of subordinates directly under them and the additional 1 is the link to an immediate superior (Turchin & Gavrilets 2009). As the population grows or an industry develops a sub-branch, the state must naturally develop an additional stratification level or tier to deal with the increased complexity. Thereby the initial group of subordinates is split into multiple sub-groups, each with a bureaucratic level (Figure 3.2). This process may be continuously repeated as populations grow, creating an extremely complex, many-tiered socio-economic system. This is the case of most modern states, which delegate authority from federal, to state, to local governments and councils in order to effectively manage the many different groups and occupations co-existing in modern societies. However not all states achieve or require such complexity, particularly when dealing with past societies (Smith 2004).

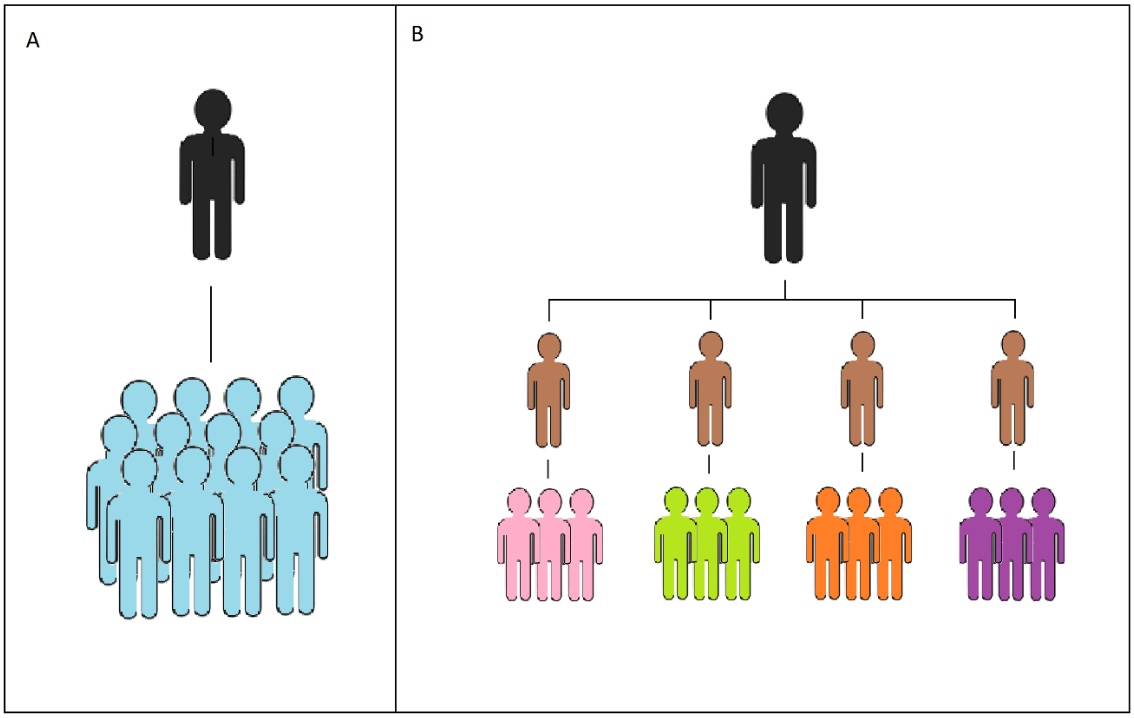

Figure 3.2 Illustration of segmenting the population into groups and tiers in a stratified social system. A. the basic power relationship in a state with a person/group of people with power over (and responsible for) a distinct group of subordinate people. B. As the subordinate group either grows too large or develops multiple industry pathways it becomes unmanageable for the limited superiors to continue overseeing. The result is the subordinate group breaks into smaller, more specialised subgroups, each managed by its own overseer/s. These middlemen then report to the ultimate superior.

At its most basic, a state need only contain a minimum of three tiers: Elites, specialists, and commoners/farmers (Flannery 1972; Smith 2010). Isla and Reindel (2006) have argued that the

Nasca culture (200 BCE – 600 CE) in Peru was a primitive state rather than a series of chiefdoms. The researchers describe three levels of mortuary wealth and status in tombs through the Nasca region. At the necropolis site of La Muna the tombs and grave goods demonstrated far greater effort and prestige value than even high-status burials elsewhere in the Nasca region. Reindel and Isla (2001) suggest the La Muna necropolis could have been an exclusive site for the interment of state rulers. A second tier of regional leaders may be discerned in high status burials (though well below the level of the La Muna interments) within poorer populations which make up the final, third level of the socio-economic landscape (Isla & Reindel 2006).

Identifying the transition from chiefdom to early state, however is incredibly difficult as characteristic markers of states do not necessarily appear all at the same time, if at all, blurring the lines between primitive or proto- state and chiefdom. Smith (2004: 80) puts it thus: '*the economies of chiefdoms can be quite difficult to distinguish – conceptually and empirically – from those of weak states'*. The presence of economically stratified tiers in the mortuary data should not be considered as the sole source of information in determining between states and chiefdoms.

Several other important markers of statehood (Service 1962) have been previously identified which must be considered. One of the major distinctions between chiefdoms and states on a regional scale is the presence of permanent urban centres and a high level of centralisation in states (Service 1962). Because states, unlike any other social system, only have a certain portion of the population engaged in agriculture and food production (Flannery 1972), towns and cities within a state are able to develop unique characteristics.

As an example of centralisation, one may consider a hypothetical, specialised district. Two towns within the province may be mainly agriculturally focussed and produce enough surplus to provide not only for their own needs, but also several other towns. The populations who benefit from not needing to produce their own food are able to participate in other industries, such as metalworking or ceramic production, on a full-time basis (Turchin & Gavrilets 2009). The goods produced in these towns may be traded for food from farmers and the raw materials required for their industries from other, mining focused settlements. However, the raw material produced in mining villages is not in and of itself useful for the agriculturalists and so would not entice large-scale trade between the mining and farming settlements that would be required to feed the mining population. It therefore becomes highly advantageous to have markets, with some form of monetary trade in place of simpler bartering (Flannery 1972).

At these markets, most likely located in the industrial city as a nodal point in the regional system, miners can exchange raw material for a form of currency with which to purchase food. All this effectively creates a complex system with all branches of industry and production flowing through a central city for the district. Over time, bureaucrats and regional elites will be charged with maintaining the system and paying tribute in order for the state capital to effectively tax the wealth of the province (Flannery 1972). In this example the agricultural and mining settlements are periphery or satellite production towns around a regional capital, which itself is periphery to the state capital where the ruling elites reside. Depending on the size and complexity of the state, there may be several levels of centrality, such as the state capital, regional capitals, and small villages in descending order of size and power.

One final often-cited aspect of states worth noting is the ability to wage war and maintain an army (Flannery 1972; Cohen 1981; Cohen 1985). While warfare is not solely the domain of states, Carneiro (1970) argues that large scale, organised violence is a 'prime mover' in the formation of states and that no early states can exist without war. While chiefdoms and other less complex social systems may certainly engage in battles or raiding skirmishes, the kinship and charismatic bonds that link those groups together do not lend themselves to consistent conflicts as in a state (Service 1962; Cohen 1985). Regular conflict on a large scale requires laws and the social contract of states to draft citizens into a soldier levy (Sanders & Marino 1970; Flannery 1972). Once raised, it is also necessary to have the means of feeding and maintaining an army over a campaign season. The benefits of a victorious campaign can provide significant economic stimulus into a state. Assuming success, wars may result in new income in the form of tribute from subjugated neighbours, territorial expansion and potentially access to desirable resources, loot, and slaves (Carneiro 1970). It is hardly surprising then, given the potential positives, that many states and rulers venerate successful military campaigns with public works and celebrations, furthering the connection of statehood to warfare.

The above traits are among the most commonly sought characteristics of state socio-political systems. The understanding provided here of the implications of stratified distribution of wealth, centralisation of control over large areas, and the existence of markets and warfare will be crucial in classifying the level of social complexity across Northeast Thailand and Central-Northwest Cambodia.

Summary

Studying specific aspects of the archaeological record has the potential to reveal information on the level of social complexity operating the past. In 1962 Elman Service outlined four types of social systems which cultures may fall into. Bands, tribes, chiefdoms, and states all have their own set of markers through unique ways of operating and organising populations. The review here has focussed on distinguishing between chiefdoms and states. Of particular importance is the socio-economic differentiation in ranked versus stratified societies. The outlined differences between these systems and how they may appear in the archaeological record will be vital to the aims of this project in identifying and explaining differences in the social organisation of Northeast Thailand and Central-Northwest Cambodia during the late Iron Age.

Conclusion

The theoretical frameworks covered in this chapter have outlined the major issues faced in this thesis. As the main point of data and discussion in this project, it is important to understand not only the potential benefits and applications of mortuary assemblages to the reconstruction of past social systems, but also how cultural views of death and the afterlife may affect the funerary record. While Binford's (1971) seminal paper on the subject which proportionally linked burial wealth to status in life certainly inspired many of the following archaeological examinations of cemetery populations, it is also important to consider potential social influences on the interment of burial goods. Issues discussed include the potential for the living to influence the funerary context through gifted items and displays of power, while certain artefacts may have included an inherent social meaning.

Wealth is clearly a loaded term carrying numerous potential implications and possible bias points. For the work conducted in this thesis, wealth refers results from the application of Alekshin's (1983) model for quantifying mortuary assemblages. Using this three-layered approach to defining mortuary wealth, assemblage size is considered as the first indicator, with larger assemblages considered wealthier than those of relative sparsity. The range of artefacts within each assemblage then provides an additional test of wealth, with more variety theorised to reflect a greater ability to access different resources during life. The final indicator used in assessing wealth in burials is the types of materials present in an assemblage, with precious and semi-precious materials that occur relatively infrequent at a particular site given the greatest weight in determining increased wealth.

Following the discussion of mortuary frameworks, an overview of established models for the socio-political organisation of human communities was presented (Service 1962). The question of potential variability of increases in social complexity in Northeast Thailand and Central-Northwest Cambodia during the late prehistory is best framed by determining how these regions compare with chiefdom and state models. Chiefdoms are characterised by many small, relational links that connect the population in a ranked hierarchy. In this system, the chief and their immediate retinue appear in the top ranks while increasing proportions of the remaining population is then connected on the basis of steps away from the chief. This relational system precludes distinct divisions within the population as each group is connected with the one above and below. States, conversely, operate by a bureaucratic organisational system to deal with the increases in complexity and emergence of full-time specialists. This leads to a tiered economy with groups kept distinct from others. While these models provide useful markers of increasing socio-political complexity, there is little allowance in the models for transitional systems and groups somewhere between chiefdom and state organisation. It may therefore be unreasonable to label such a system as either one or the other. The theoretical models and issues in analysing mortuary contexts and past social systems presented in this chapter will be applied to the analysis and discussion of burial assemblages for prehistoric sites in Northeast Thailand and Central-Northwest Cambodia.

Chapter 4 Methodology for Data Collection: fieldwork and data-processing

This chapter documents the data gathering and processing methods undertaken as part of this thesis. The four prehistoric sites that supply the mortuary data for this study: Phum Sophy, Phum Lovea, Prei Khmeng, and Non Ban Jak, were all excavated prior to this project commencing, which allowed the fieldwork conducted here to focus strictly on the examination and analysis of the recovered artefacts. In the case of Non Ban Jak in the Mun Valley, excavation of the site remained on-going, with a further season planned at the time of data collection. The excavated mortuary artefacts from these four sites were examined, cleaned, measured, and photographed for entry into a database. Following the data collection, initial post-processing centred on organisation of the information into a format conducive to the identification of divergent inter- and intra-site burial practices. I was present as a member of the team for the excavation of Prei Khmeng in 2014 (O'Reilly et al. 2014) and spent time at Non Ban Jak (Higham et al. 2014; pers comm) while a team was excavating in early 2016 under Higham. For Phum Sophy and Phum Lovea the site reports (O'Reilly et al. 2015; O'Reilly et al. 2013) and associated documents along with personal correspondence with lead excavator O'Reilly, were relied upon to understand the site morphology. Site reports and original burial drawings were also used to provide details of individual burials to accompany the artefact data.

The fieldwork and data collection were conducted in conjunction with Tse Siang Lim, a PhD student at the Australian National University. Lim's project focussed on the ceramic assemblages of the same prehistoric burial sites. We therefore agreed to share our data to enable a stronger, more detailed catalogue of all burial artefacts, ceramic and non-ceramic from the four sites.

In order to address issues of sample size, supplementary data were sought from previously excavated and reported Iron Age sites in Northeast Thailand. Noen U-Loke was selected for its large Iron Age mortuary population while Ban Non Wat provides a chronological perspective with continuous occupation from in the Neolithic of the Mun Valley (Higham et al. 2007; Higham & Kijngam 2012). All information regarding artefacts and burials for these two sites was attained through the published site reports as it was not feasible to examine the assemblages. The data from these supplementary sites are therefore not as detailed as the published evidence typically only contains a count of artefacts per burial context without measurements or description for individual items. These supplementary data were processed to allow analysis of differences in burial assemblages similar to that applied to the collections from the other sites in this study.

As an additional method of documenting artefacts, photogrammetry was employed to create three-dimensional digital models of selected objects in accordance with aim four of this project: the creation of a morphological typology for Iron Age circlets. This procedure is still in its infancy, and as such, much of the methodology, particularly regarding photo-capture in the field, was developed experimentally through this project. It is suggested that the final methodology achieved may serve as a guide to best practice for the modelling of small artefacts such as bangles and rings.

Fieldwork

The collections from Phum Sophy, Phum Lovea, Prei Khmeng and Non Ban Jak were examined and recorded in a comprehensive catalogue featuring quantitative and qualitative descriptive aspects for each artefact. The goal of the fieldwork was to collect as much information as possible within the time constraints to cover not only the requirements for this project, but also any possible future analysis.

An initial visual examination identified the artefact and material type and also determined whether cleaning was required (removing adhering soil) before measurements and photographs could be taken. At the time of fieldwork, the majority of artefacts from Cambodian sites were housed at the University of Sydney's Robert Christie Research Centre (RCRC) in Siem Reap prior to being returned to the Cambodian Government. These artefacts, along with all skeletal remains, have since been returned to the curatorship of their respective Governmental authorities. As part of an initiative between the excavation team at Phum Sophy and Cambodian government, several artefacts from burial assemblages are stored in the Banteay Meanchey Provincial Museum in Sisophon. Permission was obtained from the Cambodian Ministry of Culture and Fine Arts to access these materials, unfortunately only a portion were accessible due to storage arrangements at the museum. At the time of fieldwork in Northeast Thailand, The Non Ban Jak collection were housed in Phimai under the supervision of Dr Thosarat.

Following the recording of measurements and descriptions of all artefacts in a burial assemblage, photographs were taken for 3D modelling of those artefacts that were deemed suitable. The criteria for selection required the object to be intact enough to evaluate its morphological features in order to develop a typology. To this end most of the selected objects were bangles or rings. Several non-circlet objects were also selected, often due to a specific feature which could not be adequately depicted in a standard photograph.

Artefact Cleaning

Upon viewing the Cambodian collection, it was clear that soil and clay adhesion, especially where present in thick layers, was a major issue for accurate data collection. The clay interfered with accurate descriptions of surface morphologies and had the potential to obscure important distinctive features. In certain cases of particularly thick accretion, the matrix was even found to contain smaller artefacts such as glass beads. Broadly, the soil removal process was divided by material, with metals, corrosive, or soluble objects being dry treated and non-soluble or corrosive material such as ceramic, glass, stone and shell cleaned with the use of water. During both sets of procedures latex gloves were worn while cleaning.

Metals

Concreted soil was removed as gently as possible using bamboo scrapers and toothpicks. By using these tools in place of heavier-duty metal scrapers a better feel was achieved to minimise the risk of damaging the artefact. The remaining loose soil was removed with brushes. In some cases, these two steps were repeated on objects with thick crusted layers of clay.

Where objects such as beads and ceramic sherds were held loosely or just attached with clay to another artefact it was deemed safe to separate the artefacts. In this case a new catalogue (CAT) number was assigned to the attached artefact with a note being made of its provenance associated with the metal object. However, where the objects were fused together (this applied to many metal artefacts, especially bronze bangles and rings where it was customary to find multiple worn on a single limb) no attempt was made to separate the artefacts for risk of damaging one or both items in the process. For these cases a single entry was made in the database with a note stating the number and different types of artefacts contained within that catalogue item.

Non-soluble or Corrosive Materials

For materials not adversely affected by water, the adhering soil was removed by brushing with a toothbrush under the application of water. This was conducted over a bucket (or small bowl in the case of beads) with the removed soil in the bucket or bowl sifted for any small artefacts in order to avoid any accidental loss of material in the cleaning process. The artefacts where then left to air dry before any recording.

The excavation and post-excavation practices in place during the excavation of Non Ban Jak, meant that the Thai collection was already adequately cleaned so that the above steps were not required.

Artefact Recording

After cleaning each artefact was entered into a spreadsheet of raw data along with the provenance. Each entry included measurements and a qualitative description, photographs, and, where necessary, drawings.

Measurements

The following variables were recorded for each artefact: key dimensions and weight (Table 4.1), colour, typology (where known), and number of individual artefacts (where more than a single artefact per catalogued item number). In cases where a catalogue entry covered multiple objects these were each recorded individually in a separate spreadsheet. In many cases the typology was left blank or only preliminarily ascribed pending further analysis of forms utilising 3D modelling. This particularly applies to circlets as the typology was formed as an ongoing process throughout the project. As the data span several excavations and catalogue numbers are therefore repeated between sites, a unique identification number was assigned to each artefact.

Table 4.1 Field Equipment

EQUIPMENT	RANGE	ERROR	USE
Digital Vernier Caliper	0.01-189.75 mm	±0.005 mm	Main measuring tool used for all artefacts
Digital Outside Calipers	0.1-238.1 mm	±0.05 mm	Main tool for measuring larger objects
Measuring Tape	0-2000 mm	±0.5 mm	For measuring objects greater than 239 mm
Kitchen Scales	0-5000 g	±0.5 g	For measuring weight of artefacts
Magnifying Glass	n/a	n/a	For examining beads and small details on larger artefacts

Accessibility issues regarding a small number of artefacts (particularly those stored in non-accessible cases in the Banteay Meanchey Museum) meant that traditional measurements could not be taken. Rather than ignoring these artefacts and potentially creating false trends in the burial data, supplementary readings were taken from existing photographs (all artefacts having been photographed with a scale prior to being sent for storage or restoration). The estimation of size and width was recorded in the database with a note stating that these were based on a photograph and as a result have a much higher inbuilt error.

Photography

After cleaning and measuring, each artefact was photographed on a white background. A minimum of two pictures were taken for each catalogue entry: 1 including details of the provenance and catalogue number, and at least one just focussed on the artefact. In cases where artefacts showed particular points of interest (e.g. fused rice husks, evidence of hafting, bamboo sheath remains, etc.) detailed photos were taken using a macro lens. A photo scale was included in all photographs. As poor lighting was frequently an issue, a number of photographs were brightened using Adobe Photoshop CC. In each case care was taken to ensure colour aspects of the artefact remained true to life.

Drawing

In addition to photographing, several artefacts were also hand drawn at a 1:1 scale. Due to the time-consuming nature of this practice, only objects with features that could not be properly illustrated in a two-dimensional photograph were drawn. It was through this process that the need for a three-dimensional virtual library was identified.

Three-Dimensional Modelling of Artefacts

After traditional recording and data entry of the burial assemblages, a selection of artefacts was chosen for three-dimensional (3D) digital modelling utilising photogrammetry. Photogrammetry remains a relatively new technique whereby a digital replica of an object is produced from a series of photographs. The potential benefits of digitising artefacts in 3D are numerous.

The process effectively preserves a copy of the artefact in its present state for as long as the digital record remains. This may potentially serve as an additional conservation procedure for regions such as Southeast Asia and the Pacific where high levels of humidity breakdown metal objects at an accelerated rate.

In terms of research benefits, the unrivalled ability to manipulate digital models is perfect for morphological analyses in particular. Replicas may be sliced along cross-sectional planes to allow clear examination of artefact shapes, fused artefacts can be separated digitally for individual examination, and post-depositional breaks and concretion smoothed (Agisoft LLC). If desired the models can even be printed to scale and painted to give an approximate physical replica of the artefact before it was buried.

Creating a library of 3D models also greatly increases the potential for archaeologists to share and attain information and data. Often it can prove difficult for researchers to access material vital for their study as it is stored half a world away and requires written permission from a governing body, a process that can easily take several months and still be declined. An online database of three- dimensional models could provide researchers and educators with instant access to all the information they require. Similar online databases have been set up in recent years (e.g. The Institute for Southeast Asian Archaeology (ISEAA) Digital Database) however are limited in their functionality by only containing 2D photographs.

While the potential to create 3D models of artefacts has been technologically possible for several years, to date this has relied on the use of expensive and cumbersome laser scanners (i.e. Bruno et al. 2010; Arayici 2007). For archaeologists working in the field, and often with limited budget, such technology remains out of reach. The result has been very little uptake in this promising tool in archaeology world-wide and in Southeast Asia in particular. The relatively low cost and high portability of photogrammetry has far greater potential impact in archaeology.

The majority of artefacts selected for digital modelling were restricted to bangles and rings in keeping with the aim of creating a typology for circlets. Due to time constraints, only artefacts that were complete or mostly intact were selected. Photogrammetry was also applied to a small number of other artefacts with interesting features such as iron knives with the fused remains of rice husks and woven bamboo marks. The nature of introducing such a new technique into the field necessitated a large degree of experimentation in the photo-acquisition process. As a result, the process and equipment used varied considerably between the 2015 and 2016 data collection seasons. While the methods used for both seasons are recorded in Appendix 4, it is strongly recommended that the later method (2016) represents the current best-practice for three-dimensional capturing of small artefacts while on location. This methodology will no doubt continue to be refined as further work is conducted utilising photogrammetry on small artefacts in the field.

Artefact Storage

Once documentation and recording of artefacts was complete they were returned to their original storage arrangements established by the original excavation teams. Typically, this involved bubble-wrap or similar inside a clear, sealed, plastic bag labelled with the artefact's catalogue number and provenance. Additional protective padding was added where necessary for particularly fragile items. Since completion of fieldwork, the collections from Phum Sophy, Phum Lovea, and Prei Khmeng have been returned to the Cambodian government.

Data Processing (post-fieldwork)

The raw data obtained from the fieldwork had to be cleaned and processed into a coherent layout conducive for quality research. This applied to both the spreadsheet of artefact measurements and details, and the vast number of photographs taken for photogrammetry.

Processing the Raw Data

Data on each artefact were initially recorded in a single database organized by identification (ID) numbers covering all artefacts and material types. Upon returning from the field additional information regarding the provenance and position within burials was added to this database from the site reports and drawings. While the field database was optimal for quickly recording artefacts by catalogue or identification numbers, it does not provide ease of examination or analysis of patterns over the entire collection. In order to rectify this, a series of new spreadsheets were produced to make the processed information more readily useable.

Two spreadsheets were produced with the explicit aim of quickly identifying any deviations in the funerary expression which may reflect variance in socio-economic settings at both inter- and intra- site levels. This would provide a guide for the direction of more in-depth analysis of the mortuary record across Central-Northwest Cambodia and Northeast Thailand. The data was organised to provide a breakdown of the items per burial. Rather than an entry for every artefact a tally was produced for each of the more common objects (appendix one). Available information on sex, age, and date of burials was also included in the table. This provides an excellent database for quickly and efficiently automating the extraction of information as required. For example, if at any point it was important to count the number of female burials that included bronze bells at a particular site/s, a command entry can instantly access and display the information. The automated process also eliminates the potential for miscounts when dealing with over two hundred burials and thousands of artefacts (including the supplementary data sites).

A second database tallied artefacts by cemetery site, mapping the distribution of artefacts by age, sex and relative wealth at each site. This database served as a very useful analytical tool for this project as it allowed for qualitative, visual examination of trends and patterns in artefact distribution by these key variables (age, sex and wealth. A simple test, for example, might be to examine the proportion of subadults vs adult individuals buried with iron knives at Prei Khmeng. If any trends were identified at one site, then it was a simple matter to see if this was also the case in other populations, or if the pattern was unique to a single village.

These two cleaned and processed databases presented a good starting point for the initial investigation into funerary differences and what they may comment on social and political differences operating in the Iron Age. The second database in particular was used as the basis for the regional databases used in the results section.

Three-Dimensional Modelling

As with the traditional data, the two-dimensional photographs were also addressed in the post-fieldwork processing. Each series of photographs capturing a single artefact was imported into a photogrammetry program to create a digital 3D model. The workflow for this processing is recorded in Appendix 4. Over 100 artefacts were subject to modelling, with varying results based largely upon lighting levels and even photo positioning. As a result the 2016 produced more top-quality models, however a number of the 2015 season attempts fashioned satisfactory final products. The final models from both seasons aided in examining morphological features of circlets to create the morphological typology. Creating an online portal or database where researchers may access both videos and models is a potential next step after this project which could revolutionise how archaeological knowledge is shared.

Data Management

In order to sort the data into manageable variables it was necessary to create categories for age and wealth. These categories, along with sex, are integral in any attempt to elucidate social and economic patterns in past cultures and are therefore key points of interest in this project. The sex of the interred individuals had previously been identified by the excavation teams at each site as male, female, or unknown (for juveniles or adult skeletons without the necessary preservation to allow for identification). As there was no reason to suggest these assignments were incorrect they have been accepted for this project. Similarly, the initial excavations also assigned an age to the individuals (O'Reilly et al. 2013; 2014; 2015; Higham et al. 2014). However different measures or cut-offs between age groups were employed by the different teams in their reports, so it was necessary to merge these together in a new classification system. As covered in the mortuary theory section of chapter three, the wealth variable is perhaps the most relevant in terms of economic differentiation within sites. It is also the least readily definable. For close to a century, numerous ideas have been put forth regarding how wealth and status of individuals should be measured, and whether it is even reasonable to do so (Bendann 1930; Kruglov & Podgaetskii 1935; Kurochkin 1970; Binford 1971; Renfrew 1972; Alekshin 1983; Barretto-Tesoro 2003). From the review of mortuary literature in chapter three, a method was adopted for this project to provide a standardised wealth score which allowed amalgamation of intra-site data.

Age

Producing a cohesive system of categorising age-at-death for individuals across the sites used in this study (including the supplementary data from the published report of Noun U-Loke) presented an unexpected challenge. The different reports, excavation teams, and bioanthropologists working on the assemblages each employed their own method for recording and categorising age ranges. While these are reasonably consistent, even small differences in age boundaries create difficulties in accurately merging datasets. This is compounded by several reports recording age in categories (i.e. adolescent, middle-adult, etc) which are not linked to a data key for translation to an estimated age at death in years. In many cases this is likely due to issues of poor preservation of skeletal remains which made estimating age beyond broad categories impossible.

Despite these issues, it was vital to have comparable age data across sites in order for any useful analysis of intra-site diversity. Therefore, six broad categories were established (with a seventh for unknown) for this project (Table 4.2 Age categories). It is likely that there is some overlap and perhaps erroneous categorisation in these age groups resulting from importing and merging age data that used different categories. It is important to state that any errors are my own and not the fault of mis-categorisation by the initial excavation teams.

Table 4.2 Age categories

AGE CATEGORY	ESTIMATED AGE AT DEATH
Infant	pre-term – c. 1 yr. old
Child	c. 1 yr. – c. 12 yrs.
Subadult	c. 13 yrs. – c. 15 yrs.
Young Adult	c. 15 yrs. – c. 20 yrs.
Adult	c. 21 yrs. - mid 30's
Middle-aged	mid 30's – c. 40 yrs.
Elderly	c. 40 yrs. +

Wealth

Burial wealth is a medium employed to one degree or another in almost all mortuary analyses of the last half century (Binford 1971; Parker Pearson 1999; Barretto-Tesoro 2003). Just as societies, cultures, and funerary rituals vary to an incredible degree globally, as do the methods that have been employed to judge the wealth of individuals. Wealth is often used as a proxy indicator of status, with the general sentiment that greater burial wealth is proportional to greater higher social status (Binford 1971; Saxe 1971; Alekshin 1983). It is important to note that this does not hold true universally as cultural and ritual practices obscure such clean-cut links (Hodder 1980; Parker Pearson 1982). Unsurprisingly, this field of study has generated a large amount of literature debating different systems for assessing wealth. Unfortunately, it is difficult to find a method which is universally applicable or accepted. The primary method selected for this study employs a count of all artefacts per burial as the central mode of determining wealth (Alekshin 1983). This was reinforced by analysis of the different types of artefacts present in assemblages, as well variances in materials included in mortuary contexts.

All burials at each site (including the supplementary data from Noen U-Loke and Ban Non Wat) were listed with a count of artefacts found within the interment. This included ceramics, jewellery, tools, and animal bones (where the excavation team believed their presence in the grave was deliberate). Each artefact was weighted equally e.g. a single ceramic vessel was counted the same as a bronze bangle or animal remains. Groups of beads were counted as one item per context so that, for instance, a necklace with 200 glass beads is considered a single artefact. This ensured that beads did not skew the data by the sheer number of beads which are of minimal individual significance (Frieman 2012).

The method of judging burial wealth by a count of artefacts provides a basic overview of cemetery wealth at a single site. However, it does not allow any comparison between individuals across different sites. This is because each site in the study contained different standards of wealth. Phum Sophy contains by far the richest mortuary assemblages found in the Cambodian sites, while at Non Ban Jak individuals average far fewer artefacts per burial. If mere artefact counts were compared between these two sites for example, a person from Non Ban Jak who was locally reasonably wealthy would likely register below average wealth at Phum Sophy. While this might be a reasonable analysis if all the sites were considered of equal status, this is unlikely to be the case. Additionally, numerous studies have illustrated the potential for different imbued meanings and wealth in assemblages and artefacts across different mortuary sites (Alekshin 1983; Kamp 1998; Williams 2007). Therefore, to compare assemblages associated with similar economic status across sites it was necessary to produce a relative wealth score.

To generate relative wealth values, Z scores measuring the standard deviation (σ) away from the local (site) mean (μ) were calculated for each burial (Drennan 2004). In this way a value was produced to reflect how far from the site average an individual assemblage was (either poorer with a negative value or wealthier with a positive value). The standardised score (z score) for a single burial is calculated through subtracting the μ from the real value for an individual (in this case the number of artefacts in the assemblage) and dividing by the σ (Drennan 2004). This provides a relative score for burial wealth based on the spread of assemblage sizes across a cemetery. In normally distributed data c. 68% of individuals would be expected to fit one σ either side of the mean (Wheeler and Chambers 1992).

The z scores were categorised into segments of a quarter of a standard deviation for values between a single σ below and one σ above than the mean. Outside of that range the categories were expanded as fewer individuals fell within these brackets. Table 4.3 outlines the categories employed for this study. This process was applied to each site separately so that the standardized value of each mortuary context is relative to its place within its own cemetery. By standardised the values of burial wealth by each site, this method allows for comparison of relative wealth standings between cemeteries. Once relative wealth values were calculated at each site, the data were then merged to compare trends in burials of the same relative wealth across multiple sites.

Table 4.3 Wealth categories

Standard deviation from mean
<-1
-1 - -0.75
-0.75 - -0.5
-0.5 - -0.25
-0.25 - 0
0 - 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1
1-2
2-3
3<

Issues around terminology

It is also important, after considering the methodology for quantifying wealth, to discuss the meaning of terms such as 'wealthy' and 'poor', as used in this thesis. There are obvious and immediate issues when referring to wealthy and poor individuals and groups in a non-monetary society. This brings to the fore legitimate questions of what defines wealth, and whether it can be truly defined by a collection or accumulation of things. In some societies this may applicable, in others wealth may be defined in more abstract measures which elude archaeological investigations. Ultimately the reasons for determining and quantifying wealth as conducted in this thesis have been outlined above in Chapter 3. The terms wealthy and poor are therefore used here strictly in relation to the relative abundance, or lack thereof, of grave goods. While there may be some assumed correlation of wealth to status, such relationships are considerably more difficult to measure, and are not necessarily proportional (see the discussion of interpretative problems in Chapter 3).

Conclusion

The methodology implemented in this project for the collection and processing of data from Phum Sophy, Phum Lovea, Prei Khmeng, and Non Ban Jak was designed to gather all necessary information for a detailed study of social trends apparent in the mortuary assemblage, as well as providing scope for any future research requirements. A balance between maximum efficiency and speed while maintaining accuracy and precision was imperative to ensure all field work was completed in the allotted time. All artefacts from the four primary data sites were visually examined and cleaned as required prior to recording. Quantitative measurements were then logged for the dimensions of each artefact as well as photographing and, in a small number of cases, scale drawings. The raw data recorded in the field were processed to allow meaningful examination of inter and intra-site trends. This included inputting information on age-at-death, sex, and the position of artefacts within burials.

After cleaning, burial data from each site were organised according to burial, with the number of artefacts of different types calculated for each individual mortuary context. This data was utilised to produce a standardised z-score reflecting the size of a burial assemblage in relation to the site mean. The standardised nature of the z-scores allows for the comparison of population distribution data between sites without issues of varied local abundance interfering with the analysis.

In addition to traditional recording processes photogrammetry was employed to digitally replicate artefacts. Photos taken in a 360-degree orbit around artefacts were converted into virtual models during post-field processing. A considerable degree of experimentation was required to determine optimum procedures for the capturing for small objects in the field. As a result, the methodology employed for photo capturing of the Non Ban Jak collection is vastly different than that employed in the earlier Cambodian field season. It is strongly suggested that the later method represents a more-successful approach for modelling small artefacts. The two approaches to data gathering employed by this project, database entry and 3D modelling, work together to provide quantitative information for a wide range of analyses as well as digital models of bronze circlets perfect for morphological studies. The use of both these data in tandem will provide an unprecedented level of insight into social and economic systems in place in the late Iron Age of Central-Northwest Cambodia and Northeast Thailand.

Chapter 5 Developing a Morphological Typology for Circlets

This chapter sets out a new morphological typology for circlet ornaments developed as part of this thesis. For the purpose of the typology, the term ‘circlet’ refers to a category of circular or oval-banded jewelry comprising bangles, rings, anklets, earrings, and bimetallic rings (Figure 5.1). This definition encapsulates a total of 935 artefacts from Phum Sophy, Phum Lovea, Prei Khmeng, and Non Ban Jak. While there is some difference in each subset category of circlets, particularly earrings, it is prudent to include them all in the same typology as this establishes the same diagnostic elements across all artefacts. It is possible that larger artefacts such as bronze belts could fit into this typology, however only a handful were recovered from Non Ban Jak and none from the other primary sites under study. This is too few to firmly establish whether it was reasonable to include them in this typology and consequently they were not included. For Iron Age sites such as those examined in this project, circlets are typically metallic, usually of a copper-based alloy. However, there are examples, particularly at earlier sites, of these ornaments produced from stone and shell in large quantities (Pilditch 1984; Chang 2001; Higham & Thosarat 2004). While it is not within the bounds of this study, the typology used here could potentially be extended to these artefacts also.

Figure 5.1 Reconstructed bronze bangle (3D model of a T-5x bangle from Prei Khmeng. Printed to scale and painted to give an illustration of the original artefact at the time it was buried)

The lack of a previously established morphological typology for circlet ornaments makes this work vital for the analysis of these important and prominent features of social display in prehistoric Southeast Asian archaeology. Bangles in particular are among the most plentiful artefacts found in Iron Age burials in Cambodia and Northeast Thailand (i.e. Chang 2001; Higham et al. 2007). It is hoped that a better understanding of their different forms may allow an increased level of insight into variances in social constructs through the social dress during late prehistory (Hodder 1987; Levy 1989; Renfrew 1998). It is necessary here to acknowledge the work of others in recognising the need for a regional reference system and taking the first steps to establishing an overarching typology. Two projects in particular have helped to shape the methodological system I employed here. Chang's (2001) doctoral thesis focused on ornamentation in the Bronze Age sites Nong Nor and Ban Lum Khao in Northeast and central Thailand as well as some consideration of the Iron Age population at Noen U-Loke. Chang examined the cross sections of mainly stone and shell bangles as a means of separating different types. Although the research certainly provided a good catalogue of non-metal circlet ornaments, Chang (2001: 32) states that significant research would be required to extend his typology to metallic based items.

The other project which has helped shape the typology created here was undertaken by White and Hamilton as part of the Ban Chiang Project through the Institute for Southeast Asian Archaeology (ISEAA). While their work has not presently been published in any peer-reviewed manner, the institute's web portal displays a typology to describe the few circlet ornaments found at the sites of Ban Chiang, Ban Phak Top, Ban Tong, and Don Klang in Thailand (ISEAA 2018). The online typology also utilises cross sectional shape as the main characteristic for distinguishing forms, but also adds a second level dealing with the degree of completeness of the circlet band (i.e. if there is no gap, or the ends overlap, etc.). This typology represents another step towards creating an over-arching system, at least for Thailand. However, due to the regionally restricted dataset used to create White and Hamilton's (ISEAA 2018) typology and the focus on non-metal material in Chang's (2001) dissertation, neither are capable of being applied directly to other Iron Age sites without considerable re-modelling. It is the opinion of the author that a system which must be reconfigured for each different area loses much of its research potential as datasets using different systems cannot be cross referenced. The present typology was created with the intention of being as universally applicable as possible (for the prehistory of Southeast Asia). Where forms do not appear at the four sites used in this project but have been noted by the previous authors, they are still included in the typology. For the sake of continuity much of the basic classification layout used by White and Hamilton has been carried through to this typology.

Terminology

Measurements, descriptions, and photographs, were taken of all circlets recovered from mortuary and non-mortuary contexts at Non Ban Jak, Prei Khmeng, Phum Sophy, and Phum Lovea. These provided the information necessary to create this morphological typology. 3D models were also produced of the more intact bangles and rings. These manipulable models allowed digital slicing and measuring of artefact cross sections.

As part of the implementation of a typology it is necessary to establish a consistent descriptive language used when referring to circlets. Figure 5.2 and Table 5.1 cover the descriptive terms used in this project.

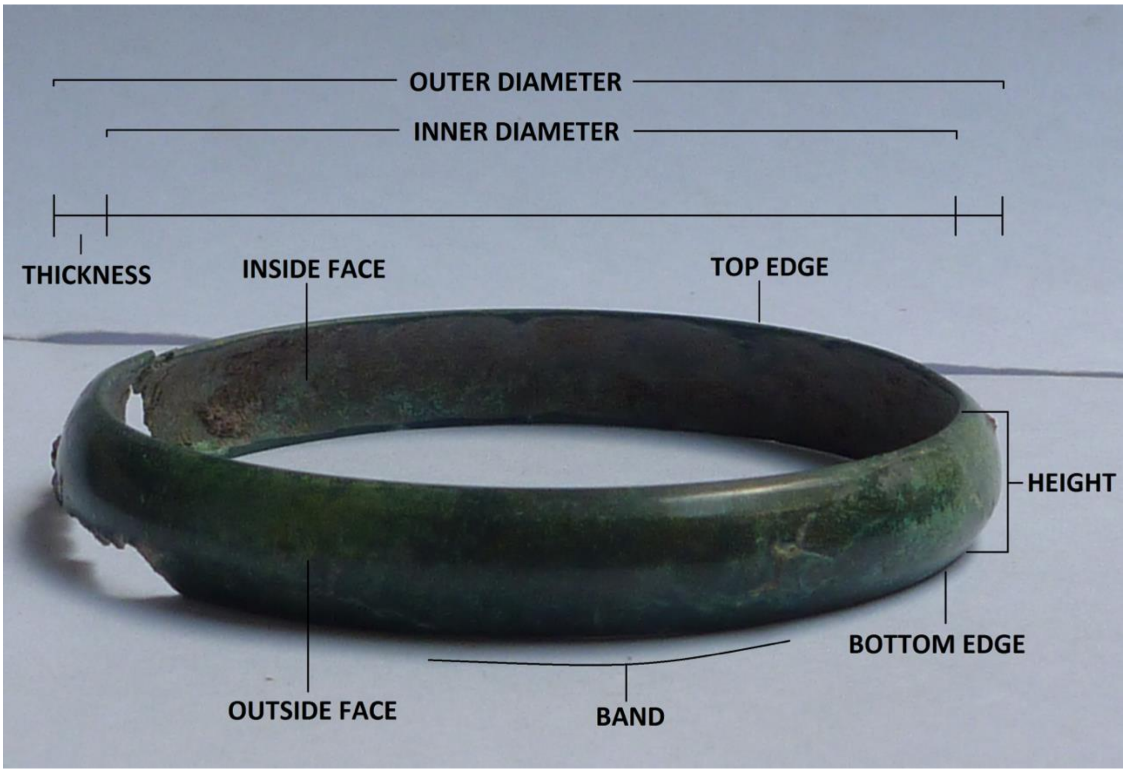

Figure 5.2 Illustration of a circlet highlighting main facets.

*Table 5.1 Terminology used to refer to circlet ornaments. *Allocation of Top and Bottom edge is arbitrary as in most cases it is not possible to determine which edge was worn facing up or down. **Not present if the circlet is a continuous circle/oval with no breaks.*

Circlet Descriptive Terminology	
Term	**Definition**
Band	The physical material of the circlet
Top edge*	Top edge when the circlet is lying flat. Surface that would either be facing proximal or distal along the limb when worn
Bottom edge*	Bottom edge when the circlet is lying flat. Surface that would either be facing proximal or distal along the limb when worn
Inside Face	Part of the circlet facing into the body/limb when worn. Would not have been visible when worn.
Outside Face	Part of the circlet facing away from the body when worn. Usually the most visible surface.
Inner Diameter	Distance between inside faces at the widest part of the circlet.
Outer Diameter	Distance between outside faces at the widest part of the circlet.
Band ends**	The two points where the band finishes at a break
Band midpoint**	The mid-point between the band ends, opposite the break in the circlet.
Circlet Shape	Shape the circlet appears from the Top View
Cross section	Cut through of the circlet band vertically from top to bottom edge.
Thickness	Distance of the band from Inside face to Outside face
Height	Distance between the Top edge and Bottom edge
View Points	
Top View	View of the circlet from directly above. Shows the top edge and circlet shape
Side View	View of the circlet from the side. Shows the outside face and best view for cross section
Oblique View	View of the circlet in between side and top angles. Provides a good though slightly optically distorted view of the entire circlet form.

Three-tiered Categorisation

The design of this typology utilises a three-tiered system to categorise the morphology of circlets. The first tier, denoted by a capital letter, refers to the cross-sectional shape of the band. This shape is typically the most distinctive feature of circlets and thus likely played the most important role in determining what, if any, social message accompanied a particular circlet. The second tier, denoted numerically, refers to the type of opening (or lack thereof) on the circlet band. This morphological factor likely refers to differences in functionality and craftsmanship (for instance a bangle with an opening may be slipped on over the wrist whereas one which forms a complete loop must slide in over the hand). While not as visible as the cross-sectional shape, this trait would still be distinguishable when worn and so is allocated the second tier. It should be noted that the first two tiers this typology follows the same layout as that developed by White and Hamilton, though significantly expanded. The final tier, marked as a single lower-case letter, refers to the shape of a circlet from the top view. For the most part this is the least visible category (with the exception of earrings) and so likely has little to do with any social meaning so much as differences in craftsmanship and potentially regional preferences.

To provide an example of the application of this typology, the cross section of Figure 5.1 reveals that the band is much thicker than it is high. Additionally, both the inside and outside faces are marked with raised ridges. This is a type 'T' cross section. Next the band is not a continuous circlet but rather has two edges which meet and press together ('5'). Finally, the circlet as viewed from above is circular ('x'). Therefore, the typology designation for this particular circlet is T-5x. Meanwhile Figure 5.2 has a cross section of an outward-curving band ('M'), a continuous band (though it was broken post deposition) ('1'), and is circular in the top view. Thus the code for that circlet is M-1x. While the typology is constructed to mirror the likely social importance of each morphological factor, the practicality of three descriptive levels allows researchers, both now and for any future study, to examine a circlet dataset by either all or just one of the tiers.

Typological Forms

The following section provides a description for each of the identified form types across the three tiers. Where available images from 3D models have been used to allow for maximum illustrative power when describing cross sections.

First Tier

The first typological tier refers to the cross-sectional view of the circlet band from the side view. 24 unique morphological forms have been identified mainly from Phum Sophy, Phum Lovea, Prei Khmeng and Non Ban Jak and a few from the work of Chang (2001) and White and Hamilton (ISEAA 2018) (Figure 5.3). The vast majority of these forms are completely morphologically separate from the others, however, a small number (such as circular cross sections) are produced in large quantities at varying sizes. For these forms it was deemed prudent to split the types by size for a more nuanced designation. It is argued that the typology presented here provides enough clarity distinguishing between forms while seeking to avoid creating potentially artificial boundaries between types. Chang's (2001) typology, which focusses predominately on shell and stone bangles that predominated during the Bronze Age, comprises 29 types (termed 'styles'). White and Hamilton's (ISEAA 2018) typology, perhaps due to a smaller dataset, sits at the other end of the spectrum with only 16 types. While it would be erroneous to assume the arbitrary divisions created for the forms in this typology coincide directly with social meanings as understood by the wearers, there remains research value in splitting these large categories.

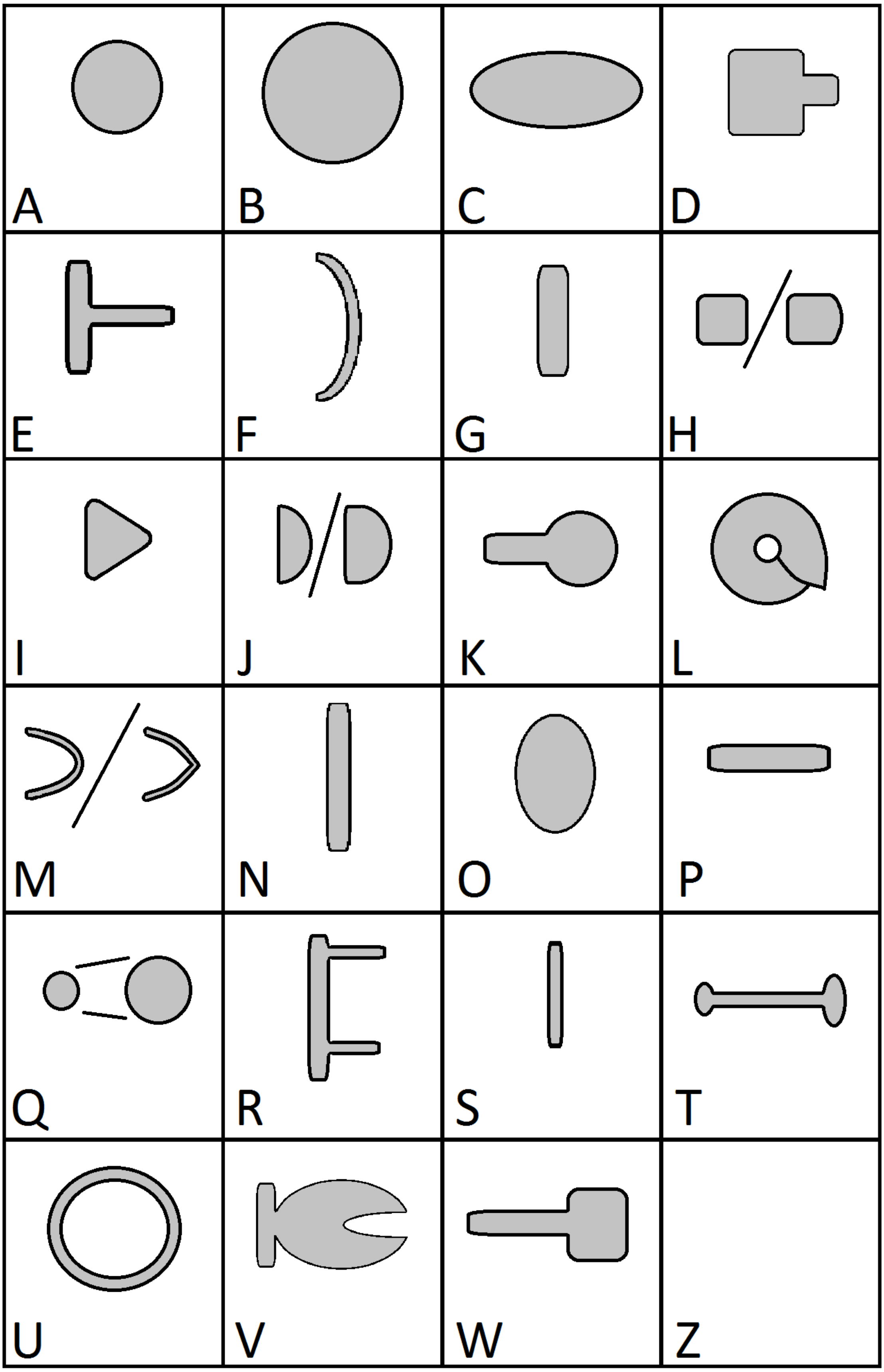

Figure 5.3 Illustrations of first tier typological categories. All cross sections are depicted with the inside face on the left.

Type A

Roughly circular cross section less than 5mm in diameter.

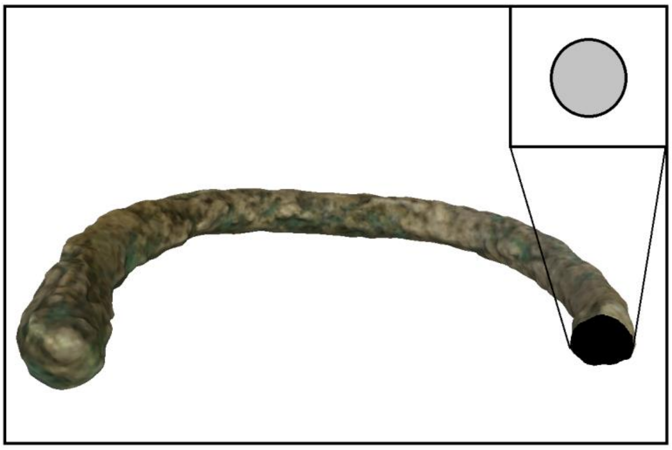

Figure 5.4 Type A illustration.

Type B

Roughly circular cross section 5mm or larger in diameter.

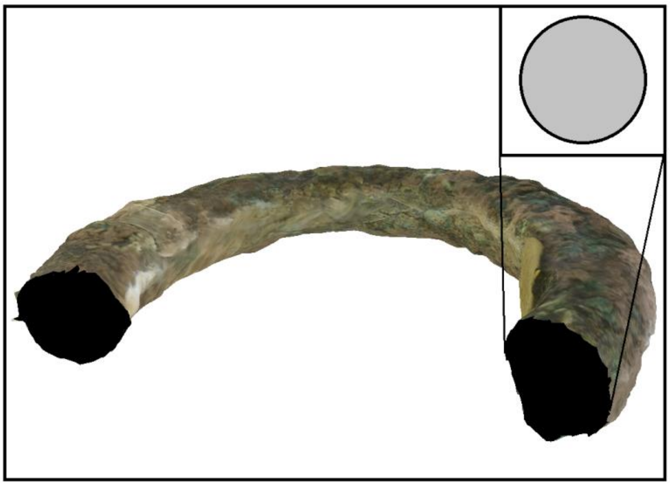

Figure 5.5 Type B illustration.

Type C

Oval cross section longer along band thickness than height. Inside and outside faces may be quite sharply angled. (No circlet of this typology was identified during this study. This form has been identified by White and Hamilton from Ban Chiang).

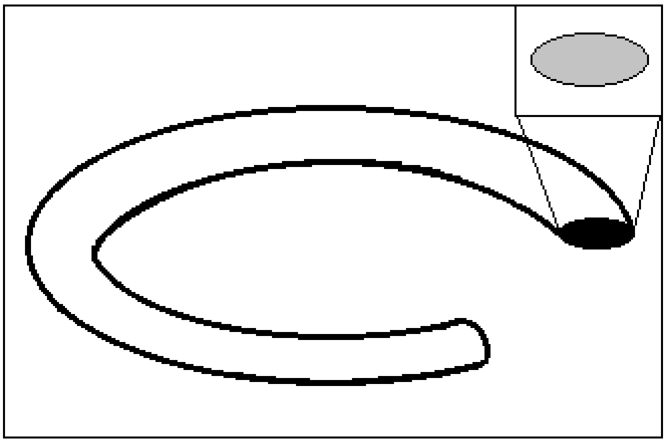

Figure 5.6 Type C illustration

Type D

Cross section appears like 2 blocks, 1 larger than the other. Inside rim formed by the larger 'block'. Band height lessens for the smaller outside block which forms the outside rim. Outside edge may be decorated as raised bumps.

Figure 5.7 Type D illustration

Type E

Cross section appears like a sideways capital 'T' with the inside face forming the top bar of the 'T'. Only one fragment of a circlet of this typology was identified during this study, however it does appear commonly across Southeast Asia, especially in Bronze Age shell bangles (Chang 2001; Pilditch 1986, 1987). The form is identified by both Chang and White and Hamilton in their typologies.

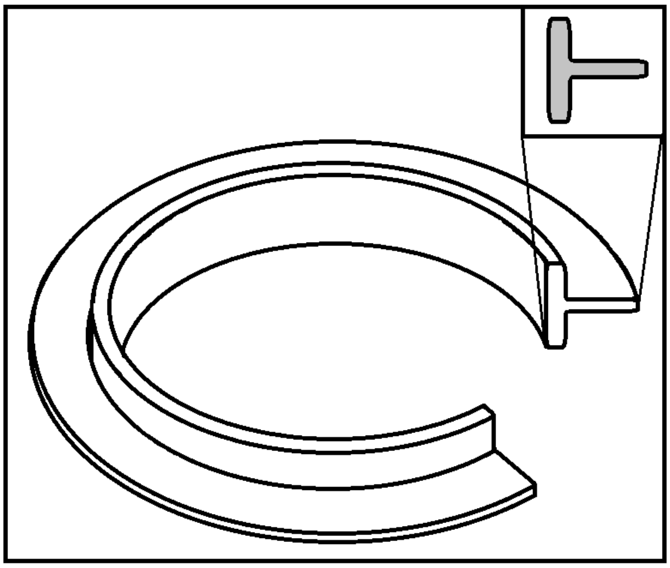

Figure 5.8 Type E illustration

Type F

A gently curving open 'U' or half convex cross section with the bulge on the outside face.

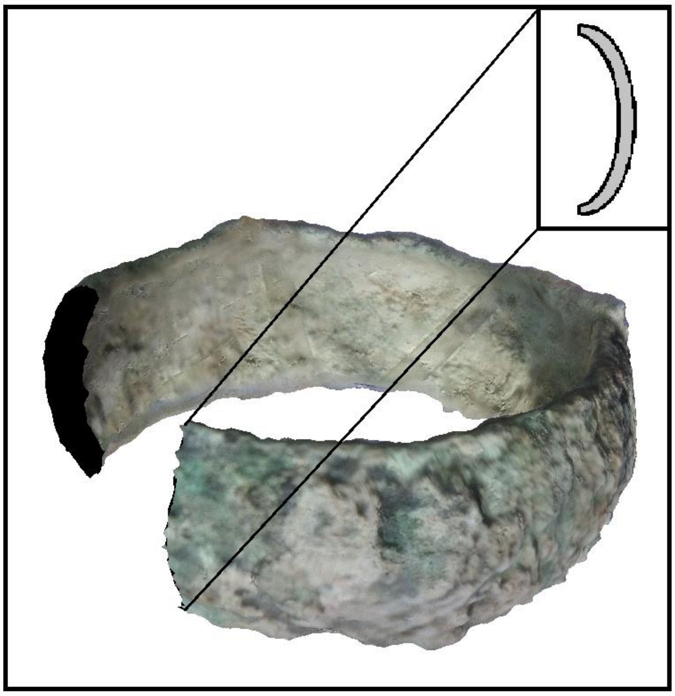

Figure 5.9 Type F illustration

Type G

Flat vertical cross section running from the bottom to top edge. Height is less than 10mm and thickness more than 1.5mm.

Figure 5.10 Type G illustration

Type H

Square cross section. Outside face may be slightly convex.

Figure 5.11 Type H illustration

Type I

Roughly triangular cross section tapering from high inner face to outside point. Points are usually curved.

Figure 5.12 Type I illustration

Type J

Semicircle/ ‘D’ cross section. Inside face forms the straight edge. May have a small horizontal top and bottom edge separating the straight inside face and convex outside face.

Figure 5.13 Type J illustration

Type K

Flat horizontal cross section however outside half is made up of a series of raised bumps several millimetres long. (No circlet of this typology was identified during this study. This form has been identified both by Chang 2001 and White & Hamilton).

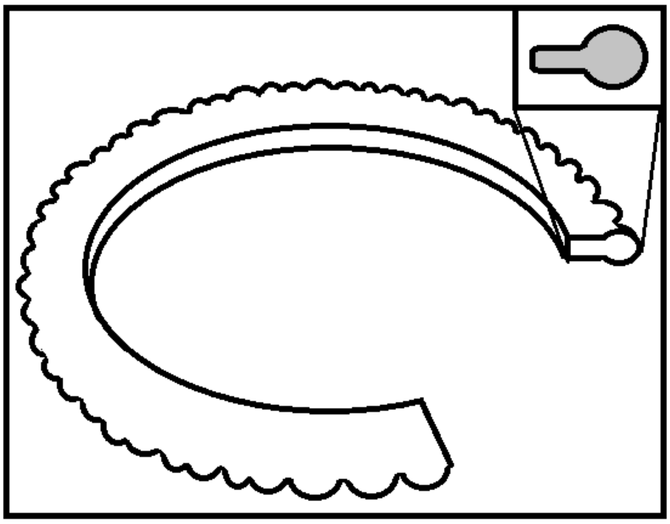

Figure 5.14 Type K illustration

Type L

Hollow circular spiral cross section. Made by wrapping the band in a tight spiral around the hollow core.

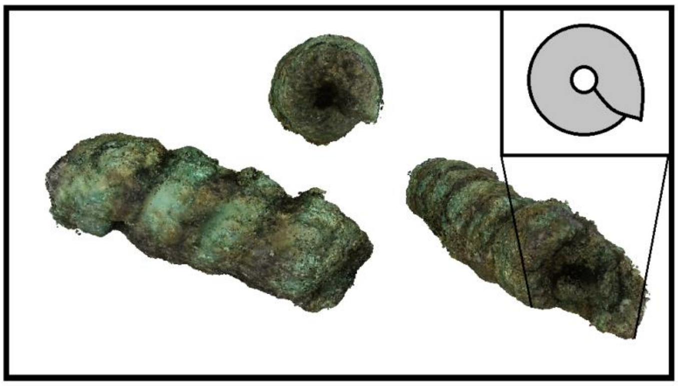

Figure 5.15 Type L illustration

Type M

Sideways 'V' or steep 'U' cross section. The open ends of the 'V'/'U' are on the inside face. The band is usually very thin – c. less than 2mm, and maintains constant thickness along the cross section. (Degree of curvature is much sharper than 'Type F').

Figure 5.16 Type M illustration

Type N

Flat vertical cross section running from the bottom to top edge. Height is 10mm and over while thickness more than 1.5mm.

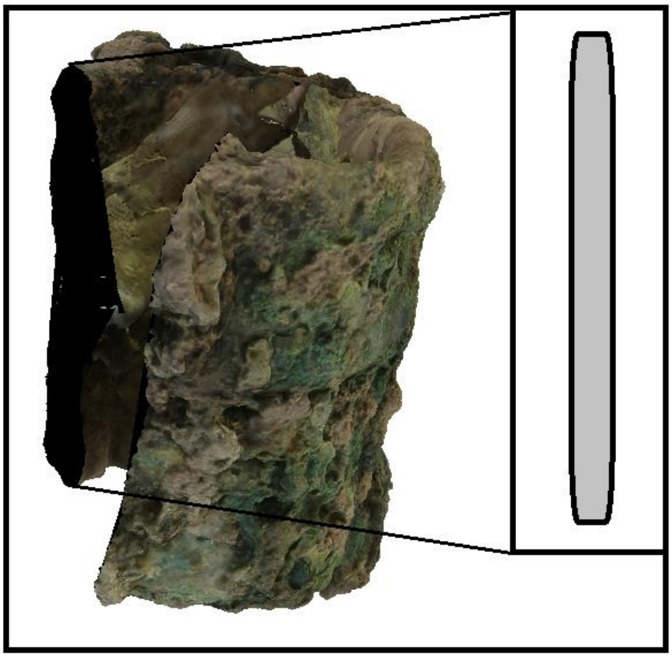

Figure 5.17 Type N illustration

Type O

Roughly oval cross section higher than thick.

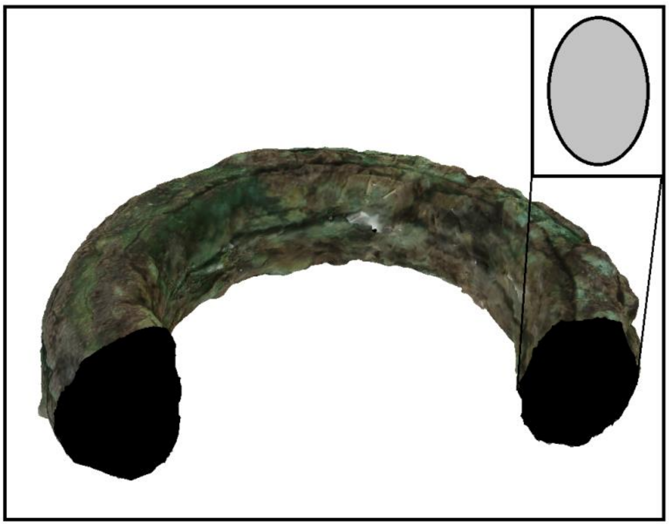

Figure 5.18 Type O illustration

Type P

Flat horizontal cross section running from inside face to outside face.

Figure 5.19 Type P illustration

Type Q

Roughly round cross section where the height and/or thickness of the band changes along the circlet. Usually size changes from the band midpoint gradually towards the ends.

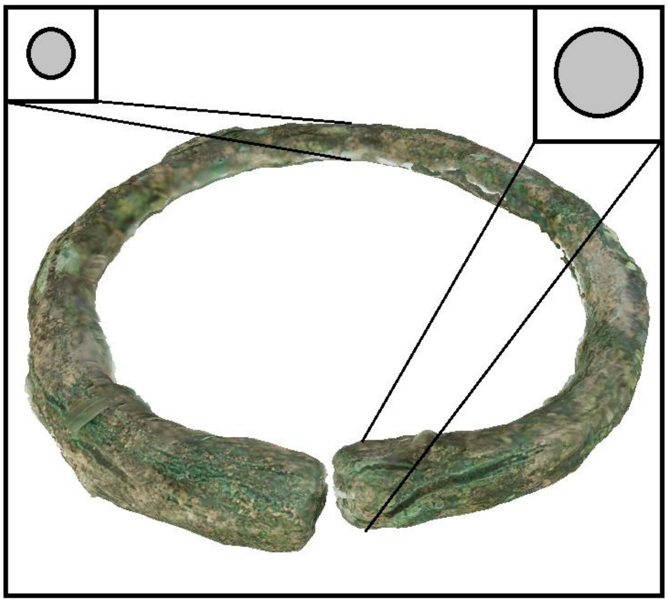

Figure 5.20 Type Q illustration

Type R

Studded flat vertical cross section running from the bottom to top edge. Outside face has two small exterior rings, probably for holding a precious/ semi-precious stone.

Figure 5.21 Type R illustration

Type S

Very thin flat vertical cross section running from the bottom to top edge. Thickness is 1.5mm or less.

Figure 5.22 Type S illustration

Type T

Flat horizontal cross section running from inside face to outside face. Raised ridges on both inside and outside edges form distinct rims.

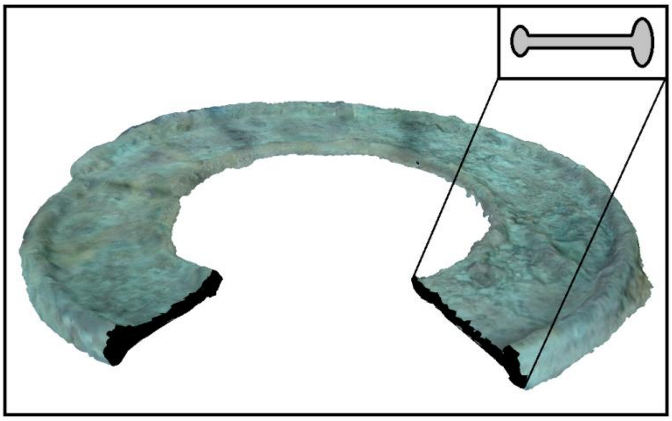

Figure 5.23 Type T illustration

Type U

Hollow circular or oval cross section. (Different from 'Type L' as it is not a wrapped coil of metal and the hollow part is much larger).

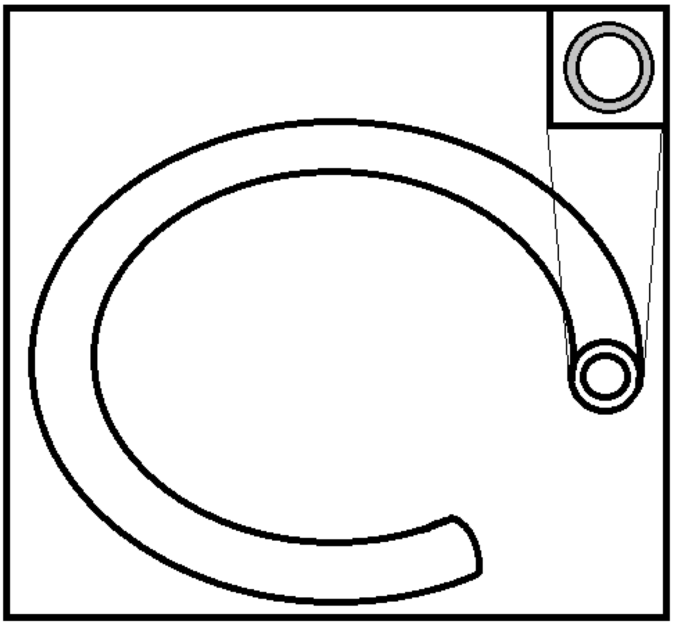

Figure 5.24 Type U illustration

Type V

Circlet band with attached bronze bell

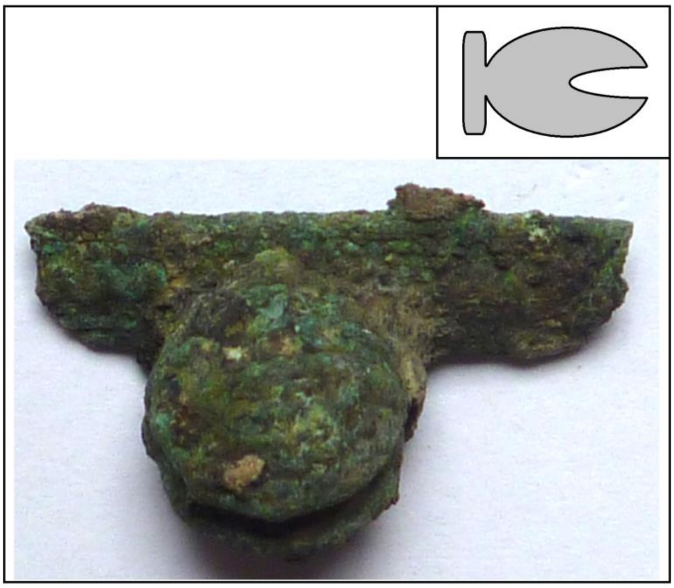

Figure 5.25 Type V illustration

Type W

Flat horizontal cross section running from inside face to outside face with large raised ridge on the outside rim. Centre opening may by square or rectangular shaped.

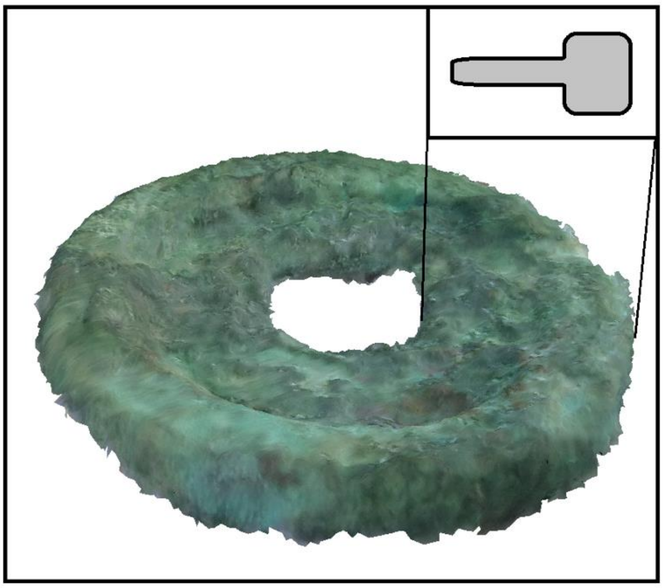

Figure 5.26 Type W illustration

Type Z

Irregular or miscellaneous cross section

Second Tier

The second tier of the typological assessment refers to the type of opening in the circlet band. Six unique opening designators are used in the typology. These should cover any opening type likely to be encountered in prehistoric Southeast Asian assemblages.

Opening 1

The circlet is complete with no ends or break.

Figure 5.27 Opening 1 illustration

Opening 2

The circlet ends overlap each other (by less than 2/3 of the circlet circumference)

Figure 5.28 Opening 2 illustration

Opening 3

The circlet ends do not meet, leaving a break between them.

Figure 5.29 Opening 3 illustration

Opening 4

Spiral circlet. The ends overlap by over 2/3 of the circlet (often creating several circlet loops).

Figure 5.30 Opening 4 illustration

Opening 5

The circlet ends are pressed together so there is effectively no gap

Figure 5.31 Opening 5 illustration

Opening 0

Unable to identify circlet opening form due to fragmentary nature.

Third Tier

The final morphological trait considered in the typology is the shape of the circlet when viewed from the top. Four categories have been identified in the dataset and once again, this likely covers the majority of Southeast Asian circlets. This category would be most visible (and therefore perhaps most meaningful) for earrings as the shape is facing out from the body rather than covered by a limb or digit as for bangles, anklets and rings.

Shape w

Roughly triangular circlet shape. The corners may be pointed or curved.

Figure 5.32 Shape w illustration

Shape x

Roughly circular shape. Often diagenesis can cause metallic circlets (especially delicate bangles and anklets) to warp and bend resulting in a roughly round shape but with distorted section. These circlets should still be considered circular.

Figure 5.33 Shape x illustration

Shape y

Roughly oval shape.

Figure 5.34 Shape y illustration

Shape z

Unknown circlet shape due to fragmentary nature of artefact.

Breakdown of Data

The following section offers an overview of the range and frequencies of various circlet types in the dataset. This is designed to identify the more common forms as well as providing a base from which subsequent analysis can expand in later chapters. It is important to state that the data given here and analysed throughout the thesis refers only to items found in mortuary settings. Relative abundancies of different types circulating in the living population may have differed from that accompanying the deceased. A more specific consideration is also given for each subset of circlet artefacts (i.e. bangles, rings, etc.). For the most part the first tier of the typology will be the focus for analysis in this project as it represents the most outwardly distinctive morphological feature of the circlets. However, a brief overview of second and third tier distributions is included here.

Figure 5.35 and Table 5.2-Table 5.3 display the distribution of types irrespective of site, while Figure 5.36 depicts variances in the frequency of first tier typologies across the four sites. These figures show that the most common forms of circlets across Iron Age sites are simple shapes: flat vertical bands (type G) are easily the most frequent, followed by circular (A) and square (H) bands. Interestingly over half the circlets are complete bands with no break ('1'). This is probably considerably higher than the 53.8% recorded given the large number (38.3%) of circlets that were in a fragmentary nature not allowing identification of break type. While this figure includes earrings, it is important to note that almost all of these have a break to attach or hang from an earlobe. Similarly, the circlet shape is dominated by roughly circular artefacts which account for 58.2% (with 29% unable to classify). Notably type G circlets are the most common first tier form in the mortuary assemblages of three of the four cemeteries (and a close second at Phum Lovea).

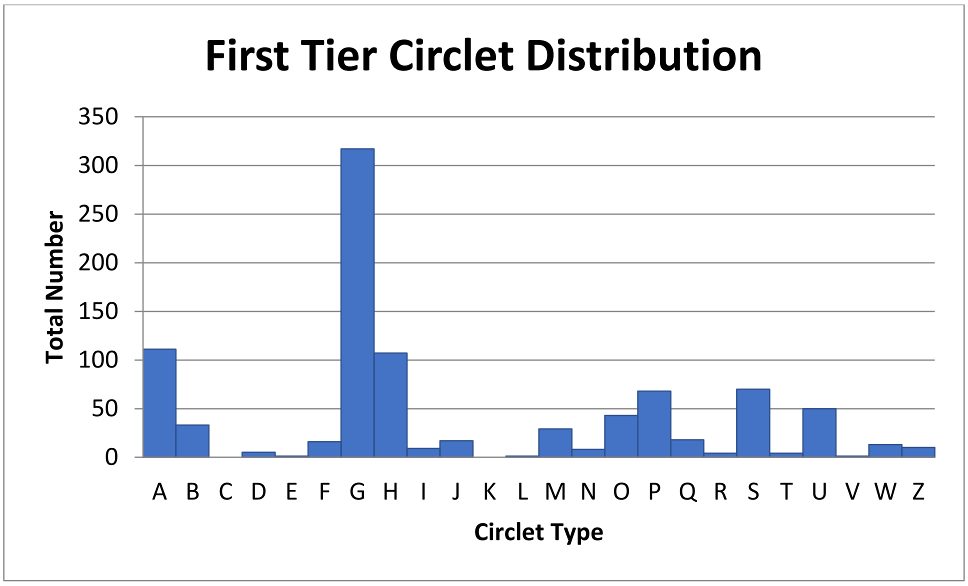

Figure 5.35 Frequency distribution of first tier forms of all metallic circlets.

Table 5.2 Frequency distribution of second tier forms of all metallic circlets.

	0	1	2	3	4	5	All
Total	358	503	18	26	5	25	935
Percent	38.3	53.8	1.9	2.8	0.5	2.7	100

Table 5.3 Frequency distribution of third tier forms of all metallic circlets.

	w	x	y	z	All
Total	7	544	113	271	935
Percent	0.7	58.2	12.1	29.0	100

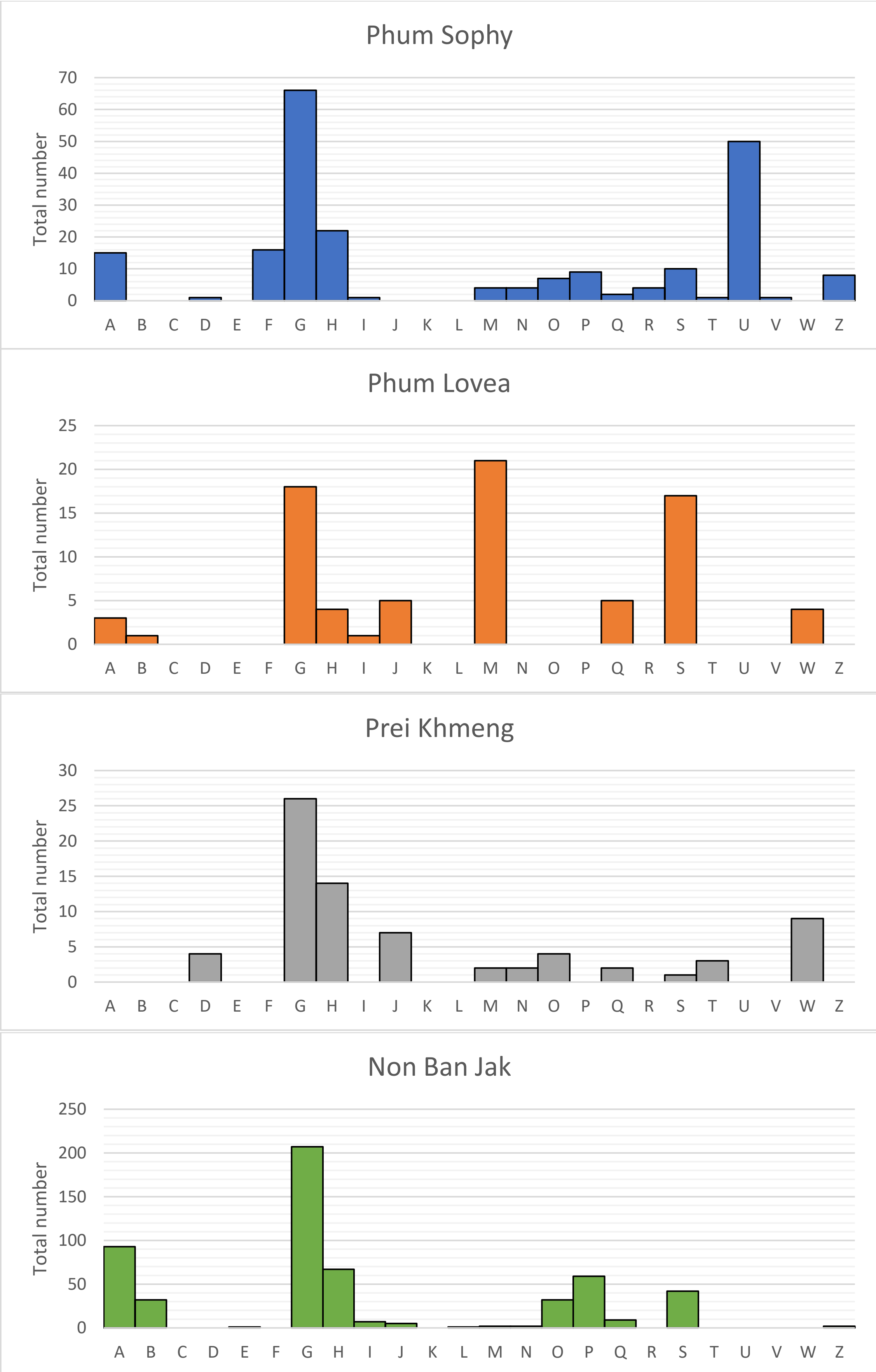

Figure 5.36 Differences in the frequency of first tier forms of metallic circlets at each study site.

Bangles

390 Bangles were recovered in burials across the four study sites. This equates to 41.7% of the total number of circlets, making bangles the largest contributor to the category. It is therefore unsurprising that the general trends visible in the overall circlet typology breakdown (Figure 5.35), are very similar to those purely in bangles (Figure 5.37). Flat vertical bands (type G) dominate the assemblage, making up close to half (42%) of all bangles recovered from mortuary settings. For comparison, the next most common form (type A), at 14.6%, is almost three times fewer in occurrence. However, while simple, easy to produce forms dominate the dataset, Figure 5.37 shows that there is still a wide degree of variation in forms that each account for a small percent of the total assemblage. This may, perhaps, be indicative of the social role of bangles in allowing potentially higher status individuals a means to display their elevated standing. It is also worth noting that bangles are the most plentiful artefact recovered in burials across all sites, slightly in front of ceramic vessels (359).

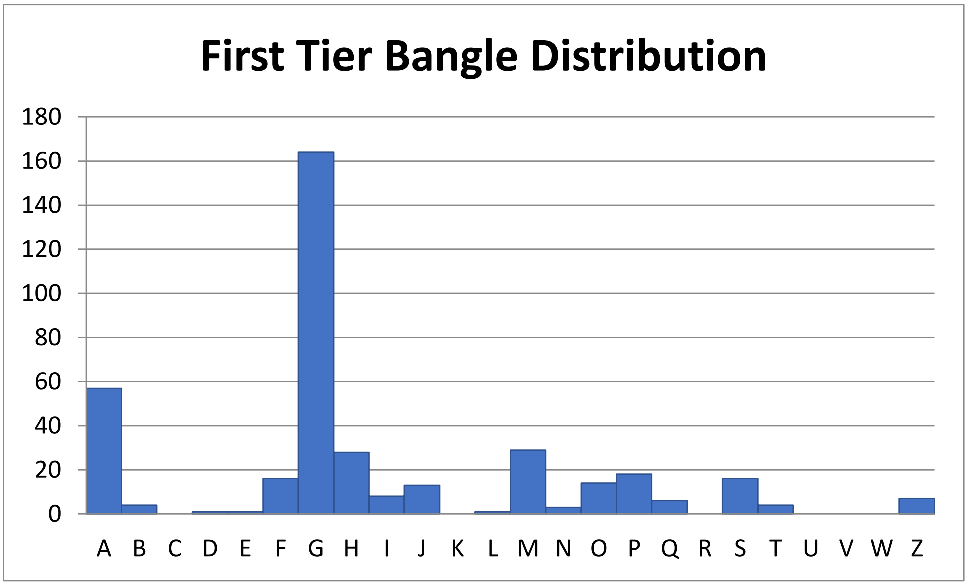

Figure 5.37 Breakdown of bangles across all sites by cross-sectional type

Anklets

The distribution of first tier anklets types (Figure 5.38) is noticeably very different from bangles. This is somewhat surprising given that of all circlets, anklets and bangles are the most similar in size and appearance. Indeed, the main factor that allows one to differentiate between the two artefacts at all is by their mortuary context either around the ankle-shin or wrist-forearm. The marked difference in the distribution of these artefacts may suggest that they were not interchangeable and each had a specific social or economic role.

There is, however, a caveat to this data. Given the relatively small number of anklets recovered (117 making up 12.5% of all circlets), the data are vulnerable to skewing by anomalously wealthy individual burials. On close inspection of the data, all the more complex, hollow anklets (type U) come from a single burial. Similarly, the majority of the type P bangles can be traced to just a few individuals. If this typology is implemented more widely across Southeast Asia a clearer picture of anklet forms will appear.

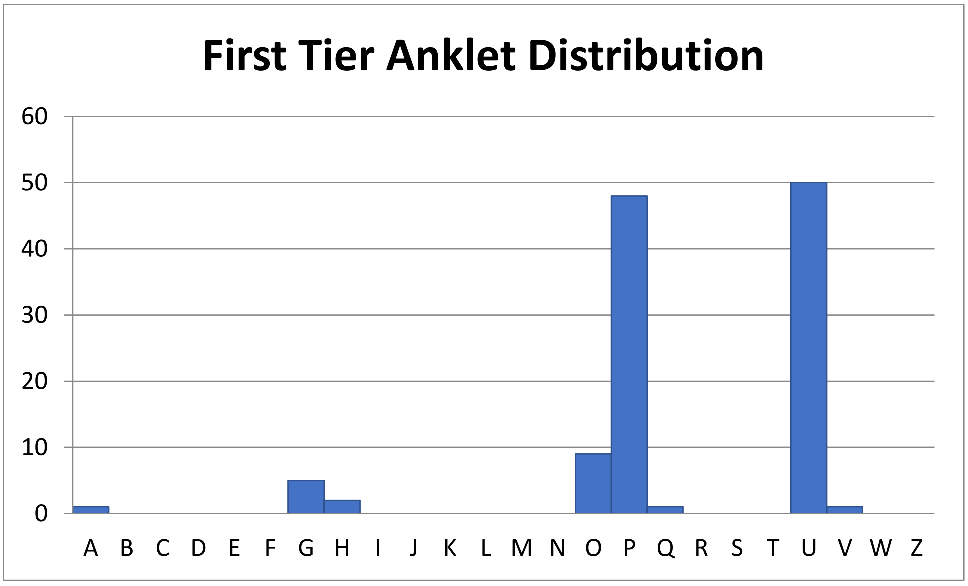

Figure 5.38 Proportion of anklets across all sites by cross-sectional type

Rings

Finger and thumb rings are the second largest category of circlets with 327 (35%) and the third most common mortuary artefact overall. Once again, the bulk of the rings are simple forms (G, H, and A), however there is less prolificacy of more complex or intricate forms that can be found in bangles (Figure 5.39). The proportion of S type rings (15%) is partly an exception as the delicate nature of the very thin bands would have required greater skill to produce. It is possible then that comfort played a larger role in the design of prehistoric rings. Bands which are particularly thick would no doubt be uncomfortable to wear due to rubbing and digging into neighbouring digits. The implication of this is that the rings were not restricted to funerary rituals but were also worn as part of a daily outfit.

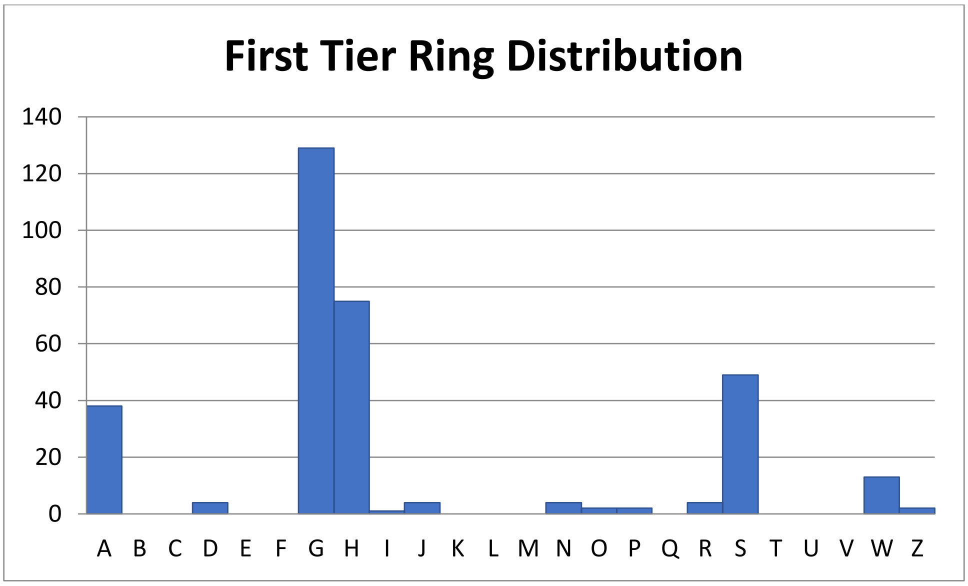

Figure 5.39 Proportion of finger and toe rings across all sites by cross-sectional type

Earrings

Despite being present at all four sites in this study, earrings are the equal least abundant of all circlets with only 50 (5.4%) found in mortuary contexts. Figure 5.40 illustrates that, despite being a different kind of decorative circlet – unlike bangles, anklets, and rings these are not worn on a limb, the same forms are still utilised. The only form which is weighted more towards earrings is type Q, where the band changes thickness from the midpoint to the ends. This could potentially indicate these were designed specifically so the thinnest part of the band could be inserted in the earlobe while the thicker, more prominent part of the earring was on display. However, this form is sometimes found in bangles, so it is not completely specific to earrings. Similar to anklets, a fuller picture of earring forms will be achieved as the typology is employed in more archaeological studies to create a larger dataset.

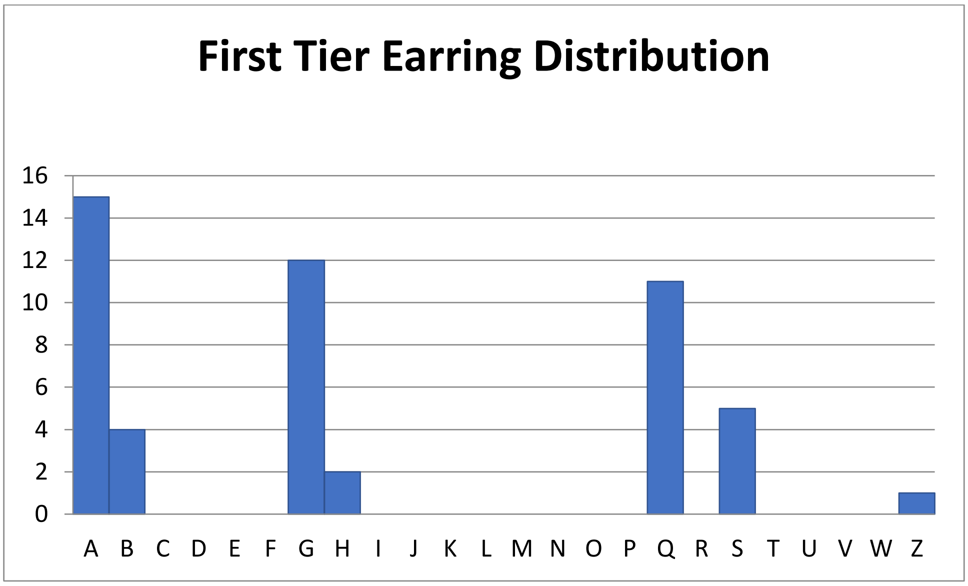

Figure 5.40 Proportion of earrings across all sites by cross-sectional type

Bimetallic rings

Bimetallic rings are something of an unexplained oddity in prehistoric Thai mortuary assemblages. The first distinction is the composition of the material used for the artefacts. While gold, iron, shell, stone and even precious stones (i.e. nephrite) were sometimes crafted into jewellery circlets, the vast the majority are bronze or a copper-based alloy during the Iron Age. The bimetallic rings, however, are formed by iron over a bronze core.

Additionally, unlike the artefacts listed above, bimetallic rings do not have a specific area of the body in which they are universally found. In most cases the rings are not worn but found on or around the body. It is possible that the rings were used as fasteners for ropes or straps as part of the clothing or a burial shroud. However numerous infant burials at Non Ban Jak contain bimetallic rings worn as bangles. These rings are morphologically no different to those serving other functions, and on average have a considerably smaller interior diameter than bangles.

In terms of the breakdown of bimetallic rings by tier one typologies, another difference is immediately clear. In the dataset used for this project there are only 4 types present, all of which are simple forms (Figure 5.41). This perhaps indicates a more functional and less decorative role, especially considering that types B and O, which account for 84%, are both quite thick and robust shapes.

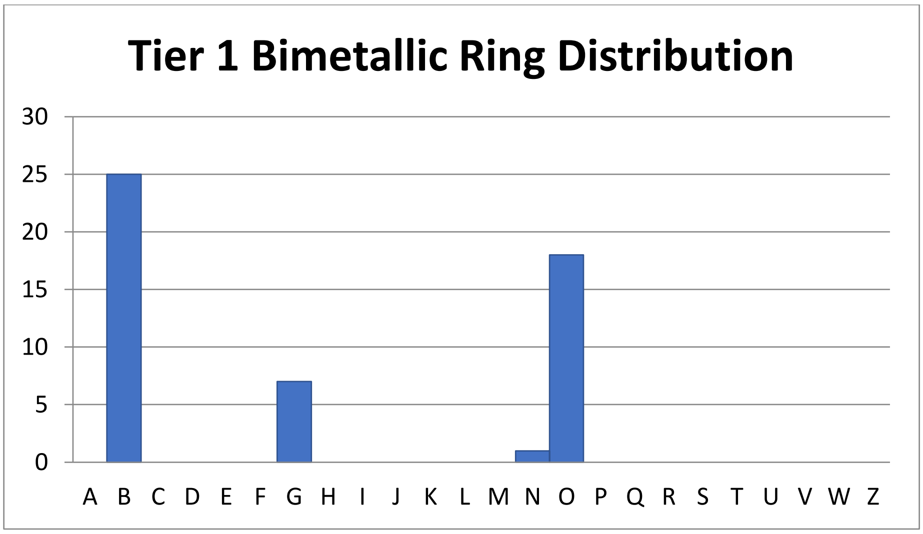

Figure 5.41 Proportion of bimetallic rings by cross-sectional type

Discussion

The morphological typology, based on 935 circlets from mortuary contexts in Cambodia and Northeast Thailand, offers a new insight into the way circlets were worn and distributed among populations, which is a necessary step in achieving greater understanding of expressions of place through the social dress.

The typology presented in this thesis identifies three aspects of circlet morphology, cross-sectional design, band connection type, and overhead shape. A predominance of simple, easy-to-produce designs in notable in the distribution of circlets among Iron Age mortuary populations. This is potentially indicative of a system in which clay moulds were employed to produce vast numbers of plain ornaments without requiring a great level of craftsmanship. If such a system existed, then one may extrapolate that elites and those wishing to distinguish themselves from the general populace, utilised circlets as a means to do so through wearing rarer, more intricate designs (Fowles 1974; Wiessner 1990). This follows the third indicator of mortuary wealth utilised in this study. The creation of the morphological typology is a vital step towards providing a platform for future studies to examine the social relationships of the late prehistory through the lens afforded through circlet ornamentation (i.e. Cougle-Jose 2010).

One particularly important 'next step' in the integration of digital modelling into archaeological research is the structuring of a medium in which to share the produced data. It is currently the challenge for the researcher to convey a sense of the benefits of 3D models, while restricted to the 2D form of a research paper or presentation. This problem is a significant one, which threatens to seriously inhibit the benefits of digital technology until we as researchers can establish a way for sharing and displaying 3D research as it has been produced. Online databases may be the answer to conundrum, at least in part.

It is also suggested that the typology presented in this paper may be coupled with metallurgical or provenancing studies of bronze ornaments (i.e. Pryce et al. 2017) to examine trade and exchange patterns. Such research would be of interest in examining whether prehistoric bronze was exchanged as ingots for use by local craftsmen, or was traded as ready-made circlets, perhaps adding to the object's prestige.

Conclusion

In this chapter a new typology for categorising prehistoric Southeast Asian metallic circlets has been presented. Building upon the work of Chang (2002) and White and Hamilton (ISEAA 2018) The typology fills a significant gap in the current approach to late prehistoric archaeology in Southeast Asia. Currently there is no set method for identifying and classifying subtle differences in circlets of Iron Age context, with the result that all bangles, for example, are considered as the same. The approach outlined here allows for circlets to be classified on three levels or 'tiers'. The first tier considers the cross-sectional shape of the circlet band, the second refers to the type of opening, and the third is the shape when seen from above. Using this typology, it has been shown that the most abundant first tier forms tend to be those which are simplest and easiest to produce, therefore likely carrying the least cost. The data produced here will be applied further in this thesis to aid analyses of social and economic differences on inter and intra site levels.

Chapter 6 Phum Sophy

Phum Sophy is a mounded, non-moated, occupation site in Northwest Cambodia dating to the mid-late Iron Age (Figure 6.1). The village, which is the richest Cambodian site in this study both in terms of artefact assemblage and the number of burials, is located in the O'Chroc District of Banteay Meanchey Province, Cambodia. The excavation led by O'Reilly and Shewan was part of the Australian Research Council (ARC) funded project 'History in their bones: A diachronic, bio-archaeological study of diet, mobility and social organisation in Cambodia' (O'Reilly et al. 2015). The modern village of Phum Sophy was targeted for excavation after reports of large scale looting unearthing prehistoric remains. The looting uncovered such a large cemetery population that when the excavation team arrived at the site they encountered a large stupa erected by local Buddhist monks which contained skeletal remains of over a hundred of individuals (O'Reilly et al. 2015).

Figure 6.1 Satellite image of the modern village at Phum Sophy. The site marker indicates the approximate location of the initial excavation in 2009.

The excavators encountered a late Iron Age cemetery in soil horizon two (O'Reilly et al. 2015). Radiocarbon dating of both in-situ mortuary contexts, and several skulls from the stupa have returned a range from the first to the seventh century CE (O'Reilly et al. 2015: 35). This places the cemetery as active from the mid to late Iron Age. Given that all burials were from the same layer without any discernible shifts in funerary ritual, they are considered to be from the same mortuary phase. While the cemetery appears temporally restricted to the prehistoric, evidence of continued occupation in the area is present in the form of several nearby pre-Angkorian temples (Figure 6.2) and a number of early historic artefacts including kendi spouts and lead ingots unearthed by looters (O'Reilly pers comm).

O'Reilly et al. (2015) note that Phum Sophy is located on the western edge of a dense cluster of prehistoric sites (Figure 6.2). It is likely that the inhabitants of Phum Sophy were in contact to some degree with these sites and may have migrated from one such location in the first century

CE. At this point no large-scale excavation program has been conducted in the area to explore what, if any, connection existed. The abandonment of the cemetery at Phum Sophy in the early or proto-historic follows a general trend in the greater area of Cambodia and Northeast Thailand for relocation to rectilinear sites (Higham 2014; Welch 1998).

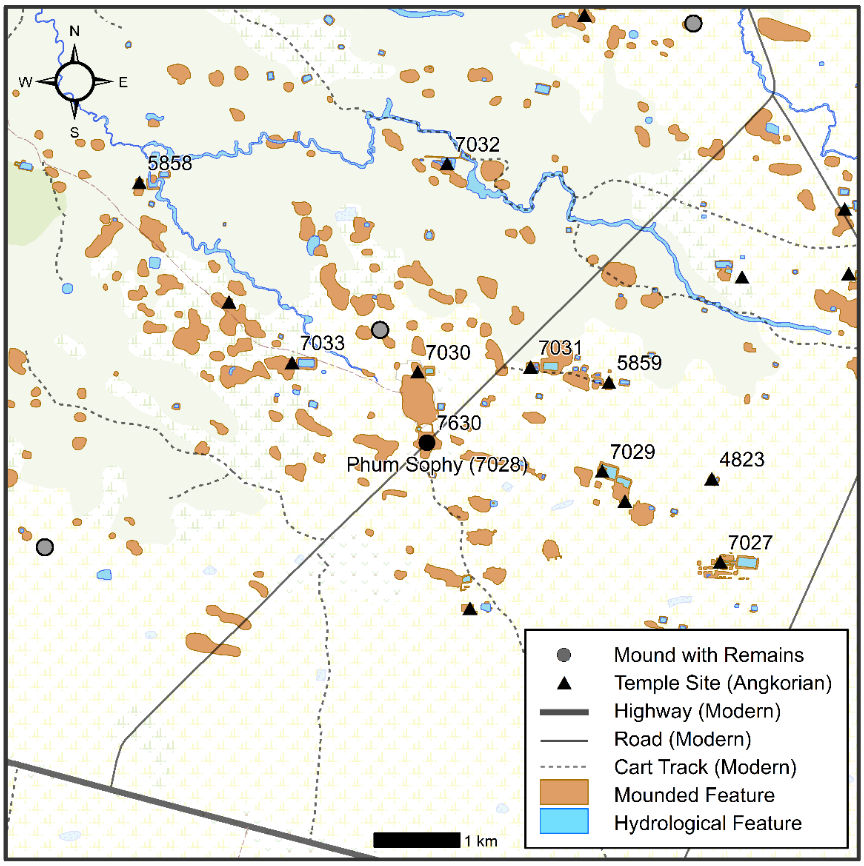

Figure 6.2 Map of numerous unexplored archaeological sites (prehistoric and historic) in close proximity to Phum Sophy. Image originally from O'Reilly et al. 2015. Used with permission.

Excavation details

Excavation at the site was undertaken over two field seasons in 2009 and 2010. Due to extensive looting over the mound the excavators were restricted to a 3m x 5m unit (with a 1m x 2m extension) on the inside enclosure of the Buddhist monastery during the initial season (O'Reilly et al. 2015) (Figure 6.3). While this area on the eastern periphery of the prehistoric mound had been saved from looters, bioturbation had caused considerable disruption to the prehistoric contexts. In total excavators encountered four jumbled burials containing eight individuals in 2009.

In 2010 a second season of excavation was undertaken. The team initially attempted to excavate a 10m x 10m unit, however quickly found that it had been completely looted. The excavators then turned to digging a 5m x 3m trench in a central location within the village mound (O'Reilly et al. 2015). Ten burials containing 12 individuals were uncovered in the unit. These were typically richer than those found on the mound periphery and had also been subject to less bioturbation. However, preservation was not ideal in the southeast corner of the unit where burials 5, 9, 12, and 13 were uncovered.

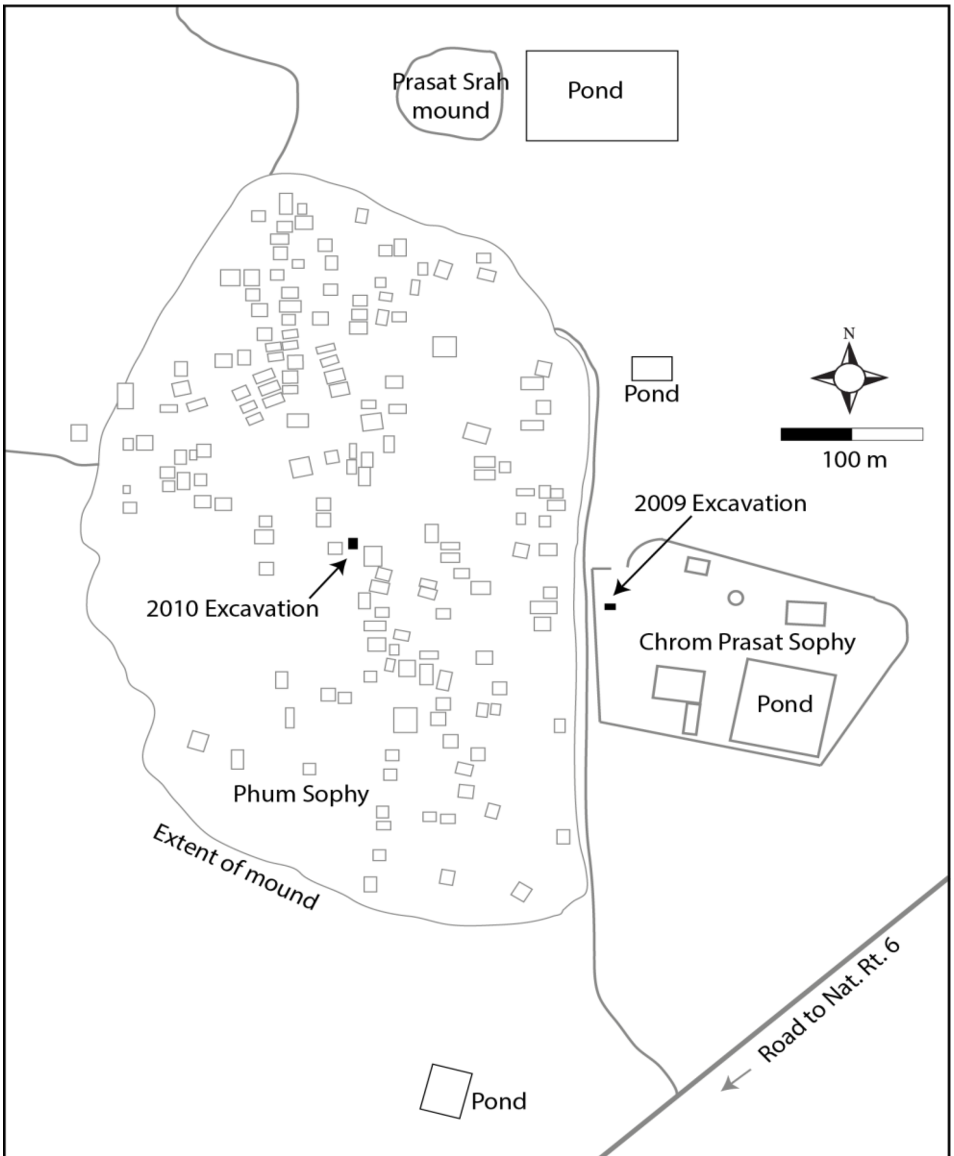

Figure 6.3 Map of Phum Sophy with the excavation units marked. Image originally from O'Reilly et al. 2015. Used with permission.

Mortuary Data

In total, the skeletal remains of 20 individuals were uncovered in the two seasons of excavation at Phum Sophy. Osteological analyses have been conducted on the skeletons (as well as several skulls extracted from the stupa) and have provided an overview of age, sex, and stature (Domett & Newton 2013a; Newton & Domett 2013). Table 6.1 provides a breakdown of the physical characteristics of the Phum Sophy burials.

As noted above, most of the individuals recovered from the 2009 season and those assigned mortuary context 5 in 2010 were severely disturbed. As it was impossible to distinguish artefacts belonging to different individuals in these contexts, the decision was made to eliminate those individuals from the dataset for the present analysis. PS 1.1, 1.2, 2.1, 4.1, 5.1, and 5.2 were all so disturbed that no artefacts could be confidently attributed to a single individual (Table 6.1). Including these six burials (over ¼ of the entire excavated population) in the dataset recovered from Phum Sophy would undoubtedly return erroneous results indicating a large group of incredibly poor individuals who may, in fact, have been buried with much larger assemblages. Therefore, only the main burial of these disturbed mortuary contexts was included for further analysis in the study. Appendix two provides an illustrated glossary of all artefacts covered in this project.

*Table 6.1 Burials at Phum Sophy. *Orientation refers to the end of the interment with the cranium. Where Orientation and Type are blank the burial was too incomplete to identify.*

Burial	Age	Sex	Orientation*	Type	All Artefacts
1 PS	middle aged	M			35
1.1 PS	2-4 years	?			0
1.2 PS	adult	F			0
2 PS	adult	F			11
2.1 PS	6-8 years	?			0
3 PS	adult	?	W	extended	5
4 PS	adult	?	W	extended	27
4.1 PS	<1 year	?	W	extended	0
5 PS	young adult	F	NW	extended	29
5.1 PS	adult	?	NW	extended	0
5.2 PS	young adult	?	NW	extended	0
6 PS	5-7 years	?	W	extended	31
7 PS	adult	M	NW	extended	68
8 PS	2-4 years	?	W	flexed burial	12
9 PS	2.5 years	?	NW	extended	4
10 PS	6-9 years	?	NW	extended	51
11 PS	15-18	F	NW	extended	20
12 PS	adult	?	NW	extended	0
13 PS	2-2.5	?			0
14 PS	middle aged	F	NW	extended	188

Burials

None of the osteological work outlined below was undertaken by the author. All findings are taken from Domett and Newton and have been published elsewhere (Domett & Newton 2013a; O'Reilly et al. 2015; Newton & Domett 2013). Presented here is a brief overview of each mortuary context and the factors the post excavation team used in ascribing age and sex. A list of artefacts associated with each burial is included based on fieldwork undertaken in this project. In the case of beads the number of individual beads is listed followed by the number of contexts or catalogued entries in which they were found. Each context is assumed to have been a single artefact such as a necklace and it is this number, rather than individual beads, that is counted when quantifying artefacts in burial assemblages.

PS 1

The mortuary context associated with this individual was uncovered 130 cm below the surface of Unit 1 (in the Buddhist monastery grounds) at layer 2:2 (O'Reilly et al. 2015). The remains were osteologically identified as a middle-aged male (Domett & Newton 2013a). Two further individuals (PS 1.1. and PS 1.2) were also removed from this context, though due to the disturbed nature of the context the remains were only able to be differentiated during post excavation analysis. A considerable portion of the skeletal remains could not be differentiated between burial 1 and 1.2 (Domett & Newton 2013a). While these remain unassigned, it is unlikely they represent any further individuals. No grave cut was distinguished.

The assemblage associated with the burial comprised (see appendix two for photographic descriptions of artefacts):

Eleven bronze finger rings, an iron knife, an iron pendant, 369 glass beads (from three contexts), 22 carnelian beads (from four contexts), a spindle whorl, ten ceramic vessels, two pendants, one of shell the other bone, a shell offering, and some miscellaneous iron fragments.

PS 1.1

The second burial of this context was identified by a single tibia which, based on its length, belonged to a child who was 2-4 years of age at death (Domett & Newton 2013a). Due to the heavily disturbed and fragmentary nature of the context the individual has not been included in the analyses conducted in this project.

No artefacts were directly associated with this individual.

PS 1.2

A collection of bones belonging to the left and right feet of a second adult were designated as burial 1.2 (Domett & Newton 2013a). The calcanei of the feet were considerably smaller than those of burial 1. A small piece of ilium was linked to this burial and suggests the individual was female. It was not possible to determine an age at death more specific than an adult though no degeneration of the foot bones may suggest the individual was not elderly. Due to the disturbed and fragmentary nature of the context the individual has not been included in the analyses conducted in this project.

No artefacts were directly associated with this individual.

PS 2

The remains of burial 2 were first uncovered 120 cm below the surface at layer 2.1 (O'Reilly et al. 2015). The mortuary context was severely disturbed and appeared as a jumble of mostly adult remains. Only during post excavation osteological examination of the material was a second individual (2.1) distinguished. Based on a narrow greater sciatic burial 2 was identified as male. It was not possible to specify an age at death beyond adulthood, however minimal wear on a possible 2nd molar may suggest a somewhat young adult (Domett & Newton 2013a). No grave cut was distinguished.

The assemblage associated with the burial was made up of:

An iron point, 68 glass beads (four contexts), four ceramic vessels, and several iron fragments

PS 2.1

A second individual was identified through the presence of the proximal portion of a femur and a single rib. Comparison with other prehistoric Southeast Asian femurs (from Man Bac in Vietnam (Oxenham et al. 2011; Matsumura et al. 2011)) suggests an age between 6-8 years (Domett & Newton 2013a). Due to the disturbed and fragmentary nature of the context the individual has not been included in the analyses conducted in this project.

No artefacts were directly associated with this individual.

PS 3

Burial 3 was uncovered 52 cm below the surface in layer 1:6 (O'Reilly et al. 2015). The context was very disturbed with few remains. Osteological examination confirmed that the bones belong to a single individual (Domett & Newton 2013a). Even so, identifying sex was impossible given the lack of measurable features on the pelvis or cranium. The examiners did note some slight gonial eversion of the mandible which is typically a male trait. However, on the whole, the skeletal remains were noted as moderately gracile and measurements of the femoral head returned readings very close the sectioning point of Southeast Asian populations. Therefore, the individual was likely either a robust female or gracile male. The fragmentary nature of the remains also made it difficult to provide an age at death approximation beyond adulthood. Average wear on a 2nd molar may indicate the individual was aged between young adulthood and middle age.

The moderate assemblage associated with the burial was made up of:

Ten glass beads (in one context), a carnelian bead, and three ceramic vessels.

PS 4

The fourth and final mortuary context of the 2009 season was encountered 130cm beneath the surface in the extension to Unit 1 (Unit 1A) (O'Reilly et al. 2015). As with all other burials from the first season, the grave was highly disturbed and the skeletal material was very incomplete. A second individual (labelled 4.1) was recovered from the same context. The only surviving remains of burial 4 were two pieces of a femoral shaft and three incomplete vertebrae (Domett & Newton 2013a). Based on these scant remains neither the sex nor specific age beyond adulthood could be identified.

The assemblage associated with the burial comprised:

A bronze ring, a bronze bell, an iron knife, three iron projectile points, an iron digging implement, 340 glass beads (two contexts), three spindle whorls, two clay pellets, ten ceramic vessels, and two miscellaneous iron implements.

PS 4.1

The second burial in the mortuary context contained slightly more skeletal remains than burial 4. The individual was represented by cranial fragments, pieces of long bones, a rib, and part of the right ilium (Domett & Newton 2013a). Age at death was estimated at less than 1-year-old given that the hypoglossal canal was not complete. Due to the disturbed and fragmentary nature of the context the individual has not been included in the analyses conducted in this project.

No artefacts were directly associated with this individual.

PS 5

Mortuary context 5 was first burial identified in the second (2010) season of excavation. The grave cut was uncovered 120 cm below the surface (O'Reilly et al. 2015). The context was heavily disturbed, with the incomplete remains of three individuals intermingling in the grave. Burial 5 was the largest and most complete individual. The remains confidently associated with this individual include part of the pelvis (both left and right), the left patella, right ulna, both clavicles and scapulae, the femoral heads, and some hand bones (Domett & Newton 2013a). Age at death was estimated as a young adult based on analysis of the ventral arc. The pubic bone was noted as strongly suggestive that the individual was female.

The left maxillary third molar was submitted for dating and returned a date of 90-240 cal CE (O'Reilly et al. 2015).

The assemblage associated with the burial comprised:

Two bronze bangles, five bronze rings, an iron digging tool, 184 glass beads (two contexts), a carnelian bead, six spindle whorls, three clay pellets, six ceramic vessels, an iron ring, and two stone flakes.

PS 5.1

A second adult was distinguished by the lateral end of their right arm (radius, ulna, and hand bones). These remains did not provide any information to identify sex or age at death (Domett

& Newton 2013a). The examiners did note that there was no sign of joint degeneration so it is unlikely that the person was middle-aged or older. Due to the disturbed and fragmentary nature of the context the individual has not been included in the analyses conducted in this project.

No artefacts were directly associated with this individual.

PS 5.2

The final individual recovered from the mortuary context was the smallest in stature (Domett & Newton 2013a). Post excavation osteological examination struggled to accurately assign a number of skeletal remains between 5.1 and 5.2. The right and left ulnae, left MC 5, and right hamate were the only items that could be confidently assigned to this individual. Several remains were listed as probably belonging to 5.2, including a right and left zygomata and part of a right maxilla with some loose teeth. It is on the base of analysis of the teeth, which have only light attrition, that the individual was estimated as a young adult. Due to the disturbed and fragmentary nature of the context the individual has not been included in the analyses conducted in this project.

No artefacts were directly associated with this individual.

PS 6

The grave cut for mortuary context 6 was encountered 120 cm below the surface at layer 2:5 (O'Reilly et al. 2015). This was the first burial uncovered in either season at Sophy featuring minimal disturbance to the skeletal and material remains. The individual was interred in an extended supine position on a western orientation. The skeleton was recovered in good condition and was almost complete. The large amount of skeletal remains, especially the well-preserved dentition, allowed for a very confident age at death assignation of 5-7 years (Domett & Newton 2013a).

A small portion of bone was sampled for radiocarbon dating. The results returned a date range of 230-395 cal CE (O'Reilly et al. 2015).

The assemblage associated with the burial comprised:

Seven bronze bangles, two bronze rings, two iron sickles, two iron projectile points, an iron digging implement, 378 glass beads (three contexts), an agate bead, 19 carnelian beads (two contexts), a spindle whorl, eight ceramic vessels, a decorated bone, and a shell ornament.

PS 7

The grave cut for mortuary context 7 started 120 cm below the surface at layer 2:5 (O'Reilly et al. 2015). The burial was well preserved with minimal disturbance of the skeleton or material assemblage. The individual was in an extended supine position oriented to the northwest. The mostly intact nature of the skeletal remains allowed for positive sex and age determination. Pelvis and cranial evidence indicated that the individual was male (Domett & Newton 2013a). Age at death was determined by an extensive analysis of the entire skeleton. Mandibular and maxillary dentition displayed moderate to advanced wear. Similarly, analysis of the vertebrae revealed minor to moderate osteoarthritis in the cervical and thoracic regions, while it was more severe in the lumbar region. The bioarchaeological examiners also noted signs of osteoarthritis in several joints such as the knees and shoulders. Based on the degree of wear evidence through the skeleton, age at death was a middle aged to older adult.

The funerary items accompanying the burial present the immediate impression of wealth, and numerically represent the second largest individual assemblage uncovered at Phum Sophy. As a mark of wealth, the individual's right forearm was covered entirely with bronze bangles (Figure 6.4). Such use of bangles has been fairly universally linked to higher status individuals in the prehistory of Southeast Asia (Higham 2011a; Higham 2011b; Higham et al. 2007). The assemblage associated with the burial comprised 19 bronze bangles, three bronze rings, four bronze bells, a bronze bowl, a bronze necklace, a gilded gold-bronze earring, two iron sickles, ten iron projectile points, iron digging/agricultural tools, two iron spears, 192 glass beads (three contexts), two agate beads (two contexts), 14 carnelian beads (four contexts), a spindle whorl, a clay pellet, ten ceramic vessels, an agate pendant, and an animal tooth pendant.

Figure 6.4 Bronze bangles covering the right forearm of PS 7. Catalogue number 209. Photograph taken by initial excavation team. Used with permission.

PS 8

Mortuary context 8 was uncovered 130 cm below the surface at layer 3:1 (O'Reilly et al. 2015). The skeleton was nearly complete and excavators noted that the skull and long bones were found in particularly good states of preservation. The interment was the only burial in either season of excavation at Phum Sophy where the individual was identified in a flexed position (Figure 6.5) (though it is possible some of the severely disturbed or looted burials were interred this way). The body was positioned on a westerly orientation. Age at death, as estimated from dental formation, places the child between 2 to 4 years old (Domett & Newton 2013a).

The assemblage associated with the burial comprised:

Six bronze bangles, an iron spear, four glass beads (one context), a carnelian bead, and three ceramic vessels.

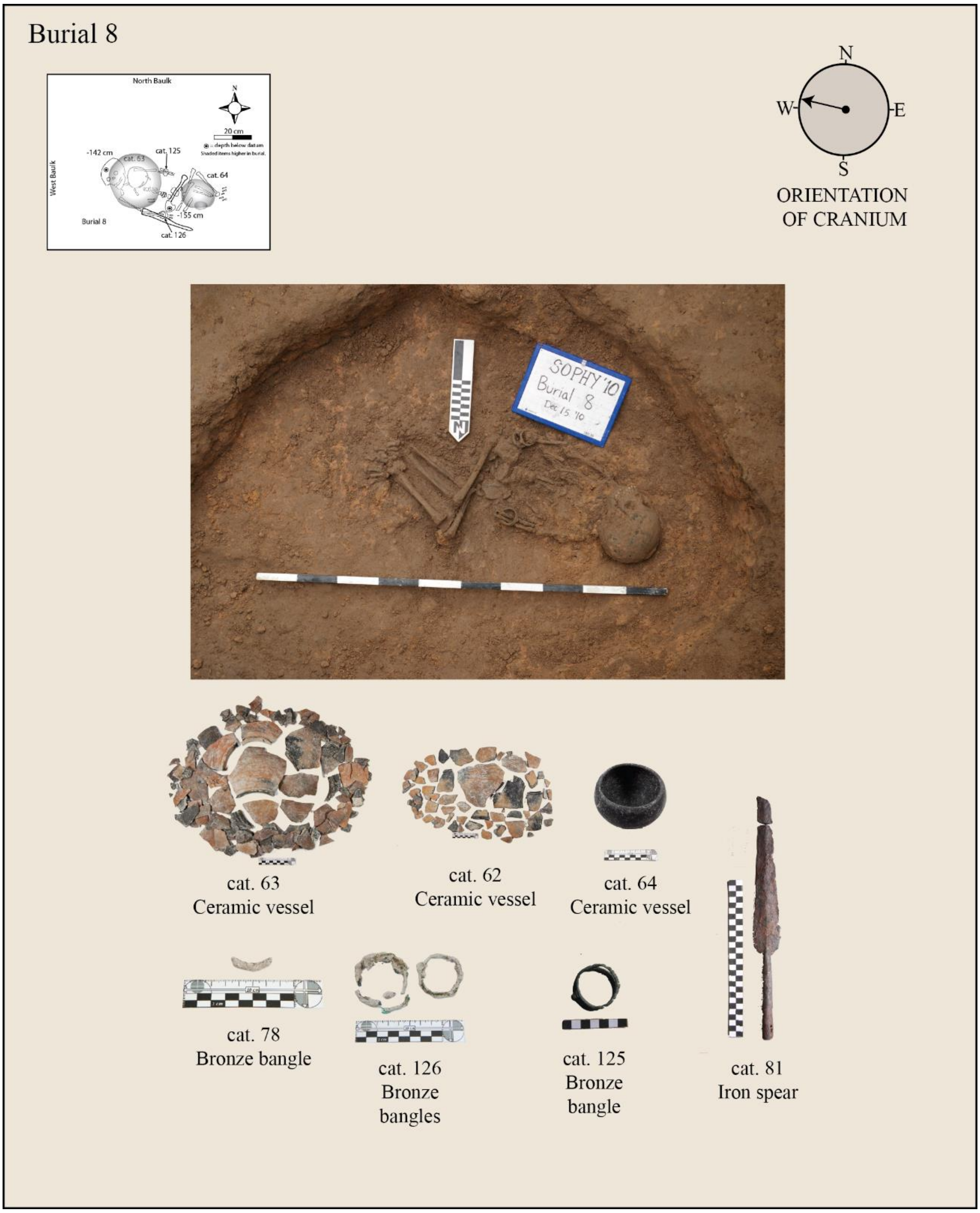

Figure 6.5 Image of burial 8 and the accompanying mortuary collection. Image originally from O'Reilly et al. 2015, used with permission.

PS 9

Mortuary context 9 was encountered in close proximity to burials 5 and 13, 130 cm below the surface in layer 3:1 (O'Reilly et al. 2015). Burial 9 was the most intact of this small cluster of disturbed burials in the southeast section of the 2010 excavation unit. Excavators noted that most of the skeleton was present (aside from the feet and a hand), however the bones were in a very fragmentary state. The individual had been placed in an extended supine position with the head orientated northwest. Age at death was estimated from dental formation, which places the child 1.5 to 3.5 years old (Domett & Newton 2013a).

The close proximity and some disturbance of burial 5 and 9 means that some loose, fragmentary artefacts could not be confidently assigned to either burial. Only four artefacts were positively associated with this individual. The assemblage associated with the burial comprised:

A carnelian bead and three ceramic vessels.

PS 10

Mortuary context 10 was uncovered 130 cm beneath the surface in layer 3:2 (O'Reilly et al. 2015). The skeleton was fairly well preserved as most of the remains were still present, though in a somewhat fragmented state. The individual had been placed in an extended supine position on a northwest orientation. Analysis of the remains uncovered a few adult human bones scattered in the grave (Domett & Newton 2013a). These included part of a right mandible, a possible premolar, 2 phalanges (from a foot and hand) and part of a clavicle. While post-excavation analysis confirmed that these remains did not belong to burial 10, they were not subsequently given a numbered burial, perhaps because there is no evidence they are from a single individual. Age at death for burial 10 was estimated from dental formation at 6 to 9 years old.

The assemblage associated with the burial comprised:

Four bronze bangles, a bronze bell, an iron knife, an iron sickle, 15 iron projectile points, an iron digging implement, and iron chisel, 450 glass beads (six contexts), five carnelian beads (two contexts), eight spindle whorls, eight ceramic vessels, iron slag, and several miscellaneous bronze and iron fragments.

PS 11

The grave cut for mortuary context 11 was first encountered 130 cm below the surface at layer 3:1 (O'Reilly et al. 2015). The context was very well preserved, with almost the entire skeleton present and in good condition. The body had been placed in an extended, supine position on a northwest orientation. Part of the grave cut, including the cranium, extended into the western baulk of the excavation unit. Age at death was estimated from the degree of epiphyseal fusion present on many bones, which suggests a range of 15 to 18 years old (Domett & Newton 2013a). Pelvic and cranial morphology suggests that the individual was female.

A sample of bone from the mandible was extracted for radiometric dating. The analysis returned a date range of 237 – 380 cal CE.

The assemblage associated with the burial comprised:

A bronze bangle, a bronze earring, an iron knife, an iron point, an iron digging implement, 113 glass beads (two contexts), two spindle whorls, two clay pellets, five ceramic vessels, a lithic core, several shell offerings, and an animal bone.

PS 12

The mortuary context for PS 12 appeared in the southeast corner of the 2010 excavation unit. This area displayed considerable evidence of being disturbed and the contexts here were incomplete. Mortuary context 12 was encountered 140 cm below the surface at layer 3.2 (O'Reilly et al. 2015). The burial is represented by fragments of the cranium and long bones. Based on these fragments the orientation of the burial was attributed a north-westerly direction and appears to have been in an extended, supine position. Unfortunately, the scant skeletal remains did not contain the necessary markers to provide accurate estimates for age at death and sex of the individual other than to say they were an adult (Domett & Newton 2013a).

No artefacts were recovered in the mortuary context.

PS 13

Burial 13 was uncovered in a disturbed mortuary context 140 cm below the surface at layer 3:2 (O'Reilly et al. 2015). Due to the disturbed nature of the context no grave cut was distinguished. The skeletal remains were recovered just to the north (and slightly below) PS 9. Only the lower limbs were present and intact, along with some fragments from the cranium, pelvis, a vertebra, and upper limbs. To illustrate the degree of disturbance, the individual's right maxillary lateral incisor was found with the PS 13 context, however the contralateral tooth was recovered in the PS 5.3 collection (Domett & Newton 2013a). Age at death was estimated from the available dentition formation as between 2 and 2.5 years old.

No artefacts were recovered in the mortuary context.

PS 14

The final burial recovered at Phum Sophy, the grave cut for mortuary context 14 was encountered 130cm below the surface at layer 3:1 (O'Reilly et al. 2015). The individual lay in an extended supine position oriented northwest progressing into the west baulk. Only the legs protruded into the initial excavation trench. The context returned a near complete skeleton only missing the feet (Domett & Newton 2013a). Age at death was estimated as middle aged based on analysis of the pubic symphysis and great tooth wear. Based on pelvic and cranial measurements the individual was likely female.

Burial 14 was by far the most well-appointed burial recovered from either season at Phum Sophy (Figure 6.6), with more than double the number of artefacts present in the next highest (PS 7). The probable high status of the individual was marked by both shins and the left forearm being completely covered in anklets and bangles.

The large assemblage associated with the burial was made up of:

59 bronze bangles, 50 bronze anklets, 43 bronze rings, a bronze earring, two bronze bells, an iron sickle, two iron projectile points, two iron digging implements, an iron chisel, an iron spear, 49 glass beads (five contexts), five agate beads (two contexts), 273 carnelian beads (three contexts), 11 ceramic vessels, an animal tooth pendant, a shell and glass pendant, a perforated animal bone disc, a shell offering, and a miscellaneous iron object.

Figure 6.6 Illustration of burial 14 with its large mortuary assemblage. Image originally from O'Reilly et al. 2015, used with permission.

*Table 6.2 Artefacts recovered from two seasons of excavation at Phum Sophy. * refers to the number of burials included for further analysis.*

Phum Sophy	
Burials*	14
Burials containing goods	12
Bronze bangles	98
Bronze anklets	51
Bronze rings (finger or toe)	66
Bronze earrings	3
Bronze bells	8
Iron knives	4
Iron sickles	6
Iron points	34
Iron digging tools	12
Iron spears	4
Glass beads	2157
Agate bead	8
Carnelian beads	337
Gold items	1
Spindle whorls	22
Clay pellets	8
Ceramic vessel	81

Site Trends

On average the funerary assemblages recovered from Phum Sophy were considerably larger than the other sites included in this study. After removing PS 1.1, 1.2, 2.1, 4.1, 5.1, and 5.2 due to their highly disturbed nature, the remaining burials average 33.8 artefacts each (where beads are considered a single artefact per context). This of course does not account for variation in wealth and status within the Phum Sophy population. The following section offers an examination of distinctions in funerary assemblages across age, sex and wealth groups at Phum Sophy. Due to the small numbers of burials recovered from each Cambodian site, the below section only illustrates site trends. No attempt is made to interpret the data until a later chapter where the sites can be grouped together to create a more meaningful dataset less susceptible to false trends from small sample size.

Standardising Wealth

The extreme wealth of burial PS 14 created a problem in standardising wealth at Phum Sophy. The PS 14 assemblage alone raises the values for the mean and standard deviation by 50% and 100% respectively (compared to when PS 14 is not included in calculations). The result, as can be seen in column 3 of Table 6.3, was all but three burials returning negative z scores within 0.7 σ of each other. Therefore PS 14 was treated as a statistical outlier and was removed from calculations of the mean and standard deviation (Table 6.3 column 4) which produced a more normal data spread with seven burials below and seven above the mean. Using the revised mean and standard deviation, nine (64.3%) individuals are within a single standard deviation of the mean. Finally, the data were grouped into categories of 0.25 σ for those one standard deviation either side of the mean and larger categories further from the mean.

Table 6.3 Calculation of relative wealth values (z scores) for burials at Phum Sophy

Burial	Total artefacts	Z score (includes PS 14)	Z score (excludes PS 14)	Standardised value
1	35	0.014741711	0.609687	0.5 - 0.75
2	11	-0.480576807	-0.55732	-0.75 - -0.5
3	5	-0.604406436	-0.84907	-1 - -0.75
4	26	-0.171002733	0.172059	0 - 0.25
5	29	-0.109087918	0.317935	0.25 - 0.5
6	31	-0.067811375	0.415185	0.25 - 0.5
7	68	0.695804673	2.214323	2-3
8	12	-0.459938535	-0.5087	-0.75 - -0.5
9	4	-0.625044708	-0.8977	-1 - -0.75
10	51	0.344954056	1.387692	1-2
11	20	-0.294832363	-0.11969	-0.25 - 0
12	0	-0.707597794	-1.0922	<-1
13	0	-0.707597794	-1.0922	<-1
14	188	3.172397261	8.049363	3<

σ (excluding PS 14): 20.6

μ (excluding PS 14): 22.5

Breakdown of Wealth

Three separate groups are discernible upon review of the standardised cemetery data for wealth (Figure 6.7). The three poorest categories (<-1, -1 – -0.75, and -075 – -0.5) appear to represent a group of poorer individuals. A middle tier may be present between -0.25-0 and 0.5-0.75-1 standard deviations from mean wealth. Those individuals whose burial assemblages were over a standard deviation wealthier than the average represent the highest group.

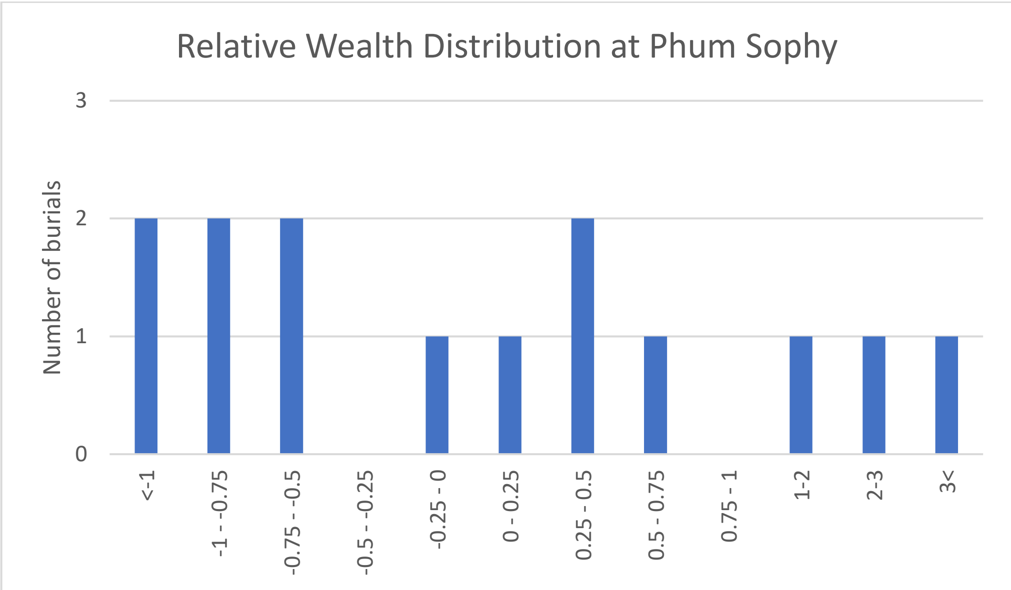

Figure 6.7 Distribution of wealth at Phum Sophy relative to the site mean.

An examination of the composition of grave assemblages associated with the above three tiers (Table 6.4) reveals that many artefacts are absent from the poorest group (<-1 – -0.5). Projectile points, bronze bells, earrings, digging implements, pendants, sickles, finger rings, and spindle whorls are all present in both of the other groups but absent in the lowest tier. In total, the burial assemblages of the poorest tier contain a combined total of five types of artefacts (not including different forms of ceramic vessels).

The variance between artefacts found between the middle (-0.25 – 0.75) and highest (1<) wealth groups is less distinct. The main difference is instead sheer quantity of each artefact. However, a few differences in assemblages do appear.

Clay pellets, iron knives, and stone flakes belong solely to the middle wealth tier. The burial assemblages of the middle group have a combined tally of 17 types of artefacts.

Meanwhile anklets, bronze bowls (only one), iron chisels, spears (one also with a 'poor' burial), toe rings, and animal tooth pendants all appear in the wealthiest burials but not in the middle group. 21 different artefact types belong to the combined burial assemblages of the wealthiest group.

Table 6.4 Artefacts recovered according to wealth groups at Phum Sophy. Tick marks indicate the presence of an artefact in at least one burial of that wealth tier. For an illustrated glossary of artefacts see appendix two.

Artefact	**Poor**	**Middle**	**Wealthy**
Anklet			✓
Projectile point		✓	✓
Bangle	✓	✓	✓
Beads	✓	✓	✓
Bell		✓	✓
Bronze bowl			✓
Chisel			✓
Clay pellet		✓	
Earring		✓	✓
Flake		✓	
Digging implement		✓	✓
Knife		✓	
Machete		✓	
Pendant		✓	✓
Perforated disc			✓
Miscellaneous tool	✓	✓	✓
Ring		✓	✓
Sickle		✓	✓
Spear	✓		✓
Spindle whorl		✓	✓
Spoon-shaped digger			✓
Toe ring			✓
Tool		✓	✓
Tooth pendant			✓
Ceramic vessel	✓	✓	✓
Total	5	17	21

Sex Differentiation

Of the 14 burials included from the Phum Sophy collection, biological sex could only be distinguished for six individuals. These were evenly split with three males and three females. Six of the remaining burials were underage and therefore had not developed morphologically distinguishable skeletal characteristics, and two (PS 3 and 12) did not have the necessary features adequately preserved for measurements.

Table 6.5 shows the average number of artefacts per individual based on biological sex. Unsurprisingly the unknown category is lowest as it is comprised predominately of subadults. Of those skeletons that sex determination was possible, females average more than double the grave goods of males.

Table 6.5 Average assemblage size according to biological sex.

	MALE	FEMALE	UNKNOWN
Total Artefacts	108	231	134
Total Individuals	3	3	8
Average Assemblage Size Per Burial	36	77	22.3

After standardising the raw data into z scores (Table 6.3) individual burials can be viewed in their relative position of wealth within Phum Sophy. Table 6.6 demonstrates that the wealthiest individual was a female (PS 14). In the main (apart from one male) the bottom three groups which make up the bottom wealth tier (<-1 - -0.5 deviations from the mean) comprise individuals for whom sex could not be determined.

Given that only six skeletons at Phum Sophy have a positive determination of sex it is not possible to identify whether any particular artefacts are associated with a single sex over the other. Even in the small group there is no item that is found in every individual of one sex and absent in the other.

Table 6.6 A tally of the number of individuals at each wealth group after the data have been standardised.

Standardised wealth category	Male	Female	Unknown
<-1			2
-1 - -0.75			2
-0.75 - -0.5	1		1
-0.5 - -0.25			
-0.25 - 0		1	
Mean Wealth			
0 - 0.25			1
0.25 - 0.5		1	1
0.5 - 0.75	1		
0.75 - 1			
1-2			1
2-3	1		
3<		1	

Age Differentiation

An examination of wealth accumulation based on age at death (Table 6.7) reveals that, on average, greater wealth was attained in adulthood. This is common in mortuary assemblages (Crawford 2000; Oxenham et al. 2008a) due to the simple reason that children and subadults do not have the means to attain wealth for themselves and are therefore reliant on adults to fill their funerary assemblage. Middle age adults, the oldest group uncovered at Phum Sophy, is the wealthiest on average. There does not appear to be any difference in types of artefacts included in grave assemblages based on age.

Table 6.7 Average assemablage size based on age-at-death.

ASSEMBLAGE SIZE PER AGE

	Infant	Child	Subadult	Young adult	Adult	Middle aged
Average Assemblage Size	0	18.8	16	29	10	95
Average (Grouped)	18.3			44.25		

Typological Trends in Circlets

In addition to a general analysis of the range and quantity of artefacts in graves, the morphological typology for circlet designed as part of this study (Chapter 5) can provide further insight into economic and social differentiation at Phum Sophy. Along with ceramics, circlets represent the most distinctive and readily visible part of the funerary assemblages. Assuming that these were worn in life as well as death, it is reasonable to consider that aspects such as the number and different types worn by an individual could have been a sign of their standing to other members of the society (Fowles 1974; Arnold 1991).

Figure 6.8 and Figure 6.9 provide a breakdown of (Figure 6.8) the average number of circlets and (Figure 6.9) different shapes found in burials across wealth categories. In both figures the bottom tier is noteworthy for its absence. Only one member of the poor tier, which accounts for nearly 43 percent of the cemetery population, wore any circlets. That individual (PS 8) wore only the most common, flat-band type (G). The result of almost entirely excluding the poorest individuals, is that circlets only begin appearing in burials around mean wealth and above. Figure 6.8 shows a somewhat consistent upward trend of increasing quantities of circlets accompanying individuals of greater wealth. The wealth category 1-2 standard deviations above the mean stands out as anomalously lacking in circlets, though Figure 6.9 shows that even with the few circlets, there is still an increase in the number of different types present.

Interestingly, the average number of different types increases dramatically per wealth category within the upper tier (Figure 6.9). However, aside from the upper tier, the average number of types per burial remains fairly static around two types per individual.

In total the lowest wealth tier only included a combined total of one type. Nine different types were recovered from burials in the middle tier, while the three individuals of the upper tier produced a combined total of 15 unique types.

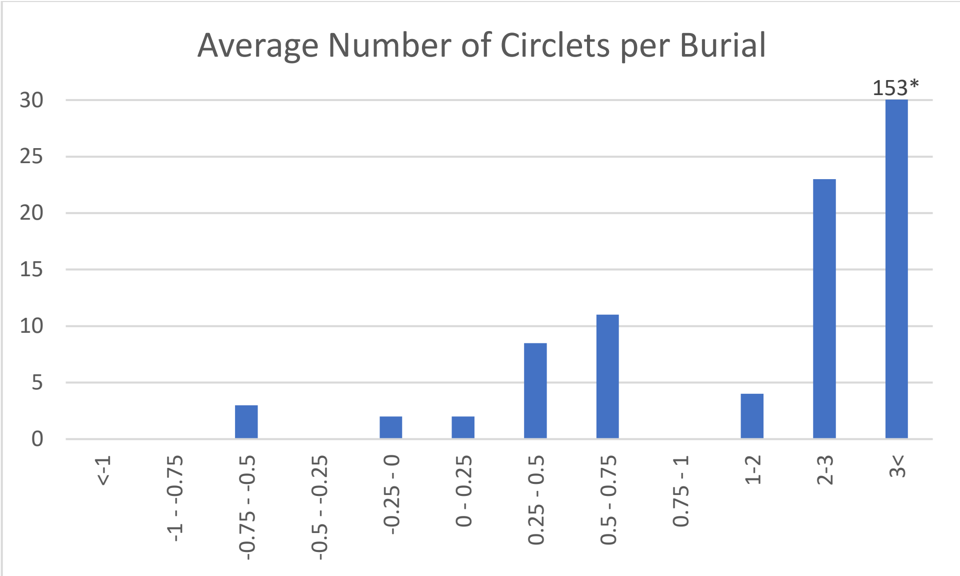

*Figure 6.8 Average quantities of circlets in assemblages across relative wealth categories. *The ceiling value for the bar chart was limited to 30 circlets to aid illustration.*

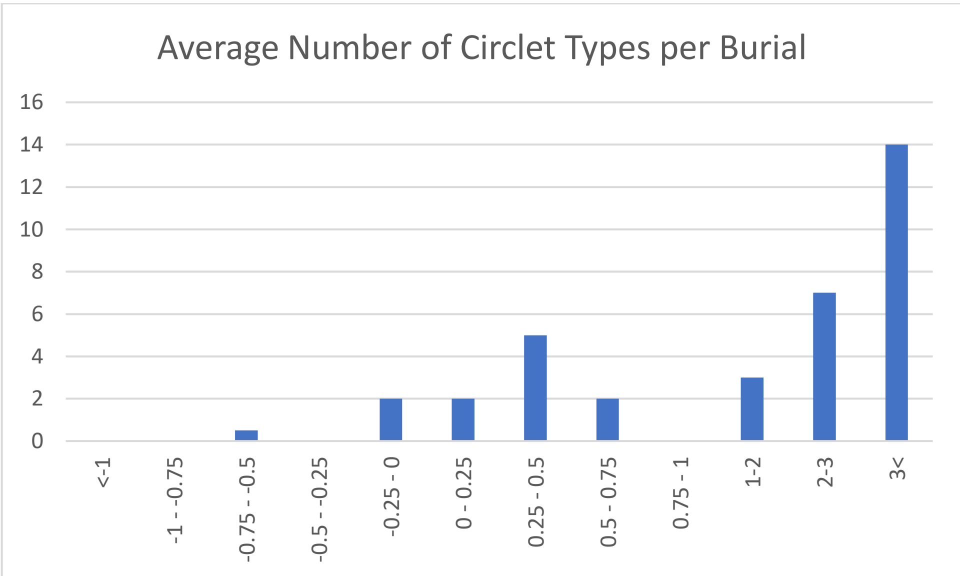

Figure 6.9 Average number of different 1st tier typological forms in burial assemblages across relative wealth categories.

In relation to societal differentiation around roles of the sexes, analysis of circlet typologies echoes the complete material assemblage. Due mainly to the presence of PS 14 as by far the wealthiest burial in the cemetery, females average several times more circlets per burial, as well as more than double the number of circlet types (Table 6.8). While PS 14 accounts for 153 (93.9%) of the circlets associated with females, the richest male burial (PS 7) contains 23 (67.6%)

of those found with males. The wealthy burials considerably push up the averages for both sexes, it is just that wealthy female far outstrips the wealthy male. This illustrates the dangers of drawing conclusions from such a small dataset where individual outliers may drastically alter the resultant picture.

Table 6.8 Average frequency of circlets and circlet types by biological sex.

	MALE	FEMALE	UNKNOWN
Total Circlets	34	163	21
Total Types	9	19	12
Total Individuals	3	3	8
Average Circlets Per Assemblage	11.3	54.3	2.6
Average Types Per Assemblage	3	6.3	1.5

Conclusion

The late Iron Age site of Phum Sophy in the Banteay Meanchey province of Northwest Cambodia yielded, on average, the richest burials of the cemeteries included in this project. Twenty individuals were recovered from two seasons of excavation in 2009 and 2010. Unfortunately, the entire site had been subject to large scale looting and as a result the excavation team faced difficulties finding suitable areas within the modern village to dig. The initial season was located on the periphery of the mound and yielded eight mostly poor and disturbed contexts. The 2010 season was more successful, excavating an un-looted area near the middle of the village mound. The burials uncovered there were typically wealthier and less disturbed than those of the preceding season. Due to the highly disturbed nature of several burials, six individuals for whom a mortuary assemblage could not be distinguished were removed from this analysis.

The assessment of mortuary assemblages conducted in this chapter potentially distinguishes three economic tiers demonstrated both by general burial wealth and also the use of circlets. On average female burials are significantly wealthier than males at Phum Sophy, however, as both groups only contain three individuals, these numbers are skewed significantly by individual burials. The trends illustrated in the second half of this chapter will be examined further in combination with the data from the remaining sites to offer a more robust dataset.

Chapter 7 Phum Lovea

Phum Lovea is a circular prehistoric occupation site in Northwest Cambodia (Figure 7.1). The site consists of a pair of moats encircling an elevated central mound located in the Puok District of Siem Reap Province, Cambodia. Archaeological examination and excavation at Phum Lovea was led by O'Reilly and Shewan as part of the Australian Research Council (ARC) funded project *From Paddy to Pura* (O'Reilly et al. 2013). The project included a diverse, multi-disciplinary approach to analysis of the prehistoric village, incorporating LiDAR analysis of the landscape, geomorphological exploration of the surrounding earthworks, analysis of the glass beads and ceramic material, as well as bioanthropological study of the human skeletal material. Phum Lovea lies in close proximity to the Angkor park in the Siem Reap Province (Figure 7.2), which likely aided the relatively early 'discovery' of the site. The presence of archaeological material at Phum Lovea was first noted over half a century ago by Malleret (1959a) who noticed two encircling embankments around the village mound.

Figure 7.1 Satellite image of the modern village situated on the prehistoric mound at Phum Lovea. Encircling tree lines mark embankments forming the boundary of extinct moats.

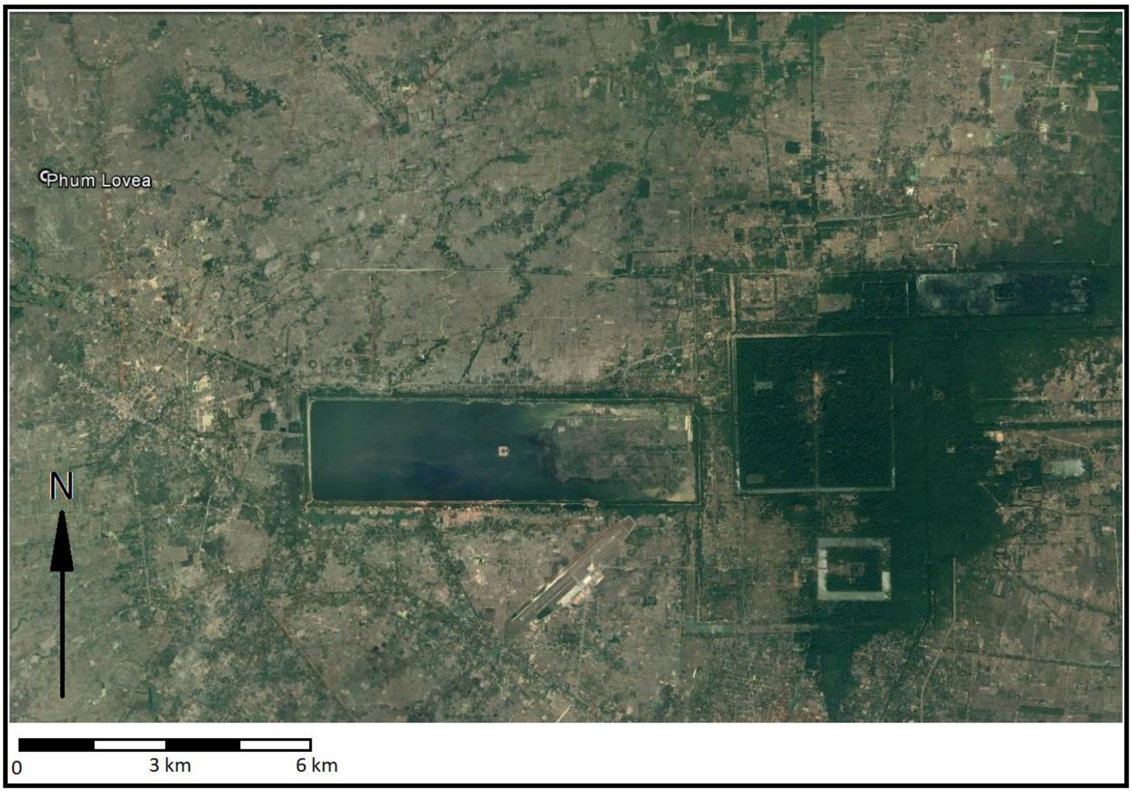

Figure 7.2 Phum Lovea in geographic relation to the main Angkorian temples.

Excavation revealed a prehistoric cemetery in the third and final soil horizon (O'Reilly et al. 2013). Radio carbon dating places the prehistoric cemetery in use for roughly three centuries from c. 100 – 400 CE, during which no clear phases of mortuary activity could be distinguished. Later Angkorian debris in Layer two indicates that occupation of the mound continued into the Historical Period, though the prevailing Angkorian funerary practice of cremation makes any burials in this period archaeologically invisible (Beavan et al. 2012; O'Reilly 2007). The top soil horizon represents the modern activity at Phum Lovea (O'Reilly et al. 2013).

Several Angkorian period structures including temples and a large baray have been identified in nearby area (Figure 7.3). Notable among them, Banteay Sra, a sizable rectilinear temple dating to the Angkorian period, lies a little over 2km to the south east. As an illustration of the proliferation of surrounding archaeological sites, on the east side of Phum Lovea the outer moat almost comes into contact with a small, most likely Angkorian-era, reservoir (visible as a square shape in the northeast corner of Figure 7.1). On the southern side Phum Lovea touches on part of the northern edge of an Angkorian period baray. In the wider area Phum Lovea sits less than 10 km from the edge of the great West Baray (Figure 7.2).

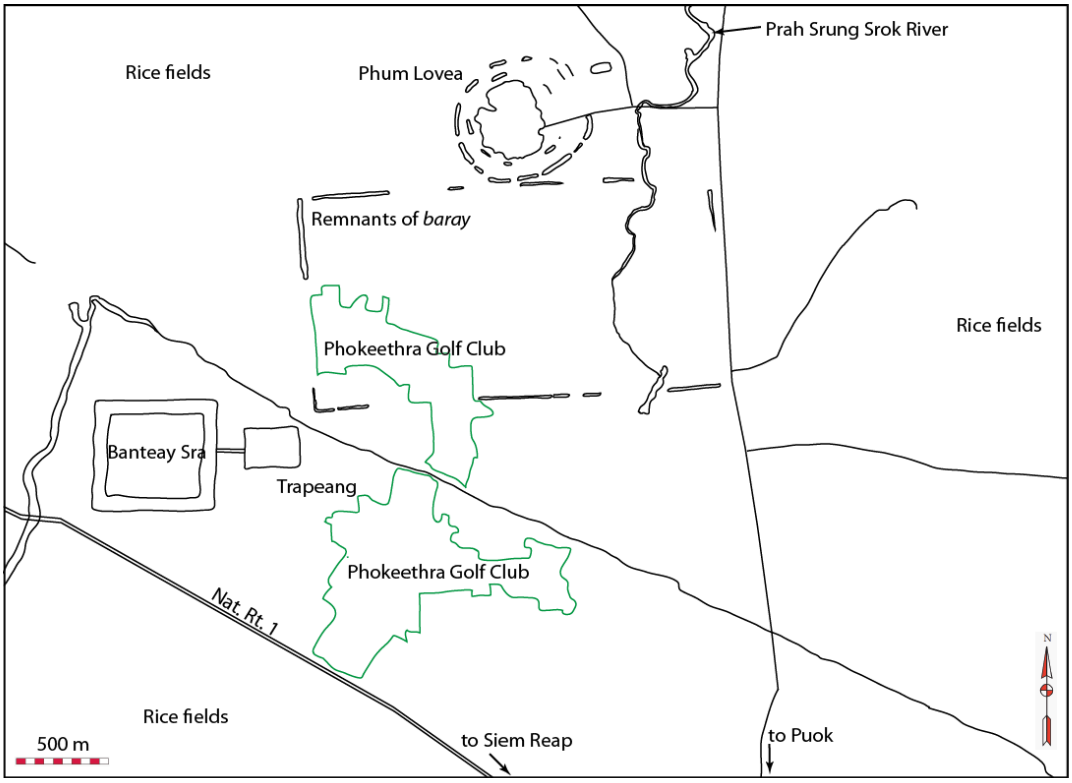

Figure 7.3 Map of surrounding archaeological and modern features in close proximity to Phum Lovea. Image originally produced for O'Reilly et al. 2013. Used with permission.

Excavation Details

Phum Lovea was excavated over two seasons from 2011 to 2013. During the initial season in 2011/12 an 8m x 8m trench was excavated in the centre of the prehistoric mound (Figure 7.4) (O'Reilly et al. 2013). Thirteen individuals were recovered from the unit, however the excavators noted especially poor preservation of all skeletal material. Of the individuals recovered, no subadults were identified. This may be due to the poor preservation or perhaps is a sign that younger individuals were subject to different funerary treatment possibly in a different area of the cemetery not encountered in the excavation. The latter conclusion is perhaps more likely given that no females were identified in the recovered burials (though it was not possible to determine sex for several individuals).

The second season of excavation in 2012/13 sought to understand the geomorphological nature of the mounded village and its moat and embankment system. To this end several trenches were established across sections of the earthworks (Figure 7.4). These found no trace of former palisades or defensive structures, supporting theories that moats such as these were constructed for water storage rather than defence (O'Reilly et al. 2013: 74; Scott & O'Reilly 2015). No funerary contexts were uncovered in the surrounding earthworks and only one burial was identified in the second season (in Unit 2).

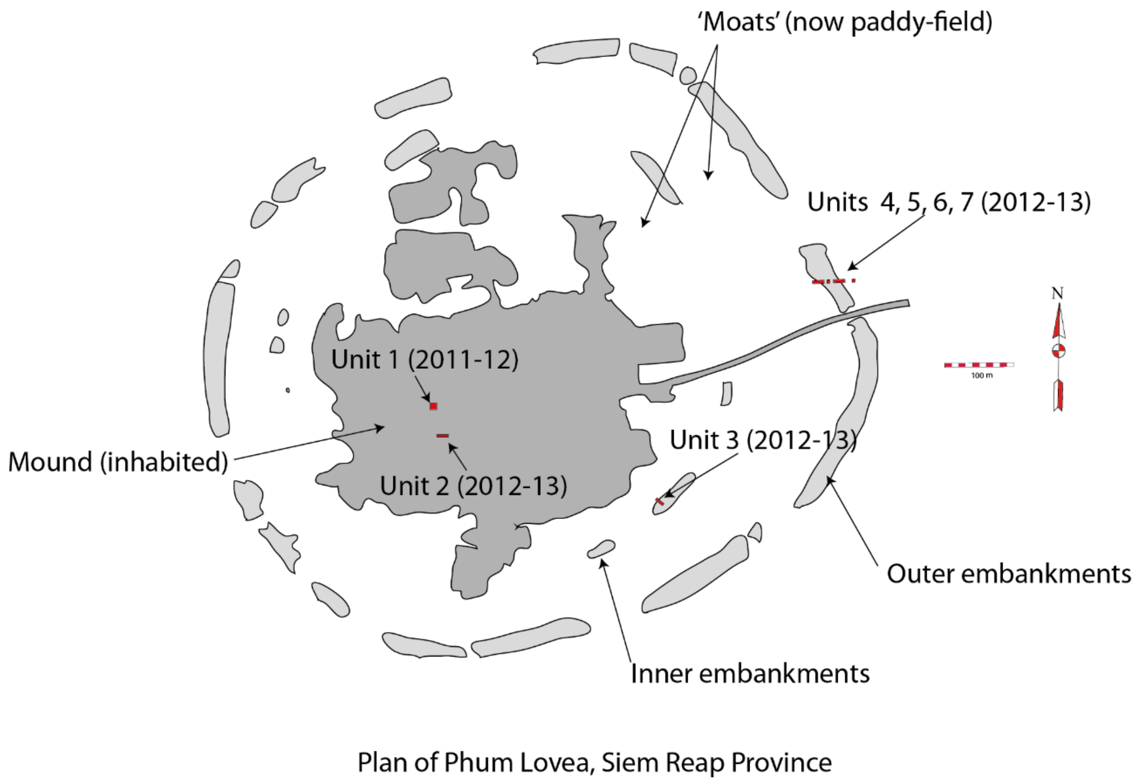

Figure 7.4 Map of the mound and embankments at Phum Lovea with the locations of excavation trenches marked. Image originally from O'Reilly et al. 2015. Used with permission.

Mortuary Data

In total 14 individuals were uncovered from 12 mortuary contexts across the two seasons at Phum Lovea. The results of osteological analyses conducted by Domett and Newton (2013b) are listed below along with details of the mortuary assemblages accompanying each individual. Table 7.1 provides an overview of the major characteristics of each burial including age at death, sex, and number of accompanying artefacts. Where beads are found, the total number recovered is listed followed in brackets by the number of contexts as noted by the excavators (a single context reflects a cluster or pattern of beads which may have made up a single artefact such as a necklace). Appendix 2 provides an illustrated glossary of the artefacts listed here.

All burials belonged to a single mortuary phase in the mid-late Iron Age based on their associated mortuary assemblage and radiocarbon dates (O'Reilly et al. 2013). The recovered artefacts display a similar range and style of items as at Phum Sophy. This includes: glass, carnelian and agate beads, iron digging implements and sickles, and bronze jewellery. Appendix two provides an illustrated glossary of all artefacts covered in this project.

*Table 7.1 Burials at Phum Lovea. *Orientation refers to the placement of the cranium in the burial. Where Orientation and/or Type are blank, poor preservation did not allow for identification.*

Burial	Age	Sex	Orientation*	Type	All Artefacts
1 L	adult	?	SE	extended	35
2 L	elderly	M			11
3 L	adult	M			18
3.1 L	adult	?			5
3.2 L	18-20 years	M	S	extended	34
4 L	adult	?	S	extended	22
5 L	adult	?	SE	extended	4
6 L	elderly	M	S	extended	14
7 L	18-20 years	M		extended	20
8 L	young adult	?		extended	23
9 L	adult	M	S	extended	24
10 L	elderly	M	S	extended	34
11 L	adult	?	S	extended	8
12 L	18-20 years	?		extended	2

Burials

L 1

The first mortuary context recovered at Phum Lovea was identified in layer 3:3 as a poorly preserved outline of a cranial vault and both femora and the left tibia (Domett & Newton 2013b). Despite the poor preservation, the burial appeared undisturbed and the bones were articulated in an extended supine position on a southeast orientation (O'Reilly et al. 2013). The poor state of preservation did not allow for an estimation of the individual's sex and age at death was limited to adult based on the length of the long bones.

The assemblage associated with the burial comprised:

Seven bronze bangles, a bronze ring, two bronze earrings, three bronze coins, two iron sickles, an iron spear, 110 glass beads (four contexts), three agate beads (one context), three carnelian beads (two contexts), five clay pellets, two ceramic vessels, an iron hook, a burnishing stone, and miscellaneous bronze, iron and stone objects.

L 2

Mortuary context 2 was represented in layer 3:4 by a cranium and several disarticulated post-cranial bones (O'Reilly et al. 2013). The context was poorly preserved and displayed evidence of having been disturbed in prehistory. Due to its disturbed nature it was not possible to distinguish the orientation or type (i.e. extended) of the burial. Based on cranial metrics, the individual was identified as male (Domett & Newton 2013b). Age at death was estimated as elderly.

The assemblage associated with the burial comprised:

Three bronze rings, one digging or agricultural tool, 12 glass beads (one context), two clay pellets, a ceramic vessel, and miscellaneous bronze and iron fragments.

L 3

Mortuary context 3 was encountered at layer 3:4 in close proximity to mortuary context 2. The area was disturbed in prehistory and contained the remains of three individuals (O'Reilly et al. 2013; Domett & Newton 2013b). Consequently, it was difficult to distinguish which skeletal material belongs to which individual, and also what may have come from L 2. What is presented here represents the best estimation by the excavation and post excavation osteological team.

The skeletal remains of L 3 consist of a partial skull accompanied by some disturbed upper and lower long bones. On the basis of these the individual was classified as a male though age at death could not be defined more than adult.

The assemblage that could be associated with L 3 comprised:

Four bronze bangles, one bronze ring, one bronze earring, 49 glass beads (four contexts), a spindle whorl, five clay pellets, an iron hook, and a miscellaneous iron object.

L 3.1

The second individual recovered from mortuary context 3 was represented only by a cranium. No post-cranial remains were identified belonging to this individual (Domett & Newton 2013b). Unfortunately, the cranium was not preserved well enough to allow for determination of the sex. Age at death was somewhere in adulthood.

A small assemblage was associated with these remains including:

Three bronze rings, an iron digging tool, and a ceramic bead.

L 3.2

The final individual found in the mortuary context stands out as a fully articulated skeleton almost entirely preserved in terms of bones present (Figure 7.5). The individual had been placed in an extended supine position with the cranium orientated south. The grave cut for L 3.2 likely caused the disturbed contexts in L 2, L 3, and L 3.1 (O'Reilly et al. 2013; Domett & Newton 2013b). This individual is therefore possibly one of the latest burials in the excavated portion of the cemetery and is likely to be at least a generation later than the rest of the individuals in mortuary contexts two and three. Despite this, no differences are apparent in the treatment of the body or the funerary assemblage. It is therefore reasonable to suggest that the mortuary phase and ritual remained the same. Osteological examination of the skeleton identified the individual as a young adult male between 18 and 20 years old.

The assemblage that could be associated with L 3.2 comprised:

Nine bronze bangles, four bronze rings, a bronze earring, two iron digging tools, an iron spear, 58 glass beads (three contexts), an agate bead, a spindle whorl, six clay pellets, a ceramic vessel, and miscellaneous bronze and iron objects.

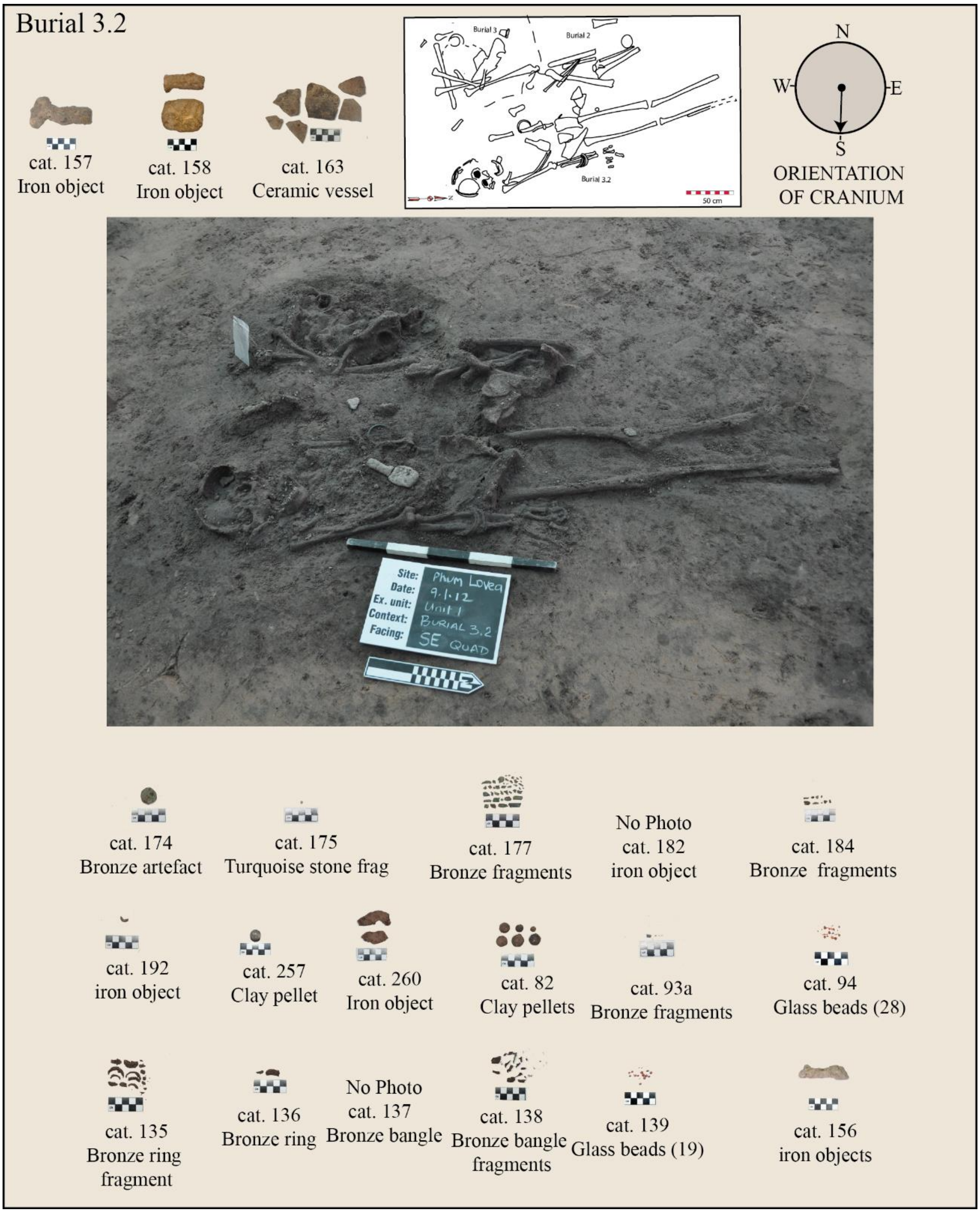

Figure 7.5 Image of burial 3.2 and associated mortuary assemblage. Image originally from O'Reilly et al. 2013, used with permission.

L 4

Mortuary context 4 was uncovered in layer 3:5 104 cm below the surface (O'Reilly et al. 2013). The preservation of skeletal material was noted by the excavators as incredibly poor. As a result, despite the context showing no signs of having been disturbed, the only remains recovered were fragments of both the left and right arms. As far as could be seen, the individual was interred in an extended supine position with a southern orientation. Due to the poor preservation no sex determination could be made for the individual (Domett & Newton 2013b). Age at death was narrowed only to adulthood based on the size of the bones.

While preservation of bone was remarkably poor, the material assemblage was recovered more intact. The burial assemblage consisted of:

Six bronze bangles, a bronze ring, a bronze earring, an iron knife, 406 glass beads (three contexts), an agate bead, two carnelian beads (one context), two clay pellets, three ceramic vessels, some iron slag, and a miscellaneous iron object.

L 5

Mortuary context 5 was the worst preserved burial excavated at Lovea. A dark stained patch of soil was encountered in layer 3:4 (O'Reilly et al. 2013). As the team excavated the feature they uncovered a single long bone and a calcaneus. No other skeletal remains were recovered from the context. As a consequence of the extremely fragmentary nature of the context, it was impossible to discern much information from the burial (Domett & Newton 2013b). No sex assignation could be made while age at death was tentatively placed as an adult.

The burial assemblage found in the context was also very sparse, consisting of only four items:

A clay pellet, two ceramic vessels, a miscellaneous hafted iron object.

L 6

The tops of the cranium of mortuary context 6 was encountered 93 cm below the surface (O'Reilly et al. 2013). While bone preservation was again poor, with much of the material either fragmented or heavily concreted, the majority of bones were present. The individual had been placed in an extended supine position with the head orientated to the south. Femur length and dental wear suggest that this individual was an older adult male (Domett & Newton 2013b).

The assemblage associated with the burial comprised:

An iron sickle, seven glass beads (two contexts), an agate bead, eight carnelian beads (three contexts), two clay pellets, two ceramic vessels, and several miscellaneous bronze and iron objects.

L 7

Burial seven was encountered 105 cm below the surface (O'Reilly et al. 2013). Only half of the burial fell inside the original excavation unit, with everything from the pelvis down extending into the northern baulk. The portion of the burial that was recovered was noted as the best-preserved skeleton encountered at Lovea. While there was a small amount of fragmentation, most of the bones were near complete. Examination of maxillary and mandibular teeth revealed very minimal dental wear (Domett & Newton 2013b). There was also no evidence of osteoarthritis found in any of the joints. Based on the dental analysis as well as the unfused sternal clavicular epiphyses, age at death was estimated as a young adult between 18 and 20 years. The morphology of the skull suggests that the individual was male.

Of especial note, the individual wore a marble bangle on his arm (Figure 7.6). Holes drilled in the bangle show that this had been repaired at least once, possibly suggesting a high value. While marble bangles have been recovered in several Bronze Age contexts in Northeast Thailand (Higham 2011a; Higham & Kijngam 2012a), this is the only such artefact found at any of the mid-late Iron Age sites included in this study.

A carbon sample adhering to one of the recovered tools was sent for radiocarbon analysis. It returned a date of 137 – 340 cal CE.

The assemblage associated with the recovered portion of the burial comprised:

Six bronze bangles, three bronze rings, an iron sickle, an iron digging tool, and iron spear, 18 glass beads (two contexts), two agate beads (one context), two carnelian beads (one context), a clay pellet, a marble bangle, and two miscellaneous iron objects.

Figure 7.6 A marble bangle recovered in burial L 7. Holes drilled on either side of breaks reveal the artefact was repaired in prehistory. Cat number 131.

L 8

Mortuary context 8 was identified as an area of dark stained soiled. It was initially labelled as feature 3:6 F2 however was reassigned as the eighth burial when a small piece of an ulna was found encircled by a bronze bangle (O'Reilly et al. 2013). No further skeletal remains were recovered in the context. Excavators did, however, encounter a moderate material assemblage in an arrangement that would have matched an extended interment. This suggests that the incredibly sparse amount of bone is likely due to poor preservation rather than the context having been disturbed at some point. With only a small fragment of bone to examine, sex could not be determined and age at death was tentatively estimated as a young adult (Domett & Newton 2013b). This was one of only three burials excavated at the site (along with L 11 and the disturbed L 3.1) without any clay pellets.

The assemblage associated with the burial comprised:

Eight bronze bangles, a bronze earring, an iron knife, three digging tools, an iron spear, 72 glass beads (two contexts), three carnelian beads (two contexts), a ceramic vessel, iron slag, and miscellaneous bronze and iron fragments.

L 9

Mortuary context 9 was encountered in layer 3:6 in close proximity to L 8 (O'Reilly et al. 2013). The burial was arranged in an extended position with the cranium pointing south. Preservation of bone was incredibly poor, though slightly more remains survived than in L 8. The cranium and mandible were perhaps the best preserved of the context, however, the osteological team noted that cleaning the surviving pieces proved difficult due to the fragile condition (Domett & Newton 2013b). The post cranial skeleton was only represented by fragments of the left radius and ulna. Like L 8, a mortuary assemblage was recovered in an arrangement around what would likely have been the full extended skeleton. This context therefore had likely not been disturbed. Estimations based on the limited identifiers available for osteological analysis suggest that the individual was a male aged somewhere in adulthood.

The assemblage associated with the burial comprised:

Six bronze bangles, an iron digging tool, an iron spear, 57 glass beads (six contexts), three agate beads (three contexts), a carnelian bead, three clay pellets, two ceramic vessels, and several miscellaneous iron fragments.

L 10

The skeletal material of mortuary context 10 was more intact than many of the mortuary contexts encountered at Phum Lovea. The majority of the appendicular skeleton aside from the hands and feet was present with the exception of the left tibia and fibula (O'Reilly et al. 2013). Most of the skull was also present as well as several vertebrae and ribs (Figure 7.7). The individual was laid out in a supine, extended position oriented to the south. While much of the skeleton could be seen *in situ*, heavy concretion made excavation difficult. This, as well as the fragility of the bones which caused fragmentation during the excavation process, hindered post excavation examination. Fortunately, the cranium and mandible were preserved well enough for analysis of morphology and dental wear (Domett & Newton 2013b). Based on these the individual was most likely an older adult male.

The assemblage associated with the burial comprised:

A bronze bangle, a bronze ring, an iron sickle, a projectile point, nine iron digging tools, two iron spears, 18 glass beads (four contexts), a clay pellet, two ceramic vessels, a possible sword point, iron slag, a grindstone, and several miscellaneous hafted iron objects.

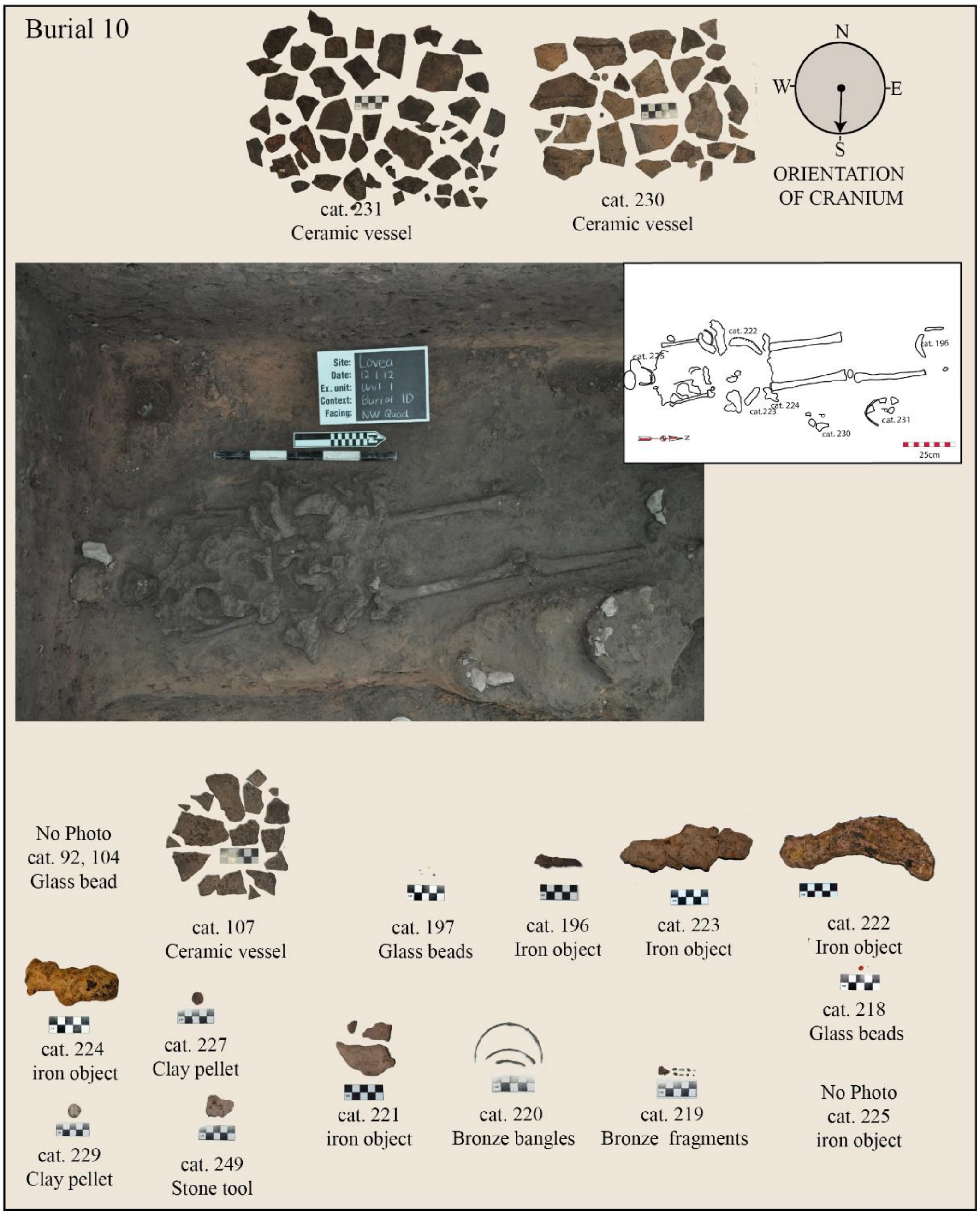

Figure 7.7 Image of Burial 10 and associated mortuary assemblage. Image originally from O'Reilly et al. 2013, used with permission.

L 11

Mortuary context 11 was encountered beneath burials L 8 and L 9 (O'Reilly et al. 2013). The context was poorly preserved and only the upper body of the skeleton was present down to roughly mid-femora level. The skull was particularly poorly preserved and in a highly fragmented state (Domett & Newton 2013b). The body appeared to have been interred in an extended supine position with the skull orientated to the south. Due to the poor preservation, no sex could be attributed to the individual and age at death was limited to adulthood.

A charcoal sample retrieved from the burial was submitted for radiocarbon dating. It returned a date range of 132 – 353 cal CE.

The grave assemblage recovered in the context was very sparse. It contained:

Four bronze bangles, a bronze ring, an iron sickle, four glass beads (one context), and a bronze coin.

L 12

Mortuary context 12 was the only burial unearthed in the second season of excavation at Phum Lovea. The context was uncovered in Unit 2 (with trench numbers following on from the 2011/12 season) which was located on the prehistoric mound 60 m south of Unit 1 (Figure 7.4) (O'Reilly et al. 2013). The context was first encountered in layer 3:8 where it extended into the northern baulk of the trench. Only the skull lay within the confines of the unit and no extension was excavated to remove the remainder of the body. As with the remains found in the Unit 1, the bones were poorly preserved. Upon examination of the minimal dental wear, age at death was estimated as a young adult roughly 18 – 20 years of age (Domett & Newton 2013b). No estimation of sex was possible from the remains.

Given that only the top of the burial was excavated it is no surprise that the accompanying assemblage was quite sparse. Only two items were recovered:

An iron sickle, and a clay pellet.

Table 7.2 Artefacts recovered in funerary contexts at Phum Lovea.

Phum Lovea	
Burials	14
Burials containing goods	14
Bronze bangles	51
Bronze rings (finger or toe)	22
Bronze earrings	6
Iron knives	2
Iron sickles	7
Projectile points	1
Digging tools	19
Iron spears	7
Glass beads	811
Agate beads	11
Carnelian beads	19
Spindle whorls	2
Clay pellets	29
Ceramic vessels	16

Site Trends

On average the grave assemblages accompanying individuals at Phum Lovea represents the poorest of the Cambodian sites included in this study. 226 artefacts (where beads are counted as a single artefact per context) were recovered from the 14 individuals. This equates to an average of just over 16 (16.1) artefacts per burial. The following section presents a detailed examination of site trends around issues such as age and wealth distribution. Sex-based differences could not be discerned at the site given the lack of definitively identified females. Similar to Phum Sophy and Prei Khmeng, the dataset of burials at Phum Lovea is too small for robust interpretation of trends. The section below limits itself to presenting the site information and preparing the data for amalgamation with the other sites.

Standardising Wealth

The wealth data at Phum Lovea do not conform to a normal distribution. As Table 7.3 illustrates, eight burials fall within a single σ of the mean. This equates to 57.1% of the sample which is less than the expected c. 68% for normally distributed data. Unlike Phum Sophy there are no burials of extreme wealth above two σ beyond the mean. Also, despite some burials showing signs of disturbance (L 2, L 3, and L 3.1) or being only partially excavated (L 7 and L 12) all of the individuals had some form of accompanying mortuary assemblage, no matter how sparse. There was therefore no need to exclude any burials when calculating the μ and σ.

Table 7.3 Calculation of relative burial wealth (as standardised z scores) at Phum Lovea.

Burial	Total artefacts	Z score	Standardised value
1	35	1.576604893	1-2
2	11	-0.542357169	-0.75 - -0.5
3	18	0.075673433	0 - 0.25
3.1	5	-1.072097684	<-1
3.2	34	1.488314807	1-2
4	22	0.428833776	0.25 - 0.5
5	4	-1.16038777	<-1
6	14	-0.277486911	-0.5 - -0.25
7	20	0.252253604	0.25 - 0.5
8	23	0.517123862	0.5 - 0.75
9	24	0.605413948	0.5 - 0.75
10	34	1.488314807	1-2
11	8	-0.807227426	-1 - -0.75
12	2	-1.336967942	<-1

Standard deviation (σ): 11.3

Mean (μ): 18.1

Distribution of Wealth

No clear pattern appears in the distribution of wealth at Phum Lovea (Figure 7.8). In comparing the pattern to the three tiers at Phum Sophy, it is possible that a poor group remains, this time encompassing the four lowest categories (from -0.25 σ and lower). However, the most populous category in this group, those more than a full σ below the μ, contains a disturbed burial (L 3.1) and one which only the cranium was excavated (L 12). It is therefore likely that these individuals would not originally have appeared quite so poor. The largest point of departure from the Phum Sophy collection is the absence of upper categories of wealth. Without any burials in the two wealthiest categories (from 2 standard deviations above the μ) the distribution displayed in Figure 7.8 appears skewed to the poorer side. This is reflected by Phum Lovea having the lowest average of artefacts per individual of all Cambodian sites studied.

However, if the three individuals 1-2 deviations above the μ were evenly distributed amongst the top tier (as at Phum Sophy) then the distribution of wealth would follow a similar tripartite pattern – the poorest group from -0.25 - <-1 σ, the middle tier between 0 – 0.75 σ, and the wealthiest encapsulating those above 1 σ. It is possible therefore, that Phum Lovea does have the same three categories, just without the extreme wealth rounding out the top tier. Following that model, six individuals (42.9%) make up the poorest tier, five (35.7%) the middle group, and three (21.4%) in the wealthiest. In fact, this is exactly the same proportions per tier as at Phum Sophy.

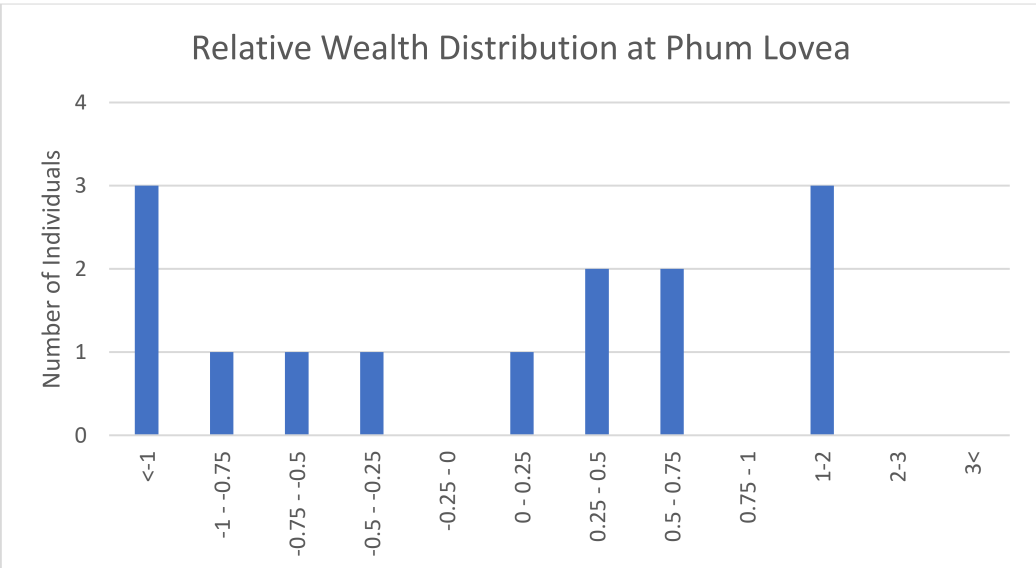

Figure 7.8 Distribution of wealth at Phum Lovea relative to the site mean.

Nineteen unique artefacts were identified in mortuary contexts at Phum Lovea (where all forms of ceramic vessels are counted as one artefact and beads are counted as another single type regardless of material). The distribution of artefacts in relation to the possible wealth tiers is similar to Phum Sophy in that, while the number of burials decreases in each successive wealth tier, the number of different artefacts associated shows the inverse (Table 7.4).

Just over half (10) of the artefacts found at Lovea appear in at least one burial in the poorest tier. Earrings, small iron hooks, iron spears, and spindle whorls are all artefacts that were found in both other tiers but not amongst any of the poorest burials. Only a single individual in the poor tier (L 11) wore any bangles. An iron thumb ring, found with L 11, was the only artefact found in a poor burial that was not in either of the other tiers.

The middle tier contains 14 unique artefacts (73.7% of artefact types found at Phum Lovea). The only artefact not present in the middle tier that is found in both other groups is a bronze coin. These coins were found more often in non-mortuary contexts across the site, potentially from being dropped and lost during daily activities. Two iron knives and a miscellaneous iron implement were only found in middle tier burials.

Over three quarters of the mortuary artefacts found at Phum Lovea (16 at 84.2%) were also recovered from at least one of the three wealthy tiered burials. Only iron knives, an iron thumb ring, and a miscellaneous iron instrument (possibly a tool), were not associated in some way with the rich burials. None of these were found in both poor and middle tier burials. By contrast, a projectile point, grindstone, and the tip of a possible sword were all solely recovered from rich burials.

Table 7.4 Artefacts recovered in Phum Lovea funerary contexts. Tick marks indicate the presence of an artefact in at least one burial of that wealth tier.

Artefact	Poor	Middle	Wealthy
Projectile point			✓
Bangle	✓	✓	✓
Bead	✓	✓	✓
Clay pellet	✓	✓	✓
Coin	✓		✓
Earring		✓	✓
Grindstone			✓
Hook		✓	✓
Digging tool	✓	✓	✓
Knife		✓	
Ring	✓	✓	✓
Sickle	✓	✓	✓
Socketed object	✓	✓	✓
Spear		✓	✓
Spindle whorl		✓	✓
Sword point			✓
Thumb ring	✓		
Tool		✓	
Ceramic vessel	✓	✓	✓
Total	10	14	16

Sex Differentiation

The poor preservation of skeletal remains at Phum Lovea greatly hinders any attempt to examine how biological differences in the population presented in the material culture and from there extrapolate some form of social meaning. As has been stated above, none of the remains excavated in either season could be identified as female. Of the 14 individuals unearthed, seven were male while seven were too degraded to classify. It should be noted that those that remain uncategorised were all adults. No individual younger than a young adult was found at the site.

It is possible that the exclusion of subadult (and potentially female) burials was due to differences in funerary treatment which included interment in a different location at the site. This is perhaps more likely than an issue of taphonomy given that material culture was typically far better preserved than skeletal material. Even if all biological remains of subadults had been lost, traces of the burials would be expected to appear through grave goods. The exclusion of large parts of the prehistoric population from the sampled Phum Lovea cemetery makes any meaningful insights on the Phum Lovea population difficult.

Table 7.5 provides a breakdown of burials and the average number of artefacts accompanying sexed and unsexed individuals. Those who have been identified as male are on average accompanied by a larger mortuary assemblage than those who could not be classified. However, this is hardly surprising given that the better preserved burial contexts tended to be the ones where a sex determination could be achieved.

Table 7.5 Average assemblage sizes at Phum Lovea according to biological sex.

	MALE	**UNKNOWN**
Total Artefacts	131	95
Total Individuals	7	7
Average Assemblage Size Per Burial	18.7	13.6

The unknown burials appear to be strongly split in into two small groups. Upon examining relative wealth of individual mortuary contexts, the unknown burials appear at two ends of the spectrum (Table 7.6). Four (L 3.1, 5, 11 and 12) of the seven unknown burials make up the four poorest graves at Phum Lovea. Of these, L 3.1 was disturbed, L 12 was only partially excavated, and L 5 and L 11 were poorly preserved. On the other end of the scale, three unsexed burials registered above the mean, one (L 1) even in the wealthiest tier.

Table 7.6 also indicates that males appeared to occupy all levels of wealth, with their distribution spread quite evenly across the categories.

Given that no females were identified it is not possible to examine whether particular artefacts were associated with either sex.

Table 7.6 Tally of individuals in each wealth group after standardising the data.

Standardised wealth category	Male	Unknown
<-1		3
-1 - -0.75		1
-0.75 - -0.5	1	
-0.5 - -0.25	1	
-0.25 - 0		
Mean Wealth		
0 - 0.25	1	
0.25 - 0.5	1	1
0.5 - 0.75	1	1
0.75 - 1		
1-2	2	1

Age Differentiation

Similar to the above section on sex differentiation, the data recovered from Phum Lovea severely limit our ability to examine socio-economic differences in age ranges. Specific age at death estimations were only possible for half of the skeletons, while the others were limited to somewhere in adulthood (Table 7.7). This would still be useful but for the absence of any individuals aged less than young adults. It is therefore impossible to examine issues such as infant burial wealth and the differences in assemblage content for younger ages. For adulthood at least, Table 7.7 suggests a fairly even distribution of wealth.

Table 7.7 Average assemablage sizes based on age-at-death.

ASSEMBLAGE SIZE PER AGE				
	Young adult	Adult	Middle aged	Elderly
Total Burials	4	7	0	3
Total Artefacts	71	109	0	45
Average Assemblage Size	17.8	15.6	0	15

Typological Trends in Circlets

The following section provides a further examination of economic and social trends from the mortuary assemblages at Phum Lovea through the use of circlets. Two aspects of display are considered here, the average number of circlets worn by individuals at different wealth rankings (Figure 7.9), and the average number of different circlet types on display (Figure 7.10). As such a dominant part of the mortuary, and probably living, dress it is reasonable to consider that the intricacies of number and shapes of circlets could have carried inherent social meaning (Sorensen 1997; Storm 1987).

The distribution of circlets at Phum Lovea is immediately differentiated from the pattern from Phum Sophy in several areas. At Sophy circlets were heavily restricted in poorer burials and yet at Lovea, while it is fair to say that in both total quantity and the number of types, poor tier burials average fewer circlets, they still contain a respectable amount. This is particularly interesting given that the excavated portion of Phum Lovea is much poorer on the whole, meaning that those individuals in the poor tier have only a handful of artefacts compared to Phum Sophy where even assemblages into double figures still registered in the poor tier.

The other clear trend illustrated in both Figure 7.9 and Figure 7.10 is the lack of a clear, steady increase in circlets and typologies with increasing wealth. In this case Phum Lovea is again at odds with the more measured incline at Phum Sophy. Figure 7.9 does, to a certain extent, present a case for the number of circlets worn by an individual increasing with wealth. However, Figure 7.10 does not show any discernible link in the average number of circlet types and wealth. To illustrate this point, those of roughly average wealth have just as many if not more types than the wealthy. This may indicate that circlets held less socio-economic significance at Phum Lovea.

The absence of identified female or subadult burials again hinders further examination of distribution trends.

It is worth noting that at Sophy those burials 1-2 standard deviations above mean wealth showcased a dip in circlets compared to the wealthiest categories of the middle tier. This dip was then rectified with a vast increase in circlets in burials two or more deviations above the mean. It is possible then that the absence of these extremely wealthy individuals at Phum Lovea is a telling factor altering the appearance of overall wealth trends at the site.

In total four unique types (irrespective of circlet form: i.e. bangle, earring, etc.) were found in poor burials. These did not include the most basic and common cross sections: circular (A) and flat (G). The forms found were: H, J, M, and W.

The middle tier contained the highest number of unique cross sections. The burials included a spread of both simple and more complex types. Eight types: A, B, G, I, J, M, Q, and S were found in middle tier burials.

Six circlet forms were found in wealthy tiered burials. The collection is very similar to that of the middle tier with the main difference being the exclusion of the two circular cross section forms. G, J, M, Q, S, and W were found in wealthy contexts.

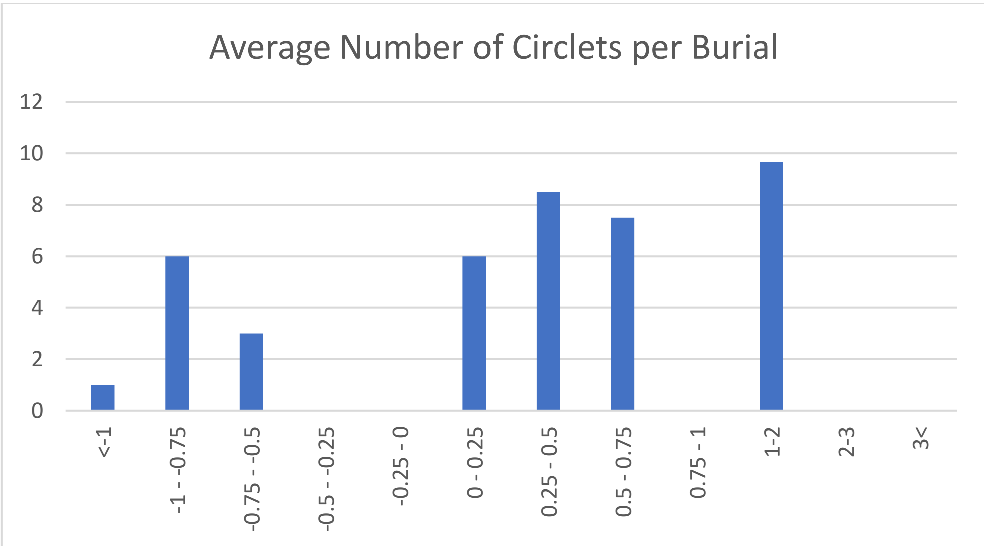

Figure 7.9 Average quantities of circlets in assemblages across relative wealth categories.

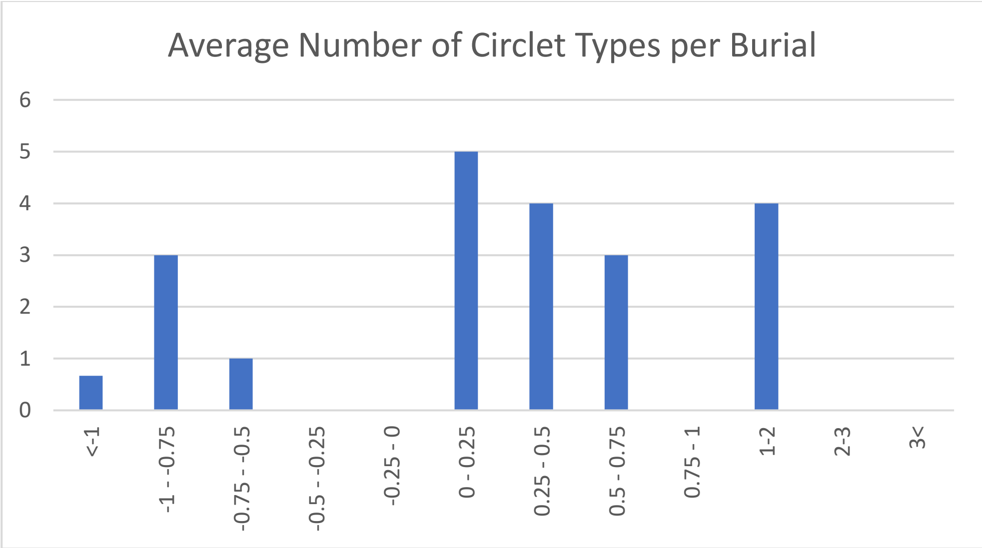

Figure 7.10 Average number of different 1st tier typological forms in burial assemblages across relative wealth categories. Each type is counted once per circlet form (i.e. 2 type G bangles count as 1, but a type G bangle and a type G earring count as 2)

Conclusion

Phum Lovea, a moated, mid-late Iron Age occupation mound in the Siem Reap province of Northwest Cambodia was excavated in 2011-2013 as part of the Paddy to Pura project. Thirteen of the recovered burials were excavated in the first season from the middle of the village mound while a final interment was encountered in the second season roughly 60m south of the 2011 unit. The 2012/13 season focused primarily on examination of the morphology of the moat and embankment system surrounding the site. No burials were recovered from these contexts.

Local soil conditions proved non-conducive to the preservation of skeletal material, resulting in many of the recovered burials being in a very fragmentary and incomplete state. This enforced limits on the ability of the initial examiners to provide precise estimations of biological sex and age at death for many of the skeletons. Only half of the recovered individuals were able to be confidently assigned a sex, all of whom were males. No females or subadults were encountered during the excavation, though it is difficult to determine if this is due to issues of preservation, or reflects differential interment practices based on age and sex. The preservation issues, however, did not typically extend to the mortuary assemblages accompanying the burials. On average burials recovered from Phum Lovea are poorer, in terms of the number of artefacts, than the other prehistoric Cambodian cemeteries included in this study: Phum Sophy and Prei Khmeng. This impression is enhanced by a lack of any precious metals such as gold or silver, as well as the absence of any burials of extreme wealth.

Assessing social trends in the mortuary data of Phum Lovea proved difficult due to the absence of any identified female burials or individuals younger than c. 18 years of age. However, once the information obtained from the site is merged with the other sites in this study it is hoped that Phum Lovea will help contribute to a firmer understanding of the social and economic trends in the region.

Chapter 8 Prei Khmeng

Prei Khmeng is a multi-period occupation and temple site in the Angkorian heartland in the Siem Reap Province of Cambodia (Figure 8.1). A mid-late Iron Age cemetery is situated on a slight mound just to the south of a later Hindu temple first archaeologically catalogued by Lunet de Lajonquiere in 1911. While construction of the brick temple occurred in the 7th century CE (Pottier et al. 2001a), an inscription mentioning completion of the Bakheng temple during the reign of Yasovarman I (889 – 910 CE) suggests the temple continued to be in use until at least the 10th century (Trouve 1933; O'Reilly et al. 2014). Previous excavations by Pottier et al. (2003) have also revealed a small number of prehistoric burials within the temple mound. Excavations targeting the prehistoric occupation area of Prei Khmeng were led by O'Reilly and Shewan as part of the Australian Research Council (ARC) funded project *From Paddy to Pura* (O'Reilly et al. 2014). The project utilised a multi-disciplinary approach for the analysis of the site and material, incorporating airborne LiDAR analysis of the landscape (through the Khmer Archaeology LiDAR Consortium (KALC) (Evans et al. 2013)), as well as bioanthropological study of the human skeletal material.

Figure 8.1 Satellite image of Prei Khmeng and immediate surrounds.

Prei Khmeng is unique among the sites included in this project in that the 2014 excavation which produced the data used here was not the first archaeological work in the area. The Early-Angkorian period temple at Prei Khmeng has been well documented by archaeologists from as early 1911 (Lunet de Lajonquiere 1911) and is the namesake of its art style since Georges Trouve discovered a unique decorative lintel at the temple mound (Trouve 1933). In 1950 the vegetation at the northeast of the temple was cleared though no excavations were conducted. Since the turn of the 21st century Prei Khmeng has garnered significant archaeological interest, with the École Française d'Éxtreme Orient (EFEO) and the Authority for the Protection and Management of Angkor and the Region of Siem Reap (APSARA) conducting three separate excavations at the site in the early 2000's as part of the larger project: Mission Archéologique Franco-Khmère sur l'Aménagement du Territoire Angkorien (MAFKATA) (Pottier et al. 2001a, 2001b, & 2003). The excavations, the units for which are displayed in Figure 8.2, focused primarily on the temple mound and its surrounding moat, though several trenches were opened on the occupation mound to the south. These southern units unearthed evidence of prehistoric occupation apparently predating the Angkorian temple (Pottier et al. 2001a). It was on the basis of those finds that the 2014 excavation was located in the same area to further explore the prehistoric context (Figure 8.2).

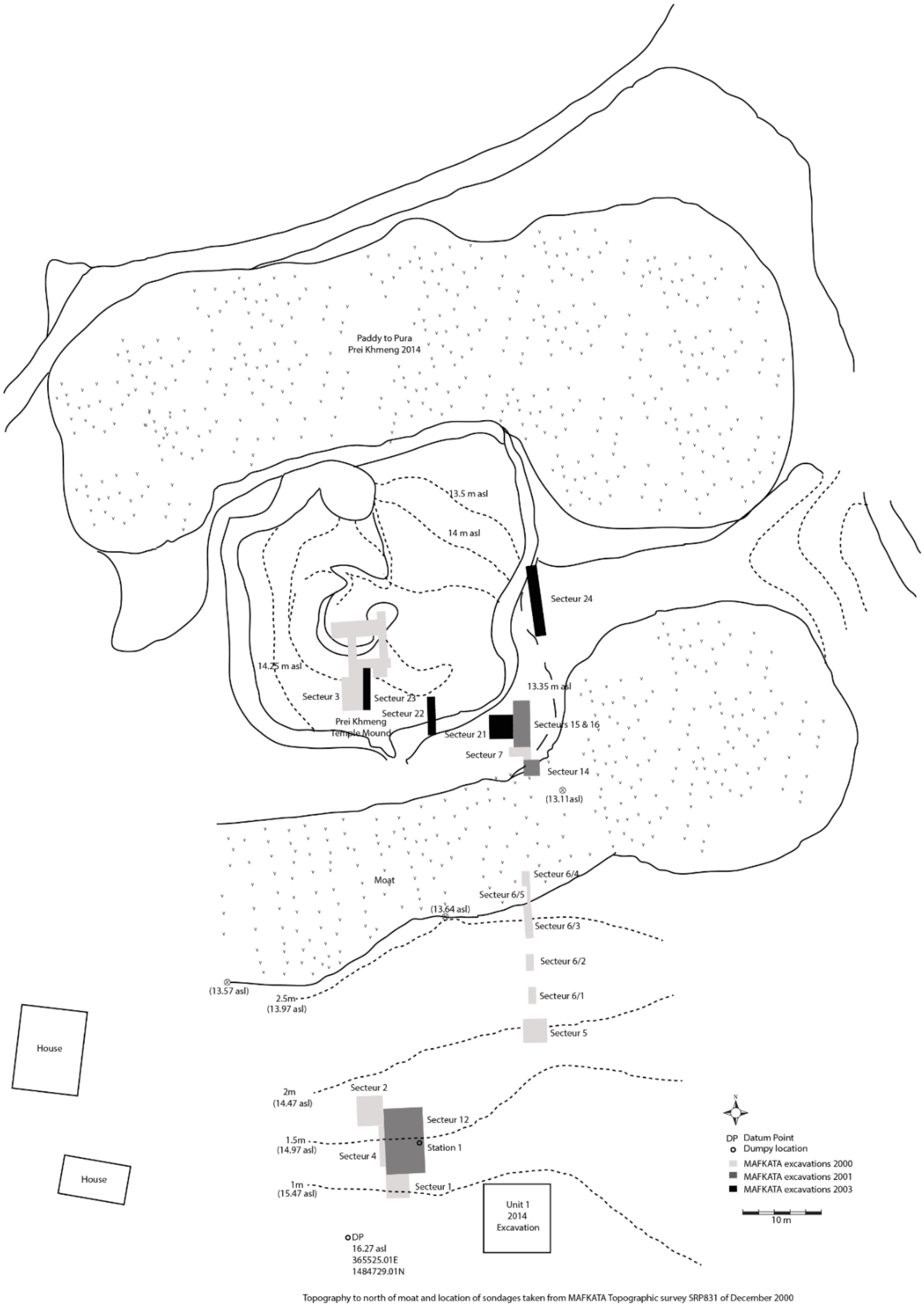

Figure 8.2 Map of excavation units opened at Prei Khmeng since 2000. Map originally from O'Reilly et al. 2014. Used with permission.

LiDAR analysis of the area conducted as part of the *Paddy to Pura* project revealed a potential second circular prehistoric mound just south of Prei Khmeng which has been cut in half by the Route National 6 (Figure 8.3). The two mounds appear to intersect with each other, perhaps suggesting that they were not contemporaneously occupied (O'Reilly et al. 2014). Unfortunately, no excavation has yet been conducted on the southern mound so any inference on the relative chronology and relationship of the mounds is little more than speculation.

In the slightly wider area, Prei Khmeng is located in the heartland of the later Angkor Empire. The great West Baray ends less than half a kilometre from the prehistoric mound and numerous smaller Angkorian temples can be found in in relatively close proximity.

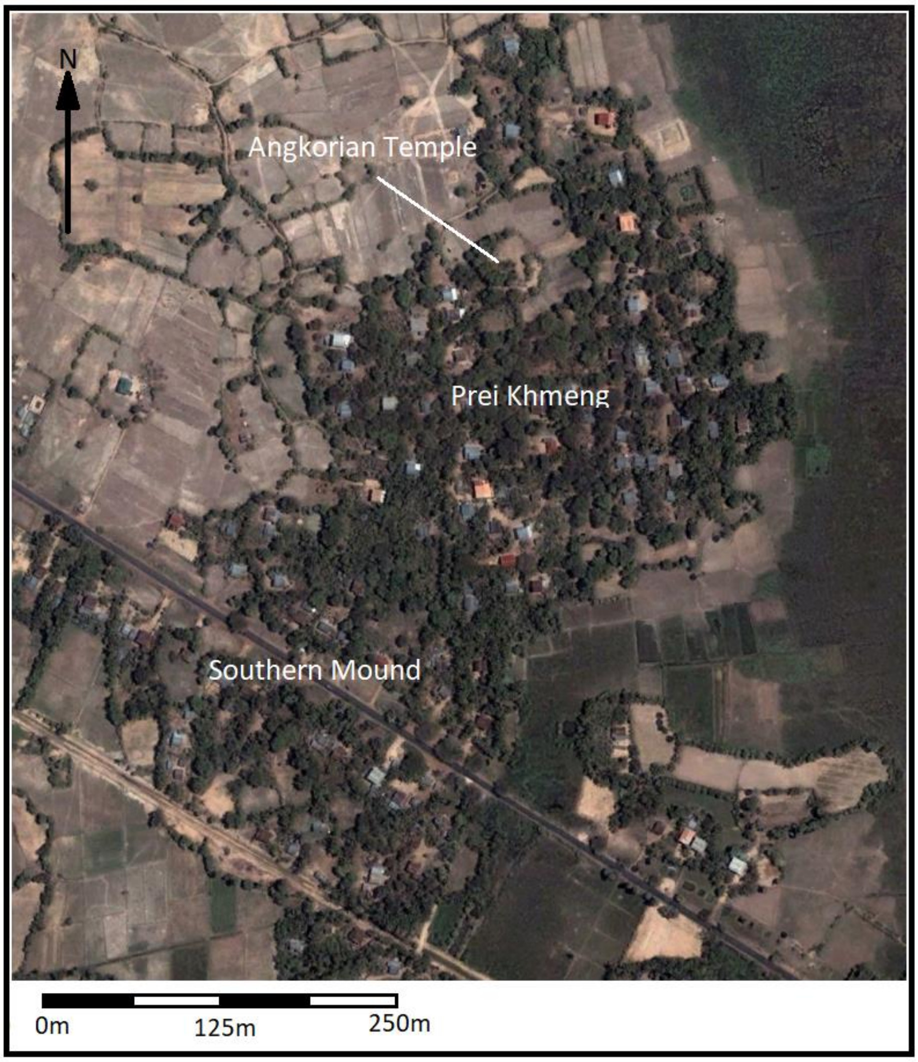

Figure 8.3 Satelite image of Prei Khmeng. The two adjacent mounds makes the site an unusual configuration for prehistoric settlements. A later temple abuts the top of the northern mound.

Excavation details

Four layers were distinguished in an 8 x 8m excavation trench excavated during a single season in 2014. The lowest level dates to the Iron Age and it is in this layer that all 10 confirmed and a possible 11th (though no skeletal material remains were in the context) burials were recovered (O'Reilly et al. 2014). All the burials were extended or semi-flexed (upper body extended and legs flexed) interments containing grave inclusions of some form. Grave goods included metallic tools and jewellery, though iron was restricted to tools and bronze formed a range of artefact types including body adornments. As with most Southeast Asian collections, considerable oxidation had affected the metallic artefacts. Other grave goods included glass and agate beads, ceramic mortuary vessels, and a single gold hook.

Preservation at the site was, on the whole, quite good and the excavated area showed no signs of having been disturbed either through looting or natural bioturbation.

The assemblage at Prei Khmeng suffers from the same problem as many in Cambodia; that of relatively small sample sizes. However, there is a mix of adults and some infants as well as a range of grave goods present in burials which provides a large enough spread of variables to produce a useful data series.

Mortuary Data

The Prei Khmeng cemetery yielded the smallest population of the sites examined in this project. Ten confirmed individuals were recovered from the 2014 excavation, all dating to a single mortuary phase in late prehistory. A possible eleventh mortuary context (labelled 4:6 feature 2) was also identified during the excavation. 4:6 F2 contained several artefacts in close proximity, suggesting they may have been intentionally buried together, however no trace of human remains was found. As a result, this context has not been included in the data or analyses, though an overview of the feature and its contents is provided below. An absence of available published data on the two prehistoric burials recovered during the MAFKATA excavations meant that it was not possible to include these assemblages in the analysis here.

The osteological analyses and determinations for each skeleton outlined below were conducted by Domett and Newton. Table 8.1 lists the major characteristics of each burial including age, sex, and number of the funerary artefacts. As with the other sites, beads were counted per context (i.e. a necklace) rather than individual beads. An illustrated glossary of funerary artefacts is supplied in Appendix two. On average the assemblages at Prei Khmeng were slightly more extensive than those at Phum Lovea, though still a considerable way from the size of those recovered at Phum Sophy.

*Table 8.1 Burials at Prei Khmeng. *Orientation refers to the placement of the cranium in the burial. Where Orientation and/or Type are blank, poor preservation did not allow for identification.*

Burial	**Age**	**Sex**	**Orientation***	**Type**	**All Artefacts**
1 PK	13-15 years	F	E	extended	9
2 PK	mid-older adult	M	E	extended	33
3 PK	1.5 years	?	W	semi-flexed burial	12
4 PK	mid-older adult	M	W	semi-flexed burial	7
5 PK	middle aged	F	E	semi-flexed burial	25
6 PK	young adult	M	E	semi-flexed burial	24
7 PK	neonate	?	E		12
8 PK	0.5 years	?			16
9 PK	young adult	M	E	semi-flexed burial	32
10 PK	young adult	F	NE	extended	53

Burials

PK 1

The first mortuary context encountered during the *Paddy to Pura* excavation at Prei Khmeng was uncovered in layer 4:5, 13.52 m above sea level (asl) (O'Reilly et al. 2014). The skeletal preservation, while not particularly good, was considerably better than that encountered in most of the burials at Phum Lovea. Most of both the upper and lower limbs were present with the exception of the left forearm (Figure 8.4). The skull was also preserved in a mostly intact state. The individual was buried in an extended supine position with the head pointing east.

Osteological examination of the skull suggests that the individual was female. Age at death has been estimated in the early teens from 13-15 years old.

Four carbon samples were recovered from the burial context. Radiocarbon analysis returned a range of 23 – 333 cal CE.

The burial assemblage comprised:

Three bronze bangles, an iron sickle, an iron digging implement, 60 glass beads (two contexts), a ceramic vessel, and a hammer scale.

Figure 8.4 Photograph of burial 1. Image originally from O'Reilly et al. 2014, used with permission.

PK 2

The grave cut for mortuary context 2 was uncovered layer 4:5, 13.62 m asl (O'Reilly et al. 2014). Preservation in the context was quite good, and most of the skeleton was present. The body was laid out in an extended supine position with several ceramic vessels placed on top of the chest and upper body. The head was orientated to the east. The good preservation, particularly of the pelvis and skull, allowed the osteological team to conduct a precise analysis. The individual was identified as a middle aged to elderly male.

Two carbon samples were extracted from the mortuary context for radiocarbon dating. A range of 85 – 406 cal CE was returned.

The burial assemblage comprised:

Two bronze bangles, 11 bronze bells, an iron sickle, three iron digging implements, two iron spears, two iron axes, 50 glass beads (three contexts), an agate bead, a clay pellet, four ceramic vessels, a burnt animal bone, a pig skull, and miscellaneous iron and bronze objects.

PK 3

Mortuary context 3 was encountered in layer 4:7, 13.52 m asl (O'Reilly et al. 2014). The context was poorly preserved and only fragments of the long bones remained. The small size of the burial and surviving bones indicates that the individual was very young, which may have contributed to the poorer preservation. Only parts of the long bones and the skull remained, which were complete enough to allow the excavators to discern the orientation and layout of the individual. The body was laid in a semi-flexed position with the upper body lying supine and the legs pulled up in a flexed position. The burial was orientated to face west. Age at death was placed just beyond infanthood at around c. 18 months.

The burial assemblage comprised:

A bronze bangle, a bronze earring, an iron sickle, two digging implements, 99 glass beads (four contexts), eight agate beads (two contexts) and a miscellaneous iron object.

PK 4

The grave cut for mortuary context 4 first appeared 13.91 m asl in layer 4:2 and extended down until the top of the cranium was exposed in layer 4:6 (O'Reilly et al. 2014). The soil matrix surrounding the burial was very compacted and hard, adding considerable difficulty to the excavation of the context. Despite this the skeletal remains were quite well preserved especially in regard to the limbs and skull. The individual was placed in a semi-flexed position with the upper body supine and the legs flexed. The grave was orientated west. The individual has been identified as a middle aged - elderly male.

A charcoal sample was recovered for radiocarbon dating. The analysis returned a range of 142 – 379 cal CE.

The burial assemblage was the sparsest of those burials recovered at Prei Khmeng. The context was also the only burial without any beads (glass or otherwise). The assemblage comprised:

Three bronze bangles, a bronze earring, an iron digging tool, a ceramic vessel, and a miscellaneous iron object.

PK 5

The grave cut for mortuary context 5 appeared at the surface of layer 4:8 at 13.38 m asl (O'Reilly et al. 2014). Preservation of skeletal material was not ideal. The forearms, folded up over the thoracic region, and the legs were the only bones recovered mostly intact. Parts of the pelvis, cranium, and some foot bones were also recovered along with several bone fragments from the upper body. The individual appears to have been laid out in a semi-flexed supine position with the head orientated to the west. On the basis of the recovered pieces of pelvis and cranium the skeleton was probably a female. Age at death has been allocated as middle aged. PK 5 was the only burial that contained carnelian at Prei Khmeng.

The burial assemblage comprised:

Ten bronze bangles, three bronze rings, an iron projectile point, 226 glass beads (four contexts), a carnelian bead, two clay pellets, three ceramic vessels, and a miscellaneous bronze object.

PK 6

The grave cut for mortuary context 6 was first encountered in layer 4:7 (O'Reilly et al. 2014). The burial was well preserved and almost the entire skeleton remained. The individual was placed in a supine semi-flexed position orientated to the east with the legs folded up. The arms were also crossed over the abdomen. Given the very good preservation of the bones, osteological analysis was able to precisely measure indicators for age and sex. The individual has been categorised as a male who died in young adulthood.

A piece of charcoal was extracted from the context for radiocarbon analysis. The sample was dated to 251 – 389 cal CE.

The burial assemblage comprised:

Five bronze bangles, four bronze rings, an iron knife, an iron axe, 140 glass beads (seven contexts), two agate beads (one context), three ceramic vessels, and several miscellaneous iron objects.

PK 7

Mortuary context 7 was uncovered in layer 4:6 directly to the north of the possible mortuary context (4:6 F2) (O'Reilly et al. 2014). Unfortunately, the human bone in the context was very poorly preserved. Fragments of the cranium, ribs, and radius were the only surviving remnants. From these scant remains it is not possible to determine which funerary method was employed in laying the body in the grave be it fully extended or with legs flexed. From the grave cut and the position of the cranial fragments the individual appears to have been orientated with the skull pointing east. Osteological estimations based on the size of the surviving skeletal fragments suggests the individual was a neonate.

The close proximity to 4:6 F2, the grave cut for which excavators note as appearing to conjoin with PK 7, may suggest that the two grave cuts were contemporaneous. The poor skeletal preservation in PK 7 could strengthen the view that 4:6 F2 was indeed a burial. It is worth reiterating that neither contexts show any signs of disturbance, so poor preservation is due to localised taphonomic processes.

Four samples were removed from the mortuary context for radiocarbon dating. These returned a range of 138 – 545 cal CE. This wide range reflects the extensive taphonomic effects in the localised area.

The burial assemblage comprised:

A bronze bangle, an iron sickle, four iron digging tools, nine glass beads (three contexts), two ceramic vessels, and a miscellaneous socketed iron tool.

PK 8

The grave cut for mortuary context 8 first appeared in layer 4:2 and extended down c. 0.5 m to where the skeletal material was encountered 13.46 m asl in layer 4:7 (O'Reilly et al. 2014). The context was ascribed as a burial on the basis of only a few human skeletal fragments found at the bottom of the grave cut. The remains were too poorly preserved to provide any information on the orientation or type of burial. Based on the size of the surviving bones, the individual was most likely an infant roughly six months old.

The burial assemblage comprised:

Two bronze rings, nine bronze coins, three iron digging tools, 33 glass beads (one context), and a ceramic vessel.

PK 9

The grave cut for mortuary context 9 first appeared in layer 4:4 and continued down c. 0.4 m to where the skeletal material was found in layer 4:8 at 13.33 m asl (O'Reilly et al. 2014). Excavators noted that, while the bones were in relatively poor condition, the majority of the skeleton was present. The upper body, from the neck to the pelvis, was particularly fragmentary while the lower limbs and the skull were fairly intact. The body had been placed in a semi-flexed position with the upper body extended supine and the legs flexed (Figure 8.5). The forearms appeared to have been crossed over the abdominal area. The skeleton was orientated with the head pointing east. Post-excavation osteological analysis of the remains indicated the individual was male and died as a young adult.

The burial assemblage comprised:

Four bronze bangles, five bronze rings, three iron sickles, an iron projectile point, an iron point, six iron digging tools, ten glass beads (three contexts), two agate beads (two contexts), a clay pellet, five ceramic vessels, and a miscellaneous bronze object.

Figure 8.5 Photograph of burial 9. Image originally from O'Reilly et al. 2014, used with permission.

PK 10

Mortuary context 10 was the final burial context uncovered during the *Paddy to Pura* excavations at Prei Khmeng. The grave cut for PK 10 was quite deep as the soil context was noted as early as 14.07 m asl in layer 3:10 but no burial material was encountered until 13.19 m asl in layer 4:9 (O'Reilly et al. 2014). The context was remarkably well preserved as most of the skeleton, including the ribs and vertebrae, were present and intact. The individual was laid out in a fully extended supine position orientated to the northeast with both arms straight at the sides. The burial continued into the western baulk, though only the feet actually fell outside the excavation unit. The burial was the by far the wealthiest at Prei Khmeng in terms of the sheer number of artefacts and was also the only context that contained gold. Osteological examination indicates that the individual was a female and age at death was estimated as a young adult.

A charcoal sample from the context was submitted for radiocarbon dating. It returned a date of 140 – 333 cal CE.

The extensive burial assemblage comprised:

Ten bronze bangles, ten bronze rings, two iron knives, three iron sickles, five iron projectile points, four iron chisels, 95 glass beads (eight contexts), a small gold hook, three clay pellets, three ceramic vessels, iron slag cake (and a possible furnace fragment), a hammer scale, and several miscellaneous iron objects.

Possible Mortuary Context 4:6 F 2

As has already been stated, a possible eleventh burial was encountered in the vicinity of PK 7 (O'Reilly et al. 2014). The feature resembles a grave cut from its roughly rectangular shape and dimensions of 1.2 m x 0.8 m. Lengthways the rectangle ran East-West. However, when the feature was excavated no human bone was recovered. A range of artefacts were recovered from the area, found in an arrangement that could be imagined around a body. The presence of the artefacts, along with the general shape and dimensions of the feature, lead the excavators to suggest the context was probably a burial and that localised taphonomic processes resulted in the absence of skeletal evidence.

Given that there is no definitive proof that this context represents a burial, and even if it was no information about the individual survives, the context has not been included in the data analyses conducted here or elsewhere in this thesis.

The artefact assemblage recovered from the possible mortuary context comprised:

A bronze bangle, an iron digging tool, an iron tool, an iron sickle, a glass bead, two agate beads (two contexts), two carnelian beads (one context), a clay pellet, three ceramic vessels, a possible smithing fragment, and several miscellaneous bronze and iron objects.

Table 8.2 Artefacts recovered in funerary contexts at Prei Khmeng.

Prei Khmeng	
Burials	10
Burials containing goods	10
Bronze bangles	39
Bronze rings (finger or toe)	24
Bronze earrings	2
Bronze bells	11
Bronze coins	9
Iron knives	4
Iron sickles	9
Projectile points	7
Digging tools	20
Iron spears	2
Iron axes	3
Iron chisels	4
Gold hook	1
Glass beads	722
Agate beads	13
Carnelian beads	1
Clay pellets	7
Ceramic vessels	23

Site trends

Examining and analysing any distribution trends at Prei Khmeng in isolation is problematic due the very small sample size available. Unfortunately, this is the story repeated time and again for prehistoric sites in Central-Northwest Cambodia at the present and Prei Khmeng represents the most extreme example included in the study with only 10 burials. However, this does not mean that the Prei Khmeng data are redundant. Indeed, even in the small sample a good, wide spread of the population is achieved in terms of age and sex. The data presented in this chapter are therefore quite valuable for the scope it adds to the combined Cambodian database.

On average the burial assemblages at Prei Khmeng are wealthier than those at Phum Lovea, though still considerably smaller than the average at Phum Sophy. A total of 212 artefacts (where beads are counted as a single artefact per context) were found in the ten confirmed burials excavated in 2014. This averages out to 21.2 artefacts per burial. As has already been stated, despite its small sample size, the Prei Khmeng cemetery yielded a wide spread of individuals across ranges of age and sex. It is worth noting an apparently locally specific characteristic in mortuary presentation in the form of semi-flexed burials (see Figure 8.5). Half of the burials uncovered in the cemetery were positioned in such a way, including PK 3 who was only 1.5 years of age, suggesting that this was not restricted to solely adult interments. The following section presents a detailed examination of the general site trends around the age, sex, and wealth variables. Any interpretation of trends will be deferred until the data are merged with that from other sites to create a more sizeable and robust dataset in chapter 11.

Standardising Wealth

It is not possible to determine whether wealth was normally distributed in the prehistoric population at Prei Khmeng. With only ten individuals there are clearly too few data points for any robust pattern analysis, particularly as wealth increases over a single σ above the μ. Table 8.3 shows that eight (80%) of the individuals are within one σ either side of the mean. This is unique in the sites included in this study as being a greater proportion of the population than in a normally distributed dataset. Similar to Phum Sophy, the cemetery population at Prei Khmeng includes an individual that stands out as considerably wealthier than the rest (PK 10). In this case the wealthy burial is within reasonable bounds (just over two standard deviations as opposed to eight at PS 14), and so was included in calculating the σ and μ.

Table 8.3 Calculation of relative burial wealth (as standardised z scores) at Prei Khmeng

Burial	Total artefacts	Z score	Standardised value
1	9	-0.946367784	-1 - -0.75
2	33	0.748619292	0.5 - 0.75
3	12	-0.734494399	-0.75 - -0.5
4	7	-1.087616707	<-1
5	25	0.1836236	0 - 0.25
6	24	0.112999138	0 - 0.25
7	13	-0.663869938	-0.75 - -0.5
8	16	-0.451996554	-0.5 - -0.25
9	32	0.67799483	0.5 - 0.75
10	53	2.161108522	2 - 3

Standard deviation (σ): 14.2

Mean (μ): 22.4

Distribution of Wealth

No clear pattern or groups appear in the distribution of wealth at Prei Khmeng as displayed in Figure 8.6. The strongest clustering of individuals appears in what would be the poor tier at Phum Sophy and Phum Lovea (a z score of -0.25 σ or lower). Half (50%) of the individuals recovered from the 2014 excavation fall within this poorer group. The standardised categories that would be expected to make up the middle tier do not show the same even spread as at the former sites. Figure 8.6 may appear slightly deceptive however, as 40% of individuals fall within in this middle category (from the mean to 0.75 σ). This is not dissimilar to that at the other Cambodian sites where 35.7% of individuals occupied the middle tier. It may well be that a larger sample size would have revealed a more even spread of individuals within the middle tier. The Prei Khmeng sample also has a smaller portion of its mortuary population in the upper tier than at either Phum Sophy or Phum Lovea. Only a single burial (PK 10) qualifies for the upper tier (beyond one σ above the mean). This burial stands out as exceptionally wealthy within the sample more so due to the absence of any other individuals of sufficient wealth.

Considering that Prei Khmeng has a large portion of burials in the bottom wealth group and only one individual in the upper tier, it is interesting that it still averages more artefacts per burial

(21.2) than Phum Lovea (16.1). Perhaps a larger sample with a more filled-out middle tier would push the average further up towards Phum Sophy (39.5).

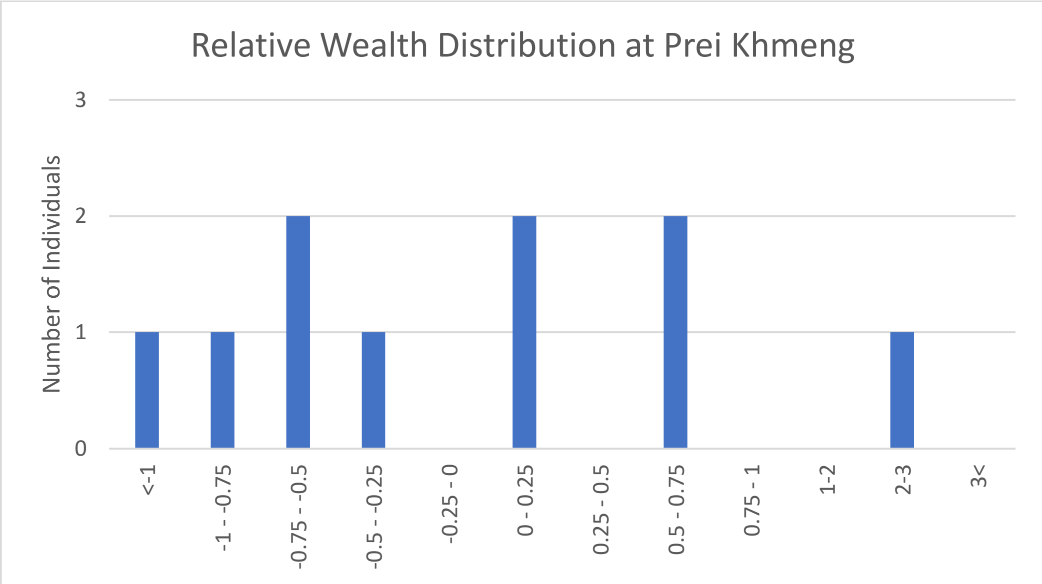

Figure 8.6 Distribution of wealth at Prei Khmeng relative to the site mean.

21 unique artefacts were recovered in Prei Khmeng burial assemblages. This figure does not include different forms of ceramic vessels and beads are counted only once irrespective of material (glass, agate, or carnelian). Much like the average number of artefacts per burial, this figure places Prei Khmeng between Phum Sophy (with the most unique artefacts at 25) and Phum Lovea (the fewest at 19). This is despite Prei Khmeng having the least burials.

Table 8.4 shows that Prei Khmeng diverges from the other Cambodian sites in the distribution of artefact types across wealth tiers. Where Phum Sophy and Phum Lovea showcased a straightforward increase in the number of different types of artefacts found in each tier, with the poorest groups having the fewest and the richest having the most, Prei Khmeng does not exhibit the same trend. Instead the middle tier out performs the wealthy. There is, of course, the caveat of smaller sample size on this trend. As was noted above, the excavated sample at Prei Khmeng has a larger percentage of its population in the middle categories and a smaller proportion of individuals in the wealthy tier.

A little over half (11 at 52.4%) of the artefacts found in Prei Khmeng burial assemblages were included in at least one interment in the poor tier. An examination of class exclusivity of the artefacts demonstrates less divisional bias than Phum Sophy and Phum Lovea. Only two types of artefacts, projectile points and clay pellets, were recovered in both middle and wealthy burials but not in any poor burials. Additionally, bronze coins and bronze earrings were restricted to poor burials.

The middle tier contains the largest variety of artefacts with 15 (71.4%). No artefact was confidently found in both other tiers that was not also in at least one middle tier assemblage. Miscellaneous socketed iron objects, most likely tools, were found in both other tiers, but as these were heavily encrusted it is difficult to say if they were even the same implement. Iron axes, bronze bells, possible iron spears, and an iron point were all solely recovered in middle tier assemblages.

61.9% (13) of mortuary artefact types at Prei Khmeng were recovered in the single wealthy tier burial. Only agricultural tools, namely iron digging implements and a larger, more rounded tool, appear in middle and bottom tier assemblages but not the wealthy burial. The artefacts exclusive to the wealthy tier are: a gold hook (the only gold item recovered at Prei Khmeng), iron chisels, and a miscellaneous thin iron object that may have been a tool. Additionally, only a single iron knife was found in a middle tier burial while the other two were both in the wealthy tier.

It must again be noted that the wealthy tier is only represented by a single burial assemblage. It is entirely likely that, had a second wealthy burial been uncovered, it would have been accompanied by a slightly different assemblage, perhaps incorporating more class-exclusive artefacts and almost certainly increasing the number of different items in this tier.

Table 8.4 Artefacts recovered in Prei Khmeng funerary contexts. Tick marks indicate the presence of an artefact in at least one burial of that wealth tier. Illustrated glossary of artefacts supplied in appendix two.

Artefact	Poor	Middle	Wealthy
Projectile point		✓	✓
Axe		✓	
Bangle	✓	✓	✓
Bead	✓	✓	✓
Bell		✓	
Chisel			✓
Clay pellet		✓	✓
Coin	✓		
Earring	✓		
Gold Hook			✓
Digging tool	✓	✓	
Knife		✓	✓
Iron point		✓	
Miscellaneous tool			✓
Ring	✓	✓	✓
Sickle	✓	✓	✓
Socketed object	✓		✓
Spear		✓	
Agricultural tool	✓	✓	
Tool	✓	✓	✓
Ceramic vessel	✓	✓	✓
Total	11	15	13

Sex Differentiation

Of the ten burials excavated at Prei Khmeng biological sex could be identified for 70%. Males were slightly more common (four) than females and unknown individuals, both of whom were represented by three individuals. This is a higher proportion of successfully identified individuals than at either Phum Sophy or Lovea and is due to the better local preservation of skeletal material encountered. The three individuals that could not be identified (PK 3, PK 7 and PK 8) were all under two years of age and therefore well below an age at which sexual dimorphism presents in the skeleton. This, then, represents the best collection of the Cambodian sites for looking at sexual differentiation in a local population as all adults are of a known sex.

Table 8.5 provides a breakdown of the average number of mortuary artefacts for male, female, and unknown burials. Several things are immediately clear from the data. Firstly, and in conjunction with what has been revealed at the other sites, unknown burials average considerably fewer artefacts than those of known sex. Given that all the unknown burials are infants or children, this is a clear illustration that wealth, and possibly status, were considerably reduced prior to adulthood in comparison to both males and females.

The other, very interesting, point from Table 8.5 is that females at Prei Khmeng were on average wealthier than males. Female burials almost contain the same number of total artefacts as those recovered from male burials despite having one less individual. This higher average wealth is the same (though to a lesser margin) as the pattern presented at Phum Sophy, while Phum Lovea had no confirmed female burials for comparison.

Table 8.5 Average assemblage sizes at Prei Khmeng according to biological sex.

	MALE	**FEMALE**	**UNKNOWN**
Total Artefacts	88	83	41
Total Individuals	4	3	3
Average Assemblage Size Per Burial	22	27.7	13. 7

Table 8.6 offers an insight into the relative wealth of burials at Prei Khmeng. A few noteworthy points appear in the distribution. Despite the considerably smaller mortuary assemblages associated with unknown burials (Table 8.5), the two lowest categories are occupied by individuals of known biological sex; a male (PK 4) and female (PK 1). The three young, burials of unknown sex are then clumped closely together in the more moderate categories of the poor tier. It is perhaps worth noting that PK 1, the poor female burial, had age at death estimated as a subadult 13-15 years old. It is possible then that at least part of her lack of apparent wealth is due to her young age.

At the other end of the table a single female burial (PK 10) sits several categories clear of the nearest burial. This matches the scenario at Phum Sophy where a prestigiously wealthy female stands out from all others.

The remaining individuals of known sex make up the middle tier. This is dominated by three males to a single female, though this could be due to small sample size with one less female burial.

Table 8.6 Tally of individuals in each wealth category after standardising the data.

Standardised wealth category	Male	Female	Unknown
<-1	1		
-1 - -0.75		1	
-0.75 - -0.5			2
-0.5 - -0.25			1
-0.25 - 0			
Mean Wealth			
0 - 0.25	1	1	
0.25 - 0.5			
0.5 - 0.75	2		
0.75 - 1			
1-2			
2-3		1	
3<			

Due to the small sample size it is not possible to determine whether any particular artefacts were specifically associated with either sex. Several items were recovered exclusively from a male or female assemblage, however they only appeared in one or two burials. In these instances care must be taken to avoid establishing false patterns of dominance towards one set of individuals. None of the artefacts that appeared in all burials of one sex (bangles, beads (female) and ceramic vessels (both male and female)) were exclusive that sex.

Age Differentiation

The Prei Khmeng cemetery population provides an opportunity to examine the distribution of wealth amongst different age groups. As Table 8.7 illustrates, a spread of age ranges is represented in the excavated sample. As was noted when examining Table 8.6, the four individuals yet to reach adulthood are all contained in the lowest standardised wealth tier. It is therefore of no surprise to see here the average mortuary assemblage for these ages is fairly even and smaller than for adults. Young adults are easily the wealthiest on average, perhaps suggesting that the physical labour and ability (McGuire 1992) or potential reproductive capability (MacDonald 2001; Crawford et al. 1989) of this group was highly valued. The remaining adult mortuary assemblages, while well below the average wealth of young adults, are comfortably larger than those yet to reach adulthood.

Table 8.7 Average assemablage sizes at Prei Khmeng based on age-at-death

	ASSEMBLAGE SIZE PER AGE					
	Infant	Child	Subadult	Young adult	Middle aged	Elderly
Artefacts	28	13	9	104	22	36
Burials	2	1	1	3	1	2
Average Assemblage Size	14	13	9	34. 7	22	18
Average (Grouped)	12.5			27		

Typological Trends in Circlets

Circlets appear to have held a significant place in an individual's social display at many prehistoric Southeast Asian sites. These easily recognisable artefacts, particularly as bangles and finger rings, often dominate mortuary assemblages as some of the most profuse items (Higham & Kijngam 2012b; Pilditch 1986; Chang 2001). This section examines some of the economic and social trends borne out in the distribution of circlets at Prei Khmeng. As applied to the other sites in the study, two aspects of circlet assemblages will be assessed. Figure 8.7 displays the average number of total circlets worn by individuals depending on their relative wealth. This information is considered in conjunction with the average number of different circlet shapes worn at different wealth categories (Figure 8.8).

The distribution of circlets (Figure 8.7) shows that at least one burial in each of the occupied wealth categories contained some circlets. Even the burial more than one σ below the mean (PK 4) contained four circlets. Indeed, apart from the large spike at z scores -0.5 – -0.25 σ from the mean, the bottom wealth category compares quite favourably to the rest of the poorest tier. The middle tier, however, does not show the expected increase in the average quantity of circlets as seen at Phum Sophy and Phum Lovea. This is particularly evident in the average of the two burials 0.5 – 0.75 σ above the mean where a clear decrease is presented. This is especially perplexing as Figure 8.8 shows that there is a rise in the number of circlet shapes between the poor and middle tiers. It appears that the middle tier focused more on acquiring and displaying different circlet forms rather than sheer quantity.

The top tier showcases almost the exact opposite pattern as the middle tier. Figure 8.7 shows a clear increase in the quantity of circlets recovered in the single wealthy tier burial at Prei Khmeng. However, this does not convert to an increase in types of circlets. Of the 20 circlets worn by PK 10, only three different forms were identified. This seems especially small given that types are counted each time they present as a different artefact (i.e. a bangle and a ring of the same cross-sectional shape count as 2 types). As a comparison, at Phum Sophy, the same relative wealth category (2 – 3 σ above the mean) averaged seven types. At Phum Lovea the wealthiest individuals only presented with relative wealth 1 – 2 σ above the mean, but even these averaged four circlet types per mortuary assemblage.

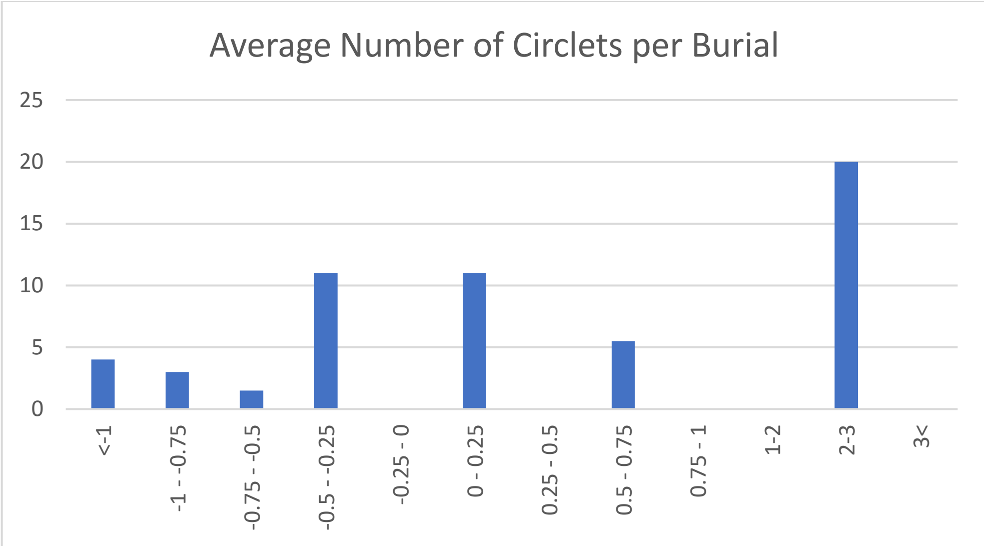

Figure 8.7 Average quantities of circlets in assemblages across relative wealth categories.

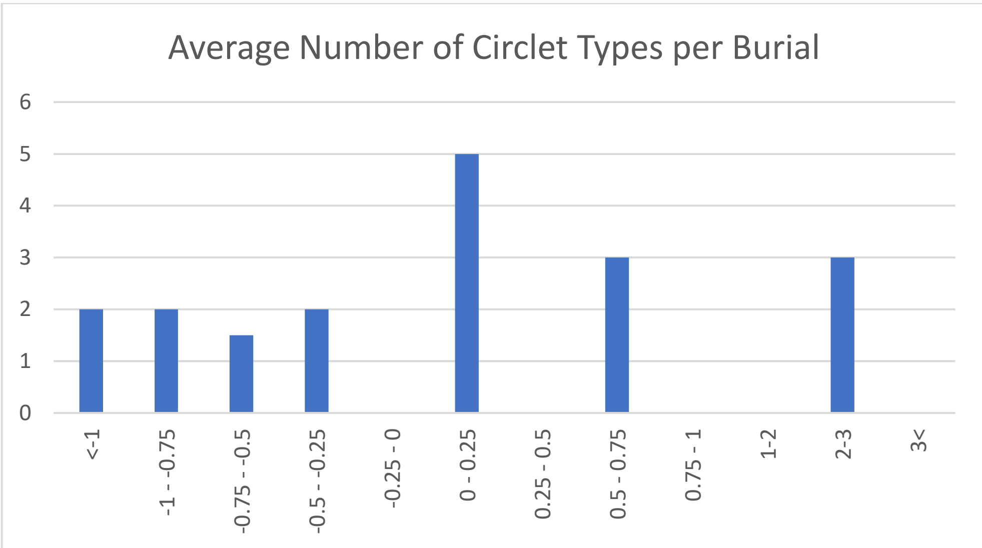

Figure 8.8 Average number of 1st tier typological forms in burial assemblages across relative wealth categories. Each type is counted once per circlet form (i.e. 2 type G bangles count as 1, but a type G bangle and a type G earring count as 2).

In total seven unique circlet types, regardless of artefacts forms (bangles, rings, etc.), were recovered from poor tier burials. This is the equal most number of types with middle tier burials and more than double those recovered in the single rich tier burial. While there are quite a large number of types, they are on the main restricted to common cross section shapes with flat or roughly round bands. The exceptions to this are type T with its raised inner and outer raised rims, and the imported bronze coins (type W). The typologies recovered were: G, J, N, O, Q, T, and W.

The middle tier also contained seven unique circlet types. There was a considerable overlap with poor tier burials as more than half (G, J, O and T) of the types were found in both tiers. Of the remaining three types in the middle tier, one is a simple square cross section, while the other two are more delicate with quite thin bands (S and M). The typologies recovered were: G, H, J, M, O, S, and T.

Only three unique typologies were recovered from the sole rich tier burial. This decrease is almost certainly due to the presence of only a single burial compared to five and four in the poor and middle tiers respectively. Two of the three typologies (G, and H) are common forms and were found in other tiers. The remaining type (D), is a rare circlet type in the assemblages inspected in this study. The form is more complex with an external ridge around a squarish band and the ridge is often decorated with regular incisions (Figure 8.9). The types recovered were: D, G, and H.

Figure 8.9 Type D bronze ring from PK 10. PK Cat # 317.

Somewhat surprisingly, no circlets were recovered with a circular cross section (type A or B) in any Prei Khmeng burial. This is despite oval (type O) and semi-circle (Type J) forms being recovered. The absence of the smaller diameter type A circlets is particularly surprising given that they are the second most common first tier shape among the sites under study here.

Conclusion

Excavation of the late Iron Age cemetery at Prei Khmeng uncovered ten confirmed prehistoric burials. The archaeological investigation of the site was conducted in early 2014 over a single season as part of the *Paddy to Pura* project. The excavation trench was placed near the centre of the mound in close proximity to where prehistoric occupation contexts have previously been found by Pottier et al. (2003) and roughly 50 meters south of a historic period temple. Preservation at the site was better than at Phum Sophy and Phum Lovea, allowing the osteological team to provide estimations of age at death and sex of all adult individuals and age at death for subadults. On average, the mortuary assemblages contained more goods than at Phum Lovea though considerably fewer than at Phum Sophy.

The examination of mortuary goods conducted in this chapter was limited by the small number of graves encountered in the excavation. However, it is possible that a three-tiered economic system was in place at Prei Khmeng as has potentially been observed at the other Cambodian sites. The small number of burials means that there are clear gaps left in the data, but what is present may reflect pieces of the three-tiered system.

Clearer is the distribution of wealth across age and sex groups. Very young individuals were uniformly grouped amongst the poorest individuals at Prei Khmeng followed by a considerable increase in the size of mortuary assemblages in adulthood. Young adults, potentially as a reflection of physical and reproductive input into the society, received the wealthiest assemblages. The presence of excessively wealthy females, potentially in some form of matriarchal position, is provided by PK 10; a female young adult who was the wealthiest burial encountered in the group. This is similar to Phum Sophy where a female was also the wealthiest by a large margin. The trends examined and identified in the second half of this chapter will be further tested in a combined Cambodian dataset in an effort to allay some of the issues of small sample size that all prehistoric Cambodian datasets currently face.

Chapter 9 Non Ban Jak

Non Ban Jak is the only non-Cambodian collection for which it was possible to personally examine the mortuary artefacts as part of this thesis. The prehistoric settlement mound is a circular, dual-moated village located in the Upper Mun River Valley in Northeast Thailand (Figure 9.1). The inner mound comprises two peaks –on the east and west, divided by a small dip in elevation. Non Ban Jak was initially occupied in the mid-late Iron Age before being abandoned in the 8th century CE (Higham et al. 2014). The village is part of a much larger pattern of intense population growth and expansion during the Iron Age of Northeast Thailand, particularly in the Mun and Chi river basins of the Khorat Basin (Cox et al. 2011; Higham 2011b). The Upper Mun River Valley is one of several densely packed site clusters of moated prehistoric sites (Figure 9.2) which have attracted archaeological research in the past decades (i.e. O'Reilly 1998; Higham et al. 2007; Higham & Kijngam 2012b). While Non Ban Jak is located on the periphery of this cluster, at least ten roughly contemporaneous moated sites lie within a 10 km radius.

Figure 9.1 Satellite image of Non Ban Jak. The raised oblong mound is surrounded by two moats (embankments marked by the tree lines). The site is located at 15°15'30.66"N, 102°10'13.46"E.

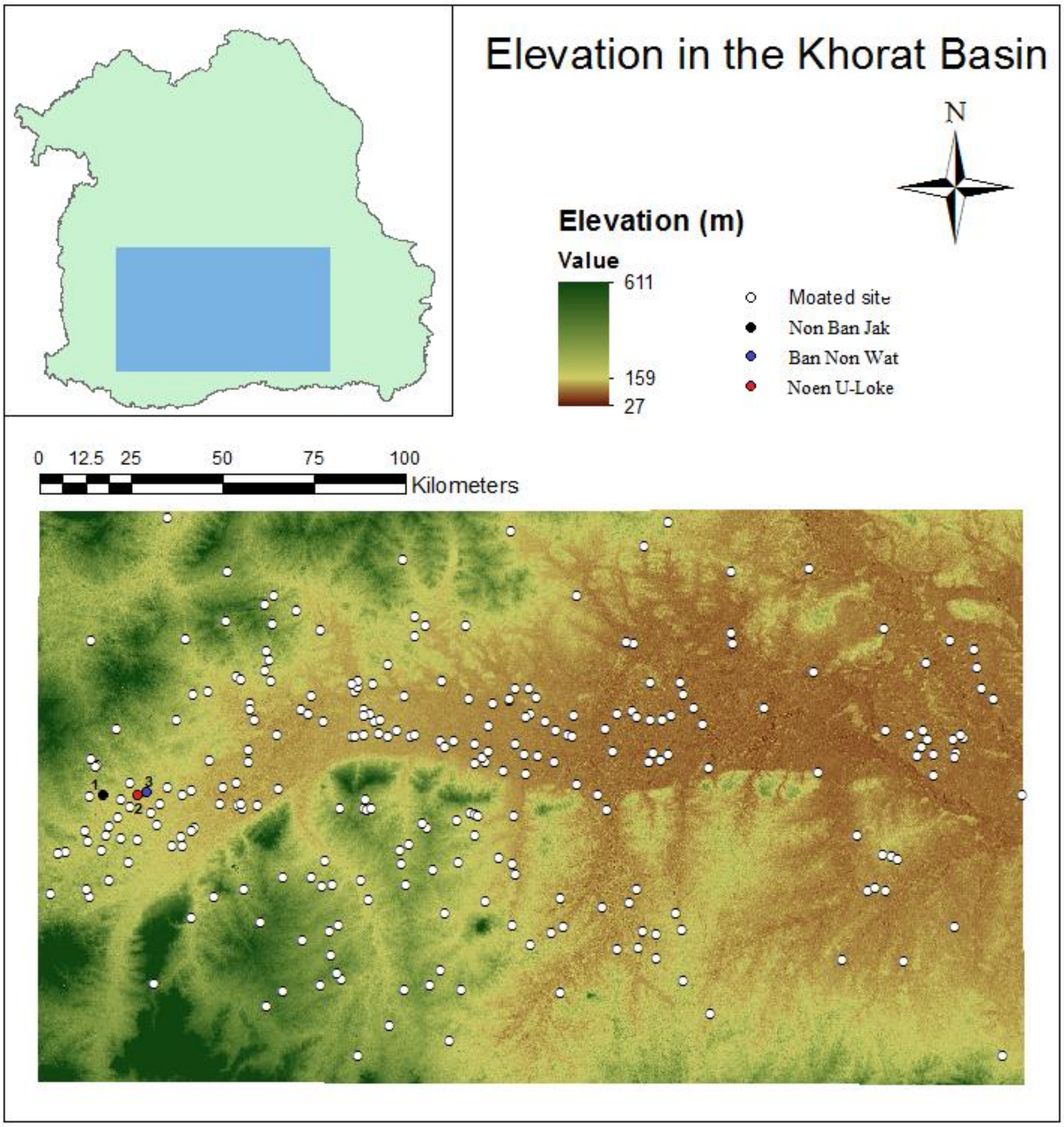

Figure 9.2 Iron Age circular moated sites in the Upper Mun River Valley (1 Non Ban Jak, 2 Noen U-Loke, 3 Ban Non Wat).

Excavations at Non Ban Jak contrast with the state of archaeology in Cambodia in which prehistoric sites have received considerably less attention both in research and actual on the ground excavation. Even where prehistoric mounds have been excavated in Cambodia the available area and time (in number of seasons) is more limited with the result of considerably smaller datasets produced than comparative Thailand sites.

Excavation at Non Ban Jak began in 2011 and, after seven seasons at the site, finished in early 2017 (Higham et al. 2014; Higham n.d.). Time limitations meant that it was not possible to examine the assemblages unearthed in the final two seasons (in early 2016 and 2017). Consequently, these two seasons have not been included in this project. This limits the number of burials to 145.

Two main units were opened at the site. The initial season targeted the eastern mound with an 8 x 8 metre trench, however few interments were encountered in this mainly residential zone. Subsequently latter seasons unearthed a large cemetery in a 35 x 10 m trench extending from the central lower elevation area into the western mound. Previous geomorphological examination across the moat and embankment system by McGrath and Boyd in 2001 produced AMS dates for the construction of the features in the late Iron Age c. 300-450 CE.

Excavation Details

The cultural sequence uncovered in the excavation at Non Ban Jak, particularly in the much larger western trench in which most remains have been found, has been divided into four mortuary phases (MPs) by Higham (n.d.). These were based on slight changes in soil colour and texture rather than any noted shifts in cultural or mortuary traditions. Higham notes that the differences in layers are 'so ephemeral as to be mostly arbitrary' (n.d. Ch. 7: 1). The lack of truly distinct cultural phases may be due to a relatively short occupation of the site, which Bayesian analysis suggests was from the 4th to 8th centuries CE.

Dating of shells recovered from both burial contexts and shell midden deposits formed the basis of the radiocarbon dating of Non Ban Jak and was used in conjunction with ceramic typologies in a Bayesian analysis to provide absolute dates for the layers (Higham n.d.). The deepest cultural layer (layer four) places initial occupation c. 220 CE and extends till c. 440 CE. This was followed by two short temporal layers. Layer three transitioned to layer two after roughly 60 years in c. 500 CE. The top layer begins c. 550 CE and incorporates the end of the prehistoric and into the early historic period before abandonment c. 700-800 CE.

Mortuary Data

A range of interment forms were encountered in the excavation units. Extended burials were marginally the most common funerary practice, accounting for 51 (35.2% of cemetery population) individuals. Only slightly fewer were jar burials (47 at 32.4%) in which the body was placed flexed in a single ceramic vessel. A small number (9 at 6.2%) were found in an extended position with both ends of the body extending into ceramic vessels (termed 'double jar' burials for this project). Two secondary burials were encountered as a bundle of bones belonging to one individual each. Both secondary burials were in the first mortuary phase and were accompanied by very minimal assemblages. The remaining 36 (24.8%) were either disturbed or there was no available information. Additionally, some burials, particularly in the eastern mound, were recovered under residential clay floors though most interments appeared to be in specifically mortuary contexts.

The artefacts found in mortuary assemblages at Non Ban Jak share similarities with those found in the Central-Northwest Cambodian assemblages. The range of goods revolves around the same main items such as glass, agate, and carnelian beads, bronze circlets, ceramic vessels, and iron tools. There are however some stylistic differences. Sickle blades are perhaps the most distinctive point of difference as they change from curved in Cambodia to long, straight blades in the Khorat Plateau (Figure 9.3). There are also, less noticeable, distinctions in the makeup of assemblages. The dominance of digging tools or agricultural hoes, in Cambodian graves is replaced with a knife and sickle combination at Non Ban Jak. A more arbitrary point of difference appears to be a preference in the colour of glass beads. At the three Cambodian sites examined in this study light red beads were often easily the most common colour in burials whereas at Non Ban Jak blue glass was preferred.

These differences are ultimately quite superficial and, with the exception of sickle blade forms, may be explained away as simple cultural preferences at separate villages. A comparative study such as this is therefore important and overdue to examine whether the two regions can be classified together as economically and socially homogenous in the late prehistory.

Figure 9.3 Comparison of sickle blades across regions. A. a restored sickle from Phum Lovea (Cat # 222); the blade gently curves over the entire length. B. a sickle from Non Ban Jak (Cat # 165); a sharp bend near the hafting end is followed by a long, straight blade that tapers off to the end.

Due to the comparatively large number of burials recovered at Non Ban Jak, it is not feasible to provide the same in-depth description of each mortuary context as is provided for the Cambodian data. Only the pertinent information regarding grave assemblage, age, sex, and burial type will be given. Information regarding the preservation or state of mortuary contexts can be found in the original site reports (Higham et al. 2014; Higham n.d.). It must be stated that the osteological determinations provided here were conducted by the original excavation team and not by the author.

As with the Cambodian sites, when total artefact counts are provided beads were counted per context (i.e. a necklace) rather than individual beads. On average Non Ban Jak is easily the poorest mortuary population in this study in terms of assemblage sizes. An illustrated glossary of artefacts is presented in appendix two. The burials will be presented according to the four separate mortuary phases based on soil horizons as determined by the excavation team.

Burials

Mortuary Phase 1 (c. 220 – 440 CE)

The first Mortuary Phase contains 29 individuals (Higham n.d., Ch. 8), the characteristics of each burial are presented in Table 9.1. The majority of burials were infants though there is a small range of adults. No one type of burial appears particularly preferred, though as a general rule most infants are buried in jars while adults were laid out in extended positions. The average burial assemblage in this period contained 6.3 artefacts.

Table 9.2 lists the artefacts found in MP 1 burial assemblages. This phase appears relatively lacking in prestige items as gold and agate are completely absent while both materials appear in the remaining phases.

*Table 9.1 MP 1 burials at Non Ban Jak. *Refers to the orientation of the cranium. ** Neonates are considered the same as infants for the purposes of analyses in this project.*

Burial	Age**	Sex	Orientation*	Type	All Artefacts
16 NBJ	Infant	?	n/a	jar burial	5
17 NBJ	Infant	?	n/a	jar burial	5
18 NBJ	Infant	?	n/a	jar burial	9
19 NBJ	adult	F	N	extended	3
20 NBJ	adult	M	N	extended	14
21 NBJ	adult	M	N	extended	19
22 NBJ	adult	?	S	secondary	1
29 NBJ	Infant	?	n/a	jar burial	4
30 NBJ	Infant	?	n/a	extended	14
31 NBJ	neonate	?	n/a	jar burial	3
32 NBJ	Infant	?	n/a	jar burial	15
33 NBJ	adult	?	n/a	secondary	0
34 NBJ	middle aged	F	N	extended	2
35 NBJ	elderly aged	F	N	extended	4
41 NBJ	Infant	?	n/a	jar burial	8
42 NBJ	Adult	?	N	extended	1
43 NBJ	adult	?	S	extended	1
48 NBJ	Infant	?	n/a	jar burial	2
53 NBJ	adult	?	?	disturbed	5
54 NBJ	Infant	?	n/a	jar burial	1
55 NBJ	Infant	?	n/a	jar burial	1
56 NBJ	Infant	?	n/a	jar burial	10
59 NBJ	Infant	?	N	extended	7
60 NBJ	Infant	?	N	jar burial	6
61 NBJ	elderly aged	F	N	extended	15
61B NBJ	adult	M	?	disturbed	1
64 NBJ	middle aged	M	N	extended	8
108 NBJ	elderly aged	M	SE	extended	6
139 NBJ	young adult	M	SE	extended	12

*Table 9.2 Artefacts recovered in MP 1 burials. *Bracketed number indicates the number of contexts found (for beads).*

Burial	16	17	18	19	20	21	22	29	30	31	32	33	34	35	41	42	43	48	53	54	55	56	59	60	61	61B	64	108	139	Total
All artefacts	5	5	9	3	14	19	1	4	14	3	15	0	2	4	8	1	1	2	5	1	1	10	7	6	15	1	8	6	12	182
Bronze Bangles	3	1	7	1	5	17			8		9			2	1	1			1			7	1	1			2	5	6	78
Bimetallic Rings									2																					2
Bronze Anklets		2																					2	1						5
Bronze Rings					5																									5
Bronze Toe rings																									12					12
Bronze Earrings									1																		2			3
Iron Knives																													1	1
Glass Beads	2 (1)	202 (1)		10 (1)	118 (1)		222 (1)	96 (1)			3 (1)				90 (3)				18 (1)			282 (1)		9 (1)			4 (1)			1056 (14)
Spindle Whorls																											2			2
Ceramic Vessels	1	1	2		1	2		3	3	2	2		2	2	3		1	2	3	1	1	2	3	1	3		1	1	3	46
Other/ Miscellaneous				1	2					3	3				1								1	2		1			2	16

Mortuary Phase 2 (c. 440 – 500 CE)

Mortuary Phase 2 produced the largest dataset in terms of burials with 45 individuals (Higham n.d., Ch. 9). The pertinent identification details are provided in Table 9.3 along with a tally of artefacts in each burial. Compared to MP 1 there is an increase in the proportion of disturbed burials (13) which somewhat disrupts the information, particularly in regards to interment types and the orientation of burials. The MP 2 cemetery population once again favours infants and young subadults in the majority, but also provides a full range of ages including several elderly individuals.

Adult burials remain predominantly extended (where it is possible to determine), however, a shift begins occurring in the way infants are buried. Jar burials are still the predominant method of interment, accounting for 70.4 % of individuals 1-year old or less. This is a smaller proportion than in MP 1 and is due to an increase of infant extended burials.

Burial assemblages in mortuary phase 2 averaged slightly less than the preceding phase, at 5.7 artefacts per burial. A single bead in burial 94 represents the only carnelian recovered in funerary contexts at the site. A tally of artefacts found in each of the 45 burials is presented in Table 9.4 a-b.

*Table 9.3 MP 2 burials at Non Ban Jak. *Refers to the orientation of the cranium. ** Neonates are considered the same as infants for the purposes of analyses in this project.*

Burial	Age**	Sex	Orientation*	Type	All Artefacts
26 NBJ	Infant	?	n/a	jar burial	6
27 NBJ	Infant	?	n/a	jar burial	2
28 NBJ	Subadult	?	?	disturbed	2
51 NBJ	elderly aged	M	?	disturbed	1
52 NBJ	Infant	?	?	disturbed	1
57 NBJ	elderly aged	F	N	extended	3
79 NBJ	Infant	?	SSE	extended	0
83 NBJ	Infant	?	NNW	extended	0
84 NBJ	elderly aged	F	NW	extended	14
85 NBJ	middle aged	M	?	disturbed	2
85B NBJ	adult	F	NW	disturbed	3
86 NBJ	Infant	?	SSE	extended	11
87 NBJ	Infant	?	n/a	jar burial	4
88 NBJ	adult	?	?	disturbed	2
89 NBJ	elderly aged	F	?	disturbed	8
89B NBJ	Infant	?	?	disturbed	0
89C NBJ	young adult	F	?	disturbed	0
90 NBJ	3-4 years	?	SSE	extended	21
91 NBJ	Infant	?	n/a	jar burial	18
93 NBJ	Infant	?	n/a	jar burial	16
94 NBJ	Infant	?	-	secondary	3
95 NBJ	Infant	?	N	extended	10
96 NBJ	elderly aged	M	SSE	extended	12
97 NBJ	Infant	?	n/a	jar burial	1
98 NBJ	adult	?	?	disturbed	2
99 NBJ	Infant	?	n/a	jar burial	2
100 NBJ	Infant	?	n/a	jar burial	1
101 NBJ	Infant	?	n/a	jar burial	2
102 NBJ	Subadult	M	?	disturbed	3
103 NBJ	Infant	?	n/a	jar burial	2

Burial	Age**	Sex	Orientation*	Type	All Artefacts
104 NBJ	Infant	?	n/a	jar burial	4
105 NBJ	elderly aged	M	E	disturbed	7
106 NBJ	Infant	?	n/a	jar burial	3
107 NBJ	Infant	?	n/a	jar burial	3
124 NBJ	Neonate	?	n/a	jar burial	1
127 NBJ	Infant	?	n/a	jar burial	8
131 NBJ	pre-term	?	n/a	jar burial	2
132 NBJ	pre-term	?	n/a	jar burial	1
133 NBJ	middle aged	F	-	secondary	25
134 NBJ	elderly aged	M	E	extended	18
135 NBJ	Neonate	?	n/a	jar burial	2
136 NBJ	elderly aged	M	N	extended	15
138 NBJ	pre-term	?	n/a	jar burial	2
140 NBJ		?		disturbed	0
141 NBJ	Infant	?	-	extended	15

*Table 9.4 a Artefacts recovered in MP 2 burials. *Bracketed number indicates the number of contexts found (for beads).*

Burial	**27**	**28**	**51**	**52**	**57**	**79**	**83**	**84**	**85**	**85B**	**86**	**87**	**88**	**89**	**89B**	**89C**	**90**	**91**	**93**	**94**	**95**	**96**	**97**	**98**
All artefacts	2	2	1	1	3	0	0	14	2	3	11	4	2	8	0	0	21	18	16	3	10	12	1	2
Bronze Bangles								1			4			1			17	11						
Bimetallic Rings	1							1			1	3		1			2		4		6			2
Bronze Anklets																								
Bronze Rings								2						3				2	1			7		
Bronze Toe rings																								
Bronze Earrings																		3						
Iron Knives								1		1														
Iron Sickles																						1		
Glass Beads		2 (1)			1			2 (1)			240 (2)						2 (1)	1	39 (4)	12 (2)	3 (1)	3 (1)		
Agate Beads								1			10 (1)											3 (1)		
Carnelian Beads																				1				
Gold items																								
Spindle Whorls																								
Ceramic Vessels	1	1	1		2			5		1	2	1	1	2			1	1	5		2	1	1	
Other/ Miscellaneous				1				2	2	1	1		1	1					2		1	1		

*Table 1.4 b. Artefacts recovered in MP 2 burials continued. *Total column refers to all burials in MP 2. **Bracketed number indicates the number of contexts found (for beads).*

Burial	**99**	**100**	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**124**	**127**	**131**	**132**	**133**	**134**	**135**	**136**	**138**	**140**	**141**	**Total***
All artefacts	2	1	2	3	2	4	7	3	3	1	8	2	1	25	18	2	14	2	0	15	257
Bronze Bangles							1							8			8			6	57
Bimetallic Rings											4									1	26
Bronze Anklets																				2	2
Bronze Rings														5	2						22
Bronze Toe rings															9						9
Bronze Earrings																					3
Iron Knives															1						3
Iron Sickles															1						2
Glass Beads				2 (1)		5 (1)					58 (2)									178 (2)	550 (22)
Agate Beads							3 (1)										1				18 (5)
Carnelian Beads																					1
Gold items	10 beads (1)																				1
Spindle Whorls				1			2							3							7
Ceramic Vessels	1	1	2		1	2		3	3	1	2	2	1	5	2	2	2	2		4	67
Other/ Miscellaneous				1	1	1	3							4	3		3				30

Mortuary Phase 3 (c. 500 – 550 CE)

Mortuary Phase three comprises 34 individuals (Higham n.d., Ch. 10). Information on each burial including age, sex and the number of associated artefacts, is displayed in Table 9.5. The proportion of infants in the cemetery decreases to just under half the sample population (16 individuals under c. 1 year of age). There was also considerably less disturbance in the layer, with only three disturbed mortuary contexts.

The method for child and infant burials continues to gradually transition away from the dominance of the jar burial tradition. 55.6% of MP 3 infants and children were interred in jars. The remaining 44.4% were laid flat rather than flexed. Simple extended burials are complemented by the introduction of burials in which the individual is laid out fully extended with jars covering either end to encapsulate most of the body (termed 'double jar burial'). Adult burials continue to favour extended burials. The excavators note that a shift on mortuary tradition occurs during this phase, with graves found associated with clay floors and collapsed walls (Higham et al. 2014). This has been interpreted as a shift to residential interment, however given that this area of the western mound was already used as a cemetery, it is possible that these structures constructed specifically as funerary houses (Higham et al. 2014).

Burial assemblages in MP 3 averaged a considerable relative increase compared to the first two phases (Table 9.6 a-b). Each assemblage averages 10.3 artefacts. This appears due in part to the appearance of one exceptionally wealthy burial (NBJ 46), but there is also a general smaller increase in several burials. Gold was also more prevalent in MP 3, even included in some assemblages of only a few artefacts. Additionally, the combination of an iron sickle and knife included together becomes more common in assemblages.

*Table 9.5 MP 3 burials at Non Ban Jak. *Refers to the orientation of the cranium. ** Neonates are considered the same as infants for the purposes of analyses in this project.*

Burial	Age**	Sex	Orientation*	Type	All Artefacts
24 NBJ	Infant	?	NNW	double jar	4
25 NBJ	Infant	?	SSE	double jar	5
46 NBJ	adult	?	N	disturbed	64
47 NBJ	Infant	?	S	extended	4
49 NBJ	middle aged	M	N	extended	21
58 NBJ	Infant	?	n/a	jar burial	3
62 NBJ	young adult	M	S	extended	5
68 NBJ	adult	M	NNW	extended	2
71 NBJ	middle aged	M	SSE	extended	11
72 NBJ	young adult	M	NNW	extended	15
73 NBJ	3-4 years	?	SSE	extended	6
74 NBJ	Infant	?	n/a	jar burial	6
75 NBJ	adult	F	SSE	extended	29
76 NBJ	middle aged	F	NNW	extended	25
77 NBJ	middle aged	M	SSE	extended	16
78 NBJ	Infant	?	N	extended	2
80 NBJ	Infant	?	n/a	jar burial	7
81 NBJ	middle aged	M	SSE	extended	25
82 NBJ	middle aged	M	NNW	extended	17
114 NBJ	middle aged	F	NNW	extended	5
115 NBJ	middle aged	M	NNW	disturbed	8
116 NBJ	adult	M	SSE	disturbed	8
117 NBJ	6-8 years	?	SSE	double jar	11
118 NBJ	Infant	?	SSE	double jar	2
119 NBJ	Neonate	?	n/a	jar burial	1
120 NBJ	middle aged	M	SSE	extended	36
121 NBJ	Neonate	?	n/a	jar burial	1
122 NBJ	Neonate	?	NNW	double jar	4
123 NBJ	Neonate	?	n/a	jar burial	2
125 NBJ	middle aged	F	SSE	extended	1
126 NBJ	Neonate	?	n/a	jar burial	1
128 NBJ	Neonate	?	n/a	jar burial	1
129 NBJ	Infant	?	n/a	jar burial	1
130 NBJ	pre-term	?	n/a	jar burial	1

*Table 9.6 a. Artefacts recovered in MP 3 burials. *Bracketed number indicates the number of contexts found (for beads).*

Burial	**24**	**25**	**46**	**47**	**49**	**58**	**62**	**68**	**71**	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**80**	**81**
All Artefacts	4	5	64	4	21	3	5	2	11	15	6	6	29	25	16	2	7	25
Bronze Bangles		1			2				3				1	9	5			9
Bimetallic Rings	1	1	1		1					1				1	2			1
Bronze Anklets			46															
Bronze Rings			3		8				3	2		3	24	6	3		4	7
Bronze Toe rings			10								1							
Bronze Earrings			2		3					1	2		1	1	1			2
Iron Knives					1		1		1	1				1				1
Iron Sickles					2				1	1			1	1				1
Glass Beads										2 (2)					1			
Agate Beads																		
Gold items							1 ring											
Ceramic Vessels	3	3	2	4	2	2	2	1	3	4	2	3	2	3	2	2	3	3
Other/ Miscellaneous					2	1	1	1		3	1			3	2			1

*Table 9.6 b. Artefacts recovered in MP 3 burials continued. *Total refers to all MP 3 burials. **Bracketed number indicates the number of contexts found (for beads).*

Burial	**82**	**114**	**115**	**116**	**117**	**118**	**119**	**120**	**121**	**122**	**123**	**125**	**126**	**128**	**129**	**130**	**Total***
All Artefacts	17	5	8	8	11	2	1	36	1	4	2	1	1	1	1	1	350
Bronze Bangles		4		1				3									38
Bimetallic Rings	1							2									12
Bronze Anklets					1					1							48
Bronze Rings			1	2	5			18									89
Bronze Toe rings																	11
Bronze Earrings	4							2									19
Iron Knives	1		1	1				1									10
Iron Sickles	1		1	1				1									11
Glass Beads																	3 (3)
Agate Beads								3 (1)									3 (1)
Gold items								2 earrings									3
Ceramic Vessels	6		1	1	5	2	1	3	1	3	2	1	1	1	1	1	76
Other/ Miscellaneous	4	1	4	2				3									29

Mortuary Phase 4 (550 – 700-800 CE)

The final mortuary phase was also the smallest in terms of population. Only 16 individuals were recovered from this phase (Table 9.7), which was excavated just below the ground surface (Higham n.d., Ch. 11). The proportion of infants in the cemetery continued to decrease, with only four people under 1-year recovered, two of whom were in jar burials and two in double jars. There was increased disturbance compared to MP 3, with six adult burials impacted.

The adult funerary ritual continued to remain quite static, as every context that could be identified was an extended burial. The iron knife and sickle combination that was quite prevalent in adult MP 3 burials subsides, though still appears in two assemblages.

The average mortuary assemblage reduces in wealth to 6.1 artefacts per person, a similar level to MPs 1 and 2. This is borne out in Table 9.8, which demonstrates a lack of excessively wealthy individuals and a general reduction in wealth.

*Table 9.7 MP 4 burials at Non Ban Jak. *Refers to the orientation of the cranium. ** Neonates are considered the same as infants for the purposes of analyses in this project.*

Burial	Age**	Sex	Orientation*	Type	All Artefacts
36 NBJ	adult	M	?	disturbed	0
37 NBJ	Infant	?	n/a	jar burial	4
38 NBJ	middle aged	F	NNW	extended	7
39 NBJ	Infant	?	N	double jar	6
40 NBJ	adult	?	?	disturbed	1
45 NBJ	adult	?	S	extended	9
65 NBJ	middle aged	F	N	disturbed	9
66 NBJ	7 years	?	NNW	extended	17
67 NBJ	young adult	?	NNW	disturbed	0
69 NBJ	elderly aged	M	SSE	extended	13
70 NBJ	Infant	?	SSE	double jar	2
109 NBJ	Neonate	?	n/a	jar burial	1
110 NBJ	middle aged	M	NNW	disturbed	19
111 NBJ	adult	?	-	disturbed	1
112 NBJ	young adult	M	SSE	extended	7
113 NBJ	middle aged	F	SSE	extended	11

*Table 9.8 Artefacts recovered in MP 4 burials. *Bracketed number indicates the number of contexts found (for beads).*

Burial	**36**	**37**	**38**	**39**	**40**	**45**	**65**	**66**	**67**	**69**	**70**	**109**	**110**	**111**	**112**	**113**	**Total**
All artefacts	0	4	7	6	1	9	9	17	0	13	2	1	19	1	7	11	107
Bronze Bangles				2				1									3
Bimetallic Rings										1							1
Bronze Anklets		1															1
Bronze Rings						4	2	4					1			6	17
Bronze Earrings						1		3					4				8
Iron Knives			1				2			1			1			1	6
Iron Sickles													1			1	2
Iron Spear													3				3
Glass Beads							1	15 (1)							1		17 (3)
Agate Beads															2 (2)		2 (2)
Gold items										1 earring			1 earring				2
Spindle Whorls			3														3
Ceramic Vessels		3	2	3	1	4	1	5		5	2	1	3	1	4	1	36
Other/ Miscellaneous			1	1			3	3		5			5			2	20

Unassigned Burials

In addition to the four mortuary phases noted at Non Ban Jak, a further 21 prehistoric burials were recovered in the first five seasons that were not assigned a particular phase. Information on these burials was quite variable. Full information on interment type and artefact assemblage could be found for roughly half the individuals, while almost no data were available on the others. Due to the gaps in information, the data per burial is adequately conveyed in Table 9.9 and therefore it is not considered necessary, or in several cases possible, to provide a more in-depth breakdown of assemblages associated with each individual.

Despite the lack of information, these unassigned burials still clearly belong to the same late prehistoric period on the basis of continuity in artefact assemblages. The items found in these burials were all also recovered from burials in the four mortuary phases. Additionally, the size of the funerary assemblages is within similar bounds as those in established mortuary phases at Non Ban Jak. It is therefore considered acceptable to include these burials in further analysis.

*Table 9.9 Unassigned burials at Non Ban Jak. *Refers to the orientation of the cranium. ** Neonates are considered the same as infants for the purposes of analyses in this project.*

Burial	Age**	Sex	Orientation*	Type	All Artefacts
1 NBJ	Infant	?	No data	No data	2
2 NBJ	Adult	?	-	disturbed	0
3 NBJ	adult	?	S	extended	0
4 NBJ	Infant	?	No data	No data	0
5 NBJ	Infant	?	No data	No data	3
6 NBJ	Child	?	No data	No data	5
7 NBJ	Elderly	F	NNW	extended	27
8 NBJ	Infant	?	No data	No data	0
9 NBJ	Child	?	NNW	double jar	13
10 NBJ	Infant	?	n/a	jar burial	6
11 NBJ	Infant	?	No data	double jar	4
12 NBJ	adult	?	SSE	extended	37
13 NBJ	Infant	?	n/a	jar burial	1
14 NBJ	Infant	?	n/a	jar burial	1
15 NBJ	adult	?	-	disturbed	0
23 NBJ	No data	?	No data	No data	0
44 NBJ	No data	?	No data	No data	0
50 NBJ	No data	?	No data	No data	0
63 NBJ	No data	?	No data	No data	0
92 NBJ	No data	?	No data	No data	0
137 NBJ	No data	?	No data	No data	4

Site trends

Non Ban Jak offers a considerably larger and more robust dataset than any of the Cambodian cemeteries. The 145 individuals recovered over five seasons and a significant area of excavation, allow for greater clarity of analysis in regard to site trends. There remain however, a few important issues to note.

First, unlike any of the Cambodian sites, multiple mortuary phases have been identified at Non Ban Jak. As noted earlier in the chapter, Higham identified these phases through subtle stratigraphic horizons visible in the western mound (2014). Crucially though, despite the fact these breaks are accompanied by general dates linking them to other late prehistoric villages in the region such as Ban Non Wat and Noen U-Loke, Higham (n.d., Ch. 7) states that these phases are somewhat arbitrary and not accompanied by shifts in funerary tradition. The distribution of artefacts as examined as part of this study suggests that this assessment is accurate, though there are some differences, particularly in regard to infant funerary tradition and a spike in wealth in MP 3.

If it is accepted that there are minimal cultural differences between the mortuary phases, it is then reasonable to treat the entire Non Ban Jak cemetery as a single mortuary population instead of dividing it into four. Radiocarbon dating undertaken by Higham (2014) points to an occupation lasting roughly five centuries, which is comparable to the length of activity noted at Cambodian cemeteries included in this project.

On average funerary assemblages at Non Ban Jak are considerably poorer than sites south of the Dângrêk mountains in Cambodia. At 6.1 items per individual, the mean is a little over one third the size of the poorest Cambodian site: Phum Lovea (16.1 average). Even MP 3, the relatively wealthy phase at Non Ban Jak, only increased the average to 10.3 artefacts per individual. Despite this, the wealthiest burial (NBJ 46) contained more items than any individual at either Prei Khmeng or Phum Lovea.

The remainder of this chapter presents a detailed examination of the general site trends with particular focus on wealth, age, sex, and the use of circlets. Comparisons between mortuary phases will also be presented to ensure that grouping the population together remains valid and reflects the nature of the data. Given that Non Ban Jak is just one site, interpretation and extrapolation into larger trends in Northeast Thailand will be reserved until the data are aligned with previously published supplementary mortuary records from Noen U-Loke and Ban Non Wat in subsequent chapters.

Table 9.10 Mortuary artefacts recovered at Non Ban Jak.

Non Ban Jak	
Burials	145
Burials containing goods	137
Bronze bangles	199
Bimetallic ring	50
Bronze anklet	66
Bronze rings (finger or toe)	206
Bronze earrings	39
Bronze belts	5
Iron machetes	2
Iron knives	21
Iron sickles	16
Iron points	5
Digging tools	3
Iron spears	4
Glass beads	1636
Agate beads	23
Carnelian beads	1
Agate pendants	8
Gold items	5
Spindle whorls	12
Clay pellets	1
Ceramic vessels	239

Standardising Wealth

As with all cemetery populations included in the study, funerary wealth at Non Ban Jak was standardised by the standard deviation (σ) in assemblage sizes as related to the site average to produce a z score (Drennan 2004). Due to the larger dataset, a detailed overview of wealth calculation for all Non Ban Jak burials has been placed in appendix three. Table 9.11 also shows the μ and σ of each mortuary phase when considered separately. As can be seen, phases 1, 2 and 4 are very similar in both σ and μ.

Wealth at Non Ban Jak did not follow a normal distribution curve. 130 burial assemblages fell within a single standard deviation of the mean. This represents 89.7% and is considerably more than the c. 66% in a normal distribution (Wheeler and Chambers 1992). The data are positively skewed so that the bulk of individuals are at the lower ends of the wealth spectrum below the mean. Because the σ is larger than the μ, even mortuary contexts with no artefacts are not outside one σ below the mean. The data then have a long tail out to the wealthier end.

Table 9.11 Standard deviation and mean assemblage size at Non Ban Jak.

	Overall	**MP 1**	**MP 2**	**MP 3**	**MP 4**
Standard deviation (σ)	8.96	5.29	6.45	13.19	5.77
Mean (μ)	7.38	6.24	5.71	10.29	6.56

Distribution of Wealth

A summary of the distribution of wealth among the population at Non Ban Jak is presented in Figure 9.4. A clear positive skew with most burials occupying the poorer categories is immediately evident, followed by the long, tapering tail with increasing relative wealth. There is no evidence, either among Figure 9.4 or appendix three, to suggest a three-tier economy or differentiated classes. Rather each standardised category provides a small, incremental variation on the preceding one.

For the purposes of examining wealth and population trends, the data are here split into three groups: those more than 0.25 σ below mean wealth, those more than 2 σ above the mean, and those in-between. It is important to state that these are arbitrary distinctions chosen to maximise the ability to examine in particular differences in poor and excessively wealthy assemblages. It is not suggested that this reflects economic and social boundaries within the society.

The lack of any strong distinction or boundary between poor and wealthy groups suggests that status and wealth may not have been permanent, and individuals could slide up and down the spectrum during their life, such as in a heterarchy (Crumley 1995). This could suggest that the effects of possible heterarchical systems in place in Northeast Thailand during the Bronze Age (White 1995, O'Reilly 2000) were still felt in the hierarchical landscape of the late Iron Age.

Despite incorporating only three standardised categories, the poorest individuals as judged below the mean by 0.25 σ or more account for 60.7 % of the population (Figure 9.4). This is a noticeably larger section of the population than for the corresponding poorest tier at any of the Cambodian sites in this study. The sliding bracket of individuals between the poorest and wealthiest groups (-0.25 σ to 2 σ) contains most of the remaining population with 35.9 %. This is quite similar to the Cambodian populations, however the grouping at Non Ban Jak is an arbitrary delimitation and contains several more standardised categories than the Cambodian middle tier. Finally, the richest burials more than 2 σ above the mean are quite rare. Only 3.4% of the population qualifies for this group.

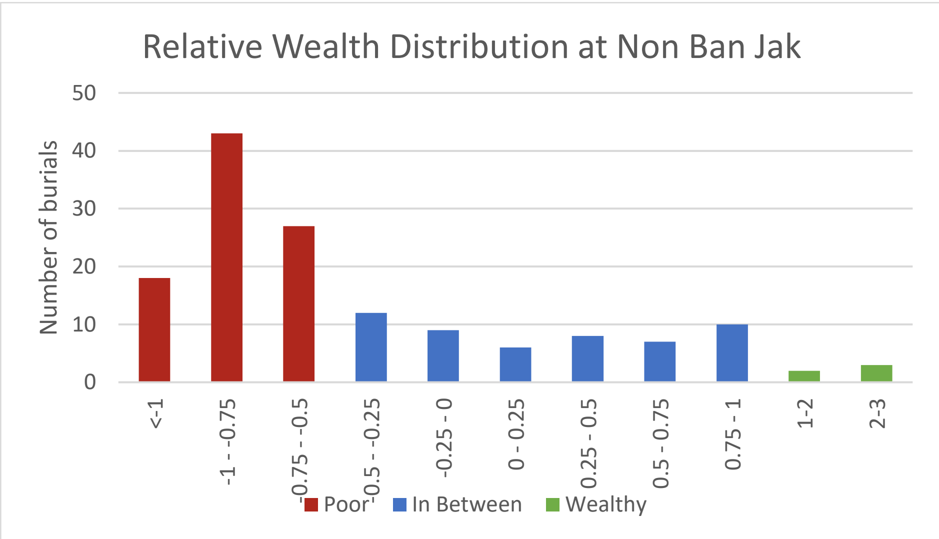

Figure 9.4 Distribution of wealth at Non Ban Jak relative to the site mean. Coloured series represent the arbitrary divisions defined in the study to aid comparisons of assemblages at either end of the wealth spectrum.

Figure 9.5 presents the results when burial wealth was standardised according to the σ and μ in each mortuary phase. In each phase, the category with the most individuals is one of the poorest two. MPs 2 and 3 closely resemble the same pattern as seen in the overall Non Ban Jak population from Figure 9.4. No strong pattern is present in either MP 1 or 4. Phase one is unique in that the majority of the mortuary population display relative wealth greater the mean, suggesting that the poor group have dragged down the mean beyond an accurate representation of overall wealth during this period.

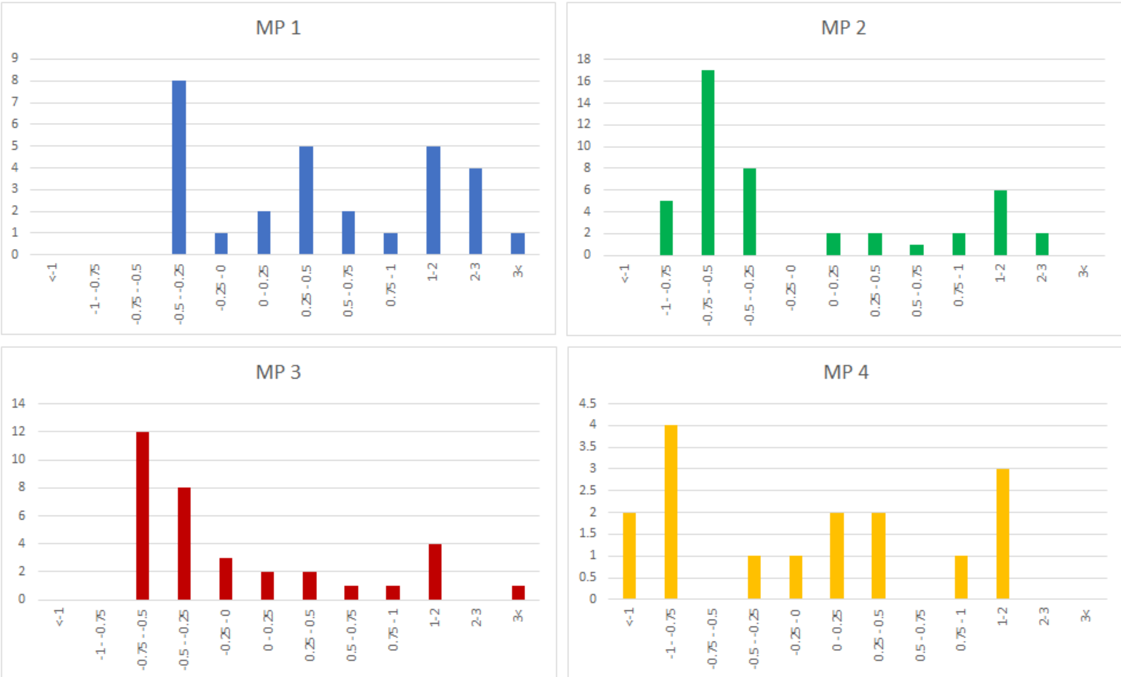

Figure 9.5 Distribution of relative wealth in each Mortuary Phase when calculation of standard deviation and mean exclude all other phases. MP 2 and 3 follow same pattern as overall site trend. While MP 1 and 4 are more varied, the poorest categories in each phase are still the most populous.

In total, 25 unique artefacts were recovered in funerary assemblages during the first five seasons of excavation at Non Ban Jak. This figure does not include different forms of ceramic vessels, while beads are counted only once irrespective of material (glass, agate, or carnelian). This number is equal to Phum Sophy, which contained 125 fewer interments. Table 9.12 provides a breakdown of the contexts that artefacts were found in terms of burial wealth.

Similar to Phum Sophy and Phum Lovea, poor assemblages at Non Ban Jak are seemingly defined less by what they contain and more by what is excluded. Of the 88 individuals more than 0.25 σ below the mean, only 10 different items were recovered. With the exception of a solitary stone adze, all artefacts found in poor assemblages were commonly found in rich and 'in between' burials. Interestingly, one poor burial did contain gold in the form of 10 clay-centred beads. No agate or carnelian was recovered in any poor burial.

The five wealthy burials alone contained 16 unique artefact types. However, only a single artefact was solely associated with wealthy assemblages. That case, a clay pellet, was the only instance of such an artefact in Non Ban Jak burials. Additionally though, several of the items found in wealthy assemblages such as agate pendants, machetes, and toe rings, were only associated with the upper-middle standardised wealth categories. This is perhaps another indicator of a sliding scale between rich and poor and illustrates that the Non Ban Jak mortuary population was not organised by stark divisions. Interestingly bronze belts were not found in the wealthiest burials. They were however restricted to the upper 'in between' burials.

As a further illustration that there was no distinct middle class or tier, those burials neither very poor nor excessively wealthy (-0.25 σ to 2 σ) accumulatively contain almost every type of artefact recovered at Non Ban Jak. The only two items not found in any of these assemblages are both very rare: the afore-mentioned single stone adze and clay pellet.

This lends further weight to a theory that rank and wealth were more closely aligned with fluid, non-delimited constructs rather than a tiered hierarchy. Certainly, while there are differences in assemblages for the very poorest and richest at either end of the spectrum, this appears to have occurred through gradual shifts rather than strongly emphasised class boundaries.

Table 9.12 Artefacts recovered in Non Ban Jak funerary contexts. Tick marks indicate the presence of an artefact in at least one burial in the wealth group. See illustrated glossary of artefacts in appendix two.

Artefact	Poor	In between	Wealthy
Adze	✓		
Agate Pendant		✓	✓
Anklet	✓	✓	✓
Bangle	✓	✓	✓
Bead	✓	✓	✓
Belt		✓	
Bimetallic ring	✓	✓	✓
Clay disc		✓	
Clay pellet			✓
Earring		✓	✓
Digging implement		✓	
Knife	✓	✓	✓
Machete		✓	✓
Pendant		✓	✓
Perforated disc	✓	✓	✓
Red ochre		✓	
Miscellaneous tool		✓	
Ring	✓	✓	✓
Sickle	✓	✓	✓
Spear		✓	
Spindle whorl		✓	✓
Toe ring		✓	✓
Tool		✓	
Tooth pendant		✓	
Ceramic vessel	✓	✓	✓
Total	10	23	16

Sex Differentiation

Biological sex could not be determined for over two thirds (68.3%) of skeletal remains at Non Ban Jak. This large portion is mostly due to the considerable portion of subadults, particularly infants that were encountered. When the 76 individuals too young to exhibit signs of sexual dimorphism and seven burials for which no information was available are removed, 16 (25.8%)

of confirmed adults could not be identified. As demonstrated in Table 9.13, males were more common than females. More striking however, is the difference in burial wealth as compared to contemporary Cambodian sites.

Unlike Phum Sophy and Prei Khmeng where female burials were, on average, distinctly wealthier than males, very little difference appears in Non Ban Jak (Table 9.13). Males average negligibly more (0.6 of an artefact per individual) than females. Table 9.14 demonstrates that similar, very fine margins were present in MPs 2, 3 and 4. Only the first phase shows any sign of a sexual bias in wealth as the difference extends out to an averaged 4 items per assemblage (in favour of males). As if in demonstration that no bias was present, the ascendancy is flipped in MP's 2 and 3 so that female assemblages hold a marginally higher average (in MP 3 by 0.1).

Table 9.13 Average assemblage sizes at Non Ban Jak according to biological sex.

	MALE	**FEMALE**	**UNKNOWN**
Total Artefacts	278	167	445
Total Individuals	28	18	99
Average Assemblage Size Per Burial	9.9	9.3	4.5

Table 9.14 Wealth differentiation between sexes per mortuary phase.

MP	**Sex**	**Artefacts**	**Burials**	**Average**
1	male	60	6	10
	female	24	4	6
2	male	57	7	8.1
	female	53	6	8.8
3	male	164	11	14.9
	female	60	4	15
4	male	38	4	9.5
	female	27	3	9

Table 9.15 showcases how both sexes were spread right across almost all levels of wealth at Non Ban Jak. Males appear more predominant in the upper-middle categories from roughly 0.5 σ to 2 σ above mean wealth. However, there are also more males below the mean than females.

Overall no strong trends appear in the distribution or restriction of males or females across levels of wealth.

The only real point of interest is that of unidentified remains which dominate the poorest levels of funerary wealth. These are mainly subadults with the addition of some disturbed and unidentifiable adults. Table 9.15 therefore shows that most people gained wealth after reaching adulthood, though this was not a universal occurrence as seen by a portion of both males and females also occupying these very poor categories. In this factor Non Ban Jak aligns with what is seen from the Cambodian assemblages.

Table 9.15 Tally of individuals in each wealth category after standardising the data.

Standardised wealth category	**Male**	**Female**	**Unknown**
<-1			
-1 - -0.75	1	1	16
-0.75 - -0.5	4	2	37
-0.5 - -0.25	2	5	20
-0.25 - 0	4	1	7
Mean Wealth			
0 - 0.25	2	2	5
0.25 - 0.5	1	1	4
0.5 - 0.75	5	1	2
0.75 - 1	2	1	4
1-2	6	2	2
2-3		2	
3<	1		2

Unlike the Cambodian sites in this study, the dataset in Non Ban Jak reveals some favouring of artefacts towards a certain sex. This appears only to go one way, with some artefacts being mostly or entirely associated with males, but none appear female oriented. Earrings, digging tools, knives (including machetes), sickles and spears were all associated either completely (digging tools, machetes and spears) or predominantly (earrings, knives and sickles) with male interments.

Given the physical/labour association with several of these artefacts (i.e. knives, sickles, and the digging tools), it is quite possible these reflect different roles performed based on a person's sex. These roles do not appear to carry an associated difference in rank or overall wealth.

Age Differentiation

The Non Ban Jak cemetery population follows similar age trends as seen in the Cambodian sites in that persons who have yet to reach adulthood are typically poorer (see Table 9.16). Infants in particular were very poor. Even their interment method – predominantly flexed in earthenware jars, marked them different to adults who were almost entirely in extended burials. For several infants the only grave goods were the vessels they were buried in. Paradoxically, children averaged the second wealthiest age bracket (though only a small number were encountered). These child burials tended to imitate adult interments as extended burials, sometimes in the form of double jar burials.

Middle aged and elderly individuals average the wealthiest assemblages among adults. This may indicate that wealth was gradually accumulated throughout life, even after passing prime physical condition to partake in labour intensive activities.

Table 9.16 Average assemblage size according to age-at-death.

AVERAGE ASSEMBLAGE SIZE PER AGE								
	Infant	Child	Subadult	Young adult	Adult	Middle aged	Elderly	Unknown
Artefacts	255	70	1	37	186	216	121	4
Burials	69	6	1	7	24	18	13	7
Average Assemblage Size	3.7	11.7	1	5.3	7.8	12	9.3	0.6
Average (Grouped)	4.3			9				0.6

Figure 9.6 provides an interesting observation of the distribution of wealth at Non Ban Jak according to those who have reached adulthood (young adult and older) and those who have not. 57.1% of the adult population is clustered below the mean site wealth, followed by a softly wavering decline as wealth increases. Subadults, however display a much more dramatic

disparity of wealth. 80% of subadults fall below mean wealth, by far outstripping the wealth gap in the general population. However, perhaps more interesting is the long tail in the subadult data. This thin spread of subadult burials through the wealth spectrum even to over one standard deviation beyond mean wealth may suggest some level of hereditary status, though this clearly is not extended to all, or even most, subadults.

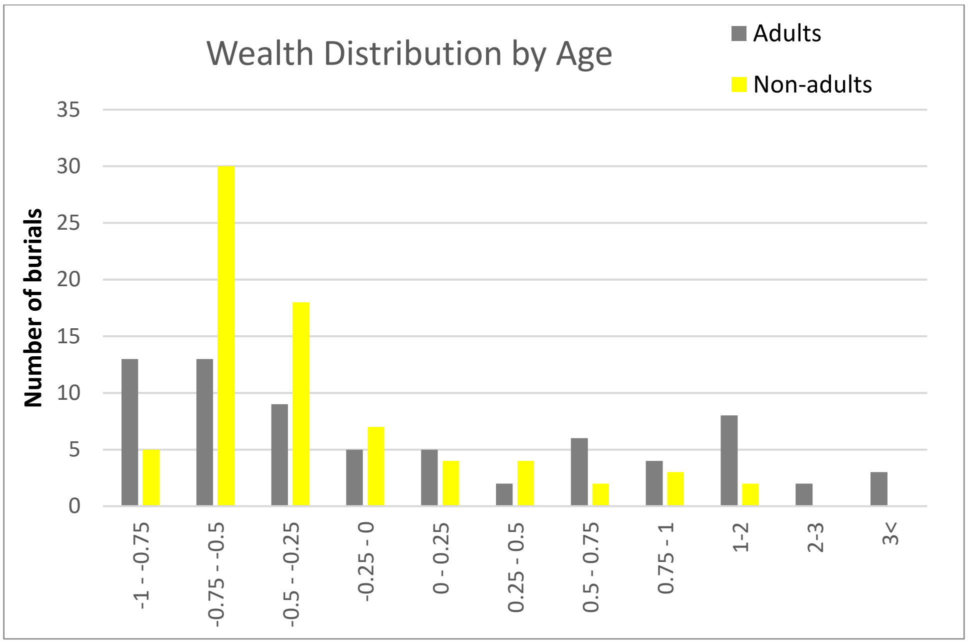

Figure 9.6 A comparative graph of the distribution of wealth at Non Ban Jak for adults and non-adults.

Typological Trends in Circlets

As in Cambodian prehistory, circlets have a long history as an integral part of the social display in Thailand (Gorman & Charoenwongsa 1976; Pilditch 1984; Higham 1989a; Higham & Tosorat 2004). Over time the material and forms shifted from mainly shell during the Neolithic and Bronze Age (Pilditch 1987; Chang 2001), to bronze and even some experimental use of iron in the early Iron Age (Higham & Kijngam 2012b). It is clear circlets already had a long tradition of use by late prehistory. It is reasonable to consider, therefore, that each item, separately and as part of an assemblage, fit within a well-defined cultural system of meaning. This section examines the trends borne out in Non Ban Jak circlets and how these match up with the wider funerary patterns in the cemetery.

For the purposes of the analysis here, bimetallic rings are not included in the analysis of circlets. This is due to the likely predominantly functional instead of ornamental role (i.e. clasps/loops for burials shrouds or clothes bindings etc) of these items. It is the theory of the author that where they appear in infant burials worn as bangles this is as a replacement for bronze bangles that could not be produced (or was not economically justifiable to produce) due to the sudden nature of an infant death. Further research is required to properly elucidate the function of these poorly understood artefacts. Such work is outside the bounds of this project.

The distribution of circlets per wealth category (Figure 9.7) demonstrates a conformity to the general construction of the wealth variable – that is to say more items (in this case circlets) go with increasing wealth. An order 3 polynomial trendline was applied to the data with a R^2 value of 0.8292. This suggests that a trend of a single valley (individuals at the poorer end have few circlets) and one peak (individuals with many circlets occupy the wealthy categories) is applicable to this data.

The three categories that have somewhat arbitrarily been pooled together as the 'poor' group (z scores of -1 – -0.25 σ) contain virtually no circlets. The 18 burials in the -1 – -0.75 σ category, which includes interments with no accompanying assemblages, did not contain a single circlet. The following category (-0.75 – -0.5 σ), which was the most populous with 43 individuals, did a single circlet better. Circlets only start appearing on a semi regular basis in the final poor category (-0.5 – -0.25) again perhaps suggesting that the boundaries between wealth groups were quite mild and inconsistent. These 27 assemblages accumulatively housed 24 circlets – still less than one per person. All subsequent incremental wealth categories average a minimum of two circlets per person in a generally increasing pattern.

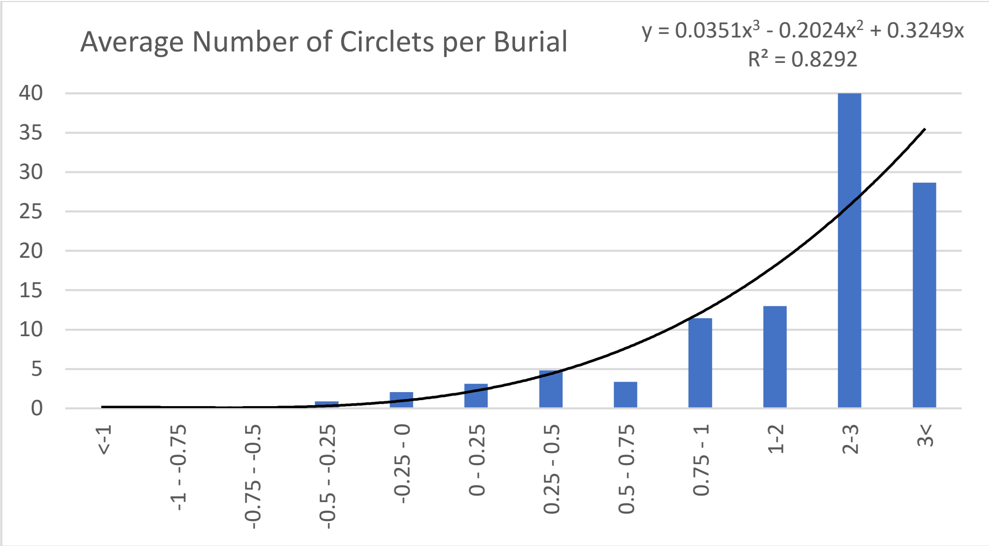

Figure 9.7 Average quantities of circlets in assemblages across relative wealth categories. An order 3 polynomial trendline illustrates the single valley (at the poorer end) and peak (amongst wealthy burials) in the data.

Figure 9.8 displays a breakdown of the average number of circlet types per burial across the wealth spectrum. It shows a similar pattern as in Figure 9.7 though with less rigid observance of a gradual accumulation. This is evidenced by the inability to apply a polynomial trendline to the data while achieving an R^2 value close to 1 (value ranges from 0 to 1 with 1 being a trendline perfectly representing the data). In order to achieve a R^2 value similar to Figure 9.7, at least 5 orders (multiple peaks and troughs) were required in the polynomial calculation. This may indicate that the sheer number of circlets was more important than the shape and there was little meaning between wearing, for example, two different types compared to four types.

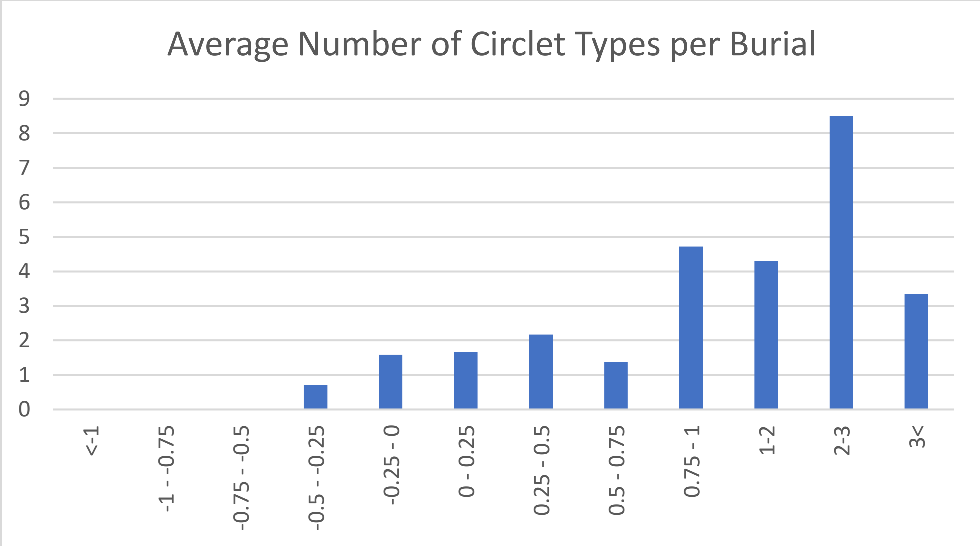

Figure 9.8 Average number of 1st tier typological forms in burial assemblages across relative wealth categories. Each type is counted once per circlet form (i.e. 2 type G bangles count as 1, but a type G bangle and a type G earring count as 2).

In total, only seven unique circlet types, regardless of the specific artefact (bangles, rings, etc.), were recovered from the 88 poor burials. This is the fewest of any group at Non Ban Jak. The types themselves are typically common forms centring on flat, circular, or squarish cross sections. Type S – flat bands less than 1.5mm thick, is the most delicate form present though the thinness does come with the trade-off of using less bronze metal which could have reduced the cost of production. No types were found solely in poor interments. The types recovered were: A, G, H, I, O, P, and S.

The five wealthy mortuary assemblages contained 10 unique circlet types between them. This includes all those recovered in poor interments as well as three other types. Two of the additional types, both of which were also found in the in-between burials, were also variances of circular cross sections. The only type unique to rich burials, type M, was the most sophisticated design - a thin band bent into a sideways U or V. The typologies recovered were: A, B, G, H, I, M, O, P, Q, and S.

The 52 burials that were classed in between poor and wealthy status contained a combined 14 types. This included all those found in poor assemblages and all bar one type from rich contexts. Five types were also recovered that were not found in either of the other groups. Two of these were based around a circular or flat cross section while a third type represents circlets whose form could not be identified. The remaining two were rare (each only appeared once at Non Ban Jak) and complex cross sections. This is especially true of type L – a bronze coil around a hollow core in a spiral pattern. Type E, a sideways 'T' was the other complex typology present. Both were recovered from burials around mean wealth. The types recovered were: A, B, E, G, H, I, J, L, N, O, P, Q, S, and Z.

Conclusion

Five seasons of excavation at Non Ban Jak from 2011-2015 uncovered 145 individuals dated to the late prehistoric. Two large units were opened at the site. The unit is the eastern mound encountered few burials, while the 10 x 35m trench extending from the central dip into the western mound uncovered a large mortuary population. Four mortuary phases were identified by excavators on the basis of minor shifts in stratigraphy (Higham n.d., Ch. 7). Funerary practices at the site strongly distinguished between adults and subadults through the placement of the body. Adults were almost entirely extended with the main variation only in orientation. Conversely infants and young children displayed more variability. The majority of interments were as a flexed bundle in a single jar. Over time increasing numbers of young were interred in ways to mirror adult burials – either directly as extended burials, or as an amalgamation of the two in extended 'double jar' interments.

The examination of mortuary assemblages in this chapter suggests that Non Ban Jak operated under a different social and economic system to contemporary Cambodian late prehistoric villages. This is reflected by a fluid, gradually shifting transition from a large poor population through to a few rich individuals instead of strongly defined wealth tiers. There was also no evidence for possible matrilineal (or for that matter patriarchal) economic systems as there was negligible differences in assemblage wealth between sexes. Functional iron tools such as sickles and knives tended to favour male interments, though this appears as a reflection of roles rather than status as there was no associated increase in the burial wealth where these items were present.

The data produced at Non Ban Jak will be reviewed against published mortuary evidence from other neighbouring prehistoric sites in Northeast Thailand. This will aid in determining whether differences to the Cambodian collections represent a one-off occurrence or is indicative of two separate regions with different levels of socio-economic complexity.

Chapter 10 Supplementary Late Prehistoric Thailand Sites

The supplementary data included in this chapter are designed to overcome potential weaknesses in the primary data (mortuary collections personally examined and recorded) in regard to coverage of the Mun Valley in the late Iron Age as well as comparative evidence from earlier periods. One potential issue for this project is that it suffers from a lack of comparative Northeast Thailand cemeteries with which to juxtapose the trends at Non Ban Jak. A second issue in the data is the tightly confined temporal period which, while important for studying the late prehistoric immediately prior to the transition to the early historic, does not allow for insightful examination of variances in social trends compared to earlier populations. In order to resolve these two issues, supplementary data (published data not personally examined) from two extensively excavated and well-documented sites in the Mun Valley will be incorporated for comparison. Noen U-Loke contains a large population mainly dating to the mid-late Iron Age (Higham, Kijngam & Talbot 2007). Meanwhile Ban Non Wat, though quite sparse in mid-late Iron Age burials, is perhaps the best example of a long-term habitation site in Southeast Asia, with evidence for continuous occupation from the Neolithic to the Iron Age (Higham & Kijngam 2012). Both these sites are situated in close proximity to Non Ban Jak within a densely packed cluster of circular moated sites that were occupied during the Iron Age (Figure 10.1).

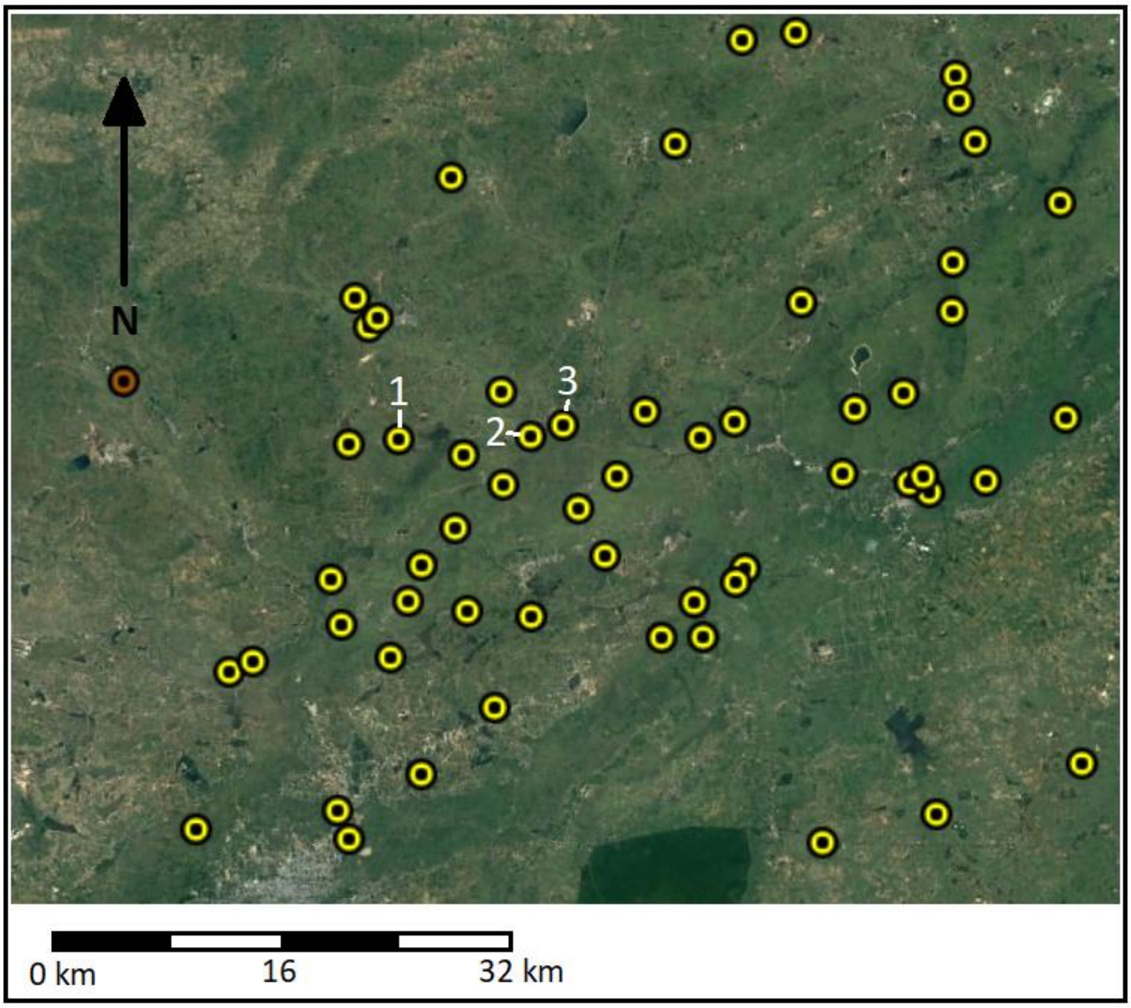

Figure 10.1 Google Earth satellite image of circular moated sites clustered in the Upper Mun River Valley. 1 Non Ban Jak, 2. Noen U-Loke, 3. Ban Non Wat.

A strong consideration in the selection of Noen U-Loke and Ban Non Wat as supplementary sites was not only for the gaps they fill, but also because they have been extensively published in detailed site reports. The mortuary data in the reports provides a description (in most cases accompanied by a photograph) of each burial context, as well as tallies of the artefacts recovered. Given that the circlets were not examined personally, it was not possible to asses any typological aspects of the collections. While this is unfortunate as it rules out any comparison of circlet trends as well as eliminating a method for viewing different social groups within the population, it does illustrate the need for a comprehensive morphological typology applicable across sites.

This chapter focusses on overall trends at these two supplementary sites. At Noen U-Loke the aim is to determine if trends in the mortuary population are most closely linked with Non Ban Jak, suggesting a regional Mun Valley culture; or the Cambodian sites, which could suggest that the lesser complexity demonstrated at Non Ban Jak is anomalous for either side of the Dângrêk mountains. The aim of examining the Ban Non Wat data is to attain a firmer understanding of the economic setting in Northeast Thailand leading up to the late prehistoric.

Noen U-Loke

Site Details

Noen U-Loke is a circular moated site located in the Upper Mun River Valley. The prehistoric mound was excavated as part of *The Origins of the Civilisation of Angkor*, a large scale archaeological and geoarchaeological project (Higham, Kijngam & Talbot 2007). As is the case for many Iron Age settlements in Northeast Thailand, the central mound is surrounded by an encircling system of moats and embankments. With at least five separate moat-and-embankment systems, the earthworks surrounding Noen U-Loke are among the most extensive for circular moated sites in Northeast Thailand, with most mounds restricted to one or two moats (O'Reilly & Scott 2015).

Three seasons of excavations at Noen U-Loke from 1996-1998 uncovered four phases dating to the Iron Age (Higham, Kijngam & Talbot 2007). A possible fifth phase (MP 1) may represent the initial settlement of the site, however this only contained a single burial. The earliest cultural deposits date to the beginning of the Iron Age or possibly the very end of the Bronze Age circa the mid first millennium BCE (Higham & Thosarat 2007). The site was abandoned c. 1000 years later in the mid-late first millennium CE. Dating of the site mostly utilised charcoal deposits from hearths and furnaces with two other samples supplied from the resin coating of potsherds (Higham 2011: 107-108). The material culture uncovered, particularly in regard to the mortuary items, was very similar to Non Ban Jak (Table 10.1). 126 burials were recovered at the site, the vast majority of which date to MP 3 (150 BCE –200 CE) or later.

Noen U-Loke therefore provides a useful dataset for direct comparison with contemporary populations in Northeast Thailand during Iron Age.

Mortuary Phases at Non Ban Jak (Higham & Thosarat 2007):

MP 1:
Date range: late Bronze Age – early Iron Age
Burials: 1

MP 2:
Date range: c. 420 – 150 BCE
Burials: 7

MP 3:
Date range: c. 150 BCE –200 CE
Burials: 25

MP 4:
Date range: c. 200 – 400 CE
Burials: 62

MP 5:
Date range: c. 400 – 600 CE
Burials: 31

Given that Noen U-Loke, unlike the data from Non Ban Jak where the excavators note the distinction between recorded phases is 'so ephemeral as to be mostly arbitrary' (Higham n.d. Ch. 7: 1), is split into multiple mortuary phases, it is important to determine what section of the mortuary record can be reasonably utilised as supplementary to the wider archaeological landscape of the late Iron Age in Northeast Thailand. The first three mortuary phases do not cover the required dates to impact on the late Iron Age, and are therefore not utilised further in this study. Mortuary phases four and five both align with the date range from Non Ban Jak and the cemetery contexts in central-Northwest Cambodia. However, these represent two different periods at Noen U-Loke and cannot simply be merged together without first examining if there is enough degree of similarity in wealth distribution to justify an amalgamation of the data. Figure 10.2 displays the distribution of wealth in the final two phases at Noen U-Loke when each phase is treated as a distinct population. As displayed in the histogram, the pattern of wealth distribution is remarkably similar in both phases, and indeed carries parallels with the distribution at Non Ban Jak (Figure 9.4). The majority of both phases (MP 4 = 75.8%, MP 5 = 77.4%) are situated below mean wealth, followed by an incremental decline in burials accompanied by increasingly large assemblages. The large spike in MP 4 at -0.5 - -0.25 is due to the large standard deviation (see standardising wealth section below) which means that even the very poorest burials cannot register below this category. The similarities in the relative distribution of wealth in Mortuary phases 4 and 5 is taken as evidence that it is appropriate to include both cemetery populations in the supplementary data for Northeast Thailand. The total grave goods recovered from across both phases is listed in Table 10.1.

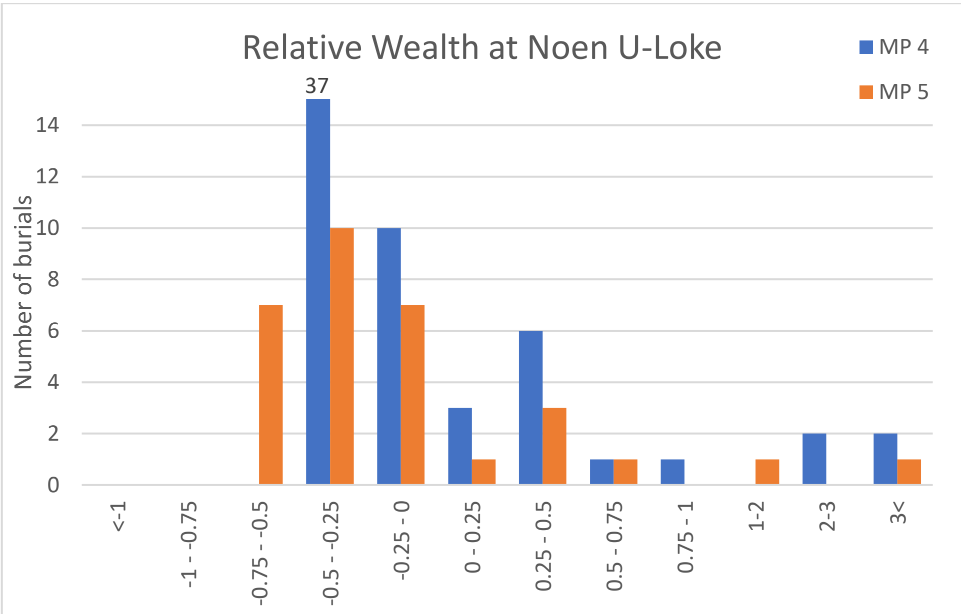

*Figure 10.2 Relative distribution of wealth at Noen U-Loke in Mortuary Phases 4 and 5. (Extrapolated from data from Higham, Kijngam & Talbot 2007). * The ceiling value for the chart was limited to 15 burials to aid illustration*

Table 10.1 Artefacts recovered from mortuary contexts in Mortuary Phases 4 and 5 at Noen U-Loke (Higham, Kijngam & Talbot 2007).

Noen U-Loke	
Burials	93
Burials containing goods	86
Bronze bangles	465
Bimetallic rings	52
Bronze anklets	65
Bronze rings (finger or toe)	507
Bronze earrings	59
Bronze bells	25
Iron knives	28
Iron sickles	7
Digging tools	2
Iron spears	2
Projectile points	3
Glass beads	38
Agate beads	30
Carnelian beads	1
Gold items	4
Spindle whorls	12
Clay pellets	1
Ceramic vessels	146
Other	176

It is worth noting before proceeding with the analysis of the Noen U-Loke mortuary data, that Higham et al. (2007) have identified several clusters of what they term ‘social units’ on the basis of spatial groupings in mortuary phase 4.

Cluster A contained 13 individuals in deep-cut graves that were often filled with rice and occasionally lined with clay (Higham et al. 2007). A wide variety of artefacts were found associated within the cluster of burials including bronze ornamentation, iron tools, and glass and stone beads.

Cluster B comprised mainly infant burials (13 of 18) grouped around an elderly female (Higham et al. 2007). The site excavators note that one of the few adult burials was a female who died as a result of beheading, providing one of the uncommon traces of violence in Iron Age contexts in the Mun Valley. Unlike cluster A, none of the graves here were lined with clay, nor was there evidence of gold or silver material.

Cluster C was made up of 14 individuals including several of above average or exceptional wealth. Several of the infants were also accompanied by large mortuary assemblages, potentially suggesting that the cluster represents a group of elites whose status was at least partially hereditary.

Cluster D was identified on the basis of only five burials at the northern extent of the excavation trench, with the site report hypothesising that more individuals would have been found further north (Higham et al. 2007). Of the five burials only one was undisturbed and indeed this was accompanied by the largest assemblage encountered at the site. The only infant in the cluster was also interred with a wealthy assemblage.

While these clusters may indeed represent social units based on kin or economic relationships, it would be erroneous to focus on these clusters in comparison to the wider archaeological landscape where sites (particularly in the case of Cambodia) have not been excavated to the same extent which could reveal any potential corresponding groups. To compare a socially and spatially defined cluster against an entire population sample would create a sampling bias of targeted verse random sampling. This would doubtless lead to erroneously weighted results and should be avoided. Therefore, while it is usefuls to note these clusters in MP 4, the entire population is utilised to generate the data sets rather than single clusters.

Standardising Wealth

The same method for standardising wealth according to a z score based on standard deviation away from the mean (Drennan 2004) as used on the primary datasets was applied to the supplementary sites. The mean assemblage size and standard deviation were calculated separately for both mortuary phases, with the resulting standardised z-scores therefore reflective of the wealth of a burial relative to its own population. In general, wealth at at Noen U-Loke was greater than Non Ban Jak, with the average assemblage size exceeding that at Non Ban Jak in both mortuary phases 4 and 5.

The mean mortuary assemblage for Noen U-Loke was 21.1 and 10.1 artefacts across MPs 4 and 5 respectively, with a total average assemblage size of 17.5 cumulatively, compared to less than 8 at NBJ. This is still lower than any of the Cambodian collections, though is most comparable to Lovea (18.1) and Prei Khmeng (22.4). The contrast between Noen U-Loke and Non Ban Jak is perhaps even more apparent when a comparison is drawn between mortuary phases. In MP 3, the wealthiest period at Non Ban Jak, the mean assemblage size of 10.3 is less than half that of the mean during the wealthiest period at Noen U-Loke – MP 4.

The apparent increase in available wealth at Noen U-Loke compared to Non Ban Jak may indicate that, while Northeast Thailand was economically weaker than Northwest Cambodia, the disparity may not have been as dramatic as it seems just by considering Non Ban Jak. The implication of this is therefore that Non Ban Jak was a poor village within the greater Mun Valley. The position of Non Ban Jak on the periphery of the cluster of contemporary moated sites in the Upper Mun River Valley (Figure 10.1) may have contributed to its poorer standing compared to Noen U-Loke.

A wide range of assemblage sizes in both mortuary phases 4 and 5 at Noen U-Loke, including several of exceptional wealth, resulted in standard deviations considerably larger than the mean value for each phase. Consequently, the poorest individuals (including seven interments with no grave goods) only register z scores of -0.5 (0.5 σ below the mean) for MP 4 and -0.75 in MP 5 (Figure 10.2). This also affects richer burials, effectively minimising the standardised distance from average assemblages.

Table 10.2 Standard deviation and mean assemblage size for mortuary phases 4 and 5 at Noen U-Loke. Average is from all assemblages from the two phases combined.

	Average	**MP 4**	**MP 5**
Standard deviation	36.48	42.86	16.14
Mean	17.45	21.15	10.06

Distribution of Wealth

As noted above, more than three quarters of the cemetery population in both mortuary phases exhibited wealth below the mean at Noen U-Loke. Such a strongly skewed dataset does not match with any of the trends at the sites under examination, however, it most closely resembles that at Non Ban Jak, where the proportion of the population below mean wealth was 60%.

Interestingly though, the percentage of exceptionally wealthy individuals (more than 1 σ above the mean) is infact higher at Noen U-Loke (6.5%) than Non Ban Jak = 3.4%. This perhaps suggests that a larger or more defined class of elites at Noen U-Loke were responsible claiming a greater portion of the wealth in the village, thereby forcing the mean assemblage size to increase while leaving a large portion of the population to fall behind this mean wealth mark.

No strong associations of particular artefacts with wealth scores appears in the population. Common items, such as bangles and rings, are present in almost every category, while rarer objects such as gold artefacts and iron projectile points appear at both ends of the wealth spectrum.

Sex Differentiation

The distribution of wealth by biological sex at Noen U-Loke provides an interesting case study in the issue of comparing two samples populations of different sizes. The averages displayed in Table 10.3 show females assemblages were larger than males by roughly five artefacts per burial. This initially appears similar to that at Phum Sophy and Prei Khmeng (with Lovea having no confirmed female interments to assess). However, as demonstrated in Table 10.4, the divergent averages are due to the larger population of confirmed males (m=17 compared to f=10). As expected with 80% of the total population below mean wealth, most males in the sample fell in the poor categories, particularly the poorest value (-0.5 – -0.25 σ). Meanwhile the average assemblage size for the smaller sample of females, which also have most of their individuals below mean wealth, is more affected by the couple of excessively wealthy assemblages.

In addition to their greater representation below mean wealth, Table 10.4 shows that males are also twice as common in the upper categories (more than 1 σ above the mean). This includes the two wealthiest individuals at Noen U-Loke (across any phase), which are both males.

Table 10.3 Average assemblage sizes according to biological sex at Noen U-Loke (Higham, Kijngam & Talbot 2007).

	MALE	**FEMALE**	**UNKNOWN**
Total Artefacts	414	296	903
Total Burials	17	10	66
Average Assemblage Size Per Burial	24.4	29.6	13.7

Table 10.4 Tally of individuals in each wealth category after standardising the data (extrapolated from data from Higham, Kijngam & Talbot 2007).

Standardised wealth category	Male	Female	Unknown
<-1			
-1 - -0.75			
-0.75 - -0.5			
-0.5 - -0.25	9	3	44
-0.25 - 0	2	3	14
Mean Wealth			
0 - 0.25	1		2
0.25 - 0.5	1	1	2
0.5 - 0.75		1	3
0.75 - 1			1
1-2	2		
2-3		2	
3<	2		

As with Non Ban Jak, a small contingent of the artefacts appear to have carried some sort of engendered meaning. In burials where sex could be identified, anklets were worn exclusively by females. A caveat on this is that more anklets were found with unidentified individuals (mainly subadults) than confirmed females. It is impossible to say if the unidentified skeletons would maintain or disrupt this pattern. Meanwhile bronze bells were solely with males and a small number of unidentified individuals. Earrings also heavily favoured males, though a couple were found with females.

Age Differentiation

Age trends at Noen U-Loke followed the same pattern as all previously examined cemeteries. Table 10.5 shows that the average wealth in all subadult categories, be it infants, children, or young teenagers, is below the site mean. This lack of wealth expands to incorporate the small number of individuals (4) who died in their physical prime as young adults. A significant increase in wealth appears as one enters full adulthood and continues trending upwards so that the interments of middle-aged people averaged more than double the next wealthiest age group.

As at Non Ban Jak, a large portion (50%) of the bimetallic rings recovered were in infant burials. Unfortunately, no information is available on how these presented in the burials (whether worn on the arm or merely accompanying the body) so no comments can be made as to a potential similar use as makeshift bangles.

Table 10.5 Average assemablage size based on age-at-death at Noen U-Loke (extrapolated from data from Higham, Kijngam & Talbot 2007).

AVERAGE ASSEMBLAGE SIZE PER AGE							
	Infant	Child	Subadult	Young adult	Adult	Middle aged	Elderly
Total Artefacts	336	33	14	27	606	511	78
Total Burials	36	7	2	4	27	9	4
Average Assemblage Size	9.3	4.7	7	6.8	22.4	57	19.5
Average Assemblage Size (Grouped)	8.5			27.8			

Summary

Noen U-Loke is a useful comparative dataset for the Upper Mun River Valley. While distribution of wealth at Noen U-Loke does not conform exactly with Non Ban Jak, there is a certain level of association. Despite a mortuary population which was clearly wealthier than Non Ban Jak, there still remains a large poor sub group and only a few richer individuals without any clearly defined boundaries or cut-offs between the two.

Based on the assessment of the supplementary data from Noen U-Loke conducted here, it is considered reasonable to merge the contemporary data from mortuary phases 4 and 5 with the Non Ban Jak collection for analysis of the wider Northeast Thailand region in the late prehistory and into the protohistoric.

Ban Non Wat

Ban Non Wat is perhaps the most completely excavated and documented prehistoric site in Southeast Asia. Due both to the size of the excavation and the long continuous cultural deposits uncovered, the prehistoric village features prominently in almost every synopsis of Southeast Asia's early history of the past 15 years (i.e. Higham 2011a; 2011b). The dating scheme at the site also forms a core part of short chronology model of Southeast Asian prehistory (Higham et al. 2015; Higham & Higham 2009).

The supplementary data used here will focus on the Iron Age deposit at Ban Non Wat, most of which is early Iron Age (late first millennium BCE). The Bronze Age and earlier layers have been well published and a brief overview is enough to illustrate the site sequence leading up to the period of interest.

Site Details

Ban Non Wat is also a circular moated site in the Upper Mun River Valley of Northeast Thailand (Figure 10.1). Excavations conducted from 2002 – 2007 as part of *The Origins of the Civilisation of Angkor* project revealed 12 phases of settlement, the last three of which coincide with the Iron Age (Table 10.6) (Higham & Kijngam 2009; 2010; 2012a; 2012b; Higham 2011: 107). Dating of the sequence has applied a Bayesian approach to the radiocarbon analysis of freshwater shellfish within graves as well as several charcoal samples (Higham & Higham 2009).

The Bronze Age sees an immediate increase in assemblage sizes from the preceding Neolithic phase, though shell continues to be the main material for jewellery. Displays of wealth, not just in terms of assemblage sizes but also in the dimensions of grave cuts, increases through the Bronze Age up to BA 2-3. Bronze metals also become more common and feature in a variety of uses from ornamental to functional objects. Displays of wealth peak at the site during BA 3 before prosperity of the village appears to steadily subside. This slide continues into the mid first millennium BCE so that minimal mortuary wealth was recovered as iron artefacts begin appearing during the early Iron Age. It is this final period that the supplementary data cover.

Table 10.6 Mortuary phases at Ban Non Wat. Phase numbers refer to regional chronological phases established by Higham and Higham (2009). (Data from Higham & Kijngam 2012b; Higham 2011a)

Period	Phase	Date Range	Burials
Neolithic	N 1	1650 – 1250 BCE	31
	N 2	1250 – 1050 BCE	38
Bronze Age	BA 1	1050 – 1000 BCE	7
	BA 2	1000 – 850 BCE	32
	BA 3	850 – 800 BCE	33
	BA 4	800 – 700 BCE	142
	BA 5	700 – 420 BCE	35
Iron Age	IA 1	420 – 150 BCE	142
	IA 2	150 BCE –200 CE	11
	IA 4	400 – 600 CE	7

Table 10.7 Artefacts recovered in Iron Age mortuary contexts at Ban Non Wat (Higham & Kijngam 2012b).

Ban Non Wat	
Burials	160
Burials contains goods	150
Bronze bangles	85
Bronze anklets	32
Bronze rings (finger or toe)	14
Bronze earrings	2
Iron knives	32
Iron sickles	1
Iron points	7
Digging tools	5
Iron spears	14
Glass beads	5
Agate beads	27
Carnelian beads	11
Gold items	2
Spindle whorls	58
Clay pellets	31
Ceramic vessels	659
Other	810

Standardising Wealth

In contrast to the large displays of funerary wealth at Ban Non Wat during the Bronze Age, the Iron Age population showcases very minimal wealth (Table 10.8). In order to allow for variation during the roughly thousand-year duration of the Iron Age, mortuary wealth was standardised by each of the three phases present. This approach ensures data are only being compared against roughly contemporary data and should reveal any differences in cultural and social expressions in funerary practises over time.

IA 1 (420 – 150 BCE) is the only phase with enough burials to be truly considered a robust sample in Northeast Thailand where prehistoric cemeteries have yielded considerably larger mortuary populations than in Cambodia. This phase averages closest to the late Iron Age Non Ban Jak sample (7.4) in terms of the average number of artefacts per individual mortuary context (Table 10.8). While caution must be used in comparing this earlier population with late Iron Age settlements, the average of 11.8 artefacts per assemblage is the second poorest encountered in this project in either Cambodia or Northeast Thailand.

Such a result comes as unexpected considering the long history of the village, the considerable displays of wealth during the Bronze Age, and the above-average number of moats (three) constructed in the Iron Age around the central mound (c.f. O'Reilly & Scott 2015). The data reveal that the wealthiest assemblage in the IA 1 cemetery only contains 50 items. This compares quite unfavourably with the later sites. At Noen U-Loke for example, such a tally would not even place an individual outside a single standard deviation from the mean during MP 4 and 5. Even Non Ban Jak contained a burial with more items (64).

It appears likely that an economic shift occurred late in the Bronze Age which diverted wealth and power in the upper Mun Valley away from Ban Non Wat. This may have been a symptom of the rapidly increasing population and the appearance of many new villages in the vicinity which could have diluted any wealth and power in an almost oppositional progression to early state formation.

It is worth making a note of IA 2 (150 BCE – 200 CE), which stands out as particularly poor (only 2.4 artefacts per assemblage). However, the 11 individuals include eight infants accompanied solely by the ceramic vessel in which they were interred. The few adults, while themselves quite poor (3, 6, and 9 artefact assemblages respectively) are considerably pulled down by these bare infant interments.

Examination of the small IA 4 (400 – 600 CE) population reveals very similar numbers to IA 1 in terms of the standard deviation and mean (Table 10.8). However, with only seven individuals, the sample size is too small for any robust analysis.

Table 10.8 Standardised burial wealth during the Iron Age at Ban Non Wat (data extrapolated from Higham & Kijngam 2012b).

	IA 1	**IA 2**	**IA 4**
Standard Deviation (σ)	10.1	2.7	10.2
Mean (μ)	11.8	2.4	11.4

Distribution of Wealth

The distribution of wealth early in the Iron Age (IA 1) is very different to anything seen in the study of late prehistoric mortuary populations in this thesis. Figure 10.3 shows that the population was spread far more evenly along the wealth spectrum than in later periods. While the overriding theme of a positive skew continues (largest clump of individuals at the lowest end with a decreasing tail towards positive values), the distribution is much closer to a normal pattern. 73.2% of mortuary assemblages were within a single standard deviation of the mean (positive or negative). This is relatively close to a normally distributed dataset (Wheeler & Chambers 1992). Indeed, a minor bell curve effect is present roughly 0.5 σ either side of the mean with the peak number of individuals around the mean wealth score. The normality of the data distribution is only disrupted at either end of the spectrum, particularly the poorer end which contains the largest categories in terms of the number of individuals instead of very few as in a normal distribution. The lack of burials to provide data for later Iron Age wealth distribution and economic patterns at Ban Non Wat is illustrated in Figure 10.4. Neither datasets for IA 2 or 4 provide enough information for analysis. The significant divergence of the IA 1 pattern from those exhibited at later sites may reflect a less complex socio-economic system during the early Iron Age in Northeast Thailand, perhaps as a reflection of possible heterarchical constructs in the Bronze Age (White 1995; O'Reilly 2000) gradually transitioning into a more hierarchical setting.

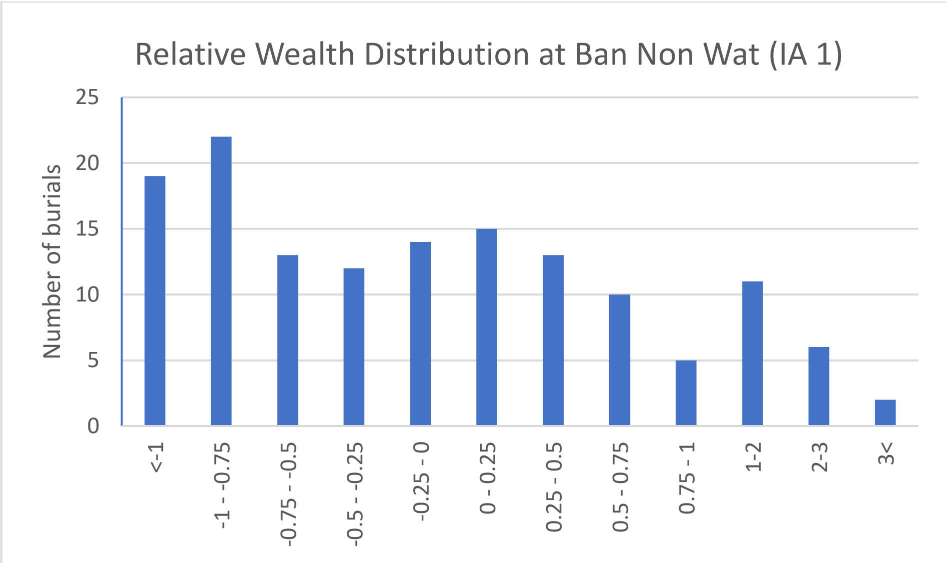

Figure 10.3 Distribution of wealth at Ban Non Wat relative to the site mean during IA 1 (420 – 150 BCE) (data extrapolated from Higham & Kijngam 2012b).

Figure 10.4 Comparison of late Iron Age (A. IA 2, B IA 4) wealth distribution at Ban Non Wat. The small sample sizes do not provide the required level of clarity for a comparative dataset of late prehistoric social-economic organisation (data extrapolated from Higham & Kijngam 2012b).

Sex Distribution

The early Iron Age at Ban Non Wat is one of very few mortuary populations included in this study in which males averaged a larger funerary assemblage than contemporary females (Table 10.9). While this difference is only an average of 1.9 artefacts per person, the low assemblage averages makes this equate to a 17.8% increase in male assemblages compared to females. The data from Ban Non Wat are also interesting in that, on average, burials where biological sex could not be determined actually exhibited large mortuary assemblage. This is in comparison to all other sites where a significant decrease is evident for these unknown burials. At Ban Non Wat IA 1 the average for undetermined burials sits squarely in between males and females. The following section will examine if this is a product of a reduction in age-based bias compared to later sites.

When the economic distribution of individual burials is tallied against sex (Table 10.10) it is clear that, proportionally, females were more commonly poor (67.6% below mean wealth) compared to males (54.9% below mean wealth). This obviously translates to the inverse of males being represented more in the above-mean wealth categories. This continues to include interments of exceptional wealth. 15.7% of males were accompanied with assemblages at least one standard deviation above the mean compared to only 11.8% of females.

The cemetery populations recovered for both IA 2 and IA 4 were too small (IA 2 = Males:2, Females:1; IA 4 = Males:1, Females:1) for any analysis of wealth bias based on biological sex.

Table 10.9 Average assemblage size according to biological sex at BNW in IA 1 (Higham & Kijngam 2012b).

	MALE	**FEMALE**	**UNKNOWN**
Total Artefacts	643	365	667
Total Burials	51	34	57
Average Assemblage Size Per Burial	12.6	10.7	11.7

Table 10.10 Tally of individuals at BNW IA 1 by wealth category after standardising the data (data extrapolated from Higham & Kijngam 2012b).

Standardised wealth category	Male	Female	Unknown
<-1	5	7	7
-1 - -0.75	4	7	11
-0.75 - -0.5	7	2	4
-0.5 - -0.25	7	1	4
-0.25 - 0	5	6	3
Mean Wealth			
0 - 0.25	6	3	6
0.25 - 0.5	5	1	7
0.5 - 0.75	2	1	7
0.75 - 1	2	2	1
1-2	6	1	4
2-3		3	3
3<	2		

Several artefacts appeared in assemblages either exclusively or predominately favouring one sex. Iron objects such as projectile points, agricultural tools, and spears all appeared solely in male or unknown burials. The distribution of iron knives also favoured males though six were recovered with females. On the other side beads of any material – glass, agate or carnelian, were exclusive to females and unknown individuals. This perhaps suggests a dichotomy around functional artefact sets (male) verses ornamental displays (female).

Age Differentiation

Following the relatively large average assemblage size in skeletons of unknown sex mentioned above, there is far less difference between adults and subadults in the early Iron Age at Ban Non Wat than anywhere else in this study. Table 10.11 shows that even infants and children are comparable to young adults, though slightly less than more mature-aged individuals. Seemingly, the economic or funerary system placed more importance on children during the early Iron Age than at later periods. One possible explanation may be that this was a by-product of the population expansion in the Khorat Plateau during the early Iron Age, resulting in greater mourning of the loss of young lives before reaching reproductive age (MacDonald 2001; Crawford et al. 1989).

Table 10.11 Average assemablage size based on age-at-death at Ban Non Wat IA 1 (Higham & Kijngam 2012b).

AVERAGE ASSEMBLAGE SIZE PER AGE							
	Infant	Child	Subadult	Young adult	Adult	Middle aged	Elderly
Total Artefacts	113	161	275	259	230	360	223
Total Burials	12	18	22	29	17	27	16
Average Assemblage Size	9.4	8.9	13	8.9	13.5	13	13.9
Average Assemblage Size (Grouped)	10.6			12.0			

Summary

The Ban Non Wat data provide perspective to the predominately late Iron Age focus of this study. The evidence from wealth distribution suggests different economic and social systems were active in the mid-late first millennium BCE than immediately prior to the emmergence of states in Southeast Asia. None of the investigated aspects of wealth distribution matched anything present in the late Iron Age villages. The population was divided in a much more equal spread closer to a normal bell curve in regard to the quantity of grave goods, potentially reflecting an absence of active hierarchical structures. Another major point of difference was the lack of an age bias in mortuary wealth. This may suggest an added importance placed on reproduction and population growth coming out of the Bronze Age that had dissipated by the mid-late Iron Age.

The evidence from the early Iron Age cemetery is especially interesting given the large wealth deposits that have been documented at the site during the Bronze Age (Higham & Kijngam 2012a; Higham 2011a). The presence of seemingly high-status burials in these early phases has led to suggestions of some form of hierarchy featuring wealthy social aggrandisers (Higham 2011a) when most contemporaneous populations may fit better in a heterarchical model (White 1995; O'Reilly 2000). Clearly a change occurred during the late Bronze Age in Northeast Thailand which stymied the growth of Ban Non Wat from a powerful, wealthy village perhaps capable of harnessing influence over neighbouring areas, into a fairly poor village without any clearly defined elites. Possible reasons for this include contact with India establishing new trade routes and influence (Basa et al. 1991; Bellina 2003), and climatic shifts resulting in the onset of the current monsoonal weather pattern (King et al. 2013; Wohlfarth et al. 2016). Regardless of the cause, a possible heterarchical system in place at the start of the Iron Age could well have contributed to slowing the growth of social complexity in Northeast Thailand in comparison to Central-Northwest Cambodia.

Summary of Observed Site Trends

Through detailing in-depth the archaeological detail of each site in this study, a number of observations have been made regarding various patterns, and observed points of interest. While the potential meaning of these will be discussed and interpreted in the following chapter in a wholistic sense incorporating evidence from all sites, it is worth recapping these observations here.

It has been repeatedly seen that using the number and different types of circlets appears to consistently corroborate wealth as measured by quantity at the sites involved. Particularly worth noting is that it is not just the number of circlets that increases with overall assemblage size, but the more delicate and sophisticated designs consistently appear solely in those with larger assemblages. However, even in these cases, more common, simple designs still made up the bulk of the wealthy assemblages.

At all the sites, burial assemblages which were classified as 'poor' on the basis of a minimal number of inclusions, were almost universally restricted to a few basic artefact types – notably ceramic jars in the absolute poorest, then bangles and rings, and some iron agricultural implements sickles and hoes. Conversely, the difference between a more mid-range assemblage size and those of greater wealth is largely reliant on the size of assemblage, rather than the inclusion of rare artefacts or materials. That these pattern are repeated across sites and area, without notably being skewed according to age or sex, is worth noting and may be indicative of emergent class-based inequality.

Some potential evidence for matriarchal systems is present in the data from Phum Sophy and Prei Khmeng, where female burials both averaged larger assemblages overall, and the largest recovered assemblages were associated with females. This stands in contrast to the data from Northeast Thailand were no such discrepancy is found.

Potential social or economic differentiation on the basis of age is difficult to examine in the Cambodian sites due the relatively small datasets that are presented at each individual site, and indeed no subadults were recovered from Phum Lovea. At this stage no artefacts appear to favour a potential age range (either through a direct accumulation of goods or inversely through a clear absence of a particular item for individuals of a certain age). However as a general rule of thumb subadults were interred with fewer items than adults, though this between sites as to the magnitude of the trend, as does the age range with the greatest average displays of wealth.

Conclusion

The evidence covered in this chapter provides a more rounded image of the economic and social circumstances of the Iron Age in The Mun Valley of Northeast Thailand. The published mid-late Iron Age data from Noen U-Loke follow similar patterns to those at Non Ban Jak. This effectively refutes any suggestion that Non Ban Jak could have been an atypical village within an overarching, single region incorporating Northeast Thailand and Northwest Cambodia. The addition of the early Iron Age data from Ban Non Wat, along with an overview of the preceding Bronze Age sequence, give context to the apparently poor Mun Valley. From a thriving, wealthy village with possible evidence of an emerging class of elites in a potentially hierarchical structure in the mid-Bronze Age, Ban Non Wat steadily lost many of its gains. By the early Iron Age this economic decline was complete, and the data show a poor population evenly distributed along the wealth spectrum without any prestigious or clearly elite interments. The data from Noen U-Loke will be combined with Non Ban Jak in the following chapter to create a dataset for Northeast Thailand.

Chapter 11 Discussion

Archaeological research in mainland Southeast Asia has faced a tendency among some scholars to assume the existence of a largely homogenous prehistoric cultural landscape (Solheim 1970; Bayard 1984a; Higham 1989b; White 1995; Higham 2011c). This is particularly true for inland areas such as Northeast Thailand and Central-Northwest Cambodia, which did not have the benefit of coastal trade as a source of external stimulus (Higham 2016; Higham et al. 2019). This *modus operandi* in archaeological study is certainly understandable, in a global sense the archaeology of Southeast Asia is still in its adolescence and the lack of large-scale comparable datasets has hindered the development of nuanced interpretations of prehistory, particularly in countries such as Cambodia, Laos, and Myanmar (Bellwood & Glover 2004).

With increasing archaeological research, it has become necessary to re-examine the assumption that two cultures separated by well over 100 kilometres and the Dângrêk mountain range experienced identical and contemporary developments in socio-economic complexity. The primary basis for assertions of comparable levels of complexity in these two regions appears to focus on similarities in material assemblages and site structures (Higham 2016). While both these elements certainly suggest contact links and possibly a shared history, the available archaeological evidence does not support the supposition that Central-Northwest Cambodia and Northeast Thailand followed identical paths towards increasing social complexity during the late prehistoric period (White 1995; Higham 2014).

The data and results presented in the preceding chapters are compiled to address two research questions. (1) *Is there evidence for economic differentiation in late Iron Age mortuary ritual between sites located in Central-Northwest Cambodia and Northeast Thailand?* (2) *What can any differences, should they exist, tell us about the level of socio-economic development pertinent for this region and time?* In order to investigate these two questions, a number of aims and hypotheses were introduced.

Aim 1: To create a morphological typology of circlets in the late prehistory of Southeast Asia to facilitate the assessment of variances in the social dress across wealth and geographical divides.

Aim 2: To create a regional dataset for late Iron Age Central-Northwest Cambodia which allows for examination of markers of social complexity in the mortuary record.

Hypothesis: The mortuary record from late Iron cemeteries across Central-Northwest Cambodia will provide greater insight into the level of social complexity through the distribution of artefacts and burial wealth.

Aim 3: To create a regional dataset for late Iron Age Northeast Thailand which allows for examination of markers of social complexity in the mortuary record.

Hypothesis: The mortuary record from late Iron cemeteries across Northeast Thailand will provide greater insight into the level of social complexity through the distribution of artefacts and burial wealth.

Aim 4: To determine if variances in the mortuary display between contemporary late Iron Age sites in Central-Northwest Cambodia and Northeast Thailand indicate differing degrees of social complexity between the two regions.

Hypothesis: The distribution patterns of wealth and mortuary artefacts (particularly circlets) in the two regions, as established in Aims Two and Three, will corelate to different socio-economic systems.

Morphological Typology of Iron Age circlets

The analysis of circlets across all sites both signifies a considerable addition to the wider body of research which has been conducted on bronze jewellery in prehistoric Southeast Asia (Pilditch

1984; Pilditch 1987; Chang 2001; ISEAA 2018) and also formed a major component in the methodology of this thesis. The term circlet has been applied to the subset of jewellery, typically metallic during the late Iron Age, comprising a band looped in a roughly circular shape providing a large central space to be worn on the body. For the dataset in use, this incorporates (in descending order of prevalence): bangles, rings, anklets, earrings, and bimetallic rings.

Circlets in burials have been used in this study as a proxy for examining mortuary wealth and status. This is based on the theoretical frameworks established particularly in anthropological studies which have illustrated the important role played by dress and ornamentation in conveying social meaning (Fowles 1974; Roach and Eicher 1979; Wiessner 1990; Reinhold 2003). Fowles (1974) goes so far as to state that the primary function of clothing in modern society is communication. In Southeast Asian mortuary contexts these frameworks are most useful in the analysis of circlets. More circlets were identified in mortuary assemblages at the sites examined in this project than any other item. In fact, bangles alone are the most prevalent item in this study dataset (n=390) (see appendix one). The only artefact that is close to appearing in similar numbers are ceramic vessels. In total, 58.7 % of all burials encountered in Central-Northwest Cambodia and Northeast Thailand contained at least one circlet in association. However, it is not merely the quantity of these ornaments that likely made them a focal point of social communication in the prehistoric. As covered in chapter five, numerous different forms and shapes of circlets existed in prehistory. It may be that the design of these ornaments allowed for various unspoken expressions that are otherwise absent from the archaeological record. Chapter five demonstrates that particular cross-sectional shapes favoured in the different sub-categories of circlets (bangles, rings, anklets, earring, and bimetallic rings) differ between sites. While further work is required if we are to garner even a portion of the social meaning conveyed by these ornaments, it appears reasonable to suggest that circlets found in late prehistoric Southeast Asian burials carry information on the social standing of the individual bearing them.

The typological analysis focused on three aspects of circlet morphology: cross sectional shape, band opening type, and overhead shape. Together these create a three-level categorisation system for all circlets in Iron Age contexts from Central-Northwest Cambodia and Northeast Thailand, if not the majority of the Southeast Asian mainland. The system was developed to provide greater scope for understanding and analysing these significant items of social display as well as providing a standardised framework through which circlets may be recorded across excavations and regions.

The importance of dress as a communicator of a person's place within society has long been acknowledged in anthropological debates (Fowles 1974; Wobst 1977; Roach & Eicher 1979; Storm 1987). Indeed, Fowles (1974) has suggested that communication is the cardinal function of dress. While that is perhaps an overstatement, there is considerable anthropological evidence to illustrate the importance of dress and ornamentation both for the living and the dead. In 1990, Wiessner examined the ceremonial dress and adornments worn by dancers in tribal New Guinea. The dress of each dance group served a dual communicative function. Primarily it served as a distinguishing uniform by which a dancer was immediately identified as a member of their group. However, minor variations between dancers allowed for expressions of individuality, and so aspects of different personalities were also conveyed in the dress and adornment of each dancer. In a contemporary Western setting, one may consider the example of social team sports. Here, a colour or theme is used to denote membership as part of the unit, while each individual will typically achieve this differently, effectively keeping markers of their own style and character.

In a mortuary scenario, Reinhold (2003) has attempted to identify levels of communication displayed in burial costumes of the Koban culture (late Bronze Age to early Iron Age) in Chechnya. She found that mortuary dress, including ornaments and jewellery, served to illustrate an individual's place within the social system on two levels. On one level, the mortuary costumes communicated membership to various groups such as families and kin groups, roles within the society (i.e. farming, hunting, warrior, etc.), or the sex of the individual. Reinhold also suggested a second message in the mortuary dress pertained to the individual's vertical status within the society. Using these principals Reinhold noted that the displays convey a change in social differentiation during the Iron Age in Chechnya.

While our ability to understand these messages may be obscured somewhat due to the nature of mortuary settings in archaeology, the importance of dress and ornamentation should not be underestimated. Dress analyses have been incorporated into archaeological projects globally for several decades (Wiessner 1990; Arnold 1991; Sorensen 1997). One recent study by Cougle-Jose (2010) utilised burial ornamentation in Osteria dell'Osa, an Iron Age cemetery in Italy, as a way of understanding individuals' standings in social and cultural spheres. A focus on circlets in Southeast Asian prehistory is therefore quite warranted as these items are often amongst the most commonly found artefacts in burials.

The additional insights generated by the typological classification of circlets are utilised to provide additional robustness to wealth analysis and economic distribution among the cemetery populations. Generating information on the different forms of circlets allows for a more detailed and nuanced examination of their distribution. At the first classification level of the new typology, the cross-sectional shape of the circlet band was divided into 24 unique categories (denoted by a capital letter A-Z). This variable is the most readily visible when the circlet is worn and therefore it is given the greatest priority in this study as it likely conveyed the greatest social meaning. The second tier characterises the type of opening in the circlet band, ranging from closed bands with no break, to those with multiple loops forming a spiral pattern. Six categories were identified (0-5) which are theorised reflect more the utility of circlet and how it was worn. A final variable was identified in the overhead shape of circlets. Only four categories were identified (w-y), and while this third tier may have little to do with social meaning as it is not obvious when the artefact is worn on a limb, it has been shown that the shape may aid in distinguishing between circlets and anklets, which are almost universally treated as interchangeable items. The application of this typology has revealed a clear difference from bangles, which are predominately circular, to anklets, which favour oval designs, suggesting that the two artefact classes were viewed as separate entities during the late Iron Age.

This level of insight compares to the supplementary data from Noen U-Loke and Ban Non Wat, where no such typologies exist and so analysis was restricted to a simple count of circlets per assemblage with no consideration of any differences between artefacts types.

Aim 1 Conclusion: Designing a morphological typology for the classification of Iron Age circlets.

The development of a standardised morphological typology for the recording and analysis of circlets provides an important tool in analysing late prehistoric jewellery in mainland Southeast Asia. The three-tiered system for recording these artefacts allows for meaningful insight into the shape and form of circlets. Crucially, the database of three-dimensional models of Iron Age circlets produced in this thesis is not envisaged as the final product but rather an important first stage in the creation of a comprehensive online resource for Southeast Asian prehistoric jewellery. The use of accessible models, along with the morphological typology, will aid research in the region by providing accurate data to researchers. As more sites are excavated using the typology created here, greater clarity will be achieved regarding the social communicative function of these important artefacts.

Evidence for a Stratified Economy in Late Iron Age Central-Northwest Cambodia

A central theme of this thesis is determining what, if any, characteristics of a complex social structure appear in late Iron Age society in Central-Northwest Cambodia. In order to examine the case for complex polities in Central-Northwest Cambodia, the social ranking data from the Cambodian sites in this study will be examined and compared to the literature to determine whether they present markers of increasing complexity and potential development beyond that expected for chiefdoms.

It must be noted here that this research is not aiming to suggest that there was a unified political entity in Central-Northwest Cambodia that could be labelled a state during the late Iron Age. Evidence abounds, not least from the adoption of a fully-developed Indic script employed in Sanskrit inscriptions, that a range of cultures from the nearby Mekong Delta, to Funan and Chenla, and even as far as India, all contributed to the formation of the Angkorian Empire in 802 CE, perhaps the first entity in Southeast Asia that can be confidently categorised as a state (Cœdès 1968; Vickery 1998; Higham 2001; Higham 2002; Stark 2006a). Rather, the aim here is to determine whether the late prehistory in Central-Northwest Cambodia developed the requisite structures of social complexity to provide a platform from which later polities were able to flourish as the seat of regional power moved from the Mekong Delta under Jayavarman II.

The combined Cambodian dataset comprises the mortuary assemblages from Phum Sophy, Phum Lovea, and Prei Khmeng. This creates a group totalling 38 individuals from mid-late Iron Age contexts. While this figure is small for data analysis, it is considerably more robust than a single site overview. However, the relatively small sample size precludes statistical testing of any trends that may be observed. Any attempt to implement such tests on this dataset would likely return highly skewed results. Unfortunately, this issue is currently unavoidable until more data are unearthed from excavation of prehistoric sites in Central-Northwest Cambodia. The following section will present the available evidence from the Cambodian mortuary contexts. The trends observed and their implications in terms of emerging social complexity will be discussed in conjunction with Northeast Thailand under aim four. Here, however, it necessary to outline the observed patterns.

The tiered distribution of wealth in the late Iron Age Central-Northwest Cambodian mortuary populations is the major point of difference separating this population from its contemporary in Thailand. As is revealed by several strands of evidence (Figure 11.1, Figure 11.5, and Table 11.2), the Cambodian mortuary population can be divided on the basis of relative wealth into three distinct groups, or 'tiers' (see individual site chapters for the calculation of relative wealth values based on standard deviation (σ) from the mean (μ) assemblage size).

As is illustrated in Figure 11.1, the mortuary population appears divided into three separate groups based on relative assemblage sizes. The bottom tier is particularly evident as those burials accompanied by an assemblage z score -0.5 σ below the site mean and lower. There appears to be some minor indistinction in the boundary between the bottom and middle tiers as shown by a small proportion of individuals falling in an intermediate zone (from -0.5 σ to mean wealth) which separates the poorest individuals from those grouped in a midrange wealth tier. If the bottom tier is widened to include anyone of relative wealth -0.25 σ below the mean at each village, this accounts for 44.7% of recovered mortuary contexts (n=17).

The middle tier contains 13 burials in a distinct and well-defined group (from mean wealth to 0.75 σ) with a clear boundary separating these individuals from the wealthiest tier. To resolve the equivocal nature of the bottom boundary, the tier is extended to include the single individual in the category -0.25 σ – μ. This totals 14 individuals or 36.8% of the Cambodian sample.

The final tier, which is quite distinct, is the wealthy group. This tier refers to individuals whose burial assemblage was at least a full standard deviation larger than their site's mean value. Even within this group, it appears that not all individuals were of equal status. A small number (four or 10.5% of the total mortuary population) of potentially lower or lesser elites appear between 1 σ – 2 σ, while those of truly exceptional wealth beyond this mark are even fewer. Seven burials, all bar one adult, comprise the top tier. This is only 18.4% of the population and exactly half the size of the next smallest tier (the middle group).

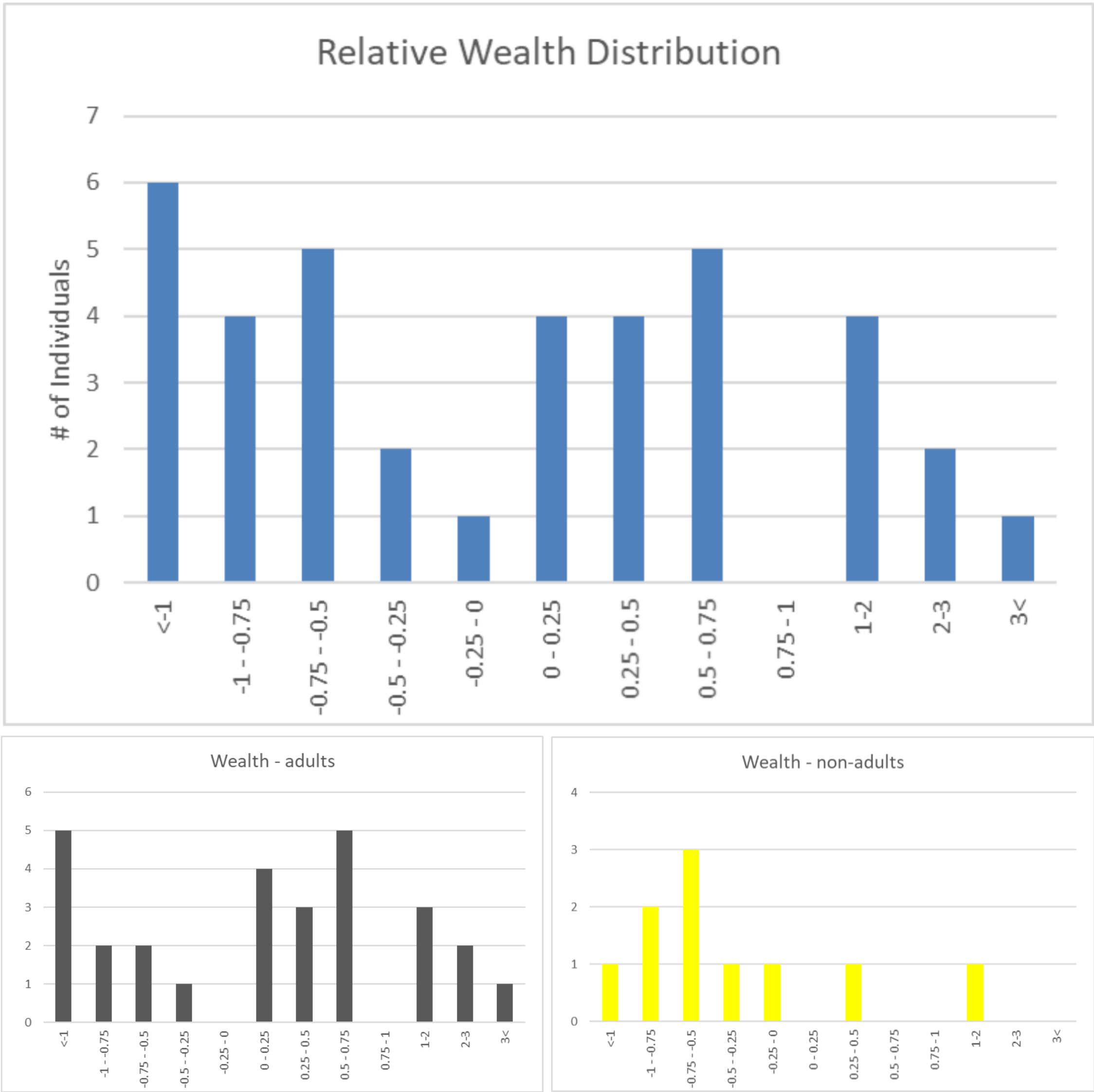

Figure 11.1 The distribution of the Cambodian mortuary population according to relative wealth of burials assemblages.

Figure 11.1 also displays the effect of breaking the population into age demographics with adults (young adults, adults, middle aged, and elderly) and non-adults (infants, children, and sub-adults) separated. Both the middle and upper tiers are largely comprised of adult interments. Only one burial (PS 10: a child of 6-9 years old) in the wealthy group was a subadult. Adults therefore comprise 85.7% of the top tier. The middle tier contains the same proportions as the top tier (85.7% adults). Only one subadult is present in the clearly demarcated middle tier between the mean and 0.75 σ, however the single burial included from the indistinct barrier separating the middle and poor tiers was also a subadult.

Table 11.1 Tally of burials demonstrating the distribution of wealth across Cambodian cemeteries based on age-at-death.

Standardised Value	Infant	Child	Sub Adult	Young Adult	Adult	Middle Aged	Elderly
<-1		1		1	3		1
-1 - -0.75		1	1		2		
-0.75 - -0.5	1	2			1		1
-0.5 - -0.25	1						1
-0.25 – 0			1				
Mean Wealth							
0 - 0.25				1	2	1	
0.25 - 0.5		1		2	1		
0.5 - 0.75				2	1	1	1
0.75 – 1							
1-2		1		1	1		1
2-3				1		1	
3<						1	

The effect of age on available wealth is demonstrated in Table 11.1. There is a clear line between those who had attained 'adulthood', and those who were yet to reach such an age. Infants, children, and sub adults all display a considerable tendency towards smaller assemblages rating below mean wealth. The exceptions are child burials, where two individuals (33%) were of middle or high wealth.

The pattern is inversed upon entering adulthood, where burials tend to be accompanied by larger assemblages. This is particularly noticeable with young adults and middle-aged individuals, almost all of whom rated above mean wealth at their respective sites. However, there remains a significant portion of adults and elderly burials that rate among the poorest assemblages encountered.

This appears to align more closely to an achievement-based wealth system, as opposed to a strictly hierarchal economy in which wealth and status are assigned at birth.

The bottom tier is where the majority of subadult contexts reside. However, this group is not simply a manifestation of the large number of infant and subadult interments which are, on average, poorer than adult burials. Indeed, adults are still in the majority in the poor tier. Ten adult burial contexts were linked to this group, totalling 58.8% of the group. While this is certainly smaller than the proportions of the middle and upper tiers, it is clear that the poorest tier in these Cambodian cemeteries was not a social class for subadults who had not yet attained the full wealth and status of adulthood.

It is worth noting that the presence of most of the non-adults from Cambodian contexts in the poorest tier (n=7 or 70%) reinforces the theory that wealth, and perhaps status, were predominantly achieved throughout life rather than ascribed at birth. The two child burials with assemblages rating z scores beyond mean wealth (one in the middle group and one in the wealthy tier) must therefore either be exceptions to the achieved wealth model, or perhaps have been the recipients of funerary gifts possibly from wealthy parents or kin (Crawford 2004).

The circlet data analysis reveals that the use of these artefacts follows the same three-tiered pattern as general wealth. Both the average number of circlets (Figure 11.2) and the average number of circlet shapes (Figure 11.3) per burial are aligned into three distinct groups with clearly defined boundaries. The ambiguity of the boundary between the poor and middle tiers that was present in the general wealth between -0.5 σ – μ is eliminated through examining circlets which demonstrate a sharp separation in the mortuary population at -0.25 σ. The distinct margins of each group align to the same relative wealth marks as above; namely the bottom tier between < -1 σ – -0.25 σ, the middle tier at -0.25 – 0.75 σ, and the wealthy tier from 1 σ and above.

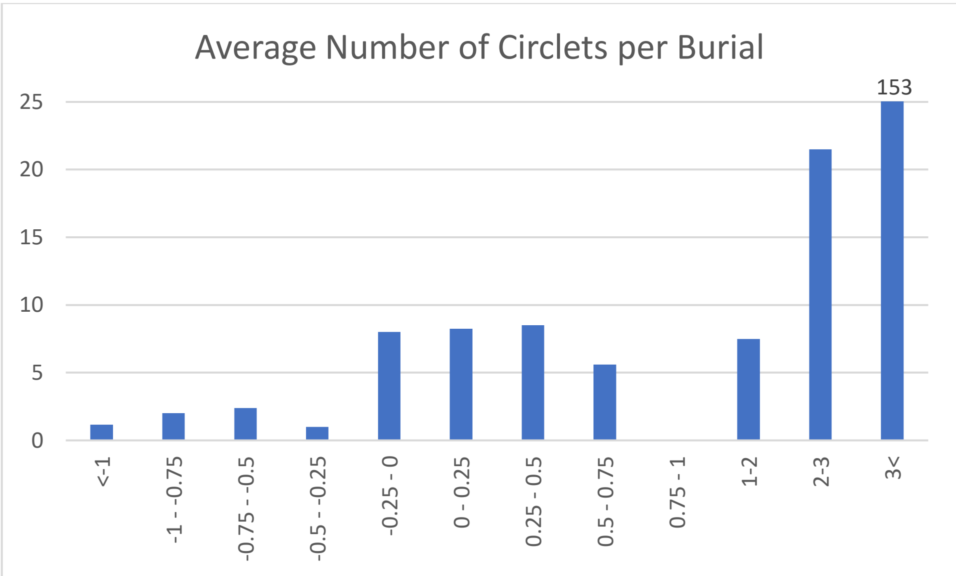

*Figure 11.2 Average quantities of circlets in assemblages across relative wealth categories in Cambodia. *The ceiling value for the bar chart was limited to 25 circlets to aid illustration.*

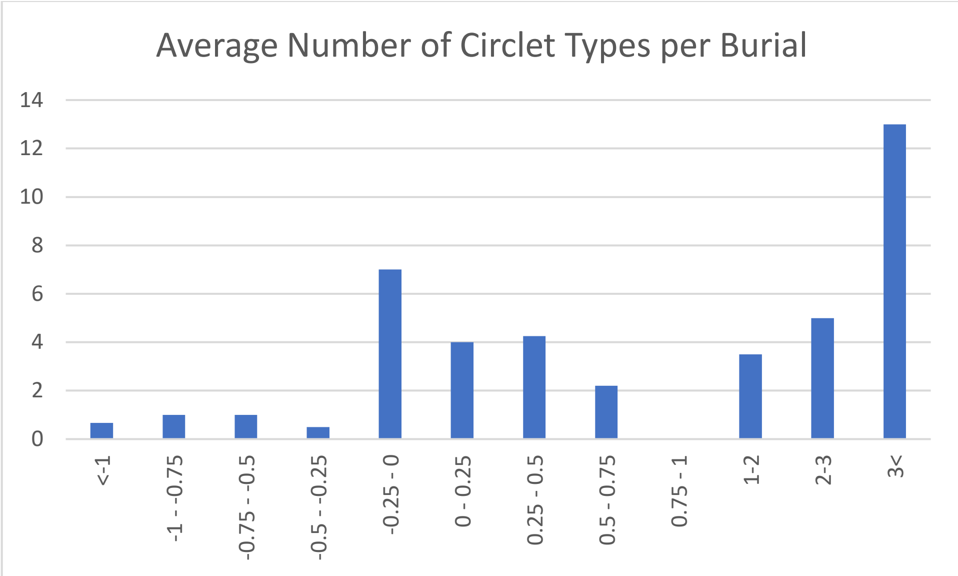

Figure 11.3 Average number of different 1st tier typological forms in burial assemblages across relative wealth categories in Cambodia.

As covered by Alekshin's (1983) third wealth indicator, in order to gain a greater understanding of wealth distribution it is important to not only consider the number and types of artefacts present in different assemblages, but also variation in material, particularly precious and semi-precious commodities. During the late Iron Age of Cambodia iron, bronze, ceramics, and glass are all common items which appear in the majority of funerary contexts. At the other end of the spectrum, precious metals such as gold and silver are rare and only appear in two burials in the Cambodian collection studied here. While these were both extremely wealthy interments with z scores more than 2 standard deviations above their site means (PS 7 and PK 10), such small quantities do not allow for robust interpretation. It is therefore the presence of two types of semi-precious stone, agate and carnelian, that provide a medium for analysis of materials in relation to overall wealth distribution. Both these stones appear in Southeast Asian assemblages during the Iron Age mostly carved into barrel/tube (in the case of agate) or spherical (carnelian) shaped beads (Francis Jr 2002; Bellina & Glover 2004). Provenancing studies in recent years have demonstrated these materials were sourced predominantly from India and have yet to return any concrete indication of raw material being sourced from Southeast Asia (Carter & Dussubieux 2015; Carter 2016).

Figure 11.4 illustrates that the distribution of burials containing agate and/or carnelian adheres to a similar pattern of three clearly defined groups. The proportion of assemblages including either material increases from being relatively rare in poor burials through to appearing in roughly half of all middle tier burials, and a slight increase again in wealthy burials (Table 11.2). The only step in which this system is not followed is the percentage of middle tier and wealthy burials with carnelian, which remains exactly the same (57.1%) in both groups.

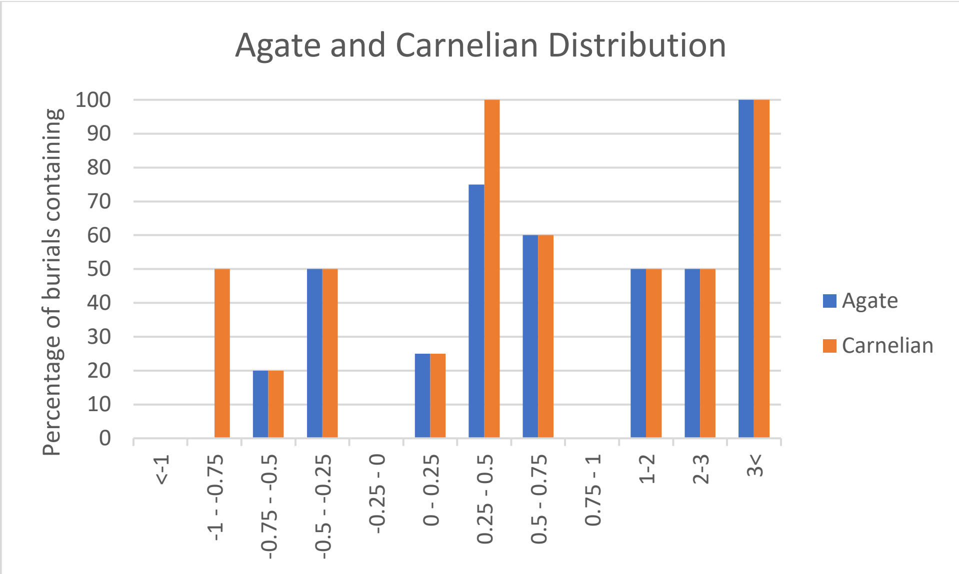

Figure 11.4 Percentage of Cambodian burials in which Agate and Carnelian appear, according to relative wealth.

Table 11.2 Percentage of Cambodian burials in which Agate and Carnelian appear. 'Poor' comprises z scores between -1 - -0.25, 'Middle' between 0 – 0.75, 'Rich' between 1 – 3<.

	Poor	Middle	Rich
Agate	11.8 %	50 %	57.1 %
Carnelian	23.5 %	57.1 %	57.1 %

From the results of general assemblage size, the quantity and types of circlets, and the distribution of semi-precious stones, a consistent picture of a three-tier socio-economic structure is presented for the late prehistory of Cambodia. Figure 11.5 identifies the extent and boundaries of each tier according to relative wealth. The characteristics of each tier are examined below.

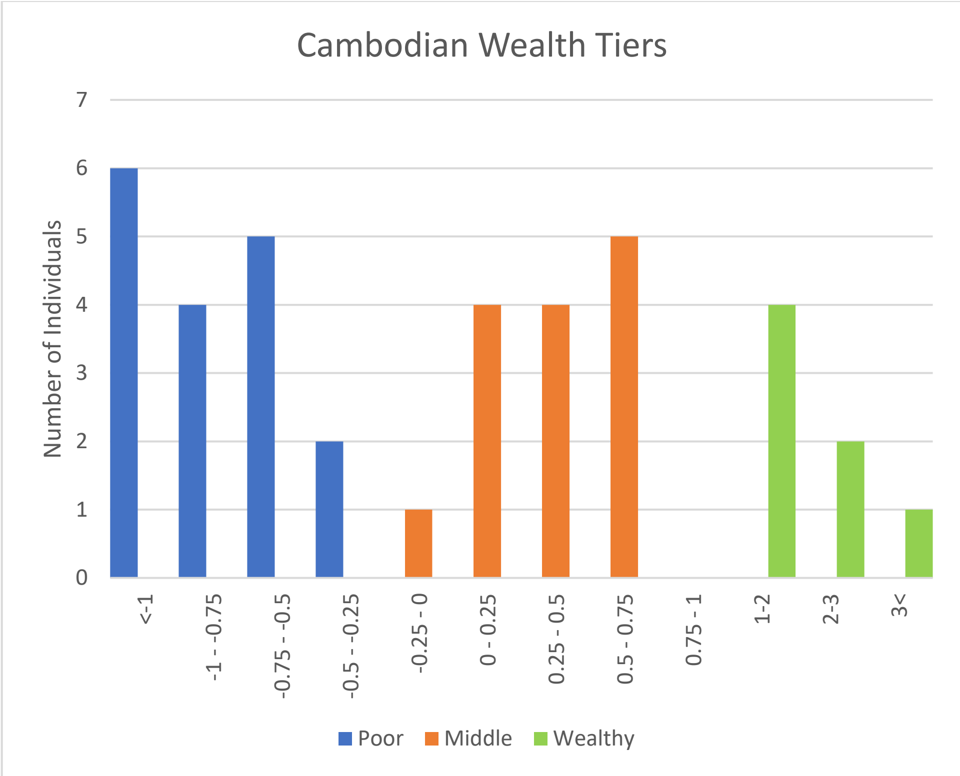

Figure 11.5 Distribution of Cambodian burials highlighting the range of the three tiers according to relative wealth.

The Bottom Tier (relative wealth <-1 σ – -0.25 σ)

The following section examines the key characteristics of the 17 assemblages that comprise the poorest tier in late prehistoric Cambodian sites. This group is characterised not only by frugal burial assemblages but also an absence of a number of artefacts (i.e. bronze bells, projectile points, chisels and iron knives) which are often present in burials which fall into wealthier tiers. Despite containing close to half (44.7%) of the recovered burials from Cambodian contexts, there is less variety in the artefact assemblage associated with poor contexts than either the middle or upper tiers (Table 11.3). In total, only 16 different artefacts (45.7% of identified mortuary artefacts) can be linked to the poor tier at the sites included in this study. This is a 25.7% decrease of artefact types compared to the next lowest group (the middle tier with 25 artefacts from 14 burials). Other indicators of the dearth of wealth include: less differentiation in types of circlets (a total of eight, the majority of those present being common square or circular cross sections) and fewer agate and carnelian artefacts (11.8% and 23.5% of burials include agate and carnelian respectively) than the other tiers. In completing the theme of distinction by what is not present rather than what is, no artefacts were identified as exclusively, or even predominately, associated with the poor.

The Middle Tier (relative wealth -0.25 σ – 0.75 σ)

The middle tier consists of 14 burials from Phum Sophy, Phum Lovea, and Prei Khmeng. This group represents an upward step in many aspects of wealth. The number of total artefact types rises to 25 (71.4% of Cambodian mortuary artefacts) and, unlike the bottom tier, all items present in both wealthy and poor contexts are also found in at least one burial of the middle group (Table 11.3). Other measures for wealth also rise as agate (50% of burials) and carnelian (57.1% of burials) increase considerably in frequency. The variety of circlet types also increases, doubling from eight in the poor tier to 16, though, again, most of these are variations of circular or square cross sections.

Perhaps the main characteristic of middle tier mortuary assemblages is a strong association with the cutting and carving toolset. Iron knives and all the related implements: machetes, iron points and long points, and even a couple of stone flakes which may have been used as cutting tools, are almost entirely exclusive to this group. 85.7% of all such tools are found in the middle tier. Iron axes, though rare (only three identified), complement the cutting toolset as the only other item solely associated with the middle tier.

The Top Tier (relative wealth >1 σ)

Even with the increase in the wealth and items in the middle tier, there is a clear separation between this and the likely high-status burials of the wealthiest group. Only seven individuals qualified for this tier across the three Cambodian sites included in this study. Despite a sample population half the size of the middle tier, the number of different artefacts increases once again to 28 (80% of all Cambodian mortuary artefacts) and, as with the middle group, no items were absent from the top tier that were included in both the bottom and middle groups (Table 11.3).

Precious materials appear solely in this tier from two burials containing one gold artefact each (a small gold hook and a gilded earring). Agate also appears slightly more frequently, being included in 57.1% of wealthy mortuary assemblages, while carnelian (also 57.1%) remains steady with the middle group.

Interestingly, while the number of circlet types recovered within rich contexts remains the same as the middle tier (16 different types), some of the common cross sections disappear in favour of complex types unique to the top tier. Two types are especially worthy of mention: Type R – a ring with two smaller metal loops that appear to act as prongs to hold a precious or semi-precious stone, and type U – a hollowed out cross section not possible to create using piece mould casting techniques. These types are significantly more complex than the vast majority of prehistoric circlets and may have carried prestigious meaning.

In terms of the larger artefact assemblage, the top tier contains two exclusive items (toe rings and iron chisels). Several other items also occur predominately with this group including bronze anklets, iron spears, and iron projectile points.

Table 11.3 Artefacts recovered in Cambodian funerary contexts. Tick marks indicate the presence of an artefact in at least one burial of that wealth tier.

Artefact	Poor	Middle	Wealthy
Anklet		✓	✓
Projectile point		✓	✓
Axe		✓	
Bangle	✓	✓	✓
Bead	✓	✓	✓
Bell		✓	✓
Bowl			✓
Chisel			✓
Clay pellet	✓	✓	✓
Coin	✓		✓
Earring	✓	✓	✓
Flake		✓	
Grindstone			✓
Hook		✓	✓
Digging tool	✓	✓	✓
Knife		✓	✓
Long point		✓	
Machete		✓	
Pendant		✓	✓
Perforated disc			✓
Hoe blade	✓		
Point		✓	
Miscellaneous tool	✓	✓	✓
Ring	✓	✓	✓
Sickle	✓	✓	✓
Socketed object	✓	✓	✓
Spear	✓	✓	✓
Spindle whorl		✓	✓
Digging implement	✓	✓	✓
Sword point			✓
Thumb ring	✓		
Toe ring			✓
Tool	✓	✓	✓
Tooth pendant			✓
Ceramic vessel	✓	✓	✓
Total	16	25	28

Aim Two: Summary

From the analysis presented above of mortuary populations at Phum Sophy, Phum Lovea, and Prei Khmeng, the late Iron Age socio-economic system in place across Central-Northwest Cambodia appears to have divided the population into three distinct tiers. These tiers seem to have been arranged in a vertical relationship and can be thought of as a poor, middle and wealthy group. The potential interpretations of this pattern of wealth distribution in terms of its implications for social complexity and whether there is evidence to suggest a complex polity in Central-Northwest Cambodia during the late Iron Age will be discussed in aim four.

Evidence for a Ranked Society in Late Iron Age Northeast Thailand

The Northeast Thailand dataset consists of the Non Ban Jak assemblage and the published data from mortuary phases 4 and 5 at Noen U-Loke. This totals a robust 238 burials and accompanying assemblages. The funerary patterns will be presented and discussed here in comparison to the above trends in the Cambodian data. The implications of these trends and the possible socio-economic structures into which they fit will be examined under aim four.

The distribution of wealth among mortuary populations in Northeast Thailand during the late Iron Age strikingly distinguishes the region from contemporary patterns recognised in mortuary populations in Central-Northwest Cambodia. The average assemblage sizes at both Non Ban Jak (6.1) and Noen U-Loke (17.5) provides an initial indication that displays of mortuary wealth were considerably smaller in the Mun Valley than Cambodia (23.7). However, it is the way in which this wealth was distributed within each village that provides the clearest point of difference.

Figure 11.6 illustrates a lack of any grouping or sharp disruptions to separate the population into distinct tiers. The population is largely clumped at the poorer end of the spectrum (73.5% of people with z scores of relative wealth between -1 σ and the mean). To place this in perspective, a normal distribution would see roughly one third of the population occupy the same relative wealth band (Wheeler and Chambers 1992). This is in comparison to Cambodia where, while the bottom tier is also the most populous, only 47.4% of all burials are below the mean.

The remaining mortuary population in late prehistoric Northeast Thailand contexts follow a rough trend of fewer burials as wealth increases, though this is uneven with several minor increases and decreases (Figure 11.6).

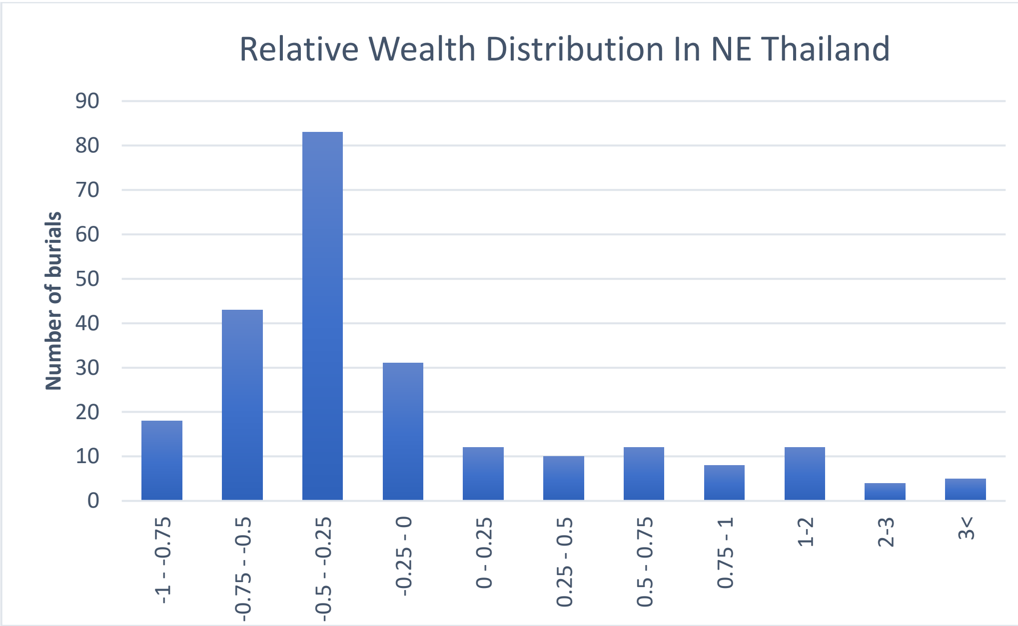

Figure 11.6 The distribution of wealth among mortuary populations in Northeast Thailand according to relative weighting. Data are from Non Ban Jak and mortuary phases 4 and 5 at Noen U-Loke.

One of the main contributors to the bottom-heavy system of wealth distribution initially appears to be the large number of subadults (particularly infants) buried with very few items. Indeed, in numerous cases infants and neonates were only accompanied by the burial jar in which they were interred. Figure 11.7 demonstrates this disparity of subadult representation particularly when relative wealth is between -0.75 σ – μ. Only 42.3% of individuals with z scores below the mean had reached adulthood (57.7% subadults). To illustrate the relative abundance of subadults recovered in Thailand contexts, the bottom tier in Cambodia (<1 σ – -0.25 σ), which was noted above as the tier with the highest proportion of subadults, contains a majority (58.8%) of adults (41.2% subadults). It is difficult to confidently determine a reason for the considerable increase in the proportion of subadults encountered in Northeast Thailand, however this may be a by-product of differences in the mortuary treatment of subadults between the two regions. The prominence of jar burials, particularly for infants and young children, in Northeast Thailand could have aided in the preservation of, often fragile, subadult remains. Archaeological sampling methods may also have factored into the disproportionate number of subadults uncovered, with the more spatially confined excavations in Cambodia potentially missing dedicated areas for the interment of the young. Figure 11.7 also demonstrates that, even though there is a larger proportion of subadults below mean wealth, the wealth distribution data follows the same pattern in both adults and subadults – namely that of a large peak below mean wealth with a long tail extending with a gradual decline towards greater relative wealth.

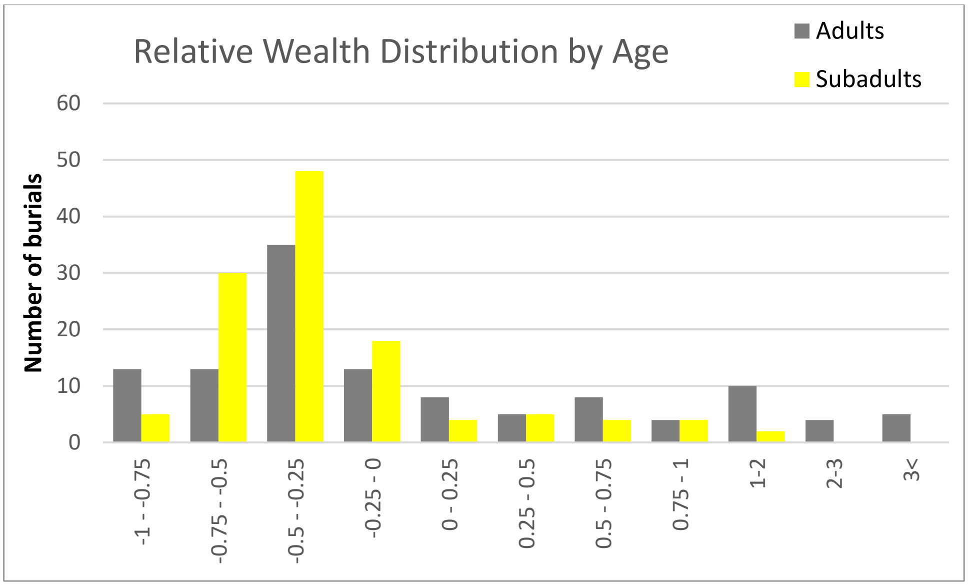

Figure 11.7 Distribution of relative wealth in late Iron Age Northeast Thailand contexts sorted according to age.

The appearance and distribution of circlets in Northeast Thailand assemblages were used as secondary proxies for quantifying funerary wealth. As was the case in Cambodia, circlets closely echo the overall pattern of wealth distribution in Northeast Thailand during the late Iron Age. Figure 11.8 depicts a graduated series of increasing quantities of circlets as relative wealth increases, without any clear breaks or groupings. Circlets of any kind are incredibly rare in the poorest categories of relative wealth at both Non Ban Jak and Noen U-Loke before becoming more common in burials approaching mean wealth. The steady increase in circlets results in the wealthiest assemblages one or more standard deviations above the mean exhibiting an average considerably higher than other burials.

Unfortunately, the supplementary nature of the published data from Noen U-Loke in the Northeast Thailand dataset means that no morphological typology has been applied to the artefacts recovered from those contexts. Consequently, it is not possible to test whether the average number of circlet types per burial also adhere to this pattern. It can, however, be noted this was the case at Non Ban Jak as illustrated in chapter nine (Figure 9.8).

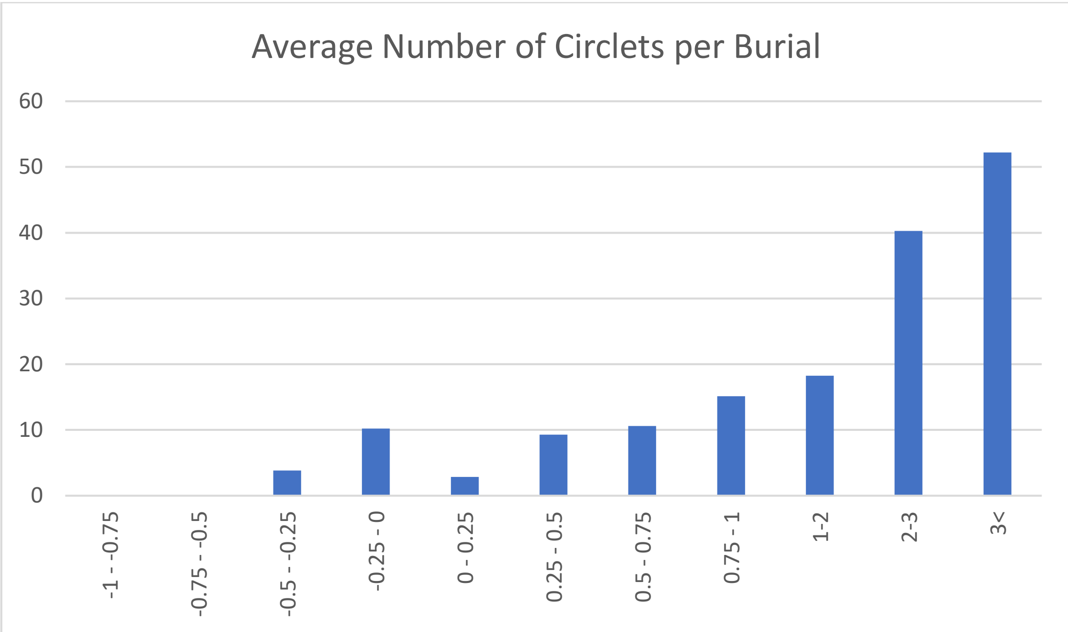

Figure 11.8 Average quantities of circlets in assemblages across relative wealth categories in Northeast Thailand.

Similar to the Central-Northwest Cambodian collection, bronze, iron, ceramics, and to a lesser extent glass were all commonly found in late prehistoric burials in Northeast Thailand. It is therefore necessary to examine the distribution of other materials in order to apply Alekshin's (1983) third indicator for quantifying burial wealth according to the distribution of different materials in mortuary contexts. Precious and semi-precious material at Noen U-Loke and Non Ban Jak was largely limited to agate beads and pendants, along with a small amount of gold, silver and carnelian. The limited numbers of gold artefacts do not adhere to a simple, wealthy only, distribution. Of the eight burials at Non Ban Jak and Noen U-Loke containing gold, four exhibited wealth more than one standard deviation above the population mean, while three others were below the mean, and the remaining burial had a z score in the middle. Silver (in only four burials) also appeared in varied contexts, from below the population mean to a very wealthy assemblage.

While gold and silver were also rare in Cambodian collections, the rarity of carnelian in Northeast Thailand assemblages is a striking contrast (Figure 11.9). Compared to Cambodia where carnelian beads were recovered in 42% of all burials, only 0.8% of assemblages at Non Ban Jak and Noen U-Loke contained the material. Figure 11.9 also displays the percentage of late prehistoric burials containing agate. As can be seen, no pattern is apparent in the relative wealth of burials with agate. While the semi-precious stone does appear commonly in burials with z scores for relative wealth more than two standard deviations above the site mean, there appears little predictability for the presence of agate in other wealth categories.

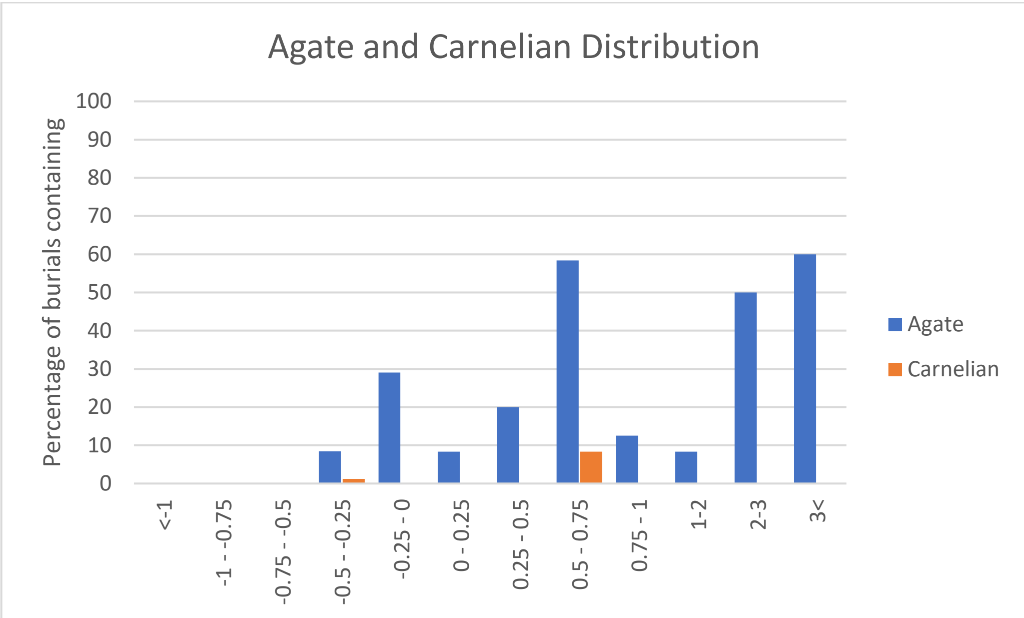

Figure 11.9 Percentage of burials from Non Ban Jak and Noen U-Loke (MP 4 and 5) containing agate and/or carnelian according to relative wealth.

Given the context of gradual, ill-defined wealth and status levels, it is not surprising that no materials or toolsets can be confidently associated with any particular part of the wealth spectrum. Certainly, the poorest assemblages lack many goods, and at the extreme are typically only accompanied by one or two ceramic vessels. However, other patterns are not so forthcoming. Bronze belts may perhaps have some association with mid-high wealth, though too few have been recovered to confidently judge. Meanwhile, objects that appear to carry high-status associations in Cambodia, such as projectile points, knives, and spears, hold no such place in the combined Thailand dataset. Even materials such as agate and gold do not hold the same restrictions to rich assemblages.

Aim Three: Summary

The available data for the late Iron Age socio-economic system in Northeast Thailand indicate that the population was not split into any well-defined groups based on vertical status and wealth. Rather, a gradual system by which individuals were arranged along a sliding scale of influence appears to have underpinned the economy of the region. The potential socio-economic implications that can be drawn from this pattern will be examined in aim four.

Evidence for differential levels of Social Complexity Between Central-Northwest Cambodia and Northeast Thailand

The final aim of this thesis seeks to bring together the results of the relative wealth analyses discussed above to evaluate potential points of difference in the socio-economic complexity of populations in Northeast Thailand and Central-Northwest Cambodia during the late Iron Age (c. 200 – 600 CE) (Solheim 1970; Higham 2004; Higham & Higham 2009). Higham (2016) has argued that the neighbouring inland regions of Northern Cambodia, Southern Laos, and Northeast Thailand were linked by common themes of cultural development towards early state systems during the late Iron Age. The shared developments in complexity, Higham argues, resulted in a rapid transition to many small states, known by Chinese annalists as Chenla, during the fifth and sixth centuries CE.

In order to assess the validity of models such as Higham's supporting parallel levels of social complexity in Central-Northwest Cambodia and Northeast Thailand, this thesis employs the hypothesis that regional differences in complexity will be revealed through how wealth and artefacts (particularly circlets) were distributed within mortuary populations. In order to test the hypothesis, the results from the regional datasets covered under aims two and three is discussed along with the wider archaeological landscape to determine how the populations in these regions aligned with established markers of socio-economic complexity.

Differentiating Between Chiefdoms and States

Chapter three outlined a selection of the characteristics that have been used by archaeologists and anthropologists to define the level of complexity in a given culture. The list, which is certainly not exhaustive, of the many fine details that may separate one level of societal organisation from another, provides some of the key considerations in examining the evidence for increasing socio-economic development in Central-Northwest Cambodia. Due to the nature of human societies, it is rare for any culture to fit entirely within any of the many different 'shopping list' style classification charts (i.e. Service 1962; Isla & Reindel 2006). In the majority of cases the line between different societal forms is, at best, blurred. This issue is compounded further in the archaeological setting where many indicators of social complexity can be difficult, or even impossible, to examine.

However, this does not necessarily mean that the study of characteristics found in different societal groups is without merit. The application of these classification models is useful in that they allow researchers to look for markers of increasing social complexity as they appear in societies. This does not necessitate applying a label to define a society or culture, but can instruct on variabilities in complexity across regions and times. The main archaeologically visible, theoretical differences between chiefdoms and states are outlined below, particularly in the context of why this affects the development of distinct socio-economic tiers.

Chiefdoms and other small-scale societies (tribes and bands) are typically not considered to possess clearly defined hierarchical classes which separate the population into wealth-based groups (Sanders & Marino 1970; Carmichael 1995; Isla & Reindel 2006; Turchin & Gavrilets 2009). Rather the economic distribution in a chiefdom follows a gradual, continuous gradient by which the poorest members of a village are separated from the richest individual (the chief) by a series of minor increases of wealth (Carmichael 1995). This is due, in large part, to the highly personalised nature of the power or status basis in a chiefdom. The chief both gains and provides power to his or her immediate subordinates (in the case of a complex chiefdom this may be lesser chiefdoms while in a simple chiefdom this may be a subordinate elite group) (Turchin & Gavrilets 2009). This flow is then replicated in succeeding relationships, from the elites to warrior retinues, from the warriors to their families, and so until it links every member of the society by small, relational bonds (Sahlins 1963; Sanders & Marino 1970). Because the flow of power reflects links of close personal relationships (and is often underpinned by a mythological or founder-focussed rank-order) (Bellwood 1996; Fox & Sather 1996), no sudden breaks or tiers can develop even though a hierarchical structure is present with the chief alone at the highest point and the 'average' members of society together at the lowest.

Comparatively, state-level societies operate by impersonal links which allow for the appearance of distinct class and status barriers to separate out multiple levels or tiers (Flannery 1972). The links binding citizens no longer flow primarily along kinship lines as the increasing complexity and specialisations requires bureaucrats and rules, which over time can become laws if they are written down (Isla & Reindel 2006). The spatial extent of a state is measured based on territorial and geographic boundaries. This compares to chiefdoms, which Sanders & Marino (1970) suggest, measure their extent by the kin groups that fall under a particular chief. Commerce also changes and takes on a more defined role in response to increasing production specialisation in state level societies. According to Sanders & Marino (1970), organised markets are another indicator of the transition to states in order to adequately distribute the increasing streams of production.

All this effectively creates a less personal, more easily divided and stratified, socio-economic system. Earle (1987) argues that the stresses of coping with increases in specialisation, commerce, and geographic control are the drivers which either cause a system to collapse or else develop new levels of decision making (represented as a new tier). Carmichael (1995: 162) surmises the difference in socio-economic environment between chiefdoms and states thus.

> *A ranked* [chiefdom] *society is a graded society, while a stratified* [state] *society is divided. The distinction is that of degree and kind. Ranked societies follow a continuous status gradient, while stratified societies contain discontinuous status groupings*.

The late Iron Age of Central-Northwest Cambodia

The main variable used in this study to identify variability in the level of social complexity between regions is the presence or absence of class segregation. The evidence for a three—tiered internal economy in Central-Northwest Cambodia during the late Iron Age has been provided in aim two. This was based primarily on the distribution of cemetery populations according to relative wealth (using a standardised rating of burial assemblage size). The three-tier socio-economic model was corroborated in the analysis of circlet distribution across mortuary contexts, and it has been argued that these may have carried inherent social meaning understood by members of the community. An additional factor was the increasing abundance of precious and semi-precious material by wealth tier. Each tier was found to have its own unique character based on associated material finds.

The poor tier, although containing the largest proportion of the population, is sparse in goods and any characteristic toolset, perhaps because items were considered too precious to the living or else were not constructed of archaeologically durable material (i.e. made of perishable textile or plant matter). The middle tier is shown to demonstrate an increase in wealth. An iron toolset centred on cutting and sawing appears in interments belonging to this tier, perhaps suggesting a level of specialisation not present in the bottom tier. The top tier incorporates another escalation of wealth and possible markers of status. A distinction in role may potentially be responsible for the predominance of projectile points and spear points to this group. It is possible that these items could reflect an association with a combative or hunting role within the community. The case for multiple tiers matching the requirements for complex polity is therefore met in the late prehistory of Central-Northwest Cambodia.

This, of course, still leaves many of the signs or indicators of state level societies as covered in chapter three unexamined. One missing factor absent from the Cambodian sites in this study is a lack of military paraphernalia and evidence for conflict on an organised scale. Almost all artefacts recovered from the sites included in this study which may potentially be associated with conflict could equally be tools for hunting (i.e. projectile points and spear points). Indeed, it could be argued that the flat head design of many of the projectile points adds greater force or stopping power at the expense of penetration capacity (Figure 11.10). While there is currently no research on the typology and function of prehistoric projectile points in Southeast Asia, the broad, flat-head design would seem to favour hunting animals rather than trying to pierce a potentially armoured foe. This of course raises another question of whether armour was present during the late prehistoric period. Certainly, I am unaware of any evidence from excavations of metal being forged into armour of any description, though this does not discount the potential for protective devices made from textiles and plant matter. It is perhaps worth noting that the later Chinese *Sui Shu* text describes inhabitants of 7th century Chenla wearing armour as part of daily attire (Cœdès 1968), though does not provide any details of the design or material used. Unfortunately, barring the discovery of a militaristic site with exceptionally rare preservation, the function of projectile points will remain a matter of conjecture.

Figure 11.10 A collection of broad, flathead projectile points recovered from Phum Sophy (cat # 75).

While one may choose to interpret the predominance of projectile and spear points with the upper wealth tier as an indicator of elite warriors, this in would be more closely associated with a chiefdom system in which a retinue is formed and occupies a status level just below the chief (Redmond & Spencer 2012). In order to provide evidence for violence on an organised scale, the symbology of warrior would be required to appear across the wealth spectrum, rather than a single, elite group of warriors. This would especially be expected of those individuals in the lowest wealth tiers, who, while potentially missing symbolic artefacts, would be expected to exhibit skeletal evidence of trauma from being pressed into military action.

The exception to this absence of militarism in the late Iron Age lies with Phum Snay. Unfortunately, it was not possible to include the assemblage in this study, however the excavators noted several markers for organised violence, including paraphernalia such as ceramic epaulets and swords, as well as a high proportion (23.4%) of recovered skeletal material (both from *in situ* prehistoric contexts and those recovered from looting activities) exhibiting signs of trauma, particularly in the form of head injuries (O'Reilly et al. 2006; Domett et al. 2011). This, then, may suggest that organised conflict was not completely absent in Central-Northwest Cambodia and that, at least at some sites, elites were capable of pressing a large portion of the population into military service beyond just a warrior retinue.

Another missing component of complexity beyond the chiefdom level is evidence for organisation on an inter-site level. Redmond and Spencer (2012) have suggested that fully-fledged 'archaic' states can be expected to exhibit four levels of regional settlement hierarchies based primarily upon site size and administrative buildings. At present, no urban centres have been recognised in the late prehistory of Central-Northwest Cambodia. A difficult survey environment in Cambodia due to areas of heavy forest cover and the dangers of landmines, coupled with accessibility issues arising from political volatility until the late 1990s, means that our knowledge of the late Iron Age landscape still requires considerable expansion. Improving accessibility and cost of remote survey technologies such as LiDAR provide encouragement that this will change over the coming years (Evans & Fletcher 2015; Evans 2016). However, to date, no prehistoric centres in the centre-northwest of the country have been uncovered. The variance in overall site wealth from Phum Sophy to Phum Lovea and Prei Khmeng certainly indicates that there were different levels of wealth between sites. Whether this equates to a hierarchical inter-site system is not possible to assess until considerably more late prehistoric sites have been excavated.

While it is difficult to assess the potential presence or absence of an organised commerce system or markets, it may be noted that a small number of bronze coins were recovered from Phum Lovea and Prei Khmeng (Figure 11.11). Pryce et al. (2017) have conducted metallurgical analysis on several of the bronze artefacts from Phum Lovea and suggest that, stylistically, the coins were probably *ban liang*, of the Wang Mang period (7-23 AD) in China. There may also be some suggestion that the coins originated from Northern Vietnam (Bellwood pers. comm.). The very small numbers of coins recovered (13 from mortuary contexts) suggests that the mere presence of these items does not confirm markets and the use of currency.

Figure 11.11 Bronze coin recovered from Phum Lovea (ID# 665)

While not featuring as a traditional marker of state-level societies, high status females may be included here given the semi-matrilineal royal succession system in the Angkor Empire as well as epigraphical evidence for autonomous ruling queens featuring in the Chenla polity (Cœdès 1944; Van Esterik 1996; Jacobsen 2003). There is evidence for some degree of matriarchal structure at both Phum Sophy and Prei Khmeng (with Phum Lovea having no identified female interments). At both sites, the wealthiest individual by some margin was an adult female. This was particularly striking at Phum Lovea where burial 14, a middle-aged female, was more than six standard deviations beyond the mean assemblage size. Additionally, the overall average for female mortuary assemblages in the Phum Sophy and Prei Khmeng cemeteries are both greater than the associated male averages (Sophy: Females = 77, Males = 36; Prei Khmeng: Females = 27.7, Males = 22).

While the averages may be somewhat offset by outlying, excessively wealthy burials (such as the case of burial 14 on the Phum Sophy average), Table 11.4 illustrates the standardised tally of individuals by sex across the Cambodian cemeteries. As this provides the relative standing of each individual it allows for greater clarity in determining the standing of an entire group (in this case females) without being significantly impacted by outlying data points. Only a single confirmed adult female (16.7% of females) is present in the lowest wealth tier in comparison to the four males (28.6% of males). The middle tier is evenly split with 50% of both females and males residing here. It is therefore in the upper tier where female burials are proportionally more common than males (two females at 33.3% compared to three males at 21.4%).

Ultimately, while further work with a larger sample size is required to fully elucidate the function of these wealthy females during the late prehistory in Central-Northwest Cambodia, the evidence from this study certainly bears considering with regards to some form of matriarchal system.

Table 11.4 Distribution of relative wealth by biological sex in Cambodian burials.

Standardised value	Male	Female	Unknown
<-1	1		5
-1 - -0.75		1	3
-0.75 - -0.5	2		3
-0.5 - -0.25	1		1
-0.25 - 0		1	
Mean Wealth			
0 - 0.25	2	1	1
0.25 - 0.5	1	1	2
0.5 - 0.75	4		1
0.75 - 1			
1-2	2		2
2-3	1	1	
3<		1	

Conclusion: A Complex Polity in Central-Northwest Cambodia

The evidence presented above provides a considerable argument for Central-Northwest Cambodia developing systems of social complexity during the late Iron Age that best fit the model of a complex polity. While it is not plausible to classify the social organisation of the region as a state in late prehistory, there are sufficient markers, particularly in the appearance of hierarchical wealth tiers, to suggest the region's population was organised in a form that perhaps lay between a traditional chiefdom and an early state and may best be described as a complex polity. The later appearance of the Angkorian state was, no doubt, primarily fuelled by increasing complexity in the socio-political landscape of mainland Southeast Asia during the first millennium CE, particularly from polities such as Funan and Chenla (Higham 2001; Stark 2006a). However, the evidence presented here suggests that the late Iron Age of Central-Northwest Cambodia had developed nascent structures which may have aided the Angkorian Empire to flourish.

The late Iron Age of Northeast Thailand

The model of an increasingly complex socio-economic system in Central-Northwest Cambodia is here juxtaposed by an analysis of the contemporary populations in Northeast Thailand. This discussion provides one of the first analyses of regional variability of complexity through inland Southeast Asia during prehistory. In order to assess this issue, it is necessary to determine whether the late Iron Age archaeological record in Northeast Thailand exhibits evidence for less social stratification and complexity than in contemporary Central-Northwest Cambodia. A result suggesting a chiefdom system in Northeast Thailand could provide greater strength to the argument that the development of complex polities in the early historic period of Southeast Asia relied heavily on established social complexity to allow expansion into new regions.

Determining the level of social complexity present in the late Iron Age of Northeast Thailand focuses primarily on the distribution of wealth through the mortuary populations from Non Ban Jak and Noen U-Loke. As illustrated in Figure 11.6 Figure 11.8, the distribution of wealth flowed through the mortuary populations from a small elite group to a large poor segment without any discernible jump or breaks. no breaks appear in the flow of wealth from the poor to the rich. The lack of tiers was supported by the graduated distribution of circlets in burials. In the place of any socio-economic tiers, the society displays a gradual gradient moving from the poor end, where the vast majority of individuals were found, to the wealthiest few individuals. This conforms to the conditions outlined by Carmichael (1995) for a ranked (unstratified) society.

This is to say that the model of a chiefdom fits very well when applied to the mortuary data. Each of the slight declines in relative wealth starting at the richest burial thereby represents a step away from the chief following the relational flow of power by small links. Few members of the society are included within the chief's close kin group and retinue; however, with each relational step or link the kinship groups are broadened, so increasing the number of people who qualify. By the time relative wealth values pass below the mean and beyond, most of the remaining portion of the population, though not directly associated with the chief, register.

In addition to the distribution of wealth among the population, other results from the mortuary analysis are also more closely aligned with a chiefdom than another system. The mortuary evidence indicates that the populations in Northeast Thailand were seemingly poorer than those in Central-Northwest Cambodia. The average assemblage size for mortuary populations across Northeast Thailand were consistently smaller than the Cambodian counterparts, with Non Ban Jak (6.1) and Noen U-Loke MP 5 (10.1) both considerably poorer than Phum Sophy (34.3), Phum Lovea (18.1), and Prei Khmeng (22.4). Only the Noen U-Loke MP 4 sample (21.1), which is by far the wealthiest period at Noen U-Loke, compares favourably, falling between the Phum Lovea and Prei Khmeng averages.

Similarly, the abundance and variety of circlets as well as the prevalence of semi-precious agate and carnelian jewellery, are lowest in the two late Iron Age Northeast Thailand sites included in this study. This provides strong evidence that there was less economic stimulus occurring during the late Iron Age of Northeast Thailand than that exhibited at contemporary sites south of the Dângrêk mountains. The apparent decrease in wealth at Noen U-Loke between MPs 4 and 5 during which the average assemblage halved in size, may reflect a shift in funerary practices towards the end of the Iron Age. However, there is no evidence to suggest this corresponds with increasing social complexity, particularly as relative wealth distribution patterns have been shown to remain consistent between MP 4 and 5 (Figure 10.2).

Comparatively, the mortuary evidence from Ban Non Wat suggests much greater economic stimulus may have been present during the early to mid-Bronze Age. During this phase Higham (2014) has suggested that Ban Non Wat was advantageously located to profit from contact with the Chao Phraya valley in central Thailand through passes in the Phetchabun Mountains. Exotic resources such as marble and shell as well as metals in the form of copper and tin flowed from central Thailand likely in exchange for the salt produced in the Khorat Plateau (Higham et al. 2011c; Higham 2011a). However, despite the greater displays of wealth and potential emergence of a class of social aggrandizers during the middle Bronze Age, the early Iron Age mortuary population (IA 1 BNW 420 – 150 BCE) display an even distribution of wealth, with 73.2% of mortuary assemblages within a single σ of mean wealth (see chapter 10, Figure 10.3). The distinction between this mortuary population with minimal evidence for strong hierarchy and the results noted above regarding the ranked system during the late Iron Age suggest that Northeast Thailand did experience increases in complexity during the early to mid-first millennium CE. However, this does not appear to have occurred at the same pace as in Central-Northwest Cambodia where contemporary mortuary populations were divided into stratified groups.

Interestingly, if one considers only the largest assemblage at each late Iron Age cemetery then the Thailand sites actually compare quite favourably with their Cambodian counterparts. In ascending order, the burials with the largest assemblages from each site are: PL 1 (35 artefacts), PK 10 (53), NBJ 46 (64), PS 14 (188), NUL 14 (240). Even Non Ban Jak, with its low site average, exhibits a single exceptionally wealthy individual who fits into third place on the overall site rankings. These exceptionally wealthy individuals at both Non Ban Jak and (to a lesser extent) Noen U-Loke stand out in sharp contrast to the meagre background wealth of their villages. This perhaps displays similarities with the Melanesian 'big-man' societies in that the power and privilege of a single individual far outstripped the rest of the community even in relatively poor areas (Sahlins 1963).

Another aspect of the economy in the Mun River Valley during the late Iron Age as displayed in the mortuary ritual at Non Ban Jak and Noen U-Loke was an apparent lack of full-time specialisation through distinct toolsets of artefacts linked with a specific group of individuals. The only identified association of a group of artefacts was the use of iron knives and sickles during MP 3 at Non Ban Jak where nine of 16 adults wore the tools together in a woven bamboo sheath. However, given the inherent agricultural role of the sickle in rice harvesting, it is probable that this does not highlight a specialisation so much as the prominence of farmers. It appears probably that, similar to copper production during the Bronze Age in Northeast Thailand, specialisations such as metal smithing, salt production and ceramic making were part-time roles conducted on a small, community-based scale around agricultural requirements (White & Pigott 1996).

Northeast Thailand and Central-Northwest Cambodia are similar in a lack of martial implements and bioarchaeological evidence for large scale conflict. While exceptions can be found, such as a young male found with a projectile point embedded in a vertebra at Noen U-Loke (Higham et al. 2007; Higham 2015a), these are very much in the minority and should not be used as indicators of increasing or large scale as Higham (2015c) suggests. While Higham (2015a) notes that the number of iron weapons found in mortuary assemblages increases during the later stages of the Iron Age, as yet no settlement in Northeast Thailand has demonstrated such overt signs of personal armaments and skeletal trauma as reported at Phum Snay (O'Reilly et al. 2006).

Several projects in the last three decades (Moore 1988; Welch & McNeil 1991; Scott 2013) have conducted remote surveys of the circular moated sites that typify mid to late Iron Age settlement on the Khorat Plateau. Large scale deforestation in the region has enabled the use of satellite imagery to identify sites over most of Northeast Thailand (O'Reilly & Scott 2015). Therefore, a much firmer stance may be taken on the nature of settlement patterns, particularly in the Mun River Valley, compared to Cambodia. No evidence has been found for urban centres during the late Iron Age. Scott and O'Reilly (2015) have presented evidence for several groups of moated sites based on kernel density mapping which could possibly be the domains of chiefdoms. A nearest neighbour analysis of the Mun Valley also returned a result of very minor clustering (Scott and O'Reilly 2017), suggesting some level of planning in site placement. This clustering may be due to chiefdom boundaries or more fundamental concerns such as local topography and the need to stay near an adequate water supply.

Aim 3 Conclusion: No evidence for complexity beyond the level of chiefdoms in Iron Age Northeast Thailand

The potential for social aggrandizers and emerging hierarchical structures during the mid-Bronze Age at Ban Non Wat (Higham 2011a) appeared to set the scene for a period of dynamic economic and social growth that seemingly failed to eventuate. The absence of such a rapid rise in complexity is illustrated by a minimally defined hierarchy during the Ban Non Wat IA 1 cemetery population. This depth of history is the strength of the archaeological record in Northeast Thailand, and the Mun Valley in particular, when compared to the relative sparsity of available information for the prehistory across much of the rest of mainland Southeast Asia. In the context of gradually developing hierarchy in villages across Northeast Thailand through the later Bronze Age and into the early to mid Iron Age, the data from late Iron Age mortuary populations at Non Ban Jak and Noen U-Loke provide added impetus. Wealth was divided across each observed population in a graduated distribution pattern which separates the few wealthy individuals from the large poor populace by a series of small steps consistent with a ranked social system. The other observable markers of social complexity in Northeast Thailand, from a lack of urban centres and markets, to little evidence for organised conflict or a large scale, are also consistently aligned with a chiefdom-style system.

Perhaps the only indicator of complexity beyond a chiefdom is the construction of large earthworks surrounding sites in the form of moat and embankment systems during the mid-late Iron Age. However, while these features certainly represent significant public architecture and works, they are commonly accepted as reactionary to the changing climate and hydraulic environment in the Khorat Basin (McGrath et al. 2008; Scott 2013; O'Reilly & Scott 2015; Higham 2019) and any power derived by the local elites would thus have been a secondary function.

The results discussed in this thesis indicate that the level of social complexity in Northeast Thailand did not increase at the same rapid pace as that displayed in Central-Northwest Cambodia during the late prehistoric. It is instead suggested that the social environment of the late Iron Age in Northeast Thailand is best described as a collection of chiefdoms as apposed to a complex polity more in line with contemporary Central-Northwest Cambodia.

Aim 4 Conclusion: Varied levels of complexity in Central-Northwest Cambodia and Northeast Thailand

The discussion presented in this thesis has argued that Central-Northwest Cambodia and Northeast Thailand, despite their similarities in material culture, exhibit evidence for contrasting trajectories of social complexity during the late Iron Age. The available evidence from the mortuary contexts at Phum Sophy, Phum Lovea, and Prei Khmeng supports a model for a three-tier social ranking system. Analysis of the relative wealth, the number and variety of circlets, and the distribution of semi-precious materials in burials have each distinguished three separate groups within the Cambodian mortuary population. This stands in contrast to the evidence from

Non Ban Jak and Noen U-Loke in the Mun Valley, which depict a more graduated distribution of the mortuary population. No distinct classes or breaks can be identified in the mortuary population at the sites in Northeast Thailand. Instead, the burials follow an inclining pattern from a large proportion of the mortuary population registering below mean wealth gradually transitioning to a few burials exhibiting exceptional wealth. These differences in relative wealth distribution, along with the wider archaeological landscape in the regions, leads to the conclusion that Central-Northwest Cambodia may be described as a complex polity in the late Iron Age while Northeast Thailand is better classified at a chiefdom level.

Conclusion

The emergence of state level societies and particularly the Angkorian Empire in Southeast Asia were presaged by a varied archaeological landscape in the late Iron Age. Due in large part to a dearth of prehistoric archaeological research, particularly in Cambodia, over-arching reviews of the archaeological sequence in mainland Southeast Asia have tended to treat the prehistory of Northeast Thailand and Central-Northwest Cambodia as following parallel courses (White 1995; Higham & Higham 2009; Higham 2011c; Higham et al. 2019). The underlying assumption in these studies is that the sequence derived predominately from a handful of sites in Northeast Thailand can be applied to the less-studied areas of mainland Southeast Asia, including Central-Northwest Cambodia. This project has sought to provide fresh evidence to bolster our current understanding of differences in these two regions divided by the Dângrêk Mountain Range during the crucial c. 300-400 years of the late Iron Age and determine whether the prevailing framework is still justified.

Circlets form a central aspect of mortuary dress and adornment in Southeast Asian prehistory which to this point has been remarkably under researched. This project has produced a morphological typology which categorises circlets in a three-layer approach encompassing all main aspects of circlet forms. The typology has been accompanied by a series of digital three-dimensional models which offer far greater protentional for examination than traditional two-dimensional photographs or drawings. The dataset and typology created through this project provides a platform for a consistent approach to recording circlets across sites and regions in Southeast Asia.

The socio-economic distribution of the cemetery populations at Phum Sophy, Phum Lovea, Prei Khmeng, Non Ban Jak, and Noen U-Loke were examined through analysis of relative burial wealth as determined by assemblage sizes, the prevalence of semi-precious material, and circlets as the most frequently occurring body adornments. A comprehensive comparison of the Thailand and Cambodian cemeteries revealed differences in the relative socio-economic distribution of the sampled population within each village. Northeast Thailand demonstrates a gradual transition from poor (many burials) to wealthy (few), characteristic of a ranked society. Meanwhile clear breaks separate distinct tiers of relative wealth among the Cambodian mortuary population. The latter display fits more closely with a complex, stratified society.

The mortuary record from late prehistory in Central-Northwest Cambodia contains several indicators to suggest that social complexity was increasing in the region towards what may be best described as a complex polity. Class stratification across the Cambodian populations is accompanied by high status females, potentially indicating some form matriarchal setting similar to inscriptional evidence of autonomous Chenla queens and the semi-matrilineal descent of rulers in the later Angkorian Empire. However, minimal evidence has been uncovered during the late Iron Age for other markers of a state systems such as inter-site organisation, markets and monetary systems, or organised violence on a military scale. Given the data presented, a transitional, complex polity appears to be the most apt description of the late Iron Age in Central-Northwest Cambodia.

Conversely Northeast Thailand, after having seemingly been on the cusp of increasing complexity and a centralised centre of power as early as the Bronze Age at Ban Non Wat, appears not to maintain this momentum into the early Iron Age. The use of circlets as the major archaeologically visible aspect of mortuary dress, as well as general burial wealth, point towards a ranked, unstratified society typical of a chiefdom during the late Iron Age. While the range of artefacts recovered in the Mun Valley is similar to that in contemporary Cambodia, the evidence from the mortuary assemblages at Non Ban Jak and Noen U-Loke suggest that the region was much poorer on the whole. This dearth of prosperity may have limited the potential scope for increases in socio-political complexity. While the region certainly displays evidence of a strengthening hierarchy from the early to late Iron Age, this does not appear to have progressed beyond simple chiefdoms. Consequently, no complex polities developed out of the Khorat Plateau and the region was eventually subsumed into the Angkorian Empire out of Cambodia in c. 1000 CE (Higham 2002).

The research in this thesis provides a fresh perspective on regional variability during the first half of the first millennium CE. The results presented here expand upon models of the late prehistory of Southeast Asia which have been hampered by a lack of data from outside Thailand. It is suggested that this cross-regional analysis provides a strong argument that Central-Northwest Cambodia is best characterised as complex polity while the populations of Northeast Thailand are better characterised by a series of chiefdom level societies during late prehistory.

Chapter 12 Conclusion

The research presented in this thesis has sought to provide insight into the level of variability in social complexity through inland regions of Southeast Asia during late prehistory. Northeast Thailand and Central-Northwest Cambodia are both inland areas without the benefit of direct access to the economic stimulus derived from coastal trade networks operating between China and India during the Iron Age (c. 500 BCE – 500 CE). Previous archaeological projects have revealed many resemblances in the material assemblages across both regions which, in conjunction with similarities in mounded site structure, has encouraged suggestions of parallel levels of social complexity on either side of the Dângrêk Mountains throughout prehistory (i.e. Higham 2016). The goal of this study has been to utilise mortuary assemblages from sites in Central-Northwest Cambodia and Northeast Thailand to firstly determine if social complexity in these two regions was at similar levels during the late prehistory c. 200 – 600 CE, and secondly to provide a model of the most likely form of social organisation in each region. The hypothesis of this thesis has been that a discernible level of variability in social complexity is apparent between regions by the distribution of wealth and certain artefacts in the mortuary record.

An important factor in determining the validity of this hypothesis has been the creation of a morphological typology for Iron Age circlets. These ornaments are often among the most common items in prehistoric Southeast Asian burials (Chang 2001), and therefore offer a key insight into past populations which has yet to be properly harnessed. It is hoped that the typology provided as part of this project will form a platform for a standardised method of recording Iron Age circlets in Thailand and Cambodia which will allow for examination and analysis of patterns in shapes and sizes across regions and time.

From initial settlement by anatomically modern humans c. 60,000 years ago, the history of occupation in Southeast Asia progressed from hunter-gatherers to the emergence of the Angkorian Empire in 802 CE. A widespread technological suite of flaked pebble tools appeared toward the end of the Last Glacial Maximum collectively termed Hoabinhian and remained the predominant culture until the Neolithic began, initially in northern Vietnam before spreading through Southeast Asia from c. 2,000 – 1,700 BCE (Bellwood et al. 2011; Oxenham et al. 2015; Piper 2017). Multiple migrations of agriculturalists bringing domesticated rice and millet from southern China appear to have integrated with existing communities during this period (Bellwood 2001; Dodo 2010; Shinodo 2010; Higham 2013). The Neolithic transitioned into the Bronze Age c. 1,200 BCE as bronze technology percolated down from contact with people in southern China and rapidly spread through the Southeast Asian mainland (Higham & Higham 2009; Higham 2015a). Following on from the Bronze Age, the Iron Age lasted roughly a millennium from c. 500 BCE – c. 500 CE and was a time of population expansion and rapid social and cultural advancements. The mid-late Iron Age witnessed the appearance of early state-like polities Funan and Chenla which were recorded by Chinese travellers and speak of the increasing complexity through Southeast Asia during the late prehistoric. However, while coastal regions with advantageous access to resources and international trade networks certainly flourished in late prehistory, it is the level of social complexity in inland regions such as Central-Northwest Cambodia and Northeast Thailand that is under review here.

This thesis utilised mortuary assemblages from mid-late Iron Age cemeteries at Phum Sophy, Phum Lovea, and Prei Khmeng in Cambodia, and Non Ban Jak and Noen U-Loke in Northeast Thailand to examine the distribution of wealth among late prehistoric populations. The practice of utilising mortuary wealth to understand socio-economic systems of the past has been a common theme in many archaeological projects since Binford's paper (1971) linking burial wealth to status. However, issues such as imbued social meaning on certain artefacts (Reinhold 2003), gifts supplied by the living (Crawford 2004), and manipulation of the dead to serve the living (Parker Pearson 1999), mean that drawing direct links between the number of items in a burial and the status of the individual is not always accurate. In order to ensure the link to status in the cemeteries under question is as robust as possible, a three-pronged approach to quantifying burial wealth (Alekshin 1983) was employed. This method for the analysis of burial wealth removes the issue of over-reliance on any single aspect of the mortuary data, and instead encourages a more wholistic approach which considers not just assemblage size, but also the composition of individual assemblages.

Utilising Alekshin's (1983) method, a count of the items in each assemblage forms the raw value for wealth in each burial context. This allows graphic representation of the spread of wealth in a cemetery, determining the distribution of the population by the size of their funerary assemblages. The validity of the wealth values was then tested by the second and third approaches, which analyse the abundance of different types of circlets (as the most common part of the funerary dress) and the distribution of semi-precious materials in the population. The second stage in determining wealth in mortuary populations is the consideration of variability in the numbers and different types of artefacts in burials (Alekshin 1983). Circlets were used in this thesis to fulfil this role due to both their abundance as the most common funerary item and also the great variability in the number of designs of Iron Age circlets. The creation of a morphological typology allowed for the analysis of circlet distributions in burials based of these differences in cross-sectional shape. The results found that not only did burials with larger assemblages have more circlets, but they also contained more different types of them and included several more intricate designs. Meanwhile poorer burials tended to have few different types of circlets and those that were present were usually restricted to simplistic circular or rectangular shapes.

The third and final step in analysing mortuary wealth considers the abundance of different materials across the wealth spectrum. In the assemblages included in this study, common materials such as bronze, iron, and ceramics were all present at fairly even levels regardless of burial wealth. Therefore, semi-precious stones, in the case of Southeast Asia agate and carnelian, offer the best context to examine variability. Both these materials conform to the general wealth patterns already established, with a greater proportion of wealthy burials containing these materials than those lower in the wealth spectrum. This multi-faceted approach to quantifying mortuary wealth provides a robust analysis of the wealth of each individual burial and was used to examine socio-economic trends in the prehistoric communities in question.

Mortuary assemblages from four prehistoric sites were examined and recorded in this project. Phum Sophy, Phum Lovea, and Prei Khmeng are located in Central-Northwest Cambodia and are among very few excavated prehistoric sites in this region. Non Ban Jak is located in the Upper Mun River Valley in Northeast Thailand among a dense cluster of similar circular moated sites dating to the Iron Age. While the vast majority of these sites have yet to see any form of archaeological ground work, Noen U-Loke and Ban Non Wat are two well excavated nearby villages. Data from the published reports from both sites were used to supplement the primary dataset for this project and provide a more robust analysis of Northeast Thailand.

Phum Sophy is a mid-late Iron Age mound in the Banteay Meanchey province of Cambodia (O'Reilly et al. 2015). Excavations across 2009 and 2010 opened two 3 x 5m trenches in response to reports of large scale looting at the site (O'Reilly et al. 2015). Intense local bioturbation and evidence of looting were found to have severely disturbed several of the recovered burial contexts. As a result, only fourteen of a total twenty burials dating between the first and seventh centuries CE were included in this study. The average assemblage size was comfortably the largest of any of the sites included in this study and included a middle-aged female (PS 14) of extraordinary wealth several standard deviations beyond the site mean. Three tiers were identified in the distribution of the population based on their relative wealth (distance from the mean). The proportion of the population in each tier decreased from the poor group (which had the most people) to the richest group (with the least people) while the number of different artefacts recovered in each group displayed the inverse trend.

Phum Lovea is in the minority of prehistoric occupation mounds in Cambodia due to the pair of encircling moats that it features (O'Reilly et al. 2017). Fourteen burials dating between 100 – 400 CE (O'Reilly et al. 2013) were recovered across two seasons at the site between 2011 and 2013 and have been included in this analysis. All burials were recovered from two units near the centre of the prehistoric mound, while a series of trenches bisecting the moat and embankment earthworks did not reveal any mortuary contexts. Poor preservation of organic matter at the site meant that the skeletal analysis only provided determinations of biological sex for half of the cemetery population, all of whom were male (Domett & Newton 2013b). The remaining seven individuals were also adults, with no subadults recovered from the site. Analysis of the distribution of the population by relative wealth revealed less definition in population grouping or tiers, potentially as a result of the cemetery having the lowest average assemblage sizes (and therefore least scope for differentiation within the population) of Cambodian sites included in the study. Despite this, while the pattern is more obscured, the proportions of the population in the three relative wealth tiers are the same as at Phum Sophy.

Prei Khmeng in the Siem Reap Province, Cambodia, produced the smallest mortuary population utilised in this study, however better preservation resulted in the ability to identify biological sex for several males and females, while several infants and older adults provide a broad representation of the community (O'Reilly et al. 2014). Located near the boundary of the western baray, the prehistoric cemetery sits within the later Angkorian heartland. While the prehistoric cemetery has been dated between the 1st – 4th centuries CE, a brick Hindu temple abutting the mound was constructed in the 7th century and inscriptions suggest was still in use at least until the 10th century (Trouve 1933). Analysis of the ten confirmed prehistoric burials from a single 8 x 8 m unit is hampered by the small sample size, however the results of the mortuary analysis of the of the site suggest that a three-tiered separation of the population according to relative wealth remains a possibility. As was observed at the other Cambodian sites, the most populous group is the poorest categories, with the number of burials decreasing in breaks (rather than a steady decline) as wealth increases. Only one individual, a female young adult, had wealth greater than one standard deviation above the site mean.

Located in the Upper Mun River Valley of Northeast Thailand, Non Ban Jak is a circular moated site which was settled during the mid-late Iron Age before it was abandoned in the 8th century CE (Higham et al. 2014). While excavations at the site have spanned seven seasons from 2011 to 2017, time and fieldwork constraints meant that it was not feasible to incorporate the data from the final two seasons in this thesis. Assemblages from 145 burials across four mortuary phases dating between c. 220 – 800 CE were utilised in this study. Unlike the Cambodian cemeteries, a clear point of difference is evident in the funerary practices for adults and subadults. Almost all adults were interred in an extended supine position. Meanwhile subadults, and particularly infants, were most often found in flexed jar burials and in later phases extended in a 'double jar' burial with either end of the body set in a jar. The Non Ban Jak collection was also distinguishable for having the smallest average assemblage size. The distribution of the population at Non Ban Jak according to relative wealth revealed a gradually shifting decline from a large poor population through to a few rich individuals. No breaks or large jumps are found, suggesting there was no demarcated groupings in the populace.

In addition to Non Ban Jak, the published data from Noen U-Loke and Ban Non Wat were examined and where appropriate included in the study dataset. Burial assemblages from mortuary phases four and five at Noen U-Loke, which covers 93 burials dating between 200 – 600 CE, were included in the thesis dataset for Northeast Thailand (Higham, Kijngam & Talbot 2007). The nature of the published data, which typically include only a raw count of each artefact and a two-dimensional image of the entire assemblage, means that it is not possible to compare typological trends of circlet to those observed at other sites in the study. However, the general trend of population distribution according to relative wealth matches closely with that at Non Ban Jak. That is to say that, a steady gradient divided the population from the large group categorised as poor to the few rich assemblages.

Ban Non Wat is perhaps the most extensively excavated prehistoric site in mainland Southeast Asia (Higham & Kijngam 2009; 2010; 2012a; 2012b; Higham 2011b: 107). The inclusion of this circular moated site, which displays evidence of continual occupation from the Neolithic through to the Iron Age, is necessary to provide chronological perspective to any models of changing social complexity during late prehistory. Although excavations at Ban Non Wat have revealed an Iron Age population, only seven interments were recovered during the mid-late Iron Age under review here. This was deemed too few to meaningfully contribute to the Northeast Thailand dataset given the much larger contributions from Non Ban Jak and Noen U-Loke. Examination of the Ban Non Wat data was therefore primarily used to provide an insight into the socio-economic landscape of the mid-late first millennium BCE in comparison to the strengthening hierarchical systems in the late Iron Age. Unlike the bottom-heavy wealth distribution observed in late Iron Age assemblages in this study, the early Iron Age population at Ban Non Wat was much more evenly distributed around mean wealth.

The field of differentiating the level of social complexity in societies is based on the seminal work of Service (1962) which stated that all cultures are sorted into one of four broad categories; bands, tribes, chiefdoms, and states. It is the distinction between the final two of these, and how this applies in prehistoric Mainland Southeast Asia, which is the focus of this thesis. While both are hierarchical systems, chiefdoms function by highly personal links which connect the many ranks in small steps (Earle 1991). States, conversely, are comprised of several different groups which are entirely separated and require bureaucratic organisation to maintain (Smith 2004). This key difference in the structure of chiefdoms and states is reflected in the distribution of wealth in the population with either a steady gradient from rich to poor (chiefdom) or distinct groups or tiered population brackets (state). While this distinction is the main point of focus in this thesis, there are many different markers for chiefdoms or statehood, all of which are rarely found together in a single society (Flannery 1972; Smith 2004). This serves to illustrate the complexity of human social systems and the way we choose to organise ourselves in communities. It is therefore important to consider that Service's four system model, while useful as a theoretical framework, should not be adhered to universally, particularly in regards to defining systems in a transitional phase between two categories. The mortuary analysis in this project has therefore sought to determine how the distribution of wealth in late prehistoric Central-Northwest Cambodia and Northeast Thailand conforms with models of social complexity, and whether it is appropriate to apply such a strict dichotomy to characterise the regions.

Despite being one of the most common artefacts found in Iron Age assemblages in mainland Southeast Asia, circlets have been largely under researched until now. The lack of a standardised methodology for recording morphological aspects of these items, without which there can be little hope for analysis of trends on a regional scale, is certainly a symptom of the dearth of previous research on the subject. As part of this project, all circular, banded ornaments (bangles, rings, anklets, earrings, and bimetallic rings) recovered across the study sites have been classified in a morphological typology designed to categorise the shape of the three main variables of circlets. The first typological level separates the artefacts into 23 unique groups based on the cross-sectional shape, while the second and third designations refer to the type of opening in the band and the circlet shape from above, respectively. This new typology allows for meaningful examination of trends in circlet shapes and types on intra- and inter- site levels, as well as how shapes differ between sub categories of circlets (i.e. bangles and rings). Moving forward, the application of the typology to more Iron Age sites may offer insights into trade and contact routes. For the purposes of this thesis the typology was used to analyse the different numbers of cross-sectional shapes in burials to examine if poorer assemblages also had fewer different forms and of more simplistic designs, than wealthier assemblages.

The results of the mortuary analysis have provided strong evidence to argue that the degree of social complexity in Inland Southeast Asia differed between Northeast Thailand and Central-Northwest Cambodia during late prehistory. The distribution of relative mortuary wealth among the cemetery populations reveal a stark difference in patterns between the two regions. The Cambodian collection, comprising the mortuary data from Phum Sophy, Phum Lovea, and Prei Khmeng, displayed a potential tiered system of wealth distribution with distinct boundaries and gaps. Conversely, Non Ban Jak and mortuary phases 4 and 5 at Noen U-Loke in Northeast Thailand each exhibit wealth distribution on a much more gradual scale with a steady gradient connecting the poor (most of the population) to the rich (few individuals).

The arrangement of the Cambodian population in a series of distinct groups based on wealth is indicative of complex polities. The lack of cohesion between wealth tiers suggests an impersonal, bureaucratic system of governing that is characteristic of many states (Flannery 1972). However, the wider archaeological record for Iron Age Central-Northwest Cambodia does not support state-level classification. Evidence for markets, urban centres, and conflict on a large scale (with the exception of the village of Phum Snay) are all accepted markers that are absent from the record (Service 1962). As a result, it is concluded that Central-Northwest Cambodia was likely in a transitory period c. 200 – 600 CE best described as a complex polity. There is a caveat on the findings for Cambodia as, at present, examination and excavation of late prehistoric sites is still in its relative infancy. Until more sites, and particularly on a large-scale similar Ban Non Wat in Northeast Thailand or Angkor Borei in the Mekong Delta, are excavated, a final assessment of complexity in the region cannot be tendered.

The level of social complexity in Northeast Thailand during the late Iron Age, conversely, appears much easier to categorise. The steady gradient in the distribution of wealth from the majority of the population in the poorest categories to the few excessively wealthy burials reflects a ranked, non-stratified society in which the population is linked by small personal bonds (Sahlins 1963; Carmichael 1995). This, along with the other archaeological evidence from the Khorat Plateau depicting a lack of urban centres, markets, and large-scale organised violence, presents a strong case for complexity at the level of a chiefdom society. The evidence from Ban Non Wat suggests that this chiefdom classification represents a significant increase in complexity from the start of the Iron Age, however not on the same level as that south of the Dângrêk Mountains.

To conclude, despite similarities in material culture and site structure, inland regions of Southeast Asia showcase evidence for variability in social complexity during the late prehistory. Central-Northwest Cambodia appears to have been in a transitory period with distinct wealth tiers separating the population in a system best described as a complex polity. Northeast Thailand, however, does not exhibit any evidence for attaining a similar level of complexity. The gradual, ranked method of wealth distribution is suggestive of the personal links found in a chiefdom society. The conclusions presented in this thesis provide a greater understanding of the late prehistory of Southeast Asia as well as indicating areas requiring further research, particularly in exposing more prehistoric sites in Central-Northwest Cambodia, and the continued implementation of the presented typology for Iron Age circlets.

Appendix 1 Distribution of Artefacts in Burials

The following appendix lists each burial with the accompanying number of items divided into artefact categories. This presents the raw data in an easy to manage spreadsheet that allows for initial assessment of trends in artefact distributions. This data pertaining to artefact assemblages from Noen U-Loke and Ban Non Wat are extensively published elsewhere and are therefore not included here. The number of individual beads is followed by the number of catalogued entries in brackets.

Site codes:

PS = Phum Sophy

PL = Phum Lovea

PK = Prei Khmeng

NBJ = Non Ban Jak

Site	Burial	All Artefacts	Bangles	Rings	Bronze earrings	Knives	Sickles	Iron points	Digging tools	Iron spears	Glass beads	Gold items	Spindle whorls	Clay pellets	Ceramic vessels	Other items
PS	1	35		11		1					369 (3)		1		10	1 iron pendant, 1 bone pendant, 1 shell pendant, 1 shell, 1 iron object
PS	1.1	0														
PS	1.2	0														
PS	2	11						1			68 (4)				4	2 iron objects
PS	2.1	0														
PS	3	5									10 (1)				3	
PS	4	26		1		1		3	1		340 (2)		3	2	10	2 rice tools
PS	4.1	0														
PS	5	29	2	5					1		184 (2)		6	3	6	1 iron ring, 2 stone flakes
PS	5.1	0														
PS	5.2	0														
PS	6	31	7	2			2	2	1		378 (3)		1		8	1 decorated bone, 1 shell ornament
PS	7	68	19	3			2	10	3	2	192 (3)	1 gilded earring	1	1	10	1 bronze necklace, 1 bronze bowl, 1 agate pendant, 1 cow tooth pendant.

Site	Burial	All Artefacts	Rings	Bronze earrings	Sickles	Iron points	Digging tools	Iron spears	Glass beads	Agate beads	Carnelian beads	Spindle whorls	Clay pellets	Ceramic vessels	Other items
PS	8	12						1	4 (1)		1 (1)			3	
PS	9	4							0		1 (1)			3	
PS	10	51			1	15	2		450 (6)		5 (2)	8		8	iron slag, several unidentified bronze and iron pieces
PS	11	20		1		1	1		113 (2)			2	2	5	1 lithic core, several shells, animal bone
PS	12	0													
PS	13	0													
PS	14	188	43	1	1	2	3	1	49 (5)	5 (2)	273 (3)			11	1 cat tooth pendant, 1 shell and glass pendant, 1 shell, 1 bone perforated disc, 1 iron tool.
PL	1	35	1	2	2			1	110 (4)	3 (1)	3 (2)		5	2	1 iron hook, 1 burnishing stone, 3 bronze coins, unidentified iron, bronze and stone objects
PL	2	11	3				1		12 (1)				2	1	unidentified bronze and iron objects

Site	Burial	All Artefacts	Bangles	Rings	Bronze earrings	Knives	Sickles	Iron points	Digging tools	Iron spears	Glass beads	Gold items	Spindle whorls	Clay pellets	Ceramic vessels	Other items
PL	3	18	4	1	1						49 (4)		1	5		iron hook, unidentified iron object
PL	3.1	5		3					1		0					1 ceramic bead
PL	3.2	34	9	4	1				2	1	58 (3)		1	6	1	animal bones, unidentified bronze and iron objects
PL	4	22	6	1	1	1			1		406 (3)			2	3	iron slag, unidentified iron object
PL	5	4									0			1	2	unidentified hafted iron object
PL	6	14					1				7 (2)			2	2	several unidentified bronze and iron objects
PL	7	20	6	3			1		1	1	18 (2)			1		1 mayble bangle, 2 unidentified iron objects
PL	8	23	8		1	1			3	1	72 (2)				1	iron slag, sandstone frag, unidentified bronze and iron objects

Site	Burial	All Artefacts	Bangles	Rings	Bronze earrings	Bronze bells	Sickles	Iron points	Digging tools	Iron spears	Glass beads	Agate beads	Carnelian beads	Clay pellets	Ceramic vessels	Other items
PL	9	24	6						1	1	57 (6)	3 (3)	1 (1)	3	2	several unidentified iron objects
PL	10	34	1	1			1	1	9	2	18 (4)			1	2	1 sword point, iron slag, 1 grindstone, several (9?)unidentified iron hafted objects
PL	11	8	4	1			1				4 (1)					1 bronze coin
PL	12	2					1							1		
PK	1	9	3				1		1		60 (2)				1	hammer scale
PK	2	33	2			11	1		3	2	50 (3)	1 (1)		1	4	2 iron axes, unidentified iron object, burnt animal bone, pig skull, unidentified bronze object
PK	3	12	1		1		1		2		99 (4)	8 (2)				1 unidentified iron tool,
PK	4	7	3		1				1						1	unidentified iron object
PK	5	25	10	3				1			226 (4)		1 (1)	2	3	unidentified bronze object

Site	Burial	All Artefacts	Bangles	Bimetallic rings	Rings	Knives	Sickles	Iron points	Digging tools	Iron spears	Glass beads	Agate beads	Gold items	Clay pellets	Ceramic vessels	Other items
PK	6	24	5		4	1					140 (7)	2 (1)			3	1 iron axe, several unidentified iron objects,
PK	7	12	1				1		4		9 (3)				2	1 socketed iron object
PK	8	16			2				3		33 (1)				1	9 bronze coins,
PK	9	32	4		5		3	2	6		10 (3)	2 (2)		1	5	unidentified bronze object
PK	10	53	10		10	2	3	2			95 (8)		1 hook	3	3	4 iron schisels, several unidentified iron objects, iron slage cake, furnace fragment?, animal bone, hammer scale
NBJ	1	2						1			10 (1)					
NBJ	2	0														
NBJ	3	0														
NBJ	4	0														
NBJ	5	3			3											
NBJ	6	5		1			1								3	
NBJ	7	27	3	2	16	1									3	1 silver earring, red ochre clump

Site	Burial	All Artefacts	Bangles	Bimetallic rings	Anklets	Rings	Bronze earrings	Knives	Glass beads	Spindle whorls	Ceramic vessels	Other items
NBJ	8	0										
NBJ	9	13	2			9					2	
NBJ	10	6	3	2							1	
NBJ	11	4		2							2	
NBJ	12	37	13	2	10	9	2					1 agate pendant
NBJ	13	1									1	
NBJ	14	1									1	
NBJ	15	0										
NBJ	16	5	3						2 (1)		1	
NBJ	17	5	1		2				202 (1)		1	
NBJ	18	9	7								2	
NBJ	19	3	1						10 (1)			1 stone adze
NBJ	20	14	5			5			118 (1)		1	1 shell pendant, 1 agate pendant
NBJ	21	19	17								2	
NBJ	22	1							222 (1)			
NBJ	23	0										
NBJ	24	4		1							3	
NBJ	25	5	1	1							3	
NBJ	26	6							2 (1)	1	3	bronze object
NBJ	27	2		1							1	
NBJ	28	2							2 (1)		1	
NBJ	29	4							96 (1)		3	
NBJ	30	14	8	2			1				3	
NBJ	31	3									2	3 bivalve shells
NBJ	32	15	9						3 (1)		2	3 bronze belts
NBJ	33	0										
NBJ	34	2									2	
NBJ	35	4	2								2	
NBJ	36	0										
NBJ	37	4			1						3	
NBJ	38	7						1		3	2	red ochre
NBJ	39	6	2								3	1 iron rod
NBJ	40	1									1	
NBJ	41	8	1						90 (3)		3	bronze object
NBJ	42	1	1									
NBJ	43	1									1	1
NBJ	44	0										

Site	Burial	All Artefacts	Bangles	Bimetallic rings	Anklets	Rings	Bronze earrings	Knives	Sickles	Glass beads	Gold items	Spindle whorls	Ceramic vessels	Other items
NBJ	45	9				4	1						4	
NBJ	46	64		1	46	13	2						2	
NBJ	47	4											4	
NBJ	48	2											2	
NBJ	49	21	2	1		8	3	1	2				2	gastropod shells, 1 bivalve shell
NBJ	50	0												
NBJ	51	1											1	
NBJ	52	1												2 bivalve shells.
NBJ	53	5	1							18 (1)			3	
NBJ	54	1											1	
NBJ	55	1											1	
NBJ	56	10	7							282 (1)			2	
NBJ	57	3								1 (1)			2	
NBJ	58	3											2	iron object
NBJ	59	7	1		2								3	1 anadara shell
NBJ	60	6	1		1					9 (1)			1	bronze object
NBJ	61	15				12							3	
NBJ	61.1	1												1 bronze object
NBJ	62	5						1			1 ring		2	1 agate pendant
NBJ	63	0												
NBJ	64	8	2				2			4 (1)		2	1	
NBJ	65	9				2		2		1 (1)			1	1 iron rod

Site	Burial	All Artefacts	Bangles	Bimetallic rings	Rings	Bronze earrings	Knives	Sickles	Iron spears	Glass beads	Agate beads	Gold items	Clay pellets	Ceramic vessels	Other items
NBJ	66	17	1		4	3				15 (1)				5	1 iron bangle, 1 clay disc. 1 tektite pebble
NBJ	67	0													
NBJ	68	2												1	1 burnishing stone
NBJ	69	13		1			1					1 earring		5	1 iron ring, 1 shell bead, 2 clay objects, 1 iron object
NBJ	70	2												2	
NBJ	71	11	3		3		1	1						3	
NBJ	72	15		1	2	1	1	1		2 (1)				4	4 clumps of red ochre, lump of blue clay.
NBJ	73	6			1	2								2	1 iron object
NBJ	74	6			3									3	
NBJ	75	29	1		24	1		1						2	
NBJ	76	25	9	1	6	1	1	1					1	3	piece of animal bone, lump of red ochre
NBJ	77	16	5	2	3	1			1	1 (1)				2	1 animal bone
NBJ	78	2												2	
NBJ	79	0													
NBJ	80	7			4									3	
NBJ	81	25	9	1	7	2	1	1						3	1 bivalve shell
NBJ	82	17		1		4	1	1						6	2 bronze belts, 2 bivalve shells
NBJ	83	0													
NBJ	84	14	1	1	2		1			2 (1)	1 (1)			5	carbonised rice grains in one of the ceramic pots, 1 bivalve shell
NBJ	85	2													1 tektite pebble, 2 bivalve shells
NBJ	85.1	3					1							1	iron object

Site	Burial	All Artefacts	Bangles	Bimetallic rings	Rings	Bronze earrings	Sickles	Glass beads	Agate beads	Carnelian beads	Gold items	Spindle whorls	Ceramic vessels	Other items
NBJ	86	11	4	1				240 (2)	10 (1)				2	bronze object
NBJ	87	4		3									1	
NBJ	88	2											1	1 bivalve shell
NBJ	89	8	1	1	3								2	1 iron object
NBJ	89.2	0												
NBJ	89.3	0												
NBJ	90	21	17	2				2 (1)					1	
NBJ	91	18	11		2	3		1 (1)					1	
NBJ	92	0												
NBJ	93	16		4	1			39 (4)					5	2 cowrie shells
NBJ	94	3						12 (2)		1 (1)				
NBJ	95	10		6				3 (1)					2	1 bivalve shell
NBJ	96	12			7		1	3 (1)	3 (1)				1	1 bivalve shell
NBJ	97	1											1	
NBJ	98	2		2										
NBJ	99	2									10 beads (1)		1	
NBJ	100	1											1	
NBJ	101	2											2	
NBJ	102	3						2 (1)				1		bronze object
NBJ	103	2											1	iron object
NBJ	104	4						5 (1)					2	egg shell
NBJ	105	7	1						3 (1)			2		1 iron object, 1 bronze object, 1 bivalve shell
NBJ	106	3											3	
NBJ	107	3											3	

Site	Burial	All Artefacts	Bangles	Bimetallic rings	Anklets	Rings	Bronze earrings	Knives	Sickles	Iron points	Digging tools	Iron spears	Glass beads	Agate beads	Gold items	Ceramic vessels	Other items
NBJ	108	6	5													1	
NBJ	109	1														1	
NBJ	110	19				1	4	1	1	2		3			1 earring	3	1 iron machete, 1 dog tooth pendant, 1 iron object
NBJ	111	1														1	
NBJ	112	7											1 (1)	2 (1)		4	
NBJ	113	11				6		1	1							1	1 agate pendant, 1 bronze object
NBJ	114	5	4								1						
NBJ	115	8				1		1	1		2					1	1 fused mass of iron tools, 1 iron object
NBJ	116	8	1			2		1	1							1	1 iron bangle, 1 iron object
NBJ	117	11			1	5										5	
NBJ	118	2														2	
NBJ	119	1														1	
NBJ	120	36	3	2		18	2	1	1					3 (1)	2 earrings	3	1 iron machete, 1 agate pendant, 1 bivalve shell
NBJ	121	1														1	
NBJ	122	4			1											3	
NBJ	123	2														2	
NBJ	124	1														1	
NBJ	125	1														1	
NBJ	126	1														1	
NBJ	127	8		4									58 (2)			2	
NBJ	128	1														1	

Site	Burial	All Artefacts	Bangles	Bimetallic rings	Anklets	Rings	Knives	Sickles	Glass beads	Agate beads	Spindle whorls	Ceramic vessels	Other items
NBJ	129	1										1	
NBJ	130	1										1	
NBJ	131	2										2	
NBJ	132	1										1	
NBJ	133	25	8			5					3	5	1 agate pendant, 3 iron objects
NBJ	134	18				11	1	1				2	2 bivalve shells, 1 iron object
NBJ	135	2										2	
NBJ	136	14	8							1 (1)		2	1 agate pendant, 2 bronze objects
NBJ	137	4	2			1						1	
NBJ	138	2										2	
NBJ	139	12	6				1					3	1 agate pendant, 1 silver ring
NBJ	140	0											
NBJ	141	15	6	1	2				178 (2)			4	

Appendix 2 Illustrated Glossary of Artefacts

The following appendix provides an illustrated glossary of the artefacts encountered in mortuary contexts in this study including their descriptions and how they were measured.

Artefact: Adze

Description: Stone adze. An uncommon find in Iron Age assemblages.

Measurements: Length (L) – longest section of the adze from end to end; width (W) – widest section of adze from edge to edge.

Figure 1 measurement for an adze. PK Cat 96.

Artefact: Anklet

Description: Circular body adornment worn on the ankles or feet. Typically bronze.

Measurements: Length – inner diameter/ outer diameter (or, where no complete diameter, thickness was recorded); width – height of band from top to bottom.

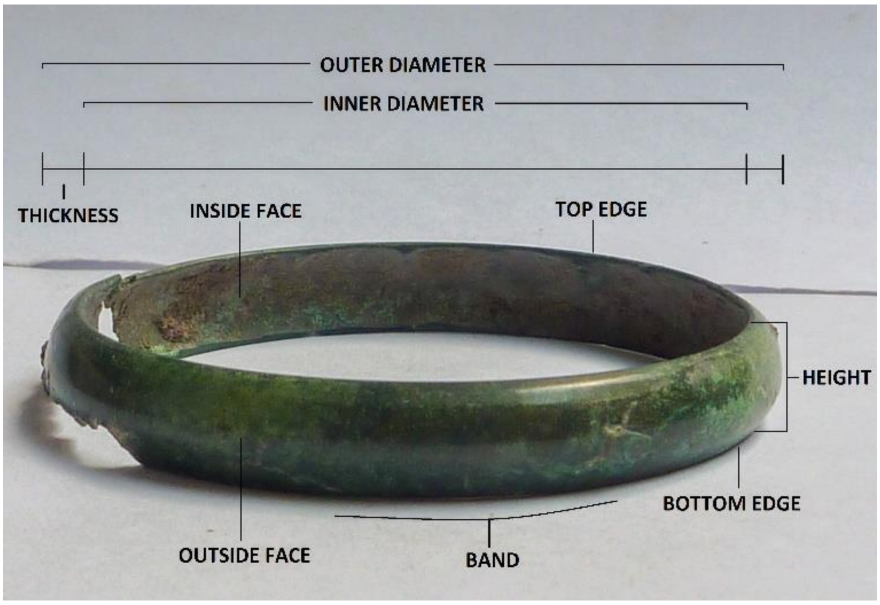

Figure 2 measurements and terminology for anklets. PL Cat 201.

Artefact: Axe

Description: Large tool most likely designed for cutting wood. Often hafted using a socket joint. Typically iron.

Measurements: Length – top of axe head to the bottom of the hafting neck; width – maximum distance from edge to edge of axe head.

Figure 3 measurement for an axe head. PK Cat 359.

Artefact: Bangle

Description: Circular body adornment worn on the wrist or arm. Typically bronze.

Measurements: Length – inner diameter/ outer diameter (or, where no complete diameter, thickness was recorded); width – height of band from top to bottom.

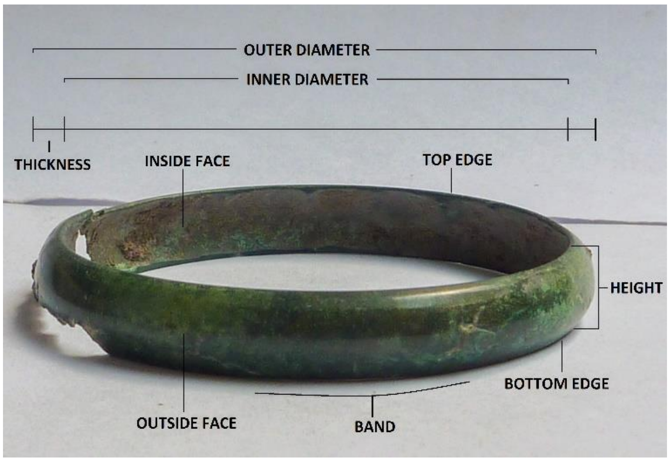

Figure 4 measurements and terminology for bangles. PL Cat 201.

Artefact: Bead

Description: Perforated ornamental bead threaded through a string to adorn the mortuary dress. Typically glass, carnelian, or agate during the Iron Age. Glass beads appear in varying colours. Mainly spherical or cylindrical in shape.

Measurements: Length – maximum diameter of bead; width – diameter of perforation.

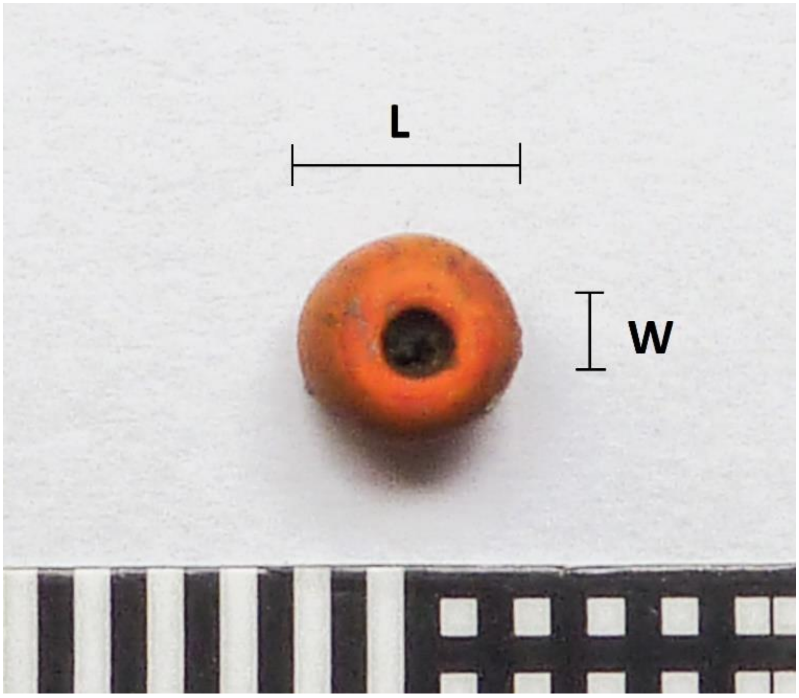

Figure 5 measurements for a bead. PK Cat 304.

Artefact: Barrel Bead

Description: Perforated ornamental bead threaded through a string to adorn the mortuary dress. Often found around the neck perhaps as a pendant. Less common than normal beads. Typically agate.

Measurements: Length – length of barrel bead from end to end/ maximum diameter of bead; width – diameter of perforation.

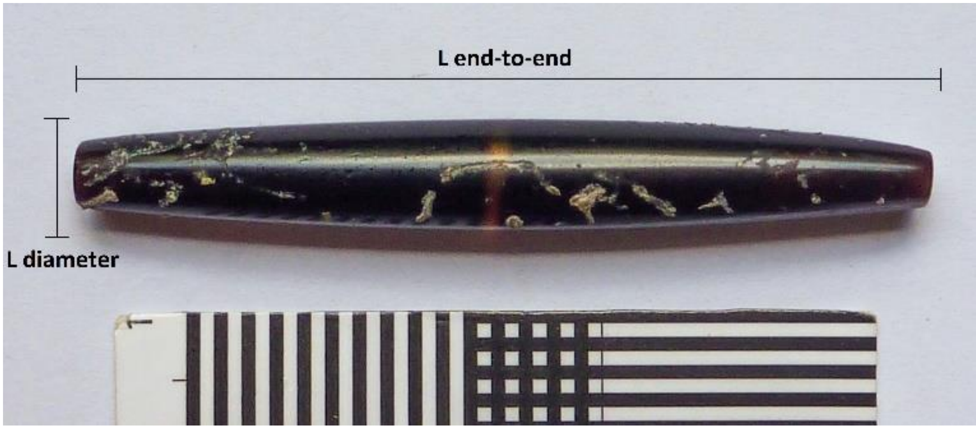

Figure 6 length measurements for a barrel bead. PK Cat 331

Artefact: Bell

Description: Small, musical bell with a loop at the top so it may be threaded through a string. Typically worn on the anklets, generally with more than one bell. On rare occasions included into an anklet band rather than having a loop for a string. Often the main body of the bell is decorated with incised lines. Typically bronze.

Measurements: Length – top of the attachment hook to bottom of bell/ maximum length front-to-back; width – maximum length side-to-side.

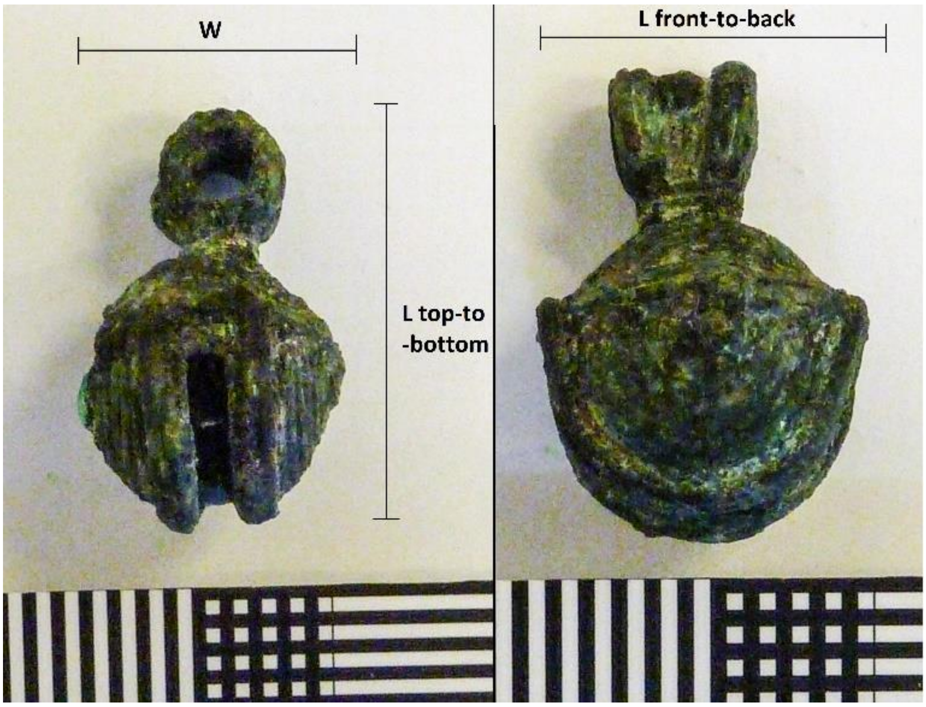

Figure 7 measurements for a bell. PS Cat 160.

Artefact: Belt

Description: Roughly circular or oval single loop of thick metal band. Worn around the waist, sometimes with several other similar belts.

Measurements: Length – thickness of band (no belts survived intact for measuring full inner/outer diameter); width – height of band.

<No intact belt recovered>

Artefact: Bimetallic Ring

Description: A metallic circlet of unknown function. Made of iron around a bronze core. Potentially functioned as a fastener for clothing or ties on a burial shroud. Sometimes worn as a bangle on infants

Measurements: Length – inner diameter/ outer diameter (or, where no complete diameter, thickness was recorded); width – height of band from top to bottom.

Figure 8 length measurements for bimetallic rings. NBJ Cat 234.

Artefact: Bronze Bowl

Description: A bronze open bowl. Very rare Iron Age artefact. No intact or complete bowls were recovered.

Measurements: Length – diameter of bowl opening; width – thickness of metal sheet.

Figure 9 reconstructed diameter of bronze bowl. PS Cat 104.

Artefact: Chisel

Description: Long, thin, roughly rectangular shaped tool. Tapering from a thick hafting socket to a thin, flat cutting edge.

Measurements: Length – distance from hafting end to cutting edge; width – maximum distance from edge-to-edge.

Figure 10 measurements for a chisel. PS Cat 52.

Artefact: Clay Disc

Description: Flat cylindrical disc of baked clay. Enigmatic artefact of unknown function found at many late prehistoric sites.

Measurements: Length – maximum diameter of circular face, width – height from top-bottom.

Figure 11 length measurement for clay discs. PL Cat 256.

Artefact: Clay Pellet

Description: A spherical ball of baked clay. Sometimes decorated with cord impressions.

Measurements: Length – maximum diameter; width – minimum diameter

Figure 12 clay pellet. PS Cat 112.

Artefact: Coin

Description: A circular bronze coin with a roughly square hole through the middle. Most likely a *ban liang* from the Wang Mang period (7-23 AD) in China or possibly from northern Vietnam.

Measurements: For measuring treated the same as a circlet. Length – inner diameter/ outer diameter (or, where no complete diameter, thickness was recorded); width – height of band from top to bottom.

Figure 13 length measurement for a bronze coin. PL Cat 203.

Artefact: Digging Implement/ tool

Description: An agricultural instrument similar to a hoe. Used for digging trenches or through hard earth. The digging head is connected by a socket hafting neck. Still used in modern day Cambodia called a *Jop Jeek*.

Measurements: Length – distance from the end of the hafting neck to edge of blade; width – maximum width of digging head.

Figure 14 measurements for a Digging tool. PK Cat 223.

Artefact: Earring

Description: Body adornment worn in/at the ear. Occur in different shapes, though still fall under the broader category of a circlet. Typically bronze during the late Iron Age.

Measurements: Length – inner diameter/ outer diameter (or, where no complete diameter, thickness was recorded); width – height of band from top to bottom at the thickest part.

Figure 15 length measurements for an earring. PS Cat 231.

Artefact: Flake

Description: An anthropogenically fashioned stone flake. May have served a variety of functions. Uncommon during the Iron Age.

Measurements: Length – longest section of flake end-to-end; width – widest section from edge-to-edge.

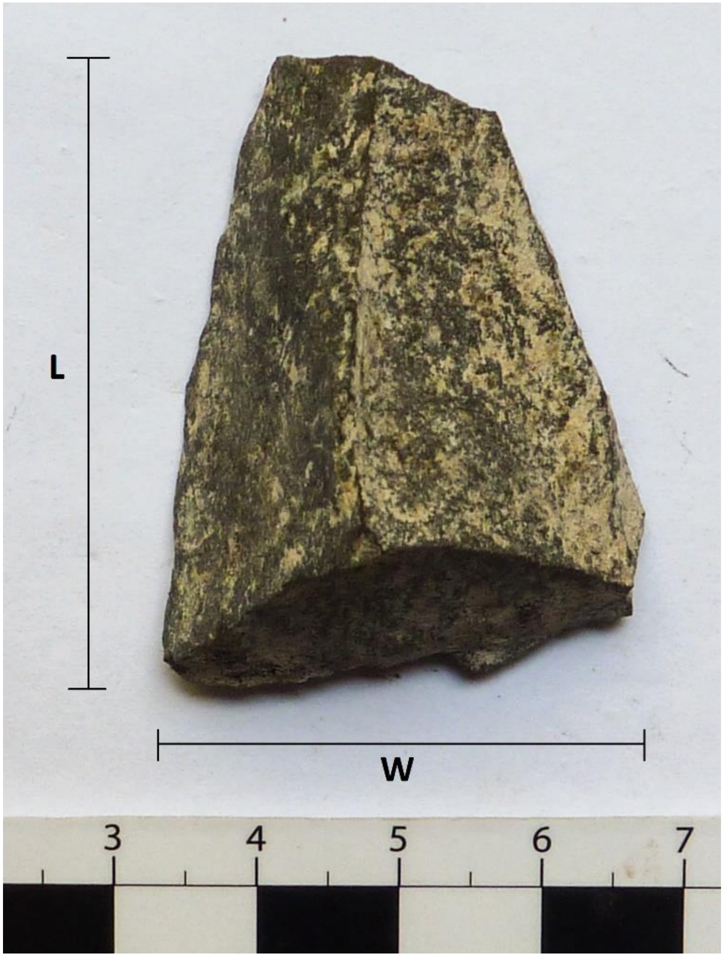

Figure 16 measurements for a stone flake. PS Cat 240.

Artefact: Grindstone

Description: A stone tool with a smoothed surface from acting as a grinding platform/surface to sharpen other tools.

Measurements: Length – longest section of stone end-to-end; width – widest section from edge-to-edge.

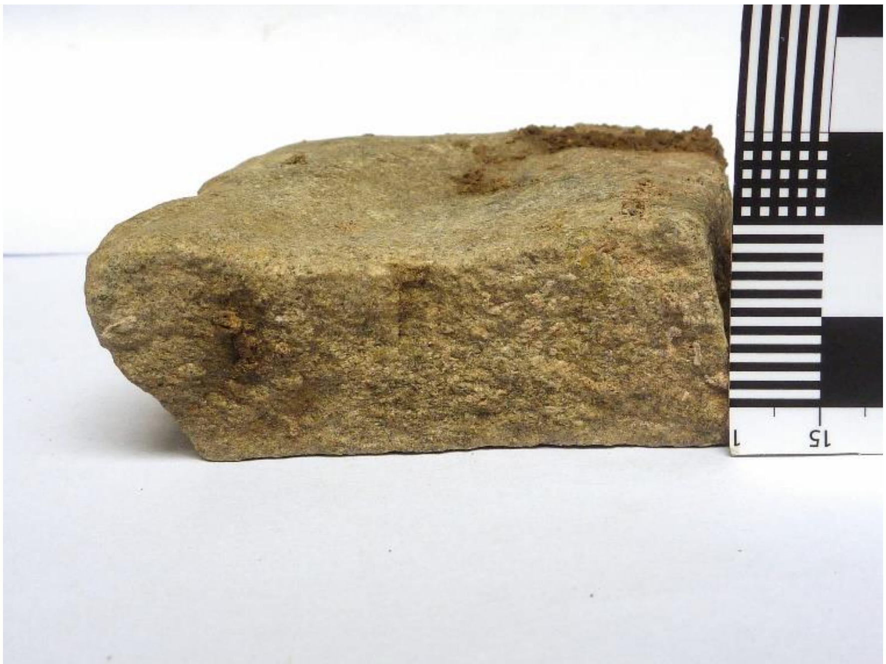

Figure 17 grindstone example. A smooth groove has been worn into the top surface from repeated use as a grinding platform. PS Cat 51.

Artefact: Hook

Description: A metallic band bent into a hook shape. Uncommon artefact appearing in various sizes.

Measurements: Length – distance from the long end of the hook to the bottom of the curve; width – band thickness.

Figure 18 measurements for a hook. PL Cat 24.

Artefact: Knife

Description: Iron cutting and/or slicing tool. Typically a thin rectangular shape, gradually tapering to a point at one end.

Measurements: Length – distance from tip to end; width – maximum distance across.

Figure 19 measurements for a knife. NBJ Cat 154.

Artefact: Miscellaneous Tool

Description: An unidentifiable piece of metal believed to have been part of a tool. Typically flat and thin and often found with fused rice husks fused onto one side indicating it was placed on top of a bed of rice.

Measurements: Length – largest side of fragment; width – other directional side of fragment.

Artefact: Pendant

Description: A large piece of jewellery found at the neck with a perforation or loop to allow for threading on a string. Probably used to adorn a necklace as the central feature. Often made of agate.

Measurements: Length – maximum length/maximum height; width – perforation diameter.

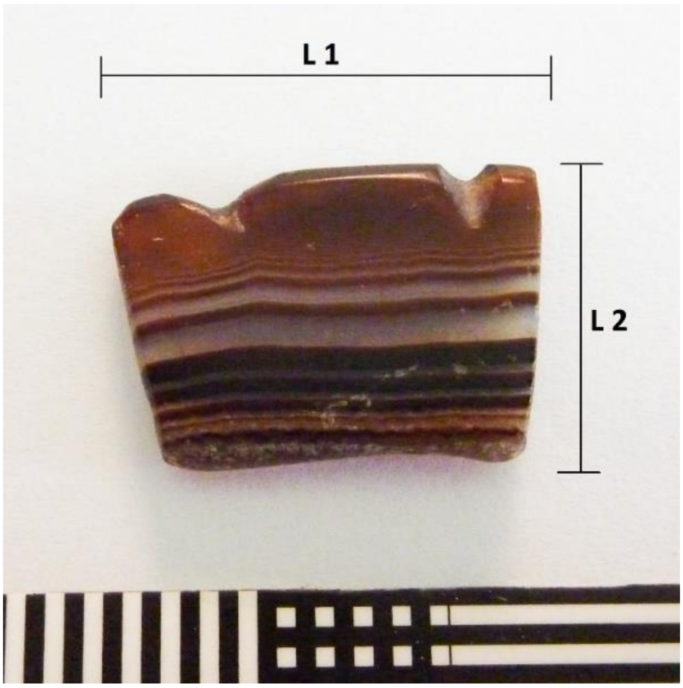

Figure 20 length measurements for a pendant. NBJ Cat 62.

Artefact: Point

Description: Miscellaneous sharp, pointed tool. Typically iron. Covers a range of shapes that may have been small knives, projectiles, or the broken tip of a larger pointed instrument.

Measurements: Length – distance from tip to end; width – maximum distance across.

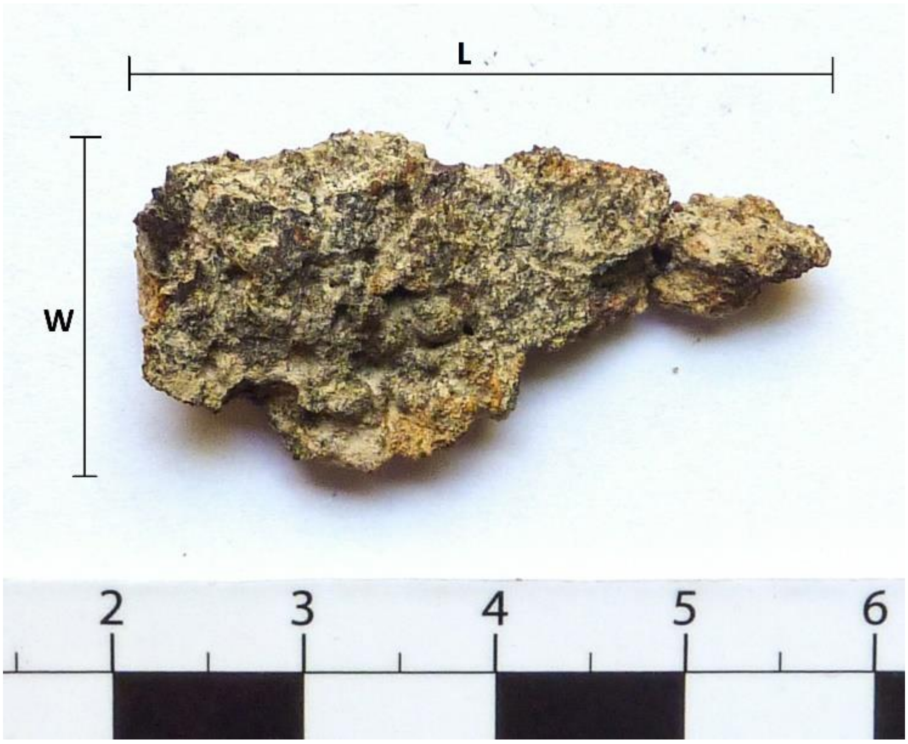

Figure 21 measurements for a point. PS Cat 225.

Artefact: Projectile point

Description: Small point that likely formed the head of an arrow. Typically iron.

Measurements: Length – from tip to furthest point on hafting end; width – widest part of the projectile point.

Figure 22 measurement for an arrow head. PK Cat 246.

Artefact: Ring

Description: Circlet worn on the fingers or toes. Typically bronze during the Iron Age.

Measurements: Length – inner diameter/ outer diameter (or, where no complete diameter, thickness was recorded); width – height of band from top to bottom.

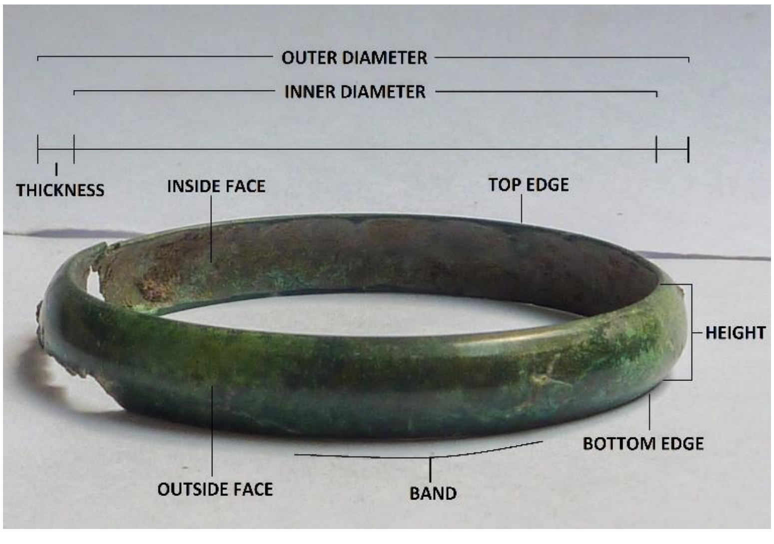

Figure 23 reference system for a ring. PL Cat 201.

Artefact: Sickle

Description: A curved iron knife used for reaping crops (most likely rice) using a scything technique. Still used in modern day Cambodia and Northeast Thailand. Cambodian sickles exhibit a gentle, continual curve over the entire length of the blade while Thai sickle are straight bladed after a sharp bend from the hafting handle.

Measurements: Length – linear distance from base of blade to tip; width – maximum width of blade from edge-to-edge.

Figure 24 measurements for a sickle. PK Cat 278.

Artefact: Socketed Object

Description: An unidentifiable piece of metal believed to have been part of a tool. Typically quite large and/thick. The socketed hafting neck of a tool which has since broken away.

Measurements: Length – length of hafting neck from base to broken end; width – width of hafting neck from side-to-side.

Artefact: Spear

Description: A large, pointed iron spear head featuring a socketed haft for long wooden pole. Designs vary widely during the iron age though common forms include long, gently tapering blades; leaf-shapes; and squat, triangular shapes.

Measurements: Length – length of the entire instrument from bottom of hafting neck to tip of blade; width – width of largest section of the blade.

Figure 25 measurements for a spear. PS Cat 191.

Artefact: Spindle Whorl

Description: A perforated tool used for spinning twine. Typically conical or mushroom shaped with the widest end at the base. Usually made of ceramic or fired clay, though rare bone spindle whorls do appear. Commonly decorated with circular or spiral incisions on the base surface.

Measurements: Length – base diameter / top-bottom length; width – perforation diameter.

Figure 26 measurements for a spindle whorl

Artefact: Sword Point

Description: An iron sword. A rare item in the iron age of Cambodia or Thailand. No intact swords were recovered.

Measurements: Length – from tip to hilts; width – widest part of the blade.

<No intact sword recovered>

Artefact: Tooth Pendant

Description: A perforated animal tooth worn on a necklace or string.

Measurements: Length – tip of tooth to base of root / maximum thickness of tooth; maximum diameter of perforation.

Figure 27 measurements for an animal tooth pendant. NBJ Cat 7.

Artefact: Vessel (ceramic)

Description: A ceramic vessel. One of the most common artefacts in Iron Age burials. This covers a wide variety of vessels, including large interment jars, decorative vases, and offering vessels. In the majority of cases are recovered at least partially broken. When counting ceramic vessels, all sherds from one vessel are counted as a single, combined artefact. The ceramic vessels were being studied by Lim as part of a PhD project at the time of this publication, therefore no analysis of these artefacts was conducted in this project aside from a tally of vessels recovered.

Measurements: No measurements taken.

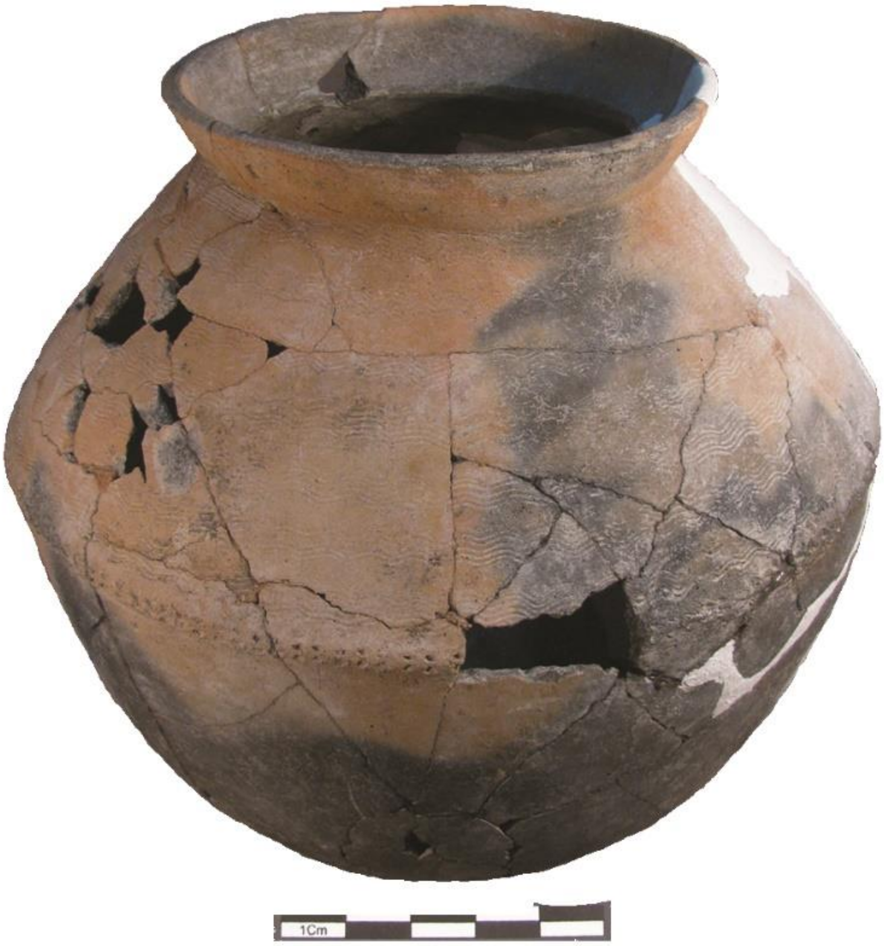

Figure 28 example of ceramic vessel recovered from Iron age contexts in Cambodia

Appendix 3 Wealth z scores for Non Ban Jak Burials

Burial	MP	Assemblage size	Z score	Standardised value
1		2	-0.5998639	-0.75 - -0.5
2			-0.8229537	-1 - -0.75
3			-0.8229537	-1 - -0.75
4			-0.8229537	-1 - -0.75
5		3	-0.4883190	-0.5 - -0.25
6		5	-0.2652292	-0.5 - -0.25
7		27	2.1887585	2-3
8			-0.8229537	-1 - -0.75
9		13	0.6271299	0.5 - 0.75
10		6	-0.1536843	-0.25 - 0
11		4	-0.3767741	-0.5 - -0.25
12		37	3.3042075	3<
13		1	-0.7114088	-0.75 - -0.5
14		1	-0.7114088	-0.75 - -0.5
15			-0.8229537	-1 - -0.75
16	1	5	-0.2652292	-0.5 - -0.25
17	1	5	-0.2652292	-0.5 - -0.25
18	1	9	0.1809504	0 - 0.25
19	1	3	-0.4883190	-0.5 - -0.25
20	1	14	0.7386748	0.5 - 0.75
21	1	19	1.2963993	1-2
22	1	1	-0.7114088	-0.75 - -0.5
23			-0.8229537	-1 - -0.75
24	3	4	-0.3767741	-0.5 - -0.25
25	3	5	-0.2652292	-0.5 - -0.25
26	2	6	-0.1536843	-0.25 - 0
27	2	2	-0.5998639	-0.75 - -0.5
28	2	2	-0.5998639	-0.75 - -0.5
29	1	4	-0.3767741	-0.5 - -0.25
30	1	14	0.7386748	0.5 - 0.75
31	1	3	-0.4883190	-0.5 - -0.25
32	1	15	0.8502197	0.75 - 1
33	1	0	-0.8229537	-1 - -0.75
34	1	2	-0.5998639	-0.75 - -0.5
35	1	4	-0.3767741	-0.5 - -0.25
36	4	0	-0.8229537	-1 - -0.75
37	4	4	-0.3767741	-0.5 - -0.25
38	4	7	-0.0421394	-0.25 - 0
39	4	6	-0.1536843	-0.25 - 0
40	4	1	-0.7114088	-0.75 - -0.5
41	1	8	0.0694055	0 - 0.25
42	1	1	-0.7114088	-0.75 - -0.5
43	1	1	-0.7114088	-0.75 - -0.5

Burial	MP	Assemblage size	Z score	Standardised value
44			-0.8229537	-1 - -0.75
45	4	9	0.1809504	0 - 0.25
46	3	64	6.3159197	3<
47	3	4	-0.3767741	-0.5 - -0.25
48	1	1	-0.7114088	-0.75 - -0.5
49	3	21	1.5194891	1-2
50			-0.8229537	-1 - -0.75
51	2	1	-0.7114088	-0.75 - -0.5
52	2	1	-0.7114088	-0.75 - -0.5
53	1	5	-0.2652292	-0.5 - -0.25
54	1	1	-0.7114088	-0.75 - -0.5
55	1	1	-0.7114088	-0.75 - -0.5
56	1	10	0.2924953	0.25 - 0.5
57	2	3	-0.4883190	-0.5 - -0.25
58	3	3	-0.4883190	-0.5 - -0.25
59	1	7	-0.0421394	-0.25 - 0
60	1	6	-0.1536843	-0.25 - 0
61	1	15	0.8502197	0.75 - 1
61.1	1	1	-0.7114088	-0.75 - -0.5
62	3	5	-0.2652292	-0.5 - -0.25
63			-0.8229537	-1 - -0.75
64	1	8	0.0694055	0 - 0.25
65	4	9	0.1809504	0 - 0.25
66	4	16	0.9617646	0.75 - 1
67	4	0	-0.8229537	-1 - -0.75
68	3	2	-0.5998639	-0.75 - -0.5
69	4	13	0.6271299	0.5 - 0.75
70	4	2	-0.5998639	-0.75 - -0.5
71	3	11	0.4040402	0.25 - 0.5
72	3	15	0.8502197	0.75 - 1
73	3	6	-0.1536843	-0.25 - 0
74	3	6	-0.1536843	-0.25 - 0
75	3	29	2.4118483	2-3
76	3	25	1.9656687	1-2
77	3	16	0.9617646	0.75 - 1
78	3	2	-0.5998639	-0.75 - -0.5
79	2	0	-0.8229537	-1 - -0.75
80	3	7	-0.0421394	0 - 0.25
81	3	25	1.9656687	1-2
82	3	17	1.0733095	1-2
83	2	0	-0.8229537	-1 - -0.75
84	2	14	0.7386748	0.5 - 0.75
85	2	2	-0.5998639	-0.75 - -0.5
85.2	2	3	-0.4883190	-0.5 - -0.25
86	2	11	0.4040402	0.25 - 0.5

Burial	MP	Assemblage size	Z score	Standardised value
87	2	4	-0.3767741	-0.5 - -0.25
88	2	2	-0.5998639	-0.75 - -0.5
89	2	8	0.0694055	0 - 0.25
89.2	2	0	-0.8229537	-1 - -0.75
89.3	2	0	-0.8229537	-1 - -0.75
90	2	21	1.5194891	1-2
91	2	18	1.1848544	1-2
92			-0.8229537	-1 - -0.75
93	2	16	0.9617646	0.75 - 1
94	2	3	-0.4883190	-0.5 - -0.25
95	2	10	0.2924953	0.25 - 0.5
96	2	12	0.5155851	0.5 - 0.75
97	2	1	-0.7114088	-0.75 - -0.5
98	2	2	-0.5998639	-0.75 - -0.5
99	2	2	-0.5998639	-0.75 - -0.5
100	2	1	-0.7114088	-0.75 - -0.5
101	2	2	-0.5998639	-0.75 - -0.5
102	2	3	-0.4883190	-0.5 - -0.25
103	2	2	-0.5998639	-0.75 - -0.5
104	2	4	-0.3767741	-0.5 - -0.25
105	2	7	-0.0421394	-0.25 - 0
106	2	3	-0.4883190	-0.5 - -0.25
107	2	3	-0.4883190	-0.5 - -0.25
108	1	6	-0.1536843	-0.25 - 0
109	4	1	-0.7114088	-0.75 - -0.5
110	4	18	1.1848544	1-2
111	4	1	-0.7114088	-0.75 - -0.5
112	4	7	-0.0421394	-0.25 - 0
113	4	11	0.4040402	0.25 - 0.5
114	3	5	-0.2652292	-0.5 - -0.25
115	3	8	0.0694055	0 - 0.25
116	3	8	0.0694055	-0.25 - 0
117	3	11	0.4040402	0.25 - 0.5
118	3	2	-0.5998639	-0.75 - -0.5
119	3	1	-0.7114088	-0.75 - -0.5
120	3	36	3.1926626	3<
121	3	1	-0.7114088	-0.75 - -0.5
122	3	4	-0.3767741	-0.5 - -0.25
123	3	2	-0.5998639	-0.75 - -0.5
124	2	1	-0.7114088	-0.75 - -0.5
125	3	1	-0.7114088	-0.75 - -0.5
126	3	1	-0.7114088	-0.75 - -0.5
127	2	8	0.0694055	0 - 0.25
128	3	1	-0.7114088	-0.75 - -0.5
129	3	1	-0.7114088	-0.75 - -0.5

Burial	MP	Assemblage size	Z score	Standardised value
130	3	1	-0.7114088	-0.75 - -0.5
131	2	2	-0.5998639	-0.75 - -0.5
132	2	1	-0.7114088	-0.75 - -0.5
133	2	25	1.9656687	1-2
134	2	18	1.1848544	1-2
135	2	2	-0.5998639	-0.75 - -0.5
136	2	14	0.7386748	0.5 - 0.75
137		4	-0.3767741	-0.5 - -0.25
138	2	2	-0.5998639	-0.75 - -0.5
139	1	12	0.5155851	0.5 - 0.75
140	2	0	-0.8229537	-1 - -0.75
141	2	15	0.8502197	0.75 - 1

Appendix 4 Photogrammetry Methodology

Photo capture (separated into 2015 and 2016 field seasons)

2015

Photo 'stage' set up

The photo stage refers to the area used to hold the artefacts while photographs were taken. Photogrammetry works by matching pixels across photos to understand the distance and relationship between features in the photo (Luhmann et al. 2006). The stage set up is therefore very important to successful modelling as it should contain distinctive reference points while avoiding moving objects that can cause reconstructive errors. Largely homogenous stages are likely to result in a failed model due to a lack of reference points. Lighting the stage is also extremely important and often presents one of the most difficult aspects of using photogrammetry in the field. It is imperative that light is uniform over the entire artefact. Shadows or ill-lit parts of an object almost universally result in a faulty model. This also effects the types of materials that may be successfully transformed into digital models. Photogrammetry cannot be applied to objects which have shiny or reflective surfaces. In such cases light is reflected off the object surface at different angles in each photograph, with the result being no uniformity of pixels to match as belonging to the same area. The photo stage used in 2015 represents a preliminary attempt to overcome these issues.

In order to create an environment of constant, uniform light the shooting location was established outside under a leafy tree canopy. The leaves diffuse direct sunlight from above, replacing it with a soft light conducive to even lighting. The middle of the day was also avoided to mitigate harshness in the light, with the preferred shooting time 1-2 hours after sunrise or before sunset. Two light-diffusing lamps were placed on the photo stage at opposite corners to provide additional lighting to the underside of the artefacts.

The area was also selected for its isolation away from passers-by who may have otherwise been captured moving through the background of some photos, potentially creating erroneous reference points in the model reconstruction.

The stage was established on a metal table painted a non-glossy, dull grey. A selection of readily available objects such as pebbles and leaves (weighted down so as not to move) were scattered over the table to act as reference points. In the middle of the table a foam rectangle was placed as a prop to hold four thin bamboo supports firmly in place standing upright (Figure 1). The bamboo supports were equipped with a small amount of plasticine on the ends and were utilised to suspend artefacts. This method of holding artefacts allows the underside to be included in the model; however, it does obscure a marginal area where the supports are in contact with the artefact. Finally, a photo scale was placed on the foam base where it would appear in as many photographs as possible. This scale allows the produced models to be set at an exact scale for precise measurement taking.

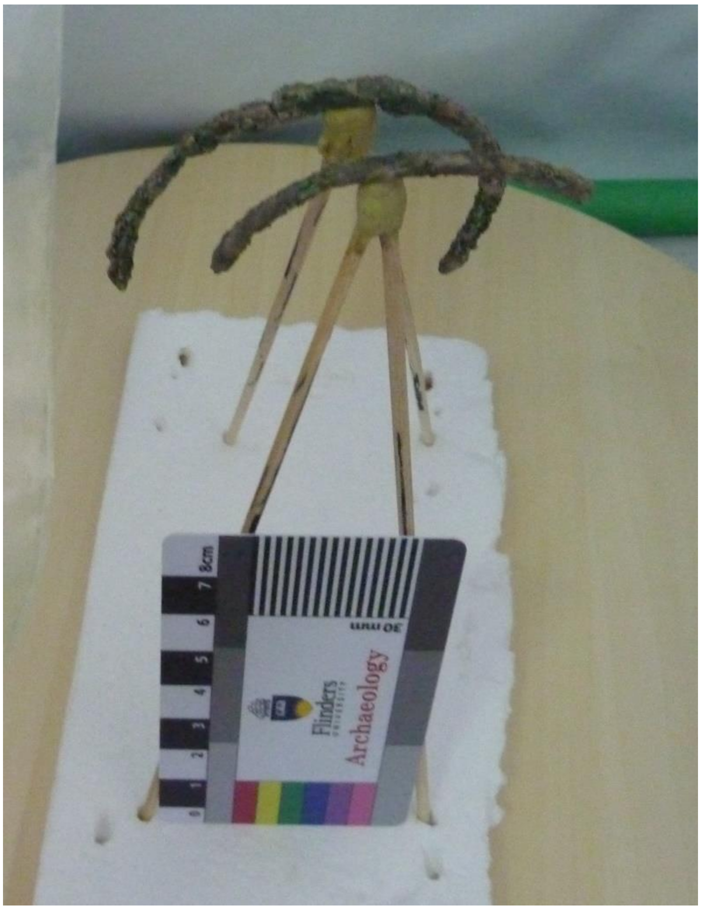

Figure 1 Artefact photography stage constructed of a foam base with bamboo supports.

Equipment and settings

A Panasonic Lumix DMC-FT1 digital camera was employed to take the photos during the 2015 season. The photos were shot by hand without a tripod on an in-built macro setting. A continuous, unbroken chain of images is needed in order for a program to match photos together. From a starting position in front and slightly above the stage photos were taken at regular intervals in a 360-degree rotation around the stage, keeping the camera at roughly the same level. This process created a single 'orbit' of the artefact. Once back to the starting position the camera was lowered in a series of small intervals. Once able to view the bottom of the object a second orbit was initiated following the same procedure as the first. For more complex artefacts three orbits at different heights were taken to ensure every aspect of the surface was covered in the photographs. A general range of 50-100 photographs, depending of object complexity, were taken per artefact.

2016

During the ensuing period between field seasons a number of early models were processed with mixed results. Aiming to rectify a number of the issues encountered, a range of small scale experiments were undertaken with various set-ups and equipment. These experiments led to the formation of the methodology used in the 2016 field season for the Thailand collection.

Photo stage set up

The stage configuration was almost entirely altered for the second season of fieldwork. Rather than an outdoor, open-air setting, the photo-stage was kept indoors. A portable photo studio designed specifically to provide even lighting on small object, was arranged around the stage (Figure 2). The light studio is a 40cm^3 cube of white fabric which diffuses light passing through to create an even spread inside the shooting area. One side of the cube is open for a camera to shoot the scene. A pine wood 'Lazy Susan' turntable formed the base of the stage instead of a static grey metal base. This change served two purposes, firstly it allowed the camera position to remain static while the table rotated to create an orbit. This both saved time and also allowed for a far greater level of homogeneity in the height of photographs and the spacing between them (Figure 3). The only movement required by the camera was when moving up and down between orbit levels and when going closer to pick up fine details on the artefacts. The light finish of the pine turntable meant that it served a vital secondary purpose as a reflector. A major issue encountered in the 2015 season was providing adequate lighting for the underside of artefacts. Having one or multiple reflectors on the ground is a common practice in photography in order to counter such issues without having to build lights into the floor (Langford 2002).

The equipment used to prop up the artefacts remained as the only point of consistency. The Styrofoam base, bamboo supports and photo scale remained the best available method for capturing as much of an object as possible.

Figure 2 Portable photo studio arranged over a wooden turntable for recording an artefact in 360 degrees under optimal, even lighting.

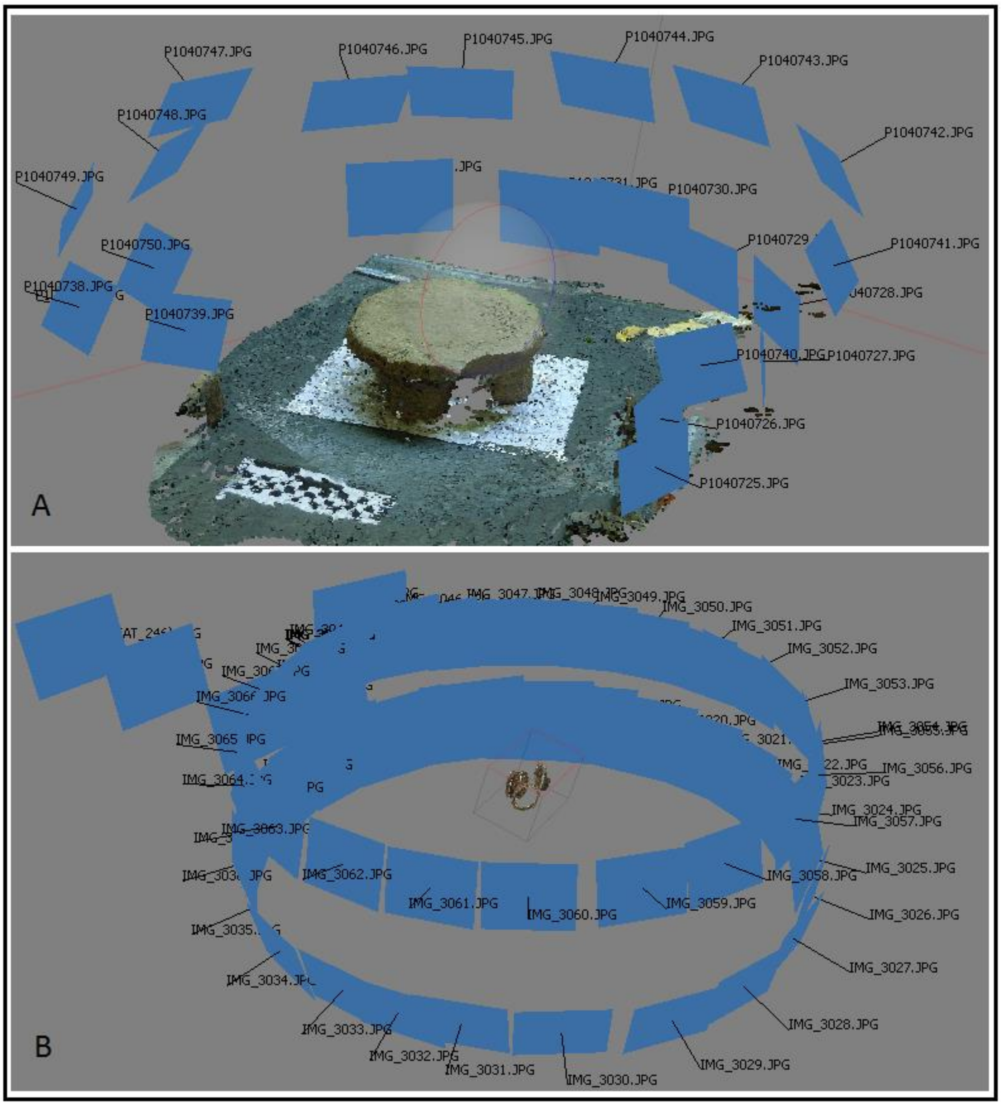

Figure 3 Digital illustration of capture orbits. Blue rectangles mark the camera position for models captured in 2015 (A) and 2016 (B).

Equipment and settings used

A Canon EOS 100D DSLR with a Canon EF 100 mm f/2.8 Macro USM lens was used for to take the photographs in 2016. The change in camera and lens setup provided a much greater level of detail which enhances the texture and accuracy of the final models. Changing to a DSLR allowed finer control of camera settings, in particular that of aperture diameter (f stop) and shutter speed. Good aperture control is vital for photogrammetry as this controls the depth of field of the photograph. A high f-stop (i.e. f/1.8) creates a very small depth of field where only a portion of the photograph is in focus and the rest remains blurred (Langford 2002: 42-49) (Figure 4 A). This kind of effect is commonly used in artistic photographs. Contrastingly, a low f-stop (i.e. f/14+) brings the entire photograph into sharp focus (Figure 4 B). This later setting is required for photogrammetry to run effectively. However, a low f stop also means that the camera aperture is smaller, allowing less light to pass through (Pritchard & Saxby 2005: 40). To counter this, the camera shutter speed must be slowed down, increasing exposure to permit more light to pass through and adequately illuminate the photographed scene. The effect of slowing the shutter speed is that any movement of the camera, no matter how minute, will blur the image. It was therefore necessary to incorporate a tripod to stabilise the camera. A two second timer was also applied to each photo to avoid camera shake when pressing the shutter button. While it is not possible to provide a definitive setting that should be universally applied for capturing photos using this setup as the level of lighting and the reflective properties of the object must be considered, a typical setting is around f/16 with a shutter speed of 1/10 sec. A range of between 50-100 photos were taken per artefact, with best results coming where a photo was taken every 10-15 degrees of rotation on two orbital levels (roughly 60-80 photos).

The macro lens also allowed even small rings to fill the screen, fulfilling a general recommendation of photogrammetry that the object to be modelled occupy at minimum roughly 70% each photograph (Autodesk Inc. 2015).

Figure 4 Demonstration of the effect of depth of field. The same scene above is shown when shot using two different camera settings. (A) A relatively high aperture setting creates a shallow depth of field in which only part of the scene is in sharp focus while the rest is blurred. (camera settings: f/4, shutter speed 1/30 sec). (B) A low aperture setting creates a large depth of field which brings the entire scene in focus (camera settings: f/22, shutter speed 1/8 sec).

Digital Modelling

The photogrammetry processing of images into three dimensional models altered between the first (Cambodian) and second (Thai) season. Initially, the entire process from inputting photos to exporting a manipulable model and even rendering video animations of models, was conducted using a single program, Autodesk® Memento (beta version- has since been rebranded commercially as Autodesk Remake). This particular software package is designed for people with little to no background knowledge in modelling or animation (Autodesk Inc. 2015) and automates the majority of the process, with the user only required to upload the desired photo stack and leave the program to convert this into a model. Once the model is complete it is then simply a case of cleaning the model by removing background 'noise' such as the photo stage to isolate the artefact. The photo scale included in photographs provides a scale to set a relatively accurate measurement system for the model. When the beta testing stage for the software ended in early 2016 only the Cambodian collection had been processed and it was unfeasible at the time to purchase a license of the full Autodesk Remake software.

The photogrammetry for the artefacts excavated in Thailand, along with a small number of those from Cambodia that required re-processing, was conducted using Agisoft Photoscan® (Agisoft LLC). This software package is designed more towards those with previous experience and knowledge with digital modelling. Photoscan provided numerous advantages for this project over Remake, including finer control of the modelling process as well as greater accuracy and quality of the final product. The digital models are constructed in stages, from matching of the photos, to building a dense cloud (3D model by matched pixels), to creating the mesh or wire frame and finally the texture overlay (Figure 5). The user may make alterations at any stage of this process, which is especially useful for removing background material which can distort the final model.

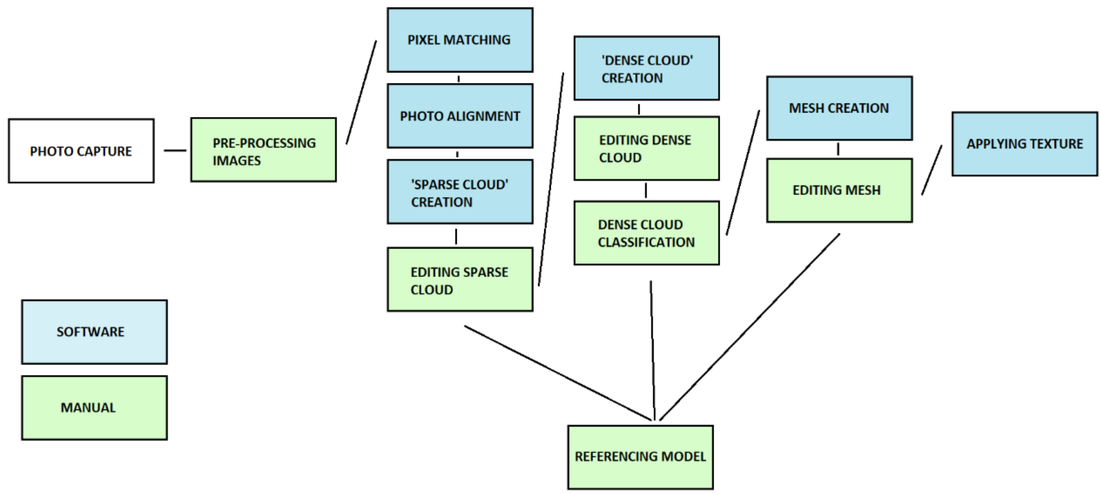

Figure 5 Workflow chart of photogrammetry process in Agisoft Photoscan®. Green boxes require human intervention, or may be skipped altogether, blue boxes are conducted automatically by the software. Providing a reference scale for a model may occur at several stages of the modelling process.

To create a video sequence to showcase the model the finished model must be exported from Agisoft Photoscan® into an animation or video editing program. This project used a freely available animation software package called Blender to create simple turntable videos for easy display of several artefacts. Videos such as these make for easy sharing of the models as they are typically small enough to be sent via email and can be read by most video players. To access the genuine, manipulable model itself it is necessary to have the appropriate software to open 3D models.

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