

The Identity at Death of the Old and Young from the Neolithic, Bronze and Iron Ages on the Southeast Asian Mainland

Kenneth William Ross



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ARCHAEOPRESS PUBLISHING LTD
13-14 Market Square
Bicester
Oxfordshire OX26 6AD
United Kingdom
www.archaeopress.com

ISBN 978-1-80583-062-7
ISBN 978-1-80583-063-4 (e-Pdf)

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Contents

List of Figures	v
List of Tables	vii
Declaration	viii
Acknowledgements	ix
Abstract	x
1 Introduction	1
1.1 Overview	2
1.2 Dissertation Objectives	4
1.3 Dissertation Argument	5
1.4 Dissertation Structure	5
2 Mortuary Archaeology, Mourning and Grief	8
2.1 Introduction	8
2.2 A Strategy of Communication: Mortuary Practices	8
2.3 Influence of the Dead on the Living	11
2.3.1 Normative and Atypical Burials	12
2.3.2 Fear of the Dead	12
2.4 The Materiality of the Body	13
2.5 The Dead as Active Social Agents	14
2.6 Bereavement	15
2.6.1 Grief: Neuroanatomical and Physiological Responses	17
2.7 Attachment and Loss	17
2.7.1 The Loss of a Baby	18
2.7.2 The Loss of a Child	19
2.7.3 The Loss of an Elderly Subject	19
3 Gender, Age and Ageing	21
3.1 Introduction	21
3.2 Engendered Archaeology	21
3.2.1 Gendered Approaches in Modern Thailand	23
3.3 A Gendered Approach to the Young and the Old	24
3.3.1. Age-Identity in Modern Thailand	28
3.4 Age-based identities	28
3.5 Evolutionary approaches to ageing	30
3.6 Ageing of Subadults, Adults and the Elderly	32
3.7 Palaeodemography	34
3.8 Summary	36
4 Mainland Southeast Asia: Overview and Site Discussion	37
4.1 Introduction	37
4.2 Mortuary Developments in Southeast Asia	38
4.3 Mortuary Developments in Thailand	40
4.4 Social influences affecting change in Southeast Asia	47
4.5 The Young and Elderly in Mainland Southeast Asia	50
4.6 Site Review	50
4.6.1 Khok Phanom Di	51

4.6.2	Ban Non Wat	53
4.6.3	Ban Lum Khao.....	55
4.6.4	Noen U-Loke.....	56
4.7	Summary.....	59
5	Materials and Methods	61
5.1	Introduction.....	61
5.2	Naming Conventions.....	62
5.2.1	Age Parameters – Subadults and Older Adults	62
5.3	Materials: Site Summaries and Contemporaneous Periods	65
5.4	Challenges in research model and fieldwork experience	68
5.4.1	Limitations of mortuary data for research purposes	68
5.5	Research Methods.....	69
5.6	The Burial of Human Remains (Mortuary Suite #1).....	71
5.6.1	Field Anthropology (sub-set to Mortuary Suite #1).....	72
5.7	Characteristics of the Grave (Mortuary Suite #2).....	73
5.8	The Relationship of Fauna with Burials (Mortuary Suite #3)	74
5.9	Case studies of health impacting mortuary behaviour (Mortuary Suite #4).....	75
5.10	Material Culture and its Relationship to Burials (Mortuary Suite #5).....	76
5.11	Spatial Relationship of Burials (Mortuary Suite #6).....	77
5.12	Data Management.....	78
5.12.1	Information Technology Systems.....	78
5.12.2	Statistical Analysis.....	78
5.13	Summary.....	80
6	Results: Khok Phanom Di	81
6.1	Introduction	81
6.2	Normative Mortuary Variables	81
6.3	Burial of Human Remains (Mortuary Suite #1)	84
6.3.1	Field Anthropology	87
6.4	Characteristics of the Grave (Mortuary Suite #2).....	88
6.5	Faunal Remains (Mortuary Suite #3)	90
6.6	Health Case Studies (Mortuary Suite #4).....	90
6.6.1	Health Profile #1 (Burial 150).....	90
6.6.2	Health Profile #2 (Burial 121)	92
6.6.3	Health Profile #3 (Burial 88)	92
6.6.4	Health Profile #4 (Burial 90)	92
6.6.5	Health Profile #5 (Burial 58)	93
6.6.6	Health Profile #6 (Burial 42)	93
6.7	Material Culture (Mortuary Suite #5).....	94
6.7.1	Assessment of mean number of grave good categories by class	99
6.8	Significant non-normative burial variables	101
6.9	Spatial Relationship of Burials (Mortuary Suite #6).....	104
6.10	Summary	106
7	Results: Ban Non Wat.....	109
7.1	Introduction.....	109
7.2	Normative Burial Variables.....	109
7.3	Burial of Human Remains (Mortuary Suite #1)	117
7.3.1	Burial of Human Remains (Mortuary Suite #1) – The Neolithic	117
7.3.2	Burial of Human Remains (Mortuary Suite #1) – The Bronze Age.....	117

7.3.3	Burial of Human Remains (Mortuary Suite #1) – The Iron Age	121
7.3.4	Field Anthropology	121
7.4	Characteristics of Grave Environment (Mortuary Suite #2).....	124
7.4.1	Characteristics of Grave Environment (Mortuary Suite #2) – The Neolithic.....	125
7.4.2	Characteristics of Grave Environment (Mortuary Suite #2) – The Bronze Age	125
7.4.3	Characteristics of Grave Environment (Mortuary Suite #2) – The Iron Age	130
7.5	Faunal Remains (Mortuary Suite #3)	130
7.5.1	Faunal Remains (Mortuary Suite #3) – Neolithic, Bronze and Iron Age.....	130
7.6	Material Culture (Mortuary Suite #5).....	139
7.6.1	Material Culture (Mortuary Suite #5) – The Neolithic	149
7.6.2	Material Culture (Mortuary Suite #5) – The Bronze Age.....	158
7.6.3	Material Culture (Mortuary Suite #5) – The Iron Age	158
7.6.4	Assessment of mean number of grave good categories by class	161
7.6.5	Assessment of mean number of grave good categories by class – Neolithic	161
7.6.6	Assessment of mean number of grave good categories by class – Bronze Age.....	164
7.6.7	Assessment of mean number of grave good categories by class – Iron Age	164
7.7	Significant non-normative mortuary variables	167
7.7.1	Significant non-normative mortuary variables – Neolithic, Bronze Age and Iron Age	172
7.8	Spatial Relationship of Burials (Suite #6)	175
7.9	Summary	176
8	Results: Ban Lum Khao	177
8.1	Introduction	177
8.2	Normative Mortuary Variables	177
8.3	Burial of Human Remains (Mortuary Suite #1)	179
8.3.1	Field Anthropology	182
8.4	Characteristics of Grave Environment (Mortuary Suite #2).....	184
8.5	Faunal Remains (Mortuary Suite #3)	186
8.6	Material Culture (Mortuary Suite #5).....	186
8.6.1	Assessment of mean number of grave good categories by class.....	194
8.7	Significant non-normative mortuary variables	196
8.8	Spatial Relationship of Burials (Mortuary Suite #6).....	196
9	Results: Noen U-Loke	201
9.1	Introduction.....	201
9.2	Normative Mortuary Variables.....	201
9.3	Burial of Human Remains (Mortuary Suite #1)	205
9.3.1	Field Anthropology	208
9.4	Characteristics of Grave Environment (Mortuary Suite #2).....	208
9.5	Faunal Remains (Mortuary Suite #3)	210
9.6	Health Case Studies (Mortuary Suite #4).....	213
9.6.1	Health Profile #7 (Burial 41).....	213
9.6.2	Health Profile #8 (Burial 97).....	213
9.6.3	Health Profile #9 (Burial 57.1)	214
9.6.4	Health Profile #10 (Burial 49)	214
9.6.5	Health Profile #11 (Burial 94)	215
9.6.6	Health Profile #12 (Burial 12)	215
9.7	Material Culture (Mortuary Suite #5).....	216
9.8	Significant non-normative mortuary variables	222
9.9	Spatial Relationship of Burials (Mortuary Suite #6).....	222
9.10	Summary	225

10 Results: Generalised Linear Modelling	229
10.1 Introduction	229
10.2 The Neolithic	229
10.3 The Bronze Age	235
10.4 The Iron Age	238
10.5 Summary	239
11 Discussion: Age as a Characterisation of Identity in Southeast Asia	242
11.1 Introduction	242
11.2 Childhood and Elderly Identities in Mainland Southeast Asia	243
11.2.1 The Burial of Human Remains	244
11.2.1.1 Ochre	245
11.2.1.2 Orientation	246
11.2.1.3 Constriction Practices	247
11.2.1.4 Limb Placement	249
11.2.2 Characteristics of the Grave	249
11.2.2.1 Jar Burial	250
11.2.2.2 Burial Depth	252
11.2.3 Faunal Remains	253
11.2.4 Health	254
11.2.5 Material Culture	255
11.2.5.1 Generalised Linear Modelling – Material Culture	255
11.2.5.2 Khok Phanom Di	257
11.2.5.3 Ban Non Wat	258
11.2.5.4 Ban Lum Khao	260
11.2.5.5 Noen U-Loke	260
11.3 Subadults and the Elderly Overview	261
11.4 Summary	266
12 Regionality and Resilience Theories in the Context of Southeast Asia	268
12.1 Introduction	268
12.2 Regionality Theory	268
12.3 Resilience Theory	271
12.4 Summary	274
13 Conclusion	275
References	280
Appendix 1: Reallocated Adult Age Categories	318
Appendix 2: Funerary Variable Descriptions	322
Burial of Human Remains	323
Field Anthropology Considerations	324
Characteristics of Grave Layout	324
Faunal Remains	325
Material Culture	326
Appendix 3: Burials by site including those excluded from analysis	331

List of Figures

FIGURE 1.1: Topographic map of Thailand with site locations: 1 – Khok Phanom Di, 2- Noen U-Loke, 3 – Ban Non Wat, 4 – Ban Lum Khao (adapted from public domain Sadalmelik 2007: https://en.wikipedia.org/wiki/River_systems_of_Thailand#/media/File:Thailand_Topography.png)	6
FIGURE 2.1: Foetal jar burial (B175) from Neolithic at Ban Non Wat (Photo: Higham, C.F.W. 2017. South East Asian Archaeology Data, Retrieved from https://drive.google.com/drive/folders/0BwyPRRjONdiFc0pQM3VTS09VVTA?resourcekey=0-_22Ha1sxdNIRheYBmBCMBg).....	19
FIGURE 4.1: Unionidae bivalve at skull of B90 from Ban Lum Khao (Photo: Higham, C.F.W. 2004. South East Asian Archaeology Data, Retrieved from https://drive.google.com/drive/u/0/folders/0BwyPRRjONdiFWHM5eXpDdEd0ejQ) 39	
FIGURE 4.2: Location of sites under review and discussed at Section 4.3.....	41
FIGURE 4.3: Site map of Khok Phanom Di. Colour was inserted to indicate 1984-85 excavation area (taken from Higham and Bannanurag 1990:14)	51
FIGURE 4.4: Turtle carapace artefact associated with gender identities (with adult males) at Khok Phanom Di (Photo: Ross 2013)	52
FIGURE 4.5: Site map of Ban Non Wat including excavation locations, earthen banks and channels (taken from Higham and Higham 2009a: 129)	53
FIGURE 4.6: Site Map of Ban Lum Khao. Black square on western aspect of site indicates 1995-96 excavation area (taken from Higham and Thosarat 2004:2)	55
FIGURE 4.7: Earthen feature at Noen U-Loke (Photo: Ross 2013)	58
FIGURE 5.1: Mortality profiles of ethnographic populations and archaeological sites.....	64
FIGURE 5.2: Example of normative (single, extended, anatomical with material culture) burial (Photo: Higham, C.F.W. 2017. South East Asian Archaeology Data, Retrieved from https://drive.google.com/drive/folders/0BwyPRRjONdiFc0pQM3VTS09VVTA).....	69
FIGURE 5.3: Example of non-normative (double burial containing adult and infant remains (at left shoulder – B47 and 48) burial from Khok Phanom Di (Photo: Higham, C.F.W. 2017 https://drive.google.com/drive/folders/0BwyPRRjONdiFTXBqam91Mjh0d0U)	70
FIGURE 5.4: Example of non-anatomical positioning of legs from an individual (B163) from Ban Non Wat (Photo: Higham, C.F.W. 2017 https://drive.google.com/drive/folders/0BwyPRRjONdiFc0pQM3VTS09VVTA)	70
FIGURE 6.1: Wealthy burial (B15) at Khok Phanom Di (Photo Higham, C.F.W. 1990. Retrieved from South East Asian Archaeology Data https://drive.google.com/drive/u/0/folders/0BwyPRRjONdiFTXBqam91Mjh0d0U).....	83
FIGURE 6.2: Comparison of orientation at 46-89°	87
FIGURE 6.3: Potential containment styles at Khok Phanom Di	88
FIGURE 6.4: Ceramic artefact position in burials at Khok Phanom Di (note artefacts from fill excluded).....	95
FIGURE 6.5: Comparison of worked stone artefacts in burials	99
FIGURE 6.6: Comparative of sites with ochre at skull.....	103
FIGURE 6.7: Comparison of burials with impressed ceramic decorative styles.....	103
FIGURE 6.8: Mortuary Phase 2 at Khok Phanom Di	104
FIGURE 6.9: Mortuary Phase 3 at Khok Phanom Di	105
FIGURE 6.10: Mortuary Phase 4 at Khok Phanom Di	106
FIGURE 6.11: Mortuary Phase 6 at Khok Phanom Di	107
FIGURE 7.1: Neolithic Adult Jar Burial (B28) from Ban Non Wat (Photo: Higham, C.F.W. 2010. Retrieved from South East Asian Archaeology Data https://drive.google.com/drive/u/0/folders/0BwyPRRjONdiFc0pQM3VTS09VVTA).....	110
FIGURE 7.2: Potential containment styles at Ban Non Wat – Bronze Age	118
FIGURE 7.3: Potential containment styles at Ban Non Wat - Aggregated.....	121
FIGURE 7.4: Comparison of Style 3 (loose non-durable wrapping) by site	124
FIGURE 7.5: Comparison of Style 8 (tight durable and/or non-durable wrapping or narrow coffin) by site.....	125
FIGURE 7.6: Comparison of the presence of complete faunal skeletal remains	168
FIGURE 7.7: Mortuary Phase Bronze Age 4 (adapted from Higham 2012p: 249).....	173
FIGURE 7.8: Mortuary Phase Iron Age 1 (adapted from Higham 2012a: 275)	174
FIGURE 8.1: Position of Hand – At, under, on pelvis	179
FIGURE 8.2: Orientation of burials – 136-179°	182
FIGURE 8.3: Potential containment styles at Ban Lum Khao	183

FIGURE 8.4: Comparison by those in loose/tight non-durable, or tight wrapping, or a narrow coffin (Style 9)	183
FIGURE 8.5: Comparison of sites by shallow grave depth.....	184
FIGURE 8.6: Comparison of burials with ceramic vessels with incised decoration	193
FIGURE 8.7: Ban Lum Khao, Mortuary Phase 1 (adapted from Higham 2004b: 23).....	198
FIGURE 8.8: Ban Lum Khao, Mortuary Phase 2 (adapted from Higham and Thosarat 2004b: 33)	199
FIGURE 8.9: Ban Lum Khao, Mortuary Phase 3 (adapted from Higham and Thosarat 2004a: 99).....	200
FIGURE 9.1: Potential containment styles at Noen U-Loke	208
FIGURE 9.2: Comparison of moderate (26-50cm) grave depths between sites	210
FIGURE 9.3: Mortuary Phase 1 and 2 at Noen U-Loke (adapted from Higham and Thosarat 2007f: 143)	226
FIGURE 9.4: Mortuary Phase 3 at Noen U-Loke (adapted from Higham and Thosarat 2007h: 153)	226
FIGURE 9.5: Mortuary Phase 4 at Noen U-Loke (adapted from Higham and Thosarat 2007b: 173)	227
FIGURE 9.6: Mortuary Phase 5 at Noen U-Loke (adapted from Higham and Thosarat 2007g: 223)	227
FIGURE 11.1: Jar Burial (B266) from Ban Non Wat (Photo: Higham, C.F.W. 2012. Retrieved from South East Asian Archaeology Data https://drive.google.com/drive/u/0/folders/0BwyPRRjONdiFc0pQM3VTS09VVTA)	250
FIGURE 11.2: Jar Burial (B14) from Khok Phanom Di (Photo: Higham, C.F.W. 1990. Retrieved from South East Asian Archaeology Data https://drive.google.com/drive/u/0/folders/0BwyPRRjONdiFTXBqam91Mjh0d0U)	251
FIGURE 11.3: Burial (B466) with ceramic vessel over face from Ban Non Wat (Photo: Higham, C.F.W. 2012. Retrieved from South East Asian Archaeology Data https://drive.google.com/drive/u/0/folders/0BwyPRRjONdiFc0pQM3VTS09VVTA).....	258

List of Tables

TABLE 5.1: Age allocations and descriptions applied to study	63
TABLE 5.2: Demographic structure at sites under review by age and sex	67
TABLE 5.3: Burials selected for health case studies	76
TABLE 6.1: Burial outcomes of high frequency at Khok Phanom Di (n=154)	82
TABLE 6.2: Chi-Square comparison of normative outcomes by age-at-death and sex - Burial of Human Remains	85
TABLE 6.3: Chi-Square comparison of normative outcomes by age-at-death and sex - Characteristics of Grave Environment	89
TABLE 6.4: Summary of suite #3 (Normative outcomes by age-at-death and sex) – Faunal Remains	91
TABLE 6.5: Summary of suite #5 (Normative outcomes by age-at-death and sex) – Material Culture	96
TABLE 6.6: Mean totals of material culture and fauna by age-at-death and sex – Khok Phanom Di	100
TABLE 6.7: Chi-Square comparison of non-normative outcomes by age-at-death (Khok Phanom Di)	102
TABLE 7.1: Burial outcomes of highest frequencies at Ban Non Wat (n=459)	111
TABLE 7.2: Summary of Suite #1 (Normative outcomes by age-at-death and sex) – Burial of Human Remains	113
TABLE 7.2.1: Summary of Suite #1 (Normative outcomes by age-at-death and sex) – Burial of Human Remains - Neolithic...	115
TABLE 7.2.2: Summary of Suite #1 (Normative outcomes by age-at-death and sex) – Burial of Human Remains – Bronze Age	119
TABLE 7.2.3: Summary of Suite #1 (Normative outcomes by age-at-death and sex) – Burial of Human Remains – Iron Age ...	122
TABLE 7.3: Summary of Suite #2 (Normative outcomes by age-at-death and sex) – Characteristics of the Grave	126
TABLE 7.3.1: Summary of Suite #2 (Normative outcomes by age-at-death and sex) – Characteristics of the Grave - Neolithic	127
TABLE 7.3.2: Summary of Suite #2 (Normative outcomes by age-at-death and sex) – Characteristics of the Grave – Bronze Age	128
TABLE 7.3.3: Summary of Suite #2 (Normative outcomes by age-at-death and sex) – Characteristics of the Grave – Iron Age	129
TABLE 7.4: Summary of Suite #3 (Normative outcomes by age-at-death and sex) – Faunal Remains	131
TABLE 7.4.1: Summary of Suite #3 (Normative outcomes by age-at-death and sex) – Faunal Remains - Neolithic	133
TABLE 7.4.2: Summary of Suite #3 (Normative outcomes by age-at-death and sex) – Faunal Remains – Bronze Age	135
TABLE 7.4.3: Summary of Suite #3 (Normative outcomes by age-at-death and sex) – Faunal Remains – Iron Age	137
TABLE 7.5: Summary of Suite #5 (Normative outcomes by age-at-death and sex) – Material Culture	140
TABLE 7.5.1: Summary of Suite #5 (Normative outcomes by age-at-death and sex) – Material Culture - Neolithic	146
TABLE 7.5.2: Summary of Suite #5 (Normative outcomes by age-at-death and sex) – Material Culture – Bronze Age	150
TABLE 7.5.3: Summary of Suite #5 (Normative outcomes by age-at-death and sex) – Material Culture – Iron Age	154
TABLE 7.6: Mean totals of material culture and fauna by age-at-death and sex – Ban Non Wat - Aggregated Data	159
TABLE 7.6.1: Mean totals of material culture and fauna by age-at-death and sex – Ban Non Wat - Neolithic	160
TABLE 7.6.2: Mean totals of material culture and fauna by age-at-death and sex – Ban Non Wat - Bronze Age	162
TABLE 7.6.3: Mean totals of material culture and fauna by age-at-death and sex – Ban Non Wat - Iron Age	163
TABLE 7.7: Non-normative outcomes by age-at-death – Ban Non Wat	165
TABLE 7.7.1: Non-normative outcomes by age-at-death – Ban Non Wat by temporal period	169
TABLE 8.1: Burial outcomes of highest frequencies at Ban Lum Khao (n=107)	178
TABLE 8.2: Summary of Suite #1 (Normative outcomes by age-at-death and sex) – Burial of Human Remains	180
TABLE 8.3: Summary of Suite #2 (Normative outcomes by age-at-death and sex) – Characteristics of the Grave	185
TABLE 8.4: Summary of Suite #3 (Normative outcomes by age-at-death and sex) – Faunal Remains	187
TABLE 8.5: Summary of Suite #5 (Normative outcomes by age-at-death and sex) – Material Culture	190
TABLE 8.6: Mean totals of material culture and fauna by age-at-death and sex – Ban Lum Khao	195
TABLE 8.7: Non-normative outcomes by age-at-death – Ban Lum Khao	197
TABLE 9.1: Burial outcomes of highest frequencies at Noen U-Loke (n=107)	202
TABLE 9.2: Summary of Suite #1 (Normative outcomes by age-at-death and sex) – Burial of Human Remains	206
TABLE 9.3: Summary of Suite #2 (Normative outcomes by age-at-death and sex) – Characteristics of the Grave	209
TABLE 9.4: Summary of Suite #3 (Normative outcomes by age-at-death and sex) – Faunal Remains	211
TABLE 9.5: Summary of Suite #5 (Normative outcomes by age-at-death and sex) – Material Culture	217
TABLE 9.6: Mean totals of material culture and fauna by age-at-death and sex – Noen U-Loke	223

TABLE 9.7: Non-normative outcomes by age-at-death – Noen U-Loke	224
TABLE 10.1: Test of GLM model effects – Neolithic	230
TABLE 10.2: Estimated sample means: period by age	231
TABLE 10.3: Estimated sample means: period by sex	233
TABLE 10.4: Test of GLM model effects – Bronze Age	236
TABLE 10.5: Test of GLM model effects – Iron Age	240

Declaration

The contents and opinions presented in this dissertation, unless otherwise acknowledged, is entirely the responsibility of the author.

Kenneth William Ross

Date: 31 July 2018

Acknowledgements

I would like to gratefully acknowledge my appreciation for the many people and institutions that helped me to navigate the candidacy process and complete this research. Most significant praise is directed at Professor Marc Oxenham who, as mentor and supervisor, was instrumental, through encouragement, patience, wisdom and more than a little sprinkling of good humour, in assisting me throughout the research journey so resolutely from start to finish. I would have been lost without him. Special praise also goes to Professor Eileen Murphy and Associate Professor Dougald O'Reilly who, as panel members, also provided immense encouragement and guidance throughout the research experience.

I would like to take the opportunity to thank the Office of the National Research Council of Thailand for its support and approval in facilitating fieldwork, most specifically in the 5th and 12th regional offices of the Fine Arts Department. Acknowledgments go to Mrs Subongkat Thongthongtip, Director of the Prachinburi National Museum and Mr Khun Sopot Phrommanodch, Executive Director of the 12th Regional Office at Phimai. Thanks must be expressed to the Director-General of the Fine Arts Department for the provision of access to archaeological material in Prachinburi and Nakhon Ratchasima provinces. I am grateful to the dedicated staff at each location including Miss Arunee Sae-Lout (Curator, Prachinburi National Museum), Mr Tossapon Srisamon (Director, Phimai National Museum) and Mrs Vipaporn Kwanpadung (Archaeological Assistant, Phimai Fine Arts Department Storage Facility) for their tireless support, encouragement, professionalism, and hospitality during my time at each location. I am also grateful to the professional staff from the Prachinburi National Museum, Phimai National Museum and the Phimai Fine Arts Department Storage Facility who provided tremendous support and warm hospitality during my time at each location. I felt very privileged to be given the opportunity to access and examine many important cultural artefacts of Thailand's rich prehistoric past.

Many other people from the Australian National University (ANU) and other institutions (University of Otago, James Cook University, University of Queensland) have provided direct, and indirect, support, either directly related to the research, approval to access, or the provision of, research material and advice in some capacity across the research process. Thanks go to Professor Peter Bellwood, Professor Charles Higham, Dr Nancy Tayles, Dr Nigel Chang, Dr Anna Willis, Dr Robert Attenborough, Dr Patrick Faulkner, and Dr Phil Piper. Appreciation also goes to Mr Bob Forrester and Dr Hwan-Jin Joon from the ANU's Statistical Consulting Unit. Several peers were invaluable colleagues along the journey and provided moral support, a good laugh and sage advice along the way and include Christine Cave, Dr Jarvis Hayman, Dr Lorna Tilley, Dr Mathieu LeClerc, Abu Kibria, Lauren Prossor, Dr Juliet Checketts and Elle Grono. Thanks also go to Dave McGregor, Max Napier, Liz Walters, Sue Fraser, Mark Dullow and Lan Tran from the School of Archaeology and Anthropology for your support and guidance when needed. This research is supported by an Australian Government Research Training Program (RTP) Scholarship.

My family and closest friends have provided endless goodwill, faith, and support throughout as the research process ensured I became a significantly peripheral figure in the social and familial landscape. Much love and deep respect goes to Predrag, Yasmine, Jane, David, Karl, Tanya, Cameron, Katrina, Sue, and Grahame. Love to my parents, Cathy, and John, who, through being strong advocates for education and personal drive, have always been supportive of my choices. Special thanks also go to my immediate, and extended, family, especially Daniel, Derek, and Dianne for their support. Finally, I want to acknowledge the life-affirming support, patience, wit, and affection from Annalisa and Corwyn who have been inspirational guides and companions for so long across this research journey.

Abstract

The aim of this research was to undertake a mortuary analysis to explore the identity-at-death of the young and old from four prehistoric Thai populations. The mortuary analysis sought to understand if each age group was exposed to normative or atypical funerary treatment over time as a predicate of differential, or shared, social views towards each age group. While studies, focussed on the young, have begun to emerge from prehistoric Southeast Asia the elderly remain under-researched. Research objectives sought to understand the significance and socially prescribed attitudes and behaviours towards each cohort, as expressed through the mortuary process. Indicators of potential transitional age barriers related to the young and the elderly were also explored.

The four cemetery populations comprised over 800 burials and provided the funerary data for this research. The sites spanned the archaeologically defined periods from the Neolithic to the Iron Age. One site, Khok Phanom Di (2000-1500BCE, Neolithic), was found in Prachanburi Province, Central Thailand, and the remaining three sites, Ban Lum Khao (1400-500BCE, Bronze Age), Ban Non Wat (1750BCE-CE500, Neolithic to Iron Age) and Noen U-Loke (400BCE-CE400, Iron Age) being found in Nakhon Ratchasima Province of Northeast Thailand. It was hypothesised that biosocial age was an important structuring element of social organisation in each community. It was further hypothesised that mortuary data for elderly subjects would demonstrate that the experience of ageing was unlikely to be expressed similarly over time following the attainment of an adult personhood status.

Biosocial analysis was based on a series of mortuary evidence commonly found in archaeological studies related to human burial, including features of the grave, spatial distribution, health, fauna, and material culture. Mortuary data was explored for each site individually; at a temporal level through the application of linear modelling and, to a lesser degree, between each geographic region. A recently developed ageing technique was applied to re-evaluate the age-at-death of adult subjects from Khok Phanom Di, Ban Lum Khao and Noen U-Loke with preliminary age assessments from Ban Non Wat retained.

While variable across time, the results suggest that age, and an age-identity, was an important structuring element, as observed through the mortuary sphere, of each site's social organisation. Evidence suggested broad differences in funerary practices between adults and subadults but also notes changing attitudes to children developing over time. Inferences of transitional age barriers related to children, but not the elderly, are seen in limited contexts. Results showed that the experience of adulthood, expressed through the funerary space, was not universal with, in many instances, evidence indicating that elderly subjects may have been afforded select, or elevated status based on their age in some contexts. Further research, either theoretical or methodological, focussed on elderly subjects is supported.

1

Introduction

This mortuary research explores the age-identities of individuals from four cemeteries in ancient Thailand. Primarily this research seeks to identify and discuss behaviours expressed towards subadults and elderly subjects following their death. The analysis is undertaken through the examination of funerary variables common in archaeology. While there are studies exploring subadults in prehistoric Southeast Asia (e.g., Oxenham et al., 2008a, Oxenham et al., 2008b, Halcrow et al., 2012, Halcrow et al., 2013) there is little research related to the elderly in this region (Ross and Oxenham, 2016). Where this study looks to add to the body of knowledge related to subadults from the region it also represents the first concentrated effort to explore the potential significance of the elderly from a number of sites across a broad span of time. A focussed examination on the elderly should provide more nuanced insights into the expression of adult personhood status over time.

Age is a defining characteristic of an individual's identity. Additionally, age is a lens through which the larger population perceives and behaves towards each actor. Biological age maps growth or decline as the individual transforms across the lifespan. Social age also gives rise to a series of transformations across the life course as the subject transitions through one phase and into another culturally defined age-based identity category. Actions based on an age-identity may solely affect the individual and the cohort to which they belong and, resultantly, deny or enable their interaction with a range of activities within their environment.

For children this may affect their social and personhood status as they transition through, near, or eclipse, a socially prescribed status threshold. A transitional age barrier may result in the individual being subject to socially prescribed obligations, limitations, or opportunities. Each transition may mark a broad change in perception and conduct towards the individual as they move from a period of variable dependency to independence. Further, a youth's age may beget societal expectations as to their role, anticipated level of engagement with certain tasks and their involvement, in ritual activity. Conversely, the effects of submitting to a socially enforced cessation of employment for elderly individuals marks, as perceived by many, a transition from independence and social engagement towards a withdrawal from society and increased dependency (i.e., governmental, filial, and medical) (Fealy et al., 2012). While brief, each example provides a simple demonstration of the potentiality for the profound effects of age on the individual's experience across the life course.

A relatively recent phenomenon of the industrial era has been the demographic ageing of the majority of nations. Through the twentieth and into the twenty-first century, we see a common trend among populations reflecting significant increases in the proportions of young-old (those aged 55-75 years) and old-old (those aged 75+ years) age cohorts (Powell and Gilbert, 2009, Vaupel, 2010, Leeson, 2015, Pakulski, 2016). This skewing upwards of age profiles reflects significant declines in infant mortality coupled with increasing longevity (Colombo, 2015). As populations age, a range of issues that impact individuals of advancing age present increasing challenges to relevant nation's health sectors, economies and social safety nets (Harper, 2006, Colombo, 2015, Pakulski, 2016). Demographic evidence from Britain shows a decline in infant mortality rates of children under one year of age from 154/1000 (15.4%) in the early period of the twentieth century to 4.4/1000 (<1.0%) in 2011 (Leeson, 2015). Conversely, the mortality profile of the British population is increasingly comprised of the young-old and old-old. In the mid-twentieth century over three quarters of all deaths were of individuals aged sixty or more, but that had increased to nearly ninety per cent by 2009 (Leeson, 2015). Similarly in the same period, the proportion of old-old within the mortality profile increased from a third to nearly two-thirds (Leeson,

2015). Projected levels in Australia of individuals aged sixty-five or more in the population are expected to double to 27.0% by 2050 (Pakulski, 2016).

Human senescence, or deterioration associated with increasing physiological age, has been delayed in many countries due to the twin effects of improved health outcomes and improved quality of life (Vaupel, 2010). Improved health outcomes have been achieved through improved management of chronic health conditions with its subsequent impact on disease burden rates. Improvements in quality of life has been influenced by factors, for example, related to improvements in nutrition, education, residency patterns and lifestyle. Across a range of Organisation for Economic Cooperation and Development (OECD) nations it is anticipated that life expectancy will increase in conjunction with a drop in the fertility rates (1.7 per woman), below the projected replacement level (2.1 per woman in the US) (Porta, 2014), and that people aged eighty years will increase by up to three times the current levels by 2050 (Colombo, 2015, Dupre-Harbord, 2015, OECD, 2015). This trend is witnessed in Thailand, the country of research, with fertility rates dropping below two children per woman and the proportion of the population aged sixty or more doubling by 2050 (Knodel and Chayovan, 2014). It is projected that the elderly (60+ years) will constitute a quarter of Thailand's population by 2030 (Knodel and Chayovan, 2014).

An increase in the elderly age demographic in a population's structure has resulted in the development and reinforcement of a range of negative characterisations of the elderly. These have been brought about by governmental or societal messaging within youth-centric Western nations and promulgated by media stereotypes (Harper, 2006, Fealy et al., 2012). Most affected by the negative societal effects of advanced ageing are adult females (Liechty and Yarnal, 2010, Dupre-Harbord, 2015). This is due to the longevity of the lifespan of females in comparison to males and may stem from greater susceptibility to health, cognitive and financial issues. Financial issues for females may be exacerbated by societal expectations of conduct or action (i.e., expectation of marriage, domestication etc.), the temporal deleterious effects of childbearing and child-rearing for women in the workforce, and the embedded inequality in relation to remuneration and advancement in employment across the life course. At a governmental level, there are two common themes in reference to the threat of an ageing population on a nation's economy. These related to the sustainability of costs on the healthcare system and/or the social security safety net as well as the burden on the economy, as the ratio of non-workers to workers increases over time (Colombo, 2015, Vogt and Kluge, 2015, Fealy et al., 2012).

Within this framework, dominant social policies related to the elderly focus on active ageing, or ageing well. This is to counter the inferred deleterious effects of the elderly on a society at a broad level and promote the continuation of independence. Research shows that notions of successful ageing are shared across cultures and relate to social, cognitive, physiological and emotional wellbeing (Fernández-Ballesteros et al., 2010), although there are cross-cultural variations to this approach (Liang and Luo, 2012). Wisely, governmental policy agendas towards the elderly must be mediated by the fact that some in this cohort represent an active, and growing, political base. Individuals acting on behalf of those unwilling or unable to represent their own interests are empowered to challenge or support the legitimacy and efficacy of sitting democratic government approaches to the elderly (Barnes et al., 2012). Within this environment of increased proportions of elderly citizens, studies have observed changing attitudes and expectations in regards to age-identity and how the subject perceives themselves in relation to family, peers, friends and the broader community (e.g. Sherman, 1994, Kaufman and Elder Jr., 2003, Craft et al., 2009).

1.1 Overview

As stated from the outset, the research undertaken in this dissertation will focus on bioarchaeologically derived age-at-death categories to explore the potentiality of age-identities, specifically for subadults

and the elderly, as a source of insight into mortuary behaviour on the Southeast Asian mainland. The approach taken to explore the age-identity of the young and old across the Neolithic, Bronze, and Iron Age, provides an opportunity to discuss temporality and the possibility of differential attitudes to age-identities in mortuary settings over time. Further, where discourse on social development with ancient Southeast Asia is well established this research leveraged two recently developed social theories, namely Regionality Theory and Resilience Theory, to explore the applicability of each in the Southeast Asian context using the available mortuary data.

Research centred on age-identities in the past provides a greater understanding of social organisation in antiquity. It also enables insights into the potential influence specific age cohorts exerted in ancient communities. Age identities are fluid across the lifespan. An age-identity can be constructed, independently or through the interaction of, biological changes or socially defined parameters affecting the individual (Sherman, 1994, Kaufman and Elder Jr, 2002, Gowland, 2009). Age identities inform perceptions and behavioural expectations, both objective and subjective, of individuals at a specific historical-cultural time as they adapt and transition through, different socially identified and constituted age barriers within a population.

Within the context of archaeological enquiry, the exploration of primarily biological age, is a key variable in biocultural calculations seeking to understand demographic, health and socio-cultural behaviours in the past. Bioarchaeological analysis of age and ageing provides information on issues related to population size, fertility levels, mortality profiles and the spread, impact and response of subjects to chronic or acute episodes of infection and disease (e.g. Panter-Brick, 1998, Beausang, 2000, Goodman and Martin, 2002, Hoppa and Vaupel, 2002, Hoppa, 2002, Scheuer and Black, 2004, Baker et al., 2005, Chamberlain, 2006, Lukacs, 2008, Pinhasi, 2008).

At a socio-cultural level, an examination of age and the ageing process in archaeological settings enables researchers to understand and discuss the significance of age as an inclusive or prescriptive factor in socio-cultural spheres of activity. Studies of this type can be ascribed at a population or individual level and are invariably aligned with other socially constructed parameters (Lillehammer, 1989, Kamp, 2001, Welinder, 2001, Lucy, 2005, Appleby, 2010, Appleby, 2017). This would include the individual's integration and engagement with, or through, daily spheres of social activity related to power, gender, personhood, or status, with economic responsibility and/or ritual practices. As such, age is a critical aspect of biocultural analyses towards elucidating the temporal identity of individuals from past communities.

The theoretical development of strategies to explore the potentiality of differential age cohorts was founded on the success of feminist approaches to method and practice. A developing area of research in a gendered approach to the past has included the importance of the role and significance of subadults and, more recently, the elderly (e.g. Lillehammer, 1989, Sofaer Derevenski, 1994a, Kamp, 2001, Welinder, 2001, Baxter, 2005, Lucy, 2005, Baxter, 2008, Gowland, 2009, Appleby, 2010, Appleby, 2011, Fahlander, 2013, Appleby, 2017, Gowland, 2017). This expansion of original lines of investigative enquiry towards age-based identities enabled researchers an opportunity to explore and perceive the past in previously unforeseen ways. Prior to this time, the paucity of research towards these cohorts reflected a series of theoretical and methodological limitations and entrenched bias from Western perspectives in relation to each subject group. Archaeological theory examining the significance of the young in the past is now well established. This aspect of research has been under development since the attendance of Lillehammer on the child and their socio-cultural contribution and engagement with a child's world experience (Lillehammer, 1989, Sofaer Derevenski, 2000, Lucy, 2005, Lillehammer, 2015).

While the theoretical and methodological difficulties facing the analysis of the elderly in the past are influenced by different limitations, there have nonetheless been significant barriers based on dominant

and negative Western perceptions in relation to the elderly that have influenced, or slowed, research into this important cohort (Lucy, 2005, Appleby, 2010, Appleby, 2017). Research focussed on the potential significance of the elderly in prehistory has only been under development in the very recent past with significant scope remaining for biocultural studies across different temporal periods and geographic locations (Welinder, 2001, Appleby, 2010, Appleby, 2017).

Mortuary settings are a key source of biocultural investigations for archaeologists as the medium provides material evidence on the social structure, the palaeoenvironment and socio-cultural behaviour in prehistory (Binford, 1971, Alekshin et al., 1983, Metcalf and Huntington, 1991, Carr, 1995, Chapman, 1997, McHugh, 1999, Parker Pearson, 1999, Chapman, 2003, Chapman, 2013, Fowler, 2013b). Cemetery populations preserve the individual at the fixed point of their death and may communicate, transform, negotiate or idealise how the subject was perceived socially (Mitchell, 2006, Sofaer, 2006, Michaels, 2012, Murphy and Le Roy, 2017). Archaeological approaches to mortuary analysis have undergone significant modification, in both method and theory, in the last sixty years (Trigger, 1989, McHugh, 1999, Parker Pearson, 1999).

There has been considerable archaeological and bioarchaeological research carried out across Mainland Southeast Asia in recent decades. As with other locales, much archaeological data on past populations in the region has been sourced from mortuary settings. The long history of occupation and migration, spanning through the Pleistocene to the historical period, continues to be exposed with greatest focus being on understanding social organisation, palaeohealth, and on developments related to economy or technology in the region. This research has provided evidence of Mainland Southeast Asia as a vibrant and complex area experiencing significant change through time.

The consideration of identities within a population, whether age-based, gender-based or otherwise is at an early stage of development within biocultural research from Mainland Southeast Asia. Nonetheless, researchers, particularly bioarchaeologists, in the region have started to engage with the potentiality of age-based identities, especially that of subadults, as a cohort that provides important insights in past socio-cultural systems in the region (Halcrow et al., 2007, Halcrow et al., 2008, Oxenham et al., 2008a, Oxenham et al., 2008b, Halcrow et al., 2012, Halcrow et al., 2016). This has also led to the attendance of the importance of personhood status of subadults from a number of sites including the Neolithic site of Man Bac in Vietnam (Oxenham et al., 2008b). Further, research focussed on elderly age-identity has now been initiated in the region which has provided insight into the differential status of this cohort (Ross and Oxenham, 2016). A gendered approach to the past has also been applied in Mainland Southeast Asia at the Thai Bronze Age site of Non Nok Tha, with evidence suggesting that differential positioning of human remains and the positioning of some artefacts may have been influenced by gender over time (Bacus, 2006, Bacus, 2007). All this suggests that, in addition to evidence from other sites across the region over time, there is evidence for individual identity (based on age or sex) being a factor in determining or influencing the funerary treatment of subjects across the mainland of prehistoric Southeast Asia.

1.2 Dissertation Objectives

Despite considerable progress on the part of bioarchaeologists and archaeologists to elucidate the importance of age and gender in the structure and development of some communities in Southeast Asia, there remains a critical need for continued research in relation to age-based identities in the region. This dissertation is based on the premise that there is currently a research void with respect to understanding the identities of the young and old on the Southeast Asian mainland.

The four sites explored in this thesis, Khok Phanom Di (KPD), Ban Non Wat (BNW), Ban Lum Khao (BLK) and Noen U-Loke (NUL), were selected as they enable a comparative approach towards mortuary behaviour,

1 INTRODUCTION

at an intra and inter-group level, of each age cohort of interest either temporally or geographically. That is that Khok Phanom Di and Ban Non Wat were occupied during the Neolithic and also that Ban Lum Khao and Ban Non Wat were occupied in the Bronze Age with the three sites of Ban Non Wat, Ban Lum Khao and Noen U-Loke situated in close proximity to one another. The sites selected were occupied across a period spanning the Neolithic (2000BCE-1500BCE), Bronze Age (1500BCE-500BCE) and to the Iron Age (500BCE-500CE). Figure 1.1 shows the approximate location of each site in Thailand.

The objective of this dissertation is to undertake a mortuary analysis of the aforementioned four assemblages in order to explore, identify and discuss the visible treatment of the old and young by those living survivors who buried them. Such an approach will enable an understanding of how the young and old were perceived and treated, within and across temporal periods, and provide an insight into the active roles they occupied in a range of situations from the more secular through to philosophical-religious. This core objective will be achieved through the identification and discussion, in relation to old adults and subadults, of the following items:

the attitudes and perception towards these subjects by the living population, being those individuals that observed and executed the burial of the deceased within the context of the population's belief system with respect to the appropriate treatment of the young and old;

the evidence for normative and differential/atypical mortuary treatment within, and across, specified age-based cohorts to examine if mortuary treatment towards each cohort was shared diachronically within, and synchronically between, populations;

the evidence from older adult and subadult burials that supports an inference of the transition across the life-cycle and identifies the biological and social age at which this transition occurs across each population temporally; and

socially constructed identities (i.e. age, gender, personhood, status, power, death-identity), and the individual age-based or sex-based categories that each applies to.

1.3 Dissertation Argument

This dissertation will argue that the old and young were important agents, variably, through time at each of the sites under investigation. Evidence will demonstrate that each cohort, but primarily the elderly, was significant in their social environment, as witnessed through their mortuary treatment over time. Consequently, that a subject's age, and more specifically their age-identity, especially where advancing age occurs, was an influential factor in the categorisation and subsequent mortuary treatment of its community members. Finally, from a regional, and to lesser extent global, position this dissertation will argue for greater emphasis on the study of the old and young in biocultural studies to redress the current inequality, or void, of research focussed on each of these subject groups.

1.4 Dissertation Structure

Structurally, this dissertation will be divided into two major components. The initial three chapters represent the first broad structural component, following this introductory chapter, and are focussed on discussing several divergent subjects, from a disciplinary and theoretical standpoint, to contextualise the overarching argument discussed throughout this dissertation. Chapter Two, titled "*Mortuary Archaeology, Mourning and Grief*", is constructed to evaluate and review multiple subject areas. The first section of this chapter examines social parameters surrounding the death and subsequent burial of an individual. This section discusses the potential for realising the significance of mortuary rituals and funerary practices

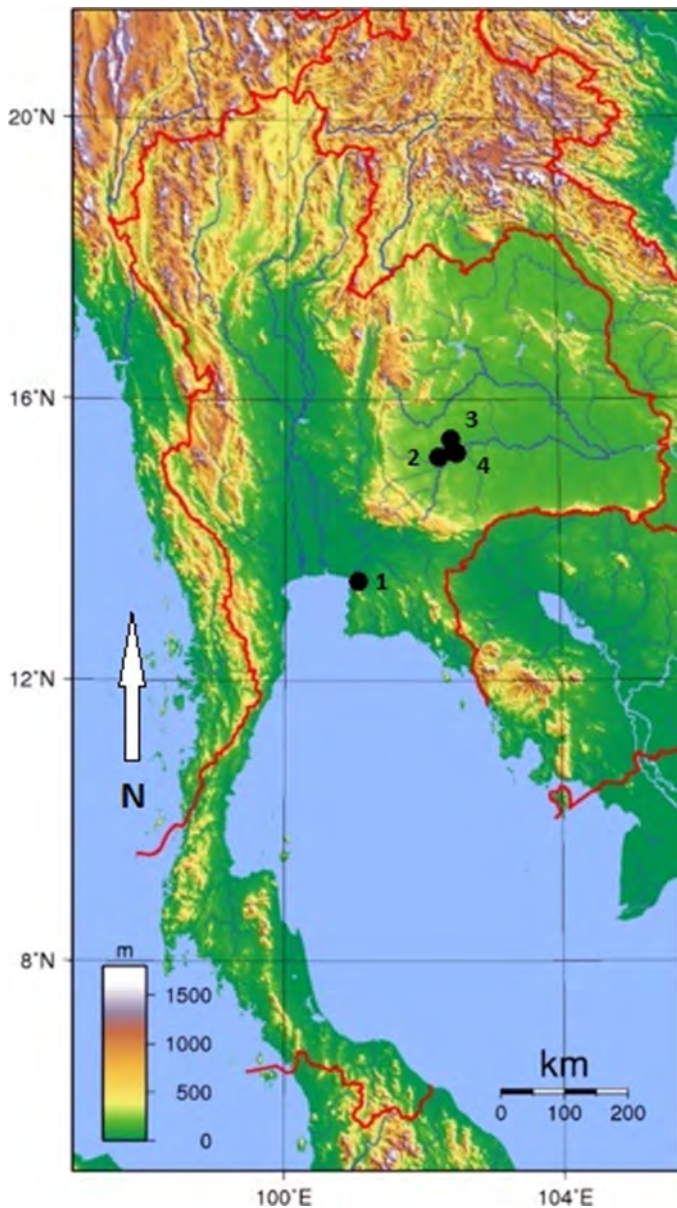


FIGURE 1.1: Topographic map of Thailand with site locations: 1 – Khok Phanom Di, 2- Noen U-Loke, 3 – Ban Non Wat, 4 – Ban Lum Khao (adapted from public domain Sadalmelik 2007: https://en.wikipedia.org/wiki/River_systems_of_Thailand#/media/File:Thailand_Topography.png)

as spheres of agency which communicate, reinforce, or re-define socio-cultural behaviour and custom and the exchange of memory. Within this environment, where the life-identity of the individual transcends into their identity at death, the dead frequently continue to actively engage with their social environment. The final section of this chapter examines the potential of physiological, psychological, and neurological responses to death and grief, especially in relation to the cohorts under review, as a means of identifying emotion affecting bereavement, grief and mortuary treatment.

Chapter Three titled “*Gender, Age and Ageing*”, examines a range of issues related to the study of age and age-identity, the biological factors influencing ageing, viewed skeletally as growth and degeneration, and the methodological and theoretical limitations affecting age-based biocultural studies. The initial section critically reviews the origins, development and influence of a gendered approach towards biocultural analysis in archaeology. This includes the role of gender in contemporary Thailand. The second part of this chapter reviews the development of age-based identity studies in archaeology, specifically in relation to the young and old, the complex understanding of age as a defining characteristic of an individual’s identity and social attitudes of the young and old. The third section examines palaeodemography, evolutionary processes and biological factors that have, or continue to, affect the human ageing process with the final section providing a critical analysis of factors, such as methodological or theoretical barriers, limited sample sizes or

intrinsic researcher bias towards the subject group, limiting research in this important area.

Chapter Four titled “*Mainland Southeast Asia: Overview and Site Discussion*”, provides a general overview of a range of mortuary traditions in Southeast Asia and in Thailand across the Pleistocene and into the Holocene with greatest emphasis being placed on critical factors affecting socio-cultural development and behaviour across the Neolithic, Bronze and Iron Ages. This includes the developing influence of India and China, the consequent suite of technologies, ideas and knowledge brought into Mainland Southeast Asia and extant debates over the origins of bronze in the region. Particular attention is also focussed

upon evidence of a gendered approach to mortuary remains and of identity studies, especially in regard to the young and old, in the region. Finally, this chapter provides a comprehensive and critical review of current research and outcomes from each of the four sites under review with greatest emphasis on studies elucidating the role of the young and old in each community across time.

Chapter Five titled “*Materials and Methods*”, provides a discussion on the available materials analysed, conventions used, and the variable methods applied to achieve the objectives of this research. Primarily this research undertakes a comparative analysis of data sourced from published material to form the primary dataset for analysis. Following the method developed by Cave and Oxenham (2016) a tooth wear analysis was executed on dentition to re-categorise age ranges of elderly subjects, if appropriate, into discrete age groups. Funerary variables under analysis include attendance of the treatment, position and status of human remains and their relationship with the burial environment, both immediate and influential, the material culture, artefacts and fauna, the health status of individual subjects and the spatial distribution of subjects across each cemetery. This chapter provides discussion on statistical methods applied and information technology systems adopted to store, manage and analyse data.

Chapters Six through Nine titled as “*Results*” by individual site name, provides detailed results, primarily through the representation of data and statistical analysis in tabulated form, of the application of each methodology applied in relation to each targeted subject area. Results of the analysis of data were used to identify and discuss mortuary behaviour, synchronically, at an intra-site level as an initial step to understanding normative funerary practices across each of the sites at specific times which subsequently demonstrated if subadults and older adults were provided normative mortuary treatment or were exposed to atypical mortuary treatment within, and across time, at each site. The analysis at Ban Non Wat is both synchronic and diachronic to factor in the potential for observed differential funerary behaviour at the site. Chapter Ten, titled “*Results: Generalised Linear Modelling*”, provides the results of an analysis examining broad trends, by age and to a lesser degree sex, across the three temporal periods under review. A series of transformed and non-transformed variables were applied to test the potential for differential mortuary behaviour.

Chapter Eleven titled “*Age as a Characterisation of Identity in Southeast Asia*” discusses each of the key objectives outlined in this research to argue there is sufficient, although variable, evidence from each of the four sites under review to support the view that the old and young, to a lesser and variable degree, were active and significant agents within the socio-cultural and philosophical-religious interactive spheres through time. As a result, data related to the perception and behaviour towards the old and young, the exposure of both age cohorts to normative and/or atypical mortuary behaviour through time, the evidence for transitioning through the life cycle and the inherent inferences of ageing and the experience of ageing, are discussed in detail. It will be observed that biosocial age was a key characteristic affecting social behaviour and that young and old were socially significant identity groups, variably, in each population. Chapter Twelve titled “*Regionality and Resilience Theories in the Context of Southeast Asia*”, uses the available mortuary data from the sites reviewed to explore and discuss, as noted above, the potentiality of two recently developed social theories, namely Regionality Theory and Resilience Theory, as new models for social development on Mainland Southeast Asia. This analyses, as an extension of the age-based focus of this research, continues to use age and sex-based mortuary data developed through this dissertation to explore each theoretical model. A Regionality Theory perspective is based on contrasting mortuary data from Khok Phanom Di and the Neolithic occupation period at Ban Non Wat. A Resilience Theory is focussed on mortuary data from the three sites, namely Ban Non Wat, Ban Lum Khao and Noen U-Loke, in the Nakhon Ratchasima Province of Northeast Thailand. The concluding thirteenth chapter provides a summary discussion of the major observations of this dissertation and reviews future avenues of research.

Mortuary Archaeology, Mourning and Grief

2.1 Introduction

Mortuary archaeology remains a key medium and avenue through which scholars can engage with and reconstruct aspects of the funerary ritual, and associated social and cultural meanings, of ancient communities. Through its long history, archaeology has researched human burials to provide insight and knowledge into social organisation, demography and palaeohealth, technological and economic development and cosmological or philosophical-religious belief systems.

With the focus of this dissertation being mortuary archaeology, it is appropriate that discussion be afforded to a range of funerary and thanatological research issues relevant to the objectives of this study. It is the intention of this mortuary research, specifically, to explore how elderly and subadult cohorts are treated, as witnessed through their mortuary outcomes, in each of the sites under review over time. As such, a range of subjects are explored that may offer insights into the range of funerary behaviours connected to the young and old at the sites under review.

The first part of this chapter (Section 2.2) discusses, in relation to a range of more conventional approaches found throughout the literature, a series of issues related to the significance and influence of mortuary and ritual practices as a feature of social organisation and individual identity.

The second part of this chapter (see Section 2.7 to 2.8) exploits clinical data, namely psychological and neurological, to explore a range of issues in relation to bereavement and grief. Given this study is focussed upon funerary practices as a medium to understanding attitudes towards the young and old, the clinical research leveraged primarily relates to those subject groups. This chapter reviews a range of subjects in relation to bereavement and grief to consider if clinical outcomes may be exploited to explain potential differential mortuary behaviour in relation to the young and old. While it is not the intent of this research to impose a set of emotions onto subjects from prehistoric Thailand, it is also recognised, in addition to the conventional mortuary approaches undertaken, that the effects of grief may also influence the range of visible behaviours directed at the young and old from each site. Areas of research reviewed in this section are focussed on maternal-infant attachment and the neurological and physiological responses to death especially following the loss of a child or elderly parent.

2.2 A Strategy of Communication: Mortuary Practices

Mortuary archaeologists examine a range of human behaviours, not least being social organisation, and the construction and transformation (i.e., living vs dead) of identities, power, embodiment, emotion and memory (e.g., Saxe, 1970, Binford, 1971, Battaglia, 1992, Carr, 1995, Tarlow, 1999, Chesson, 2001, Binford, 2004, Kuijt, 2008, Sørensen, 2009, Adams and King, 2010, Nilsson Stutz, 2010, Sayer, 2010, Fowler, 2013a, Stutz and Tarlow, 2013, Torres-Rouff and Knudson, 2017). Understanding the association between the body, however transformed, and the material culture of death is at the heart of mortuary archaeology. This can be through the materiality of the body to provide inferences regarding social behaviours, actions, and identities; through engagement with symbolic aspects of the mortuary ritual in the landscape; or through material culture which is active, biographical, memory-laden and subjective (Sofaer, 2006, Fahlander and Oestigaard, 2008, Kuijt, 2008, Taylor, 2008, Sørensen, 2009, Adams and King, 2010).

The work of van Gennep has been influential in archaeological discourse in relation to initiation and understanding funerary practices and, more broadly, passages across the life cycle with his 'rites of passage' (a threefold journey of transition, transformation and reintegration) being most significant (van Gennep, 1960, van Gennep, 2004, Garwood, 2012, Taylor, 2012, Verhoeven, 2012). These transitions marked a change in the categorisation and metamorphosis of one social category into another and were formulated through ritual (van Gennep, 1960, Littlewood, 1992, Parker Pearson, 1999, Mitchell, 2006, Garwood, 2012, Fowler, 2013b). Where a death-event occurs, the transition and transformation of the deceased is often associated with a transitional journey during a liminal phase into an afterlife which is followed by a reintegration back into the social group with a transformed identity (e.g., ancestor etc.) (Oestigaard and Goldhahn, 2006, Garwood, 2012, Röttger-Rössler, 2012, Taylor, 2012). A liminal phase refers to a transitional state between social categories and is based on the antithesis of structural norms (*communitas*) prior to being reintegrated into a community (Turner, 1969, Garwood, 2012). Liminalities occur throughout the life course and can be witnessed in barriers related to age, gender, status, identity and, in the current context, death (Cave and Oxenham, in press). Ethnographic evidence from Southeast Asia demonstrates the applicability of van Gennep's approach to ritual behaviour from Malaysia (Antoni, 1982, Appell and Appell, 2003). Antoni (1982) discusses the Semang of the Malaysian Peninsula and the belief in the liminality of death as the deceased transitions through an afterlife and back into life. Appell and Appell (2003) also observed a belief in the liminal, and peripheral, state occupied by the dead of the Rungus Momogun of Sabah.

Another influential theoretician with respect to mortuary archaeology is Hertz. Through his analysis of secondary burials of Dayak people, he noted the horror, shock, and fear of death as being overwhelming to survivors and that these emotional responses leads to a series of actions executed through a funerary ritual that are intended to mitigate risk and re-establish social structure (Hertz, 1960, Carr, 1995, Parker Pearson, 1999, Taylor, 2012). Within this context, the cause and effect of a death had the potential to destabilise the social cohesiveness of a group (Hertz, 1960, Bloch and Parry, 1982). Further, he noted that requisite mortuary rituals were determined based on relations between the deceased, its soul and survivors (Hertz, 1960, Carr, 1995). Where secondary burial occurred, it was argued that this was required to meaningfully facilitate the journey of that soul into an afterlife (Carr, 1995). An individual's mortuary treatment could inform the social identity of the subject (Hertz, 1960). In addition to its social component, Hertz recognised that the preparation of a corpse was also important, transformatively, at a biological level (wet to dry state) to mitigate the visceral horror and revulsion associated with a dead body (Hertz, 1960, Hertz, 2004, Beit-Hallahmi, 2012). The work of van Gennep and Hertz, and their conception and approaches to human remains and their effects on social and ritual behaviour, remain highly influential in mortuary archaeology to this day.

Funerals, including activities before, during and after death, facilitate, in a socially structured and symbolic way, disposal of the dead. Funerals also act to recalibrate, and provide meaning to, the social group (Littlewood, 1992, Parker Pearson, 1999, Rosenblatt, 2003, Oestigaard and Goldhahn, 2006, Leming and Dickenson, 2009, Rosenblatt, 2009, Holloway et al., 2013). Funerary action communicates, re-establishes and reintegrates cultural traditions and social values through ritualised, and repetitive, performance and the use of material culture to inform on a group's specific views of death, the afterlife and social cohesion (Kearl, 1989, Rosenblatt, 2009, Garwood, 2012, Ekengren, 2013). Funerals then, in turn, mark the passing of an individual actor but also serve as a means to communicate social identities, agency, power and ideology (Oestigaard and Goldhahn, 2006). Funerary customs in contemporary Thailand are predominantly based on the practices subscribed to within Buddhism of the Theravada school, which involves a funerary service in a temple, cremation, including cremation of the casket, and the placement of remains in an urn within a pagoda (Matsunami, 1998). Ritual behaviour, executed by family and religious specialists, include bathing of the body and an engagement with material culture

through movement and fragmentation (deliberate ritualised motions and subsequent shattering of a cup and bowl) (Matsunami, 1998). Sociologically, it can be argued that theoretical approaches to agency within the funerary sphere could facilitate an understanding of individuals in the past (Harper, 2010). This position argues for the social agency of the dead in their ability, as subject (not object), to engender, or motivate, specific types of action towards the deceased (Harper, 2010).

Mortuary archaeologists suggest that ritual, and through it the process of ritualisation, are important vehicles for understanding, and embodying, social rules, power and ideology and is variable across cultures (Berggren and Stutz, 2010, Verhoeven, 2012, Swenson, 2015). Rituals and the ritualisation process are highly symbolic and specific to the given audience, with a range of factors controlling the type of ritual process initiated and by whom it is initiated (Rosenblatt, 1997, Young and Papadatou, 1997, Rosenblatt, 2003, Beckman, 2013, Holloway et al., 2013). Theorists have argued that ritual activities are processual and structured (related to Practice Theory), with the meaning of the ritual manufactured through repetition (practice) and engagement (Bell, 1992, Verhoeven, 2012, Swenson, 2015). Following Bell's (1992) influential work, the execution of a mortuary ritual is seen as a way for survivors to communicate, transform and re-integrate the core structural values of a society and to reinforce cosmological or philosophical-religious belief systems (Bell, 1992). The ritualisation of actions associated with the funerary ritual is created, and structured, as a discrete body of behaviours that are separate from routinized behaviours and elevate the status and meaning within that social group of certain types of activity and, through them, may act to include or exclude some social actors from receiving specific types of funerary treatment (Bell, 1992, Parker Pearson, 2000, Röttger-Rössler, 2012, Verhoeven, 2012, Ekengren, 2013, Stutz and Tarlow, 2013, Perego, 2014).

An important component of ritual, in this context the funerary ritual, is its social element communicated through performance which, through symbolic and narrative interaction (i.e. commemoration, memorialisation etc.), provide both meaning and sense-making for, and of, the deceased (Verhoeven, 2012, Swenson, 2015, Davis et al., 2016). Performance aspects of ritual behaviour in relation to the dead engage with multiple senses and may also include the giving of eulogies as statements of public acknowledgement, consolation and/or praise that reinforce the transformed identity of the deceased and the living (Mitchell, 2006, Oestigaard and Goldhahn, 2006, Scarre, 2012, Davis et al., 2016). Aspects of the multi-sensory nature of performance associated with funerary rituals may engage with a variety of materialities that relate to feasting practices, visual stimuli (i.e. fire, ochre), auditory stimuli (i.e. singing, expressive wailing), olfactory stimuli (i.e. prestige foods etc.) or tactile stimuli (i.e. material culture as gift, offering or heirloom) and are argued as important in the generation, and regeneration, of identity (Hamilakis, 1998, Davies, 2002, Kuijt, 2008, Hamilakis, 2012, Beckman, 2013, Härke, 2014, Smith, 2015). The performance aspect of rituals may also be an important culturally prescribed, sanctioned, behaviour that mitigates the risk, to families or the broader social group, of the deceased (Mitchell, 2006, Adams and King, 2010). Ethnographic evidence of the mortuary activities from the Hmong people of Southeast Asia indicate that the performance aspect of the ritual is critical to communicating group history, common values and familial linkages from the past and into the future (Falk, 2004a, Falk, 2004b).

The transformative nature of performance can also influence space and the perception of space where the burial arena can become charged with power and social significance and can be absorbed into social memory (Kearl, 1989, Mitchell, 2006, Graham, 2009, McAnany, 2010, Verhoeven, 2012). Performance, as an extension of this, may also transform and imbue material objects with power and identity through the funerary ritual and through their relation with the deceased, the space within which the ritual occurs and the artefact itself (Tilley, 2006).

Much of the work of mortuary archaeology revolves around the cemetery. Archaeologically, evidence of the presence of cemetery spaces goes back to the Late Upper Palaeolithic (Pettitt, 2011). The cemetery

is a sanctioned, and often significant (social, cosmological) space, laden with symbolic significance and meaning, which can provide an insight into relations, identities, power structures and organisation in the past of both the living and the dead (Kearl, 1989, McHugh, 1999, Sørensen, 2009, Sayer, 2010). A cemetery, while sacred, can also be regarded as secular in function (Rugg, 2000). The inclusion, or exclusion, of certain burial types (e.g. unbaptised, baptised) from the cemetery, let alone their treatment within or without the cemetery, provides opportunities to explore social and cultural conventions and values (Finlay, 2000, Jacobi, 2003, Charlier, 2008). A function of cemeteries can also be found to establish and sustain a legitimisation of place (Territoriality Theory) at a geographic, community or familial level (Pardoe, 1988, Carr, 1995, Kuznar, 2003, Littleton and Allen, 2007).

Section 2.2 explored a variety of topics related to the process of death including liminality, ritual and ritualisation, the funeral and its associated performance and the significance of the cemetery. The following section explores a range of topics related to concepts of death anxiety and the pervasive notion of good or bad deaths. Researchers have argued that issues related to death anxiety or the good or bad death can be observed through the presence of deviant burials.

2.3 Influence of the Dead on the Living

A common theme throughout thanatological research, culturally constructed, is the presence of death anxiety and death denial (Ariès, 1960, Kearl, 1989, Becker, 2004, Neimeyer, 2009, Wong and Tomer, 2011). A fear of death is influenced by psychobiological, cultural and emotional responses (dread, avoidance, pollutant etc.) to the actual dead body (Parker Pearson, 1999, Davies, 2002, Beit-Hallahmi, 2012, Tritt et al., 2012). The presence of a dead body is feared at an intellectual level and also as a perceived locus of disease and corruption (Beit-Hallahmi, 2012, Taylor, 2012, Robb, 2013). Terror Management Theory (TMT) postulates that the realisation of the inevitability of human bodily death may lead to a death anxiety which constitutes a range of behaviours and practices to manage this fear (Shilling, 1993, Hayslip Jr., 2003, Neimeyer, 2009, Taubman-Ben-Ari, 2009, Beit-Hallahmi, 2012, Tritt et al., 2012, Belmi and Pfeffer, 2016). The development of an afterlife, and the belief systems and associated underlying meanings, are a means of mitigating this fear (Neimeyer, 2009, Taubman-Ben-Ari, 2009). This viewpoint is not universal with practitioners of Buddhism, for instance, unable to negate the effects of a death anxiety as proposed under the TMT, because reincarnation, unless nirvana is achieved, is a continuation of suffering (Kearl, 1989, Hayslip Jr., 2003, Hui and Coleman, 2012).

Variable factors, countering a pervasive death anxiety, include an avoidance or resigned acceptance of death, or an embrace of death where extreme suffering is involved (Kearl, 1989, Neimeyer, 2009, Wong and Tomer, 2011). Neimeyer (2009) observes a subjects embrace of death could relate to a release from pain sufferance or positive anticipation of an afterlife. It has also been suggested that alternative drivers such as meaning and self-determination, as opposed to terror, are significant where death and self-identity and self-awareness occur (Wong and Tomer, 2011, Beit-Hallahmi, 2012). Evidence suggests that a personal death anxiety decreases with increasing age, with the very old having reached a stage of acceptance and those younger more prone to denial of the death experience (Sprang and McNeil, 1995, Ellor and Harris, 2009, Momtaz et al., 2015, Major et al., 2016). This is countered by elevated anxiety over spousal loss with increasing age (Whitbourne and Meeks, 2011, Momtaz et al., 2015). Mortality profiles demonstrate that humans are living longer and this has affected modern industrialised society perceptions to death with dying becoming associated with extreme age in many societies (see Chapters One and Three) (Ellor and Harris, 2009). Ariès (1960, 2004) suggested, in the fifth phase (see Section 2.4.2) on attitudes to death, increased privatisation had also led to elevated levels of medicalisation and hospitalisation in regards to elderly cohorts which has facilitated a social isolationism of the elderly, and by proxy, the denial of death at a broader social level (Kearl, 1989, Prior, 1989, Shilling, 1993, Hart et al., 1998, Ellor and Harris, 2009, Kearl, 2009). An increase in gerontophobia, in conjunction with

the climbing rates of hospitalisation of the elderly, engages with sociological Disengagement Theory whereby there is a split between the elderly and the broader society (Kearl, 2009).

2.3.1 Normative and Atypical Burials

A relatively common encounter in the excavation of sites and cemeteries from archaeological settings is the presence of deviant, or atypical burials. Deviant burials are seen as a counterpoint to normative burials which explain the common mortuary practices predominating at an archaeological site either across, or within a specific time (Tsaliki, 2008, Weiss-Krejci, 2008, Sherwood, 2009, Perego, 2014). A death may be considered as deviant, or potentially understood as a bad death, if it falls outside the range of socially prescribed expectations surrounding a good death within a certain temporal period (Shay, 1985, Aspöck, 2008, Sherwood, 2009). A deviant burial, like the deviant death, falls outside normative mortuary practices and may be explored as a means to infer social behaviours or identities (Rose, 1922, Alekshin et al., 1983, Shay, 1985, Tsaliki, 2008, Perego, 2014). Aspöck (2008: 27) suggests that a study of deviant burials, with their focus on the individual, their agency and the marginality of some cohorts within a social landscape, lends itself to many of the objectives outlined in post-processual approaches to archaeology (Tsaliki, 2008). However, the presence of deviant burials in some contexts may indicate an ongoing social responsibility between the living and dead as outlined through processual archaeology (Shay, 1985, Aspöck, 2008).

It is postulated that deviant burials may arise as a way to mitigate the risk (i.e. pollution) to survivors associated with the deceased individual who is recognised as a malevolent or unsettled spirit that may cause harm to surviving ancestors or the community more broadly (Aspöck, 2008, Tsaliki, 2008). A growing engagement with deviant burials in archaeological discourse has provided insight into the funerary treatment of children who had died prematurely through/during childbirth, due to infectious disease war, (van Gennep, 1960, McHugh, 1999, van Gennep, 2004, Donnelly and Murphy, 2008, Sîrbu, 2008, Weiss-Krejci, 2008, Gardela and Duma, 2013) or individuals with congenital malformations (Charlier, 2008). Commonly used evidence of deviant burials from archaeological settings include the presence of decapitated remains, atypical deposition (i.e. prone, weighted etc.) or orientation, as well as atypical location within (or without) the cemetery (Aspöck, 2008, Tsaliki, 2008, Gardela and Duma, 2013).

2.3.2 Fear of the Dead

A common theme in thanatological research is the consideration of the 'good' and 'bad' death which is built upon the work of Ariès and his description of the 'tamed' death, the first of the five phases associated with death in the West from the medieval period (Ariès, 1960, Ariès, 1962). The tamed death, criticised as being overly imaginative and romantic, refers to a collective experience of death where death is theorised as being familiar, inevitable and openly accepted (Ariès, 1960, Ariès, 1962, Shilling, 1993, Ariès, 2004, Blevin, 2009b). The subsequent phases, the Death of the Self; Remote and Imminent Death; Death of the Other and the Invisible Death (Ariès, 1960, Ariès, 1962, Ariès, 2004) move away from this initial position. These changes saw a shift from an openly accepted death towards an isolated and 'shameful' death following the advent of individuation. This is the increased privatisation of the individual and the family and the medicalisation, commodification and hospitalisation of death and ageing, often associated with the "Western" experience of death (Ariès, 1960, Ariès, 1962, Shilling, 1993, Ariès, 2004).

While death is universal, the manner of the death event can influence the perception of death as good (associated with societal expectations) or bad (oppositional to societal expectations) (Sherwood, 2009). In this context, good deaths, or good ways of dying, can conform to or meet the expectations of society

and the individual and their family/community network (Kearl, 1989, Hart et al., 1998, Blevin, 2009a, Kastenbaum, 2009, Sherwood, 2009). This can include dying peacefully with an awareness and clarity of the dying experience or with dignity (Hart et al., 1998). A bad death may be understood as being untimely, as disruptive (affecting identity-formation) or as polluting in certain social or philosophical-religious spheres of activity (Kearl, 1989, Cecil, 1996, McHugh, 1999, Appell and Appell, 2003, Hayslip Jr., 2003, Vera, 2003, Sherwood, 2009, Härke, 2014). A determination of what type of death occurred may influence ritual and mortuary treatment of the deceased and also the redefined social identity following death (McHugh, 1999, Davies, 2002, Jacobi, 2003, Walter, 2009, Nilsson Stutz, 2010). Hart et al. (1998) note that increased hospitalisation and medicalisation of death and ageing leads to decreased levels of individuation, with dying elderly identities being suppressed, to fit with expectations of a good death within a hospital or care environment.

The concept of a good or bad death is applicable to both Western and non-Western societies (Bloch and Parry, 1982, Jacobi, 2003). In the West, researchers have long noted shifting familial and residential behaviours, coupled with changes to mortality profiles, as impacting on the treatment and perception of the elderly. In this circumstance, with the life expectancy of males and females increasing (72.0 years, Global Health Observatory (GHO) data, 2016), death has become perceived as belonging in the domain of the elderly (Kearl, 1989) which in turn renders it a good death. Traditionally in Taiwan the elderly (men, mothers of sons or married women) are the cohorts included as filial ancestors, with the death of these individuals seen as good deaths while the death of an unmarried woman is considered bad and as a potential social pollutant (Shih, 2010). Rituals associated with these good deaths are focused on the transformation of the social identity of the individual from living to ancestor (Walter, 2009, Shih, 2010). To counter this treatment, financially independent unmarried Taiwanese women, traditionally excluded from certain mortuary practices, have taken to securing funerary services themselves prior to their death. Conformity to, or inclusiveness in, normative burial conventions may lend itself towards an archaeological inference of a 'good' death (Nilsson Stutz, 2010).

2.4 The Materiality of the Body

Shifting direction, the current section moves towards a discussion of topics related to the materiality of the body. This includes a brief exploration on the theoretical foundations behind this aspect of research which also comprises consideration of the embodied subject and the phenomenological approach to the body. The following section (Section 2.6) will explore issues related to the agential qualities of the deceased on surviving mourners.

A key development in post-processual archaeology, built on sociological, anthropological and ethnographic work, is body theory and, through it, a reconsideration of the materiality of the embodied subject (Fahlander and Oestigaard, 2008, Robb, 2008, Shilling, 2008, Sørensen, 2009). An exploration of embodiment is tied to the work of Bourdieu and the concept of *habitus* which considers the formation of encultured practices on the body through subjective repetitive, and imitative, engagement: a 'logic of practice' within a specific social-historical milieu (Bourdieu, 1977, Bourdieu, 1989, Mitchell, 2006, Tilley, 2006, Hodder, 2007). Body theory explores the body in its social and historical context from an epistemological, phenomenological and ontological position (Scheper-Hughes and Lock, 1987). From here, aspects of agency, ideology, power and identity are meaningfully constituted through the human body (Schildkrout, 2004, Robb, 2008, Shilling, 2008).

The materiality of the body follows post-processual approaches to explore the active transformative relationship and meaning behind material culture within a fluid and contested social environment (Hodder, 1982a, Buchli, 2004, Fahlander and Oestigaard, 2008). Joyce (2004) suggests that an exploration of embodied subjects may provide an insight into how gender was constructed and experienced based

on the presence of specific material culture. A phenomenological approach to embodied subjects, built on the work of Merleau-Ponty, offers a departure from the traditional Cartesian, or Heideggerian, mind/body, object/subject duality and argues, based on a theory of perception, for both the active agency and materiality of the body, as well as the mind, in space and time (Merleau-Ponty, 1962, Tilley, 1999, Hodder, 2000a, Thomas, 2006, Thomas, 2015). That, from a phenomenological perspective, the individual intentionally influences knowledge and meaning through their own experience (Thomas, 2006).

A phenomenological approach explores the lived experience of past people as an avenue to understanding human experience and is important in recognising that social agents can influence and shape, as well as be influenced by, their environment (Scheper-Hughes and Lock, 1987, Hodder, 2000a, Joyce, 2004, van Wolputte, 2004, Thomas, 2006, Shilling, 2008, Powell and Gilbert, 2009). For example, the individual from a phenomenological perspective is not only consciously aware of an object but also of its, and their, relation and meaning to each other in a broader social context at a given time (Thomas, 2006). Here, the object (i.e. vocabulary, tool etc.) is not passive, but actively engages and shapes the interaction and experience of the individual in their social environment (Tilley, 1999, Tilley, 2006, Fahlander and Oestigaard, 2008). An alternative to the phenomenological approach in considerations of the body is that of epistemology. Epistemology, through its use of historical representations of the body and ethnography, examines knowledge and representations of the body to explore ideas of social pollution and social identity (Douglas, 1966, Shilling, 2008).

2.5 The Dead as Active Social Agents

The concept of agency explores the motivation, constraints and habits of individuals and associated material culture within a structural system at a given time. Agential studies, relating to an individual's personal agency and ability to actively influence their surroundings at an individual and collective level can provide insight into issues of identity, gender, personhood, power and ideology (Dobres and Robb, 2000, Hodder, 2000a, Bandura, 2001, Barrett, 2001, Gardner, 2008). Bandura (2001) posits four defining features of personal agency being intentionality, forethought, and self-reactiveness and reflectiveness. A theory of agency post-processually posits that individual subjects are not only influenced by the dominant structural social paradigms but are themselves vehicles in the creation and ongoing transformation of said structures through time and space (Tilley, 2000, Borić and Robb, 2008, Shanks, 2008). Theoretical approaches to agency also recognise that material culture (and the individual it engages), whether prescribed with constituted meaning at a symbolic or functional level, contains an agency to be shaped (object) and to shape (subject) its broader surroundings (Hoskins, 1998, Hoskins, 2006, Fahlander and Oestigaard, 2008). The work of Gell, where material culture (i.e. art) is offered as having an active agency in its social milieu, has been influential in the development of theoretical approaches to agency in post-processual archaeology (Gell, 1998, Hoskins, 2006).

Following on from body theory and the engagement with the dead body as subject (Taylor, 2012), it has recently been argued that the dead body is agential in its active influence on the social and ritual behaviour of survivors (Gansum, 2008, Sørensen, 2009, Harper, 2010, Robb, 2013, Crandall and Martin, 2014). This viewpoint observes the potentially transformative nature of the dead and their ability to redefine, and/or reintegrate, social identities (Gramsch, 2013, Robb, 2013, Crandall and Martin, 2014). This can be observed through the range of differential meanings/treatments of corpses at hospitals, funeral homes, and funerals in private residences or at fatal accident scenes (Sørensen, 2009, Harper, 2010, Robb, 2013). Following on from the fear of the dead, and based on the influential work of Hertz, the living are compelled through a range of ritual, social, cultural and psychobiological responses to act in meaningfully constituted ways with respect to the corpse (Hertz, 1960, Jacobi, 2003, Hertz, 2004, Sørensen, 2009, Beit-Hallahmi, 2012). Ethnographic and archaeological observations show ancestral beliefs affect the behaviour of antecedents, through obligatory and ritual action, tied to an expression

of collective memory that seeks to mitigate harmful consequences and/or maintain a proximal link with ancestors for the ongoing security and benefit of kin or household (Adams and King, 2010, McAnany, 2010).

2.6 Bereavement

As noted in the introductory section, this chapter comprises two overarching themes. The first half, Sections 2.2 to 2.5, explored a range of topics related to mortuary archaeology, agency, the materiality of the body, death anxiety and notions good and bad deaths and how they may be visible archaeologically. Now the chapter (see Section 2.6 to 2.8.3) moves away from more conventional and widely accepted approaches to mortuary studies and discusses a range of issues related to the human experience of bereavement and grief with particular attention paid to the effects, on survivors, of the death of the young or old. Given the focus of this research, this approach was undertaken to explore, at a meta-level, if the potential for differential mortuary treatment of either of the two cohorts under review could be explained, in part, by behaviours associated with the grieving process in modern populations.

Post-processualism has engendered a series of theoretical applications regarding the buried body and its materiality. These include the advent of feminist archaeology and a consideration of gender and age as spheres of inquiry in relation to archaeological data (see Chapter Three). A developing issue in archaeological discourse is that of emotion as a behavioural driver, in addition to social factors and cultural traditions. The individual agency of social actors, within the framework of socially prescribed behaviours where death occurs (Holloway et al., 2013), can actively influence the burial environment because of the emotional attachment they held with the deceased (Tarlow, 1999, Stutz and Tarlow, 2013, Cannon and Cook, 2015). While the literal emotional output of grieving survivors will remain invisible to analysis, an emotional attachment may be inferred through the deceased's mortuary treatment or associated grave goods. Bioarchaeological analyses have recently begun to argue for the presence of care, and by implication compassion, in prehistory where there is evidence of an individual requiring care-giving due to the osseous presence of severe pathology (Tilley and Oxenham, 2016). Emotional displays from survivors may be viewed in the broader context, comparatively to other burials, of the mortuary setting the deceased subject occupies.

While death is universal, bereavement, the grieving process and mourning rituals associated with it are not. Bereavement refers to the emotional condition of survivors following the death of an individual with which they had some form of relationship while the mourning process acts as the socially prescribed behaviour in this context (Sprang and McNeil, 1995, Balk, 2009). An important element for survivors in the bereavement and grieving process is meaning-making, or sense-making, following the loss (Sprang and McNeil, 1995, Neimeyer and Gamino, 2003, Hayslip Jr et al., 2009, Schuurman, 2009, Holloway et al., 2013, Gillies et al., 2014, Davis et al., 2016). Meaning-making refers to a personal process that is constructed following the death of an individual to enable mourners to address, understand, and renegotiate the death in its social, spiritual and emotional context (Neimeyer and Gamino, 2003, Holloway et al., 2013). This could include issues surrounding individual identity, gender, memory, social relations, spirituality or guilt as examples and is a process that is ongoing as well as shaped through a range of communication strategies (Neimeyer and Gamino, 2003, Holloway et al., 2013, Davis et al., 2016).

The process of mourning may include specific ritual practices, the observation of local cultural traditions, extended over variable time periods, public displays of grief, enforced isolation from the social group, and affect behaviour (speech, clothing) (Rosenblatt, 2003, Holloway et al., 2013). The grieving process is related to bereavement and reflects the emotional manifestation of that process and can affect the individual at a social, physiological and psychological level (Balk, 2009, Jakoby,

2012, Corden and Hirst, 2013, Hayslip Jr et al., 2015, Cannon and Cook, 2015). A grieving process for an individual that held an emotional bond with the deceased involves a redefining and transformation of identity following the death of an attachment figure and a meaning-making process through the shared social communication of memories and biographies as a coping mechanism (Whitbourne and Meeks, 2011, Jakoby, 2012, Gillies et al., 2014). Grief diagnoses include Common (Uncomplicated), Resilient, Chronic, Complicated and Disenfranchised Grief. Common grief refers to the effects of grieving which pass over time, with Resilient Grief being applied to the bereaved that demonstrate minimal displays of public emotion following the death (Littlewood, 1992, Whitbourne and Meeks, 2011). Sufferers of Chronic Grief experience elevated levels of depression and grief over an initial period with the grieving process continuing over time, while less common Complicated Grief is characterised as occurring over a prolonged period with psychological and physiological effects (Littlewood, 1992, O'Connor et al., 2008, Lang et al., 2011, Mancini and Bonanno, 2011, Whitbourne and Meeks, 2011).

Grief studies are influenced by, and built upon, Freud's *Mourning and Melancholia* (1917) which saw the mourning process in terms of withdrawal and denial (Neimeyer and Gamino, 2003, Balk, 2009). Grieving, and the intensity of the grieving process, is affected by a range of factors. These include the relationship with the deceased, the survivor's personality, cultural and/or religious influences, social factors, the manner of the individual's death and the survivor's own previous experience with death and loss (Sprang and McNeil, 1995, Rosenblatt, 2003, Vera, 2003, Hayslip Jr et al., 2009, Hunt and Greeff, 2011-12, Hayslip Jr et al., 2015). Clinical research into the psychological effects of death and grieving are dominated by analyses taking place in Western environments. However, an expanding corpus has engaged with the grieving process from a cross-cultural perspective which challenges Eurocentric perceptions of grieving (Cecil, 1996, Rosenblatt, 1997, Young and Papadatou, 1997, Rosenblatt, 2003). For example, the Rungus people of Borneo consider death as dangerous and disruptive to social continuity as negative energies and restless spirits, unless managed appropriately through the ritual process, can have an ongoing deleterious influence on surviving kin and the community more broadly (Appell and Appell, 2003). Of significance are deaths of children, death in childbirth, accidental death or death through an illness (see Section 2.4.1). An understanding of cross-cultural approaches to grieving recognises that the cause of death may be perceived as coming from natural or supernatural causes and that this may influence the manner of mortuary treatment and ritual and/or grieving behaviour prescribed for the deceased (Rosenblatt, 2003).

Clinical research indicates that acute grief was recognised as a debilitating medical condition from the mid-twentieth century (Neimeyer and Gamino, 2003). The development of complicated, long lasting, grief can be exacerbated or brought forward with respect to parents' relationships or family units when the death involves a child (Hunt and Greeff, 2011-12, Lang et al., 2011). Further studies demonstrate a variable range of physiological and psychological impacts including behaviours relating to the broader community to death and grieving based on age and sex (Vera, 2003, d'Epina et al., 2009-10, Whitbourne and Meeks, 2011, Hayslip Jr et al., 2015). For instance, males tend to externalise behavioural issues (i.e. disengagement, anger, concentration) while females manifest somatic variation (i.e. fatigue, breathlessness, abdominal complaints) following the death of a parent (Hayslip Jr et al., 2015).

The presence of a dead individual has been suggested to have an agentive quality which influences the behaviour of survivors as they seek to cope with the loss and transform their social setting at an individual and collective level (Sørensen, 2009). Archaeological practice in relation to the dead has benefited from adopting theoretical perspectives from a range of alternative disciplines including history, sociology and anthropology. This has facilitated a broader approach to understanding the deceased individual in their social and cultural environment. Expanding on this tradition, this research seeks to explore psychological approaches to bereavement and grief, as an adjunct to a potential emotional response to death as an additional area to consider where an understanding of differential mortuary practices

occur in archaeological settings. The research recognises that the remaining sections of the chapter are tangential to discussions commonly found in archaeological discourse. However, in addition to more commonly applied approaches to mortuary data, a consideration of the potentiality of grief as a predicate of funerary practices was considered. Clinical data shows a variety of responses, both immediate and long lasting, pertaining to the death of an older or younger individual. Although still considered problematic across the discipline, a consideration of grief and emotion within the funerary sphere may provide greater insight when addressing the variability found in mortuary settings.

2.6.1 *Grief: Neuroanatomical and Physiological Responses*

Psychological effects of bereavement are commonly recognised and include guilt, anger, anxiety or relief (Littlewood, 1992, Schuurman, 2009). Neurological testing (i.e. functional Magnetic Resonance Imaging (fMRI), Positron Emission Tomography (PET)) of grieving humans indicates an activation of localised areas in the ventral prefrontal brain associated with processing of emotions (O'Connor et al., 2009). Further, pictorial/verbal testing methods show activation in a number of neural areas (visual imagery, processing, and memory retrieval), including the caudate nucleus, which may have some correlation with the neurological basis of attachment, as hypothesised and argued in Attachment theory (see Section 2.8) (Bowlby, 1980, Gündel et al., 2003). Further, neural testing has revealed that the nucleus accumbens, an area of the brain associated with social attachment, yearning, craving and reward, is activated in individuals with Complicated Grief (ongoing) (O'Connor et al., 2008). An fMRI of mothers of aborted malformed foetus show activation in areas of the brain (gyrus, thalamus) that are associated with pain (Kersting et al., 2009). Physical responses of grief include, for instance, muscular weakness, heightened sensitivity to aural stimulation and lack of energy (Littlewood, 1992).

2.7 Attachment and Loss

Moving away from the brief discussion on neurological evidence of activation centres associated with grief, the following sections explore the psychological effects of grief. The initial discussion in this section centres on human attachment with particular reference to the maternal-infant bond. Additional discussion (see Sections 2.7.1 to 2.7.3), in alignment with psychological responses to death and grieving, explores the death of the elderly, children and the effects of spontaneous abortion and stillbirth deaths. The death of an individual is both traumatic and disruptive to survivors at an individual and social level. This approach was included to investigate if the mortuary treatment of these cohorts could be further understood, in part, from clinical observations related to loss and grief from contemporary populations. The clinically observed effects of death related to the young or elderly may be part of the complex grief processes in addition to culturally prescribed ritual behaviours and traditions affecting the burial of each cohort at the sites under review.

Underscoring the importance of the psychological responses to loss, particularly of subadults, is attachment. Theoretical approaches to human attachment have been dominated by the research of Bowlby (Attachment Theory) and Ainsworth (Secure Base Theory) (Ainsworth and Bell, 1970, Bowlby, 1971, Ainsworth, 1973, Bowlby, 1973, Bowlby, 1980). Bowlby noted four phases of mourning; Numbing, Yearning, Disorganisation and Reorganisation phases which outline the steps moving through internal disbelief and emotional responses to the separation from the attachment figure to a redefining and reorganisation of the self (Bowlby, 1971, Bowlby, 1980, Fraley and Shaver, 1999, Balk, 2009, Thomson, 2010). Attachment Theory refers to the formation and continuation of a synchrony between the infant and mother/care-giver dyad that is overt behaviour which is compelled by psychobiological drivers (Schoore, 2000, Schoore, 2003, Posada, 2008). Key aspects of Attachment Theory include the provision, between mother/care-giver and child, of security, protection and resources and establishes and regulates sensory means to communicate interpersonal transactions in their social environment (Bowlby, 1980,

Bowlby, 1973, Schore, 2000, Carter, 2002, Neimeyer and Gamino, 2003, Posada, 2008, Thomson, 2010). Secure Base Theory posits that a child will use the mother/caregiver attachment figure as a secure base to safely explore, and retreat from, their environment (Ainsworth and Bell, 1970, Ainsworth, 1973, Posada, 2008).

Maternal attachment occurs during pregnancy and involves neurological and physiological functions that facilitate the maintenance of proximity and interaction between mother and child (Maestripieri, 2002, Schore, 2003, O'Leary et al., 2011). The attachment of the infant can be expanded to other caregivers if required with the sex of the care-giver affecting social behaviour towards the infant (Carter, 2002, Hayslip Jr et al., 2015). It is postulated that the death of an attachment figure of an infant or juvenile can lead to developmental and behavioural issues (Fraley and Shaver, 1999). Separation from attachment figures, as part of the grieving process, can affect the functionality and behaviour of survivors in the process of reintegrating their identity and their journey back into their society (van Gennep, 1960, Fraley and Shaver, 1999). Grief and the grieving process is partly influenced by the effects of separation of the attachment of the deceased and the survivor but also include social, cultural and ritual factors (O'Leary et al., 2011, Jakoby, 2012). Attachment among the elderly is related to increased dependency as couples age together with anticipated partner death adding to elevated levels of fear and anxiety (Whitbourne and Meeks, 2011, Momtaz et al., 2015).

Evidence shows that human attachment is a powerful driver of behaviour and underscores a range of relationships across the lifespan. The following three sub-sections will conclude the exploration of bereavement and grief in this chapter through a review of clinical data to examine the grieving process following the death of the young and old, the two primary cohorts under review, to assess if select, or singular, emotions are expressed that may be visible. From a Southeast Asian context, this research will, in part, explore the potentiality of bereavement and grief in discussion chapters noting, for example, that mortuary practices provided to infants may reflect a differential identity caused by the grief of their early death.

2.7.1 *The Loss of a Baby*

The loss of a pregnancy, before, at the point of, or just following birth, is a highly traumatic event (Singg, 2003, O'Leary et al., 2011, Brierly-Jones et al., 2014-2015). Foetal deaths can occur at any time across the gestational period of a pregnancy and can include spontaneous abortion, stillbirth, abortion (scheduled or induced) or ectopic pregnancies (Lang et al., 2011). Miscarriage can occur within a period up to twenty weeks of gestation with stillbirths occurring from twenty to twenty eight weeks *in utero* (Carter, 2003, Romanoff and Farley, 2009). Perinatal death is defined as occurring in a period from the twenty second gestational week of pregnancy up to seven days post-partum. Pregnancy loss can be influenced by a range of factors including maternal genetics, immunology, risk of infectious disease, age and pregnancy loss history (deLuca and Leslie, 1996).

Hormonally, an increase in maternal bonding with a first foetus can occur from twenty weeks gestation onwards (Carter, 2002, Maestripieri, 2002, Carter, 2003, Singg, 2003, O'Leary et al., 2011). The loss of a pre-term birth can have immediate effects on surviving parents, individually, and as a couple. From a social perspective, the grief associated with miscarriage, stillbirth or perinatal death events for parents may manifest as disenfranchised grief. Disenfranchised grief reflects, in this context, circumstances where the death of the foetus is not considered socially significant to be either publicly acknowledged or mourned (Vera, 2003, Lang et al., 2011, Sturrock and Louw, 2013). Where disenfranchised grief occurs, the foetus may not be afforded personhood status by the immediate family or society (e.g. medical) more broadly, but has attained an identity (personhood status), nonetheless, by grieving parents (Littlewood, 1992, Cecil, 1996, Singg, 2003, Vera, 2003, Romanoff and Farley, 2009, Lang et al., 2011, O'Leary et al., 2011,

Brierly-Jones et al., 2014-2015). Where a physical body may be clearly associated with a stillbirth, the lack of a clearly recognisable body associated with some miscarriages may lead to further psychosocial complications for grieving parents (Bakermans-Kranenburg et al., 1999). Further, a stillbirth may impact negatively on the mother's social identity (taboo) within the broader community or her personhood status (Littlewood, 1992, Carter, 2003, Murphy, 2011a, Sturrock and Louw, 2013, Bakermans-Kranenburg et al., 1999) with the memorialisation and development of biographical narratives as key methods of securing the deceased baby's personhood status in the family and community more broadly (Brierly-Jones et al., 2014-2015). Sturrock and Louw's (2013) study on the effect of neonatal death affecting Xhosa mothers found grieving could be identified as disenfranchised, with the mothers experiencing loss on many fronts (identity as parent, hopelessness etc.) with a variety of social ramifications. Foetal remains have been discussed from archaeological settings in Mainland Southeast Asia including the sites under review (Halcrow et al., 2008, Halcrow et al., 2012, e.g. Halcrow et al., 2016).

2.7.2 The Loss of a Child

A dead child can be seen to be representative of many identities within their social environment and to the parents in particular. These identities could reflect, following the loss, the potential for changing the status, role or identity of surviving kin or relationship networks (i.e., friends etc.), as representative of a link to the past (lineage) and the future (familial, economic etc.) (Sprang and McNeil, 1995, Singg, 2003). Parental responses to the loss of a child are influenced by the circumstances of the death (i.e., unanticipated, anticipated) that can adversely influence the couple's relationship (i.e., marital relationship, *de facto* etc.) (Lang et al., 2011, Bergstraesser et al., 2015). Clinical studies have observed gender differentiation in the manifestation of grieving following the death of a child (Bergstraesser et al., 2015). Very young children are highly empathetic to the death of another with psychological and physiological effects, including fear (their own illness, death or isolation), reduced energy and increased emotional expression (anger, stress), although this may be expressed non-verbally through mannerisms and physical behaviour (Bugge et al., 2014). Generally, however, it is recognised that bereaved children are at heightened risk of anxiety and depression which, in turn, may impact ongoing relationships (Schoorman, 2009).



FIGURE 2.1: Foetal jar burial (B175) from Neolithic at Ban Non Wat (Photo: Higham, C.F.W. 2017. South East Asian Archaeology Data, Retrieved from https://drive.google.com/drive/folders/0BwyPRRjONdIFc0pQM3VTS09VVTA?resourcekey=0-_22Ha1sxdNIRheYBmBCMbg)

2.7.3 The Loss of an Elderly Subject

Just as the young can represent multiple identities to survivors across a community, so too can the elderly. A deceased elderly subject may incorporate a series of social identities including spouse, parent, grandparent, friend or lover as well being a repository of knowledge, learning and experience of social practices and cultural traditions. As noted, the effect of the grieving process is influenced by the nature of the subject's relation to the deceased as well as a range of other factors (Hayslip Jr et al., 2009, Whitbourne and Meeks, 2011). As with child deaths, clinical research has observed gender, as well as age, differentiation in grieving where adult children have experienced parental death (Hayslip Jr et

al., 2015). Functional status can be affected at variable levels by elderly survivors who have suffered through spousal death or the loss of a friend (d'Epinay et al., 2009-10) and parental loss of adult children may precipitate obligations of filial responsibility and mark a redefinition of an individual's identity in the family and across the broader community (Barner and Rosenblatt, 2008). However, where family networks may support the individual through their mourning process, the support through the loss of an intimate friend of the very old may not occur due to changing residential patterns of the family unit (in the West) and the effects of increasing isolation and hospitalisation of the elderly to establish new contacts (d'Epinay et al., 2009-10). The death of an elderly parent can alter the self-identity of the surviving child as it ushers in a transformation in core values, belief and responsibilities at a social level (Littlewood, 1992, Barner and Rosenblatt, 2008).

2.8 Summary

This chapter has provided a non-exhaustive discussion of a range of topics related to developments in mortuary archaeology, ritual activity and an exploration of issues related to bereavement and grief. Discussion has been given to the significance of ritual and funerary activity and the material culture associated with this behaviour as critical elements for archaeological practice to engage with, and understand, past societies, and the individuals that occupied them. Further, discussion explored the materiality of the body and its agency as a vehicle to control and inform social behaviour prior to, during, and following death.

A focus on bereavement, attachment and the psychobiological effects of grief was undertaken, not in a deterministic fashion but to consider, as an additional component, the consequences of grief, with specific focus on the cohorts (young and old) under analysis, in mortuary settings. The following chapter will provide a discussion on key aspects of archaeological discourse in relation to gender, age and ageing.

Gender, Age and Ageing

3.1 Introduction

The study of age, and ageing, continues to resonate across a broad range of disciplines including biomedical science, public administration and the social sciences. A consideration of age and ageing remains a critical aspect of archaeological analysis. Bioarchaeological and palaeodemographic explorations of age, either at an individual and/or a population level, continue to provide insight into aspects of fertility, morbidity and mortality in the past. Bioarchaeological research is increasingly applicable to the exploration of social issues including identity.

Section 3.2 discusses the rise and influence of a feminist, and gendered, theoretical critique in archaeological discourse and the impact this approach has had on the exploration of the young and old in the past. A focus on the young and the old directly flows from a gendered approach to the past as well as enables a consideration of the impact of second and third-wave approaches to gender in modern Thailand.

Section 3.3 provides a discussion on historical developments related to a gendered approach in consideration of subadult and elderly adult cohorts. Section 3.4 discusses the developments and dominant categorisations of age recognised in this study. These include commentary on chronological, physiological/biological, and social age classifications as established by Ginn and Arbor (1995). This section also explores age-phase (i.e. 20-29 years, 30-39 years etc.) categories and associated research challenges.

Sections 3.5 to 3.7 engages with three alternative theoretical and biological fields in relation to this topic. Section 3.5 explores theories in relation to the evolution of ageing and senescence (process of deterioration with increasing age) and includes a discussion on evolutionary considerations of childhood, ageing, and the effects of human senescence and the significance of menopause. Section 3.6 explores maternal health and foetal growth as factors affecting growth and ageing across the life course as well as a discussion on some of the approaches and challenges encountered by bioarchaeologists in relation to the accurate estimation of age-at-death for subadults and adults in archaeological samples. Section 3.7 provides a brief oversight of palaeodemography including some of the dominant themes and issues including challenges associated with age-at-death assessments especially in relation to older adults within the discipline.

3.2 Engendered Archaeology

Prior to the feminist critique of archaeological practice, considerations of gender were developed in the social sciences and psychology through the 1960s and 1970s (Gilchrist, 1999, Díaz-Andreu, 2005). The ascendancy of second and third-wave feminist critiques had a profound effect on established conventions within the archaeological discipline by providing ongoing evidence of the complex, and invariably complementary, or dominant, position of female (and other) agents in the past. Prior to the emergence of a gendered approach to prehistory from the 1980s following the seminal publication by Conkey and Spector (Conkey and Spector, 1984), it is widely recognised that archaeology was primarily based on an androcentric view of the past, influenced by ethnographic approaches at the time (Conkey and Gero, 1991, Wylie, 1991, Gilchrist, 1999, Balme and Bulbeck, 2008, Hays-Gilpin, 2008). Archaeological engagement with gender was initially gynocentric at the second-wave and developed from a focus on

inequality towards a broader approach to differences and bodily practices in the third-wave movement (Gilchrist, 1999, Meskell, 2002, Gilchrist, 2007, Geller, 2009). A gendered approach in archaeological discourse has been fundamental in bringing visibility to archaeological subjects previously neglected, or biased against. It has also established the significance of gender identities towards understanding social organisation in the past. A feminist engagement with archaeological theory promoted and challenged intrinsic and entrenched attitudes towards gender and sex in the discipline (Conkey and Gero, 1991, Lesick, 1997, Sofaer and Sørensen, 2013). In the traditional androcentric context, female subjects were characterised as passive and, if included in discourse, were portrayed as oppositional or peripheral agents to males in many social contexts (Lesick, 1997).

A gendered approach to archaeology challenged and rejected the inherent essentialism of the time. Essentialism refers to a belief that each entity has a set of natural characteristics that identify and define them (Meskell, 1998, Gilchrist, 1999, Ghisleni et al., 2016). Where gender is considered, an essentialist viewpoint assumes that male/female gender (sex) differences manifest naturally as opposed to the formation of a gender identity through culturally sanctioned social behaviours (Gilchrist, 1999). The promotion of a gendered approach to archaeology (Conkey and Gero, 1991, Conkey and Gero, 1997), which contested an essentialist view, was used to explore relationships between males and females cross-culturally, challenge the established patriarchy and provide a platform to engage with female subjects in the past (Gilchrist, 1999, Hays-Gilpin, 2008). Greater sophistication in practice has expanded this basic approach to include exploration of gender, in terms of its relationship with others in alignment with other structural factors such as age, status (power) or ethnicity as organising principles underlying a group's social behaviour (Conkey and Gero, 1991, Babić, 2005, Hays-Gilpin, 2008, Sofaer and Sørensen, 2013). Other areas of research that have benefitted from an expanded engendered approach to the past include considerations of queer theory, sexuality, sexual practice and sex, cross-culturally (Gilchrist, 1999, Gilchrist, 2007).

A gendered approach to the past has facilitated and demonstrated through ongoing research, the significance of gender identities as an aspect of individual identity and social organisation (Sofaer Derevenski, 2002, Díaz-Andreu, 2005). Gender identities are fluid and are influenced by a range of factors including sex, age, status or ethnicity that are subject to continuous renegotiation across an individual's life-course (Ginn and Arber, 1995, Joyce, 1996, Gilchrist, 1999, Gilchrist, 2007, Bussey, 2011). Gender identities are more complex than the traditionally offered male/female binary division. Gender identities formed early in life are influenced by several factors (i.e. biology, peers, family) and are structuring tools present in social organisation (Zosuls et al., 2008, Sánchez et al., 2009, Bussey, 2011, Scabini and Manzi, 2011). Individual identities are constructed through the interaction and relationship with others within and across groups (Spears, 2011). This also occurs as the individual applies meaning and transforms through various life stages and functions (Berzonsky, 2011, Chen et al., 2011, Vignoles, 2011, Skorikov and Vondracek, 2011). Individual identities, through their formation, transition, and transformation, overlap and intersect across the lifespan (Fisher and DiPaolo Loren, 2003). Gender identities, defined within a specific historical-cultural context, are constructs that are meaningfully sanctioned by the social group (Díaz-Andreu, 2005) with evidence of alternatives (gender complementarity) to the normal binary definition being offered (Joyce, 1996). In turn, the individual agent's self-identity, with the gender identity being one aspect of this construct, is influenced and/or defined by how others identify and engage with the subject based on intrinsic beliefs, about socially sanctioned gender behaviour within that environment (Díaz-Andreu, 2005, Gilchrist, 2007).

In general and at its simplest, a gender-identity is understood and influenced by culturally constructed behaviours in relation to biological sex (Gilchrist, 1999, Alberti, 2005, Díaz-Andreu, 2005). However, it is also argued that one can observe cultural and/or biological influences in the manifestation of sex and

gender on the body that enables a greater understanding of how bodies were conceptualised in the past (Butler, 1990, Gilchrist, 1999, Alberti, 2005, Bussey, 2011, Sofaer and Sørensen, 2013).

Historically, archaeological practice has viewed relationships, either based on sex or age, with so-called gender-specific material culture (e.g. clothing) as a way of understanding gender in the past (Díaz-Andreu, 2005, Sofaer, 2006, Balme and Bulbeck, 2008, Sofaer and Sørensen, 2013, Ghisleni et al., 2016). As noted in Chapter Two, material culture has agency, acting as a link between the past, through the present and into the future for social actors and is actively embedded in structuring the symbolic and interactionist spheres of individuals going about their daily lives. Material culture is a critical structural component of social groups as individuals engage, interact, reject and negotiate with one another (Sofaer Derevenski, 1997a, Díaz-Andreu, 2005). This is due to the inherent transformative qualities meaningfully constituted by the social group of the relevant material culture and how this shapes and defines those interacting with the artefact (Sofaer Derevenski, 1994a, Sofaer Derevenski, 1997a, Moore, 2000, Fisher and DiPaolo Loren, 2003, Díaz-Andreu, 2005).

This section has discussed the impact that a gendered approach has had on archaeological practice across the last few decades. A gendered approach to archaeology has established a new orthodoxy which has provided greater insight into how gender identities were formed, across the life course. The following sub-section explores gender identities across modern Thailand. This approach was taken to gain an insight into attitudes and behaviour towards male and female subjects in the country where the sites under review are located.

3.2.1 Gendered Approaches in Modern Thailand

Although a recognition of the significance of women in mainland and island Southeast Asia through the lens of filial descent, ritual and economic life has been recognised for decades, the application of third-wave feminist approaches to gender identities in Thailand have only emerged recently (Andaya, 2007). Despite this, ethnographic studies demonstrate differential attitudes, expectations and behaviours between females and males in the domestic, political, and religious spheres.

Although the family unit dynamic (i.e., decreased fertility, migration, increased urbanisation) is changing in Thailand, traditional attitudes related to filial obligation and reciprocity continue. In this context, the male has financial responsibilities with the female expected to act as mother, wife and care-giver after inheriting the family home, for elderly family members as well as emotional support for her husband and children (Knodel et al., 1999, Fox, 2005, Falk, 2010, Rittirong et al., 2014). There are also different societal values and perceptions placed on males and females in regards to sexual behaviour within and prior to marriage (Knodel et al., 1999).

In the political sphere, whether martial law is in effect or not, males predominate with only a fraction of positions (approximately 10.0%) occupied by female representatives (Bjarnegård, 2010). Anthropological evidence shows differential roles and societal expectations (or limitations) based on the subject's gender identity present in the dominant belief system practiced in Thailand being Theravada Buddhism. This is despite openly held secular beliefs related to women not being reflected in Buddhist texts (Falk, 2010). Monks and nuns are encouraged to actively pursue positive actions and thoughts with young adult men, even if only briefly, encouraged to become ordained monks (Rittirong et al., 2014). Females may become practicing nuns, but the role of mother/wife is preferred for this cohort (Knodel et al., 1999, Falk, 2010, Rittirong et al., 2014). Where monks and monasteries are actively supported by government and engaged in communities nunneries, in contrast, do not receive financial support from government as their status is formally classified as secular (Falk, 2010). Moreover, power is further denied to this group through their exclusion from participating in elections based on their religious status (Falk, 2010).

Interestingly, although practice supports a division of males/females based on biological sex in Thailand, anthropological evidence shows that the concept of sex and gender, generally promoted in Western discourse, is contested and culturally ambiguous (Cook and Jackson, 1999).

The previous sections outlined and discussed the emergence and influence of a gendered approach to archaeology through the promotion of female subjects as points of interest over time and how the gynocentric perspective has been expanded to explore difference rather than simply inequality in the past. This was followed by an overview and examination of gender identities in contemporary Thailand which demonstrated differential behaviours afforded to, and expected of, male and female actors in this country. Expanding on the discussion provided on a gendered approach to the past, the following section engages with developments and progress in archaeological practice in relation to the study of subadults and the elderly. As a continuation of the discussion in Section 3.2.1, the following section will also provide a discussion of attitudes in relation to age-identities in contemporary Thailand.

3.3 A Gendered Approach to the Young and the Old

The emergence of an archaeological focus on the study of children, and elderly to a much lesser degree, is associated with the advent of a gendered approach to prehistory through the rise of feminist critiques discussed at Section 3.2 (Baxter, 2005, Baxter, 2008). Prior to an engendered approach to prehistory, children, like the elderly were invisible and overlooked as a meaningful cultural and biological cohort essential to a holistic approach for understanding the past (Baker, 1997, Gilchrist, 2000, Kamp, 2001, Lucy, 2005, Ardren, 2006, Lillehammer, 2015). This bias occurred due to a widespread Western belief in the passive association of children with females (the mother), who in turn were invisible for some time in archaeological discourse, in their association with the domestic, non-male, sphere (Conkey and Gero, 1991, Sofaer Derevenski, 1994a, Baker, 1997, Lillehammer, 2000, Kamp, 2001, Díaz-Andreu, 2005, Lucy, 2005, Ardren, 2006, Hutson, 2006, Crawford and Lewis, 2008, Romero, 2008). In part, this perceived invisibility of the young is argued to be based, in addition to the inherent bias at the time, on cultural behaviour and taphonomic factors affecting the preservation of subadult skeletal material (Baker et al., 2005, Baxter, 2005, Baxter, 2008).

A gendered consideration of the young and the old is rooted in third-wave approaches to the past which moved away from essentialised, second-wave concerns of inequality between males/females, and engaged with body practices and differences between and within populations (Lesick, 1997, Gilchrist, 1999, Gilchrist, 2007). Proponents of third-wave approaches to prehistory remain committed to a feminist approach to archaeology as seen in second-wave (gynocentric) approaches. However they also urge, through the exploration of differences in identity studies, the inclusion of maleness/masculinity as an example, across the lifespan to engender a more complex understanding of identities in the past (Meskell, 1998, Gilchrist, 1999, Geller, 2009, Venn et al., 2011). For instance, contemporary Western studies demonstrate a shift in behaviour with males demonstrating greater engagement in the domestic sphere including involvement with care-giving responsibilities which is counter to traditional views of males in the domestic space (Bussey, 2011, Venn et al., 2011). First wave feminist approaches spanned the late nineteenth to early twentieth century and centred on achieving greater freedoms and rights for women in the public and private spheres (Gilchrist, 1999, King, 2013). As implied above, second wave feminist approaches engaged with power relations at an institutional, as well as social, level (Conkey and Gero, 1991, Conkey and Gero, 1997, Lesick, 1997, Gilchrist, 1999) while the motivations of third-wave feminist approaches are discussed above.

Age identities, like gender and other identity types, are artefacts that are constructed within historical-cultural contexts that must be explored to better understand the development and conceptualisation of potential personhood, or identity constructs, such as childhood, infancy or elderly (Díaz-Andreu,

2005, Gilchrist, 2007, Gowland, 2009). Individual identity and status of elderly subjects, in consideration of role theory, may be influenced by the transformed function they assume, such as a grandparent, in advancing years (Kaufman and Elder Jr., 2003). Grandparents, living longer and with improved health status, increasingly have an augmented role in care-giving duties and for the transfer and mentoring of social knowledge, skills and values (Mann, 2007, Marshall and Bengtson, 2011). However, perceptions of a feminisation occurring in later life, through an increased engagement of elderly males with the domestic sphere has the potential to impact on the self-identity of males in contrast to traditional perceptions of males in Western societies (Venn et al., 2011). However, these perceptions may be influenced by the familial situation (Mann, 2007) and fail to observe changing age-identities as the individual moves across the lifespan (Arber et al., 2007).

The experience and perception of ageing, whether young or old, is dynamic, fluid and subject to a range of variable factors. Factors influencing the ageing process of either cohort include genetics, pathology and infectious disease burden, nutritional status, psychological outlook, and the significance of meaningfully constituted social behaviours within specific historical-cultural contexts. The identification of specific culturally defined age-barriers may be associated with physiological milestones or the attainment of and transformation through socially constituted milestones (i.e., rites of passage, marriage, motherhood, grandmotherhood etc.) (Sofaer Derevenski, 1997b, Kamp, 2001, Garwood, 2012), although this should not be considered universal (Lucy, 2005, Gowland, 2009). Age identities, like other identities, are fluid social constructs and intrinsic aspects of a group's social organisation at a given time and place (Kamp, 2001, Appleby, 2010, Appleby, 2017). Like gender identities, age identities reflect the perceptions, attitudes and expectations from both an objective and subjective perspective regarding socially sanctioned behaviours of an individual as they adapt, traverse, transition and transform through different age barriers as defined by that social group or population in public or private spheres (Sofaer Derevenski, 1997b, Gilchrist, 2000). In addition to gaining insight into a population's social organisation, age-based studies are useful for understanding embodied practices and morbidity profiles across the lifespan (Sofaer, 2006). A potential age-identity transition of aged female actors, dependent on the historical-cultural context, may occur when the individual transitions, post menopause, from a reproductive to a non-productive identity (Lesick, 1997). Older males, following functional decline and manifesting an increased 'feminisation' as they shift from the public to domestic space with increasing age may also transition from one age-based identity to another (Lesick, 1997, Arber et al., 2007).

Children were previously essentialised due to pervasive views of the young in a natural, romanticised, primitive, under-developed, innocent, non-mature and dependent context in their actions and behaviour in the past prior to the potentiality of their footprint in the archaeological record being explored (Sofaer Derevenski, 1994a, Baker, 1997, Sofaer Derevenski, 2000, Lillehammer, 2000, Baxter, 2005, Lucy, 2005, Hutson, 2006). Further, like female subjects, children were viewed as oppositional or peripheral to the 'adult' and were marginalised due to established and biased conceptions of childhood (Sofaer Derevenski, 1994a, Sofaer Derevenski, 2000, Baxter, 2005, Lucy, 2005, Baxter, 2008, Crawford and Lewis, 2008). Cross-cultural evidence from various regions demonstrates the error of this stance, with children in many contexts being shown to be active participants in engaging with, and influencing, their social spheres (Kamp, 2001, Baxter, 2005, Ardren, 2006, Baxter, 2008). From a demographic approach, a failure to include considerations of the young is flawed given the high proportion of subadults encountered in prehistoric populations that contributed to the development of the archaeological record under review (Hutson, 2006).

Although there is evidence that childhood is defined at an evolutionary (Bogin, 1997) and biological (Sofaer, 2006) level, the overarching Western perception of childhood, underpinned by medical outlooks, is of a gendered liminal non-adult phase that is dependent and non-productive (Kamp, 2001). The ground-breaking work of Grete Lillehammer, building on feminist discourse in Scandinavia in the

1970s into the child's world, initiated a series of enquiries which have launched research into the role, agency and contribution of the young in the past (Lillehammer, 1989, Lillehammer, 2000, Lillehammer, 2015). Where age-identity studies occur, it is research into subadults, beginning from the 1990s, that led to a burgeoning body of literature providing an increasing body of knowledge on the significance and influence of children, in all aspects of life, in prehistory (Lucy, 2005).

Continuing research in the arena of childhood studies, both independent of and interconnected with, adult contemporaries has been beneficial in providing insight into a range of social, health, spatial and ritual functions this cohort occupied in the past (Goodman and Armelagos, 1988, Goodman and Armelagos, 1989, Scott, 1999, Baxter, 2005, King, 2006, Perry, 2006, Romero, 2008, Baitzel, 2017). Archaeologically, a great deal of the understanding of the behaviour and attitudes towards children is from mortuary settings and their resultant, sometimes atypical, mortuary behaviour (Bloch-Smith, 1992, Murail and Girard, 2000, Lucy, 2005, Wileman, 2005, Sîrbu, 2008). Normative, or atypical, mortuary treatment of children, such as the exclusion of neonates or infants from burial grounds or the absence of commonly recovered material items present opportunities for researchers to explore personhood and identities of this cohort (Baxter, 2005, Lucy, 2005, Baxter, 2008, Murphy, 2011a, Murphy, 2011b). For example, funerary practices from the Chantambre cemetery (c. CE100-500) in France observed the predominance of neonatal jar burials in the south-western area of the cemetery which contrasted with the spatial location of older children (Murail and Girard, 2000). This difference, where the mortuary behaviour associated with older children echoed that experienced by adults at the site, was used to infer differential identities of subadults based on variable age.

Where some material culture types have traditionally been associated with a specific gender, so too have children been seen to be only associated with smaller artefacts or toys (Sofaer Derevenski, 2000, Kamp, 2001, Baxter, 2005). Greater consideration of the agency of children within their social milieu, where material culture is concerned, has seen changing attitudes to this relationship (Sofaer Derevenski, 1994a). Research has provided insight, beyond that of childhood simply being an unrefined and experimental phase of engagement with material culture into one that recognises the dynamic and innovative influences the young exert on their material environment. This is as a consequence of enculturation, socialisation and the development and application of appropriate skill-sets (Sofaer Derevenski, 1994a, Sofaer Derevenski, 1997b, Kamp, 2001, Baxter, 2005, Ardren, 2006, Hutson, 2006, Baxter, 2008, Hays-Gilpin, 2008, Parke et al., 2008, Romero, 2008, Kamp, 2015), including an understanding of the symbolic significance of material culture within their milieu (Sofaer Derevenski, 1994a). An understanding of material culture occurs through engagement, much like the development of different identity statuses, with peers, family, and function or at an individual level through experimentation or use (Sofaer Derevenski, 1994a). Examples of this meaningful engagement could have been through the exposure to, and interaction with, material culture within certain interactive spaces through an apprenticeship (e.g. familial, functional, economic, technical or philosophical-religious apprenticeship) that may not necessarily have always had a downward trajectory (i.e., adult to apprentice) but instead reflected the influence of children on their environment and the material culture and space within it (Baxter, 2008, De Lucia, 2010, Joyce, 2000).

A focus on the contribution of the elderly in the past is a relatively new development in archaeology and remains significantly under-researched and theorised (Lesick, 1997, Welinder, 2001, Gilchrist, 2007, Gowland, 2009, Appleby, 2010, Appleby, 2011, Fahlander, 2013, Appleby, 2017). An engendered approach to prehistory successfully demonstrated that archaeological practice had rendered non-male adult aspects of past communities virtually invisible. The current approach to the elderly, and the subsequent lack of dedicated research to this cohort, is reminiscent of the bias, intentional or otherwise, that was demonstrated towards other identity groups (Baker, 1997). Although in part this invisibility is exacerbated by the shortcomings of methodological approaches to age-at-death estimation (see Section

3.7). This is where an inability to accurately determine the calendar (chronological) age of individuals of advanced years, is reflected (more accurately not reflected) in palaeodemographic data (Gilchrist, 2007). The continuing negative bias towards exploring the significance of the elderly shows they currently remain of marginal interest to the discipline (Gowland, 2009, Appleby, 2010, Appleby, 2017). This is despite the unique opportunities the elderly provide to provide insight, more holistically, with social, ritual and economic behaviour within, and across populations (Kamp, 2001, Appleby, 2010, Appleby, 2011, Fahlander, 2013, Gowland, 2016, Appleby, 2017, Gowland, 2017). Archaeologically, a focus on the elderly in mortuary settings may provide insight into the social organisation and ritual behaviour of a community as the elderly may be socially conservative and adhere to established orthodoxy within their historical-cultural setting (Fahlander, 2013). Additional information in the potentiality of the elderly as an area of study occur where research shows, in opposition to universal and idealised notions of elderly status in the past, that negative attitudes and behaviour (i.e., abuse) did occur in ancient times (Gowland, 2016, Gowland, 2017).

Where positive views remain, a changing social structure and dynamic has seen the emergence of increasingly negative and biased attitudes towards the aged (Gilchrist, 2007, Kearl, 2009). Western biased ageist stereotypical attitudes towards the elderly are based on biological, cognitive and social perceptions of decline, loss or gerontophobia and include that of loss of independence and individuality affecting the individual's social identity (Rubinstein, 1990, Featherstone et al., 1991, Bytheway, 2005, Gilchrist, 2007, Appleby, 2010, Hummert, 2011, Carney and Gray, 2015, Gowland, 2017). From a Western perspective, perceptions of the elderly centre on the individual's ability/inability to function and maintain the core attributes of individuality and independence (Jensen and Oakley, 1982-83, Johnson, 2005, Kearl, 2009). Cross-cultural studies provide insight into negative attitudes towards the elderly which are exacerbated by changes to family units brought about by increased urbanisation and modernisation (Reid, 1985).

Historical Western perceptions of the elderly primarily encapsulate wisdom, respect, obligation and reciprocity reflected in changing attitudes and behaviour over time (Reid, 1985, Johnson, 2005). Changes in mortality rates, where the elderly occupy an increasing proportion of contemporary populations is believed to have influenced this shift in the historical standpoint towards the elderly (Johnson, 2005) as well as further categorisations, with the potential for increased stigmatisation of the elderly based on health status and functional capabilities, through the implementation of 'young-old' and 'old-old' cohorts (see Chapter One) (Marshall and Bengston, 2011, Buch, 2015). Higher morbidity levels in relation to age-related pathologies and diseases, and loss of independence has seen higher levels of influence and involvement in the lives of the elderly from various third parties (Marshall and Bengston, 2011, Venn et al., 2011). These include governments through the development of social and health policy, the health profession, and private organisations (Kearl, 2009, Venn et al., 2011, Gowland, 2017). Those who fall under governmental or private care are at risk of catalysing actions which relinquish and diminish the individual's self-defined independence, autonomy, and social identity. This process can then infantilise the elderly from both an objective and subjective position through their increased dependence on others in their social network (Rubinstein, 1990, Kearl, 2009, Carr and Moorman, 2011, Weicht, 2013). These developments, as seen at Chapter Two, has brought about the isolation, passivation, commodification and marginalisation of the elderly and reinforced a proliferation of behaviours that infantilise or control the ageing process, and through this, the ageing-identity (Shield, 1990, Featherstone et al., 1991, Wiersma and Dupuis, 2010, Marshall and Bengston, 2011, Weicht, 2013, Buch, 2015).

A common social policy in relation to ageing, as an example of the influence of governmental and health sectors extant in Western society, is that of successful ageing. Successful ageing is a Western values-based construct that is emergent in the development of social ageing policy throughout the world although alternatives (harmonious ageing) have been offered (Debavalya, 2008, Liang and Luo, 2012).

Successful ageing is based on the belief that an outcome of a good old age is predicated on the individual remaining active and is built on the youth-enamoured focus in many contemporary environments (Marshall and Bengston, 2011, Liang and Luo, 2012, Buch, 2015). An approach for successful ageing advocates a deniability of the natural universal process of ageing and underpins the malignant ageism that permeates many societies in their treatment of the elderly. Interestingly, self-conceptions of elderly subjects, even in advanced age (i.e., 70 years), indicates that they still perceived of themselves as younger, cognitively, than they were. This viewpoint is in opposition to the socially constructed definition of old age (age-identity) and may, inferentially, be influenced by the dominant paradigm of successful ageing as a form of resistance to advancing age (Kaufman and Elder Jr, 2002, Kaufman and Elder Jr., 2003). Further, positive active engagement with younger cohorts may also contribute to the self-identity and youthfulness of ageing individuals later in life and also feed into the notion of successful ageing discussed above (Kaufman and Elder Jr., 2003). This ends the discussion on the development of archaeological approaches towards the young and the old. The following sub-section (3.3.1) will profile age-identities currently recorded in Thailand. This follows the earlier approach to explore gender identities in this nation.

3.3.1. Age-Identity in Modern Thailand

Currently in Thailand an elderly individual is categorised into a socially constructed age-based identity from sixty years of age in alignment with the retirement age from the governmental workforce (Knodel et al., 1995, Fox, 2005, Debavalya, 2008, Soonthornhdhada, 2009). The classification of an elderly status identity reflects increasing trends in the mortality profile in Thailand with individuals generally living longer and those individuals aged sixty or more comprising an increasing proportion of the country's demographic profile (Debavalya, 2008, Soonthornhdhada, 2009). Children are associated with the domestic sphere dominated by women, as mother, wife, nurturer and care-giver, in Thailand (Knodel et al., 1999, Rittirong et al., 2014).

Governmental approaches to dealing with an ageing population has been the drafting of two overarching policy documents on successful ageing with the second paper titled *The Second National Plan for Older Persons in Thailand (2002-2021)* (Debavalya, 2008). This policy still contains strong links with underlying Buddhist beliefs embedded in community practices, values and attitudes but also includes some aspects related to individual responsibility and independence across the subject's life course which resonates with the dominant paradigm of ageing from a Western perspective (Debavalya, 2008, Soonthornhdhada, 2009). Coupled with aspects of belief embedded in Theravada Buddhism, concerns of the elderly in Thailand reflect those in equivalent Western cohorts. These include anxieties in relation to the individual's health, residential and financial status, their independence and the fragmentation of traditional family units brought about by increased migration, modernisation and urbanisation which impacts on traditional values related to filial obligation, reciprocity and care-giving (Knodel et al., 1995, Fox, 2005, Debavalya, 2008, Soonthornhdhada, 2009, Hummert, 2011, Rittirong et al., 2014). Buddhist teachings and scriptures specify that the elderly are to be afforded respect and care with these values being encouraged internal and external (i.e. diasporas) to Thailand (Yee, 2009, Rittirong et al., 2014, Fox, 2005).

3.4 Age-based identities

In this section of the chapter there is a shift towards a discussion of the development and definition of age-based identities. Theoretical approaches to age-identities in archaeology are dominated by the research of Ginn and Arber (1995), who developed a model identifying three discrete age categories: chronological age, biological age and social age (Ginn and Arber, 1995, Gilchrist, 1999, Lucy, 2005, Sofaer, 2006, Gowland, 2009, Appleby, 2010). Of less significance, but relevant in the context of this research,

is the work of Harré who referred to biological, social and personal age categories (Harré, 1991, Sofaer, 2006). The concept of a social lifespan, which is applicable to the individual at and beyond their death (identity-at-death), may reflect the transformed social persona of the individual from the time of their death (also see Chapter Two) (Harré, 1991, Kaufman and Morgan, 2005).

Chronological age is based on the calendric age of the individual, but may have variable significance, dependent on socially constituted attitudes and expectations of specific age-barriers, in different cross-cultural settings (Ginn and Arber, 1995, Crawford and Lewis, 2008, Appleby, 2010, Fahlander, 2013). Although chronological age is often related to biological changes, it not exclusively driven by it (Lucy, 2005, Appleby, 2010, Appleby, 2011). Equally, the appearance of a specific physiological milestone should not be universally assumed to be adopted with respect to the changing personhood or identity status of the individual within a specific historical-cultural context (Appleby, 2010). Appleby (2010: 150) observes that a current focus on chronological age is built on governmental and legal priorities regarding age-based identities of its citizens and is linked to notions of independence and social maturity (Sofaer Derevenski, 1994a, Ginn and Arber, 1995).

An understanding of biological age is based upon a clinical or medical approach to the body and factors the individual's growth, developmental and degenerative status as influenced by genetics, environment and behaviour (Ginn and Arber, 1995). However, as noted below, individual growth and degeneration, influenced by a range of factors (i.e. sex, economic or nutritional status, behaviour etc.), is highly variable within and across populations (Nawrocki, 2010). Biological age, from a bioanthropological perspective, is correlated with physiological and developmental milestones such as dental eruption, weaning (onset/cessation), puberty or menopause (Baxter, 2005, Baxter, 2008, Crawford and Lewis, 2008, Kamp, 2015).

Social age is constituted within a specific milieu, interacts with other identity constructs and articulates with sanctioned behaviour based on the subject's age as they transition across the lifespan (Ginn and Arber, 1995, Sofaer Derevenski, 1997a). In some communities, the young are a critical part of the economic framework and positively participate in a range of arenas of activity. This can be contrasted with Western approaches, where an idealised view of children sees them as passive and dependent actors (Sofaer Derevenski, 2000, Baxter, 2005, Romero, 2008). As observed previously, the elderly in the West are also subject to a range of actions and behaviours which may seek to stigmatise, infantilise, or marginalise them once they have attained specific age thresholds which prescribes a changed social age-identity (Weicht, 2013, Gowland, 2017). As noted, this contrasts with how the elderly, in Western populations, perceive themselves.

Age phase categories are based on physiological/biological stages of growth or degeneration which are superimposed into chronological age categories which are potentially problematic. Normal practice will witness the use of age phase categories that span either five or ten years (Lewis, 2007, Roksandic and Armstrong, 2011). As a result, some researchers urge the adoption of purely biologically, or developmentally, meaningful categories for demographic purposes (Nawrocki, 2010, Roksandic and Armstrong, 2011) with chronological age-ranges still useful for studies that pertain to individuals (Nawrocki, 2010). Appleby (2010, 2017) outlines the applicability of functionality as a useful index for age categories when discussing elderly cohorts. Although the onset or cessation of biological milestones are variable within, and across, populations, due to genetic, behavioural and environmental factors, biological data can provide robust broad parameters in association with each developmental, maturational or degenerative milestone.

Archaeological explorations of historical data have uncovered evidence for differential categorisations of childhood (Joyce, 2000, Baxter, 2005, Baxter, 2008). Researchers recognise that biological categorisations may not always be applicable and alternative social categories for identifying the

young, or any age-based cohort, are important tools for accurate analysis and interpretation (Ardren, 2006). A non-standardised approach adopted across archaeology, from the development of age phase categories, especially regarding subadults, has been problematic to the discipline (Murphy and Le Roy, 2017). Fundamentally, a non-standardised approach towards ageing children, at its most basic, has the potentiality to misrepresent that cohort, and through them, the broader demographic, social, health and ritual implications of the population to which they belonged (Lewis, 2011).

3.5 Evolutionary approaches to ageing

As noted, the initial three parts of the chapter (Sections 3.2 to 3.4) focussed upon themes related to gender, age and ageing from the social sciences that have influenced archaeological practice in relation to identity studies. The chapter now pivots towards an engagement with a range of theoretical and biological fields that are also engaged with the broad subject of human ageing. The initial section of this group (Section 3.5) discusses some of the major developments, with a specific focus on childhood and senescence, towards evolutionary aspects of ageing. This then followed, at Section 3.6, with a discussion on human ageing and bioarchaeological approaches to age estimations in relation to subadults and the elderly.

The human ageing process is complex with a range of conflicting theories vying towards the explanation of post-maturational decline and senescence (Crews, 1993, Crews, 2003). Growth and developmental changes in the early phases (i.e., embryonic, pre-natal, post-natal etc.) of life are well understood (see Section 3.6). Further, evolutionary studies of primates have found that the phases of childhood and adolescence are significant to humans with childhood being identified as a unique period of development across the lifespan (Key, 2000, Halcrow and Tayles, 2008a). Bogin notes that childhood includes the infant period from three to seven years followed by the juvenile, pubescent and adolescent phases (Bogin, 1996, Bogin, 1999, Bogin, 2001). From an evolutionary perspective, childhood follows the weaning period and ceases when the brain has stopped growing (at seven years) (Bogin, 1997, Bogin, 1999). It is characterised as the key period of cognitive development, although the child still requires assistance for security and sustenance (Bogin, 1996, Bogin, 1997). In addition, Bogin argues that additional advantages to the presence of a human childhood period relate to developmental plasticity; the 'cost' benefits of slow growth and body size for limited resources in competition with adults; the social benefits of a slow childhood coupled with cognitive development enabling care-giving flexibility by a social group or by the individual as they mature; that care-giving is stimulated, neurologically, by the child's appearance and; as an adaptive period for multiple food providers (Bogin, 1997, Bogin, 1999).

Notwithstanding, studies related to the processes involved in extreme ageing, longevity, and senescence remain elusive and contested (Crews, 2003, Goldsmith, 2006). Modern demographic profiles indicate increased longevity with the elderly continuing to be associated with physiological and functional decline, trauma, infection and malnutrition (Finch, 2007) more or less mediated by sex, ethnicity, and socio-economic status (Crews, 1993, Finch, 2007). Studies focussed on understanding the human ageing process (including longevity and senescence) are dominated by a broad range of theories categorised as programmed or damage-based theories (Schulz-Aellen, 1997, Holliday, 2007, Sigelman and Rider, 2009, Cefalu, 2011). Senescence relates to biological change where the individual, through the process of ageing, is less able to maintain homeostasis and physiological functionality due to internal and external factors (Crews, 2003). Early theorists of human senescence argued for the key role of genetic programming where, once the periods of growth and reproductive fitness has elapsed, the survivability of the organism is increasingly diminished (Licastro et al., 2005, Austad and Kirkwood, 2008). A good example of this is the effect of immunosenescence in relation to age-related diseases where there is a trade-off of immunity benefits of resistance to disease between the early and later (post-reproductive) stages of life (Licastro et al., 2005).

The 'Hayflick Limit', which relates to the accumulation of mutated genes, or antagonistic pleiotropy, is a dominant theory regarding human ageing. Hayflick, through *in vitro* culturing of human embryonic fibroblasts, found that cells doubled a maximum of fifty times for infants but that cellular doubling decreased significantly in the very old (Hayflick, 1980, Sigelman and Rider, 2009). Further research found that the cessation of growth in human fibroblasts is primarily caused by the shortening, or loss, of telomeric DNA at each chromosomal mitosis event (Klapper et al., 2001, Zhang et al., 2016). Telomeres occupy the tips of each eukaryotic chromosome and are shortened following a cell's division (Sigelman and Rider, 2009, Zhang et al., 2016). This process is thought to be highly deterministic in biological ageing. Studies found that with each cell division its chromosome replicates but that its telomere does not as, with each chromosomal replication, the telomere is split between the new and old chromosome (Sigelman and Rider, 2009). It is hypothesised that continuous shortening of telomeres (absence of telomerase activity), which increases as humans age (decreased doubling), ultimately brings about cellular death and through it senescence (Klapper et al., 2001, Crews, 2003, Miller, 2009, Cefalu, 2011). Apoptosis (programmed cell death) occurs to provide increased survivability (i.e., cellular homeostasis, removal of mutated and/or cancerous cells, T cells etc.) following the death of defective cells (Crews, 2003, Gupta et al., 2005, Cefalu, 2011). Supporters of ageing as a consequence of an accumulation of mutated genes argue that an adaptation to an organism's fitness in early life are offset, at a biochemical and physiological level, in the latter aspects of the lifespan where maintenance and repair of a system are negatively impacted (Bellamy, 1995, Crews, 2003). Antagonistic pleiotropy, introduced by Williams in the 1950s and underpinned by natural selection, suggests that genetic mutations in the organism may be positive in the earlier phases of the life cycle (survivability) with respect to reproductive fitness but that these mutations are offset in the latter phases of the life cycle (Ikels and Beall, 2001, Aviv et al., 2003, Goldsmith, 2006, Finch, 2007, Austad and Kirkwood, 2008). Similarly, the Disposable Soma Theory sees deleterious ageing occur in the latter parts of the lifespan from an accumulation of randomly damaged cellular and molecular sources to offset benefits to the maintenance of the organism during its growth and reproductive phases (Goldsmith, 2006, Austad and Kirkwood, 2008). The basis of natural selection affecting senescence is also present in Medawar's 'wear-and-tear' theory, which suggests an organism's fitness decreases with increasing age (Borkan et al., 1982, Schulz-Aellen, 1997, Goldsmith, 2006, Austad and Kirkwood, 2008).

Other theoretical approaches to ageing include physiological factors such as immunology, neuroendocrinology, metabolic changes, oxidative stress and insulin signalling (Schulz-Aellen, 1997, Mattson, 2009, Cefalu, 2011). The autoimmune theory proposes that, as ageing occurs, the body produces autoantibodies, primarily affecting T-cell functionality that heightens risk of disease (mainly autoimmune diseases such as rheumatoid arthritis or lupus) and infection (Burns and Goodwin, 2003, Gupta et al., 2005, Vasto et al., 2006, Bürkle et al., 2007, Finch, 2007, Weinberger et al., 2009, Cefalu, 2011). This is referred to as immunosenescence. Social factors, such as nutritional or socio-economic status will influence the efficacy of an older individual's immune system (Mayer, 1994, Lesourd et al., 1998, Lesourd et al., 2002). Further study of the immune system suggests that an over-production of pre-inflammatory genotypes may be both beneficial, in youth, and detrimental, in advancing years (Licastro et al., 2005, Bürkle et al., 2007, Campisi et al., 2009). Oxidative Stress Theory, which may influence the shortening of telomeres, has two aspects, with the first arguing that free radicals bring about an accumulation of damage to the mitochondrial DNA with the second aspect considering the effect of oxidative stress on chromosomes (Klapper et al., 2001, Aviv et al., 2003, Cefalu, 2011, Zhang et al., 2016).

The extended post-reproductive lifespan of females, within the theoretical framework of the Grandmother Hypothesis, suggests that care-giving investments bestowed upon grandchildren (descendants) is advantageous to their offspring and ultimately to the older female following the cessation of her reproductive phase, although this position has its detractors (Peccei, 2001, Crews, 2003, Harper, 2005,

Hrdy, 2005, Melby and Lampl, 2011). Studies have noted physiological benefits to infants from the presence of grandmothers, as allomothers, in this context (Hrdy, 2005, Austad and Kirkwood, 2008). Grandmotherhood is seen as an adaptive process benefitting longevity with menopause, some argue, seen as a secondary effect of this adaptation (Peccei, 2001). Menopause, associated with heightened risk in a range of clinical conditions (e.g., hormonal level variation, bone loss, breast cancer, cardiovascular diseases etc.), marks the end of the menstrual and reproductive phase with cessation normally occurring by the fifth decade of life (Crews, 1990, Plato et al., 1994, Finch, 2007, Austad and Kirkwood, 2008, Fretts et al., 2008, Sowers, 2009, Curtis and Nawrocki, 2010, Homeier, 2014). The menopausal process, brought about by changes to a female's hypothalamic, pituitary and ovarian systems, can take several years (i.e., on average up to 5.5 years) to occur and includes pre- and peri- menopausal (i.e., climacteric period 10+ years following cessation of menstruation) phases. Due to its link with oestrogen and cognitive function, menopause is associated with variable thermal regulation and cognitive issues (i.e., mood, memory etc.) (Llewellynn-Jones et al., 1999, Brinton et al., 2009, Rubinow et al., 2009, Sowers, 2009, Melby and Lampl, 2011). Menopause is believed to have evolved in response to the altricial nature of human offspring and increased periods of infant dependency for security and nourishment and is virtually unique to the human species (Peccei, 2001, Austad and Kirkwood, 2008). Antagonistic pleiotropy has been put forward as an explanation for human menopause where, in the individual's youth, hormonal stability is critical for reproductive fitness but that this is offset in the latter stages of the female's lifespan (Melby and Lampl, 2011).

3.6 Ageing of Subadults, Adults and the Elderly

The reproductive lifespan of females is on average three decades and is defined as that period between the onset of menarche and menopause (Fretts et al., 2008). Pregnancy is marked by changes across several biological systems (Myatt and Powell, 2010) and requires increased nutritional requirements (Anderson and Wrieden, 2010). Maternal factors influencing the risk of pregnancy loss include genetics, age, disease burden, immune system and previous pregnancy history (deLuca and Leslie, 1996) as well as the interaction between the mother, placenta and foetus (Myatt and Powell, 2010).

The developmental origins of health and disease hypothesis (DoHAD) proposes epigenetic intrauterine development can lead to increased risk of some age-related diseases in adulthood (Barker, 1994, Godfrey and Barker, 2001, Barker, 2004, De Boo and Harding, 2006, Barker, 2007, César Feltes and de Faria Poloni, 2011, Godfrey et al., 2011, Uauy et al., 2011). Bioarchaeological research has adopted the DoHAD hypothesis to explore age-related stress events across the life course in archaeological contexts (Armelagos et al., 2009, Gowland, 2015). Age can also be an influencing factor in maternal health affecting pregnancy outcomes. Evidence shows a correlation between adolescent pregnancies, poor maternal health and reduced foetal health outcomes that include low birthweight and neonatal morbidity and mortality which may be affected by a limited nutritional intake being offset between growth in the foetus and the developing mother (Anderson and Wrieden, 2010). Advancing age significantly, especially for mothers over forty years of age, increases the risk of gestational diabetes, placental abruption and hypertension which exposes this cohort to heightened levels of hospitalisation and perinatal procedures (Fretts et al., 2008). Advancing maternal age is correlated with low foetal birthweight although adolescent mothers are also prone to higher incidences of low birthweight babies resulting in poorer health outcomes for mother and child (Fretts et al., 2008, Anderson and Wrieden, 2010).

Skeletal age at death estimation, whether focused on growth and development or degeneration, is influenced by a range of extrinsic and intrinsic factors including taphonomy, diet, biomechanical stress, cultural practices and disease burden (Loth and Işcan, 1989, Loth and Işcan, 1994, Nawrocki, 2010, Ubelaker, 2010) as well as the use of reference samples (Lampl and Johnston, 1996). Age-at-death assessments, of immature and mature skeletons, are performed through the application of a variety of

macroscopic and/or microscopic techniques (Crowder and Pfeiffer, 2010, Nawrocki, 2010). Variable age estimation methods are tested to determine their applicability and accuracy on sample populations. Generally, it is found that the gradation of error in age-at-death assessments increases across the lifespan (Loth and Işcan, 1994, Uhl and Nawrocki, 2010). However, it should be acknowledged that even small errors in relation to the subadult class, given the limited chronological/physiological period they occupy, can skew the data and potentially misrepresent the individual and the population more broadly.

Primary techniques used for age-at-death assessments of subadults centre on epiphyseal fusion timing, long bone length and dental maturation (Hillson, 1986, Ubelaker, 1989a, Hillson, 1996, Mays, 1998, Scheuer and Black, 2000, Scheuer and Black, 2000, Scheuer and Black, 2004, White and Folkens, 2005, Klepinger, 2006, Cunha et al., 2009, Nawrocki, 2010, Ubelaker, 2010) although other techniques, both macroscopic and microscopic are available (Streeter, 2010, Wood and Cunningham, 2011, Mays, 2013). Where skeletal elements are susceptible to demineralisation and decomposition due a variety of influences (i.e., shape, environment, taphonomy etc.), teeth are robust and preserve well *in situ* (Beach et al., 2010). Dental age estimation techniques are centred on developmental and degenerative phases of teeth and provide predictable indices of milestones in the physiological maturation of subadults with greater rates of wear, due to diet and behaviour, associated with advancing age (Ubelaker, 1989b, Beach et al., 2010). Other evidence of skeletal maturation in subadults relates to centres of ossification, bone density and cortical thickness (Klepinger, 2006, Ubelaker, 2010, Wood and Cunningham, 2011). Subadult age estimations are generally performed, using established growth standards, from reference samples of children of a known age and, ideally, of a similar genetic ancestry, not burdened by disease or nutritional deficiencies and with a similar taphonomic signature so as to enable greater reliability in the comparative approach undertaken (Mays, 1998, Schmitt et al., 2002, Wood and Cunningham, 2011). Notwithstanding the efficacy of this approach it stands to reason that subadult populations in archaeological contexts were likely burdened with disease and nutritional stresses.

Changes associated with ageing in elderly individuals in contemporary societies include substantive mood (Craft et al., 2009, Kearl, 2009), vascular (Mattson, 2009), cellular (Mattson, 2009, Cefalu, 2011) and physiological changes (Crews, 2003, Cefalu, 2011). Physiological changes associated with increasing age are numerous and relate to changes to the dentition (Cefalu, 2011), sensory decline (Cefalu, 2011, Homeier, 2014), body and skeletal mass (Plato et al., 1994, Srouji and Livne, 2005, Sullivan and Johnson, 2009), strength (Sullivan and Johnson, 2009, Homeier, 2014), immunosenescence (Lesourd et al., 1998, Burns and Goodwin, 2003, Bürkle et al., 2007, Campisi et al., 2009, Weinberger et al., 2009), and decreased hormone production (Crews, 1990, Crews, 2003, Cefalu, 2011). Physiological, cognitive and cellular decline can expose elderly subjects to an increased risk of cancer (Cefalu, 2011), nutritional deficiencies (Mayer, 1994, Stini, 1994, Lesourd et al., 1998, Lesourd et al., 2002, Sullivan and Johnson, 2009), disease (i.e. cardio-vascular etc.) (Homeier, 2014), depression (Schulz and Albert, 2009, Homeier, 2014) or trauma (Crews, 1990, Srouji and Livne, 2005, Homeier, 2014). The onset of increasing levels of depression in the elderly, brought about by physiological and functional limitations as well as bereavement through loss of family or social group, are seen as the biggest contributors to this development (Craft et al., 2009). Clinical evidence, in contradiction to negative stereotyping of the elderly, does not support a correlation between cognitive decline in regards to an individual's attention span, but rather suggests minimal decline with age regarding the fulfilment of executive functions, linguistic capabilities and memory loss (Craft et al., 2009).

Degenerative morphological changes to the pubic symphysis, auricular surface of the ilium, sternal rib end and cranial sutures, as well as dental wear are the primary focus for age-at-death assessments of mature (adult) skeletons (Loth and Işcan, 1994, Mays, 1998, Schmitt et al., 2002, White and Folkens, 2005, Cunha et al., 2009, Brown, 2010, Nawrocki, 2010, Purves et al., 2011). The distribution of age assessments generally follows a pattern, based on mean error rates, whereby the age of younger subjects are over-

estimated and that of the elderly are underestimated affecting palaeodemographic analysis through the misrepresentation of a population's profile (Schmitt et al., 2002, Nawrocki, 2010). Each method applied to adult age assessments, especially for those individuals of advanced years include variable error intervals that will impact the efficacy and accuracy of adult age-at-death assessments (Loth and Işcan, 1994, Klepinger, 2006, Crowder and Pfeiffer, 2010, Nawrocki, 2010). Nawrocki (2010: 86) notes the range of error for the assessment of the pubic symphysis (i.e., Suchey-Brooks method) or auricular surface (i.e., Osborne method) has the potential to span several decades.

Encouragingly, the accurate age estimation of even elderly adults, widely recognised as difficult and prone to error as individuals age, continues to be a major focus of bioarchaeological research, whether on skeletal or dental material despite its challenges (Lamendin et al., 1993, Crowder and Pfeiffer, 2010, Curtis and Nawrocki, 2010, Falys and Prangle, 2014, Cave and Oxenham, 2016). For example, Crowder and Pfeiffer (2010) have developed, following on from evidence that secondary cortical bone deposits in a measurable fashion, a histomorphometric method on the femur to accurately age aged adults over fifty years at death. Another example, using histomorphometric methods is to measure the deposition of osteons on the frontal bone of skeletally mature specimens as a complimentary approach to age estimation of older individuals (Curtis and Nawrocki, 2010). A macroscopic approach to estimating the age of the elderly, developed by Falys and Prangle (2014), assesses the sternal end of the clavicle, which fuses in the 20s to 30s, as another possibility for this challenging cohort. Where skeletal remains allow, Appleby (2010: 158) explored the social identity of burials from the site of Franzhausen I, Austria (c. 2200-1800BCE) across the life-course based on conditions affecting, potentially, performance or appearance. Bayesian approaches to the development of mortality profiles, seen in Transition Analysis, can also be applied to determine the probability of maximum individual age (Bolsden et al., 2002, Milner et al., 2008, Milner and Bolsden, 2012, Buckberry, 2015). Bolsden et al (2002) developed the method by initially collecting age estimates from cranial sutures, the pubic symphysis and the auricular surface of the ilium (Milner and Bolsden, 2012). Transition Analysis is used to counter deficiencies present in extant methodological ageing practices and is particularly useful for ageing older adults (Bolsden et al., 2002, Bullock et al., 2013, Buckberry, 2015). Although a Transition Analysis approach would have been well suited to the determination of adult age profiles across the sites reviewed within this dissertation, the Cave and Oxenham method (see Chapter Five) was preferred. The Cave and Oxenham approach, extrapolating tooth wear to potentially re-evaluate adult age ranges, was adopted due to the viability of dentition available for analysis.

This ends the discussion on human ageing and bioarchaeological approaches to age estimation of the young and old. The final section of this chapter explores the dominant themes and limitations associated with palaeodemographic research.

3.7 Palaeodemography

Palaeodemographic research is critical for understanding past demographic parameters, including fertility rates of past populations (Knudson and Stojanowski, 2008). From a palaeodemographic and (bio)archaeological perspective, demographic profiles provide the context within which to explore past health status, gene flow (particularly in terms of population mobility), and cultural and/or social practices through burial mediums (Knudson and Stojanowski, 2008, Lewis, 2011). Following the seminal *Farewell to Paleodemography* paper by Bocquet-Appel and Masset (1982), which identified a range of issues related to techniques of age assessment and the use of modern reference samples, the field has adopted a range of techniques and approaches to overcome these difficulties, including the four-pronged Rostock Manifesto (Bocquet-Appel and Masset, 1982, Hoppa and Vaupel, 2002, Knudson and Stojanowski, 2008, Milner et al., 2008, Roksandic and Armstrong, 2011).

Palaeodemographic studies are developed on the basis of three core assumptions that population growth, excluding the influence of immigration/emigration, is stationary (i.e. zero), that biological uniformitarianism exists and that the assignment of robust age estimations from skeletal samples occur (Boddington, 1987, Chamberlain, 2000b, Milner et al., 2008, Roksandic and Armstrong, 2011). A basis of uniformitarianism assumes that age-changes are constant and correlate with modern reference samples (Bocquet-Appel and Masset, 1982, Boddington, 1987, Chamberlain, 2000b, Hoppa, 2000, Hoppa, 2002, Roksandic and Armstrong, 2011). While necessary in palaeodemographic contexts, an assumption of uniformitarianism is flawed as age-changes, in both time and space, can be influenced by a range of factors including biological sex and cultural practices (Finlay, 2000, Hoppa, 2002, Murphy, 2011a, Murphy, 2011b, Roksandic and Armstrong, 2011).

A historical issue extant in palaeodemographic research is the over-ageing of subadults and under-ageing of elderly subjects (see Section 3.6) (Ackroyd et al., 1999, Klepinger, 2006, Saunders, 2008, Capella et al., 2017). This remains an issue in contemporary forensics as elderly skeletons continue to be under-aged (Capella et al., 2017). Further, a wide variation in perinate long bone length can result in identifying pre-term cases where, in fact, they are underweight and undersized (Smith and Avishai, 2005). This in turn would affect palaeodemographic profiles and consequent analysis and conclusions. A by-product of issues relating to the under- and over-ageing of samples has resulted in the mean age profile of populations being misrepresented and skewed towards conflating numbers in the younger and middle adult age categories (Bocquet-Appel and Masset, 1982, Jackes, 1992). This has fed into the bias and mistaken belief that longevity is a relatively recent phenomenon in human history (Ackroyd et al., 1999, Scott, 1999, Milner et al., 2008, Saunders, 2008, Roksandic and Armstrong, 2011). Subadults have also been found to be under-represented, particularly the very young, from palaeodemographic profiles (Johnston and Zimmer, 1989, Jackes, 1992). Explanations for this absence include cultural reasons and issues related to the preservation of the infant skeleton although preservation of adult skeletal material can also heavily influence, positively and negatively, demographic profiles (Walker et al., 1988, Guy et al., 1997, Chamberlain, 2000a, Bello et al., 2006, Saunders, 2008).

Where age-at-death assessments of subadults, due to the distinct and measurable patterns of growth in the skeleton and dentition with some small error, is relatively robust, the accurate age estimation of adult skeletal samples, especially of the elderly, is less so (Weiss, 1973, Crews, 1990, Plato et al., 1994, Lampl and Johnston, 1996, Mays, 1998, Scheuer and Black, 2000, Scheuer and Black, 2000, Scheuer and Black, 2004, Knudson and Stojanowski, 2008, Milner et al., 2008). This is due to the variability in rates of degeneration and remodelling in adults across the lifespan (Loth and Işcan, 1994, Cox, 2000, Schmitt et al., 2002, Klepinger, 2006, Capella et al., 2017). This variability is further exacerbated by a range of factors including sex, cultural practices and behaviour, nutritional status, genetics and infectious or pathological burden (Loth and Işcan, 1994, Ackroyd et al., 1999, Schmitt et al., 2002, Curtis and Nawrocki, 2010). Finally, limitations in methodological approaches to accurately estimating the age-at-death of the elderly remains an issue for palaeodemographers and bioarchaeologists alike.

Bioarchaeological analyses, through the assignment of age-at-death estimates, make a correlation between biological, or physiological/skeletal, age and chronological age for the purposes of developing a population profile of the sample population group (Roksandic and Armstrong, 2011). Unfortunately, it cannot be assumed that chronological age, in its relationship with physiological/skeletal age, is either linear or constant across and even within populations (Bocquet-Appel and Masset, 1982, Hoppa, 2000, Schmitt et al., 2002, Cunha et al., 2009, Gowland, 2009, Capella et al., 2017). However, it may be a possible that the chronological age profiles being developed may be culturally redundant in the context of the sample group. Due to the limitations and challenges in methodological approaches, demographic practices commonly apply age categories in five or ten year phase ranges (i.e., 30-35 years, 30-40 years) (Knudson and Stojanowski, 2008). Generally, as a consequence of this approach and methodological

limitations in being able to accurately assign an age to elderly subjects, demographic profiles will cut-off at a ceiling in the fourth or fifth decade of life, which feeds into the misrepresentation that the past was predominantly populated by younger cohorts (Chamberlain, 2000b). This methodological issue, inferentially, further promotes the perception and bias that the ageing process is static and shared across older and younger cohorts. The practice of adopting age phases, while common and used in this research, is not without challenge as the chronological age applied may be culturally meaningless to the prehistoric population under review independent of the underlying, yet still significant, challenge associated with skeletal age assessments (Nawrocki, 2010, Roksandic and Armstrong, 2011).

3.8 Summary

This chapter has discussed a range of developments in relation to age-at-death estimation and the process of ageing. These include a gendered approach in archaeological discourse as a means to critically engage, initially through second-wave feminist approaches, with established androcentric perspectives regarding females in the past. Feminist critiques, and the application of third-wave approaches to archaeology, has led to the emergence of the meaningful study of young and the old. Archaeology has fruitfully engaged with the young for over twenty-five years now and has challenged entrenched, and idealised, viewpoints of this group resulting in greater awareness of the significance and contribution of this cohort in prehistory at a social, ritual, economic and innovative level. However, as research on the elderly in archaeological contexts has only commenced since the turn of the century this cohort currently continues to remain under-researched and under-theorised.

This chapter also explored dominant themes in relation to the evolution of ageing affecting the development of humans, identifying that the biological mechanisms associated with senescence are still contested. A brief description of a select range of the biological phases of foetal and infant development, as well as degenerative factors found in age-at-death estimation of adults, and the overarching age estimation techniques applied to each cohort in bioarchaeological assessments was also discussed. Finally, this chapter explored the challenges facing the young, but especially the elderly, in palaeodemographic studies. The following chapter will explore key developments in Mainland Southeast Asia across the Neolithic to the Iron Age and provide an overview of the four sites, Khok Phanom Di, Ban Non Wat, Ban Lum Khao and Noen U-Loke, under review in this research.

Mainland Southeast Asia: Overview and Site Discussion

4.1 Introduction

Mortuary traditions across Island and Mainland Southeast Asia demonstrate a rich and diverse history, through the Pleistocene and Holocene (e.g. Higham, 1996, Higham, 2002, Higham, 2013, O'Reilly, 2015, Oxenham et al., in review-a, Oxenham et al., in review-b). As in other locales, mortuary traditions in this region also act as mediums through which to engage and chart the variation and development of a range of behaviours related to individual identity, group organisation and the connections and relationships between populations over time. While mortuary variability exists, it is broadly recognised that the three periods under review, the Neolithic through to the Iron Age, witnessed a transition from relatively non-stratified, sometimes egalitarian, social systems in the Neolithic and Bronze Age, with exceptions, towards a more complex hierarchal structure prior to the rise of states from the Iron Age (O'Reilly, 2000, Higham, 2004b, Higham and Higham, 2009a, Rispoli et al., 2013, O'Reilly, 2014, O'Reilly, 2015). The Iron Age precipitates the emergence of proto-states in Southeast Asia, influenced through ongoing and increased contact and exchange with India and China.

Regarding mortuary practices specifically there is a substantial body of research which demonstrates a wide variety of practices in the region. Examples of variable mortuary styles adopted across Southeast Asia over the Pleistocene and Holocene include the presence of:

- flexed, squatting and semi-flexed burials (Higham, 1996, Pietrusewsky and Douglas, 2001, Higham, 2002, Treerayapiwat, 2005, Mornais, 2007, Higham and Wiriayaromp, 2010a, Higham, 2013, Higham et al., 2014a, Tayles et al., 2015, O'Reilly and Shewan, 2016, Oxenham, 2016, Piper, 2016, Oxenham et al., in review-a, Oxenham et al., in review-b);
- secondary burials (Piper, 2016, Oxenham et al., in review-b);
- cremation (Lara et al., 2013, Ward and Tayles, 2016, Schrenk, 2017);
- the use of shrouds (Higham, 1996, Higham, 2002, Liem, 2005, Willis and Tayles, 2009, Harris and Tayles, 2012, Harris et al., 2016, Oxenham et al., 2016, Oxenham et al., in review-a);
- disposal containers (i.e., wood, clay coffins) (Higham, 2002, Treerayapiwat, 2005, Talbot, 2007, Nakbunlung and Wathanawareekool, 2008, Willis and Tayles, 2009, Higham, 2012h, Higham, 2012e, Higham, 2012f, Harris et al., 2016, Oxenham et al., in review-b);
- residential burial (White and Eyre, 2011);
- clustered burial (Higham and Bannanurag, 1990);
- rice burial (Higham and Thosarat, 2007a);
- on/under beds of gastropods (Ninh, 2000, Higham, 2012h) or broken sherd sheets (under or on top of sheet) (Douglas, 1996, Ciarla, 2008, Van Esterik, 2011);
- the ubiquitous jar burials (e.g. Indrawooth, 1997, Thinh, 2005, Dzung, 2009), primarily of subadults but also including, on occasion, adults (Higham and Wiriayaromp, 2010b); and
- boat burials (Ballard et al., 2004, Liem, 2005, Higham, 2010a, Higham, 2011b).

Mortuary variation regarding jar burials occur. In addition to the most-commonly applied whole-body placement within the vessel there are also examples of the subject's head being placed within the vessel (Tayles, 2003, Higham and Thosarat, 2007c) or where the body is deposited between two vessels that

were placed/positioned mouth-to-mouth (aperture-to-aperture) (Thinh, 2005, O'Reilly, 2007, Higham et al., 2014a).

Chapter Four is divided into five broad sections with the initial section engaging with mortuary developments on the Southeast Asian mainland and some of the major cultural traditions from non-Thai nations across the Pleistocene (Hoabinhian) and into the Holocene. Section 4.2 explores mortuary developments in Thailand in the same broad period and considers aspects of mortuary behaviour which could support or suggest the presence of identity, ideally age-identity, from the sites discussed. Section 4.3 look at influences that drove, and impacted on, social change in the region followed by a review of developments related to archaeological research focused on the young and old in Southeast Asia. The final part of the chapter provides an overview of research developments related to each of the four sites under review.

4.2 Mortuary Developments in Southeast Asia

As outlined in the introductory section, the initial component of the chapter discusses a range of the dominant, non-Thai, cultural (mortuary) traditions across Mainland Southeast Asia from the Pleistocene and into the Holocene. Pleistocene colonisation of Southeast Asia by anatomically modern humans is characterised by movement into both interior upland and coastal areas (Higham and Thosarat, 1994, Schepatz et al., 2000, Demeter et al., 2009, Oxenham et al., 2015) and is generally identified by the Hoabinhian cultural complex. Archaeological evidence of inland activities is primarily recovered from cave and rock shelter sites with evidence of localised stone-gathering, stone and bone tool manufacture, hunting-collection subsistence strategies and burials within cave settings (Bellwood, 1992, Higham and Thosarat, 1994, Anderson, 1997, Schepatz et al., 2000, Higham, 2002). Coastal sites are associated with shell middens and alternative subsistence strategies based on resource availability (Bellwood, 1992). Hoabinhian burials were buried in a supine, flexed or squatting (the most common) position and multiple (double) burials have been found at Gua Cha on the Malaysian peninsula and Mái Đá Đieu in Vietnam (Sieveking, 1954-55, Viet and Oanh, 2003, Piper, 2016, Oxenham et al., in review-b). Evidence from Hoabinhian mortuary sites also suggests the occurrence of burning and instances of secondary burial (Oxenham et al., in review-b). Material culture associated invariably included stone (worked and unworked), shell (worked and unworked), faunal remains and ochre (Oxenham et al., in review-b). The placement of cowrie (*C. arabica*) shells in the eye sockets of an elderly female at the Hoabinhian site of Phia Vai Cave, Vietnam, may also bear witness to an expression of an individual's identity within their group (Cuong, 2007, Oxenham et al., in review-b). Mortuary practices and ante-mortem ablation from the upland site of Tam Hang, in northern Laos, suggest the presence of complex social identities and the potentiality of the attainment of a prescribed personhood status from adolescence in this group (Willman et al., 2016). However, the site's chronology into the Pleistocene has been questioned (Oxenham, pers.comm).

Archaeological evidence is witness to the emergence of new cultural traditions in the Neolithic period in Southeast Asia. The Neolithic Phùng Nguyên Culture (c. 2000-1500BCE) found along the Red River Valley delta in Vietnam shows evidence of cultural and biological influences from the north and is associated with combined rice agriculture and foraging practices, domesticated pigs and dogs, spinning whorls and elaborately decorated (red slip incised and impressed) ceramics (Higham, 2002, Oxenham et al., 2005, Chi and Hung, 2010, Cameron, 2011, Higham, 2017). Decorative motifs present in Phùng Nguyên pottery are widespread across the region (Rispoli et al., 2013). Mortuary behaviour, predominantly supine but with few flexed burials (Huffer and Hiep, 2011), from the Neolithic, Phùng Nguyên site of Man Bac (c. 1800-1500BCE) (Oxenham and Matsumura, 2011), demonstrates the likelihood of a range of social identities. Several osteobiographical studies have found evidence for prolonged and sophisticated care for a severely disabled group member at Man Bac (Oxenham et al., 2009, Tilley and Oxenham,

2011, Tilley and Oxenham, 2016). Further, some burials were interred in direct association with Unionidae (*Lanceolaria* sp.) bivalves which have been identified from mortuary settings across the region through to the Iron Age and may have symbolic significance across many cultural traditions (Oxenham et al., 2008a, Ciarla et al., 2017, Ross and Oxenham, 2017). An analysis on the mortuary status of subadults at Man Bac, which comprise a disproportionately high 58.9% of the cemetery population (Domett and Oxenham, 2011), identified a potential different identity between subadults aged under two years of age and those older, due to a lack of specific grave goods emerging from two years of age and an association with adult females (Oxenham et al., 2008b).



FIGURE 4.1: Unionidae bivalve at skull of B90 from Ban Lum Khao (Photo: Higham, C.F.W. 2004. *South East Asian Archaeology Data*, Retrieved from <https://drive.google.com/drive/u/0/folders/0BwyPRRjONdiFWM5eXpDdEd0ejQ>)

The Đa Bút Culture complex, scattered throughout northern Vietnam, demonstrates biological continuity, if not cultural, with the preceding Hoabinhian period and dates from 4500BCE (Oxenham and Matsumura, 2011, Oxenham et al., in review-b, Oxenham, 2016). Đa Bút sites, show some evidence of sedentism, and are characterised by shell middens and an adaptation to, and exploitation of, coastal lacustrine and swamp environments with polished stone tools and distinctive pottery recovered (Vinh, 1991, Viet, 2005, Oxenham and Matsumura, 2011, Oxenham, 2016, Oxenham et al., in review-b). Đa Bút mortuary behaviour, best exemplified by the large cemetery site (n=266) of Con Co Ngua, is characterised by burials (wrapped in bark cloth) lacking grave goods, the majority being seated/squatting in circular pits or side flexed/foetal in the upper levels of the site (Oxenham, 2016, Oxenham et al., in review-a, Oxenham et al., in review-b). A high proportion (<70.0%) of burials were subject to skeletal modification and mutilation at Con Co Ngua (Oxenham et al., in review-a). Squatting burials of the Đa Bút Culture complex were also found at the sites of Đa Bút and Ban Thù (Oxenham et al., in review-a). Notable mortuary treatment of a subadult occurs at Đa Bút where the skull was used as a vessel to hold the disarticulated post-cranial skeleton (Oxenham et al., in review-a).

The iconic Vietnamese Bronze to Iron Age transition is characterised by the Đông Sơn culture complex. Characteristics of Đông Sơn mortuary tradition is witnessed through burial in extended, occasionally flexed, styles and the placement of bronze bowls at an individual's head (Reinecke, 2009). Interestingly, Đông Sơn mortuary suites do not contain the ubiquitous child jar burials located throughout Southeast Asia and, on occasion, some bodies are interred without the skull, which, in turn, is instead represented with a bronze bowl (Reinecke, 2009). This bears some resemblance to the removal of the skull from a few burials at the Bronze Age site of Non Nok Tha and placing Unionidae bivalves in the skulls stead (Douglas, 1996, Ross and Oxenham, 2017). Some elite late-prehistoric to early historic period Đông Sơn burials were buried in iron wood boat coffins (Miksic, 2003, Liem, 2005, Reinecke, 2009). Echoes of Đông Sơn mortuary traditions of placing bronze bowls at the individual's head has been found in metal age sites in Cambodia (O'Reilly and Shewan, 2016). Đông Sơn culture is seen as originating from the Phùng Nguyên and subsequent Dong Dau and Go Mun cultures at the Red River delta in Vietnam (Mien, 2005, Reinecke, 2009).

The Metal Age Sa Huynh culture sites (c. 500BCE-CE100), found on the south central coast of Vietnam, are located in coastal sand dunes or on river banks (Thu Bon River Valley), and are characterised by the presence of distinctive ceramics, glass, metal, shell tools and stone jewellery (e.g., carnelian,

agate) (Glover et al., 1996, Ninh, 2000, Ninh, 2005, Glover and Dung, 2011, Rispoli et al., 2013). Sa Huynh material culture, and inland and coastal site locations, are believed to have supported an extensive waterway exchange network across Southeast Asia (Yamagata, 2006, Dzung, 2009, Cameron, 2011). Sa Huynh carnelian beads are morphologically similar to others from sites across Southeast Asia and may have, with agate beads, been imported or locally produced (Glover and Dung, 2011, Rispoli et al., 2013). Mortuary behaviour in Sa Huynh sites is characterised by the presence of large, thin-walled, burial (i.e. cylindrical or ovoid) jars (Glover et al., 1996, Glover and Dung, 2011) but flexed graves have been found at Lý So'n island (Ninh, 2000, Ninh, 2005, Reinecke, 2009). Burials at the Sa Huynh site of Xom Oc were afforded unusual treatment in that the flexed bodies were laid on sand and fragmented pottery and graves were covered by gastropod and bivalve shells (Ninh, 2000). Dzung (2009) observed differential mortuary wealth at the Sa Huynh site of Lai Nghi as evidence of social inequality.

Although beyond its scope, this research recognises the Indianised, Austronesian speaking, Champa polities located on the central coast of Vietnam (c.CE500-1500) (Tingley, 2009, Glover and Dung, 2011). Like the Sa Huynh cultures, Cham people exploited coastal waterways for subsistence, agriculture and exchange (Southworth, 2004, Guy, 2008, Tingley, 2009, Glover and Dung, 2011). Indian influences are visible from Hindu architecture and cosmology (Glover et al., 1996, Ninh, 2005). Given the linguistic, material and distributional relationship of Champa centres in the late-prehistoric to historic period it has been suggested that Cham states may have originated from the Sa Huynh culture (Yamagata, 2006, Vickery, 2009, Glover and Dung, 2011).

Like Champa in the north, the emergence of the pre-Angkorian Mekong delta state of Funan (Zhenla/Chenla) is contemporaneous with the later Iron Age mortuary phases with sites in the Upper Mun River Valley (Talbot, 2007, Higham, 2012a). Important sites of the Funan state, exhibiting evidence of complex exchange networks, include Angkor Borei and Óc Eo (Mudar, 1999, Manguin, 2004). Funan burials, as found at Óc Eo, are cremated and deposited in brick-lined squares containing sand, human remains, material culture and capped by broken bricks (Khai, 2003). Conversely, burials recovered from Angkor Borei were typically supine, but also contained bundled secondary burials, associated with ceramics, glass and faunal remains. Angkor Borei burials included cremated burials described above which are described as 'fire' and 'earth' burials and may, potentially, be further evidence of social division or inequality (Stark, 2003).

4.3 Mortuary Developments in Thailand

The previous section briefly discussed a variety of mortuary traditions found across Southeast Asia from the Pleistocene and into the Holocene. Moving on, this current discussion will provide a focus on mortuary developments in Thailand, primarily central and northeast, across the same period. Although non-exhaustive, the discussion below engages with a number of key cemetery sites excavated in Thailand (see Figure 4.2) to provide a broad view of mortuary traditions across time and space in the country. As the four sites under review are very influential in our understanding of social, technological and economic developments in the region, greater discussion is withheld here and given at Sections 4.6.1 to 4.6.4.

Thad Lod Rockshelter 2. Ban Rai Rockshelter 3. Ban Wang Hai 4. Tham Ongbah 5. Ban Don Ta Phet 6. Ban Kao 7. Moh Khiew 8. Khok Phanom Di 9. Nong Nor 10. Ban Chiang 11. Ban Na Di 12. Noen U-Loke 13. Non Ban Jak 14. Ban Non Wat 15. Ban Lum Khao 16. Non Muang Kao 17. Ban Prasat 18. Ban Krabuang 19. Khok Charoen 20. Tha Kae 21. Nil Kham Haeng 22. Non Mak La 23. Phu Noi 24. Noen Din 26. Non Praw 27. Non Nok Tha 28. Ban Chaibadan 29. Don Klang 30. Muang Fa Daet

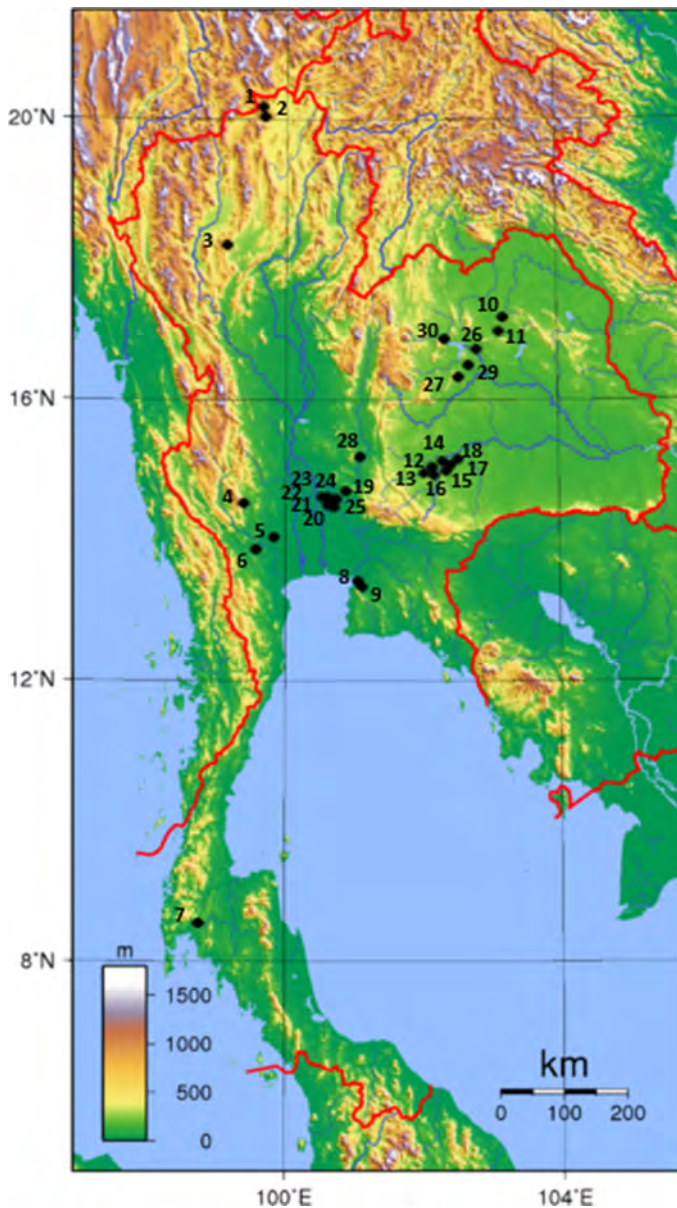


FIGURE 4.2: Location of sites under review and discussed at Section 4.3.

at a number of Hoabinhian sites in Vietnam (Oxenham et al., in review-b). Similarly, the two burials from Tham Lod (c. 14,800-14,240BCE), where at least one burial was identified as flexed, were also buried beneath a circle of large rocks (Oxenham et al., in review-b). A single flexed burial, suggestive of Hoabinhian mortuary practices, was also recovered from the mid-Holocene site (c. 6050-5845BCE) of Ban Tha Si (Piper, 2016, Oxenham et al., in review-b). Flexed burials continued into the Neolithic and were found at a number of sites including Ban Non Wat and Nong Nor (Higham and Thosarat, 1997b, Higham and Wiriayarp, 2010a, Oxenham et al., in review-b).

The transition from the hunter-gatherer to the Neolithic sites in Thailand sees a number of changes in mortuary behaviour. Changes occur in relation to body positioning (extended supine dominates), the commencement of the long-running practice (Neolithic to Iron Age) of including Unionidae freshwater

(adapted from public domain Sadalmelik 2007: https://en.wikipedia.org/wiki/River_systems_of_Thailand#/media/File:Thailand_Topography.png)

Pleistocene and early-mid Holocene mortuary behaviour in Thailand is often characterised by the use of rockshelters for the interment of individuals (flexed, supine-flexed) with similar features (large rocks deposited over/around body) and material (i.e., stone tools) and faunal (i.e., freshwater shell, animal bone/dentition) accompaniments. Early mortuary activity in Thailand can be observed from the sites of Moh Khiew, Thad Lod and Ban Rai rockshelter. Excavations at Moh Khiew rockshelter (c. 25,000-7200BCE) in southern Thailand unearthed six burials which have similarities with mortuary behaviour from other Hoabinhian sites. These include the deposition of flexed and supine burials and the placement of large rocks over the corpse (Matsumura and Pookajorn, 2005, Oxenham et al., in review-b). Ban Rai rockshelter, situated in northwest Thailand, included a single flexed burial with large rocks deposited over the skull from the late Pleistocene to early Holocene periods (c. 10,500-8250BCE) (Treerayapiwat, 2005, Oxenham et al., in review-b). After a long hiatus, continued cemetery use was undertaken at Ban Rai rockshelter in the northwest of Thailand across the Iron Age and into the Historic Period (c. 100BCE-CE800) in the form of log coffin burials (Treerayapiwat, 2005). The placement of large rocks over burials has been observed

bivalves in some graves and the inclusion of a new suite of material culture items including distinctive ceramics and a range of shell and stone artefacts. Neolithic burials also bear witness to incipient social differentiation through the presence of some very wealthy (often singular) burials, disproportionately so in comparison to their cemetery counterparts, at the sites of Khok Phanom Di, Khok Charoen and Non Pa Wai (Loofs and Watson, 1970, Higham and Bannanurag, 1990, Piggott et al., 1997, Higham, 2002, Rispoli et al., 2013). Such inequality precipitates the increasing complexity in mortuary behaviour over time in Thailand. As can be seen in the later Bronze and Iron Ages, there is evidence of long range exchange across the region where many sites, often in disparate locations, share commonalities in the design, material or construction of material items.

Ban Kao (c.2300-1500BCE), situated in Kanchanaburi Province, is relatively contemporaneous with Khok Phanom Di and has yielded over forty burials that contain material culture commonly found at other Neolithic sites (Higham, 2002). Burials were typically laid out in an extended supine fashion but there is one instance (B26) of a flexed burial occurring (Sørensen and Hatting, 1967). The inclusion of specific fauna (i.e. juvenile pig, freshwater bivalve), frequently found in mortuary contexts in Southeast Asia, occurs in later phases at Ban Kao (Sørensen and Hatting, 1967, Higham, 2002). The presence of a single infant burial at the site suggests the possibility of differential identity due to their general exclusion from the cemetery (Sørensen and Hatting, 1967, Higham, 2002, Halcrow et al., 2008). A tacit gender identity is suggested, where double burials containing a single male and female occur, through the oppositional orientation of males (Southeast orientation) and females (Northwest orientation). Ceramic wares from burials at Ban Kao are suggested to have commonalities with vessels (i.e., Impressed and Incised (I&I) vessels) from southern China (Sørensen and Hatting, 1967, Higham, 2011b) and other contemporaneous Southeast Asian sites such as Ban Chiang, Khok Charoen and Non Pa Wai (Higham, 2002, Rispoli et al., 2013). The shell beads associated with one burial (B11) are similar to those found at Khok Phanom Di (Higham, 2002). Dental metrics, supporting the two-layer hypothesis, suggests gene flow into the site of Ban Kao from East Asia (Matsumura and Hudson, 2005).

The site of Tha Kae (c1800BCE-CE900) is located near Lopburi on the Central Plain of Thailand and was occupied from the Neolithic to the Iron Age (Cameron, 2011, Rispoli et al., 2013). Grave goods include the presence of Unionidae bivalves (on/beside body, on eyes) and I&I vessels as seen in other Southeast Asian sites (Higham, 2002, Higham, 2004f, Rispoli et al., 2013, Ciarla et al., 2017, Ross and Oxenham, 2017). Jar burials have also been recorded from the Neolithic at Tha Kae (Rispoli et al., 2013). Non Pa Wai of the Lopburi Province, like Tha Kae, was occupied from the Neolithic (c. 1800BCE) to the Iron Age and is recognised as an industrial (copper production, smelting) centre in the region (Pryce et al., 2011, Rispoli et al., 2013). Sixteen Neolithic burials excavated from Non Pa Wai contained I&I vessels, clay anvils, stone tools and shell jewellery (Higham, 1996, Higham, 2002). Rispoli (2013) suggests that social differentiation at Non Pa Wai may be witnessed in the Neolithic through the presence of a very wealthy burial (B4) which draws comparisons with wealthy Neolithic burials (B15, B18) from Khok Phanom Di. Khok Charoen is another Neolithic cemetery located in Lopburi Province that yielded over seventy burials (Loofs-Wissowa, 1997). Burials were predominantly deposited in a supine extended fashion and contained varying quantities of items frequently associated with the Neolithic (i.e., I&I vessels, stone tools, stone jewellery, shell disc beads) (Loofs and Watson, 1970, Higham, 1996, Loofs-Wissowa, 1997, Higham, 2002). The variable quantity of grave goods has been suggested to infer a social inequality in this population (Higham, 1996).

Ban Chiang (c. 1600-CE200) in northeast Thailand was occupied, as a residential and cemetery site, from the Neolithic to the Iron Age (Pietrusewsky and Douglas, 2001, Higham et al., 2011b, Oxenham et al., 2015). Burials were normally laid out in an extended supine fashion at Ban Chiang with exceptions being the presence of infant jar burials (Early Period) and some flexed adult burials (Douglas, 1996, Pietrusewsky and Douglas, 2001, Pietrusewsky and Douglas, 2002, Van Esterik, 2011). Regional variation

between the Neolithic sites of Ban Chiang (Northeast Thailand) and Khok Phanom Di (Central Thailand) is suggested with respect to the contrasting number of infant jar burials at each site (Pietrusewsky and Douglas, 2002, Halcrow et al., 2008). The subadult cohort is under-represented (under 30.0% as suggested by Waldron for pre-industrial societies) at Ban Chiang (Waldron, 1994, Pietrusewsky and Douglas, 2001, Pietrusewsky and Douglas, 2002). Bronze Age Ban Chiang burials were laid out in clusters or rows (Higham, 2002). Differential mortuary treatment can be observed through the association of ceramic wares across the Early, Middle and Late periods where vessels were placed at the head or feet of the deceased (Early and Late Periods) or, alternatively, smashed and placed as a sheet over the burial (Middle Period) (Douglas, 1996). Unusually, and in contrast with other Southeast Asian sites, evidence suggests that only at Ban Chiang did infant mortality occur most frequently in the post-neonatal period (over one month) (Halcrow et al., 2016).

A great deal of the mortuary behaviour seen in the Bronze Age echoes that from the Neolithic regarding body position, material culture and spatial distribution. Social organisation, broadly, is considered as egalitarian or heterarchical depending on the theoretical stance. An exception to this, discussed in greater detail in Section 4.4, is seen through the presence of very wealthy burials in the earlier phases of the Bronze Age suggested as being evidence of transegalitarianism in the region. As noted below, there is also inferential evidence suggesting an increased presence of social inequality based on differential wealth across, and within, groups. Exchange networks continue to be reinforced through the increased presence of technological advancements and of exotic materials in mortuary contexts.

The Bronze Age cemetery site of Nong Nor (c. 1100-700BCE), located in Central Thailand near Khok Phanom Di, has yielded 155 burials (Tayles et al., 1997). Subadult burials (33/155, 21.2%) are below anticipated levels (30.0%) for a pre-industrial community (Tayles et al., 1997). With some exceptions, most burials are laid out in the normative extended supine fashion in an easterly orientation with hands over the pelvis (Chang, 1996, Higham and Thosarat, 1997b). Burials were laid out in rows, particularly in the Western area of the cemetery, and infant jar burials were deposited in small clusters or in association with an adult female burial (Higham and Thosarat, 1997b, Higham, 2002). Material culture with the burials include ceramics, shell and stone jewellery, stone tools, metal artefacts (bronze, tin) and faunal remains (Chang, 1996, Higham and Thosarat, 1997b). Complete dog skulls were recorded in graves in addition to the normative suite of faunal species recorded from mortuary contexts in this period (Chang, 1996, Higham and Thosarat, 1997a). Rispoli (2013) suggests typological similarities between barrel-shaped shell beads found at Nong Nor and the sites of Ban Non Wat and Phu Noi. Higham (1996) sees similarities of marble T-shaped bracelets found at Nong Nor with those from Ban Na Di and Non Praw. Further afield and from the Neolithic period of occupation, similar ceramic temper, form and decoration are found at the Vietnamese site of Ân So'n, Khok Phanom Di and Nong Nor (Higham, 2004f, Vincent, 2004, Sarjeant, 2010, Oxenham et al., 2015). Chang (1996) noted a disparity in wealth between subadult, and between male and female, burials but this is countered by statistical analyses which does not support mortuary differentiation by wealth based on age or sex (Debreceeny et al., 1997, Higham and Thosarat, 1997a). There is an indication of gendered identity through the association of adult male burials with grinding stones (Debreceeny et al., 1997). Structurally, Nong Nor is similar to many other Bronze Age communities in that it appears non-stratified and autonomous (Higham and Thosarat, 1997a, O'Reilly, 2000). Higham and Thosarat (1997) suggest, through the presence of exotic artefacts in mortuary contexts, that status was obtained rather than inherited.

Returning to Lopburi region on the Central Plain of Thailand we find numerous sites containing mortuary data across the Bronze Age. Excavations at the site of Non Mak La has seen nearly fifty burials recovered, some of which are infant jar burials (Higham, 2002, Van Esterik, 2011). Evidence for long distance trade is seen through the presence of *Tridacna* shell bracelets at Non Mak La and Non Pa Wai (Higham, 1996, Piggott et al., 1997). Copper production and smelting occurred at the important site of Non Pa Wai,

across the Iron Age with bivalve moulds also recovered during the Bronze Age at 1000BCE (Pryce et al., 2011). Funerary behaviour during the Bronze Age at Non Pa Wai included the wrapping of some burials in fibrous shrouds with associated material culture including ceramic vessels (similar forms found at Ban Lum Khao), shell and stone jewellery and the inclusion of freshwater bivalves (Rispoli et al., 2013). At Phu Noi, Lopburi region, over thirty extended burials, laid out in a clustered distribution, were excavated from three mortuary phases at the site (Natapintu, 1997, Higham, 2002). Differential mortuary behaviour between the phases includes changing pottery styles deposited with burials and the dissimilar placement of pig remains between mortuary phase one (feet) and mortuary phases two and three (chest, skull) (Natapintu, 1997). All burials at Phu Noi were afforded ceramic artefacts, as a minimum, as grave goods (Natapintu, 1997). Similarity is seen in ceramic typology between Phu Noi and Non Nok Tha (Higham, 1996). The potential for social inequality is suggested at Phu Noi through the presence of three wealthier burials in the initial phase (Higham, 2002). The discovery of toilet items (skin-rubbers for cleaning) at Phu Noi, in addition to other Lopburi region sites such as Tha Kae, Non Pa Wai and Nil Kham Haeng, in the Iron Age (c. CE300-500) hints at exchange with the subcontinent (Rispoli et al., 2013). Given the increased grave wealth of the fourteen burials from Nil Kham Haeng (c. 1100-300BCE) in comparison to the nearby site of Non Pa Wai, Piggott et al. (1997) suggests the potentiality for social differentiation and heightened exchange. As with Khok Phanom Di and the association of ceramic producers with specific ceramic grave goods (i.e., anvils), the inclusion of metal working artefacts at Nil Kham Haeng may hint at an elevated, or separate, status in relation to these burials within the group, or in the case of Nil Kham Haeng, in relation to neighbouring sites.

Moving away from the Lopburi region and returning again to the northeast of Thailand, we come to the Bronze Age cemetery site of Non Nok Tha (c. 900-600BCE) (Higham et al., 2014b). Non Nok Tha, a cemetery site with limited residential and industrial (i.e. pottery manufacture, bronze casting) activity, yielded 180 burials across seventeen discrete mortuary phases (subdivided into the Early, Middle, and Late Periods) followed by crematory practices (Bayard, 1971b, Bayard, 1972, Higham, 1996, Bayard and Solheim II, 2009). Burials were predominantly in an extended position in graves that included variable types and quantities of grave goods (Bayard, 1971b, Bayard, 1984, Higham, 1989, Higham, 2002). Bovids constituted the primary faunal remains associated with burials although pig and Unionidae bivalves were also present (Higham, 1996, Bayard and Solheim II, 2009). The frequently encountered I&I vessels, as seen at many sites across Southeast Asia, are also present at Non Nok Tha (Rispoli et al., 2013). Juvenile burials were most frequently excavated from the Early Period of cemetery use (Bayard and Solheim II, 2009) with low numbers of subadults suggested to be due to preservational (Pietruszewsky, 1974a) or sampling issues (Douglas, 2006). Separate mortuary periods are identified by differential mortuary treatment (i.e., appearance/disappearance of secondary burials, mounded burials, pottery clusters etc.) and the presence/absence of material culture types (Bayard and Solheim II, 2009). Based on the analysis of Middle Period burials, primarily focussed on the presence/absence of specific material culture (i.e., Type 2C and 2L vessels) and grave wealth, Bayard and Solheim II (2009: 438) suggested that social organisation at Non Nok Tha was predicated on two affiliated groups (Bayard, 1984). Based on the distribution of wealth it was suggested there is no evidence of egalitarianism in the Middle Period but only weak evidence for hierarchy at Non Nok Tha (Bayard and Solheim II, 2009: 439, 446). As will be discussed in Section 4.5, it has been suggested that gender identities are present at Non Nok Tha from evidence related to mortuary treatment and material culture (Bacus, 2006, Bacus, 2007).

Also excavated in northeast Thailand is the site of Ban Na Di (c. 600-400BCE), in the Pao River Valley, which yielded sixty burials across five mortuary phases with the majority recovered from phase's 1a-1c (Higham and Kijngam, 1984, Higham, 1996). In addition to the normative range of material artefacts found within graves, a variety of anthropomorphic figurines were present (Higham and Kijngam, 1984, Van Esterik, 2011). Affinities of material culture from Ban Na Di are shared with sites such as Ban Non

Wat and Ban Lum Khao through the presence of T-shaped stone bracelets and iron tools from Non Pa Wai and Noen U-Loke (Rispoli et al., 2013). Infants were buried in close proximity to adults and jar burials were rare at this site (Higham, 1996). The majority of research has focussed on the first three phases of mortuary activity, but it is worth noting that mortuary phase two solely comprises infant jar burials (Higham and Kijngam, 1984). There is inferential evidence for possible gender identities between males and females with females oriented north and males, with one exception, oriented in a southern direction (Higham, 1996, Bellwood, 2007, O'Reilly, 2007). Faunal remains included bovid, pig and a single subadult burial interred below a crocodile skin shroud (Bellwood, 2007). The presence of cloth adhered to metal artefacts suggests that wrapping may have been more widespread at the site (Higham and Kijngam, 1984). The number of grave goods, including bronze, increased from phase 1a to 1c and spatial data suggests one group was wealthier than its counterpart (Higham, 1989, Higham, 1996, O'Reilly, 2007). Social distinctions are premised on the differential wealth between the primary two groups at Ban Na Di, with those having greater wealth suggested to have held elevated status within this community (Higham and Kijngam, 1984, Higham, 1989, O'Reilly, 2007). There is also a suggestion that the presence of crocodile bone with some of the wealthier burials may also suggest differential status between the groups (O'Reilly, 2007).

Shifting the focus from the Bronze Age to the Iron Age sees increasing complexity brought about by a range of social (i.e., increasing inequality, heightened evidence of conflict) and environmental factors (i.e., water management leading to moated communities). A response to the increased risk associated with water restrictions in the Iron Age saw the emergence of moated communities across the region with many being recorded throughout Thailand. Increased exchange and interaction in the Iron Age can be seen through the presence of greater frequencies of exotic items, the standardised manufacture, in part, of some ceramic types and advances in technological development. Many of the Thai sites already discussed had long occupation periods that stretched into the Iron Age and are referred to above.

The northern Iron Age site of Ban Wang Hai, Lamphun Province sees the presence of a number of burials containing a suite of artefacts that typifies that seen throughout Iron Age sites in Thailand. This includes the presence of ceramic artefacts, glass, metals and semi-precious stone that have similarities with other Iron Age Thai sites such as Ban Chiang and Ban Don Ta Phet (Pautreau et al., 1997). It is possible that there may be evidence of differential age-based identity at the site based on the predominance of bronze with adults and glass, shell beads and stone with subadults (Pautreau et al., 2003). Although infant jar burials are present, burials, possibly wrapped, are typically supine in clay coffins and oriented in a south-eastern direction (Pautreau et al., 1997, Pautreau et al., 2003). The contents of jar burials at the site are unclear and may contain burnt bone (Pautreau et al., 2003).

Moving further south, preliminary investigations at Noen Din, Lopburi Region, have unearthed a number of burials which are suggested to belong to two separate mortuary phases (Ciarla, 2008). Burials from the first phase are placed in pits and lie, completely or in part, on beds of deliberately broken ceramic sherds (sherd sheets) whereas burials from the second phase are excluded from this treatment (Ciarla, 2008). A wealthy infant burial was also found at Noen Din which contained a number of artefacts including several ceramic vessels, spherical carnelian beads, faunal remains and several casting moulds of differing size. It was noted that many of the items deposited were repaired or beyond normal use and it was suggested that these items were offered as a symbolic gesture to the infant (Ciarla, 2008). Ceramics from Noen Din resemble a type (restricted pot on false pedestal) found from Ban Non Wat with spherical carnelian beads also being recovered from Ban Don Ta Phet (Rispoli et al., 2013). Non Pa Kluay, of which nineteen burials were excavated, is another site that was used as a cemetery over a short period of time. Burial goods are typical of Iron Age sites and include iron, bronze, glass and agate and there are parallels with ceramic types found with Non Nok Tha (Wilén, 1989, Higham, 1996). There is only limited evidence for some minimal inequality based on the inclusion of some material types (i.e.,

bronzes) in graves (Wilén, 1989). Other Iron Age burial sites in Lopburi Region include Muang Fa Daet, Ban Chaibadan and Don Klang (Higham, 1996). Grave goods from Ban Chaibadan, including glass beads and metal artefacts (jewellery, tools, weapons) have similarities with those from Noen U-Loke (Higham, 2002) with some grave goods such as bronze axes and ceramic vessels from Don Klang, also including fauna (i.e., bovid, pig), resembling those seen at Non Nok Tha (Higham, 1996).

Mortuary practices in the early and second phase at the moated site of Ban Krabuang (c. 300BCE-CE1300), located in northeast Thailand, sees a preference to inter individuals in lidded jars (Higham, 1996, Higham, 2002, O'Reilly, 2007). This precedes crematory practices in the Historic Period (c. CE900-1300) at Ban Krabuang. Also, in the northeast is the moated site of Non Ban Jak, located closely to Noen U-Loke, which comprise two (east and west) burial mounds and four mortuary phases and was occupied from the Iron Age and into the Historic Period (c. CE400-800) (Higham et al., 2014a). As seen in a few other sites from Thailand, there is a suggestion that residential burial, with structures represented by the easterly and westerly burial mounds, occurred at the site (Higham et al., 2014a). Mortuary traditions at Non Ban Jak are seen to resemble those from the later mortuary phases at Noen U-Loke (Higham et al., 2014a). Infants constitute a high proportion (50.0%) of burials from the initial mortuary phase at the site, occurring at the centre and east of the excavation, with the majority interred in jars (same style at Noen U-Loke and Ban Non Wat) and adults, with the exception being a single flexed burial, laid out in an extended supine fashion in a northerly orientation (Higham et al., 2014a). In addition to the suite of items often found at Iron Age sites in Thailand (i.e., glass, agate, bronze) the ubiquitous bivalve shells are also included in four infant burials and this tradition continues into later mortuary phases (Higham et al., 2014a). Infants at the second phase, primarily in lidded jar burials, again constitute a high proportion (21/33, 63.6%) of burials. This phase was buried in the western area of the site with adult and older subadult burials laid out in similar fashion as in phase one. Infant burials at this mortuary phase are identified, in contrast to all burials from phase one, as being moderately wealthy. The profile of the group shifts in the third phase with the infant proportion decreasing (42.0%) and adult males dominating prior to a return to levels seen in the first phase (50.0% infants) (Higham et al., 2014a). Only a small number of burials were excavated from the mounded site of Non Muang Kao. Nonetheless, and in contrast to the Bronze Age site of Ban Lum Khao, it marks a stark change in social differentiation through the presence of increased grave wealth that include exotic goods and non-locally produced Phimai-Black wares not visible from the earlier site (O'Reilly, 2007). Ban Prasat, occupied in the Bronze and Iron Ages (c. 1000BCE-CE500), is a large moated site situated in upper Mun Valley near Ban Lum Khao and Ban Non Wat. Normative burial traditions, over three phases, of the sixty-six graves include supine inhumation interments but secondary burial of eight infants was also recorded (Higham, 1996, O'Reilly, 2007). Burials from the initial phase of the largest excavated unit (38/66 burials) are oriented in a south-easterly direction and share a relatively constant level of grave wealth (O'Reilly, 2007). This changes in the second phase with greater variability in orientation and poorer burials and, interestingly, only contains adult females and subadults. Second phase burials were found with bivalve shells, ochre, bronze, spindle whorls and potsherds over the remains (see Non Nok Tha) as well as pig remains (O'Reilly, 2007). The final phase, to which the Iron Age burials belong, sees a normative southerly orientation and the inclusion of Phimai-Black ceramics, the disappearance of shell, and the emergence of glass, agate, bronze and ceramics (O'Reilly, 2007). There is evidence of social inequality through the presence of wealthy elites in the Bronze and Iron Age, in addition to those from the early Bronze Age at Ban Non Wat, at Ban Prasat (O'Reilly, 2007, Higham, 2012a).

Iron Age sites in the west of Thailand include, for instance, Tham Ongbah and Ban Don Ta Phet. Prior to its looting, it was recorded that Tham Ongbah comprised over ninety wooden coffin burials, some of which had bird head carvings, that contained a range of material artefacts such as glass, bronze jewellery, iron tools, iron weapons and stone beads (Higham, 1996, Higham, 2002). Also recorded were the inclusion of

Đông Sơn (Vietnamese) bronze drums as funerary items (Higham, 1996, Higham, 2002, Higham, 2010a). In addition to providing evidence of long-distance exchange the presence of the drums reinforces the significance of the trade in exotic and prestigious items or materials, for elite individuals or groups, across Southeast Asia from the Neolithic through to the Historic period (Higham, 2010a). A vast amount of material culture recovered from Ban Don Ta Phet speaks to its significance within Thailand at the time of its occupation and likely exchange relationship with India, Burma and/or Vietnam (like Tham Ongbah) (Theunissen et al., 2000, Higham, 2002, Higham, 2010a, Higham, 2011d, Rispoli et al., 2013). Material artefacts recovered from burials included iron, bronze, glass, shell, carnelian and agate beads (Glover et al., 1984). The fifty burials at Ban Don Ta Phet were laid out in rows, over a short period of time, in an extended fashion in an easterly orientation in graves topped with earthen mounds (Glover et al., 1984, Glover, 1986, Higham, 1996). Burials at Ban Don Ta Phet are recognised for their wealth even in comparison to other Iron Age sites.

4.4 Social influences affecting change in Southeast Asia

Moving away from the overarching discussion on mortuary developments across the region broadly (Section 4.2) and more specifically in Thailand (Section 4.3) the chapter now shifts towards a discussion of some social developments across the region over time. As alluded, an important use of mortuary data is to explore and discuss inter and intra-social relationships and organisational structures within and between communities through time. It is widely accepted that social complexity increased over time prior to the pre-Angkorian and ultimately the Angkor Period (c. CE802) in Southeast Asia.

The Neolithic is characterised by the presence of autonomous populations occupying inland river valley tributaries and delta zones, in particular, along the coastline. Communities employed a number of strategies, dependent on their environment, related to the appropriation of food. This included continued hunter-gatherer practices which exploited land-based fauna, fish and shellfish in a variety of environments, the domestication of bovine and pig and the cultivation, if not exchange, of rice (Higham, 1989, Higham, 2002). In addition, evidence demonstrates that knowledge and technology was present to manufacture pottery (with some highly specialised production present), tools and jewellery. Elaborate mortuary traditions suggest that limited social differentiation may have occurred due to the presence/absence of material culture and mortuary variables (Higham, 1989, Higham, 2002). The Neolithic Demographic Transition (NDT), most recently developed by Bocquet-Appel (Bocquet-Appel, 2002), characterises the transition in subsistence strategies from forager to agriculture with increasingly sedentary lifestyles and a reduction in birth intervals and associated significant increases in birth rates. Given the variability of its occurrence in the past, it is now identified as the Agricultural Demographic Transition (ADT) (Bocquet-Appel, 2011). Evidence for the ADT from Southeast Asia sees the expected increase in fertility rates during the Neolithic and a subsequent levelling off or decline (Willis and Oxenham, 2013).

A significant debate concerns the chronology of the introduction and adoption of copper-based bronze into the social, economic and technological suite of activities of Mainland Southeast Asian communities. Original radiocarbon dating, undertaken in northeast Thailand from Non Nok Tha and Ban Chiang, of charcoal from graves and occupation layers associated with bronze suggested a third millennium BCE date thus placing the adoption of bronze in Southeast Asia prior to China and the Indus Valley (Solheim II, 1968, Chester and Charoenwongsa, 1976). Initial dates for the arrival of bronze were revised across the 1980s and 1990s to a later introduction at 2000BCE (Higham, 1989, Bayard, 1996-97) or at 1500BCE (Higham, 1996, Higham, 1996-97). Current research supports an earlier introduction at Ban Non Wat from 1100-1000BCE (Higham and Higham, 2009a, Higham et al., 2011a, Higham et al., 2011c, Higham, 2015). This debate continues with one camp arguing for a Long Chronology Model (LCM) (White and Hamilton, 2009) and another for a Short Chronology Model (SCM) (Higham et al., 2011a). Both models

agree on the transmission of copper-based metallurgy from outside the region but disagree on its source, rate of dispersal and timing. Advocates of a LCM offer revised dates for the transmission of copper-based bronze into the region, based on seven AMS radiocarbon dates of organic temper and rice phytoliths from Ban Chiang, to 2000-1800BCE (White and Hamilton, 2009) and suggest that the source of bronze originated from a north-western source. Recent evidence from industrial activity from Non Pa Wai supports a longer chronological model and raises concerns over the relatively quick spread of bronze technology in the region (Bayard, 1996-97, Pryce et al., 2014, Pryce, 2015). Advocates of the SCM base their views on 76 radiocarbon dates from Ban Non Wat (Neolithic through Iron Age), and place the expansion of copper-based bronze into the region from a south-eastern trajectory at 1000BCE (Higham, 2011b, Higham, 2015). While the debate continues, the consensus view sees clear support of the SCM.

An important aspect of social development in Southeast Asia has been the influence of India and the subsequent expansion of Indianisation of the region (Coedès, 1968). Evidence of Indianisation is witnessed in the first millennium BCE (Murillo-Barraso et al., 2010, Rispoli et al., 2013) and gradually expanded across the region over several centuries (Rispoli et al., 2013), especially from the Iron Age onwards, with the movement of technology, materials and ideas via inland and maritime trajectories at a critical juncture concerning the social development of the region (Theunissen et al., 2000, Bellina and Glover, 2004, Higham, 2010a, Cameron, 2011, Higham, 2012a, Pryce et al., 2014). An Indian influence, spanning the Bronze and Iron Ages in Southeast Asia, coincides with the emergence of complex state polities, such as Funan or Cham in Vietnam and Cambodia, at the middle of the first millennium CE (Bellina and Glover, 2004, Manguin, 2004, Guy, 2008, Glover and Dung, 2011).

The presence of some exotic artefacts (i.e., glass etc.) recovered from sites across Southeast Asia, often in mortuary or industrial contexts, has been used as additional evidence of the Indianisation of the region (Bellina and Glover, 2004). Countering this view, research has demonstrated local sourcing (i.e., copper, stone) and manufacture of 'exotic' wares in some locales such as central and north-eastern Thailand (Theunissen et al., 2000, Bellina and Glover, 2004, Theunissen, 2007, Pryce et al., 2011). Ongoing research continues to show the relationship network of migrants and local populations as ideas, innovation, specialisation and materiality spread across the region over a long period of developing social complexity (Dzung, 2009, Higham, 2010a, Murillo-Barraso et al., 2010).

The site of Khao Sam Kaeo, recently excavated and located on the Thai-Malay Peninsula, has offered greater insight into the complexity and scope of exchange (technologies, ideas) with India, China and beyond (Murillo-Barraso et al., 2010). Botanical remains of cereals, beans and cotton support a model of complex exchange networks with India and China (Castillo et al., 2016). Although heavily looted, excavators unearthed a range of walled areas and artefacts indicating a large industrial and residential trading settlement (Higham, 2011d). Artefacts recovered included glass, metal, ceramics and stone (agate, carnelian) jewellery with evidence for offsite (i.e., Indian, China etc.), and on-site production by local and immigrant Indian specialists (Murillo-Barraso et al., 2010, Castillo et al., 2016). The possibility that agate beads, as part of a broader exchange network, recovered from Ban Non Wat may have originated from Khao Sam Kaeo was cautiously discussed (Carter, 2015). This possibility has been countered due to the differential, and inferior, quality of that agate from both sites. The site's occupation is contemporaneous with the early Iron Age occupation of Ban Non Wat and Noen U-Loke in the Upper Mun Valley River (Higham, 2012a).

The rise of isotopic analyses of skeletal and dental remains has facilitated explorations of issues related to human diet and mobility which in turn, can provide insights into a group's composition and migratory history. These approaches have been used to good effect in sites from the Neolithic and Bronze Age in Thailand. Isotopic and material evidence witnessed changing social behaviour from the Neolithic site of Khok Phanom Di during its occupation. Isotopic evidence initially enabled a determination of

patrilocality based on the migration of females into the population in its earliest mortuary phases (Bentley et al., 2007). This was followed, in later mortuary phases, with evidence of matrilineality based on an attainment of increased local prestige through craft specialisation in later mortuary phases at the site (Higham and Thosarat, 1994, Bentley et al., 2007). Isotopic evidence obtained from sites in the Upper Mun River Valley, noting the likely migration of a number of individuals, have suggested that some communities in this region may have subscribed to a patrilocal (i.e., females marrying into the husband's population) marriage system (Bentley et al., 2009). Isotopic analysis from Noen U-Loke suggests that by the Iron Age, along the Upper Mun River Valley Region, migratory patterns had changed and that individuals moving into local populations likely originated from the same region (Cox et al., 2011).

Neolithic and Bronze Age burial sites are generally viewed as being egalitarian (non-stratified) and have been argued as providing potential evidence of heterarchical social organisation. A heterarchical approach to social organisation, potentially present in some hierarchies, recognises the unranked fluid nature of human social and interactive spheres and has been offered as an alternative model in some Southeast Asian contexts (Crumley, 1995, White, 1995, Onsuwan, 2003, O'Reilly, 2015). Heterarchy has been offered as a potential mechanism for social organisation for some Bronze Age sites, such as at Ban Lum Khao, in north-eastern Thailand (O'Reilly, 2000, O'Reilly, 2003, Van Esterik, 2011, O'Reilly, 2014) as well as Neolithic Vietnam (Huffer, 2005). This contrasts with behaviour observed in the Iron Age (O'Reilly, 2000, O'Reilly, 2003, Higham, 2011d).

Countering a heterarchical social structure advanced for the Bronze Age is evidence for a transegalitarian period in the early-mid Bronze Age mortuary phases at Ban Non Wat (Higham, 2011a, Higham, 2015). Transegalitarianism is founded on a model that argues for the competitively enhanced status of select individuals through the display, in public mediums (i.e., feasting), of accumulated wealth to obtain prestige (Hayden, 1995, Hayden, 2001a, Hayden, 2001b, Hayden, 2003). A transegalitarian population can be observed archaeologically through ostentatious demonstrations of wealth, supported by the presence of feast features (i.e., hearth, abundant and/or prestige food remains), in mortuary contexts. Higham and others argue for the presence of social aggrandisers, and for a transegalitarian model, at Ban Non Wat during the Bronze Age where we see very wealthy burials, of both adult and subadults, in direct association with feasting features and the presence of prestige food (i.e., rice, pig, buffalo) and material (i.e., metals, stone etc.) items (Higham et al., 2011a, Higham, 2011a, Higham, 2011c, Higham, 2011b, Higham, 2012a, King et al., 2014). Although not tested, and already identified as demonstrating an increased complexity in mortuary behaviour, the rice burials from the single mortuary phase at Noen U-Loke may also bear witness to the presence of aggrandised individuals in an already stratified population.

Evidence of increasing hierarchy, a precursor to the development of incipient states in the region, and the presence of social elites can be witnessed from the Iron Age in Southeast Asia (O'Reilly, 2000, O'Reilly, 2015). From this period, mortuary and non-mortuary contexts show increasing levels of complexity in relation to exchange, industry and social inequality (Higham, 2002). Social inequality in mortuary contexts is observed through the presence of an increased level of exotic and, potentially, prestige items associated with some select, possibly related, burials (adults and children) in the mortuary suite (O'Reilly, 2000, O'Reilly, 2015). Additionally, this period reflects the movement from autonomous populations across the Neolithic and Bronze Age to the establishment of more centralised communities executing greater control over local resources, exchange and water. Water, naturally, is critical for the basic maintenance of a community but increasing control over this resource is seen as a contributor to increasing inequality and social complexity in Iron Age sites (Higham, 2004a, Higham, 2011d, Rispoli et al., 2013, O'Reilly, 2014, Duke et al., 2016). Water management, controlled by an elite maintaining authority through the construction of moats, in the deteriorating and increasingly arid conditions of the Khorat Plateau for example, would have been an important instrument for generating

an agricultural (i.e., rice, salt) surplus which would have provided sustainability and political (i.e., local, regional) influence through subsistence, exchange and potentially ritual use (Boyd, 2008, King et al., 2014, Yankowski et al., 2015, Duke et al., 2016). Water management was an important feature of the preceding Dvaravati and Angkor polities (Mudar, 1999, O'Reilly, 2014).

4.5 The Young and Elderly in Mainland Southeast Asia

Post-processualist approaches have brought about an expanded understanding and engagement with the complexity of social relationships and the insight that a gendered perspective can provide with respect to community or an individual's identity. Where discussions on the development and trajectory of organisational social frameworks are sophisticated and have been refined over several decades in regards to the island and mainland Southeast Asian context, a consideration of the identity of the young and old, reflecting patterns seen across the discipline, is relatively new to the region.

While it is clear that children and the elderly are recognised and discussed in individual studies, it is rare that either cohort is elevated to become the primary focus of an archaeological study. Primarily, it is bioarchaeological approaches to mortuary data that have promoted discussions on the status (i.e., health, social etc.) of subadults in Southeast Asia (Tayles, 1996a, Tayles and Buckley, 2004, Halcrow et al., 2007, Halcrow et al., 2008, Oxenham et al., 2008a, Oxenham et al., 2008b, Halcrow and Tayles, 2010, Halcrow et al., 2016). Bioarchaeological studies, often involving the sites examined in this dissertation, focused on subadults have provided evidence of, and discussed the potential for, mortality and morbidity rates, including dental health, and stress during pregnancy and growth periods (Domett, 2001, Domett, 2004, Halcrow and Tayles, 2008b, Halcrow and Tayles, 2010, Willis and Oxenham, 2011, Halcrow et al., 2013, Clark et al., 2014, McDonnell and Oxenham, 2014, Halcrow et al., 2016) and differential personhood status (Cophey, 2007, Halcrow et al., 2008, Oxenham et al., 2008a, Oxenham et al., 2008b, Halcrow et al., 2012), although much potential remains for the study of subadults in the region (Halcrow et al., 2008). A specifically gendered approach focussed on Non Nok Tha found some evidence for differential mortuary treatment based on the biological sex, and inferred gender, of the sample (Bacus, 2006, Bacus, 2007).

The analysis of elderly cohorts is a relatively new enterprise in archaeological discourse with the current low level of research in Southeast Asia reflecting this progression. For instance, a pilot study focussed on the elderly from the Bronze Age site of Non Nok Tha found that increasing age was a factor in individual identity, and subsequent mortuary treatment, at this site (Ross and Oxenham, 2016). As a further example, osteobiographical research on an elderly female with severe cranial trauma, potentially murdered and with the head placed in a burial jar, from the Iron Age site of Noen U-Loke was discussed in the context of elevated, or differential, status (Tayles, 2003).

4.6 Site Review

The final section of this chapter sees a complete change of direction as it shifts from the broad, overarching, discussions centred on mortuary traditions, social developments and a focus on identity-based research on the young and old in the region and moves towards a focus on the four sites under review. Each of the sites discussed will focus on a range of variables pertinent to each site including chronology, mortuary practices, health, and social developments and as to what information is currently known in relation to the young and old. Sites are discussed chronologically with an initial focus on Khok Phanom Di (Neolithic), Ban Non Wat (Neolithic to Iron Age), Ban Lum Khao (Bronze Age) and Noen U-Loke (Iron Age).

4.6.1 Khok Phanom Di

Khok Phanom Di, a Neolithic (c. 2000-1500BCE) mounded site located on the Gulf of Siam in Chonburi Province, (Higham and Bannanurag, 1990, Bannanurag, 1991, Higham and Thosarat, 1994, Higham, 2002, Higham and Thosarat, 2004c) is located 22km east of the coastline following a decline in sea levels (Higham, 2002) (see Figure 4.3). From its initial occupation the site was located in an environment that provided the potential for inter-group contact and the establishment of exchange networks (Higham, 1991, Bentley et al., 2007, Higham and Higham, 2009a, Higham et al., 2011b). Over its occupation the site experienced a series of dramatic challenges as the coastline prograded and the system transitioned from a mangal to a more arid environment (Suchitta, 1984, Thompson, 1996, Higham and Thosarat, 2004c, Higham, 2011b).

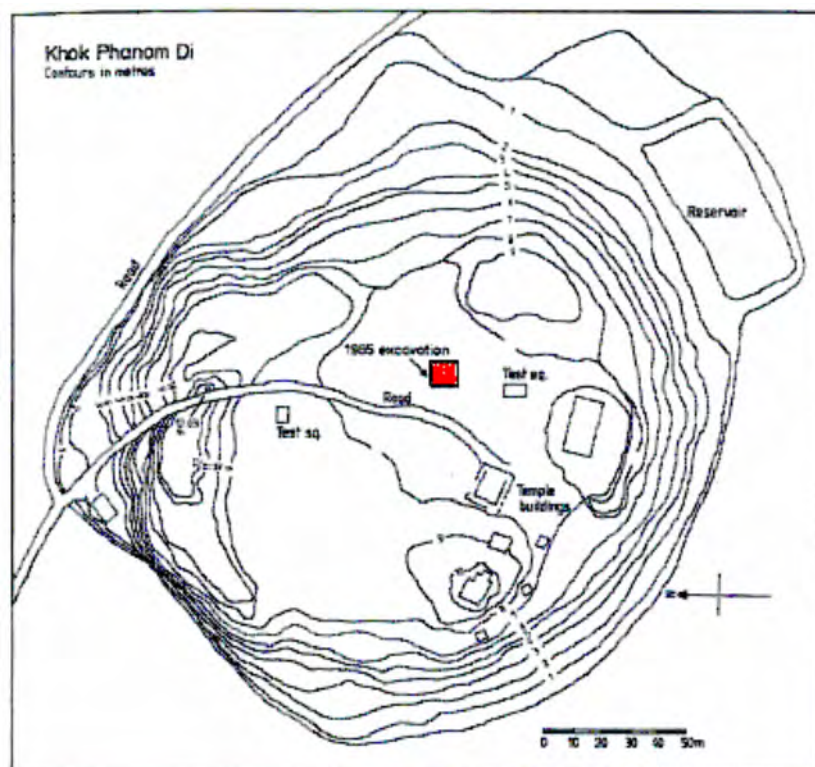


FIGURE 4.3: Site map of Khok Phanom Di. Colour was inserted to indicate 1984-85 excavation area (taken from Higham and Bannanurag 1990:14)

To date, three excavations and a series of test pits have been executed on the mound, with the main recovery, a 10 x 10m square near the centre of the mound to a depth of 6.85m, undertaken between 1984 and 1985 (Bannanurag, 1991, Higham, 2011b, Higham et al., 2011b). Eleven cultural layers and seven mortuary phases were identified from which 154 burials were recovered (Bannanurag, 1991). The earliest burial was at 6.51m below datum with the final burial recovered at 1.2m (Bannanurag, 1991). Mortuary phases were generally separated through the introduction and/or cessation of burials in clusters or rows and variation in wealth and technology (i.e., ceramic manufacture) (Bannanurag, 1991, Vincent, 2004).

The association of males, predominantly adult, with turtle carapaces (see Figure 4.4) and females with pottery anvils in later mortuary contexts at Khok Phanom Di suggests the expression of gendered identities, at least at one stage during its occupation (Higham et al., 1992, Higham and Thosarat, 2004c). Infant funerary practices (a lack of infant jar burials) from Khok Phanom Di, in comparison with other sites, has been offered as potential indicators of differential personhood status (Halcrow et al., 2008). Dental ablation, found at Khok Phanom Di (Tayles, 1996b), and many sites across Southeast Asia, could potentially indicate status or individual identity (Domett et al., 2013b, Willman et al., 2016).



FIGURE 4.4: Turtle carapace artefact associated with gender identities (with adult males) at Khok Phanom Di (Photo: Ross 2013)

Bioarchaeological evidence indicates high infant mortality (Tayles, 1999, Halcrow et al., 2016), poor childhood health (i.e., anaemia) (Higham et al., 1992, Tayles, 1996a, Tayles, 1999), but minimal evidence for trauma (Domett and Tayles, 2006a). Non-metric dental evidence indicates genetic influences from Northeast Asia at Khok Phanom Di and a suggestion of rapid migration and settlement, and interaction, from the northern region and onto the coast at the Gulf of Siam (Matsumura and Oxenham, 2014, Higham, 2017). Subadult dental health indicates low frequencies of carious lesions in the deciduous dentition but high levels in the permanent dentition, at both Khok Phanom Di and Noen U-Loke, which may indicate dietary behaviours and the impact of some food types on adult teeth (Halcrow et al., 2013).

Material culture, including pottery, bone and stone tools, from the earlier mortuary phases suggest a link with the neighbouring community from Nong Nor (Higham, 2004f, Higham and Xie, 2011). Comprehensive exchange networks at Khok Phanom Di are observed through the presence of non-local stone (Pisnupong, 1993, Higham, 1991), sourced from the hinterland at a considerable distance from the site, shell, and exotic, non-local, ceramics (Vincent, 2003, Higham, 2004f, Vincent, 2004). Similar

decorative motifs, of a human figure painted on ceramics, occurring contemporaneously with evidence for migration (Higham, 2004f, Bentley et al., 2007) and changing pottery traditions (Vincent, 1991, Vincent, 2003, Vincent, 2004) at Khok Phanom Di, are shared with Neolithic Ban Non Wat (Higham and Xie, 2011). The presence of rice agriculture at Khok Phanom Di is observed, or inferred, from faecal remains (human, dog), ceramics and tools (Higham, 1993c, Thompson, 1996, Higham and Thosarat, 2004c, Higham and Xie, 2011). It was observed that there was a relationship between some material culture types (i.e., burnishing stones) and burials with infants most frequently interred without, or with limited numbers of, grave goods (Manly, 1996, Higham and Thosarat, 2004c).

4.6.2 Ban Non Wat

Ban Non Wat is a mounded site located in the Upper Mun River Valley on the Khorat Plateau of northeastern Thailand (see Figure 4.5). Ban Non Wat's occupation spans the Neolithic through to the Iron Age and represents one of the largest and longest research agendas (spanning two research teams) in the region that offered a rare opportunity to explore social change, in one location, over an extended period. Initial research at the site was undertaken by the University of Otago and the Thai Fine Arts Department under the auspices of the “*Origins of Angkor*” Project (c. 2002-2007) with the following “*Society and Environment before Angkor*” project (Chang, 2008, Chang, 2009). Chronology was established from 76 radiocarbon dates of Unionidae bivalves deposited in mortuary contexts: the Neolithic phases (n=2) began c.1750BCE, Bronze Age (n=6) from 1050BCE and the Iron Age (n=3) from 420BCE (Higham,

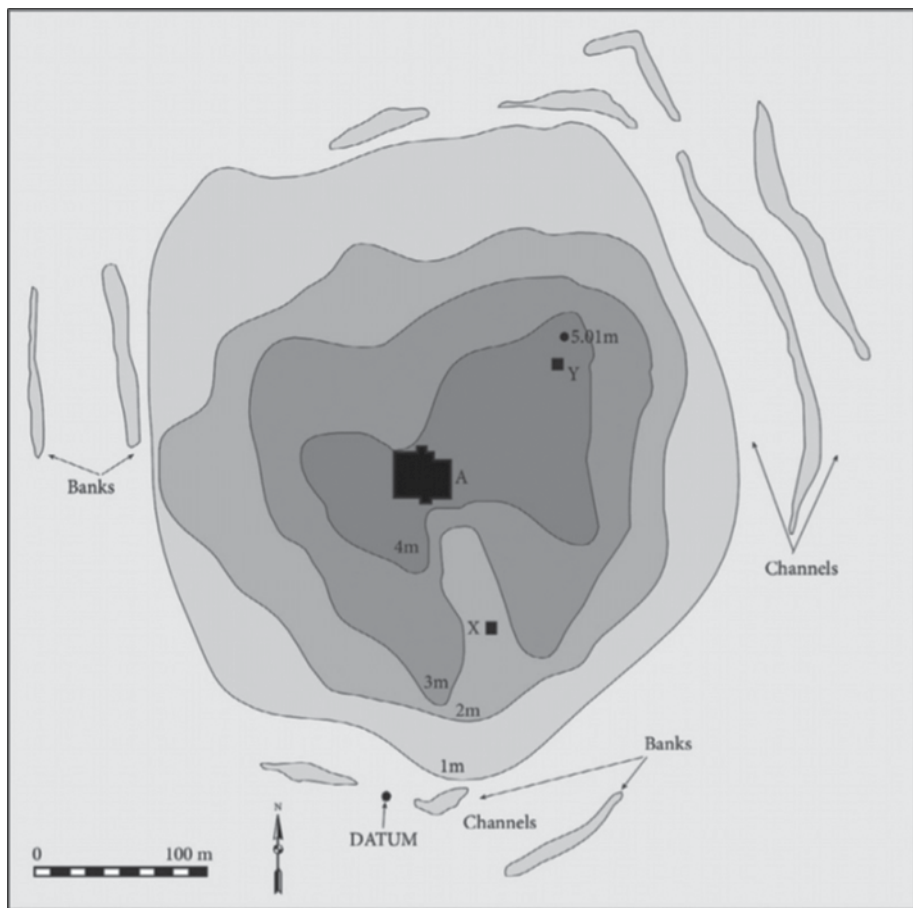


FIGURE 4.5: Site map of Ban Non Wat including excavation locations, earthen banks and channels (taken from Higham and Higham 2009a: 129)

2011d, Higham et al., 2011b). Including the flexed burials, at the base of the excavation, there are twelve phases of mortuary activity at Ban Non Wat (Higham, 2011d).

Moated systems at Ban Non Wat, constructed from the surrounding floodplain sediments, occur as early as the third century BCE (Duke et al., 2016). Preliminary explorations considered a range of social functions for moated systems, including defence and resource management. Research suggested that water management, and its ability to create an agricultural surplus and subsequent political capital during a period of environmental flux, was the most likely rationale behind their construction (O'Reilly, 2014). The presence of rice grains at the base levels of inner moats from other sites in the Upper Mun River Valley supports an agricultural adaptation for these systems. As stated earlier, management and control of water is seen as an essential characteristic of the later Dvaravati and Angkorian cultures. Both Ban Non Wat and Noen U-Loke have been identified as being on different, one of three, river meander-belts for the area (Boyd, 2007). Palynological evidence from Ban Non Wat supports movement from an initial forested floodplain, anthropogenically affected, towards dry wood and grasslands.

The mortuary tradition at Ban Non Wat includes a diverse array of behaviours over time. Most commonly individuals were buried supine and in an extended position with some individuals flexed, or having their legs flexed. Material culture deposited in graves included animal remains, metals (i.e., iron, bronze etc.), shell, bone, stone and ceramics (Higham, 2011d). Infant jar burials are present throughout the sequence (Halcrow et al., 2008) with two adults also being deposited in jar burials during the Neolithic. In addition to jar burials some individuals, although not identified as occurring exclusively by age or sex, were buried in shrouds or coffins (Harris and Tayles, 2012, Harris et al., 2016). Mortuary traditions at Ban Non Wat, during the early Bronze Age mortuary phases (c. 1000-900BCE), changed dramatically in comparison to the neighbouring site of Ban Lum Khao (Higham, 2011a). The presence of very wealthy burials from this period has been used to support the transegalitarian social model (social aggrandizers) in opposition to a heterarchical, or egalitarian, model commonly reported from the Bronze Age in Southeast Asia (Higham, 2011a, O'Reilly, 2000, O'Reilly, 2003). Wealthy burials from the early Bronze Age demonstrate an increasing social stratification, and concurrent inequality, present at that time. Extreme mortuary wealth is exhibited in the recovery of non-local marble, marine shell and bronze objects (Higham, 2011d). The final mortuary phases of the Bronze Age see a decline in mortuary wealth prior to the onset of the Iron Age (Higham, 2011a).

Dental health and an assessment of stature shows improved health in the Neolithic to the middle of the Bronze Age followed by a slight decline from the mid-to-late Bronze Age (Clark et al., 2014). Clark et al. (2014) suggest the adoption and intensification of agricultural practices, coupled with a continuation of broad-spectrum hunter-gather subsistence strategies from the Neolithic to Middle Bronze Age period. Isotopic evidence (carbon) suggests broad-spectrum hunter-gatherer subsistence strategies and migration into this community in the Neolithic (King et al., 2013). This is followed by evidence for altered dietary intake between the Bronze and Iron Ages, potentially driven by increased dry environmental conditions (King et al., 2013).

Evidence of exchange at Ban Non Wat is observed through the presence of a variety of material types (Boer-Mah, 2008, Higham, 2011d, Rispoli et al., 2013). Neolithic pottery temper (i.e., fibre) traditions at Ban Non Wat are shared with other Neolithic sites in Thailand (Khok Phanom Di, Nong Nor, Tha Kae) and Vietnam (Ân So'n) (Sarjeant, 2010). The presence of standardised Phimai Black ceramics in later phases, as witnessed from Noen U-Loke, suggests a transition from household production to mass production. Studies on the chemical composition of thin, compacted, sedimentary layers (hard floors) were examined with results showing alluvial deposits of iron nodules (Kanthilatha et al., 2017) and of activity spaces containing high levels of animal fatty acids (Kanthilatha et al., 2014). Stone tool studies found no evidence for local manufacture and suggest, as witnessed from the other sites under review,

this resource was part of a broader exchange network for this population (Boer-Mah, 2008). Features (furnace, floors) at the site indicate industrial areas for metal production (Duke et al., 2010).

4.6.3 Ban Lum Khao

The third site under review, Ban Lum Khao, was also excavated under the auspices of the “*Origins of Angkor Project*” to investigate moated settlements in the upper Mun Valley and to chart social and technological advances in the region prior to the establishment of early states (Higham and Thosarat, 2004d, Domett and Tayles, 2006b). Ban Lum Khao, primarily a cemetery site with limited evidence for occupational use spans the Bronze Age with initial site use consisting of a thin layer and several pits containing faunal remains and potsherds dated at 1500BCE with the Bronze Age cemetery being established from 1400-500BCE. The site is not moated (Figure 4.6). Radiocarbon and AMS dates were sourced from phase one occupation features and tested at the University of Waikato Radiocarbon Dating Laboratory. Ban Lum Khao, in the upper areas of the Mun River Valley, is situated below the modern village of its namesake beside conjoined streams in Amphon Non Sung, Nakhon Ratchasima Province.

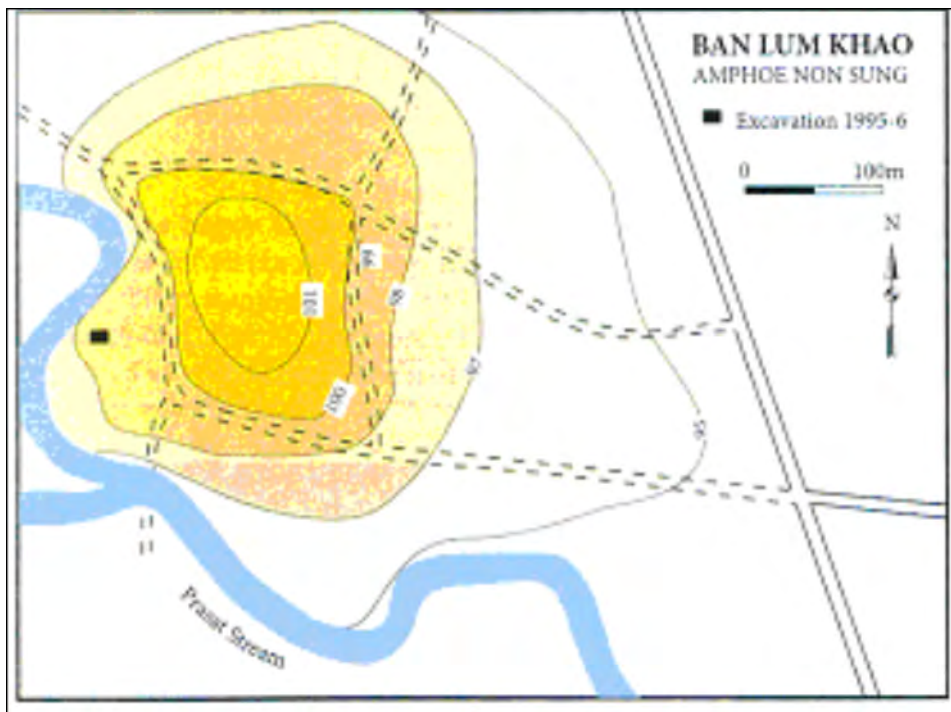


FIGURE 4.6: Site Map of Ban Lum Khao. Black square on western aspect of site indicates 1995-96 excavation area (taken from Higham and Thosarat 2004:2)

Excavations at Ban Lum Khao took place over three months from November 1995 to February 1996 through the collaboration of the Department of Anthropology, University of Otago and the Fine Arts Department of Thailand (Higham and Thosarat, 2004d). A 145m² (10 x 14.5m) square, divided into six units, was excavated by 10cm levels to a depth of 1.85m with limited stratigraphy observed due to bioturbation. Four broad phases, incorporating the three mortuary phases, and three general layers were recorded. Prior to the natural substrate, layer 3 dated to 1500BCE, has evidence of occupation through ash-filled hearths, a shell midden and several pits containing charcoal, bamboo fibres, Tamyae

style potsherds and shell (Higham, 2002). Layer 2 comprises the majority of the Bronze Age cemetery has evidence of burning through an ash lens and burnt clay containing rice chaff. Layer 1 included pits associated with aquatic and terrestrial fauna and potsherds with two burials recovered from this level. Following initial field and laboratory analysis a total of 110 human burials were recovered (Domett, 2004). Three mortuary phases are identified from Ban Lum Khao with radiocarbon dates placing MP1 at 1250-1000BCE, MP2 at 1000-600BCE and MP3 at 600-500BCE (Higham and O'Reilly, 2004). Key differences in burial phases indicate that burials from MP1 are primarily deposited in an east-west orientation (Higham, 2004d), MP2 sees the introduction of burials deposited in five rows (although it is anticipated further rows may lie outside the excavation area) (Higham and O'Reilly, 2004, Higham and Thosarat, 2004b), and MP3 sees the aggregation of two groups in the east and west, respectively, of the excavation area (Higham and Thosarat, 2004a).

Contemporaneous mortuary activity from the neighbouring site of Ban Non Wat demonstrates community level social inequality in comparison with Ban Lum Khao. For instance, Ban Lum Khao MP2 is arguably poor in relation to initial mortuary phases during the Bronze Age at Ban Non Wat (Bentley et al., 2009, Higham, 2011a, Higham, 2012a). Infants at Ban Lum Khao, showed, in some instances, increased wealth in comparison to some adults at the site (Halcrow et al., 2008). This was also present at the neighbouring Iron Age site of Noen U-Loke. Differential deposition of infants was observed with mortuary row three in MP2 containing the highest number of jar burials (Higham and O'Reilly, 2004). There is also evidence of the use of coffins and wrapping, in some instances, as is the case from Noen U-Loke (Willis and Tayles, 2009). There is limited, and questionable, evidence for dental ablation, seen potentially as a marker of identity or personhood, at Ban Lum Khao which contrasts with many other sites across the region (Domett et al., 2013a).

While no clear evidence of bronze was recovered from the site there is tacit evidence from the presence of a copper alloy, burnt clay and six crucible moulds designed to produce different artefacts, including arrowheads (Chang, 2004). Textile manufacture is evident through the presence of spindle whorls mainly recovered from the mid-point of layer 2 upwards. Spindle whorls, ceramic vessels and other material culture (i.e. shell beads) from Ban Lum Khao, through morphology and decoration, are identified with other central Thai sites (Higham, 2004c, Rispoli et al., 2013). Pottery from MP3 at Ban Lum Khao has similarities with vessels recovered from Bronze Age burials at Ban Non Wat and with burials from MP1 and 2 at Noen U-Loke (Higham et al., 2004, Tayles and Buckley, 2004, Higham, 2007b, Higham and Thosarat, 2007f, Voelker, 2007).

Bioarchaeological evidence suggests a potential social inequality where limited access to resources in childhood contributed to variable ranges in stature, and a failure to achieve genetic potential, among adult males at Ban Lum Khao (Domett, 2002, Domett, 2004). Males demonstrated greater rates of osteoarthritis and spondylosis than females at Ban Lum Khao (Domett, 2004) with skeletal pathologies suggesting a division of labour with males preferentially exposed to tasks requiring heavy lifting. Bioarchaeological analysis also demonstrated high incidences of trauma, possibly related to interpersonal violence, at Ban Lum Khao in comparison to three other sites (Domett and Tayles, 2006a). Subadult, infant and child, mortality at Ban Lum Khao (46.0%) falls within the upper reaches of expected levels from prehistoric populations (Domett, 2002, Domett and Tayles, 2006b). Subadults (30/51, 58.8%) at Ban Lum Khao were more likely to survive beyond the first year of life in comparison (24/91, 26.3%) to those of a similar age range at Ban Non Wat (taken from the research sample).

4.6.4 Noen U-Loke

Noen U-Loke is a large Iron Age mounded site located in the Upper Mun River Valley of northeastern Thailand. The site, including the mound and the five earthwork moats surrounding it, covers an area

of 36 hectares (400m) in diameter and comprises cultural deposits up to 5 metres depth (Higham, 2002, Habberfield-Short and Boyd, 2007). An area 14 x 17m (220m²) was excavated across 1996-1998 under the auspices of the “*Origins of Angkor Project*” and undertaken by the University of Otago and the Fine Arts Department of Thailand. Five mortuary phases are identified from Noen U-Loke. Radiocarbon dates include: MP1, represented by a single burial dated 400-300BCE, MP2 at 300-1BCE, MP3 at CE0-200, MP4 at CE200-300 and the terminal MP5 occurring at CE300-400 (Higham, 2002, Talbot, 2007).

Key variations across phases see the inclusion of deposition in nucleated clusters, the introduction of rice-filled and clay lined graves, metal artefacts, semi-precious stone and differential spatial distribution with age appearing to be the primary variable in burial treatment. The practice of depositing individuals in nucleated burial groups, specifically across MP3 and MP4 has been identified. While not tested, spatial evidence indicates the potential use of burial rows, as seen in MP2 at Ban Lum Khao, in use during MP5 at Noen U-Loke. Normative mortuary treatment was recorded as single extended burials deposited in narrow rectangular graves. The individual’s arms were generally extended along their sides in anatomical position or with hands resting on the pelvis. There is evidence of wrapping, in some instances, occurring at Noen U-Loke (Willis and Tayles, 2009). Atypical burials styles include burial in prone position (with arrowhead at spine), secondary burial or in isolated positions outside the clustered burial groups in MP4 (Higham and Thosarat, 2007i). There is no bias, by age or sex, in mortuary treatment at Noen U-Loke, although there is evidence of atypical burial affecting some individuals and evidence for differential wealth between subadults and adults generally (Talbot, 2007). The position of post-holes suggests grave markers may have been used (Talbot, 2007).

While Noen U-Loke is a cemetery site, there is also evidence of ceramic and metallurgical industrial activity (Parr and Boyd, 2002, Higham and Thosarat, 2007l). Bronze artefacts, manufactured *in situ*, were recovered in large quantities with other metals including bimetallic objects (bronze core with iron sheath), gold, silver and lead (Chang, 2007, Connelly, 2007). Artefact types include ornaments and jewellery, tools used in agriculture or vegetation clearance and weaponry. Evidence of rice agriculture is visible throughout the site as indicated by a range of artefacts (agriculture tools, knives), pottery temper and rice burials. Another important element of the economy, of which evidence suggests through the location of two mounds in close proximity to Noen U-Loke, is the production, and perhaps control, of salt (Rivett and Higham, 2007, Yankowski et al., 2015). There is also evidence for raising domestic livestock (McCaw, 2007c).

Evidence of extensive contact and exchange at Noen U-Loke is supported through the presence of ceramics, metals, stone tools (Higham et al., 2014a), stone and glass although geochemical analysis of agate and glass beads hints at a more local origin (Theunissen, 2007, Rispoli et al., 2013, Carter, 2015). Voelker (2007) notes a range of vessel forms including jars, bowls and pedestaled vessels primarily of the Phimai Black style. The Phimai Black style of ceramics is a standardised form (i.e., thin-walled, morphology, decoration), frequently encountered and believed to have been mass produced, marks a transition in ceramic production (from household to non-household specialisation) in Southeast Asian archaeological settings (Talbot and Janthred, 2001). Other pottery replicates forms identified during transitional phases from the Bronze Age to Iron Age and, following this period, the Iron Age into the historical period (Voelker, 2007). The presence of ceramic anvils and anvil impressions on the interior surfaces of vessels, in the earliest levels, indicates local production during the earliest phase of occupation (Higham, 2007a, Voelker, 2007).

Like Ban Non Wat, Noen U-Loke is one of a series of moated communities in prehistoric Southeast Asia that mark what is believed to be a transition to increased social complexity in the region. A series of palaeoenvironmental reports have facilitated an understanding of the geological, hydrological and palynological history of this site. Sedimentary phases consist of floodplain sediments deposited during

the Holocene, followed by in-fill, further sedimentation of the floodplain at the period of occupation, sand in channels and final build-up of soil at the edge of mounded moats (Boyd, 2007, Boyd and Habberfield-Short, 2007, Habberfield-Short and Boyd, 2007). Palynological evidence demonstrates the initial period of occupation associated with grasslands (associated with rice) and forest followed by a decline in grassland and ascension of forested area and finally a return of grassland in conjunction with a forested/arboreal habitat. Palaeogeological evidence suggests that Noen U-Loke was originally situated on a river bank but, as climate changed and locals adapted to the challenges of limited or unreliable resources, primarily water, there was a move to the construction of moated systems in the Iron Age to counteract this challenge (Boyd, 2007, Boyd and Habberfield-Short, 2007) (see Figure 4.7).



FIGURE 4.7: Earthen feature at Noen U-Loke (Photo: Ross 2013)

Bioarchaeological research found, in comparison to that of Khok Phanom Di, a high frequency of late-term pregnancy loss at Noen U-Loke but no evidence of increased fertility (Tayles et al., 2007, Halcrow et al., 2008, Halcrow et al., 2016). The original Noen U-Loke subadult population of 53/120 (44.2%) falls within the expected range of mortality for preindustrial societies identified by Weiss (1973). Also, infants were more likely to die in the first nine months in comparison to those at Ban Lum Khao where infant deaths occurred more widely across the age spectrum in the first year, suggesting that Iron Age infants were at greater risk than those in the Bronze Age (Tayles et al., 2007). Adult sex ratios are biased towards males at the site but, considering the high number of adults of unknown sex at Noen U-Loke as well as taphonomic agents and cultural practices, the ratio of 1.29:1 may not be accurate (Domett and Tayles, 2006b). Stature estimates at Noen U-Loke (of 13/57 adults or 22.8%), contrasting with growth evidence from Ban Lum Khao, suggests children had greater equality in accessing resources at this site (Tayles et al., 2007).

The recent methodological development of the bioarchaeology of care model (Tilley, 2015) has enabled additional insight into the social organisation of prehistoric communities and the social identity of

select individuals. The potentiality of this model may be applicable to future study at Noen U-Loke. A bioarchaeology of care approach enables, where a diagnoses of severe disease and/or disability limiting the independent functionality of an individual occurs, that additional aspects of a community's behaviour, perhaps compassionate, may be inferred. Southeast Asian researchers have been quick to engage with this approach. In addition to studies focussed on a disabled individual from the Neolithic site of Man Bac (see below), other areas of focus have included evidence of a severely injured middle-aged male from the Napa site in the Philippines (Vlok et al., 2017). While not explicitly discussed in the context of the bioarchaeology of care, the presence of individuals afforded inclusive mortuary treatment and diagnosed with cerebral palsy, leprosy or tuberculosis may suggest similar care was afforded to these individual's at the Iron Age site of Noen U-Loke (Tayles and Buckley, 2004, Tayles et al., 2007).

4.7 Summary

This chapter began with an exploration of mortuary traditions in Mainland Southeast Asia, broadly, and in Thailand more specifically. The evidence across the region shows a diverse regionality to mortuary practices, influenced by a range social, cultural and environmental factors, over time. Mortuary traditions found in prehistoric Thailand, aligned with increasing social complexity from the Neolithic into the Iron Age, were seen across the region. Evidence from the Pleistocene and the early to mid-Holocene in Thailand show commonalities in mortuary practices with other sites throughout the region including the use of rockshelters, the deposition of burials in similar fashion (flexed, burning, supine flexed), similar material culture (stone, fauna, shell) associated with burials and the use of large rocks to cover the grave. Flexed burials are also found in Neolithic contexts in some Thai sites including Ban Non Wat. Moving into the Neolithic witnesses significant changes in the social organisation of communities with mortuary practices reflecting this shift and hint at an emerging social inequality from the mortuary record. This can be seen from the application of burials in clusters or rows and the apparent variability in grave wealth between individual burials or groups. Additional examples would be the presence of those wealthy burials from Khok Phanom Di or Non Pa Wai. Although Bronze Age burials broadly remain relatively poor, with the exception of wealthy elites from Ban Non Wat and Ban Prasat, we can observe increasing social complexity (differential wealth, presence of exotic items etc.) occurring as we move towards the Iron Age from an egalitarian, trans-egalitarian and finally a more stratified model for social organisation.

The chapter then examined a range of factors that have affected social and cultural change in the region over time. This included the effects of migration and the spread of Neolithic-like suites of activity across the region at different times. This includes the spread of rice agriculture, the domestication of some animals (cattle, pig) and the uptake and development of certain technological practices (i.e., pottery manufacture). Archaeological evidence of an expanding social interaction sphere continues to show increasing exchange (materials, skills, innovations, beliefs) and engagement occurring over time within, and across, the region as Indian and Chinese influence advance. Prior to an extended discussion on the four sites under review the chapter also reviewed what identity-based research has occurred in relation to the young and old in the region. While bioarchaeological studies remain at the forefront of biosocial research in the region there is tremendous scope to expand on available data to consider, at an elevated level, the influence of age or sex, as examples, in the formation and development of individual and collective identity across Southeast Asia. The following chapter will discuss what materials and methodological approaches were adopted to pursue the objectives of this research.

5

Materials and Methods

5.1 Introduction

An expanding tradition of dynamic research approaches undertaken by archaeologists across Southeast Asia continues to provide insights into human behaviour as local prehistoric populations underwent significant social, economic and subsistence changes over time. Chapter Four sought to identify and discuss some of the key developments in relation to social organisation and mortuary practices observed across the Neolithic to Iron Age in Mainland Southeast Asia as well as providing a general oversight of each of the sites under review with an analysis on each site's mortuary behaviour and aspects of human identity. Chapter Four also explored how earlier research has engaged in developing an understanding of the identity of the elderly and the young at each of these sites as well as the region more broadly.

This chapter provides an overview of the materials/samples used in the application of this mortuary study, the different methodologies applied to achieve the objectives of this research and the information technology and statistical systems used to generate and analyse data.

As a broad range of material and mortuary data was used in this research an approach of dividing the data, and research questions therein, was taken. A total of six suites of broad mortuary activity were adopted and will be discussed in this chapter. The broad questions and potential outcomes associated with each mortuary suite of activity are provided at Appendix 2. As this research primarily exploits available data from published manuscripts and is focussed upon specific age categories the first part of this chapter will raise concerns in relation to each issue. In the interest of clarity, challenges associated with the adopted research approach and fieldwork are also supplied. The definition and explanation behind the adoption of the subadult and elderly age parameters are also given to fit with subadult categories already adopted from the sites reviewed. This is provided in the recognition that the subadult, child, category cut-off, has been found to be non-standardised and broad in the literature (Murphy and Le Roy, 2017). Similarly, the elderly age category defined in previous research from each site is also adopted. However, this chapter will explain the adoption and application of the Cave and Oxenham (2016) method to re-classify, where possible, the adult age, but especially the elderly age, categories used for this research.

The four sites under review are located in Thailand in proximity to the Gulf of Siam (Khok Phanom Di) and on the Khorat Plateau in Northeast Thailand (Ban Lum Khao, Ban Non Wat, Noen U-Loke). The sites were selected based on a range of factors being:

- a. occupation spanning the temporal periods under review (Neolithic–Iron Age);
- b. relevance towards the understanding of mortuary identities of specific cohorts from limited sites on the Southeast Asian mainland;
- c. robust and well published samples, based on age-at-death and sex, across cemeteries at a population level and, with greater limitations, between mortuary phases;
- d. the provision of support and access to materials, where available, held by the Fine Arts Department of Thailand (FAD), under the auspices of the National Research Council of Thailand (NRCT); and
- e. an ability to engage, and in some instances, receive advice or guidance from primary and secondary researchers.

5.2 Naming Conventions

The introductory section outlined the broad scope of this chapter and provided the rationale and location for each of the four sites under review. This section gives a definition of the subadult and elderly age categories applied in this research and supplies an overview of the methodology applied to, potentially, expand the elderly cohort into discrete, and advancing, age categories. As research on the young and old expands and the discipline wrestles with the complexity of a range of issues it is necessary to reflect and explain the terminology used to discuss subjects in this study. Naming conventions applied to the young and old are often loaded, at least from a Western perspective, with potentially negative, misleading or biased meaning which is formed by dominant paradigms of belief in relation to each cohort (Lillehammer, 1989, Kamp, 2001, Welinder, 2001, Baxter, 2005, Lucy, 2005, Hess, 2006, Gowland, 2009, Appleby, 2010, Hummert, 2011). These views are formed through a complex interplay of factors including cultural/ethnic background, social environments, economic status, legal parameters or religious/philosophical belief systems.

Where the young are considered, the use of the term 'juvenile' or 'subadult' infers, potentially, Western bias towards this cohort who have an identity that is perceived as immature (i.e., biologically, emotionally, cognitively), dependent, secondary and inferior to that of 'fully formed' adults (Lillehammer, 1989, Lewis, 2007). As observed in Chapter Three, it is noted that attitudes towards childhood have undergone significant transformation over time. Where this applies to the elderly the negative bias associated with being 'old' from a Western perspective may manifest from the subjects perceived potential inability to maintain their independence and/or individuality and the subsequent 'burden' on others (i.e., family, friends, society) (Jensen and Oakley, 1982-83, Bytheway, 2005, Hess, 2006, Hummert, 2011).

Culturally loaded, often negative, meanings associated with the young or old need to be recognised but not impact on the development of identity hypotheses regarding each group. This is especially pertinent in relation to the elderly from archaeological settings where this cohort, at least from a biological position (i.e., 40+ years), are markedly younger than cohorts classified as elderly in current periods (i.e., 50s, 60s, 70s etc.). Given that, from an initial standpoint, it appears impossible to mitigate negative inferences towards younger and older age categories, this research adopted the term 'subadult', a biological term, and 'old' adult to refer to those individuals aged fifteen years of age or less and forty years of age or more respectively. A statement for the context and application of age barriers used in relation to the young (<15) and old (40+) in this study is at Section 5.2.1.

5.2.1 Age Parameters – Subadults and Older Adults

The archaeological literature demonstrates inconsistencies in the application of universal age categories in palaeodemographic profiling of prehistoric populations. Of particular relevance to this research has been the inconsistent approach to the age-range classification of the young and the old. Scott (1999: 92) demonstrates that the infant age category has been recorded as ranging from birth to twelve years at age-at-death with the broader juvenile age category reaching up to twenty five years of age. The application of non-standard and inconsistent age classifications will misrepresent the palaeodemographic profile of prehistoric populations and negatively skew and influence the findings of archaeological studies (see Chapter Three).

A range of methods have been developed to determine and assign an age-at-death for subadult subjects (see Chapter Three). These include analysis of the individual's dental as well as skeletal development and maturation. A range of factors influence the growth and maturation of subjects including sex, genetics and behaviour which results in the risk of a high degree of variability of age assignments affecting subadult populations in the present and the past (Brothwell, 1981, Baker et al., 2005, White and Folkens,

2005, Lewis, 2007). Southeast Asian researchers frequently adopt 14.9 years (<15 years of age) as a cut-off to delineate the discrete passage from childhood into adulthood (Douglas, 1996, Tayles, 1999, Oxenham et al., 2008b, Domett and Oxenham, 2011). This includes three of the four sites under review (Ban Non Wat bioarchaeological publication pending) where bioarchaeological assessments have been performed (Tayles, 1999, Domett, 2004, Tayles et al., 2007). Tayles (1999: 31) states that beyond this age marks the conclusion of dental calcification and observes the initiation of skeletal degenerative processes associated with adulthood. Given the veracity of this observation and in the interest of aligning this research in the broader body of work undertaken from Mainland Southeast Asia, a cut-off at and below 14.9 years has been adopted to represent subadults from the populations under review.

Following Lewis (2007: 84) this research has adopted the terms to define different subadult stages of early childhood, where necessary, to include foetal (intrauterine but also recognising the perinatal category (22 gestational weeks to seven days post-partum), neonate (<27 days of extrauterine life) and infant (<28-365 days post-partum). Subadults aged from 1-14.9 years are broadly identified as children, with younger children referring to those aged 1-9.9 years and older children referring to those aged 10-14.9 years. Ageing models for the elderly are less robust than that in relation to subadults (see Chapter Three), even given the high degree of variability inherent in the subadult age class, with ageing methods being less effective for remains beyond fifty years of age (Buikstra and Ubelaker, 1994, Ackroyd et al., 1999). However, three of the sites under review (it is unknown as yet what stance will be taken in relation to Ban Non Wat) have adopted an age of 40+ years to indicate the transition into an 'elderly/old' status (Tayles, 1999, Domett, 2004, Tayles et al., 2007). In the interest of continuity this research has adopted the position that subjects transition into an 'old' adult status from forty years of age. In addition to this range, however, a consideration of factors will be adopted to investigate if mortuary evidence supports a transition, socially, from mature adult to elderly adult prior (30s) or after (50s, 60s, 70s) the established parameter of forty years of age.

A range of age categories were adopted in this study (see Table 5.1 and 5.2). Individuals were allocated to specific age categories based on their age-at-death assessments and, where appropriate, on a re-assignment of age following the application of the Cave and Oxenham (2016) method (see below). The initial, most commonly applied, approach through data analysis categorised subjects into three broad age categories (i.e., <14.9 years; 15-39.9 years and 40+ years). Table 5.1 primarily identifies the broad separation of the subadult group for analysis as a whole (i.e., neonate, infant, child, older child) but also outlines the two adult age classes. Continued analyses of results affecting sub-categories of age classes (e.g., foetal, 10-14.9 years, 50s etc.) considers if specific funerary behaviours, with respect to the young and old, were executed on certain cohorts. Those individuals unable to be assigned an age were excluded from further analysis (see Table 5.2 and Appendix 3).

TABLE 5.1: AGE ALLOCATIONS AND DESCRIPTIONS APPLIED TO STUDY

Category	Age Classification
1	Foetal, Stillbirth, <27 days (neonate)
2	<28 days-0.9 years of age (infant)
3	1-14.9 years of age (child: young child 1-9.9 years; older child 10-14.9 years)
4	15-39.9 years of age (adult)
5	40+ (old adult)

A critical issue requiring further attention in bioarchaeological research is the need to robustly assess skeletal remains beyond that of subjects currently capped between forty to fifty years of age at death.

This issue and the problems associated with it were discussed in Chapter Three (see Section 3.6). To counter this drawback and expand the age barriers beyond forty years of age into discrete categories for analysis, this research has adopted the method set out by Cave and Oxenham (2016). This method contains four steps used to reallocate age-at-death estimations for older individuals. The steps are (1) the application of a tooth wear analysis on the representative sample; (2) seriation, from youngest to oldest individuals, of the sample; (3) the selection of an appropriate ethnographic mortality profile for comparison and reallocation; and (4) the reallocation of age categories based on this information (Cave and Oxenham, 2016).

Tooth wear analysis, using both the original, and enhanced, methods for analysing molar wear (Scott, 1979, Shykolkuk and Lovell, 2010), was applied to dentition from remains from Khok Phanom Di, Ban Lum Khao and Noen U-Loke. Analysis of dentition occurred at the Storage Facility in Phimai in the Nakhon Ratchasima Province, Northeast Thailand under the auspices of the Fine Arts Department of Thailand. The reallocation of age categories was only applied to those individuals which retained a single assessable maxillary or mandibular molar (M1 or M2). The original age-at-death assessment provided by primary researchers where an assessable molar was missing (not present at excavation or storage facility) was retained. No analysis was undertaken on subjects from Ban Non Wat as access to these remains was not available. Mortality profiles of the forest dwelling northern Ache of eastern Paraguay were adopted and applied for the purpose of reallocating age categories of adults at Khok Phanom Di (Hill and Hurtado, 1996). Similarly, the mortality profiles of Hiwi hunter-gatherers of Venezuela were applied to Ban Lum Khao and Noen U-Loke (Hill et al., 2007) (see Figure 5.1) (see Cave and Oxenham 2016 for a discussion of this aspect of the methodology). This group was selected based on relatively close alignment of its mortality profile, as a proportion of the population aged over 15 years of age, and that of the site under review that could be assigned an age-at-death (Khok Phanom Di 44.1% vs Ache 41.9%; Ban Lum Khao 51.8%, Noen U-Loke 51.8% vs Hiwi 52.0% (see Figure 5.1).

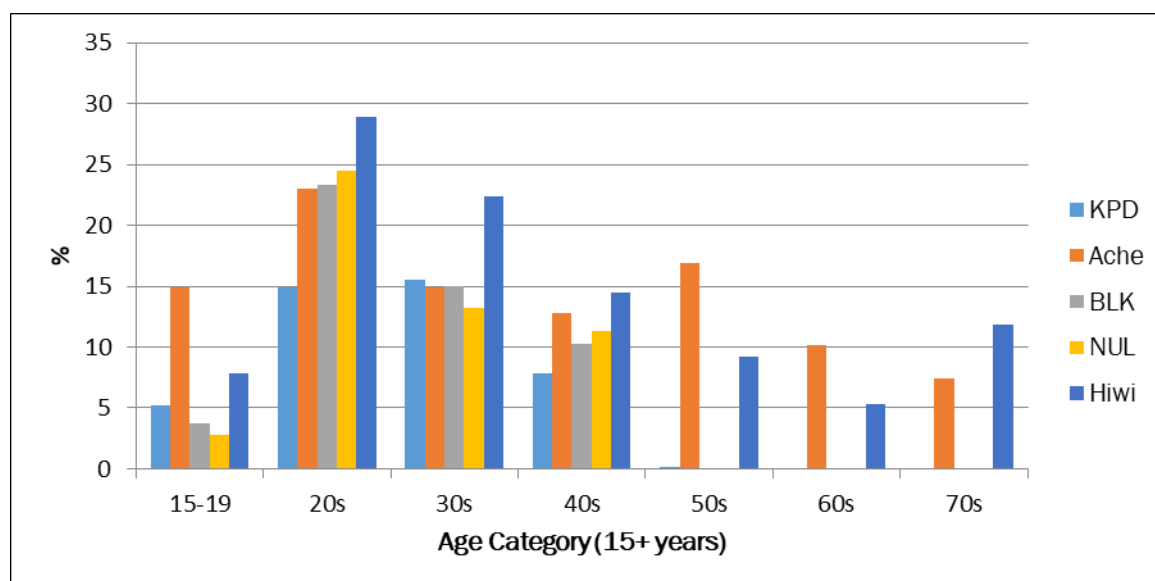


FIGURE 5.1: Mortality profiles of ethnographic populations and archaeological sites
KPD – Khok Phanom Di, BLK – Ban Lum Khao, NUL – Noen U-Loke

A total of 48/68 (70.5%) from Khok Phanom Di; 34/56 (60.7%) from Ban Lum Khao; and 28/56 (50.0%) from Noen U-Loke had an assessable molar available to execute an analysis with an adult over 15 years of age. These individuals were afforded, if appropriate, a reallocation of age based on the Cave and Oxenham (2016) method. As such, a total of 20/68 (29.4%) from Khok Phanom Di; a total of 22/56 (39.2%) at Ban Lum Khao; and 28/56 (50.0%) from Noen U-Loke were not assessed and retained the original assigned age-at-death range. The comparison of the full range of burials potentially reallocated an age classification including associated tooth wear score is at Appendix 1.

This section provided a definition, in alignment with published bioarchaeological categories, of a subadult (<14.9 years) and elderly (40+ years) cohorts used in this research. Further, following a tooth wear analysis this section gave a description of the Cave and Oxenham model which was applied to those adult burials from Khok Phanom Di, Ban Lum Khao and Noen U-Loke presenting M1 or M2 to expand the age categorisation for elderly subjects at each of these three sites. Section 5.3 provides a description of the sample size from each site used in this research.

5.3 Materials: Site Summaries and Contemporaneous Periods

Mortuary data was sourced from the relevant mortuary phases and related research reports from Khok Phanom Di (Higham and Bannanurag, 1990, Higham, 1993a, Higham, 1993b, Higham, 1993c, Pilditch, 1993, Pisonpong, 1993, Vincent, 2004), Ban Lum Khao (Chang, 2004, Higham, 2004d, Higham and Thosarat, 2004a, Higham and Thosarat, 2004b, Higham, 2004c), Noen U-Loke (see Higham et al., 2007), and Ban Non Wat (Higham, 2009a, Higham, 2009d, Higham and Wiriyaromp, 2010a, Higham and Wiriyaromp, 2010b, Higham and Wiriyaromp, 2010c, see Higham and Kijngam, 2012a, see Higham and Kijngam, 2012b).

Preliminary analysis of data identified the following viable samples: Khok Phanom Di (n=154), Ban Lum Khao (n=110), Ban Non Wat (n=636) and Noen U-Loke (n=120). The sites under review span the Neolithic (Khok Phanom Di and Ban Non Wat), the Bronze Age (Ban Lum Khao and Ban Non Wat) and the Iron Age (Noen U-Loke and Ban Non Wat) of Southeast Asia. The age-at-death and sex distribution of individuals from Khok Phanom Di, Ban Non Wat, Ban Lum Khao and Noen U-Loke is detailed in Table 5.2. This includes those individuals from Khok Phanom Di, Ban Lum Khao and Noen U-Loke that were reallocated a revised age range following the application of the Cave and Oxenham (2016) method. Individuals unable to be assigned an age-at-death and/or sex assessment were excluded from further analysis.

Revised age classifications (see Table 5.2) for adults indicate 68/154 (44.1%) for Khok Phanom Di, 56/107 (52.3%) for Ban Lum Khao, 297/459 (64.7%) for Ban Non Wat and 56/107 (52.3%) for Noen U-Loke. Burials assigned an age-at-death at forty years or older, here classified as 'old', total 33/68 (48.5%) from Khok Phanom Di, 18/56 (32.1%) from Ban Lum Khao, 56/297 (18.8%) from Ban Non Wat and 21/56 (37.5%) from Noen U-Loke respectively.

Subadult age classifications were not subjected to potential reallocation of age categorisation and therefore remain static unless unable to have an age assigned. Totals for subadults at Khok Phanom Di are 86/154 (55.8%), 51/107 (47.6%) for Ban Lum Khao, 162/459 (35.2%) for Ban Non Wat and 51/107 (47.6%) for Noen U-Loke respectively.

The quantum of burials unable to be assigned an age-at-death, and affecting the total sample size from each site, are found in Table 5.2. Only Khok Phanom Di (n=154) had all burials being assigned an age-at-death. A total of 3/110 (2.7%), 17/120 (14.1%) and 177/636 (27.8%) burials could not be assigned an age-at-death from Ban Lum Khao, Noen U-Loke and Ban Non Wat respectively. The total of burials of

an unknown age-at-death from Ban Non Wat may be revised in the future following the publication of bioarchaeological assessments for individuals or the population more broadly.

Bioarchaeological age, sex and health assessments for Khok Phanom Di, Ban Lum Khao and Noen U-Loke were taken from Tayles, Domett and Halcrow (Tayles, 1999, Domett, 2001, Domett, 2002, Domett, 2004, Tayles and Buckley, 2004, Domett and Tayles, 2006a, Domett and Tayles, 2006b, Tayles et al., 2007). A comprehensive bioarchaeological assessment of skeletal remains from Ban Non Wat has yet to be published with age assessments adopted in this study taken from preliminary assessments (Higham and Wiriyaromp, 2010b, Higham and Wiriyaromp, 2010c). The age profiles, not including the age ranges for adults over forty years of age, reflect the ranges adopted in bioarchaeological reports.

Subadult age-at-death assessments from Khok Phanom Di were developed through the analysis of dental development, skeletal development and diaphyseal bone length (Tayles, 1999). Adult age-at-death assessments were generated through the evaluation of epiphyseal fusion, tooth wear and calcification of 3rd molars, dental pathologies, the pubic symphysis and skeletal degeneration (Tayles, 1999).

Subadult age assessments at Ban Lum Khao were generated, where available, through diaphyseal length, epiphyseal fusion, skeletal development and stages of dental eruption and calcification (Domett, 2001, Domett, 2004). Adult age assessments were produced through an examination of epiphyseal union, morphological variability of the pubic symphysis, dental wear and pathology and skeletal degeneration (Domett, 2001, Domett, 2004).

Subadult age-at-death assessments from Noen U-Loke were developed by the estimation of dental formation and eruption, epiphyseal fusion and diaphyseal length (Tayles et al., 2007). Adult age ranges were formulated through assessment of epiphyseal union, morphological variability of the pubic symphysis and tooth wear (Tayles et al., 2007).

This section has outlined the identified number of burials, originally, from each of the sites under review and has provided the revised sample used in this research following the removal of burials unable to be assigned an age-at-death. An overview of methods used to assign age for subadults and adults was also provided. The following section briefly explain potential challenges associated with the current research approach.

5 MATERIALS AND METHODS

TABLE 5.2: DEMOGRAPHIC STRUCTURE AT SITES UNDER REVIEW BY AGE AND SEX

	Assemblagea			
Age Rangeb	Khok Phanom Di (%)	Ban Non Wat (%)	Ban Lum Khao (%)	Noen U-Loke (%)
Period/Age	Neolithic	Neolithic-Iron	Bronze	Iron
Foetal	-	11 (2.3)	1 (0.01)	2 (1.8)
0-0.9 years	64 (41.5)	55 (11.9)	20 (18.6)	35 (32.7)
1-4.9 years	11 (7.1)	65 (14.1)	14 (13.0)	9 (8.4)
5-9.9 years	6 (3.8)	19 (4.1)	11 (10.2)	2 (1.8)
10-14.9 years	5 (3.2)	12 (2.6)	5 (4.6)	3 (2.8)
Subtotal of subadults	86 (55.8)	162 (35.2)	51 (47.6)	51 (47.6)
15-19.9 years	7 (4.5)	10 (2.1)	3 (2.8)	4 (3.7)
20-29.9 years	13 (8.4)	114 (24.8)	20 (18.6)	18 (16.8)
30-39.9 years	15 (9.7)	117 (25.4)	15 (14.0)	13 (12.1)
40-49.9 years	15 (9.7)	56 (12.2)	9 (8.4)	13 (12.1)
50-59.9 years	9 (5.8)	-	3 (2.8)	3 (2.8)
60-69.9 years	5 (3.2)	-	2 (1.8)	2 (1.8)
70+ years	4 (2.6)	-	4 (3.7)	3 (2.8)
Subtotal of adults	68 (44.1)	297 (64.7)	56 (52.3)	56 (52.3)
Unknown	-	177	3	13
Total Sample	154 (100.0)	459 (100.0)	107 (100.0)	107 (100.0)
Sexc	Khok Phanom Di	Ban Non Wat	Ban Lum Khao	Noen U-Loke
Male	32 (47.1)	135 (45.4)	26 (46.4)	23 (41.0)
Female	36 (52.9)	133 (44.7)	30 (53.5)	20 (35.7)
Unknown Sex	-	29 (9.7)	-	13 (23.2)

^a Source: Khok Phanom Di (Tayles, 1999); Ban Non Wat (Higham 2009; 2010; 2010; 2012); Ban Lum Khao (Domett, 2001; Domett 2004; Higham and Thosarat, 2004); Noen U-Loke (Tayles and Halcrow, 2007)

^b Individuals assigned an age-at-death from bioarchaeological assessment or, where assigned an age-at-death beyond 50 years, from tooth wear analysis and the application of the Cave and Oxenham method.

^c Individuals assigned a biological sex through a bioarchaeological assessment.

5.4 Challenges in research model and fieldwork experience

Difficulties across a lengthy research process are inevitable whether during fieldwork, accessing collections, or through the intended, and ideal, application of methodologies. Generally, issues associated with executing research which is, primarily, derivative of earlier research and the subsequent re-interpretation of published data is at risk of being biased in its approach to available data. An additional shortfall included the researcher's inclusion of Ban Non Wat as one of the sites for analysis where permission was sought to gain access to a range of skeletal and material culture from this site. Unfortunately, as much of the data in relation to this site is continuing to be published from primary research organisations, access to skeletal and material remains was not possible at this time. Problems in locating and assessing curated material during fieldwork, specifically in Phimai, meant that faunal (i.e., sidedness of bivalve Unionidae with age/sex categories) and fragmentary, or unfinished, non-ceramic mortuary goods could not be assessed as planned and included in the final analysis. Further, lost or missing human samples (i.e., mandibles and associated dentition) reduced the sample that could be assessed for tooth wear and subsequent application of the Cave and Oxenham model.

The research model applied in this dissertation is primarily derivative and reliant on the published results of primary and secondary researchers of the sites under review. Within this framework the risks of such an approach are recognised due to the influence of differential research priorities, inter-observer bias through the interpretation of material at the time of excavation, human error and the potential limitations of techniques applied in the field and/or laboratory as influencing factors on published data. Further, given the fiscal constraints associated with archaeological research and the limitation of funds contributed to research programs it is evident that archaeological projects undertaken within Southeast Asia would have clear and unambiguous research priorities. As such, it is possible that some elements of analysis would not be undertaken or considered within this restrictive financial framework.

5.4.1 *Limitations of mortuary data for research purposes*

It is obvious to state that the dead are buried by the living but in an archaeological setting, where interpretations of behaviour are fraught with a range of literal and theoretical limitations, the significance of this simple observation is critical. Human burials are often idealised forms of transformation related to the deceased individual, to the broader community engaging with the burial, or both (McHugh, 1999, Parker Pearson, 1999, Sofaer, 2006). In this framework, transformation could be understood in relation to the liminal nature of the deceased, as a vehicle of succession for a surviving community member or as a means to negotiate or communicate some aspect of the social environment (see Chapter Two). The transformation is culturally informed and sets out how the deceased, or participating mourners, are viewed socially and, if in relation to the dead, represents a transformation of identity.

The risk here is that the archaeological data, usually because of the vagaries of research commitments and priorities, is typically representative of only a proportion of a population. Further, there are a range of factors that could influence the inclusion or preservation of materials in mortuary contexts of material culture (e.g., economic or ritual practices, cultural beliefs, social mores etc.) and skeletal material (e.g., taphonomy, skeletal mineralisation, cultural practices etc.) (Schiffer, 1987, Lyman, 1994). As such, the mortuary data available has the potential to be misleading or misrepresentative of the total population or, consequently, the individuals being analysed and discussed at a social, cultural, ritual or economic role.

It should also be considered that the relationship between those survivors, either at an individual or group level, and the deceased may have been highly complex and variable and influenced the manner in which the deceased was buried or of the material culture associated with them. Surviving individuals

may have been, for example, kin (parents, siblings, surviving children etc.), friends, intra or inter-site community members with no relations with the individual (i.e., passive strangers), economic partners, economic dependents, enemies, informal sexual partners or inhabited several of these identity variables. The identity of the deceased, and their subsequent mortuary treatment, may also be influenced by a range of factors in their relation to their age, sex, gender, status or ethnic background. This goes to patently state some of the typical challenges archaeologists face in the interpretation of mortuary data in relation identity-studies in the past.

5.5 Research Methods

The previous section looked at some of the pitfalls, potential and real, associated with the research approach adopted. The current section will explore, as outlined in the Introduction of this chapter, the six mortuary suites of activity explored to fulfil the objectives of this research. Broadly, mortuary data was examined to investigate what type of funerary treatment the old and young of the assemblages under review were exposed and to determine if they were subject to normative or atypical mortuary behaviour, due to their age, in relation to the broader population. The approach that was applied is straightforward and readily applicable to any cemetery environment assuming relevant data is available for interrogation.

For the purposes of this research, normative mortuary behaviour refers to those practices most frequently observed within an archaeological period and refers to a suite of variables materially visible in the record. This may include commonly applied deposition styles of human remains, the consistent presence of material culture types and/or spatial distribution of the corpse. In contrast to the broader cemetery population, deviant burials can be seen to fall outside these conventions. The exposure of an individual to normative or non-normative burial practices may provide insight into a populations value system and its organisation at specific moments in time. Normative, and by inference non-normative, burial practises at each site are not discussed here but are outlined within chapters Six to Nine. Broadly, although variability occurs between, as well as within (see Ban Non Wat at Chapter 7) sites, most burials typically were of a single individual laid out supine in an extended fashion anatomically and being interred with some types of material culture. Although not comprehensive, examples of normative (see Figure 5.2) and atypical burial (see Figure 5.3 and 5.4) practices are provided for information.

The first mortuary suite explores features associated with the human burial; the second suite refers to select features



FIGURE 5.2: Example of normative (single, extended, anatomical with material culture) burial (Photo: Higham, C.F.W. 2017. South East Asian Archaeology Data, Retrieved from <https://drive.google.com/drive/folders/0BwyPRRjONdiFc0pQM3VTS09VVTA>)



FIGURE 5.3: Example of non-normative (double burial containing adult and infant remains (at left shoulder - B47 and 48) burial from Khok Phanom Di (Photo: Higham, C.F.W. 2017 <https://drive.google.com/drive/folders/0BwyPRRjONdiFTXBqam91Mjh0d0U>)



FIGURE 5.4: Example of non-anatomical positioning of legs from an individual (B163) from Ban Non Wat (Photo: Higham, C.F.W. 2017 <https://drive.google.com/drive/folders/0BwyPRRjONdiFc0pQM3VTS09VVTA>)

of the grave that were exploited in this research; the third suite is concerned with faunal aspects in association with a burial; the fourth mortuary suite, only relevant to twelve vignettes of selected young and old burials from Khok Phanom Di and Noen U-Loke, to explore the potentiality of poor health affecting mortuary treatment; the fifth mortuary suite considers the presence/absence of material culture; and the sixth explores the spatial distribution of graves within the cemetery horizontally and vertically.

As stated at Section 5.2.1, the complete sample of burials were divided into several age categories. Primarily three (i.e., <14.9 years, 15-39.9 years, 40+ years) categories were investigated with consideration given to additional sub-categories to explore significant behaviour executed on discrete age classes. To facilitate an understanding of potentially normative mortuary behaviour this study adopted the approach of identifying which variable outcome is predominant in its association with buried subjects. For example, if several types of metal artefact were present (i.e., tools, jewellery etc.) the predominant outcome (e.g., metal tool) was regarded as the normative association. This approach enables a comparative analysis to observe conformity to, or atypical behaviour against, normative behaviour.

In many instances published datasets were unable to associate an individual with a burial variable used in this research (e.g., unknown shell artefact, unknown orientation etc.). Further, primarily related

to physical position of material culture, an object was unable to be clearly associated with the burial itself or, more likely, afforded a definitive position on, or beside the deceased (i.e., fills). Where both unknown and fill variables were presented the data was absorbed, originally, into the dataset to ensure a comprehensive collection of information but, given the ambiguity of each outcome, was not considered for further analysis or discussion. The variable suites investigated are discussed below but a full listing of the variables and potential outcomes is at Appendix 2. Further, note that where a discrepancy occurs between adult age and sex totals in tables, this reflects an example of where an age-at-death, but not biological sex, was assigned (e.g., see Table 7.2.2 – Hand Position (Pelvis); adult total observed by age (n=69), adult total observed by sex (n=67)).

Preliminary analysis considered a viewshed approach for burials under this mortuary Suite (#1) of activity. A viewshed approach would enable an exploration of the buried individual's relationship with the broader landscape in the vicinity of the cemetery under question. In addition to the natural landscape this approach was originally explored to examine if any aged-cohort had a specific relationship with exotic material such as stone, often located at a considerable distance from the primary site. A viewshed approach is closely related to research which focusses on a subject's orientation. The purpose of such an approach is to explore if discrete cohorts have a direct relationship with some feature of their broader local environment and ecosystem. Under normal circumstances a comprehensive viewshed analysis is performed through the application of a range of available geo-spatial technology such as GIS (McCoy and Ladefoged, 2009). Due to time-management issues this approach, originally undertaken at a basic level, was not included in this instance but would be highly encouraged for use for mortuary studies in Mainland Southeast Asia and further afield in the future.

5.6 The Burial of Human Remains (Mortuary Suite #1)

The initial mortuary suite considered the individual. This included whether the subject was exposed to:

- single or multiple burial and the style and position of multiple burial;
- preparatory behaviour for burial (i.e., wrapping, coffin burial etc.);
- dental ablation;
- deposition of the body (extended, flexed, semi-flexed) with additional consideration of the position of the skull, arms/hands (i.e., at pelvis, anatomical etc.) and feet (i.e., anatomical, crossed etc.);
- orientation; and
- ochre (i.e., presence of, differential application) or additional (grey) clay (at Ban Non Wat only).

While single burial is the most common type found at each of the sites there are frequent examples of multiple (n=2+) burials occurring in the same grave. Where multiple burials were recovered consideration was given to the age and sex of individuals exposed to this behaviour (e.g., adult female and subadult etc.) and the relational position of the bodies to each other (i.e., supine adjacent to one another, head-to-toe etc.).

A sub-sample of burials, covering a broad expanse of time (c. 1750 – 1050BCE), are classified as the 'Flexed' burial period at Ban Non Wat (Higham and Wiriayaromp, 2010a). This practice, whether the subject is semi-flexed (up to 134°) or fully flexed (135–180°), also occurs at the other sites under review as well as many other burials, primarily semi-flexed lower limbs, from Ban Non Wat. As a consequence, consideration was given to the burial position of the individual to investigate if a particular style is more frequently associated with a specific age class. Similarly, as some subjects were buried in a prone position the analysis considered the depositional style of buried individuals. The investigation of the

placement of the skull, hands and feet was executed to examine if select cultural behaviour was afforded to a specific cohort within a population.

The preparation of the body refers to those intentional activities to preserve, mummify, restrain (through wrapping), modify or decorate the corpse following its death and prior to its deposition in a grave. Evidence from Southeast Asia demonstrates that a range of preparatory activities, including the wrapping of individuals in shrouds or through the application of ochre, was executed on the deceased prior to burial (Higham and Bannanurag, 1990, Willis and Tayles, 2009, Harris and Tayles, 2012, Harris et al., 2016).

Ochre is present in burial contexts across Southeast Asia and persists, in varying degrees, at the sites under review. In addition to the determination of which individuals had ochre deposited in their burial, the application style (i.e., deposited on skull only, deposited at/below feet etc.) and the relationship between ochre and another artefact (e.g., whorl, grey clay, Unionidae sp. etc.) it was in direct association with was also investigated. Finally, while evidence of dental ablation was found from two sites under review, Khok Phanom Di and Noen U-Loke, only Noen U-Loke (Tayles et al., 2007) published the data in relation individual burials.

5.6.1 Field Anthropology (sub-set to Mortuary Suite #1)

Anthropologie de terrain, also known as field anthropology, promotes the consideration of decomposition variables and taphonomic processes as factors to explain skeletal and material culture movement within a grave setting (Duday and Guillon, 2006, Duday, 2009, Duday, 2014). Field anthropology considers the potential impact to the corpse, and its position upon recovery, by the loss of integrity of articulating joints, the effects of body fluids brought about through the decomposition process in the micro-environment of the grave, the influence of differential pathologies, if observed, on deposition of the corpse in the grave setting and the influence, whether restrictive or expansive of various cultural practices and material culture on the deceased (Duday and Guillon, 2006, Duday, 2009, Duday, 2014). This use of field anthropology is important as it recognises the essential consideration of the complex interplay of bodily decomposition rates, taphonomic processes, gravity and cultural practices and behaviour, before, during and after burial as critical in obtaining a holistic understanding to the burial environment.

Duday (2009) suggests that the optimal application of this approach is in the field at the point of excavating a burial as the greatest amount of measurable data can be observed. However, researchers have demonstrated that the use of photographic or pictorial evidence of the burial can provide scope for a limited analysis on the deposition and preparation of prehistoric burials (Nilsson, 1998, Nilsson Stutz, 2003a, Nilsson Stutz, 2006, Willis and Tayles, 2009, Nilsson Stutz, 2010). This approach is adopted in this study and applied where photographic or pictorial evidence is available from the sites under review or by other researchers (Willis, pers.comm.). Where visual evidence was not available the buried subject was excluded from analysis. The total number of assessable burials from each of the sites, including both subadults and adults, is at 62/154 (40.2%) for Khok Phanom Di, 198/459 (43.1%) for Ban Non Wat, 28/107 (26.1%) for Ban Lum Khao and 33/107 (30.8%) for Noen U-Loke.

While not widely embraced in Anglo-American excavation practices, there is growing evidence of the application of field anthropology techniques in Southeast Asia (Willis and Tayles, 2009, Harris and Tayles, 2012, Harris et al., 2016). This research adopted the use of the seven questions developed by Harris and Tayles (2012: 232) to explore if the dead were exposed to specific mortuary behaviours namely wrapping or the use of coffins. The questions, predicated by a yes/no response infer the presence of specific, sometimes quite broad, funerary behaviours. The questions (Harris and Tayles, 2012: 232)

focus observations on the lower part of the body to examine the disarticulation or displacement of the pelvis and patellae, if constriction is present, the shape of the skeletal remains and on the relationship between the corpse and the grave cut. Further consideration was given, where material culture was in close proximity or direct contact with remains, to the influence of objects on the position of the corpse.

5.7 Characteristics of the Grave (Mortuary Suite #2)

The second suite of variables examined the characteristics of the grave itself and its relationship with the immediate cemetery environment as potential indices assisting or affecting the interpretation of burials. Elements subject to analysis in the second suite of variables included:

- the presence of disposal containers (i.e., coffins, jar burials etc.);
- rice burials (unique to Noen U-Loke);
- grave depth; and
- the presence and position of features such as hearths, middens and pits to the burial.

Characteristics of the disposal container to be considered included the presence of such an artefact and the resource exploited for its construction (e.g., wood, clay etc.). Under ideal circumstances the determination if the resource was sourced locally or non-locally may provide further insights into the identity of the individual or group being buried, but this approach was not feasible for this study. In the context of this research the disposal container refers to a coffin-like structure or burial jar. This description precludes those instances where the individual was wrapped as a form of body preparation prior to interment (see Section 5.6.).

The analysis on grave depths has been used to assess, through the measurement of ranges of energy expenditure executed on individual burials, the social organisation of communities and the status of the individual (Tainter, 1975, Carr, 1995, Parker Pearson, 1999). The apportioning of grades, as an artefact of mortuary practices across different cultures, of grave depth for analysis is arbitrary, and specific to its cultural-historical environment and geographic location. In Southeast Asian contexts shallow burials have been regarded as measuring up to 20cm below the level of the grave cut which correlates, approximately, with the depth of the buried adult individual (Higham and Bannanurag, 1990: 143). Three grades of grave depth, shallow, moderate and deep, were adopted in this study. In the interest of continuity, but as a slight extension of the parameter described, this research prescribed a shallow burial as 0-25cm; a moderate burial depth as 26-50cm and a deep grave depth as beyond 51cm.

Fire, in its literal and figurative manifestations, is a powerful material element that was a significant feature in the economic, residential and ritual spheres of prehistoric populations (Gheorghiu and Nash, 2007, Odgaard, 2007). The role of fire through burial mediums, either as crematory practices (Lara et al., 2016) or in association with funerary hearths (or potential funerary feasts) has been recorded (Purhonen, 2007, Nash, 2008, Beauclair et al., 2009, Kaliff, 2012). It is also proposed that fire, within the interactive sphere of the mortuary performance, could provide a visceral focal point that is used actively to engage, inform, transform or integrate a range of social behaviours, attitudes and beliefs (Chesson, 2001, Mitchell, 2006, Fahlander and Oestigaard, 2008, Leming and Dickenson, 2009). Features such as pits, hearths and middens in association with human burials are present, and often associated with variable faunal remains (e.g., shellfish, pig etc), at some of the sites under review (Higham and Bannanurag, 1990, Higham, 2009b). While recognised that the destructive nature of a fire and post-depositional factors will remove some materials from the archaeological record, the presence and location of such features was still examined. Faunal remains in association with burials is covered through the analysis at Mortuary Suite #3 (see below). Caution was exercised to ensure only those features associated stratigraphically with the burial and within its immediate proximity were investigated.

5.8 The Relationship of Fauna with Burials (Mortuary Suite #3)

The third suite of variables explored is a tacit extension of that discussed in relation to hearths (see above) and examines the potential relationship between unworked, or natural, fauna with human burials. Again, this approach was taken to examine the potential link between specific fauna and ritual practices at the sites under review. Identification of faunal remains was published for Khok Phanom Di (Higham and Bannanurag, 1990, Grant and Higham, 1991, Kijngam, 1991, Mason, 1991a, Mason, 1991b), Ban Lum Khao (Higham and Thosarat, 2004b, Higham, 2004e, Thosarat, 2004), Noen U-Loke (McCaw, 2007c, McCaw, 2007b, McCaw, 2007a, Thosarat, 2007) and Ban Non Wat (Kijngam, 2010, Thosarat, 2010, Thosarat, 2012) and included in burial descriptions. Much of the faunal remains recovered from burials do not appear to be directly related to the funerary features (i.e., hearth etc.) discussed above and precipitated further investigation. The proportion of burials with faunal remains at each site is as follows: Khok Phanom Di (85/154, 55.1%), Ban Non Wat (258/459, 56.2%) with variable, and increasing levels, over different archaeological periods (see Tables 7.3.1-3), Ban Lum Khao (47/107, 43.9%) and Noen U-Loke (27/107, 25.2%). The outcomes for the third suite of mortuary activity included:

- faunal element present (e.g., hind limb, valve etc.);
- the presence and quantity of the most prevalent taxon such as *Sus*, Unionidae (freshwater pearl bivalve), bovid, cervid or specific fish taxon, as examples; and
- the burial position of the fauna in the burial.

Following preliminary observations of a high frequency of specific faunal elements in association with burials, a select range of eight types of faunal elements were identified for additional consideration. These included an examination on the presence of hind limbs, fore limbs, mollusc valves, animal dentition, animal skulls, the whole of the animal, antlers or horns and other skeletal elements. While captured, the inclusion of 'other' elements (i.e., scapula etc.) can be treated in comparison to the 'unknown' sub-category and was logged but not subject to further analysis.

Similarly, a high frequency of the same fish species, specifically from Ban Non Wat, Ban Lum Khao and Noen U-Loke, were identified in association with the burials at each site. The six species include *Channa* sp. (Snakehead fish), *Clarias* sp. (Catfish (air-breathing)), *Monopterus* sp. (Swamp eel/Rice eel), *Wallagonia* sp. (Sheatfish), *Anabas* sp. (Climbing Perch) and *Hemibagrus* sp. (Catfish). Although many more species were recovered *in situ*, taxa described were recovered the most frequent thus warranting further investigation. A wide range of fish taxa, including *Channa*, *Clarias* and *Anabas* (Kijngam, 1991), were recovered from Khok Phanom Di. However, only a broad approach to analysis was undertaken (i.e., age and sex) from Khok Phanom Di as individual taxa were not included in burial descriptions. Other fauna recovered in relatively high numbers, and examined, included pig, Bovidae (e.g., water buffalo etc.), deer, dog and Unionidae sp. (freshwater pearl mussels).

A consideration on the position of faunal remains with the human burial was based on the intent to explore if unworked animal species are deposited in an observable and patterned distribution. The ten broad zones applied are 1) grave fill; 2) in direct association with an artefact (i.e., jar burial etc.); 3) unknown position; 4) at, on, above or under the skull (including the neck); 5) at or under the torso/trunk (including the shoulders); 6) beside, on or under the arms; 7) at or under the pelvis; 8) beside, on or under the hands; 9) beside, between, on or under the legs; and 10) at, on, under or below the feet. As stated before, the continued exploration of faunal remains associated with grave fill, or in an unknown location, was ceased due to the ambiguous nature of both categories.

5.9 Case studies of health impacting mortuary behaviour (Mortuary Suite #4)

Robust bioarchaeological research of skeletal remains from three of the four sites under review has been explored (Tayles, 1992, Tayles, 1996a, Tayles, 1996b, Domett, 2001, Nelsen et al., 2001, Domett, 2002, Tayles, 2003, Domett, 2004, Tayles and Buckley, 2004, Domett and Tayles, 2006a, Domett and Tayles, 2006b, King and Norr, 2006, Tayles et al., 2007, Halcrow et al., 2012, King et al., 2013, King et al., 2014, Domett et al., 2016). Although a similar manuscript is still forthcoming there have been a number of bioarchaeological studies from Ban Non Wat to date (e.g., King et al., 2013, Clark et al., 2014).

Chapter Four contained an overview on some of the key aspects of palaeohealth at Khok Phanom Di, Ban Non Wat, Ban Lum Khao and Noen U-Loke. A lack of health data by individual burial, in addition to population level, from Ban Lum Khao and Ban Non Wat precluded inclusion to explore health as a potential variable affecting mortuary treatment of the old and young under Mortuary Suite #4. Health data for individuals, as well as at a population level, is available from Khok Phanom Di (Tayles, 1999) and Noen U-Loke (Tayles et al., 2007).

The finite case-study approach adopted here, used tacitly as an extension of the model set out by Appleby, is to examine if some individuals, both young and old, exhibiting evidence of poor health, debilitation or affected appearance/functioning of the individual were subject to normative or atypical mortuary treatment, potentially, as a result of their health status (Appleby, 2010, Appleby, 2017). The basis of the twelve subjects selection in the vignettes was made where the data was available, that fit the criterion of relevant age category (i.e., subadult, old adult), and had evidence of pathology in one form or another. As information on the health of individual buried subjects occurs only from Khok Phanom Di and Noen U-Loke a total of twelve individuals, six subadults and six adults over forty years of age, were explored as subjects of the case studies (see Section 6.6 and Section 9.6). The twelve vignettes outline, where available, the individuals age, sex and health status. If appropriate, the age (see Table 5.6) of elderly subject's reflects a re-classification following the application of the Cave and Oxenham method. The individual is then assessed, compared with normative mortuary treatment within the relevant mortuary phase, to determine if health, potentially, influenced their treatment.

The burials used for this aspect of analysis are found in Table 5.3. A similar case study was executed in relation to a child with cerebral palsy (B97) from Noen U-Loke with evidence inferring care and identity of the individual within that community (Tayles et al., 2007). A statistical approach was not adopted to consider health in relation to individuals used in case studies.

Where the information is available a consideration was given to stature as a potential indicator of mortuary behaviour. This approach was taken due to the link between stature, and growth influenced by genetics, environment, behaviour and infectious disease, as key indicators of the health status of a population (King and Uliaszek, 1999). At Khok Phanom stature was assessable for all (33/33, 100.0%) older adults whereas at Noen U-Loke only 8/21 (38.1%) older adults were assessed (Tayles, 1999, Tayles et al., 2007). No subadults had a stature assessment recorded.

Another health indicator considered, where available, was the presence of LEH with the identified subadults and older adults of the case study group. LEH may manifest as a transverse band which is evident along all, or part, of the dental crown brought about by a disruption in the production of the enamel matrix (Hillson, 1996, Goodman and Song, 1999). LEH is a non-specific signature of stress during childhood specifically the period at formation of the permanent dentition. As LEH does not remodel it provides a permanent record in adults of stress events in childhood. At Khok Phanom 11/86 (12.79%) subadults and 4/33 (12.12%) older adults, whereas at Noen U-Loke 7/51 (13.73%) subadults and 8/21 (38.1%) older adults demonstrated the presence of LEH.

TABLE 5.3: BURIALS SELECTED FOR HEALTH CASE STUDIES

Site	Burial No.	Age	Sex ^a	Health
Khok Phanom Di	88	0-0.9 years	-	SP / DP
	121	1-4.9 years	-	LEH / DP / SP
	150	1.-4.9 years	-	LEH / DP / SP
	42	70+ years	M	SA / DP / SP
	58	60-69.9 years	F	SA / DP / SP
	90	40-49.9 years	M	SA / DP / SP
Noen U-Loke	57.1	10-14.9 years	-	LEH / DP
	41	10-14.9 years	-	LEH / DP / SP
	97	1-4.9 years	-	LEH / SP
	12	50-59.9 years	M	DP / SP
	49	70+ years	F	DP
	94	40-49.9 years	F	SP / DP

^a M = Male; F = Female

^b SA = Stature Assessment; LEH = Linear Enamel Hypoplasia; DP = Dental pathology; SP = Skeletal Pathology

A final step sought to observe if the presence of poor dental health and/or skeletal pathologies influenced mortuary treatment. This approach considers the presence of a condition which may have been visible in life and potentially impacted on the appearance or functioning of the individual or their broader social environment. Osteological assessments showed 26/33 (78.7%) older adults at Khok Phanom Di had manifested some visible form of skeletal pathology and 23/33 (69.7%) a dental pathology. A total of 20/21 (95.2%) older adults at Noen U-Loke showed evidence of a visible manifestation of a skeletal pathology and 7/21 (33.3%) a dental pathology.

5.10 Material Culture and its Relationship to Burials (Mortuary Suite #5)

The examination of material culture in its association with buried subjects as a means of understanding social organisation, belief systems or value systems is common, and highly contentious, practice amongst archaeologists (Ucko, 1969, Binford, 1971, Carr, 1995, Tilley, 2000). Primary explorations of the role of material culture in mortuary contexts can be reviewed in its technological aspect or social context from Ban Lum Khao (Chang, 2004, Higham and O'Reilly, 2004), Ban Non Wat (Higham, 2012c, Sarjeant, 2012) or Khok Phanom Di (Higham and Bannanurag, 1990, Higham and Thosarat, 2004c, Vincent, 2004). Given the expanse of time covered in this research, from the Neolithic to the Iron Age, a broad range of artefacts were recovered.

Consideration was given to a range of variables in relation to each grave good associated with human burials including typology, form, material and/or temper, positioning and frequency. Broad categories, frequently used in archaeological research, were developed to capture typologies related to metals (e.g., bronze, iron, copper etc.), shell, stone (i.e., agate, carnelian etc.), bone and glass. This included the identification and classification of artefacts as tools, jewellery or weapons.

Initial analysis of material culture categories, by age and sex, was afforded to normative variables at each site. Secondary consideration was afforded to all other, non-normative categories, to explore the relationship between the old and young, and to a lesser degree sex, with these mortuary variables. The final aspect of analysis in relation to material culture, but also including faunal remains, examined the mean score by aggregated categories (i.e., ceramics, stone, fish) in relation to age and sex from each site.

A separate approach was adopted where ceramics occur due to the lack of similarity between the sites of Ban Non Wat, Noen U-Loke and Ban Lum Khao in opposition to that from Khok Phanom Di. For ceramic vessels from Ban Non Wat, Ban Lum Khao and Noen U-Loke the classification of forms provided by Sarjeant and supplemented by Barribeau was adopted (Sarjeant, 2010, Barribeau, 2011). The form classification developed by Vincent was adopted in relation to ceramic vessels from mortuary settings at Khok Phanom Di (Vincent, 2004). Although morphological variability occurs in relation to items such as anvils or spindle whorls, the ceramic class was aggregated for analytical purposes. Where present, ceramic anvils, spindle whorls, net sinkers, clay pellets and conical rollers were explored due to the potential these items have for providing insight on the social organisation of communities and the identity of individuals. For example, clay pellets may have been used for hunting and conical rollers from Ban Non Wat, may have ritual or functional significance (Higham, 2009c, Sewall, 2011).

The approach relating to the placement of grave goods at an intra-grave level mirrors the method applied to fauna (see Section 5.8). This approach will enable an investigation if specific material culture was being deposited through a non-random process within individual graves within, and across, sites based on variables such as biological age or sex with a specific focus on the young and old.

5.11 Spatial Relationship of Burials (Mortuary Suite #6)

A consideration of space in the context of mortuary settings is of value in potentially providing insight into a population's social organisation (Saxe, 1970, Goldstein, 1981b, McHugh, 1999, Parker Pearson, 1999). For example, Saxe (1970) posited in his hypothesis #8 that a structured approach to burial (i.e., clusters or rows) demonstrates corporate groups using formal burial areas as a means of legitimising, through lineal descent, the use and control of resources and territory. It has been suggested that the use of cemeteries by hunter-gatherer groups was a means of legitimising territoriality of one group over another in a specific geographic location (Pardoe, 1988, Littleton, 1998, Littleton and Allen, 2007). Inclusion or exclusion of individuals from formal burial areas can provide insight into attitudes of a community towards particular groups, whether based on age, sex, status or gender, or provide insights into notions of personhood/identity, illness and beliefs in physical or spiritual contamination or other attitudes that may permeate a community (Carr, 1995, Murphy, 2011b, Murphy, 2011a).

Where information was available this research considered a range of spatial permutations comprising the consideration of vertical and horizontal position of cohorts from each site. Consideration was given to the frequency of burials in respective squares from excavation grids (e.g., six squares from Ban Lum Khao etc.), whether the subject was afforded inclusion in a clustered (i.e., Khok Phanom Di, Ban Non Wat) or row burial (i.e., Ban Lum Khao) system and which cultural layer they were in association. Finally, to investigate the possibility that individuals of certain ages were consistently selected to mark the start or end of phases, potentially as an indicator of some form of status, the analysis explored if the elderly or subadults were deposited as the incipient or terminal burials in their respective mortuary phases. Such an overall approach was undertaken to explore if cohorts under review were subject to normative or atypical spatial distribution.

The current section outlined the broad approach towards the examination of mortuary data under the auspices of the six Mortuary Suites of activity (i.e., human remains, grave characteristics, faunal remains,

health vignettes (Khok Phanom Di and Noen U-Loke only), material culture and spatial analysis. The following, and final, section of this chapter outlines how the data was managed and what statistical approaches were undertaken to fulfil the objectives of the research.

5.12 Data Management

The following two sections outline the approach taken in relation to the collection, storage and management of data and its analysis. Data was generated post-fieldwork and sourced through the interrogation of published manuscripts. The statistical approach was adopted due to the efficacy of regressive modelling in archaeological contexts.

5.12.1 Information Technology Systems

As an initial stage, mortuary data was collected and catalogued into a *Microsoft Access* 2007-2010 database. This included the uploading of key results from forms developed for, and completed on, fieldwork in Thailand in 2013. This included tooth wear scores obtained on dentition present from the storage facility at Phimai, north eastern Thailand.

Responses in *Access* cells were, where possible, unique but descriptive text was applied where the response required. Data was migrated to a series of *Microsoft Excel* databases to facilitate statistical analyses. Cemetery layout maps were sourced and adapted from primary research (reference: Ban Non Wat, Noen U-Loke, Khok Phanom Di and Ban Lum Khao) with graphic super-positioning of burials by colour executed on *Adobe Illustrator*. Histograms, used for visual representation of data subsets in this research, are constructed through *Microsoft Excel 2016*. Qualitative data was established in categories and subsequent sub-categories where appropriate, under the broad areas discussed in this chapter.

Data was, primarily, established in the *Excel* databases in binary form (1, 0) to denote the presence (1)/absence (0) of a specific variable in association with critical fitted variables of age (as set out in Section 5.2.1), sex and mortuary phase. Quantitative analysis (mean scores) captured the actual number of specific items (e.g., shell beads, bronze tools, ceramic vessels etc.) associated with a burial and included material culture and fauna discussed above (see 5.8 and 5.12).

5.12.2 Statistical Analysis

The statistical approach undertaken explored qualitative data to examine if mortuary practices, associated with the sites and time periods under review, demonstrate statistically significant behaviour. As noted in Chapter Four, a range of statistical approaches adopted by this research have already been performed at the sites under review (Manly, 1996, Higham and Manly, 2012). It is not the intention of the research to replicate previous results but to explore the role, and subsequent identity, of the young and old within the subset of the defined parameters outlined in this chapter.

Following the cataloguing of data into *Microsoft Access 2013* and *Excel 2016* databases the initial step was to examine which burial variables, in Mortuary Suites #1-3 and 5-6 outlined above, were normative or potentially significant and requiring additional statistical analysis. Following the identification of potentially significant variables, a series of refined statistical approaches were executed to interrogate the data in a more meaningful way to determine the respective cohorts relationship with normative and/or atypical mortuary behaviour.

Intra-site analysis of data, based on comparative approaches by age-at-death (i.e., subadult, adult, older adult) and sex, were performed using Pearson's uncorrected X^2 or Yate's continuity correction, as appropriate, where observed frequencies (<5 frequencies) required. Interactive calculations for

chi-square tests of goodness-of-fit was performed on 3x2 or, where necessary, 2x2 datasets at <http://www.quantpsy.org/chisq/chisq.htm> (Preacher, 2001). A confidence level of 95.0% (p-value <0.05) was considered significant on all normative and non-normative variables under analysis. Standard convention for p-value reporting was followed. On significant results a follow up Analysis of Variance (ANOVA), as independent and weighted samples, was applied for 3x2 datasets (age=subadult, young adult, older adult) using Excel databases at <http://vassarstats.net/anova1u.html>. An ANOVA was performed, and the Bonferroni correction was applied, to test for false-positive results from the initial statistical result (i.e., significant ANOVA result for age categories is p=0.016). The results of the goodness-of-fit chi-square tests and subsequent ANOVA are found across chapter's Six to Nine in relation to site results.

Secondly, to consider potential interactions between some transformed and non-transformed mortuary variables and assemblages via age-at-death and sex through a linear regression under a Generalized Linear Model (GLM) (see Chapter Ten). Categorical data is defined as independent (age-at-death, sex) or interacting (*) which comprise age*sex across each temporal period. The examination of individual, and interactive, explanatory variables through a regression analysis GLM assumed a Bernoulli distribution, a logit link function, a fixed dispersion parameter valued to one (1) and a confidence limit at 95.0% in Genstat 16.0. A series of GLM's were fitted to test age-at-death (as categorised at 5.2.1), sex and/or cultural period, either as individual or interacting explanatory variables, in association with the range of variables under examination.

The inclusion of some non-transformed mortuary variables (i.e., grave good present, secondary burial, multiple burial), although present in the initial chi-square analysis, facilitates, through the inter-site application of a GLM, an opportunity to review the interaction of cohorts with these mixed, and broad brush-stroke, variables, that potentially trended differentially, over time. More localised statistical analyses in relation to each site is at Chapters Six to Nine. The adoption of transformed variables enables an exploration into mortuary practices and deposits of material culture at a broader level within each site and across temporal periods. Both transformed and non-transformed variables can be regarded as dependent variables. Transformed mortuary variables reviewed comprise the presence/absence of:

- grave goods;
- composite artefacts (i.e., artefacts such as necklaces, belts etc. and, by proxy where in excess of one hundred (n=100) aggregated beads were recovered from a grave;
- exotic artefacts (excluding metals and those artefacts (i.e., glass) where the materials source remains unconfirmed);
- shallow (0-25cm) grave depths;
- flexed *and* semi-flexed burials;
- an easterly orientation (1°-179°);
- high/low frequencies (i.e., 1-5 items (low), 6-10 items (moderate), 11-15 items (high), 16+ items (very high)) of grave goods in each burial;
- the proportion (i.e., <50%, 51-99% and 100%) of specific material culture (ceramics, metals, shell, stone, bone) in individual graves; and
- the proportion (i.e., <50%, 51-99% and 100%) of specific material (metals, shell, stone, bone) in individual graves *excluding* ceramic artefacts.

The GLM was performed by temporal period through the aggregation of burials into the cultural periods of Neolithic, Bronze and Iron Ages. The allocation of burials from Ban Non Wat into a cultural phase was precipitated by the mortuary phase they were identified with the exception of Flexed Burials (Higham and Wiriyaromp, 2010a) which were assigned to the Neolithic. Of the 459 burials in the sample from Ban Non Wat 14.3% (n=66) were assigned to the Neolithic, 52.7% (n=242) to the Bronze Age and 32.8% (n=151) to the Iron Age. Total burial numbers identified in the sample from Khok Phanom Di (Neolithic), Ban

Lum Khao (Bronze Age) and Noen U-Loke (Iron Age) were assigned to their relevant cultural phase. For the purposes of the GLM, of the 827 burials in the sample, a total of 220 burials (26.6%) were associated with the Neolithic, 349 burials (42.2%) with the Bronze Age and 258 burials (31.1%) with the Iron Age.

5.13 Summary

This chapter has provided an outline and discussion on the materials used from the four sites under review and the range of methods applied to data to achieve the objectives of this mortuary research. Recognition was afforded to a sample of the pitfalls, challenges and limitations in relation to approach adopted in this research. Fieldwork objectives, initially, included the application of a tooth wear analysis which was used in conjunction with the Cave and Oxenham method to revisit the classification of adult age categories at three of four of the sites under review. Preliminary efforts to include an analysis on the sidedness of Unionidae bivalves recovered from mortuary contexts and an examination of fragmented non-ceramic artefacts was set aside due to uncontrollable factors in the field. An initial strategy to include a viewshed approach was also discarded.

The bulk of this chapter provided information on the factors affecting the final sample adopted and the range of data types examined in the study. This constituted the six, or five as appropriate if individual health details were unavailable for analysis, broad mortuary suites of activity. The final section of the chapter outlined the approaches taken to data management and statistical approaches (chi-square, ANOVA, GLM) taken here. Sample sizes from Khok Phanom Di, Ban Non Wat, Ban Lum Khao and Noen U-Loke are presented in Table 5.2 with the total number of the key subject cohorts accounting for: subadults at 350/827 (42.3%) of burials recovered; and older adults at forty years or older accounting for 128/827 (15.4%). The following chapter, in relation to the Neolithic site of Khok Phanom Di, is the first of four chapters providing results of the analysis discussed.

Results: Khok Phanom Di

6.1 Introduction

The results of the analysis from the Neolithic site of Khok Phanom Di are presented in this chapter. The approach and variables explored are discussed in Chapter Five with a more general discussion of the site in Chapter Four. Chapters presenting results from the study in relation to the sites of Ban Non Wat, Ban Lum Khao and Noen U-Loke can be found in Chapters Seven to Nine respectively. This chapter sets out to explore if primary cohorts are afforded normative mortuary behaviour. Following this, quantitative and qualitative analysis are carried out on the six variable suites outlined in Chapter Five and Appendix 2. Tables and histograms are structured to demonstrate patterns in association with age-at-death and of biological sex.

6.2 Normative Mortuary Variables

Normative behaviour at Khok Phanom Di is outlined at Table 6.1 with outcomes of highest, or high, frequency identified. Table 6.1 shows that while most burials were single interments (74.0%), 25.9% were a component of multiple interments. Nearly all burials were identified as supine and the majority deposited in an extended fashion (83.7%) with the remainder being in a flexed or semi-flexed position. The positioning of the skull, hands/arms and feet from remains was commonly in standard anatomical position, in distinction, for example, the hands placed on the pelvis at Ban Lum Khao (see Chapter Seven), with the varied frequencies reflecting difficulties in establishing position from pictorial data (see Higham and Bannanurag, 1990). The skull is most commonly oriented between 46-89° (68.8%). Normative orientation deviates most frequently at the earliest three mortuary phases (MP) at the site (MP1-3) with 46/154 (29.8%) burials being oriented outside the common 46-89° range. The presence of ochre, usually deposited at the subject's skull, is common (75.3%) at Khok Phanom Di with physical and pictorial evidence suggesting that several bodies were selected for wrapping at the time of their death. Physical evidence of wrapping is manifested through the use of tapa (bark cloth) with additional evidence showing the presence of asbestos fibre in burials of at least three individuals (Higham and Bannanurag, 1990, Cameron, 2000). In addition to its use in wrapping, fibrous material was also deposited under the skull of some individuals (i.e., B57). Pictorial evidence shows, in many cases, severe constriction of limbs and commingling of foot bones suggestive of binding (Willis and Tayles, 2009)..

Many burials from Khok Phanom Di are potentially associated with structures, either as mortuary structures or residential burial locations. This assertion is based on the presence of postholes concentrated in linear arrangements or near one another (Higham and Bannanurag, 1990). However, this study did not pursue an analysis of which burials are associated with mortuary structures from Khok Phanom Di. This decision was taken due to the ambiguity of the function of the structure the postholes are associated with and an inherent difficulty in associating, through the presence of post holes, putative structures with specific burials. Exceptions to this are B100 and B107 with evidence of burial on a wooden bier (Higham and Bannanurag, 1990: 156, 200). Most interments were buried in shallow graves, as defined by this study, up to 25cm in depth with a pit, hearth or fire feature frequently in association.

The presence of faunal remains is relatively common at Khok Phanom Di (55.1%) with the majority of shellfish and fish species reflecting the site's estuarine and mangal (mangrove) palaeoenvironment. Over thirty combined species of bivalve and gastropod numbering into the thousands have been recovered

TABLE 6.1: BURIAL OUTCOMES OF HIGH FREQUENCY AT KHOK PHANOM DI (N=154)

Suite of Activity	Outcome	Obs. (%)	Outcome	Obs. (%)	Variable	Obs. (%)
Burial of Human Remains	Single Burial	114 (74.0)	Supine Burial	153 (99.3)	Ochre Present	116 (75.3)
	Multiple Burial (MB)	40 (25.9)	Extended Burial	129 (83.7)	Ochre Application (skull)	75 (48.7)
	MB Style (two subadults)	12 (7.7)	Skull Position (Anatomical)	92 (59.7)	Wrapping Present	33 (21.4)
	MB Position (adjacent and supine)	22 (14.2)	Hand Position (Anatomical)	51 (33.1)	Wrapping Material (Tapa)	22 (14.2)
	Orientation (46-89°)	106 (68.8)	Feet Position (Anatomical)	40 (25.9)		
	Disposal Container Present	3 (1.9)	Fire/Hearth/Pit Present	46 (29.8)		
Grave Layout	Grave Depth (0-25cm)	101 (65.5)	Pit Position (North of burial)	11 (7.1)		
Fauna	Fauna Present	85 (55.1)	Unionidae Present	10 (6.4)	Fauna Position (Legs)	6 (3.9)
	Pig Present	4 (2.6)	Fish Present	72 (46.7)		
Material Culture	Grave Good Present	93 (60.3)	Shell Freq. (1-500 pcs.)	36 (23.3)	Worked Stone (Adze etc.)	23 (14.9)
	Ceramic Good Present	70 (45.4)	Shell Position (Skull)	25 (16.2)	Stone Freq. (Low - 1-5 pcs.)	26 (16.8)
	2b Jar Type	42 (27.2)	Shell Beads Present	53 (34.4)	Stone Position (Legs)	11 (7.1)
	Ceramic Frequency (1-5 pieces)	69 (44.8)	Shell Beads Type (Loose Beads)	23 (14.9)	Bone/Tooth Present	24 (15.5)
	Ceramic Position (Feet)	37 (24.0)	Shell Beads Freq. (1-500 pcs.)	33 (21.4)	Bone/Tooth Jewellery	17 (11.0)
	Ceramic Decoration Present	48 (31.1)	Shell Beads Position (Skull)	23 (14.9)	Bone/Tooth Freq. (1-5 pcs.)	22 (14.2)
	Shell Bangle Present	8 (5.1)	Bone/Tooth Position (Abdomen)	8 (5.1)		
	Anvil	9 (5.8)	Shell Bangle Material (Tridacna)	8 (5.1)		
	Shell Present	56 (36.3)	Shell Bangle Freq. (1-5 pcs.)	7 (4.5)		
	Shell Jewellery	55 (35.7)	Stone Present	27 (17.5)		
	Cultural Layer (10.15)	12 (7.7)	Row Burial	30 (19.4)		
	Clustered Burial	124 (80.5)	Cemetery Location (45-90°)	30 (19.4)		

Obs = observed number from total sample identified; % = percentage of sample; Artefacts recovered from grave fill excluded from analysis.

from the site with the majority associated with features and lenses. While a variety of shellfish species were recovered from burials (Higham and Bannanurag, 1990), for the purposes of continuity with the other sites under review, this study only examined the presence of Unionidae in association with burials. In this regard, only 6.4% of burials had a species of Unionidae associated with the corpse, all *Pseudodon inoscularis*, which were recovered from most layers throughout the site's occupation. Low frequencies of fauna identified to a specific body position, in this instance the legs, reflects ambiguity of this feature in the available published literature. Like Unionidae, while pig (*S. scrofa*) is present it was primarily recovered from features with only 2.6% of burials containing this species. Fish was recovered from most burials that contained faunal remains (46.7%) with the number of fish deposited ranging from one to over a thousand (B4). While fish taxa are identified (Kijngam, 1991), some of which are present at other sites under review, published information on specific taxa in association with burials was not available.

Table 6.1 shows that a majority of the cemetery sample was buried with a grave good (60.3%), with most of this number associated with ceramic artefacts (45.4%) and, to a lesser degree, shell artefacts (36.3%). An extensive range of pottery, frequently decorated in mortuary contexts, was recovered from mortuary and non-mortuary settings at Khok Phanom Di (Vincent, 2004) with the 2b type jar (carinated burial jar) the most commonly encountered (27.2%) in mortuary contexts. In all instances, bar one (B15), individuals were buried with no more than 5 ceramic artefacts, which were frequently deposited at the subjects' feet. Shell artefacts came in a variety of forms with shell jewellery, primarily as beads in a range of forms and/or bangles manufactured from *Tridacna* sp., *Conus* sp. and nacreous bivalves (Pilditch, 1993), most commonly recovered from burials. Many of those burials with shell artefacts were interred with some form of shell bead, primarily disc beads, in a range of forms (e.g., belt, necklace etc.), but loose beads of an unidentified form were the most frequently encountered.

Where ceramics were most likely to be positioned at the feet, it was observed that shell artefacts were most frequently recovered from the individual's skull at Khok Phanom Di. Where found, it was observed that multi-component shell artefacts were mainly recovered (23.3%) in 'low' frequencies (<500 pieces) from burials. Finally, moderate frequencies of stone and bone artefacts were deposited, with individuals having worked stone artefacts (14.9%) and bone jewellery (11.0%) being the most frequently encountered forms.

The majority of burials (124/154, 80.5%) from Khok Phanom Di, primarily from mortuary phases two to four, were buried in clustered corporate units (Higham and Thosarat, 2004: 23-24). This reflects



FIGURE 6.1: Wealthy burial (B15) at Khok Phanom Di (Photo Higham, C.F.W. 1990. Retrieved from South East Asian Archaeology Data <https://drive.google.com/drive/u/0/folders/0BwyPRRjONdiFTXBqam91Mjh0d0U>)

the period of greatest intensity across the duration of the cemetery, peaking at layer 10.15 in MP2, a layer containing ash and charcoal lenses and a series of pits containing shellfish, including (7.7%) of the burials (Higham and Bannanurag, 1990). While burials were recovered from all zones across the excavation grid, the greatest frequency occurred in the north-eastern aspect of the grid with (19.4%) recovered from this area.

Having reviewed the evidence for more frequently encountered mortuary behaviours, or normative mortuary practices, at Khok Phanom Di the following sections will explore in some detail each of the six-identified mortuary variable suites in association with age and sex-based cohorts.

6.3 Burial of Human Remains (Mortuary Suite #1)

Table 6.2 provides an opportunity to consider how age-at-death and sex were factors affecting the treatment of the individual within their burial environment. Most subjects were exposed to a single burial style and deposited, supine, in an extended fashion. Only subadults (25/86, 29.0%) were not universally buried in an extended fashion, with adults always buried in this fashion. Where subadults were exposed to an extended burial style it was the older subadults, aged 10-14.9 years, that had a greater likelihood of being buried in this manner (χ^2 6.605, $p=0.085$) which is supported post hoc ($p=0.008$). A high number of individuals from Khok Phanom Di were exposed to multiple burial practices (25.9%) with the inclusion of two, or more, children being the most common. When subadults were considered in isolation, it was found that neonates and infants aged 0-0.9 years ($\chi^2=10.29$, $p=0.005$) were more likely to be buried in the multiple burial style with the period of highest occurrence, confirmed post hoc ($p=0.014$), being in MP3 (8/12, 66.6%).

As outlined at Table 6.1, an orientation between 46-89° occurred most frequently at Khok Phanom Di. This pattern is correlated with the periods of greatest site use across mortuary phases two to four but occurs across each of the seven phases to some degree. Table 6.2 shows that subadults were more frequently oriented in this position than adults but with no observed statistical significance (also see Figure 6.1). While this occurs in greatest frequency across phases two to four (44/57, 77.1%), of the five burials from MP7 that are oriented in this position all are subadults. Subadults aged 5-14.9 years (young child/older child) showed a potential statistical significance for being buried in this orientation ($\chi^2=6.448$, $p=0.091$).

By extension, when viewshed is considered, this predominant orientation aligns individuals with source locations for stone used in tool manufacture and with adjacent cultivated rice fields. Figure 6.2 shows a comparison between the four sites where an orientation of 46-89°, based on age-at-death categories, is applied. Figure 6.2 shows that burial orientation practices vary between the sites with subadults at Khok Phanom Di most frequently associated with an orientation between 46-89°. The frequency of this orientation ranges from 4.6% (Ban Lum Khao) to 21.4% (Noen U-Loke) and affects adult cohorts more than subadults for the most part.

The presence of ochre in burials is abundant (75.3%) at Khok Phanom Di. Older adults are most frequently associated with ochre ($\chi^2=7.599$, $p=0.022$) but this markedly changes depending on the type of ochre treatment/use. Although located in various positions on the body or within the grave, the application of ochre across the subject's entire body (48.7%) is the most common with adults aged 15-39.9 years (57.1%) being most frequently associated with this behaviour. The application of ochre across the entire body of the individual occurs most frequently in MP2 with subadults (23/40, 57.5%) in comparison to older adults (8/15, 53.3%) and adults aged 15-39.9 years (7/20, 35.0%) in the same phase.

TABLE 6.2: CHI-SQUARE COMPARISON OF NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX - BURIAL OF HUMAN REMAINS

	Age							Comparisons	
	Total (n=154)	SA (n=86)	YA (n=35)	OA (n=33)				(SA, YA, OA)	
	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P		(X ² with Bonferroni correction)	
Outcome									
Single Burial	114 (74.0)	61 (70.9)	30 (85.7)	23 (69.6)	3.237	0.198		-	
Multiple Burial (MB)	40 (25.9)	25 (29.0)	5 (14.2)	10 (30.3)	3.237	0.198		-	
MB Style (two subadults)	12 (7.7)	12 (13.9)	-		-			-	
MB Position (adjacent/supine)	22 (14.2)	13 (15.1)	2 (5.7)	7 (21.2)	3.441*	0.178		-	
Supine Burial	153 (99.3)	85 (98.8)	35 (100.0)	33 (100.0)	0.000	1.000		-	
Extended Burial	129 (83.7)	61 (70.9)	35 (100.0)	33 (100.0)	23.598	0.000		OA=YA>SA	
Skull Position (Anatomical)	92 (59.7)	40 (46.5)	26 (74.2)	26 (78.7)	14.314	0.000		OA>YA>SA	
Hand Position (Anatomical)	51 (33.1)	15 (17.4)	17 (48.5)	19 (57.5)	22.227	0.000		OA>YA>SA	
Feet Position (Anatomical)	40 (25.9)	7 (8.1)	15 (42.8)	18 (54.5)	33.426	0.000		OA>YA>SA	
Orientation (46-89°)	106 (68.8)	57 (66.2)	23 (65.7)	26 (78.7)	1.944	0.378		-	
Ochre Present	116 (75.3)	58 (67.4)	28 (80.0)	30 (90.9)	7.599	0.022		-	
Ochre Application (Entire Body)	75 (48.7)	40 (46.5)	20 (57.1)	15 (45.4)	1.303	0.521		-	
Wrapping Present	33 (21.4)	8 (9.3)	15 (42.8)	10 (30.3)	18.6	0.000		YA>OA>SA	
Wrapping Material (Tapa)	22 (14.2)	8 (9.3)	8 (22.8)	6 (18.1)	4.253	0.119		-	
Sex									
	Total (n=68)	Male (n=32)	Female (n=36)					Comparisons	
	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P			X ²	
Single Burial	53 (77.9)	26 (81.2)	27 (75.0)	0.385	0.534			-	
Multiple Burial (MB)	15 (22.0)	6 (18.7)	9 (25.0)	0.385	0.534			-	
MB Style (two subadults)	-	-	-	-					
MB Position (adjacent/supine)	9 (13.2)	4 (12.5)	5 (13.8)	0.036*	0.849				

Supine Burial	68	(100.0)	32	(100.0)	36	(100.0)		0.000	1.000	-
Extended Burial	68	(100.0)	32	(100.0)	36	(100.0)		0.000	1.000	-
Skull Position (Anatomical)	52	(76.4)	23	(71.8)	29	(80.5)		0.709	0.399	-
Hand Position (Anatomical)	36	(52.9)	16	(50.0)	20	(55.5)		0.21	0.646	-
Feet Position (Anatomical)	33	(48.5)	16	(50.0)	17	(47.2)		0.052	0.819	-
Orientation (46-89°)	49	(72.0)	20	(62.5)	29	(80.5)		2.743	0.097	F>M
Ochre Present	58	(85.2)	26	(81.2)	32	(88.8)		0.788	0.374	-
Ochre Application (Entire Body)	35	(51.4)	15	(46.8)	20	(55.5)		0.511	0.474	-
Wrapping Present	25	(36.7)	10	(31.2)	15	(41.6)		0.791	0.373	-
Wrapping Material (Tapa)	14	(20.5)	6	(18.7)	8	(22.2)		0.125	0.723	-

Note: The n value for all outcome suites under analysis is the same at Khok Phanom Di; SA = Subadults (0-14.9 years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

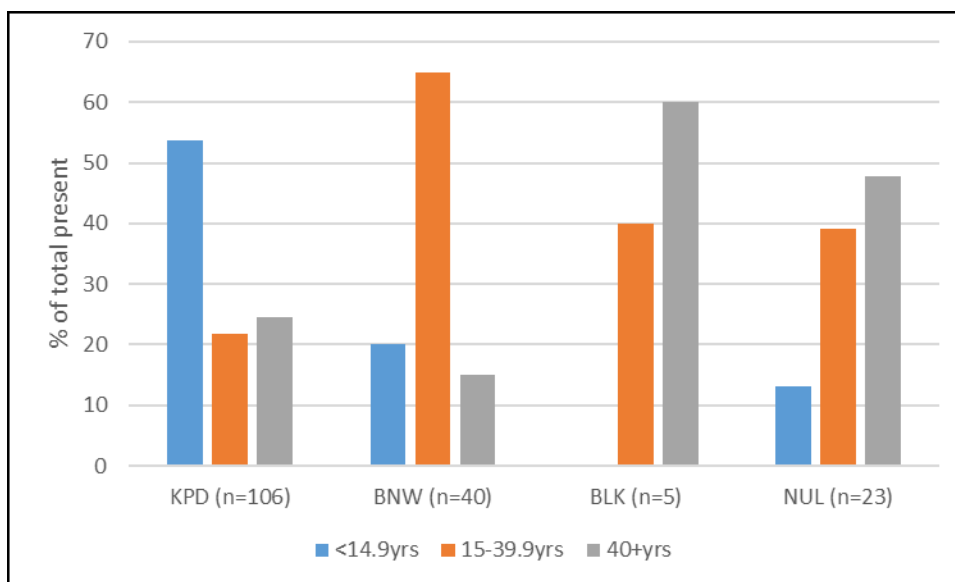


FIGURE 6.2: Comparison of orientation at 46-89°

KPD = Khok Phanom Di; BNW = Ban Non Wat; BLK = Ban Lum Khao; NUL = Noen U-Loke

Finally, evidence, either directly or inferentially, of subjects being wrapped at Khok Phanom Di occurs in a moderate number of burials (40.2%). Where physical evidence was recovered it was found that tapa (bark cloth) was used as a wrapping medium by the site's inhabitants (14.2%). No cohort was specifically associated with this behaviour (see Table 6.1). The results of post-excavation observations in the context of mortuary treatment as part of a field anthropology analysis can be seen in Section 6.3.1. Burials which had evidence for the use of tapa as a wrapping medium are included in this analysis.

6.3.1 Field Anthropology

In Chapter Four it was noted that field anthropology techniques, often overlooked as part of the suite of excavation and analysis strategies, have recently been adopted in Southeast Asia (Willis and Tayles, 2009, Harris and Tayles, 2012, Harris et al., 2016). This research adopted the seven observational questions outlined by Harris and Tayles (2012) to explore how the body was contained, where physical evidence was minimal or absent, at Khok Phanom Di. Under ideal circumstances field anthropology approaches are executed in the field. Where this does not occur, photographic or pictorial evidence can be used, which was exploited at Khok Phanom Di, to investigate potential cultural behaviour associated with mortuary treatment. With respect to Khok Phanom Di, pictorial evidence from diagrams were analysed. Evidence of a range of funerary practices at Khok Phanom Di occur through the physical presence of wooden biers, jar burials and tapa shrouds and 'head-rests'.

A total of 40.2% of the sample from Khok Phanom Di showed evidence of constriction. This excludes the single jar burial associated with B14. This assessment observed 5/9 potential outcomes outlined by Harris and Tayles with the majority (36/62, 58.0%) being categorised as buried within a loose non-durable material (see Style 3 in Figure 6.3) and in the more open-ended category (Style 9 in Figure 6.3) where the subject is exposed to burial in either loose or tight non-durable material, tight durable wrapping or burial in a narrow coffin (16/62, 25.8%).

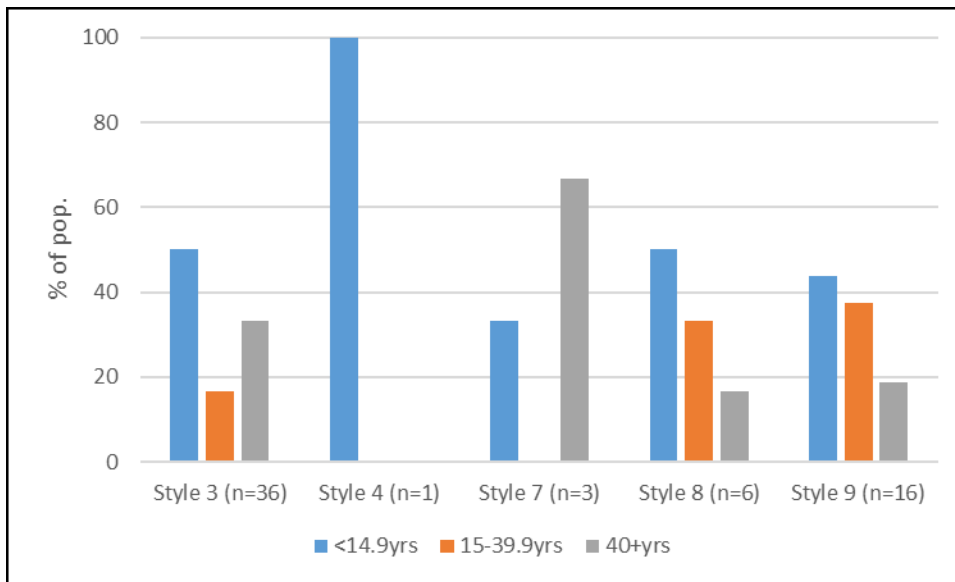


FIGURE 6.3: Potential containment styles at Khok Phanom Di
 Style 3 = loose non-durable wrapping; Style 4 = tight durable wrapping / narrow coffin; Style 7 = loose or tight non-durable wrapping; Style 8 = tight durable or non-durable wrapping / narrow coffin; and Style 9 = loose or tight non-durable wrapping / tight durable wrapping

Although subadults (18/36, 50.0%), of which the majority (14/18, 77.7%) are aged 0-0.9 years, are more frequently contained in loose non-durable material relative to the two adult age categories, there is no statistical significance associated with this behaviour ($X^2=4.154$, $p=0.125$). This is also the case for burials, of all age categories, in the more open-ended Style 9 (see Figure 6.3). Although limited due to the small sample size, there was evidence that older adults were more frequently associated with the open-ended Style 9 category at MP2 and that older adult females had a greater likelihood of being contained in loose or tight non-durable wrapping (Style 7 at Figure 6.3).

6.4 Characteristics of the Grave (Mortuary Suite #2)

Table 6.3 indicates that shallow burials were most frequently encountered at Khok Phanom Di with 65.5% being between 1-25cm in depth. While all age categories used in this study were deposited in shallow graves, it was subadults (77.9%) that were most frequently buried at a shallow depth ($X^2=13.168$, $p=0.001$). A large proportion (56/67, 83.5%) of neonates and infants (0-0.9 years) were interred in shallow graves ($X^2=11.494^*$, $p=0.009$) with additional testing showing a significant difference confirming this relationship ($p=0.000$). Of the 17 older adults in shallow graves, statistically significantly more males were buried in such graves ($X^2=7.127$, $p=0.007$). Indeed, in general more males than females tend to be interred in shallow graves ($p=0.051$). The presence of features (fire hearth, pit) is most frequently found at MP3 with adults aged 15-39.9 years (9/12, 75.0%).

The quantity of fauna, specifically fish and shellfish, recovered from burials suggests that feasting may have been an aspect of the mortuary ritual within this population as, in many cases, several hundred (or thousand) species types are associated with individuals (Higham and Bannanurag, 1990: 118-141). The greatest quantity of fish with burials occurs in the latter phases of the cemetery sequence (i.e., B4 (MP6) $n=1451$; B15 (MP5) $n=203$; B3 (MP7) $n=103$).

TABLE 6.3: CHI-SQUARE COMPARISON OF NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX - CHARACTERISTICS OF GRAVE ENVIRONMENT

Outcome	Age						Comparisons	
	Total (n=154)	SA (n=86)	YA (n=35)	OA (n=33)				(SA, YA, OA)
	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P		(X ² with Bonferroni correction)
Grave Depth (0-25cm)	101 (65.5)	67 (77.9)	17 (48.5)	17 (51.5)	13.168	0.001		SA>OA>YA
Fire/Hearth/Pit Present	46 (29.8)	23 (26.7)	12 (34.2)	11 (33.3)	0.916	0.632		-
Pit Position (North of burial)	11 (7.1)	5 (5.8)	1 (2.8)	5 (15.1)	2.601*	0.272		-
Outcome	Sex						Comparisons	
	Total (n=68)	Male (n=32)	Female (n=36)					
	Ob / %	Ob / %	Ob	%	X ²	P		X ²
Grave Depth (0-25cm)	34 (50.0)	20 (62.5)	14	(38.8)	3.778	0.051		M>F
Fire/Hearth/Pit Present	23 (33.8)	10 (31.2)	13	(36.1)	0.179	0.672		-
Pit Position (North of burial)	6 (8.8)	2 (6.2)	4	(11.1)	0.077*	0.781		-

Note: The n value for all outcome suites under analysis is the same at Khok Phanom Di; SA = Subadults (0-14.9 years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X² Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance (P < 0.05); Post hoc testing carried out using Bonferroni's correction where appropriate.

6.5 Faunal Remains (Mortuary Suite #3)

Many of the burials (55.1%) at Khok Phanom Di have an associated faunal element. This excludes burials associated with shellfish not identified as from the Unionidae family. Future studies may provide a greater understanding of the association of specific cohorts and shellfish of different family groups at Khok Phanom Di. Table 6.4 shows that sex was not a factor in determining which burials had associated faunal remains, although males rarely included Unionidae.

Table 6.4 shows that adults, generally, were most likely to have been buried with fauna with older adults proportionately more frequently associated with this behaviour. The general trend is that older adults are most frequently buried with the fauna types under review although no discrete single age category (40s, 50s etc.) demonstrates a greater statistical likelihood of being buried with fauna types under review. Of the elderly subjects buried with *P. inoscularis*, the sample is dominated by elderly female subjects (4/5, 80.0%). It should be noted that *P. inoscularis* at Khok Phanom Di is associated with the manufacture of shell knives (Higham, 1993c). The use of Unionidae in the manufacture of functional items at Khok Phanom Di differs from its hypothesised function at a range of other sites across Mainland Southeast Asia (Ross and Oxenham, 2016).

Table 6.4 shows that the presence of fish, of various taxa, are the predominant faunal remain included in graves with older adults, proportionately, most likely to have fish included in their funerary furniture. This excludes the range of shellfish taxa not included in this analysis. When subadults were considered in isolation, it was observed that young children, aged 1-4.9 years (8/27, 29.6%), were prone to having fish deposited in their graves most frequently. Although the presence of fish in burials spikes in MP2 for subadults (13/27, 48.1%) and older adults (10/24, 41.6%) respectively, there is no statistical significance associated with any cohort during any specific mortuary phases. While not statistically significant, it is interesting that females are more frequently associated with Unionidae in mortuary contexts.

6.6 Health Case Studies (Mortuary Suite #4)

A review of palaeohealth studies from Khok Phanom Di is presented in Chapter Four. The review outlines the major health developments observed in the sample. A detailed discussion of the biological status at a population and individual level from Khok Phanom Di is available for review (Higham and Thosarat, 1994, Tayles, 1996a, Tayles, 1999, Tayles et al., 2000, Domett, 2001, Domett and Tayles, 2006a, Halcrow et al., 2016). This section, following on from a description of the analysis framework at Chapter Five, explores the relationship poor health had on the mortuary treatment of six individuals (3 subadults; 3 older adults) at the site.

6.6.1. Health Profile #1 (Burial 150)

The subadult, Burial 150 (B150), was a young child assigned a biological age-at-death of 2.5 years. B150 is associated with MP1 which comprises six individuals (3 subadults, 3 adults) with two males and a single female subject present. The child is the fifth burial of MP1. B150 was recovered from layer 10.21 in cultural phase 2 which spanned 1900-1750BCE (Higham and Bannanurag, 1990, Higham and Thosarat, 2004c).

As was the case with B121 from mortuary phase 2 (see below), post excavation found evidence for severe genetic anaemia on this infant through the presence of thickened craniofacial bones and thin cortices and enlarged medullary cavities on the infants long bones (Tayles, 1996a). Dentition shows the presence of defective enamel and associated carious lesions (Tayles, 1999). B150, like the majority of burials from MP1, is not interred with ochre nor does it show evidence of constriction. Normative

TABLE 6.4: SUMMARY OF SUITE #3 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – FAUNAL REMAINS

Age										Comparisons	
	Total (n=154)	SA (n=86)	YA (n=35)	OA (n=33)						(SA, YA, OA)	
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P				(X ² with Bonferroni correction)	
Fauna Present	85 (55.1)	30 (34.8)	28 (80.0)	27 (81.8)	32.513	0.000				OA>YA>SA	
Pig Present	4 (2.5)	-	1 (2.8)	3 (9.0)	4.803*	0.090				-	
Unionidae Present	10 (6.4)	-	5 (14.2)	5 (15.1)	10.058*	0.006				-	
Fish Present	72 (46.7)	27 (31.3)	21 (60.0)	24 (72.7)	19.558	0.000				OA>YA>SA	
Fauna Position (Legs)	6 (3.8)	1 (1.1)	3 (8.5)	2 (6.0)	2.086*	0.352-					
Sex											
Total (n=68)	Male (n=32)	Female (n=36)								Comparisons	
Obs. (%)	Obs. (%)	Obs. (%)			X ²	P			X ²		
Fauna Present	55 (80.8)	26 (81.2)	29 (80.5)		0.005	0.943			-		
Pig Present	4 (5.8)	1 (3.1)	3 (8.3)		0.156*	0.692			-		
Unionidae Present	10 (14.7)	2 (6.2)	8 (22.2)		2.29*	0.130			-		
Fish Present	45 (66.1)	21 (65.6)	24 (66.6)		0.008	0.928			-		
Fauna Position (Legs)	5 (7.3)	1 (3.1)	4 (11.1)		0.63*	0.427			-		

Note: The n value for all outcome suites under analysis is the same at Khok Phanom Di; SA = Subadults (0-14.9 years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X² Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance (P < 0.05); Post hoc testing carried out using Bonferroni's correction where appropriate.

treatment of this subadult includes primary and single burial styles, burial in a shallow grave and burial with faunal remains (i.e., fish). B150 is the only child buried in a flexed position from the site and falls inside the normative south-eastern orientation of the site (Higham and Bannanurag, 1990). Other than the presence of some fauna (i.e., fish, crab, reptile) there was no other grave goods in the burial, but this is not unusual during MP1.

6.6.2 Health Profile #2 (Burial 121)

Burial 121 (B121) is a young child assigned a biological age-at-death of 1.25 years. B121 is associated with Cluster B, stage 1, of MP2 and comprises six individuals (3 subadults, 3 adults) that were buried almost simultaneously with other burials from another clustered sub-group. Higham and Bannanurag (1990: 183) suggest, due to the disposition of postholes adjacent to a large shell midden lens, that a structure may have been erected over the burials in this cluster. MP2 is the largest mortuary phase at the site and includes 55 of the 154 burials and is dominated by subadult burials (36 subadults, eight males and 11 females). The child was the fifth burial of its group and was possibly disturbed by the burial of the adult female B94.

B121 is one of three infants (including B150) having thick craniofacial bones (i.e., frontal, zygomatic etc.) and thin cortices suggestive of the presence of severe anaemia. Thin bone cortices suggest osteoporosis (Tayles, 1999). This child was afforded an inferred familial status through their inclusion in a burial cluster. Additionally, like B90 (see below), this individual was afforded a wide range of normative behaviours at the time of their death. These included normative burial styles, deposition in a shallow grave, exposure to normative fauna (i.e., fish) and material culture (i.e., ceramics, shell (jewellery, frequency, and beads), potential constriction and the application of ochre on their entire body. It was not possible to identify if the child was oriented at 46-89°.

6.6.3 Health Profile #3 (Burial 88)

Burial 88 (B88) is an infant assigned a biological age-at-death of 9 months. B88 is associated with Cluster F, stage 2, of MP2 which comprised six individuals (five subadults, one adult). B88, with B91 (an elderly adult male in their 40s) is one of the subadults included in a double burial at Khok Phanom Di. Five of the six burials in this sub-group, including B88, were buried virtually simultaneously with only a 2cm variation in depth between each burial (Higham and Bannanurag, 1990). B88 was excavated from layer 10.11 of cultural phase 2 spanning 1900BCE-1750BCE saw the establishment of the 'Cluster F' burial group (Higham and Thosarat, 2004c).

Evidence for severe anaemia affecting this individual was based on the presence of non-specific heightened porosity of long bone cortices and clavicles. Growth disruption is evident from defective enamel and caries (Tayles, 1999). Like B121, this subadult was afforded a wide range of normative treatments at the time of their death. These included primary and single burial, orientation at 46-89°, and burial in a shallow grave, faunal remains (fish) and the application of ochre and the presence of grave goods (ceramics (type, frequency, position), shell (jewellery, beads) and bone).

6.6.4 Health Profile #4 (Burial 90)

Burial 90 (B90), an adult male, was originally assigned a biological age-at-death in their late 20s. Age was re-evaluated using the Cave and Oxenham method (see Chapter Five) and the subject was reassigned to an elderly adult category (40s). B90 is associated with Cluster C, stage 4, of MP3 which comprised four individuals (one subadult, three adults). MP3 includes 43 of the 154 burials (24 subadults, ten males and nine females). B90 was the second burial of this group and was interred simultaneously with an

adult male (B93). B90 is associated with three linear pits within a metre directly north of this individual with an inference, based on the circular position of postholes at this level, of a raised structure being constructed over all four burials in the sub-group (Higham and Bannanurag, 1990).

Similar to B42 (see below) B90 was one of the largest males at the site (169.3cm versus mean of 162.3cm from sample) with robust catch-up growth in evidence following growth disruption in childhood (Higham et al., 1992, Tayles, 1999). Growth disruption in childhood was inferred from the state of the dentition and skeletal remains (Tayles, 1999). Caries was present principally in the 3rd molars. Isotopic values of B90 (0.70933) support a local origin (Bentley et al., 2007).

B90 was provided a range of normative mortuary treatments at the time of his death including primary and single burial (B93 is intrusive), orientation at 46-89°, the presence of pits in a northerly direction of the grave, fauna (i.e., fish) and a range of grave goods (i.e., ceramics (type, frequency, decoration), shell (beads, jewellery) and displays evidence of constriction. Of the six burials under review (B42, 58, 88, 90, 121 and 150) B90 displays a range of treatments which would constitute, based on the criteria used, that the individual was afforded normative mortuary behaviour.

6.6.5 Health Profile #5 (Burial 58)

Burial 58 (B58), an adult female, was originally assigned a biological age-at-death in their 30s. Age was re-evaluated and assigned to the second oldest age category (60s). B58 is associated with Cluster F at MP3 which comprised six individuals (three subadults, three adults). This female is the fourth burial of this sub-grouping and was buried, with B63 and B56, under a hearth (Higham and Bannanurag, 1990).

B58 is one of the tallest females in the sample and is the tallest of MP3 (159.6cm versus mean of 154.3cm from sample) with musculo-skeletal markers indicating an individual with a strong upper body, but also degeneration of the lumbar vertebrae and signs of oral disease (caries, infection) (Tayles, 1999). Isotopic indices suggest she came from a coastal locale into the community during a period of non-estuarine conditions at MP3 (Bentley, 2004, Bentley et al., 2005, Bentley et al., 2007).

Inclusion in burial Cluster F, or MP3, would support a level of communal status was afforded to B58 despite isotopic evidence indicating she originated from another location and migrated into the community. B58 was afforded a range of normative funerary behaviours including primary burial, use of ochre, orientation, constriction practices and exposure to a variety of grave goods (i.e., ceramics (type, position, decoration, quantity) and bone (perforated fish vertebrae) and faunal remains (i.e., fish). However, she was buried at a moderate depth (26-50cm), deeper than normal, and her burial did not contain shell or stone artefacts.

6.6.6 Health Profile #6 (Burial 42)

Burial 42 (B42), an adult male, was originally assigned a biological age-at-death in their early 30s. Age was re-evaluated and assigned to the oldest age category (70s). B42 is associated with Cluster F at MP4 which comprised four individuals (two subadults, two adults) (Higham and Bannanurag, 1990). MP4 includes 29 of the 154 burials (ten subadults, nine males and ten females). B42, at 166.4cm, is the largest male in MP4 and one of the tallest in the sample (average stature is 162.3cm for males) (Tayles, 1999).

Apart from being tall and robust, B42 shows evidence of a range of pathologies including osteophytosis affecting the vertebral bodies, trauma resulting in spinal degeneration, dental wear, caries and periodontitis and possibly anaemia (Tayles, 1999). Evidence for linear enamel hypoplasia suggests he suffered growth disruption during infancy (Tayles, 1999). While B42 suffered from a range of pathologies

and may have endured chronic pain (periodontitis, arthritis), his growth, inferred long-life through revised tooth wear analysis, physical condition, and response to illness all indicate a robust response to adversity.

Inclusion in a burial cluster, as well as being the initial burial of the group, would suggest status, direct or inferred, was afforded to B42. Further, preliminary investigations show B42 was exposed to several normative mortuary practices in relation to the sample under review. These include single primary burial in a supine and extended display and being oriented in the normative 46-89° fashion, having ochre applied to the entirety of his body, being buried in a shallow grave, and having grave goods (worked stone artefacts). In relation to this mortuary phase, B42 was buried with minimal grave goods (two burnishing stones) and no shell beads. He is not one of the males buried with a turtle carapace and was not subject to a variety of normative behaviours identified across his mortuary phase, including the relative abundance of fauna (23/29, 79.3%) and ceramic artefacts (18/29, 62.0%).

6.7 Material Culture (Mortuary Suite #5)

A large quantity of artefacts of local and non-local origin was recovered from mortuary and non-mortuary settings at Khok Phanom Di. Where burials are concerned, the site is notable for the quantity and quality of ceramic artefacts, where craft manufacture and specialisation is present, and shell objects including beads, bangles and worked shell knives (Higham, 1993c, Pilditch, 1993, Vincent, 2004). Ceramic artefacts were found in a variety of forms including over a score of vessel types, clay pellets and anvils. Moderate frequencies of stone and bone/tooth artefacts were also present. Stone objects included burnishing stones, adzes and other tools and items of jewellery. Bone items found in burials at Khok Phanom Di included fishhooks, tools, unworked objects, and items of jewellery. The site is Neolithic with no evidence for metal recovered.

Table 6.5 shows that a majority of burials were interred with a grave good of some kind, with the majority of adults having at least one item (see Table 6.5 for post hoc outcomes). Subadult burials show the fewest instances, proportionately, of any age cohort being buried with a grave good. Of subadult burials, it is older children that are most likely to be buried with a grave good (15/22, 68.1%) in comparison to neonates and infants (21/64, 32.8%). Grave goods, generally, were statistically significantly more likely to be included in burials during MP5 than other mortuary phases at Khok Phanom Di, but this phase contains the wealthiest and fewest number of burials.

Nearly half (45.4%) of the burials at Khok Phanom Di contain a ceramic item as a burial good. Like grave goods in general, younger adults were significantly more likely to be buried with a ceramic artefact of any kind in comparison to the other cohorts (see Table 6.5 post hoc outcomes). Although ceramic vessels predominate, other items manufactured from clay were also present. Vessel types include jars, bowls, platters, a pot stand and a select number ($n=5$) of unique vessels (Vincent, 2004). Ceramic items, almost exclusively in low frequencies not exceeding five items, are present with all age classes and both sexes but most commonly with younger adults ($X^2= 17.555$, $p=0.000$). The most frequently occurring vessel was the Type 2b Jar identified by Vincent (2004: 790) as an “*independent restricted caronated form with composite contours*”. While Type 2b jars were recovered from burials of all age and sex categories, most frequently younger adults, there is no statistically significant association between this age cohort and the artefact type. Adult males are also most frequently associated with this artefact type (see Table 6.5).

Ceramic items are frequently placed at the lower part of the buried body, most commonly at the feet (24.0%) followed by the legs (34/154, 22.0%). Table 6.5 shows that adults, both young and old, are statistically most frequently associated with the deposition of ceramic artefacts in the normative area

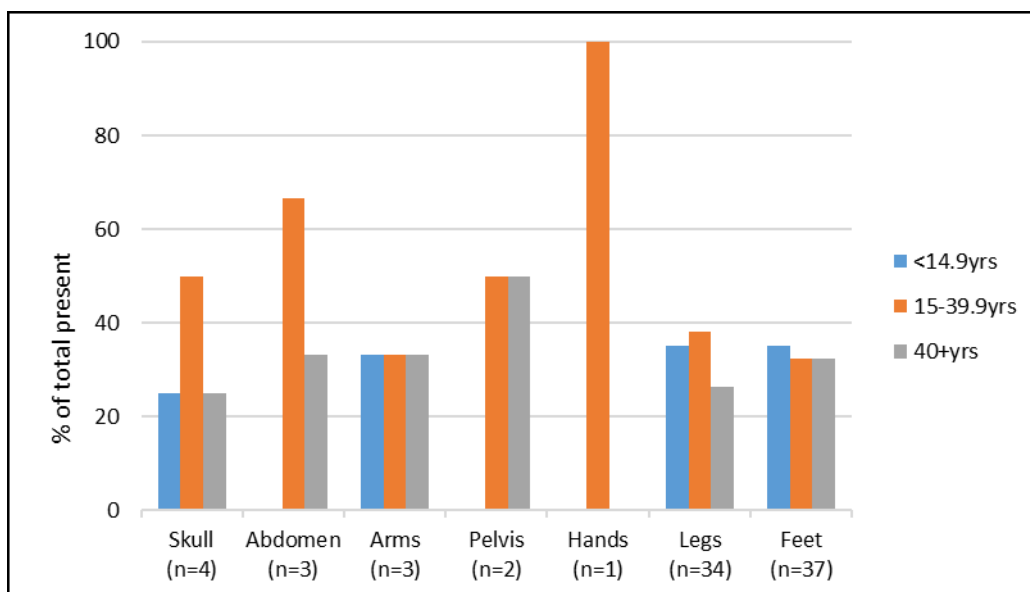


FIGURE 6.4: Ceramic artefact position in burials at Khok Phanom Di (note artefacts from fill excluded)

(at, under or below the feet) than children. Figure 6.4 shows the position, by age, of ceramic artefacts in the burial at Khok Phanom Di.

Where subadults are considered, it is the older children rather than neonates and infants that most frequently have ceramics (jar type, position, decoration present). Ceramic anvils are present with subadults and adult burials but, where adults are considered, it is adult females that are exclusively buried with these items.

While not as frequent as ceramic artefacts, shell objects usually in the form of jewellery (mainly disc beads), are present in a moderate number of burials (36.3%). All age and sex categories included shell artefact types with no statistically significant association. Where present, shell was invariably recovered in low frequencies (23.3%) and was more frequently positioned at the individual's skull (16.2%). Adult males are more frequently associated with low numbers of shell artefacts. Table 6.5 shows that 36.0% of subadults, are buried with shell beads of all types (i.e., funnel 1/3, 33.3%; disc 22/46, 47.83%; barrel 6/17, 35.2%; I-Shaped 2/5, 40.0% and H-shaped 5/6, 83.3%). Where shell beads constructed into a range of composite forms were recovered (i.e., necklace, belt etc.), it is the loose, unidentified, type that was most prevalent. In small frequencies subadults at MP7 were buried with shell bangles but no older adults were buried with shell bangles.

Stone artefacts were recovered from a somewhat low proportion (17.5%) of burials with younger adults the most likely cohort to be associated with this material (see Table 6.5 post hoc outcomes). Similarly, a statistically significantly greater percentage of younger adults had worked stone artefacts than other age classes (see Table 6.5). Stone was not locally sourced but, dependent on its type, originated from a number of locations, up to 80km distant from the site (Moore, 1993, Pisupong, 1993). Stone, from mortuary and non-mortuary contexts, was used as adzes, chisels, hoes, whetstones, flakes, pounders and burnishing stones. In mortuary contexts stone was recovered as ochre painted on buried individuals, burnishing stones, adzes, and stone jewellery. Interestingly, the distribution of stone artefacts (presence, position, quantity, type) mirrors earlier observations with older children being most frequently associated with stone objects.

TABLE 6.5: SUMMARY OF SUITE #5 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – MATERIAL CULTURE

Age											Comparisons	
	Total (n=154)	SA (n=86)	YA (n=35)	OA (n=33)							(SA, YA, OA)	
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X2	P					(X2 with Bonferroni correction)	
Grave Good Present	93 (60.3)	36 (41.8)	31 (88.5)	26 (78.7)	28.634	0.000					YA>OA>SA	
Ceramic Good Present	70 (45.4)	25 (29.0)	25 (71.4)	20 (60.6)	21.891	0.000					YA>OA>SA	
2b Jar Type	42 (27.2)	20 (23.2)	14 (40.0)	8 (24.2)	11.87	0.294					-	
Ceramic Frequency (1-5 pieces)	69 (44.8)	26 (30.2)	24 (68.5)	19 (57.5)	17.555	0.000					YA>OA>SA	
Ceramic Position (Feet)	37 (24.0)	13 (15.1)	12 (34.2)	12 (36.3)	8.51	0.014					OA>YA>SA	
Ceramic Decoration Present	48 (31.1)	16 (18.6)	19 (54.2)	13 (39.3)	16.08	0.000					YA>OA>SA	
Anvil	9 (5.8)	4 (4.6)	3 (8.5)	2 (6.0)	0.267*	0.875						
Shell Present	56 (36.3)	26 (30.2)	17 (48.5)	13 (39.3)	3.782	0.150						
Shell Jewellery	55 (35.7)	26 (30.2)	17 (48.5)	12 (36.3)	3.652	0.161						
Shell Freq. (1-500 pcs.)	36 (23.3)	19 (22.0)	10 (28.5)	7 (21.2)	0.693	0.707						
Shell Position (Skull)	25 (16.2)	13 (15.1)	6 (17.1)	6 (18.1)	0.192	0.908						
Shell Beads Present	53 (34.4)	31 (36.0)	13 (37.1)	9 (27.2)	0.963	0.617						
Shell Beads Type (Loose)	23 (14.9)	12 (13.9)	8 (22.8)	3 (9.0)	1.659*	0.436						
Shell Beads Freq. (1-500 pcs.)	33 (21.4)	18 (20.9)	10 (28.5)	5 (15.1)	1.846	0.397						
Shell Beads Position (Skull)	23 (14.9)	11 (12.7)	6 (17.1)	6 (18.1)	0.719	0.698						
Shell Bangle Present	8 (5.1)	4 (4.6)	4 (11.3)	-	2.548*	0.279						
Shell Bangle Material (Tridacna)	8 (5.1)	4 (4.6)	4 (11.4)	-	2.548*	0.279						
Shell Bangle Freq. (1-5 pcs.)	7 (4.5)	3 (3.4)	4 (11.4)	-	3.143*	0.207						
Stone Present	27 (17.5)	8 (9.3)	13 (37.1)	6 (18.1)	13.348	0.003					YA>OA>SA	
Worked Stone (Adze etc.)	23 (14.9)	7 (8.1)	11 (31.4)	5 (15.1)	10.622	0.004					YA>OA>SA	
Stone Freq. (1-5 pcs.)	26 (16.8)	8 (9.3)	12 (34.2)	6 (18.1)	11.115	0.003					YA>OA>SA	

Stone Position (Legs)	11 (7.1)	3 (3.4)	5 (14.2)	3 (9.0)	2,957*	0.227	
Bone/Tooth Present	24 (15.5)	8 (9.3)	10 (28.5)	6 (18.1)	7,236	0.026	
Bone/Tooth Jewellery	17 (11.0)	7 (8.1)	8 (22.8)	2 (6.0)	4,721*	0.030	-
Bone/Tooth Freq. (1-5 pcs.)	22 (14.2)	7 (8.1)	10 (28.5)	5 (15.1)	8,50	0.010	YA>OA>SA
Bone/Tooth Position (Abdomen)	8 (5.1)	1 (1.1)	4 (11.4)	3 (9.0)	6,61	0.094	-
Sex							
	Total (n=68)	Male (n=32)	Female (n=36)				
	Obs. (%)	Obs. (%)	Obs. (%)		X2	P	Comparisons
Grave Good Present	57 (83.8)	27 (84.3)	30 (83.3)		0.014	0.905	
Ceramic Good Present	45 (66.1)	19 (59.3)	26 (72.2)		1.249	0.263	M>F
2b Jar Type	33 (48.5)	20 (62.5)	13 (36.1)		4.723	0.029	
Ceramic Frequency (1-5 pcs.)	45 (66.1)	23 (71.8)	22 (61.1)		0.877	0.349	
Ceramic Position (Feet)	22 (32.3)	10 (31.2)	12 (33.3)		0.034	0.853	
Ceramic Decoration Present	32 (47.0)	18 (56.2)	14 (38.8)		2.05	0.152	
Anvil	5 (7.3)	-	5 (13.8)				F>M
Shell Present	30 (44.1)	16 (50.0)	14 (38.8)		0.848	0.357	
Shell Jewellery	29 (42.6)	16 (50.0)	13 (36.1)		1.336	0.247	
Shell Freq. (1-500 pcs.)	17 (25.0)	11 (34.3)	6 (16.6)		2.833	0.092	M>F
Shell Position (Skull)	12 (17.6)	5 (15.6)	7 (19.4)		0.17	0.680	
Shell Beads Present	28 (41.1)	15 (46.8)	13 (36.1)		0.81	0.368	
Shell Beads Type (Loose)	11 (16.1)	7 (21.8)	4 (11.1)		0.763*	0.382	
Shell Beads Freq. (1-500 pcs.)	15 (22.0)	10 (31.2)	5 (13.8)		2.97	0.084	M>F
Shell Beads Position (Skull)	12 (17.6)	5 (15.6)	7 (19.4)		0.17	0.680	
Shell Bangle Present	4 (5.8)	1 (3.1)	3 (8.3)		0.156*	0.692	
Shell Bangle Material (Tridacna)	4 (5.8)	1 (3.1)	3 (8.3)		0.156*	0.692	

Shell Bangle Freq. (1-5 pcs.)	4 (5.8)	1 (3.13)	3 (8.3)		0.692	0.156*	
Stone Present	19 (27.9)	7 (21.8)	12 (33.3)		0.293	1.105	
Worked Stone (Adze etc.)	16 (23.5)	7 (21.8)	9 (25.0)		0.092	0.761	
Stone Freq. (1-5 pcs.)	18 (26.4)	7 (21.8)	11 (30.5)		0.417	0.656	
Stone Position (Legs)	8 (11.7)	3 (9.3)	5 (13.8)		0.04*	0.841	
Bone/Tooth Present	16 (23.5)	13 (40.6)	3 (8.3)		8.105*	0.004	M>F
Bone/Tooth Jewellery	10 (14.7)	10 (31.2)	-				
Bone/Tooth Freq. (1-5 pcs.)	15 (22.0)	13 (40.6)	2 (5.5)		10.165*	0.001	M>F
Bone/Tooth Position (Abdomen)	7 (10.2)	4 (12.5)	3 (8.3)		0.027*	0.869	

Note: The n value for all outcome suites under analysis is the same at Khok Phanom Di; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

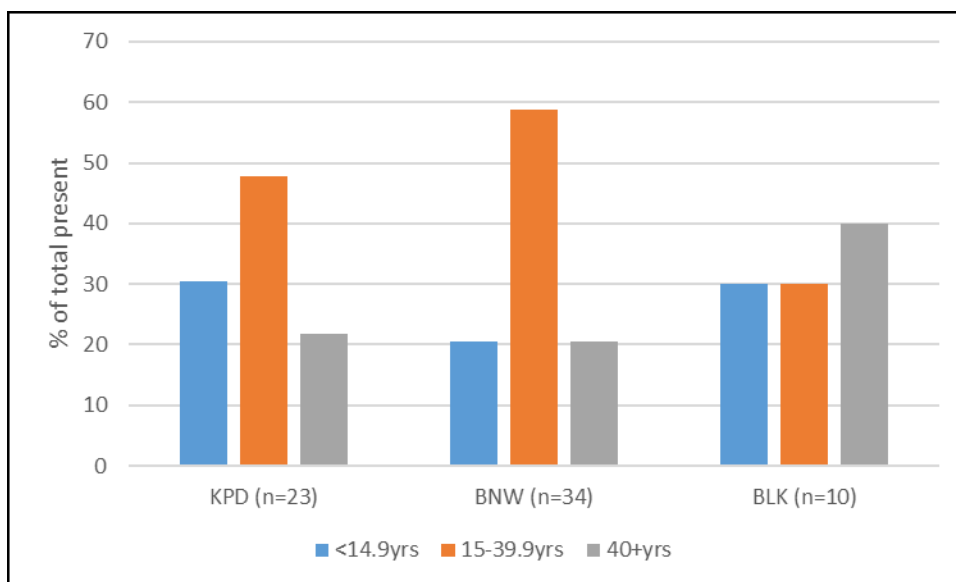


FIGURE 6.5: Comparison of worked stone artefacts in burials
(KPD = Khok Phanom Di; BNW = Ban Non Wat; BLK = Ban Lum Khao)

Figure 6.5 shows similar patterns of distribution between Khok Phanom Di and Ban Non Wat in relation to the presence of worked stone artefacts in burials with adults aged 15-39.9 years being the most likely group to be buried with worked stone. The brief comparison of worked stone artefacts between sites seen here is discussed in greater detail in relation to age-based identities at Section 11.2.5. Although only a limited sample, Figure 6.5 shows that a greater proportion of older adults from the Bronze Age site of Ban Lum Khao were buried with worked stone artefacts relative to younger adults and subadults.

A range of bone artefact forms were excavated from Khok Phanom Di in mortuary and non-mortuary contexts. These included, for example, fish-hooks, sinkers, awls, harpoons, and the site's turtle carapace objects (Higham, 1993a). The range of bone/tooth artefacts recovered from mortuary contexts included fish-hooks, worked fish vertebrae, worked turtle carapace, worked teeth (i.e., Barking deer, Rhino etc.), points and bone/tooth jewellery. Most bone/tooth artefacts were recovered from non-mortuary settings. Similar frequencies of bone/tooth artefacts, as stone artefacts, were recovered from burial contexts (15.5%). As with stone artefacts, it can be observed that younger adults are most likely to be associated with bone artefacts with only adult males exposed to burial with bone/tooth jewellery (see Table 6.5 for post hoc outcomes). Unlike with stone, further testing does not show a significant association between younger adults and the presence of bone/tooth artefacts at Khok Phanom Di except in relation to bone/tooth frequencies. Where sex is reviewed it is adult males, through the presence of turtle carapace plaques, which predominate (see Figure 4.2).

6.7.1 Assessment of mean number of grave good categories by class

An additional analysis of frequencies, by age-at death and sex, of the material culture (Table 6.5) and faunal remains (Table 6.4) recovered from burial contexts at Khok Phanom Di was carried out. The results of this analysis can be found in Table 6.6. Artefacts from non-mortuary contexts, in grave fill, or unable to be identified by primary researchers was excluded from analysis. This approach explores the mean number of mortuary goods (by age and sex) only for those burials containing the material under consideration.

TABLE 6.6: MEAN TOTALS OF MATERIAL CULTURE AND FAUNA BY AGE-AT-DEATH AND SEX – KHOK PHANOM DI

Outcome	Age							Sex								
	SA (n=86)			YA (n=35)				OA (n=33)			Male (n=32)			Female (n=36)		
	obs.	n	0	obs.	n	0		obs.	n	0	obs.	n	0	obs.	n	0
Ceramics	65	26	(2.5)	77	27	(2.8)	35	20	(1.7)		51	23	(2.2)	61	24	(2.5)
Shell Bead	43626	25	(1745.0)	184929	17	(10878.1)	55922	11	(5083.8)		101112	17	(5947.7)	139739	23	(6075.6)
Shell Bangle	13	4	(3.2)	10	4	(2.5)	-				3	1	(3.0)	7	3	(2.3)
Stone	9	8	(1.1)	30	13	(2.3)	13	6	(2.1)		13	7	(1.8)	30	12	(2.5)
Bone/Tooth	27	8	(3.3)	16	10	(1.6)	27	6	(4.5)		17	13	(1.3)	26	3	(8.6)
Pig	-			1	1	(1.0)	4	3	(1.3)		1	1	(1.0)	4	3	(1.3)
Unionidae	-			9	5	(1.8)	5	5	(1.0)		4	2	(2.0)	10	8	(1.2)
Fish	522	27	(19.3)	928	22	(42.1)	2362	23	(102.6)		765	22	(34.7)	2525	23	(109.7)

Obs. = observed number from total sample; n = number of sample with material culture type or fauna species; ; SA = Subadult (<14.9 years); YA = Younger Adult (15-39.9 years); OA = Older Adult (40 or more years)

Table 6.6 shows that, by both age and sex, the mean number of ceramic artefacts were relatively evenly spread between males and females and younger adults and subadults. However, older adults with ceramic grave goods tended to have a slightly lower mean number of these artefacts. Interestingly, where the mean number of shell beads is explored, although, numerically, there are more children's graves which contain shell beads, it is adults, specifically younger adults, on average which are buried with high volumes of this artefact type. Undoubtedly, B15 ("The Princess" at MP5) offsets this quantum but nonetheless adults are clearly associated with greater volumes of this material type than children. Where sex and shell beads is considered it is interesting, in this instance, that the high volume of beads with B15 do not influence the mean result to a greater degree. Regarding shell bangles, only subadults and younger adults have such grave goods, and those subadults with bangles have a higher mean number of them than younger adults.

Older and younger adults with stone grave goods have a similar mean number of these artefacts, in comparison to children which have a lower mean number of stone artefacts. By sex, females have a higher mean number of stone, and a much higher mean number of bone/tooth grave goods than males. Looking at this artefact distribution by age, older adults and subadults have higher mean numbers of bone/tooth grave goods than younger adults.

In terms of pig and Unionidae as grave goods, there is a similar (and low) mean number of these artefacts among young and old burials, and they do not occur in subadult graves. The mean number of fish remains, on the other hand, increases in a rather dramatic fashion from a low level in subadult graves to a high level in old adult graves.

6.8 Significant non-normative burial variables

The range of normative mortuary behaviours and how subadults and older adults are positioned against this behaviour is provided in sections 6.2 to 6.6. This section explores non-normative mortuary behaviours with respect to the categories under review. The range of funerary outcomes, normative and atypical, are detailed in Appendix 2. Table 6.7 shows a variety of different atypical funerary outcomes affecting all three cohorts under review. There was no statistically significant non-normative mortuary behaviour where sex was explored.

Table 6.7 shows that only subadults received flexed and semi-flexed burial positions. Except for bone/tooth jewellery, both adult age classes show a higher frequency of these non-normative behaviours in comparison to the subadults (see Table 6.7 post hoc outcomes).

It is mainly adults, and to a lesser degree older adults, that demonstrate a potential statistical likelihood of being buried with the hands at the pelvis (X^2 5.675*, $p=0.058$). Statistically it is older adults that will have ochre applied, only, to the skull in comparison to the other age classes under review. Younger adults are most likely to have feet crossed in the grave and be oriented at 90°. Adults of both age classes, in relatively equal proportions, are considerably more likely to be buried in a grave of moderate depth, as defined here, in comparison to subadults. Figure 6.6 demonstrates the variability in application of ochre to the skull, either applied directly or positioned in close proximity, by age and site. While Figure 6.6 shows the significance of one particular style (at the skull) of ochre application between the sites, a comprehensive discussion on the distribution and association of this material at an inter-site level is held at Section 11.2.1.2.

The elderly are statistically most likely to be buried with impressed ceramic objects and to have bone/tooth tools deposited in their graves at Khok Phanom Di. Table 6.7 shows that younger adults show a significant, or potentially significant, association with some material culture or its position (see Table

TABLE 6.7: CHI-SQUARE COMPARISON OF NON-NORMATIVE OUTCOMES BY AGE-AT-DEATH (KHOK PHANOM DI)

Outcome	Age							Comparisons	
	Total (n=154)	SA (n=86)	YA (n=35)	OA (n=33)	X2	P		(SA, YA, OA)	
	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)				(X2 with Bonferroni correction)	
Semi-Flexed	11 (7.1)	11 (12.7)	-	-		-			
Flexed	14 (9.0)	14 (16.2)	-	-		-			
Hand Position (Pelvis)	12 (7.7)	2 (2.3)	5 (14.2)	5 (15.1)	5.675*	0.058		OA>YA>SA	
Feet Position (Crossed)	10 (6.4)	1 (1.1)	7 (20.0)	2 (6.0)	11.667*	0.002		YA>OA>SA	
Orientation (90°)	19 (12.3)	6 (6.9)	9 (25.7)	4 (12.1)	6.488*	0.039		YA>OA>SA	
Ochre Application (Skull Only)	13 (8.4)	2 (2.3)	2 (5.7)	7 (21.2)	8.927*	0.011		OA>YA>SA	
Moderate Depth (26-50cm)	38 (24.6)	9 (10.4)	15 (42.8)	14 (42.4)	21.161	0.000		OA=YA>SA	
Ceramic Position (Legs)	34 (22.0)	11 (12.7)	13 (37.1)	10 (30.3)	10.227	0.006		YA>OA>SA	
Ceramic Dec. (Cordmarked)	29 (18.8)	11 (12.7)	12 (34.2)	6 (18.1)	7.531	0.023		-	
Ceramic Dec. (Incised)	29 (18.8)	11 (12.7)	11 (31.4)	7 (21.2)	5.809	0.054		-	
Ceramic Dec. (Impressed)	38 (24.6)	15 (17.4)	10 (28.5)	13 (39.3)	6.553	0.037		-	
Ceramic Dec. (Burnished)	54 (35.0)	17 (19.7)	21 (60.0)	16 (48.4)	21.003	0.000		YA>OA>SA	
Bone / Tooth Tool	10 (6.4)	1 (1.1)	4 (11.4)	5 (15.1)	7.674*	0.021		OA>YA>SA	
Bone / Tooth Jewellery	17 (11.0)	7 (8.1)	8 (22.8)	2 (6.0)	4.721*	0.094		-	

Note: The n value for all outcome suites under analysis is the same at Khok Phanom Di; SA = Subadults (0-14.9 years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

6 RESULTS: KHOK PHANOM DI

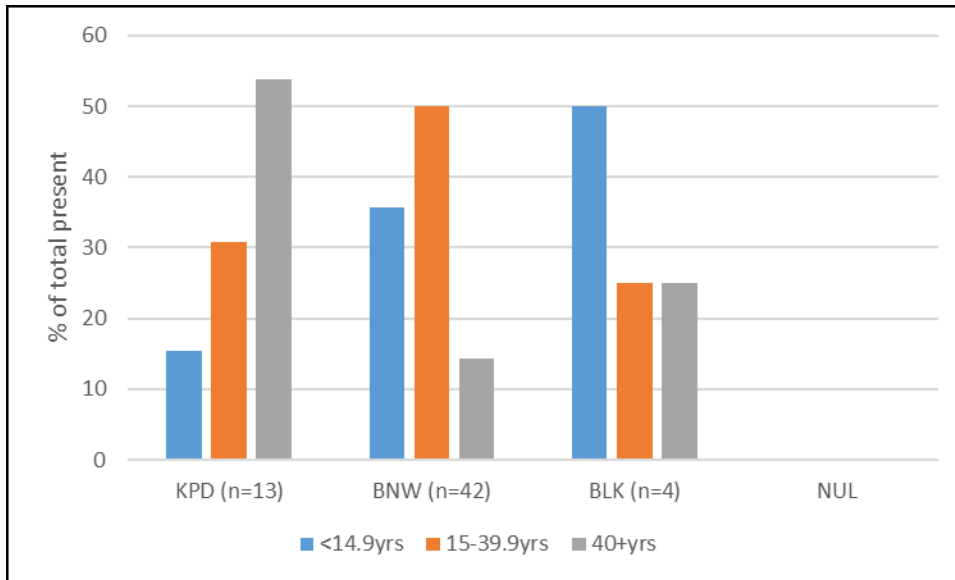


FIGURE 6.6: Comparative of sites with ochre at skull
KPD = Khok Phanom Di; BNW = Ban Non Wat; BLK = Ban Lum Khao; NUL = Noen U-Loke

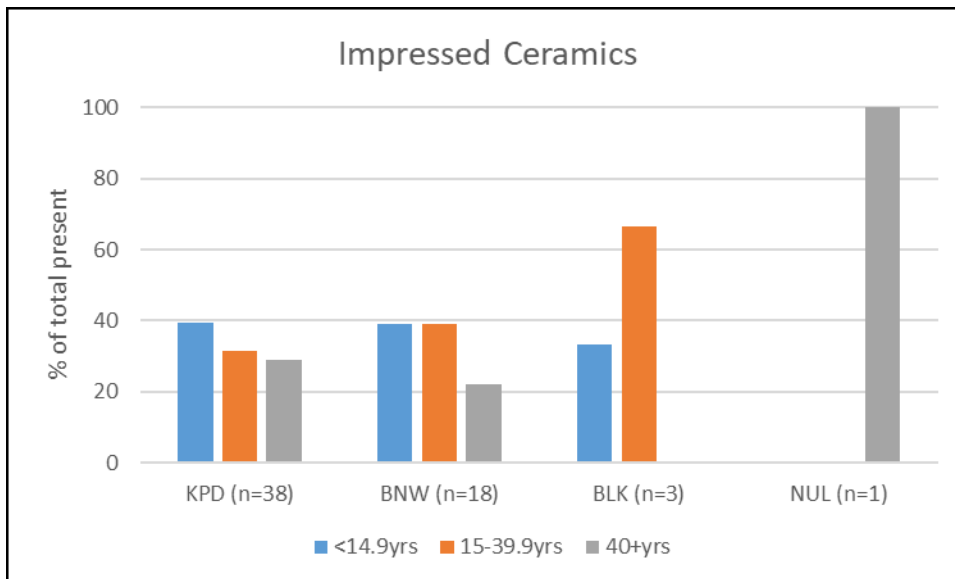


FIGURE 6.7: Comparison of burials with impressed ceramic decorative styles
KPD = Khok Phanom Di; BNW = Ban Non Wat; BLK = Ban Lum Khao; NUL = Noen U-Loke

6.7 post hoc outcomes). Figure 6.7 provides a summary of the inclusion of the impressed ceramics by age class and site. The significance of age groups between sites with specific material culture can be found across Section's 11.2.5.2 to 11.2.5.5.

6.9 Spatial Relationship of Burials (Mortuary Suite #6)

Mortuary activity at Khok Phanom Di is separated by a range of characteristics between each phase, including the introduction of clustered corporate burial units, periods of heightened mortuary activity /or extended hiatuses between phases, changes in technology and economic practices associated with burials or an increase in 'wealth' (Higham and Thosarat, 2004c). Figures 6.8 to 6.11 were adapted from previously published material with illustrative super-positioning of burials by age categories added for the purposes of this study. Original maps demarcate an easterly orientation of the directional arrow (Higham and Bannanurag, 1990). For consistency, all site maps adopted in the study used a northern directional marker. Spatial analysis explored horizontal and vertical burial deposition of the cohorts

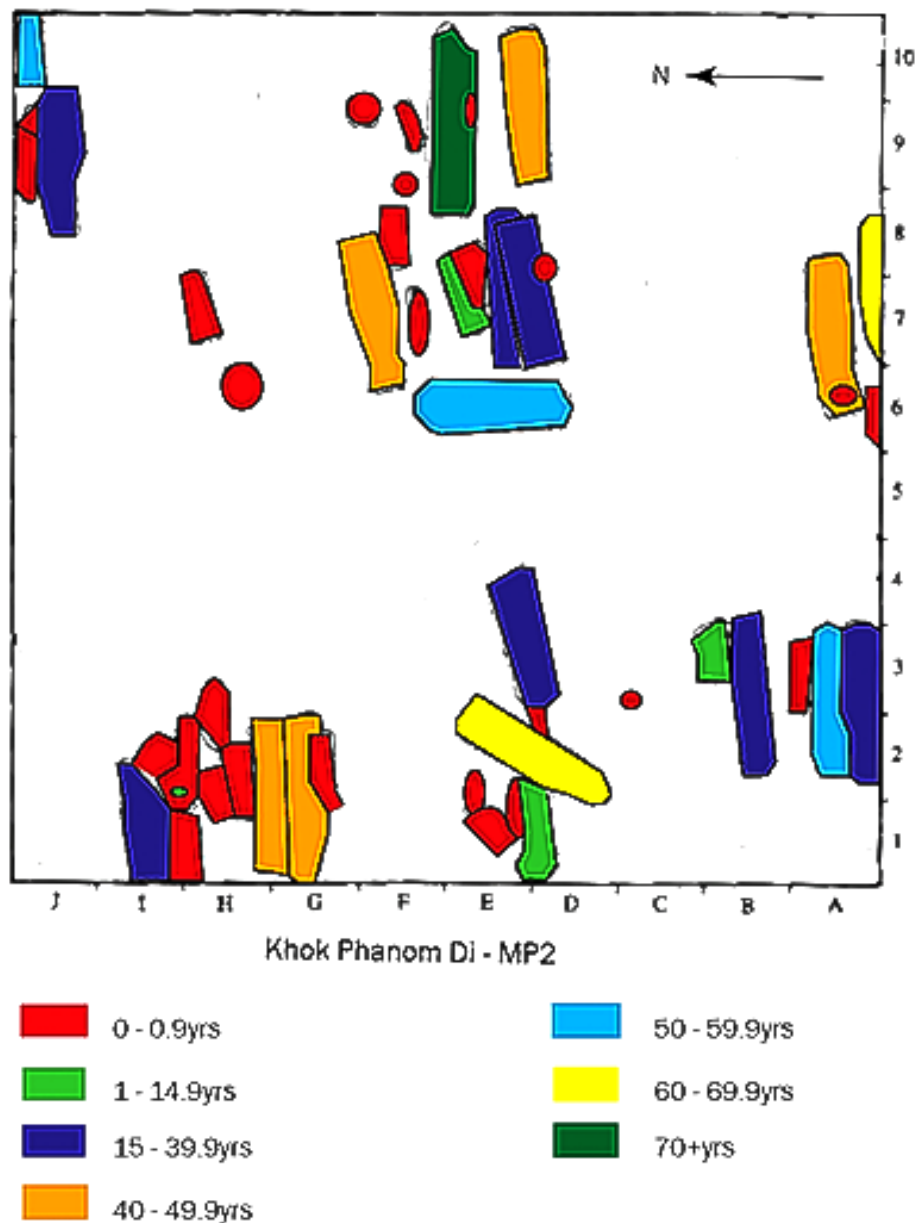


FIGURE 6.8: Mortuary Phase 2 at Khok Phanom Di
(adapted from Higham and Thosarat 2004: 22)

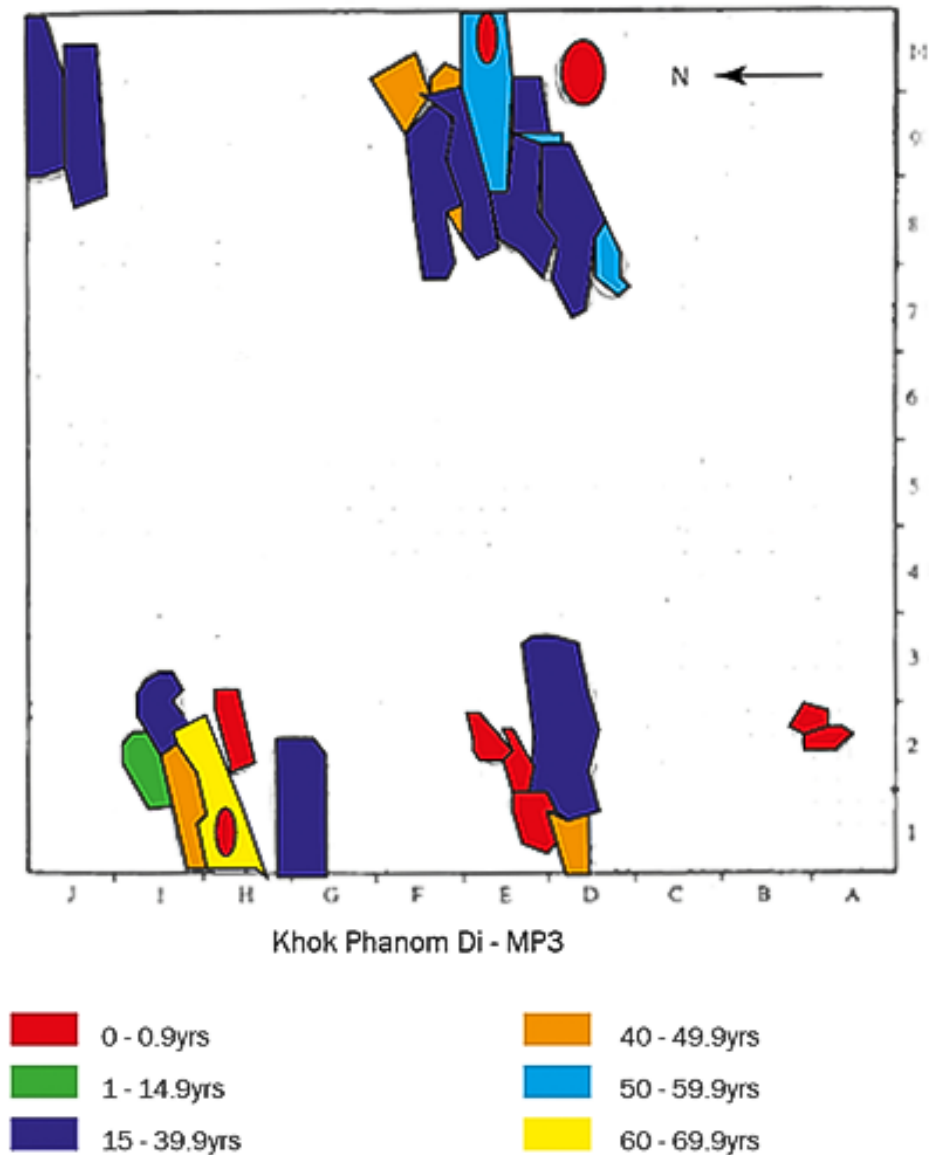


FIGURE 6.9: Mortuary Phase 3 at Khok Phanom Di
(adapted from Higham and Thosarat 2004: 23)

used in this study. Vertical spatial data was explored through a review of which age cohort was buried in a specific cultural layer and to investigate if evidence supported that subadults or the elderly were statistically most likely to be buried at the inception or terminal point of a cultural layer. A consideration of burials in the horizontal spectrum reviewed which sector (i.e., 1-45°, 91-135° etc.) a burial was predominantly positioned. Eleven depositional sequences were identified at the site comprising eight cultural phases (Higham and Thosarat, 2004c).

From the analysis undertaken (goodness-of-fit testing) there was no statistical evidence to infer that any age cohort at Khok Phanom Di was afforded spatially selective funerary treatment at the site. Of the seven clusters identified by Higham and Bannanurag (1990), subadults were the initial burial in four clustered groups (A, B, D and F/G) with an elderly subject being the incipient burial only at Cluster E.

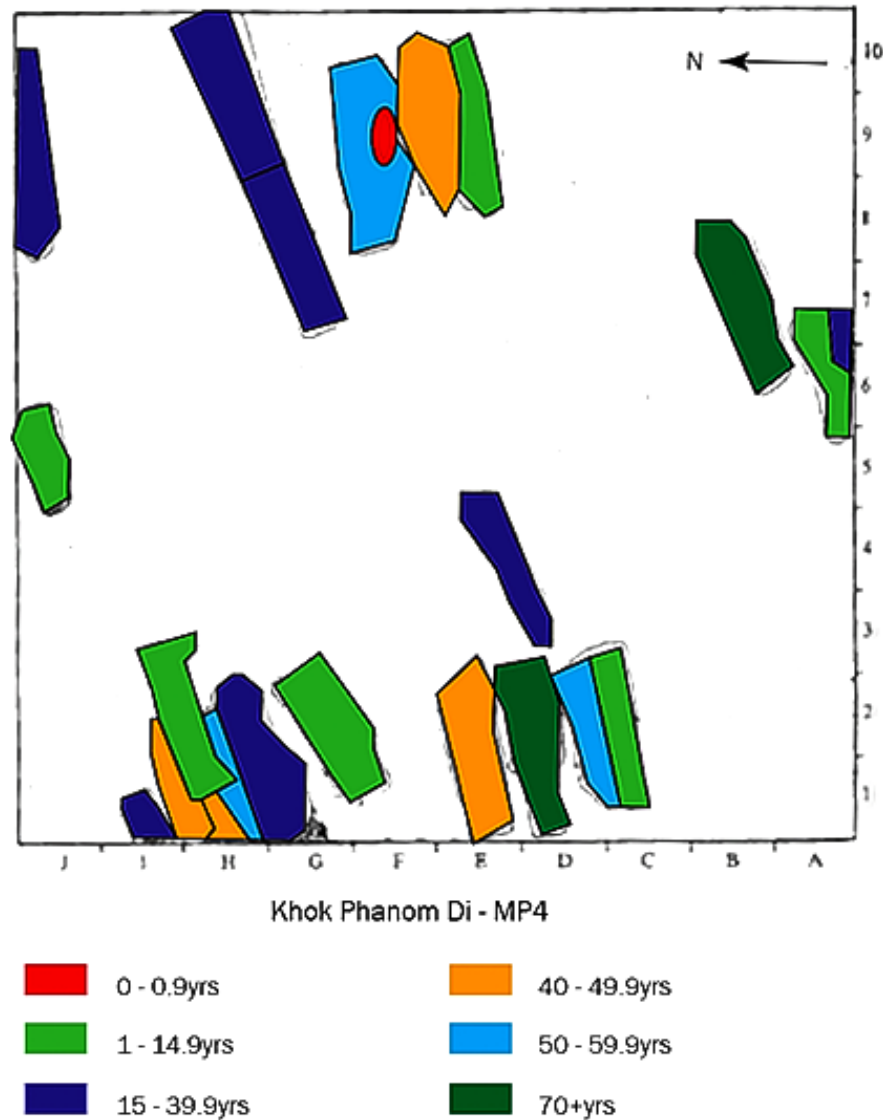


FIGURE 6.10: Mortuary Phase 4 at Khok Phanom Di
(adapted from Higham and Thosarat 2004: 24)

Terminal burials in each cluster relate mainly to adults aged 15-39.9 years (i.e., Cluster C, D and E) and to a lesser extent subadults (i.e. Cluster B and F/G). Across MP's 2-4 subadults predominate in being the incipient burial (68.7%) in a clustered burial group. This changes in relation to the terminal burial where children represent a reduced number (50.0%) of burials identified as the final burial of a mortuary phase.

6.10 Summary

Chapter Six summarised the results of analysis upon the site of Khok Phanom Di. The chapter captured the normative behaviour at the site, as defined through mortuary variables used in this study, and further refined an analysis of normative behaviour across several broad suites of activity by age-at-death and sex. Normative mortuary behaviour observed the deposition of individuals in single extended burials, laid out anatomically and most frequently oriented 46-89°. Although not always clearly visible, the positioning of skeletal remains suggests constriction practices were used at the site. More than half

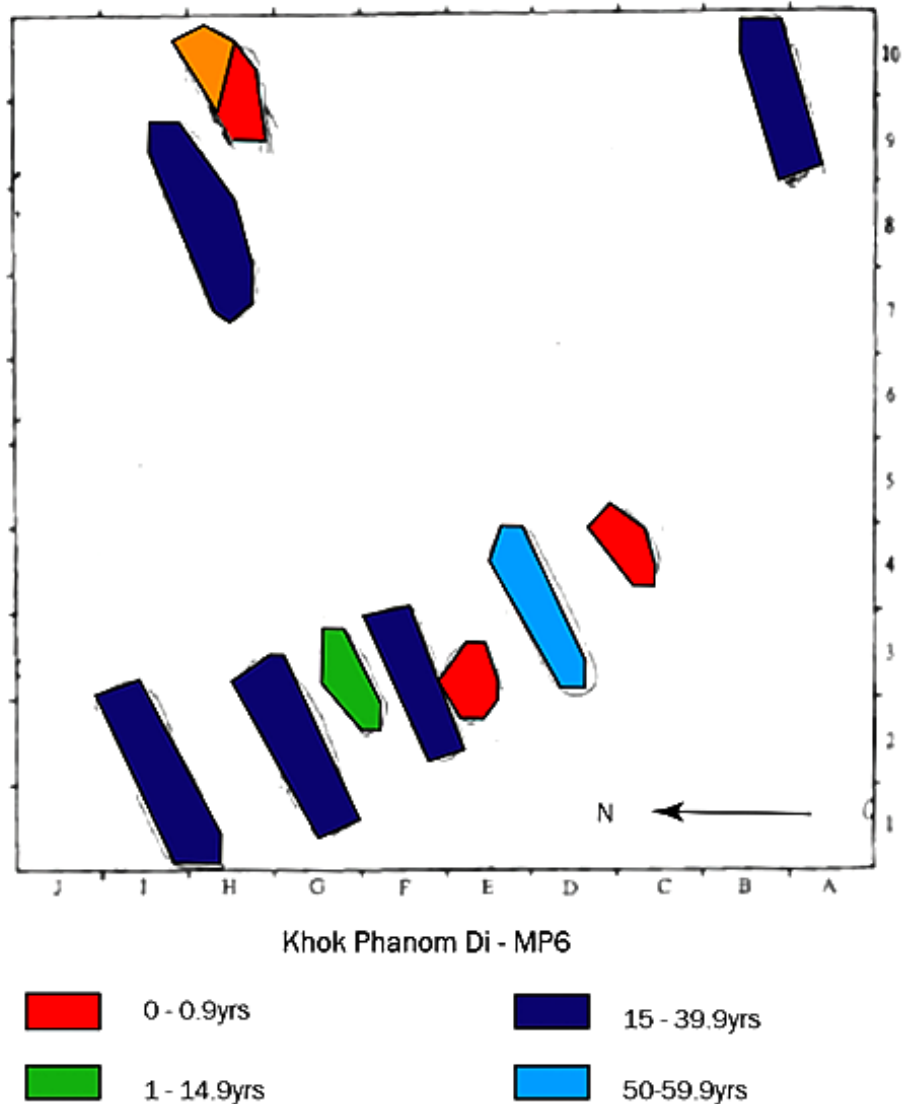


FIGURE 6.11: Mortuary Phase 6 at Khok Phanom Di
(adapted from Higham and Thosarat 2004: 26)

of the burials included a grave item, most commonly ceramic or shell, or faunal remain. Non-normative practices observed the presence of flexed or, more frequently, semi-flexed burials affecting subadults. In contrast to Ban Lum Khao, adults are primarily exposed to burial in graves of moderate depth and older adults most frequently associated with the secondary application style of ochre solely at the skull.

The analysis found that age, in many instances both qualitatively and quantitatively, appeared to be a defining characteristic in determining how subject groups were treated, at the time of their death, by surviving community participants. This is in sharp contrast to biological sex which, in comparison, does not appear to be an overwhelming factor in influencing mortuary treatment at this site. Although to be discussed in greater detail at Chapter Eleven, at a broad level it can be observed that adults in contrast to subadults, often older adults, appear to be more frequently associated, sometimes exclusively, with mortuary activities in Suites 1 (human burial), 3 (fauna) and 5 (material culture).

Again, where non-normative variables were explored, it was noted that subadults demonstrate a significant association with a minimal number of measures. This too contrasts with evidence of both younger and older adults being more frequently associated with a range of outcomes related to human burial, the characteristics of the grave and material culture deposited in the grave.

Results: Ban Non Wat

7.1 Introduction

The results of the analysis from the site of Ban Non Wat (c. 1750BCE-CE200) are presented at this chapter. The approach and outcomes examined are discussed at Chapter Five. This chapter explores normative and atypical mortuary behaviour by age and by sex with a specific focus on funerary behaviour in relation to the young and old. As published health data at an individual level from Ban Non Wat is yet to be published (see also Chapter Eight), an exploration of poor health potentially affecting mortuary treatment (Mortuary Suite #4), has not been included in this chapter.

As Ban Non Wat spans the Neolithic to the Iron Age, in addition to an analysis of aggregated data across the cemeteries use, this chapter will also explore mortuary treatment from each individual temporal period (Neolithic, Bronze Age, Iron Age) to offer evidence of variable outcomes over time. The first part of each section (i.e., Section 7.3), with some exceptions, provides data on aggregated data which is followed, as a sub-section, on each temporal period pertaining to this sites occupation.

7.2 Normative Burial Variables

Table 7.1 shows that most burials were subjected to a single burial and were deposited in an extended and supine manner. A small number of multiple burials occur where the inclusion of three or more individuals was the most frequently encountered. Burials are commonly (45.0%) oriented in a north-north westerly position (315-359°) which occurs across all phases of mortuary activity. Ochre was recovered from a moderate number of graves (26.1%) where an application to, or in proximity of, the subject's skull was the most frequently encountered. Research (Harris and Tayles, 2012, Harris et al., 2016) and pictorial evidence shows evidence of the constriction of limbs and commingling of foot phalanges. Results in relation to constriction at Ban Non Wat is presented in section 7.1.1. Higham (2010) noted the presence of grey clay, as part of the grave matrix, included in a small proportion of burials. Where this occurs, the grey clay was more frequently deposited at, near or under the subject's skull.

Like levels seen at Ban Lum Khao (see Table 8.1), a small proportion of individuals, primarily subadults, are buried in jars. The presence of two adults included in jars only occurs in the Neolithic, in the initial phase of mortuary activity, and affects a male (B28 – see Figure 7.1) and female (B292) both in their 30s (Higham and Wiriayaromp, 2010b). Subadult jar burials occur throughout the Neolithic (15/48, 31.2%), Bronze (13/48, 27.0%) and Iron Ages (20/48, 41.6%) with the highest proportions occurring at the initial phase (Neolithic - c. 1650-1250BCE; Iron Age - c. 420BCE-CE200) of activity in the Neolithic (12/48, 25.0%) and Iron Age (18/48, 37.5%). Evidence of disposal containers occurs for a low number of burials (16.7%). As found at Khok Phanom Di and Ban Lum Khao, graves at Ban Non Wat are predominantly shallow (<25cm). A range of features such as hearths and pits were identified as being in the direct vicinity of a low proportion of burials (21.3%).

Faunal remains were relatively abundant from mortuary and non-mortuary settings at the site and include a wide variety of fish species, shellfish, cattle, water buffalo, dog, chicken, rat, deer and pig (Thosarat, 2010, Isepp, 2012, Thosarat, 2012). More than half of the burials in the sample from Ban Non Wat are buried with fauna (56.2%). Faunal remains are most commonly associated with a range of artefact (i.e., ceramics, grey clay, ochre) types *in situ* but, strictly where an anatomical position is factored, are most frequently deposited at, near or under a subject's skull (19.3%). Table 7.1 shows that



FIGURE 7.1: Neolithic Adult Jar Burial (B28) from Ban Non Wat (Photo: Higham, C.F.W. 2010. Retrieved from South East Asian Archaeology Data <https://drive.google.com/drive/u/0/folders/0BwyPRRjONdiFc0pQM3VTS09VVTA>)

the primary species under analysis in this study are deposited in a quarter of burials with Unionidae species (Thosarat, 2010), *Hyriopsis* sp. and *Pseudodon* sp., located in nearly a third of graves. As indicated at Table 7.1 pig and Unionidae are most frequently deposited by the head. Of the burials with fish included in the grave (27.4%), *Channa* sp., or snake-headed fish, is the most common.

Table 7.1 shows that the inclusion of grave goods was very common (90.8%) in mortuary suites with ceramic items (87.5%) being the most frequently encountered artefact type. Regarding the original 635 burials recovered from the site, Higham (2010: 251) notes up to four thousand ceramic artefacts were identified. Of the sample under analysis, Type 1a bowls (simple and unrestricted vessels) were found a moderate number of graves with ceramic artefacts (38.3%). Spindle whorls, often decorated using a variety of techniques, were recovered extensively across the site from the Neolithic onwards with a small proportion of the population having this artefact type included in their grave furniture (Cameron, 2012b, Cameron, 2012a). Although low numbers (<5 per person) of ceramics in graves predominate, nearly half of the burial population were buried with six or more ceramic items at the time of their

TABLE 7.1: BURIAL OUTCOMES OF HIGHEST FREQUENCIES AT BAN NON WAT (N=459)

Suite of Activity	Outcome	Obs. (%)	Outcome	Obs. (%)	Outcome	Obs. (%)
Burial of Human Remains	Single Burial	433 (94.3)	Extended Burial	375 (81.6)	Ochre Application (skull)	68 (14.8)
	Multiple Burial (MB)	26 (5.6)	Skull Position (Anat.)	219 (47.7)	Extra Clay Present	45 (9.8)
	MB Style (3+ individuals)	9 (1.9)	Hand Position (Anat.)	115 (25.0)	Grey Clay	43 (9.3)
	MB Position (adj. and supine)	9 (1.9)	Feet Position (Anat.)	132 (28.7)	Extra Clay Position (Skull)	18 (3.9)
	Supine Burial	453 (98.6)	Orient (315-359°)	207 (45.0)	Ochre Present	120 (26.1)
	Jar Burial	50 (10.8)	Grave Depth (0-25cm)	328 (71.4)	Pit Position (North of burial)	24 (5.2)
Grave Layout	Disposal Container Present	77 (16.7)	Fire/Hearth/Pit Present	98 (21.3)		
Fauna	Fauna Present	258 (56.2)	Pig Position (Skull)	50 (10.8)	Bovid Present	23 (5.0)
	Fauna Position (Skull)	89 (19.3)	Unionidae Present	148 (32.2)	Fish Present	126 (27.4)
	Pig Present	113 (24.6)	Unionidae Position (Skull)	64 (13.9)	Channa sp.	82 (17.8)
	Grave Good Present	417 (90.8)	Iron Freq. (1-5 pcs.)	30 (6.5)	Stone Position (Hand)	36 (7.8)
Material Culture	Ceramic Good Present	402 (87.5)	Iron Position (Arms)	9 (1.9)	Agate Present	10 (2.1)
	1a simple unrestricted bowl	176 (38.3)	Shell Present	174 (37.9)	Agate Freq. (1-5 pcs.)	9 (1.9)
	Ceramic Frequency (1-5 pcs.)	247 (53.8)	Shell Jewellery	173 (37.6)	Agate Position (Skull)	8 (1.7)
	Ceramic Position (Skull)	276 (60.1)	Shell Freq. (1-500 pcs.)	142 (30.9)	Carnelian Present	4 (0.8)
	Ceramic Decoration Present	331 (72.1)	Shell Position (Skull)	64 (13.9)	Carnelian Freq. (1-5 pcs.)	4 (0.8)
	Whorl	54 (11.7)	Shell Beads Present	140 (30.5)	Stone Bangle Present	39 (8.4)
	Clay Pellet	10 (2.1)	Loose Shell Beads	116 (25.2)	Stone Bangle Freq. (1-5 pcs.)	39 (8.4)
	Anvil	8 (1.7)	Shell Beads Freq. (1-500 pcs.)	109 (23.7)	Glass Present	9 (1.9)
	Conical Roller	14 (3.0)	Shell Beads Position (Skull)	55 (11.9)	Glass Freq. (1-5 pcs.)	7 (1.5)

Suite of Activity	Outcome	Obs. (%)	Outcome	Obs. (%)	Outcome	Obs. (%)
	Bronze Present	27 (5.8)	Shell Bangle Present	86 (18.7)	Glass Position (Skull)	6 (1.3)
	Bronze Jewellery	17 (3.7)	Shell Bangle Mat. (Trochus)	59 (12.8)	Bone/Tooth Present	11 (2.3)
	Bronze Freq. (1-5 pcs.)	21 (4.5)	Shell Bangle Freq. (1-5 pcs.)	50 (10.8)	Bone/Tooth Jewellery	7 (1.5)
	Bronze Position (Hand)	11 (2.3)	Stone Present	86 (18.7)	Bone/Tooth Freq. (1-5 pcs.)	9 (1.9)
	Iron Present	37 (8.0)	Stone Jewellery	54 (11.7)	Bone/Tooth Position (Skull)	4 (0.8)
	Iron Tools	23 (5.0)	Stone Freq. (1-5 pcs.)	83 (18.0)		
Spatial	Cultural Layer (4.3)	57 (12.4)	Row Burial	30 (6.5)	Clustered Burial	159 (34.6)
	Cemetery Location (91-135°)	86 (18.7)				

Obs. = observed number from total sample identified; % = percentage of sample – totals include zero counts (0) of unknown variable types; Artefacts recovered from grave fill excluded from analysis

TABLE 7.2: SUMMARY OF SUITE #1 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – BURIAL OF HUMAN REMAINS

Outcome	Age										Comparisons	
	Total (n=459)	SA (n=162)	YA (n=241)	OA (n=56)	X2	P						(SA, YA, OA)
	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)								(X2 with Bonferroni correction)
Single Burial	433 (94.3)	154 (95.0)	227 (94.1)	52 (92.8)	0.398	0.819						-
Multiple Burial (MB)	26 (5.6)	8 (4.9)	14 (5.8)	4 (7.1)	0.091*	0.955						-
MB Style (3+ individuals)	9 (1.9)	5 (3.0)	4 (1.6)	-		0.368*						0.544
MB Position (adj. and supine)	9 (1.9)	-	8 (3.3)	1 (1.7)	0.029*	0.864						-
Supine Burial	453 (98.6)	161 (99.3)	237 (98.3)	55 (98.2)	0.929	0.628						-
Extended Burial	375 (81.6)	92 (56.7)	228 (94.6)	55 (98.2)	104.29	0.000						OA>YA>SA
Skull Position (Anatomical)	219 (47.7)	68 (41.9)	126 (52.2)	25 (44.6)	4.366	0.112						-
Hand Position (Anatomical)	115 (25.0)	23 (14.1)	77 (31.9)	15 (26.7)	16.362	0.000						YA>OA>SA
Feet Position (Anatomical)	132 (28.7)	23 (14.1)	92 (38.1)	17 (30.3)	27.263	0.000						YA>OA>SA
Orientation (316-359°)	207 (45.0)	69 (42.5)	111 (46.0)	27 (48.2)	0.72	0.697						-
Ochre Present	120 (26.1)	39 (24.0)	65 (26.9)	16 (28.5)	0.616	0.734						-
Ochre Application (skull)	68 (14.8)	15 (9.2)	47 (19.5)	6 (10.7)	8.904	0.011						YA>OA>SA
Extra Clay Present	45 (9.8)	11 (6.7)	30 (12.4)	4 (7.1)	3.157*	0.206						-
Grey Clay	43 (9.3)	9 (5.5)	30 (12.4)	4 (7.1)	4.802*	0.090						-
Extra Clay Position (Skull)	18 (3.9)	5 (3.0)	9 (3.7)	4 (7.1)	0.925*	0.629						-

Sex									
Total (n=268)	Male (n=135)	Female (n=133)							Comparisons
Obs. (%)	Obs. (%)	Obs. (%)			X2	P	X2		
Single Burial	250 (93.2)	126 (93.3)	124 (93.2)		0.001	0.974	-		
Multiple Burial (MB)	18 (6.7)	9 (6.6)	9 (6.7)		0.001	0.974	-		
MB Style (3+ individuals)	4 (1.4)	2 (1.4)	2 (1.5)		0.239*	0.624	-		
MB Position (adj. and supine)	9 (3.3)	4 (2.9)	5 (3.7)		0.001*	0.974	-		
Supine Burial	263 (98.1)	133 (98.5)	130 (97.7)		0.219	0.639	-		
Extended Burial	254 (94.7)	130 (96.2)	124 (93.2)		1.27	0.259	-		
Skull Position (Anatomical)	140 (52.2)	74 (54.8)	66 (49.6)		0.724	0.394	-		
Hand Position (Anatomical)	86 (32.0)	41 (30.3)	45 (33.8)		0.369	0.543	-		
Feet Position (Anatomical)	103 (38.4)	51 (37.7)	52 (39.0)		0.049	0.824	-		
Orientation (315-359°)	132 (49.2)	66 (48.8)	66 (49.6)		0.014	0.905	-		
Ochre Present	72 (26.8)	39 (28.8)	33 (24.8)		0.567	0.451	-		
Ochre Application (skull)	23 (8.5)	10 (7.4)	13 (9.7)		0.478	0.489	-		
Extra Clay Present	32 (11.9)	19 (14.0)	13 (9.7)		1.178	0.277	-		
Grey Clay	32 (11.9)	19 (14.0)	13 (9.7)		1.178	0.277	-		
Extra Clay Position (Skull)	12 (4.4)	7 (5.1)	5 (3.7)		0.318	0.572	-		

Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

TABLE 7.2.1: SUMMARY OF SUITE #1 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – BURIAL OF HUMAN REMAINS – NEOLITHIC

Age								Comparisons
	Total (n=66)	SA (n=22)	YA (n=31)	OA (n=13)				(SA, YA, OA)
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P		(X ² with Bonferroni correction)
Single Burial	56 (84.8)	16 (72.7)	28 (90.3)	12 (92.3)	3.8	0.149		-
Multiple Burial (MB)	10 (15.1)	5 (22.7)	5 (16.1)	-	0.366	0.545		
MB Style (3+ individuals)	6 (9.0)	1 (4.5)	4 (12.9)	1 (7.6)	0.413*	0.813		-
Supine Burial	61 (92.4)	21 (95.4)	28 (90.3)	12 (92.3)	0.484	0.785		-
Extended Burial	42 (63.6)	6 (27.2)	24 (77.4)	12 (92.3)	19.734	0.000		OA>YA>SA
Skull Position (Anatomical)	19 (28.7)	1 (4.5)	12 (38.7)	6 (46.1)	7.383*	0.024		OA>YA>SA
Hand Position (Anatomical)	6 (9.0)	-	3 (9.6)	3 (23.0)	0.49*	0.483		-
Feet Position (Anatomical)	9 (13.6)	-	5 (16.1)	4 (30.7)	0.475*	0.490		-
Orientation (1-44°)	13 (19.6)	3 (13.6)	3 (9.6)	7 (53.8)	9.132*	0.010		OA>SA>YA
Sex								
	Total (n=41)	Male (n=20)	Female (n=21)					Comparisons
	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P	X ²		
Single Burial	37 (90.2)	18 (90.0)	19 (90.4)		0.956			-
Multiple Burial (MB)	1 (2.4)	1 (5.0)	-	-	-			-
MB Style (3+ individuals)	-	-	-	-	-			-
MB Position (adj. and supine)	-	-	-	-	-			-

Supine Burial	37 (90.2)	18 (90.0)	19 (90.4)		0.003	0.956	-
Extended Burial	33 (80.4)	17 (85.0)	16 (76.1)		0.506	0.476	-
Skull Position (Anatomical)	17 (41.4)	9 (45.0)	8 (38.0)		0.201	0.653	-
Hand Position (Anatomical)	6 (14.6)	4 (20.0)	2 (9.5)		0.257*	0.612	-
Feet Position (Anatomical)	9 (21.9)	5 (25.0)	4 (19.0)		0.007*	0.933	-
Orientation (1-44°)	10 (24.3)	5 (25.0)	5 (23.8)		0.076	0.782	-

Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

death. Metal (i.e., bronze, iron) is present in graves, but is only included in a low number of burials. Bronze jewellery and iron tools were the most common artefact types recovered overall. Shell artefacts are a moderately abundant burial inclusion (37.9%) with items identified as jewellery dominating. Shell artefacts were manufactured in a range of beaded forms as armbands and bangles. Shell bangles were constructed from *Tridacna* sp. and *Trochus* sp. (Higham, 2010b). Stone was recovered from nearly sixty graves with items of jewellery (e.g. stone bangles) being the most frequently encountered. Agate, carnelian and glass is present in a small number of burials and only recovered from Iron Age graves.

7.3 Burial of Human Remains (Mortuary Suite #1)

Following on from an identification of normative mortuary behaviours at Ban Non Wat the relationship between funerary treatment and age-at-death and/or sex is now considered. Table 7.2 indicates that although single burials predominate (94.3%), no single age cohort is predisposed to burial in this manner. This also applies to the presence of supine burials. Where burials in an extended fashion are considered, adults in comparison to subadults, are more likely to be placed in the grave in this fashion with the elderly, proportionately, preferentially treated in this manner ($X^2=104.29$, $p=0.000$). The dichotomy here between adults and children reflects the high number of subadults buried in a flexed or semi-flexed manner at Ban Non Wat. The normative orientation (316-359°) is not clearly associated with any age-based cohort. Younger adults are more frequently buried with grey clay in their grave. Table 7.2 shows that, in relation to the Suite #1 outcomes outlined, sex is not a factor affecting funerary behaviour of the sample under review.

7.3.1 Burial of Human Remains (Mortuary Suite #1) – The Neolithic

Table 7.2.1 provides a separate overview of normative funerary behaviour at Ban Non Wat but only across the Neolithic period. This research includes ‘flexed’ burials, as identified by Higham and Wiriyaromp (2010), in the sample from this period. Outcomes (i.e., ochre present etc.) that were not observed from burials, by either age-at-death or sex, in this period were not included in Table 7.2.1. In comparison to the aggregated data from Ban Non Wat the Neolithic demonstrates a slight increase in multiple/double burials although it is not statistically significant. Burials, by age class, that are deposited in an extended fashion ($X^2=19.734$, $p=0.000$) and have the skull placed in an anatomical position ($X^2=7.383^*$, $p=0.024$) continue to be statistically significant here. The normative orientation in the Neolithic (1-44°, NNE) differs from that from the aggregated data with older adults being most likely to be buried in this position ($X^2=9.132^*$, $p=0.010$). Sex, in relation to this mortuary suite, is not a significant factor in the Neolithic at Ban Non Wat.

7.3.2 Burial of Human Remains (Mortuary Suite #1) – The Bronze Age

Table 7.2.2 shows an overview of normative mortuary behaviour at Ban Non Wat in the Bronze Age. In comparison to the aggregated data from Ban Non Wat the Bronze Age demonstrates a decrease in multiple/double burials although it is not statistically significant. Like the Neolithic the disaggregation of Suite #1 funerary data demonstrates a reduction in the number of outcomes by age-at-death where a statistically significant result is present. Again, the burial of adults generally, but elderly subjects specifically, in the sample in an extended fashion remains significant ($X^2=39.19$, $p=0.000$). Where position was identifiable, the placement of the hand in the non-normative location at the pelvis was the most frequent. Adults generally in comparison to subadults, but especially the younger adult category, were most likely to be buried with their hands in this position across the Neolithic. Ochre is most frequently, in the Bronze and Iron Ages at Ban Non Wat, found in a cluster invariably including ceramic artefacts, faunal remains (i.e., pig), Unionidae bivalves and/or grey clay and this cluster is normally positioned above the head or below the feet. While recognising this funerary activity, for the sake of consistency,

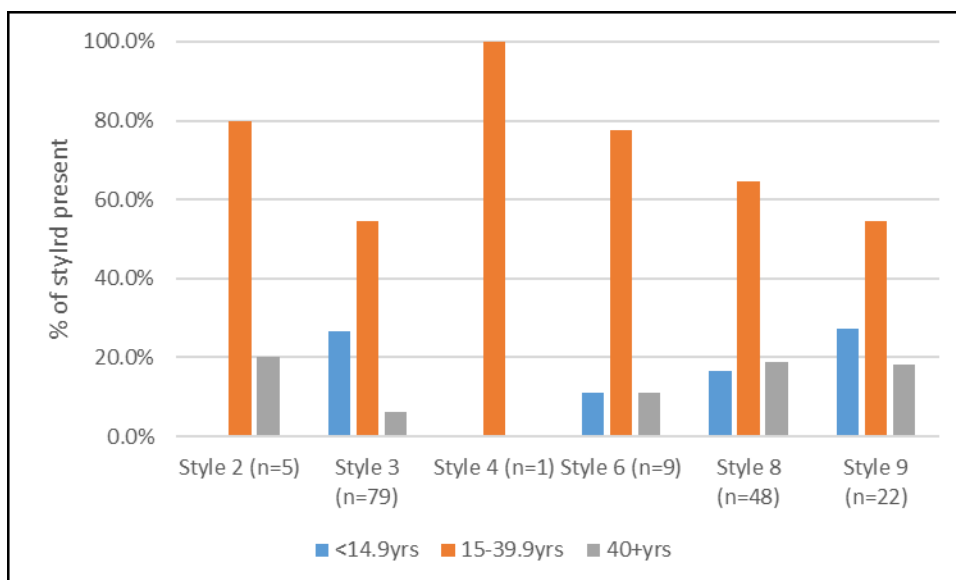


FIGURE 7.2: Potential containment styles at Ban Non Wat – Bronze Age

Style 2 = tight durable wrapping; Style 3 = loose non-durable wrapping; Style 4 = tight durable wrapping / narrow coffin; Style 6 = tight non-durable wrapping; Style 8 = tight durable or non-durable wrapping / narrow coffin; and Style 9 = loose or tight non-durable wrapping / tight durable wrapping

this research has reflected the presence of ochre in direct association with the human remains in both these temporal periods. As at the Neolithic period, sex continues to not be a factor affecting mortuary treatment at this time.

An analysis, in relation to field anthropology, was undertaken for burials across each temporal period at Ban Non Wat (also see Section 7.3.4). There were no statistically significant associations with possible containment styles in the Neolithic or Iron Age at the site. Although the proportionate sample of older adults is small in comparison to the observed rate of younger adults being buried in the Style 8 containment fashion (see Figure 7.2) a statistical assessment indicated an association between advanced age and this mortuary treatment during the Bronze Age at Ban Non Wat.

TABLE 7.2.2: SUMMARY OF SUITE #1 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – BURIAL OF HUMAN REMAINS – BRONZE AGE

Outcome	Age						Sex						Comparisons	
	Total (n=244)		SA (n=91)		YA (n=127)		OA (n=26)							
	Obs. (%)		Obs. (%)		Obs. (%)		Obs. (%)		X ²	P	(SA, YA, OA)	(X ² with Bonferroni correction)		
Single Burial	238 (97.5)		89 (97.8)		124 (97.6)		25 (96.1)		0.239	0.887	-	-		
Multiple Burial (MB)	6 (2.4)		2 (2.1)		3 (2.3)		1 (3.8)		0.109*	0.946	-	-		
MB Position (adj. and supine)	4 (1.6)		-		3 (2.3)		1 (3.8)		0.018*	0.893	-	-		
Supine Burial	243 (99.5)		91 (100.0)		126 (99.2)		26 (100.0)		0.925	0.629	-	-		
Extended Burial	210 (86.0)		62 (68.1)		122 (96.0)		26 (100.0)		39.19	0.000	OA>YA>SA			
Skull Position (Anatomical)	148 (60.6)		54 (59.3)		80 (62.9)		14 (53.8)		0.862	0.649	-	-		
Hand Position (Pelvis)	87 (35.6)		18 (19.7)		58 (45.6)		11 (42.3)		16.049	0.000	YA>OA>SA			
Feet Position (Anatomical)	97 (39.7)		19 (20.8)		68 (53.5)		10 (38.4)		23.63	0.000	YA>OA>SA			
Orientation (316-359°)	151 (61.8)		51 (56.0)		81 (63.7)		19 (73.0)		2.89	0.235	-	-		
Ochre Present	70 (28.6)		27 (29.6)		35 (27.5)		8 (30.7)		0.177	0.915	-	-		
Ochre Application (skull)	27 (11.0)		9 (9.8)		14 (11.0)		4 (15.3)		0.204*	0.903	-	-		
Extra Clay Present	14 (5.7)		5 (5.4)		8 (6.2)		1 (3.8)		0.022*	0.989	-	-		
Grey Clay	12 (4.9)		3 (3.2)		8 (6.2)		1 (3.8)		0.529*	0.767	-	-		
Extra Clay Position (Skull)	8 (3.2)		2 (2.1)		5 (3.9)		1 (3.8)		0.26*	0.878	-	-		
Outcome	Age						Sex						Comparisons	
	Total (n=145)		Male (n=71)		Female (n=74)									
	Obs. (%)		Obs. (%)		Obs. (%)		X ²	P	X ²					
Single Burial	141 (97.2)		69 (97.1)		72 (97.2)		0.002	0.964	-	-				
Multiple Burial (MB)	4 (2.7)		2 (2.8)		2 (2.7)		0.216*	0.642	-	-				
MB Position (adj. and supine)	4 (2.7)		2 (2.8)		2 (2.7)		0.216*	0.642	-	-				
Supine Burial	142 (97.9)		71 (100.0)		71 (95.9)		2.939	0.086	M>F					

Extended Burial	140 (96.5)	69 (97.1)	71 (95.9)		0.167	0.682	-
Skull Position (Anatomical)	90 (62.0)	46 (64.7)	44 (59.4)		0.437	0.508	-
Hand Position (Pelvis)	67 (46.2)	34 (47.8)	33 (44.5)		0.158	0.691	-
Feet Position (Anatomical)	74 (51.0)	37 (52.1)	37 (50.0)		0.065	0.798	-
Orientation (315-359°)	99 (68.2)	50 (70.4)	49 (66.2)		0.296	0.586	-
Ochre Present	41 (28.2)	22 (30.9)	19 (25.6)		0.504	0.477	-
Ochre Application (skull)	17 (11.7)	6 (8.4)	11 (14.8)		1.44	0.230	-
Extra Clay Present	8 (5.5)	4 (5.6)	4 (5.4)		0.092*	0.761	-
Grey Clay	8 (5.5)	4 (5.6)	4 (5.4)		0.092*	0.761	-
Extra Clay Position (Skull)	5 (3.4)	2 (2.8)	3 (4.0)		0.002*	0.964	-

Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

7.3.3 Burial of Human Remains (Mortuary Suite #1) – The Iron Age

Evidence from the Iron Age by and large reflects the behaviour observed from the Neolithic and the Bronze Age with extended burial deposition being the most notable statistically significant result from this suite of outcomes (see Table 7.2.3 below). Interestingly, adults are the only subjects, from a very small sample, that are exposed to the normative multiple/double burial styles in the Iron Age but there is no statistically significant result associated with this outcome. Although not statistically significant, subadults from the sample are universally included in single burials at the Iron Age of Ban Non Wat in comparison to adults of both classes.

7.3.4 Field Anthropology

Chapter Four identified Ban Non Wat being one of a handful of sites where a field anthropological analysis has occurred (Willis and Tayles, 2009, Harris and Tayles, 2012, Harris et al., 2016). Body containment styles (e.g., use of shrouds, coffins and other forms of constriction) were assessed by way of an examination of burial descriptions and photographs of the burials (with the assistance of Anna Willis' observations as personal communications).

A total of 198/459 (43.1%) of the sample demonstrated evidence of a range of cultural behaviours in relation to the constriction of the body at burial. The assessment identified 8/9 potential outcomes (Harris and Tayles 2012: 232) with the greatest occurrences (85/459, 18.5%) associated with loose non-durable wrapping (Style 3) and Style 8 (60/459, 13.0%) which, more openly, is categorised as tight durable or non-durable wrapping or a narrow coffin. Figure 7.3 shows the proportion of different constriction patterns across Ban Non Wat observed.

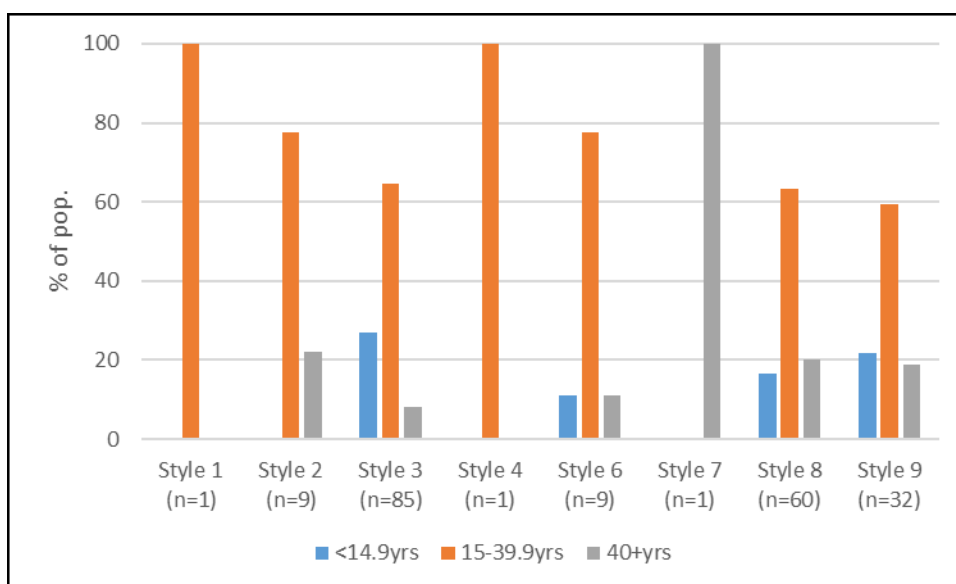


FIGURE 7.3: Potential containment styles at Ban Non Wat - Aggregated

TABLE 7.2.3: SUMMARY OF SUITE #1 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – BURIAL OF HUMAN REMAINS – IRON AGE

Age										Comparisons
	Total (n=149)	SA (n=49)	YA (n=83)	OA (n=17)						(SA, YA, OA)
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X2	P				(X2 with Bonferroni correction)
Single Burial	139 (93.2)	49 (100.0)	75 (90.3)	15 (88.2)	5.354	0.068				-
Multiple Burial (MB)	10 (6.7)	-	8 (9.6)	2 (11.7)	0.031*	0.860				-
MB Style (double - adult)	4 (2.6)	-	2 (2.4)	2 (11.7)	1.241*	0.265				-
MB Position (adj. and supine)	5 (3.3)	-	5 (6.0)	-	-	-				-
Supine Burial	149 (100.0)	49 (100.0)	83 (100.0)	17 (100.0)	0	1.000				-
Extended Burial	123 (82.5)	24 (48.9)	82 (98.7)	17 (100.0)	57.136	0.000				OA>YA>SA
Skull Position (Anatomical)	52 (34.8)	13 (26.5)	34 (40.9)	5 (29.4)	3.079	0.214				-
Hand Position (Anatomical)	46 (30.8)	6 (12.2)	35 (42.1)	5 (29.4)	12.947	0.001				YA>OA>SA
Feet Position (Anatomical)	26 (17.4)	4 (8.1)	19 (22.8)	3 (17.6)	3.763*	0.152				-
Orientation (316-359°)	53 (35.5)	17 (34.6)	29 (34.9)	7 (41.1)	0.264	0.876				-
Ochre Present	50 (33.5)	12 (24.4)	30 (36.1)	8 (47.0)	2.42	0.178				-
Ochre Application (skull)	15 (10.0)	6 (12.2)	6 (7.2)	3 (17.6)	0.935*	0.626				-
Extra Clay Present	31 (20.8)	6 (12.2)	22 (26.5)	3 (17.6)	3.001*	0.223				-
Grey Clay	31 (20.8)	6 (12.2)	22 (26.5)	3 (17.6)	3.001*	0.223				-
Extra Clay Position (Skull)	10 (6.7)	3 (6.1)	5 (6.0)	2 (11.7)	0.137*	0.933				-
Sex										
Total (n=82)	Male (n=44)	Female (n=38)								Comparisons
Obs. (%)	Obs. (%)	Obs. (%)			X2	P				X2
Single Burial	72 (87.8)	39 (88.6)	33 (86.8)		0.061	0.804				-
Multiple Burial (MB)	10 (12.1)	5 (11.3)	5 (13.1)		0.061	0.804				-
MB Style (double - adult)	4 (4.8)	2 (4.5)	2 (5.2)		0.132*	0.716				-

MB Position (adj. and supine)	5	(6.0)	2	(4.5)	3	(7.8)		0.029*	0.864	-
Supine Burial	82	(100.0)	44	(100.0)	38	(100.0)		0	1.000	-
Extended Burial	81	(98.7)	44	(100.0)	37	(97.3)		1.172	0.278	-
Skull Position (Anatomical)	33	(40.2)	19	(43.1)	14	(36.8)		0.341	0.559	-
Hand Position (Anatomical)	36	(43.9)	17	(38.6)	19	(50.0)		1.069	0.301	-
Feet Position (Anatomical)	20	(24.3)	9	(20.4)	11	(28.9)		0.798	0.371	-
Orientation (315-359°)	32	(39.0)	16	(36.3)	16	(42.1)		0.282	0.595	-
Ochre Present	31	(37.8)	17	(38.6)	14	(36.8)		0.028	0.867	-
Ochre Application (skull)	6	(7.3)	4	(9.0)	2	(5.2)		0.057*	0.811	-
Extra Clay Present	24	(29.2)	15	(34.0)	9	(23.6)		1.067	0.301	-
Grey Clay	24	(29.2)	15	(34.0)	9	(23.6)		1.067	0.301	-
Extra Clay Position (Skull)	7	(8.5)	5	(11.3)	2	(5.2)		0.348*	0.555	-

Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

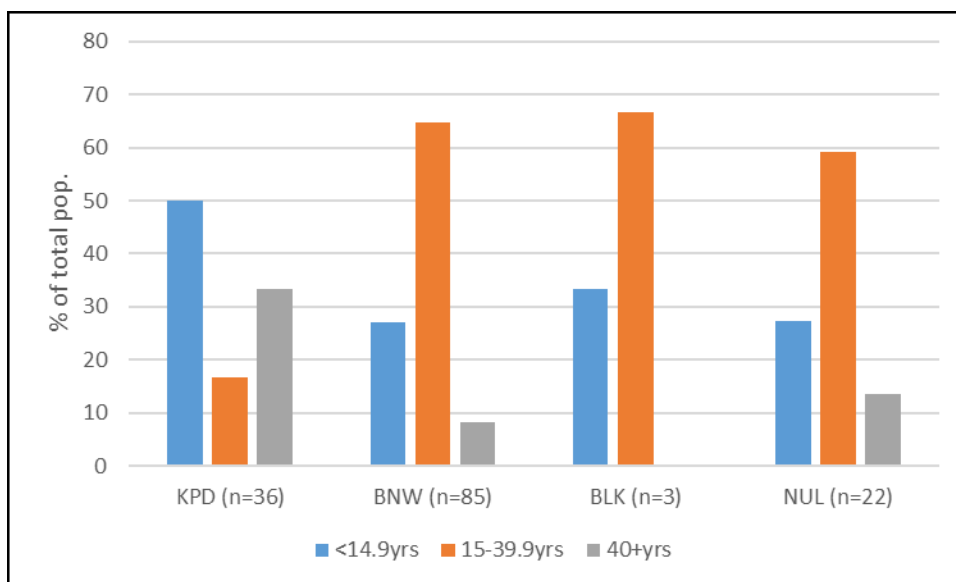


FIGURE 7.4: Comparison of Style 3 (loose non-durable wrapping) by site
KPD = Khok Phanom Di; BNW = Ban Non Wat; BLK = Ban Lum Khao; NUL = Noen U-Loke

Style 1 = wide coffin; Style 2 = tight durable wrapping; Style 3 = loose non-durable wrapping; Style 4 = tight durable wrapping / narrow coffin; Style 6 = tight non-durable wrapping; Style 7 = loose or tight non-durable wrapping; Style 8 = tight durable or non-durable wrapping / narrow coffin; and Style 9 = loose or tight non-durable wrapping / tight durable wrapping

Of those exposed to the more commonly encountered Style 3 (loose, non-durable wrapping), it is younger adults that are preferentially associated with this behaviour ($X^2=5.383$, $p=0.067$). The presence of Style 3 body treatment occurs mainly in the Bronze Age (69/85, 81.1%) and more specifically in BA4 (35/69, 50.7%). Figure 7.4 shows a comparison by site in relation to the presence of the Style 3 where it can be observed that the three sites in close proximity to one another, albeit with varying sample sizes, show some similarity in the distribution of this practice among the age-based cohorts used in this study. Greater discussion of funerary practices related to field anthropology and their potentiality as indicators of identity are held at Section 11.2.1.3.

The elderly (12/60, 20.0%) are statistically significantly associated with Style 8 (tight durable and/or non-durable wrapping or narrow coffin), which is the second most frequently observed body treatment ($X^2=10.251$, $p=0.005$) at Ban Non Wat. As with Style 3, the majority (48/60, 80.0%) of instances where Style 8 occur is across the Bronze Age ($X^2=9.974$, $p=0.006$) with the majority, again, occurring at BA4 (30/48, 62.5%). In contrast to what was observed above at Figure 7.4, there is a high degree of variability, based on age, in the use of Style 8 between the four sites under review (Figure 7.5).

7.4 Characteristics of Grave Environment (Mortuary Suite #2)

As alluded to in Section 7.2 and 7.3, subadults, as observed from many sites across prehistoric Southeast Asia, are most frequently (sometimes exclusively) associated with jar burial (Table 7.3). Of the children associated with jar burials, the majority occur in the Iron Age (c. 420BCE-CE200) and tend to be subadults (42/48, 87.5%) aged under one year-at-death ($X^2=61.773$, $p=0.000$). Table 7.3 shows that adult males have

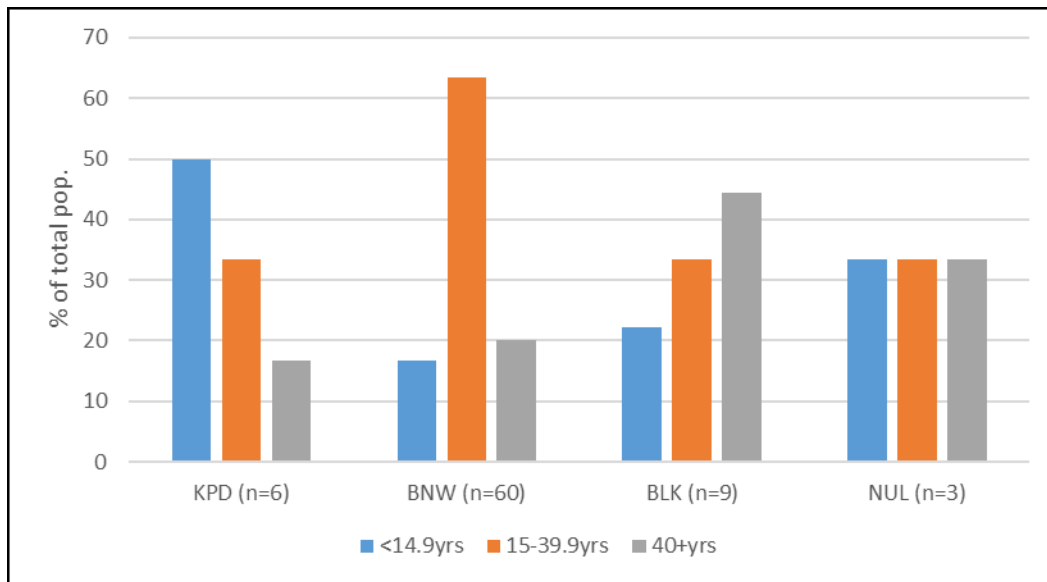


FIGURE 7.5: Comparison of Style 8 (tight durable and/or non-durable wrapping or narrow coffin) by site
KPD = Khok Phanom Di; BNW = Ban Non Wat; BLK = Ban Lum Khao; NUL = Noen U-Loke

a statistically significant association ($X^2=5.577$, $p=0.018$) with additional disposal container types (i.e. coffins, shrouds etc.) and were frequently found with wood and clay coffin burial types (11/16, 68.7%).

Table 7.3 indicates, as seen at Khok Phanom Di and Ban Lum Khao, that shallow grave depths were the most frequently encountered. The evidence indicates that neither age-at-death, although a greater proportion of elderly were buried in shallow graves at the site, or sex was a factor affecting which subjects were exposed to burial in a shallow grave at Ban Non Wat. This is continued in relation to the presence of features (i.e., hearths, pits etc.) in association with the burial.

7.4.1 Characteristics of Grave Environment (Mortuary Suite #2) – The Neolithic

Table 7.3.1 demonstrates some variability regarding Suite #2 outcomes in comparison to aggregated data. As commented above, the Neolithic at Ban Non Wat sees the only inclusion of adults in jar burials at the site from the sample applied in this study. Subadults, unsurprisingly, dominate the practice of inclusion in jar burials ($X^2=19.762^*$, $p=0.000$). The normative shallow grave depth, not significant under aggregated data, is statistically significant in the Neolithic with adults of both age classes, and elderly adults specifically, to be most likely to be buried in a shallow grave at this time ($X^2=11.847$, $p=0.002$). The position of hearths/pits differs from the aggregated data in the Neolithic with these features most frequently being positioned to the south of the buried subject. Although most frequently observed with the elderly and adult females, testing did not indicate any statistically significant relationship. Again, it can be observed there is no statistically significant relationship with any outcome by sex.

7.4.2 Characteristics of Grave Environment (Mortuary Suite #2) – The Bronze Age

A focus on the Bronze Age related to Suite #2 outcomes again notes changing patterns in comparison to overall mortuary data from the site. The exclusive inclusion of subadults in jar burials occurs from the Bronze Age at Ban Non Wat but is performed in fewer number of children in comparison to the Neolithic and Iron Age. Proportionately, the Bronze Age at Ban Non Wat sees the greatest number of burials across

TABLE 7.3: SUMMARY OF SUITE #2 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – CHARACTERISTICS OF THE GRAVE

Outcome	Age						Comparisons	
	Total (n=459)	SA (n=162)	YA (n=241)	OA (n=56)			(SA, YA, OA)	
	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X2	P	(X2 with Bonferroni correction)	
Jar Burial	50 (10.8)	48 (29.6)	2 (0.8)	-	71.312*	0.000	SA>YA	
Disposal Container Present	77 (16.7)	50 (30.8)	22 (9.1)	5 (8.9)	35.595	0.000	SA>YA=OA	
Grave Depth (0-25cm)	328 (71.4)	108 (66.6)	178 (73.8)	42 (75.0)	2.849	0.240		
Fire/Hearth/Pit Present	98 (21.3)	27 (16.6)	55 (22.8)	16 (28.5)	4.166	0.124		
Pit Position (North of burial)	24 (5.2)	7 (4.3)	15 (6.2)	2 (3.5)	0.485*	0.784		
Sex								
Outcome	Total (n=268)	Male (n=135)	Female (n=133)					
	Obs. (%)	Obs. (%)	Obs. (%)	X2	P	X2		
	Obs. (%)	Obs. (%)	Obs. (%)	X2	P	X2		
Jar Burial	2 (0.7)	1 (0.7)	1 (0.7)	0.489*	0.484			
Disposal Container Present	23 (8.5)	17 (12.5)	6 (4.5)	5.577	0.018	M>F		
Grave Depth (0-25cm)	203 (75.7)	100 (74.0)	103 (77.4)	0.414	0.519			
Fire/Hearth/Pit Present	67 (25.0)	36 (26.6)	31 (23.3)	0.403	0.525			
Pit Position (North of burial)	15 (5.5)	9 (6.6)	6 (4.5)	0.589	0.442			

Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

TABLE 7.3.1: SUMMARY OF SUITE #2 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – CHARACTERISTICS OF THE GRAVE - NEOLITHIC

Outcome	Age						Comparisons			
	Total (n=66)	SA (n=22)	YA (n=31)	OA (n=13)						(SA, YA, OA)
	Obs. (%)		Obs. (%)	Obs. (%)	Obs. (%)	X ²	P	X ²	P	(X ² with Bonferroni correction)
Jar Burial	17 (25.7)	15 (68.1)	2 (6.4)	-	-	19.762*	0.000	SA>YA		
Disposal Container Present	18 (27.2)	15 (68.1)	3 (9.6)	-	-	17.116*	0.000	SA>YA		
Grave Depth (0-25cm)	56 (84.8)	14 (63.6)	29 (93.5)	13 (100.0)		11.847	0.002	OA>YA>SA		
Fire/Hearth/Pit Present	25 (37.8)	8 (36.3)	10 (32.2)	7 (53.8)		1.846	0.397	-		
Pit Position (180°)	11 (16.6)	2 (9.0)	4 (12.9)	5 (38.4)		3.564*	0.168	-		
Outcome	Sex						Comparisons			
	Total (n=41)	Male (n=20)	Female (n=21)							
	Obs. (%)	Obs. (%)	Obs. (%)			X ²	P	X ²		
Jar Burial	2 (4.8)	1 (5.0)	1 (4.7)			0.476*	0.490	-		
Disposal Container Present	3 (7.3)	2 (10.0)	1 (4.7)			0.002*	0.964	-		
Grave Depth (0-25cm)	39 (95.1)	19 (95.0)	20 (95.2)			0.001	0.974	-		
Fire/Hearth/Pit Present	16 (39.0)	9 (45.0)	7 (33.3)			0.586	0.443	-		
Pit Position (180°)	9 (21.9)	3 (15.0)	6 (28.5)			0.452*	0.501	-		

Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X² Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance (P < 0.05); Post hoc testing carried out using Bonferroni's correction where appropriate.

TABLE 7.3.2: SUMMARY OF SUITE #2 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – CHARACTERISTICS OF THE GRAVE – BRONZE AGE

Outcome	Age						Comparisons	
	Total (n=244)	SA (n=91)	YA (n=127)	OA (n=26)				
	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X2	P	(SA, YA, OA)	(X2 with Bonferroni correction)
Jar Burial	15 (6.1)	15 (16.4)	-	-	-	-		
Disposal Container Present	38 (15.5)	17 (18.6)	16 (12.5)	5 (19.2)	1.788	0.409	-	-
Grave Depth (0-25cm)	225 (92.2)	82 (90.1)	118 (92.9)	25 (96.1)	1.21	0.546	-	-
Fire/Hearth/Pit Present	51 (20.9)	13 (14.2)	31 (24.4)	7 (26.9)	3.925	0.140	-	-
Pit Position (North of burial)	11 (4.5)	2 (2.1)	8 (6.2)	1 (3.8)	1.328*	0.514	-	-
Sex								
Outcome	Total (n=145)	Male (n=71)	Female (n=74)				Comparisons	
	Obs. (%)	Obs. (%)	Obs. (%)	X2	P	X2		
	Obs. (%)	Obs. (%)	Obs. (%)	X2	P	X2		
Disposal Container Present	20 (13.7)	15 (21.1)	5 (6.7)	6.293	0.012	M>F		
Grave Depth (0-25cm)	135 (93.1)	65 (91.5)	70 (94.5)	0.523	0.469	-		
Fire/Hearth/Pit Present	37 (25.5)	19 (26.7)	18 (24.3)	0.113	0.736	-		
Pit Position (North of burial)	9 (6.2)	5 (7.0)	4 (5.4)	0.004*	0.949	-		

Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance (P < 0.05); Post hoc testing carried out using Bonferroni's correction where appropriate.

TABLE 7.3.3: SUMMARY OF SUITE #2 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – CHARACTERISTICS OF THE GRAVE – IRON AGE

Outcome	Age						Comparisons	
	Total (n=149)	SA (n=49)	YA (n=83)	OA (n=17)			(SA, YA, OA)	
	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X2	P	(X2 with Bonferroni correction)	
Jar Burial	18 (12.0)	18 (36.7)	-	-	-	-	-	
Disposal Container Present	21 (14.0)	18 (36.7)	3 (3.6)	-	35.595	0.000	SA>YA	
Grave Depth (0-25cm)	47 (31.5)	12 (24.4)	31 (37.3)	4 (23.5)	2.849	0.240	-	
Fire/Hearth/Pit Present	22 (14.7)	6 (12.2)	14 (16.8)	2 (11.7)	4.166	0.124	-	
Pit Position (315-359°)	6 (4.0)	1 (2.0)	5 (6.0)	-	0.396*	0.529	-	
Sex								
	Total (n=82)	Male (n=44)	Female (n=38)			Comparisons		
	Obs. (%)	Obs. (%)	Obs. (%)			X2	P	X2
Grave Depth (0-25cm)	29 (35.3)	16 (36.3)	13 (34.2)			0.041	0.839	
Fire/Hearth/Pit Present	14 (17.0)	8 (18.1)	6 (15.7)			0.082	0.774	
Pit Position (315-359°)	5 (6.0)	3 (6.8)	2 (5.2)			0.029*	0.864	

Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

the age classes deposited at the normative shallow grave depth. Although not significant where age is considered there is a sizeable increase in the number of adults that were buried in a disposal container in the Bronze Age. This changes where sex is reviewed with males, at this time, being most likely to be included in a disposal container at burial ($X^2=6.293$, $p=0.012$).

7.4.3 Characteristics of Grave Environment (Mortuary Suite #2) – The Iron Age

Table 7.3.3 shows very low numbers, of subjects from all age classes, being buried in the normative shallow grave. Interestingly, a higher proportion of children are included in jar burials at the Iron Age in comparison to the other two periods. No adults that were assigned a biological sex from the sample were associated with a disposal container. Also, no elderly adults, in this period, were interred in a clearly defined disposal container. The positioning of hearths/pits associated with graves is slightly west ($315-359^\circ$) of the normative in the aggregated dataset. This deviation of behaviour does not witness any statistically significant activity via age or sex. Table 7.3.3. reflects that a shallow grave is the normative in the Iron Age at Ban Non Wat which is also the case in relation to aggregated data. The normative grave depth at all sites, as is the case at Ban Non Wat in all periods, invariably tends to be largely dominated by shallow grave depths as defined in this study. While shallow grave depth remains dominant during this period the number of burials, of known grave depths, is witnessed to be more evenly spread (1-25cm ($n=43$), 26-50cm ($n=38$), 51+cm ($n=37$)) at Ban Non Wat during the Iron Age than of any other site, or period, including the Iron Age occupation at Noen U-Loke (1-25cm ($n=29$), 26-50cm ($n=68$), 51+cm ($n=2$)).

7.5 Faunal Remains (Mortuary Suite #3)

As seen at Table 7.1, over half of the sample population at Ban Non Wat were buried with faunal remains with favoured fauna including pig, fish and bivalves, although a range of other mammals are also present. There was no cohort which was significantly associated with faunal remains. Sex, in general, is not a factor affecting the inclusion of fauna in burials from the sample from Ban Non Wat.

A general trend, as seen at Table 7.4, is that the elderly, proportionately, have a greater likelihood for being buried with fauna, generally, and some species types, more specifically, at Ban Non Wat although with only one instance of statistical significance. This occurs in relation to the presence of bovid and, to a lesser extent, fish. Where bovids are concerned, adults of both cohorts are statistically more likely to be buried with this fauna type in comparison to subadults. Although not significant, Table 7.4 shows that the elderly proportionately, have a greater likelihood of having fish included in their burial. Where fauna is normatively buried in association with an artefact within an individual grave complex ($X^2=3.324$, $p=0.189$), this study considered the deposition of fauna directly in association with the individual (i.e., skull) which showed no significance by age-at-death or sex. The inclusion of fauna in graves occurs in the greatest number of burials (58/89, 65.1%) from the mid-bronze age (Bronze Age 4, c. 800-700BCE) to the early Iron Age (c. 420-150BCE).

7.5.1 Faunal Remains (Mortuary Suite #3) – Neolithic, Bronze and Iron Age

Tables 7.4.1 and 7.4.2 show that there is no statistically significant behaviour in relation to the inclusion of fauna in burials in the Neolithic or the Bronze Age in respect to the age classes or sex under review. This is relatively consistent with aggregated data in relation to this suite of activity. At the Neolithic period it can be observed that the elderly, proportionately, are more frequently buried with faunal taxa under review in comparison to younger adults and subadults. This changes somewhat at the Bronze Age with increasing levels of younger adults to be buried with fauna studied here. The most frequently identified fish type recovered from graves during the Bronze Age (see Table 7.4.2) is *Channa* sp. This activity deviates from the normative deposition of *Clarias* sp. articulated in the aggregated data. Of the

TABLE 7.4: SUMMARY OF SUITE #3 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – FAUNAL REMAINS

Age										Comparisons	
	Total (n=459)	SA (n=162)	YA (n=241)	OA (n=56)						(SA, YA, OA)	
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X2	P	(X2 with Bonferroni correction)				
Fauna Present	258 (56.2)	83 (51.2)	139 (57.6)	36 (64.2)	3.324	0.189	-				
Fauna Position (with artefact)	140 (30.5)	54 (33.3)	65 (26.9)	21 (37.5)	3.324	0.189	-				
Pig Present	113 (24.6)	39 (24.0)	62 (25.7)	12 (21.4)	0.492	0.781	-				
Pig Position (Skull)	50 (10.8)	14 (8.6)	30 (12.4)	6 (10.7)	1.148	0.484	-				
Unionidae Present	148 (32.2)	48 (29.6)	80 (33.1)	20 (35.7)	0.915	0.632	-				
Unionidae Position (Skull)	64 (13.9)	27 (16.6)	31 (12.8)	6 (10.7)	1.722	0.422	-				
Bovid Present	23 (5.0)	2 (1.2)	17 (7.0)	4 (7.1)	5.979*	0.050	-				
Fish Present	126 (27.4)	40 (24.6)	64 (26.5)	22 (39.2)	4.655	0.097					
Channa sp.	82 (17.8)	23 (14.1)	45 (18.6)	14 (25.0)	3.535	0.170	-				
Sex											
	Total (n=268)	Male (n=135)	Female (n=133)							Comparisons	
	Obs. (%)	Obs. (%)	Obs. (%)	X2	P	X2					
Fauna Present	159 (59.3)	85 (62.9)	74 (55.6)	1.489	0.222	-					
Fauna Position (with artefact)	79 (29.4)	42 (31.1)	37 (27.8)	0.349	0.554	-					
Pig Present	68 (25.3)	31 (22.9)	37 (27.8)	0.835	0.360	-					
Pig Position (Skull)	32 (11.9)	14 (10.3)	18 (13.5)	0.638	0.424	-					
Unionidae Present	95 (35.4)	48 (35.5)	47 (35.3)	0.001	0.974	-					

Unionidae Position (Skull)	35	(13.0)	18	(13.3)	17	(12.7)		0.018	0.893	-
Bovid Present	18	(6.7)	12	(8.8)	6	(4.5)		2.049	0.152	-
Fish Present	77	(28.7)	44	(32.5)	33	(24.8)		1.981	0.159	-
Channa sp.	52	(19.4)	29	(21.4)	23	(17.2)		0.751	0.386	-

Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate

TABLE 7.4.1: SUMMARY OF SUITE #3 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – FAUNAL REMAINS – NEOLITHIC

Age										Comparisons
	Total (n=66)	SA (n=22)	YA (n=31)	OA (n=13)						(SA, YA, OA)
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P				(X ² with Bonferroni correction)
Fauna Present	20 (30.3)	5 (22.7)	11 (35.4)	4 (30.7)	0.55*	0.759				-
Fauna Position (Skull)	7 (10.6)	2 (9.0)	4 (12.9)	1 (7.6)	0.041*	0.979				-
Pig Present	5 (7.5)	-	4 (12.9)	1 (7.6)	0.001*	0.974				-
Pig Position (Skull)	4 (6.0)	-	3 (9.6)	1 (7.6)	0.001*	0.974				-
Unionidae Present	13 (19.6)	3 (13.6)	6 (19.3)	4 (30.7)	0.66*	0.718				-
Unionidae Position (Skull)	6 (9.0)	2 (9.0)	3 (9.6)	1 (7.6)	0.271*	0.873				-
Fish Present	5 (7.5)	1 (4.5)	3 (9.6)	1 (7.6)	0.287*	0.866				-
Channa sp.	3 (4.5)	1 (4.5)	2 (6.4)	-		0.094*				0.759
Sex										
Total (n=41)	Male (n=20)	Female (n=21)								Comparisons
Obs. (%)	Obs. (%)	Obs. (%)								X ²
Fauna Present	15 (36.5)	8 (40.0)			7 (33.3)	0.196				0.657
Fauna Position (with artefact)	5 (12.1)	4 (20.0)			1 (4.7)	1.026*				0.311
Pig Present	5 (12.1)	4 (20.0)			1 (4.7)	1.026*				0.311
Pig Position (Skull)	4 (9.7)	4 (20.0)			-	-				-

Unionidae Present	10 (24.3)	5 (25.0)			5 (23.8)	0.008	0.928
Unionidae Position (Skull)	4 (9.7)	2 (10.0)			2 (9.5)	0.226*	0.634
Fish Present	4 (9.7)	2 (10.0)			2 (9.5)	0.226*	0.634
Channa sp.	2 (4.8)	2 (10.0)	-	-	-	-	

Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

TABLE 7.4.2: SUMMARY OF SUITE #3 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – FAUNAL REMAINS – BRONZE AGE

Age										Comparisons	
	Total (n=244)	SA (n=91)	YA (n=127)	OA (n=26)						(SA, YA, OA)	
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X2	P				(X2 with Bonferroni correction)	
Fauna Present	145 (59.4)	52 (57.1)	73 (57.4)	20 (76.9)	3.697	0.157				-	
Fauna Position (Skull)	55 (22.5)	21 (23.0)	28 (22.0)	6 (23.0)	0.037	0.981				-	
Pig Present	68 (27.8)	25 (27.4)	34 (26.7)	9 (34.6)	0.672	0.714				-	
Pig Position (Skull)	26 (10.6)	9 (9.8)	14 (11.0)	3 (11.5)	0.034*	0.983				-	
Unionidae Present	89 (36.4)	33 (36.2)	45 (35.4)	11 (42.3)	0.443	0.801				-	
Unionidae Position (Skull)	45 (18.4)	20 (21.9)	22 (17.3)	3 (11.5)	1.013*	0.602				-	
Bovid Present	6 (2.4)	1 (1.0)	4 (3.1)	1 (3.8)	0.327*	0.849				-	
Fish Present	64 (26.2)	21 (23.0)	32 (25.1)	11 (42.3)	4.011	0.134				-	
Clarias sp.	36 (14.7)	13 (14.2)	16 (12.5)	7 (26.9)	3.546	0.169				-	
Sex											
	Total (n=145)	Male (n=71)	Female (n=74)							Comparisons	
	Obs. (%)	Obs. (%)	Obs. (%)	X2	P	X2				X2	
Fauna Present	89 (61.3)	45 (63.3)	44 (59.4)			0.235			0.627	-	
Fauna Position (Skull)	32 (22.0)	14 (19.7)	18 (24.3)			0.447			0.503	-	
Pig Present	42 (28.9)	19 (26.7)	23 (31.0)			0.329			0.566	-	
Pig Position (Skull)	16 (11.0)	7 (9.8)	9 (12.1)			0.196			0.657	-	
Unionidae Present	54 (37.2)	28 (39.4)	26 (35.1)			0.287			0.592	-	

Unionidae Position (Skull)	23 (15.8)	11 (15.4)	12 (16.2)		0.014	0.905	-
Bovid Present	5 (3.4)	2 (2.8)	3 (4.0)		0.002*	0.964	-
Fish Present	41 (28.2)	22 (30.9)	19 (25.6)		0.504	0.477	-
Clarias sp.	23 (15.8)	11 (15.4)	12 (16.2)		0.014	0.905	-

Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9 years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

TABLE 7.4.3: SUMMARY OF SUITE #3 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – FAUNAL REMAINS – IRON AGE

Age										Comparisons	
	Total (n=149)	SA (n=49)	YA (n=83)	OA (n=17)						(SA, YA, OA)	
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X2	P				(X2 with Bonferroni correction)	
Fauna Present	93 (62.4)	26 (53.0)	55 (66.2)	12 (70.5)	2.836	0.242	-			-	
Fauna Position (Skull)	27 (18.1)	7 (14.2)	15 (18.0)	5 (29.4)	1.947	0.377	-			-	
Pig Present	40 (26.8)	14 (28.5)	24 (28.9)	2 (11.7)	1.379*	0.501	-			-	
Pig Position (Skull)	20 (13.4)	5 (10.2)	13 (15.6)	2 (11.7)	0.419*	0.810	-			-	
Unionidae Present	46 (30.8)	12 (24.4)	29 (34.9)	5 (29.4)	1.596	0.450	-			-	
Unionidae Position (Skull)	13 (8.7)	5 (10.2)	6 (7.2)	2 (11.7)	0.096*	0.953	-			-	
Bovid Present	17 (11.4)	1 (2.0)	13 (15.6)	3 (17.6)	4.656*	0.097	-			-	
Fish Present	57 (38.2)	18 (36.7)	29 (34.9)	10 (58.8)	3.479	0.175	-			-	
Channa sp.	44 (29.5)	14 (28.5)	22 (26.5)	8 (47.0)	2.896	0.235	-			-	
Sex											
	Total (n=82)	Male (n=44)	Female (n=38)							Comparisons	
	Obs. (%)	Obs. (%)	Obs. (%)	X2	P	X2				X2	
Fauna Present	55 (67.0)	32 (72.7)	23 (60.5)	1.374	0.241	-				-	
Fauna Position (Skull)	16 (19.5)	7 (15.9)	9 (23.6)	0.785	0.375	-				-	
Pig Present	21 (25.6)	8 (18.1)	13 (34.2)	2.75	0.097	F>M					
Pig Position (Skull)	12 (14.6)	3 (6.8)	9 (23.6)	3.391*	0.065	F>M					
Unionidae Present	31 (37.8)	15 (34.0)	16 (42.1)	0.557	0.455	-				-	

Unionidae Position (Skull)	8	(9.7)	5	(11.3)	3	(7.8)		0.024*	0.876	-
Bovid Present	13	(15.8)	10	(22.7)	3	(7.8)		2.343*	0.125	-
Fish Present	32	(39.0)	20	(45.4)	12	(31.5)		1.65	0.198	-
Channa sp.	25	(30.4)	14	(31.8)	11	(28.9)		0.079	0.778	-

Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

six fish species most frequently recovered *Channa* sp., along with *Clarias* sp. and *Anabas* sp., are the most commonly removed during excavation in association with human burial. The subject's sex, in either the Neolithic or Bronze periods, appears to influence mortuary treatment in relation to fauna.

Table 7.4.3 exhibits some variation to this trend occurring from the Iron Age where bovids, by age-at-death, are included in funerary furniture and where pigs and the normative positioning of pig remains, by sex, occurs. Adults generally, and the elderly proportionately, show a potential to be statistically significantly associated with bovids ($X^2=4.656^*$, $p=0.097$). Similarly, adult females in the Iron Age demonstrate a potential statistical significance for having pig included in their funerary furniture and frequently at the normative position of the head.

7.6 Material Culture (Mortuary Suite #5)

As discussed at Chapter Four, a wide variety of local and non-local artefacts have been recovered from mortuary and non-mortuary settings at Ban Non Wat. Higham (2009) relates that a considerable volume of ceramic artefacts has been excavated including nearly a thousand spindle whorls. There is also considerable evidence of local manufacturing industries at the site (Higham, 2008, Barribeau, 2011, Cameron, 2012a, Geary, 2012, Higham, 2012d, Higham, 2012g). Ceramic artefacts found in mortuary contexts include a variety of vessels (i.e., bowls, jars, platters etc.), whorls, pellets, moulds, rollers and anvils (Higham, 2009c, Higham, 2010b, Cameron, 2012b). Shell artefacts found include a variety of jewellery items (i.e., necklaces, bangles, belts etc.) and tools (Higham, 2009c). Similarly, stone artefacts recovered from mortuary contexts include a variety of tools and items of jewellery (i.e., beads, bangles) (Higham, 2009c, Higham, 2010b). There is considerable evidence for metal production at the site and metal objects are present in mortuary contexts. In comparison to other artefact types, however, metal was not recovered from a large number of graves. Metal artefacts (i.e., bronze, iron, bimetallic, gold etc.) recovered from mortuary contexts were cast as tools (e.g., chisel, knives, sickles, hoes, burnishing stones etc.), weapons (e.g., points, spears) and items of jewellery (e.g., bangles, bells etc.). Items of bone or tooth found in the sample include ornaments, tools (i.e., adze, chisel, worked bone) and jewellery (i.e., beads (ivory), bangles, earplugs). Table 7.5 shows that the inclusion of grave goods was very common at Ban Non Wat with the majority of graves containing at least one artefact. Comparable rates of grave good inclusion can be observed by age-at-death and sex, particularly with regard to ceramic artefacts.

Table 7.5 shows that while most graves included ceramics, there are statistically significant differences in terms of ceramic type 1a and the positioning of ceramics by the head (more often found with elderly adults) and < 5 ceramics in any given burial (more often seen with subadults). Where subadults were reviewed independently, it was the youngest ages (<1 year-at-death) that were statistically significantly most likely (54/112, 48.2%) to be buried with the lowest quantum of ceramic items ($X^2=8.395$, $p=0.003$). Adult female burials were most frequently associated with the inclusion of spindle whorls ($X^2=5.78$, $p=0.016$). It is interesting that these spindle whorls, as industrial objects, are associated with children and primarily those older children aged over one year ($X^2=4.281^*$, $p=0.038$). There is some variation, by sex, where males show a statistical significance through having ceramic artefacts positioned at their head ($X^2=5.358$, $p=0.020$) with females being most likely to be buried with low frequencies of ceramics (<5 per person).

Table 7.5 shows limited trends in terms of age or sex with regard to bronze and copper artefacts, or specific jewellery types (i.e., bangles, earrings, bells and rings) for that matter, although fewer subadults had stone bangles. On the other hand, when looking at iron artefacts, both iron in general and iron tools specifically are more often found in adult, than subadult, graves. Where age as a factor is concerned, younger adults have a statistically significant association with iron, generally, and also iron tools. Older

TABLE 7.5: SUMMARY OF SUITE #5 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – MATERIAL CULTURE

Outcome	Age										Comparisons	
	Total (n=459)	SA (n=162)	YA (n=241)	OA (n=56)							(SA, YA, OA)	
	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X2	P			(X2 with Bonferroni correction)		
Grave Good Present	417 (90.8)	148 (91.3)	218 (90.4)	51 (91.0)	0.099	0.951	-					
Ceramic Good Present	402 (87.5)	143 (88.2)	209 (86.7)	50 (89.2)	0.384	0.825	-					
1a simple unrestricted bowl	176 (38.3)	46 (28.3)	99 (41.0)	31 (55.3)	14.401	0.000	OA>YA>SA					
Ceramic Frequency (<5 pieces)	247 (53.8)	112 (69.1)	108 (44.8)	27 (48.2)	23.863	0.000	SA>OA>YA					
Ceramic Position (Skull)	276 (60.1)	80 (49.3)	155 (64.3)	41 (73.2)	13.565	0.001	OA>YA>SA					
Ceramic Decoration Present	331 (72.1)	115 (70.9)	172 (71.3)	44 (78.5)	1.33	0.514	-					
Whorl	54 (11.7)	12 (7.4)	34 (14.1)	8 (14.2)	4.581	0.101	-					
Clay Pellet	10 (2.1)	3 (1.8)	4 (1.6)	3 (5.3)	1.483*	0.476	-					
Anvil	8 (1.7)	1 (0.6)	6 (2.4)	1 (1.7)	1.277*	0.528	-					
Conical Roller	14 (3.0)	3 (1.8)	8 (3.3)	3 (5.3)	0.815*	0.665	-					
Bronze Present	27 (5.8)	11 (6.7)	15 (6.2)	1 (1.7)	1.151*	0.562	-					
Bronze Jewellery	17 (3.7)	7 (4.3)	9 (3.7)	1 (1.7)	0.229*	0.891	-					
Bronze Freq. (<5 pcs.)	21 (4.5)	9 (5.5)	11 (4.5)	1 (1.7)	0.65*	0.722	-					
Bronze Position (Hand)	11 (2.3)	3 (1.8)	8 (3.3)	-		0.33*	0.565					
Iron Present	37 (8.0)	4 (2.4)	27 (11.2)	6 (10.7)	9.136*	0.010	YA>OA>SA					
Iron Tools	23 (5.0)	1 (0.6)	19 (7.8)	3 (5.3)	9.312*	0.009	YA>OA>SA					
Iron Freq. (<5 pcs.)	30 (6.5)	4 (2.4)	20 (8.2)	6 (10.7)	5.689*	0.058	-					
Iron Position (Arms)	9 (1.9)	1 (0.6)	6 (2.4)	2 (3.5)	1.182*	0.553	-					
Shell Present	174 (37.9)	44 (27.1)	107 (44.3)	23 (41.0)	12.501	0.001	YA>OA>SA					

Shell Jewellery	173	(37.6)	43	(26.5)	107	(44.3)	23	(41.0)	13.462	0.001	YA>OA>SA
Shell Freq. (<500 pcs.)	142	(30.9)	38	(23.4)	88	(36.5)	16	(28.5)	7.898	0.019	-
Shell Position (Skull)	64	(13.9)	12	(7.4)	41	(17.0)	11	(19.6)	9.175	0.010	OA>YA>SA
Shell Beads Present	140	(30.5)	40	(24.6)	82	(34.0)	18	(32.1)	4.062	0.131	-
Loose Shell Beads	116	(25.2)	33	(20.3)	69	(28.6)	14	(25.0)	3.503	0.173	-
Shell Beads Freq. (<500 pcs.)	109	(23.7)	35	(21.6)	62	(25.7)	12	(21.4)	1.098	0.577	-
Shell Beads Position (Skull)	55	(11.9)	12	(7.4)	32	(13.2)	11	(19.6)	6.714	0.034	-
Shell Bangle Present	86	(18.7)	15	(9.2)	57	(23.6)	14	(25.0)	14.823	0.000	OA>YA>SA
Shell Bangle Material (Trochus)	59	(12.8)	5	(3.0)	43	(17.8)	11	(19.6)	21.455	0.000	OA>YA>SA
Shell Bangle Freq. (<5 pcs.)	50	(10.8)	11	(6.7)	30	(12.4)	9	(16.0)	4.957	0.083	-
Stone Present	86	(18.7)	18	(11.1)	53	(21.9)	15	(26.7)	10.247	0.005	OA>YA>SA
Stone Jewellery	54	(11.7)	9	(5.5)	36	(14.9)	9	(16.0)	9.355	0.009	OA>YA>SA
Stone Freq. (<5 pcs.)	83	(18.0)	18	(11.1)	52	(21.5)	13	(23.2)	8.297	0.015	OA>YA>SA
Stone Position (Hand)	36	(7.8)	7	(4.3)	21	(8.7)	8	(14.2)	6.249	0.043	-
Agate Present	10	(2.1)	2	(1.2)	6	(2.4)	2	(3.5)	0.385*	0.824	-
Agate Freq. (<5 pcs.)	9	(1.9)	2	(1.2)	5	(2.0)	2	(3.5)	0.308*	0.857	-
Agate Position (Skull)	8	(1.7)	2	(1.2)	5	(2.0)	1	(1.7)	0.296*	0.862	-
Carnelian Present	4	(0.8)	-	-	2	(0.8)	2	(3.5)	0.921*	0.337	-
Carnelian Freq. (<5 pcs.)	4	(0.8)	-	-	2	(0.8)	2	(3.5)	0.921*	0.337	-
Stone Bangle Present	39	(8.4)	7	(4.3)	25	(10.3)	7	(12.5)	5.879	0.052	-
Stone Bangle Freq. (<5 pcs.)	39	(8.4)	7	(4.3)	25	(10.3)	7	(12.5)	5.879	0.052	-
Glass Present	9	(1.9)	4	(2.4)	4	(1.6)	1	(1.7)	0.195*	0.907	-
Glass Freq. (<5 pcs.)	7	(1.5)	3	(1.8)	3	(1.2)	1	(1.7)	0.258*	0.924	-

Glass Position (Skull)	6	(1.3)	2	(1.2)	3	(1.2)	1	(1.7)	0.184*	0.912	-
Bone/Tooth Present	11	(2.3)	5	(3.0)	5	(2.0)	1	(1.7)	0.133*	0.935	-
Bone/Tooth Jewellery	7	(1.5)	4	(2.4)	2	(0.8)	1	(1.7)	0.966*	0.616	-
Bone/Tooth Freq. (<5 pcs.)	9	(1.9)	3	(1.8)	5	(2.0)	1	(1.7)	0.195*	0.907	-
Bone/Tooth Position (Skull)	4	(0.8)	2	(1.2)	1	(0.4)	1	(1.7)	0.179*	0.914	-
Sex											
	Total (n=268)		Male (n=135)		Female (n=133)						Comparisons
	Obs. (%)		Obs. (%)		Obs. (%)		X2		P	X2	
Grave Good Present	240 (89.5)		121 (89.6)		119 (89.4)		0.002		0.964	-	
Ceramic Good Present	233 (86.9)		120 (88.8)		113 (84.9)		0.91		0.340	-	
1a simple unrestricted bowl	119 (44.4)		64 (47.4)		55 (41.3)		0.995		0.318	-	
Ceramic Frequency (<5 pieces)	117 (43.6)		52 (38.5)		65 (48.8)		2.92		0.087	F>M	
Ceramic Position (Skull)	183 (68.2)		101 (74.8)		82 (61.6)		5.358		0.020	M>F	
Ceramic Decoration Present	194 (72.3)		101 (74.8)		93 (69.9)		0.802		0.370	-	
Whorl	35 (13.0)		11 (8.1)		24 (18.0)		5.78		0.016	F>M	
Clay Pellet	7 (2.6)		5 (3.7)		2 (1.5)		0.557*		0.455	-	
Anvil	7 (2.6)		3 (2.2)		4 (3.0)		0*		1.000	-	
Conical Roller	9 (3.3)		6 (4.4)		3 (2.2)		0.43*		0.511	-	
Bronze Present	12 (4.4)		8 (5.9)		4 (3.0)		0.739*		0.389	-	
Bronze Jewellery	6 (2.2)		3 (2.2)		3 (2.2)		0.156*		0.692	-	
Bronze Freq. (<5 pcs.)	10 (3.7)		6 (4.4)		4 (3.0)		0.089*		0.765	-	
Bronze Position (Hand)	4 (1.4)		3 (2.2)		1 (0.7)		0.239*		0.624	-	
Iron Present	26 (9.7)		18 (13.3)		8 (6.0)		4.096		0.042	M>F	

7 RESULTS: BAN NON WAT

Iron Tools	17	(6.3)	12	(8.8)	5	(3.7)		2,967	0.084	M>F
Iron Freq. (<5 pcs.)	21	(7.8)	14	(10.3)	7	(5.2)		2.42	0.119	-
Iron Position (Arms)	7	(2.6)	5	(3.7)	2	(1.5)		0.557*	0.455	-
Shell Present	125	(46.6)	64	(47.4)	61	(45.8)		0.064	0.800	-
Shell Jewellery	125	(46.6)	64	(47.4)	61	(45.8)		0.064	0.800	-
Shell Freq. (<500 pcs.)	99	(36.9)	51	(37.7)	48	(36.0)		0.082	0.774	-
Shell Position (Skull)	52	(19.4)	28	(20.7)	24	(18.0)		0.311	0.577	-
Shell Beads Present	98	(36.5)	50	(37.0)	48	(36.0)		0.026	0.871	-
Loose Shell Beads	81	(30.2)	42	(31.1)	39	(29.3)		0.102	0.749	-
Shell Beads Freq. (<500 pcs.)	72	(26.8)	38	(28.1)	34	(25.5)		0.228	0.633	-
Shell Beads Position (Skull)	43	(16.0)	23	(17.0)	21	(15.7)		0.076	0.782	-
Shell Bangle Present	68	(25.3)	34	(25.1)	34	(25.5)		0.005	0.943	-
Shell Bangle Material (Trochus)	53	(19.7)	27	(20.0)	26	(19.5)		0.009	0.924	-
Shell Bangle Freq. (<5 pcs.)	37	(13.8)	16	(11.8)	21	(15.7)		0.873	0.350	-
Stone Present	62	(23.1)	29	(21.4)	33	(24.8)		0.418	0.517	-
Stone Jewellery	41	(15.2)	20	(14.8)	21	(15.7)		0.049	0.824	-
Stone Freq. (<5 pcs.)	60	(22.3)	28	(20.7)	32	(24.0)		0.425	0.514	-
Stone Position (Hand)	28	(10.4)	16	(11.8)	12	(9.0)		0.573	0.449	-
Agate Present	5	(1.8)	-	-	5	(3.7)		-	-	-
Agate Freq. (<5 pcs.)	5	(1.8)	-	-	5	(3.7)		-	-	-
Agate Position (Skull)	4	(1.4)	-	-	4	(3.0)		-	-	-
Carnelian Present	4	(1.4)	-	-	4	(3.0)		-	-	-
Carnelian Freq. (<5 pcs.)	4	(1.4)	-	-	4	(3.0)		-	-	-

Stone Bangle Present	31	(11.5)	18	(13.3)	13	(9.7)		0.83	0.362	-	
Stone Bangle Freq. (<5 pcs.)	31	(11.5)	18	(13.3)	13	(9.7)		0.83	0.362	-	
Glass Present	4	(1.4)	2	(1.4)	2	(1.5)		0.239*	0.624	-	
Glass Freq. (<5 pcs.)	4	(1.4)	2	(1.4)	2	(1.5)		0.239*	0.624	-	
Glass Position (Skull)	3	(1.1)	2	(1.4)	1	(0.7)		0*	1.000	-	
Bone/Tooth Present	5	(1.8)	2	(1.4)	3	(2.2)		0*	1.000	-	
Bone/Tooth Jewellery	2	(0.7)	2	(1.4)	-			-	-		
Bone/Tooth Freq. (<5 pcs.)	5	(1.8)	2	(1.4)	3	(2.2)		0*	1.000	-	
Bone/Tooth Position (Skull)	2	(0.7)	-		2	(1.5)		-	-		

Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9 years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

adults show a potential statistical significance for being buried with low frequencies (<5 per person) of iron. Further, males are more likely to have iron tools than females.

TABLE 7.5.1: SUMMARY OF SUITE #5 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – MATERIAL CULTURE - NEOLITHIC

Outcome	Age							Comparisons		
	Total (n=66)	SA (n=22)	YA (n=31)	OA (n=13)	X2	P	(SA, YA, OA)			
	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)						
Grave Good Present	47 (71.2)	19 (86.3)	18 (58.0)	10 (76.9)	6.719	0.034	-			
Ceramic Good Present	46 (69.6)	19 (86.3)	17 (54.8)	10 (76.9)	6.455	0.039	-			
7a cord-marked jar	18 (27.2)	13 (59.0)	3 (9.6)	2 (15.3)	14.098*	0.000	SA>OA>YA			
Ceramic Frequency (<5 pieces)	46 (69.6)	19 (86.3)	17 (54.8)	10 (76.9)	6.455	0.039	-			
Ceramic Position (Skull)	24 (36.3)	3 (13.6)	14 (45.1)	7 (53.8)	5.714*	0.057	-			
Ceramic Decoration Present	42 (63.6)	19 (86.3)	14 (45.1)	9 (69.2)	9.659	0.007	SA>OA>YA			
Clay Pellet	1 (1.5)	-	-	1 (7.6)	-	-	-			
Shell Present	10 (15.1)	-	8 (25.8)	2 (15.3)	0.128*	0.720	-			
Shell Jewellery	10 (15.1)	-	8 (25.8)	2 (15.3)	0.128*	0.720	-			
Shell Freq. (<500 pcs.)	10 (15.1)	-	8 (25.8)	2 (15.3)	0.128*	0.720	-			
Shell Position (Skull)	4 (6.0)	-	2 (6.4)	2 (15.3)	0.134*	0.714	-			
Shell Beads Present	8 (12.1)	-	6 (19.3)	2 (15.3)	0.014*	0.905	-			
Loose Shell Beads	4 (6.0)	-	4 (12.9)	-	-	-	-			
Shell Beads Freq. (<500 pcs.)	8 (12.1)	-	6 (19.3)	2 (15.3)	0.014*	0.905	-			
Shell Beads Position (Skull)	3 (4.5)	-	1 (3.2)	2 (15.3)	0.697*	0.403	-			
Shell Bangle Present	1 (1.5)	-	1 (3.2)	-	-	-	-			

Shell Bangle Freq. (<5 pcs.)	1	(1.5)	-	1	(3.2)	-	-	-
Stone Present	6	(9.0)	2	(9.0)	4	(12.9)	0	1.000
Worked Stone	5	(7.5)	2	(9.0)	3	(9.6)	0.164*	0.685
Stone Freq. (<5 pcs.)	6	(9.0)	2	(9.0)	4	(12.9)	-	1.000
Bone/Tooth Present	1	(1.5)	1	(4.5)	-	-	-	-
Bone/Tooth Jewellery	1	(1.5)	1	(4.5)	-	-	-	-
Bone/Tooth Freq. (<5 pcs.)	1	(1.5)	1	(4.5)	-	-	-	-
Sex								
	Total (n=41)		Male (n=20)		Female (n=21)		Comparisons	
	Obs. (%)		Obs. (%)		Obs. (%)		X2	P
Grave Good Present	25	(60.9)	13	(65.0)	12	(57.1)	0.266	0.606
Ceramic Good Present	25	(60.9)	13	(65.0)	12	(57.1)	0.266	0.606
7a cord-marked jar	3	(7.3)	3	(15.0)	-	-	-	-
Ceramic Frequency (<5 pieces)	24	(58.5)	13	(65.0)	11	(52.3)	0.672	0.412
Ceramic Position (Skull)	20	(48.7)	12	(60.0)	8	(38.0)	1.967	0.160
Ceramic Decoration Present	20	(48.7)	10	(50.0)	10	(47.6)	0.023	0.879
Clay Pellet	1	(2.4)	-	-	1	(4.7)	-	-
Shell Present	10	(24.3)	6	(30.0)	4	(19.0)	0.205*	0.650
Shell Jewellery	10	(24.3)	6	(30.0)	4	(19.0)	0.205*	0.650
Shell Freq. (<500 pcs.)	10	(24.3)	6	(30.0)	4	(19.0)	0.205*	0.650

Shell Position (Skull)	4	(9.7)	3	(15.0)	1	(4.7)		0.334*	0.563	-
Shell Beads Present	8	(19.5)	5	(25.0)	3	(14.2)		0.222*	0.637	-
Loose Shell Beads	4	(9.7)	3	(15.0)	1	(4.7)		0.334*	0.563	-
Shell Beads Freq. (<500 pcs.)	8	(19.5)	5	(25.0)	3	(14.2)		0.222*	0.637	-
Shell Beads Position (Skull)	3	(7.3)	2	(10.0)	1	(4.7)		0.002*	0.964	-
Shell Bangle Present	1	(2.4)	-		1	(4.7)		-	-	-
Stone Present	5	(12.1)	4	(20.0)	1	(4.7)		1.026*	0.311	-
Worked Stone	5	(12.1)	1	(5.0)	4	(19.0)		0.804*	0.369	-
Stone Freq. (<5 pcs.)	4	(9.7)	4	(20.0)	-			-	-	-

Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9 years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

The trend exhibited in relation to iron artefacts continues where shell objects were recovered from burials with adults generally, and younger adults more specifically, being most likely to be buried with shell (jewellery) artefacts usually in low frequencies (<500pcs). Where shell artefacts are in the normative position at, near or under the subject's skull, usually in bead form, it is older adults that are most frequently associated with this behaviour ($X^2=6.714$, $p=0.034$). Table 7.5 also shows an association between the elderly and shell (trochus) bangles, in low frequencies (<5 pcs.), at Ban Non Wat ($X^2=21.455$, $p=0.000$) although the distribution between older and younger adults is relatively even in comparison to subadults. In this instance there is no association between sex and shell artefacts.

The inclusion of stone artefacts in specific burials also appears to be affected by the age-at-death of the individual. Stone, as seen at the other sites under review, is not locally sourced but originates from considerable distances from Ban Non Wat (Higham, 2009c). Table 7.5 shows that there is no association by age with specific stone artefact types such as agate or carnelian but, at a more general level, in relation to stone jewellery types broadly and stone bangles more specifically. A modest total of the sample are buried with stone artefacts with adults again, but older adults albeit in low frequencies (<5), more specifically appearing to be more closely associated with this artefact type ($X^2=10.247$, $p=0.005$). The high statistical probability of stone artefacts at the subject's hand reflects the potential statistical association between older adults and the presence of stone bangles at Ban Non Wat ($X^2=5.879$, $p=0.052$). There is no statistical association based on sex between adults and stone artefacts. The small number of burials from this sample did not demonstrate any statistical association by age or sex with glass or bone artefacts.

7.6.1 Material Culture (Mortuary Suite #5) – The Neolithic

Mortuary evidence from the Neolithic shows that children have a statistically significant likelihood for being buried with a grave good of any kind in comparison to adults of both age classes ($X^2=6.719$, $p=0.034$). There is also a statistical significance in relation to subadults and the presence of ceramic artefacts, again of any typology but in low numbers, included in the subject's grave ($X^2=6.455$, $p=0.039$). The normative ceramic form identified with the sample during the Neolithic deviates from Type 1a simple and unrestricted bowl articulated in the aggregated data to that of the Type 7a restricted cord-marked vessel. Again, it can be observed that subadults have a statistically significant relationship with this artefact type at this time ($X^2=14.098^*$, $p=0.000$). There are no older children (10-14.9 years) in the sample from Ban Non Wat in the Neolithic. Neither those subadults aged up to one year age (<0.9 years) or those classified as younger children (1-9.9 years) has a unique, or selective, statistically significant relationship with any of the bolded outcomes at Table 7.5.1. Only children aged 1-9.9 years are buried with the Type 7a vessels.

At a general level, both subadults and the elderly, proportionately, are more likely to have grave goods and/or ceramic artefacts included in their grave in comparison to the younger adult age class in the Neolithic at Ban Non Wat. Subadults at the Neolithic, reflecting the increased probability of being buried with ceramic artefacts, have increased levels of decorated ceramics in their grave.

TABLE 7.5.2: SUMMARY OF SUITE #5 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – MATERIAL CULTURE – BRONZE AGE

Outcome	Age										Comparisons	
	Total (n=244)	SA (n=91)	YA (n=127)	OA (n=26)	X2	P					(SA, YA, OA)	(X2 with Bonferroni correction)
	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)								
Grave Good Present	236 (96.7)	83 (91.2)	127 (100.0)	26 (100.0)	13.907	0.000					OA=YA>SA	
Ceramic Good Present	226 (92.6)	80 (87.9)	121 (95.2)	25 (96.1)	4.738	0.093					-	
1a simple unrestricted bowl	113 (46.3)	31 (34.0)	62 (48.8)	20 (76.9)	15.608	0.000					OA>YA>SA	
Ceramic Frequency (<5 pieces)	124 (50.8)	56 (61.5)	58 (45.6)	10 (38.4)	7.12	0.028					-	
Ceramic Position (Skull)	183 (75.0)	57 (62.6)	103 (81.1)	23 (88.4)	12.453	0.001					OA>YA>SA	
Ceramic Decoration Present	182 (74.5)	62 (68.1)	99 (77.9)	21 (80.7)	3.284	0.193					-	
Whorl	21 (8.6)	6 (6.5)	14 (11.0)	1 (3.8)	1.175*	0.555					-	
Clay Pellet	7 (2.8)	3 (3.2)	4 (3.1)	-	0.108*	0.742						
Anvil	7 (2.8)	1 (1.0)	5 (3.9)	1 (3.8)	0.777*	0.678					-	
Conical Roller	5 (2.0)	1 (1.0)	4 (3.1)	-	0.29*	0.590						
Bronze Present	9 (3.6)	4 (4.3)	5 (3.9)	-	0.031*	0.860						
Bronze Jewellery	2 (0.8)	1 (1.0)	1 (0.7)	-	0.233*	0.629						
Bronze Freq. (<5 pcs.)	8 (3.2)	4 (4.3)	4 (3.1)	-	0.014*	0.905						
Bronze Position (Hand)	2 (0.8)	1 (1.0)	1 (0.7)	-	0.233*	0.629						
Shell Present	150 (61.4)	40 (43.9)	91 (71.6)	19 (73.0)	18.826	0.000					OA>YA>SA	
Shell Jewellery	149 (61.0)	39 (42.8)	91 (71.6)	19 (73.0)	20.256	0.000					OA>YA>SA	
Shell Freq. (<500 pcs.)	118 (48.3)	34 (37.3)	72 (56.6)	12 (46.1)	7.989	0.018					-	
Shell Position (Skull)	56 (22.9)	11 (12.0)	36 (28.3)	9 (34.6)	10.164	0.006					OA>YA>SA	
Shell Beads Present	130 (53.2)	38 (41.7)	76 (59.8)	16 (61.5)	7.763	0.020					-	

Loose Shell Beads	111 (45.4)	32 (35.1)	65 (51.1)	14 (53.8)	6.303	0.042	-
Shell Beads Freq. (<500 pcs.)	99 (40.5)	33 (36.2)	56 (44.0)	10 (38.4)	1.402	0.496	-
Shell Beads Position (Skull)	51 (20.9)	11 (12.0)	31 (24.4)	9 (34.6)	8.179	0.016	OA>YA>SA
Shell Bangle Present	76 (31.1)	13 (14.2)	51 (40.1)	12 (46.1)	19.602	0.000	OA>YA>SA
Shell Bangle Material (Trochus)	58 (23.7)	5 (5.4)	42 (33.0)	11 (42.3)	27.767	0.000	OA>YA>SA
Shell Bangle Freq. (<5 pcs.)	40 (16.3)	9 (9.8)	24 (18.8)	7 (26.9)	5.492	0.064	-
Stone Present	64 (26.2)	12 (13.1)	39 (30.7)	13 (50.0)	16.909	0.000	OA>YA>SA
Stone Jewellery	41 (16.8)	7 (7.6)	27 (21.2)	7 (26.9)	9.112	0.010	OA>YA>SA
Stone Freq. (<5 pcs.)	63 (25.8)	12 (7.6)	39 (30.7)	12 (46.1)	13.155	0.001	OA>YA>SA
Stone Position (Hand)	35 (14.3)	7 (7.6)	21 (16.5)	7 (26.9)	7.122	0.028	-
Stone Bangle Present	39 (15.9)	7 (7.6)	25 (19.6)	7 (26.9)	8.271	0.015	OA>YA>SA
Stone Bangle Freq. (<5 pcs.)	39 (15.9)	7 (7.6)	25 (19.6)	7 (26.9)	8.271	0.015	OA>YA>SA
Bone/Tooth Present	5 (2.0)	1 (1.0)	3 (2.3)	1 (3.8)	0.079*	0.961	-
Bone/Tooth Jewellery	1 (0.4)	-	-	1 (3.8)	-	-	-
Bone/Tooth Freq. (<5 pcs.)	5 (2.0)	1 (1.0)	3 (2.3)	1 (3.8)	0.079*	0.961	-
Bone/Tooth Position (Skull)	2 (0.8)	1 (1.0)	1 (3.8)	0.009*	0.924	-	-
Sex							
Total (n=145)	Male (n=71)		Female (n=74)		Comparisons		
Obs. (%)	Obs. (%)		Obs. (%)		X2	P	X2
Grave Good Present	145 (100.0)	71 (100.0)	74 (100.0)	74 (100.0)	0	1.000	-
Ceramic Good Present	138 (95.1)	69 (97.1)	69 (93.2)	69 (93.2)	1.224	0.268	-
1a simple unrestricted bowl	80 (55.1)	42 (59.1)	38 (51.3)	38 (51.3)	0.892	0.344	-

Ceramic Frequency (<5 pieces)	61	(42.0)	27	(38.0)	34	(45.9)	0.932	0.334	-	
Ceramic Position (Skull)	120	(82.7)	65	(91.5)	55	(74.3)	7.534	0.006	M>F	
Ceramic Decoration Present	113	(77.9)	58	(81.6)	55	(74.3)	1.143	0.285	-	
Whorl	12	(8.2)	3	(4.2)	9	(12.1)	2.052*	0.152	-	
Clay Pellet	4	(2.7)	3	(4.2)	1	(1.3)	0.302*	0.582	-	
Anvil	6	(4.1)	2	(2.8)	4	(5.4)	0.133*	0.715	-	
Conical Roller	4	(2.7)	1	(1.4)	3	(4.0)	0.216*	0.642	-	
Bronze Present	5	(3.4)	4	(5.6)	1	(1.3)	0.886*	0.346	-	
Bronze Jewellery	1	(0.6)	1	(1.4)	-		-	-	-	
Bronze Freq. (<5 pcs.)	4	(2.7)	3	(4.2)	1	(1.3)	0.302*	0.582	-	
Bronze Position (Hand)	1	(0.6)	1	(1.4)	-		-	-	-	
Shell Present	107	(73.7)	54	(76.0)	53	(71.6)	0.368	0.544	-	
Shell Jewellery	107	(73.7)	54	(76.0)	53	(71.6)	0.368	0.544	-	
Shell Freq. (<500 pcs.)	81	(55.8)	41	(57.7)	40	(54.0)	0.02	0.654	-	
Shell Position (Skull)	45	(31.0)	25	(35.2)	20	(27.0)	1.134	0.286	-	
Shell Beads Present	90	(62.0)	45	(63.3)	45	(60.8)	0.102	0.749	-	
Loose Shell Beads	77	(53.1)	39	(54.9)	38	(51.3)	0.186	0.666	-	
Shell Beads Freq. (<500 pcs.)	64	(44.1)	33	(46.4)	31	(41.8)	0.309	0.578	-	
Shell Beads Position (Skull)	40	(27.5)	21	(29.5)	19	(25.6)	0.276	0.599	-	
Shell Bangle Present	62	(42.7)	30	(42.2)	32	(43.2)	0.015	0.902	-	
Shell Bangle Material (Trochus)	52	(35.8)	26	(36.6)	26	(35.1)	0.035	0.851	-	
Shell Bangle Freq. (<5 pcs.)	31	(21.3)	12	(16.9)	19	(25.6)	1.66	0.197	-	

Stone Present	50	(34.4)	24	(33.8)	26	(35.1)	0.536	0.464	-
Stone Jewellery	31	(21.3)	19	(26.7)	14	(18.9)	1.267	0.260	-
Stone Freq. (<5 pcs.)	49	(33.7)	23	(32.3)	26	(35.1)	0.122	0.726	-
Stone Position (Hand)	27	(18.6)	16	(22.5)	11	(14.8)	1.407	0.235	-
Stone Bangle Present	31	(21.3)	18	(25.3)	13	(17.5)	1.306	0.253	-
Stone Bangle Freq. (<5 pcs.)	31	(21.3)	18	(25.3)	13	(17.5)	1.306	0.253	-
Bone/Tooth Present	4	(2.7)	2	(2.8)	2	(2.7)	0.216*	0.642	-
Bone/Tooth Jewellery	1	(0.6)	-		1	(1.3)	-	-	-
Bone/Tooth Freq. (<5 pcs.)	4	(2.7)	2	(2.8)	2	(2.7)	0.216*	0.642	-
Bone/Tooth Position (Skull)	1	(0.6)	-		1	(1.3)	-	-	-

<1 = less than 1%; *Note:* The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years); Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)
 Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

TABLE 7.5.3: SUMMARY OF SUITE #5 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – MATERIAL CULTURE – IRON AGE

Outcome	Age										Comparisons	
	Total (n=149)		SA (n=49)		YA (n=83)		OA (n=17)					
	Obs. (%)		Obs. (%)		Obs. (%)		Obs. (%)		X2	P	(SA, YA, OA)	(X2 with Bonferroni correction)
Grave Good Present	134 (89.9)		46 (93.8)		73 (87.9)		15 (88.2)		1.256	0.533	-	-
Ceramic Good Present	129 (86.5)		45 (91.8)		69 (83.1)		15 (88.2)		2.054	0.358	-	-
7a cord-marked jar	63 (42.2)		14 (28.5)		36 (43.3)		10 (58.8)		5.553	0.062	-	-
Ceramic Frequency (<5 pieces)	77 (51.6)		37 (75.5)		33 (39.7)		7 (41.1)		16.617	0.000	SA>OA>YA	-
Ceramic Position (Skull)	69 (46.3)		20 (40.8)		38 (45.7)		11 (64.7)		2.918	0.232	-	-
Ceramic Decoration Present	107 (71.8)		34 (69.3)		59 (71.0)		14 (82.3)		1.097	0.514	-	-
Whorl	33 (22.1)		6 (12.2)		20 (24.0)		7 (41.1)		6.54	0.038	-	-
Clay Pellet	2 (1.3)		-		-		2 (11.7)		-	-	-	-
Anvil	1 (0.6)		-		1 (1.2)		-		-	-	-	-
Conical Roller	9 (6.0)		2 (4.0)		4 (4.8)		3 (17.6)		2.381*	0.304	-	-
Bronze Present	18 (12.0)		7 (14.2)		10 (12.0)		1 (5.8)		0.26*	0.878	-	-
Bronze Jewellery	16 (10.7)		6 (12.2)		9 (10.8)		1 (5.8)		0.099*	0.951	-	-
Bronze Freq. (<5 pcs.)	13 (8.7)		5 (10.2)		7 (8.4)		1 (5.8)		0.023*	0.988	-	-
Bronze Position (Hand)	9 (6.0)		2 (4.0)		7 (8.4)		-		-	0.361*	0.547	-
Iron Present	37 (24.8)		4 (8.1)		27 (32.5)		6 (35.2)		9.182*	0.010	OA>YA>SA	-
Iron Tools	23 (15.4)		1 (2.0)		19 (22.8)		3 (17.6)		8.742*	0.012	YA>OA>SA	-
Iron Freq. (<5 pcs.)	30 (20.1)		4 (8.1)		20 (24.0)		6 (35.2)		5.815*	0.054	-	-
Iron Position (Arms)	9 (6.0)		1 (2.0)		6 (7.2)		2 (11.7)		1.049*	0.591	-	-
Shell Present	14 (9.3)		4 (8.1)		8 (9.6)		2 (11.7)		0.022*	0.989	-	-
Shell Jewellery	14 (9.3)		4 (8.1)		8 (9.6)		2 (11.7)		0.022*	0.989	-	-
Shell Freq. (<500 pcs.)	14 (9.3)		4 (8.1)		8 (9.6)		2 (11.7)		0.022*	0.989	-	-

7 RESULTS: BAN NON WAT

Shell Position (Skull)	4	(2.6)	1	(2.0)	3	(3.6)	-	0	1.000	-
Shell Beads Present	2	(1.3)	2	(4.0)	-	-	-	-	-	-
Loose Shell Beads	1	(0.6)	1	(2.0)	-	-	-	-	-	-
Shell Beads Freq. (<500 pcs.)	2	(1.3)	2	(4.0)	-	-	-	-	-	-
Shell Beads Position (Skull)	1	(0.6)	1	(2.0)	-	-	-	-	-	-
Shell Bangle Present	9	(6.0)	2	(4.0)	5	(6.0)	2	(11.7)	0.836	-
Shell Bangle Material (Trochus)	1	(0.6)	-	-	1	(1.2)	-	-	-	-
Shell Bangle Freq. (<5 pcs.)	9	(6.0)	2	(4.0)	5	(6.0)	2	(11.7)	0.836	-
Stone Present	16	(10.7)	4	(8.1)	10	(12.0)	2	(11.7)	0.890	-
Stone Jewellery	12	(8.0)	2	(4.0)	8	(9.6)	2	(11.7)	0.705	-
Stone Freq. (<5 pcs.)	14	(9.3)	4	(8.1)	9	(10.8)	1	(5.8)	0.961	-
Stone Position (Hand)	1	(0.6)	-	-	-	-	1	(5.8)	-	-
Agate Present	10	(6.7)	2	(4.0)	6	(7.2)	2	(11.7)	0.850	-
Agate Freq. (<5 pcs.)	9	(6.0)	2	(4.0)	5	(6.0)	2	(11.7)	0.836	-
Agate Position (Skull)	8	(5.3)	2	(4.0)	5	(6.0)	1	(5.8)	0.902	-
Carnelian Present	4	(2.6)	-	-	2	(2.4)	2	(11.7)	0.265	-
Carnelian Freq. (<5 pcs.)	4	(2.6)	-	-	2	(2.4)	2	(11.7)	0.265	-
Glass Present	10	(6.7)	4	(8.1)	4	(4.8)	2	(11.7)	0.836	-
Glass Freq. (<5 pcs.)	7	(4.6)	3	(6.1)	3	(3.6)	1	(5.8)	0.914	-
Glass Position (Skull)	6	(4.0)	2	(4.0)	3	(3.6)	1	(5.8)	0.914	-
Bone/Tooth Present	5	(3.3)	3	(6.1)	2	(2.4)	-	-	0.543	-
Bone/Tooth Jewellery	5	(3.3)	3	(6.1)	2	(2.4)	-	-	0.543	-
Bone/Tooth Freq. (<5 pcs.)	3	(2.0)	1	(2.0)	2	(2.4)	-	-	0.640	-
Bone/Tooth Position (Skull)	2	(1.3)	1	(2.0)	1	(1.2)	-	-	0.720	-

Sex									
	Total (n=82)	Male (n=44)	Female (n=38)					Comparisons	
	Obs. (%)	Obs. (%)	Obs. (%)	X2	P	X2			
Grave Good Present	70 (85.3)	37 (84.0)	33 (86.8)	0.124	0.724	-			
Ceramic Good Present	69 (84.1)	37 (84.0)	32 (84.2)	0	1.000	-			
7a cord-marked jar	37 (45.1)	20 (45.4)	17 (44.7)	0.025	0.874	-			
Ceramic Frequency (<5 pieces)	30 (36.5)	12 (27.2)	18 (47.3)	3.549	0.059	F>M			
Ceramic Position (Skull)	42 (51.2)	24 (54.5)	18 (47.3)	0.42	0.516	-			
Ceramic Decoration Present	60 (73.1)	32 (72.7)	28 (73.6)	0.01	0.920	-			
Whorl	22 (26.8)	10 (22.7)	12 (31.5)	0.814	0.366	-			
Clay Pellet	2 (2.4)	2 (4.5)	-	-	-	-			
Anvil	1 (1.2)	1 (2.2)	-	-	-	-			
Conical Roller	5 (6.0)	5 (11.3)	-	-	-	-			
Bronze Present	7 (8.5)	4 (9.0)	3 (7.8)	0.041*	0.839	-			
Bronze Jewellery	6 (7.3)	3 (6.8)	3 (7.8)	0.057*	0.811	-			
Bronze Freq. (<5 pcs.)	6 (7.3)	3 (6.8)	3 (7.8)	0.057*	0.811	-			
Bronze Position (Hand)	3 (3.6)	1 (2.2)	1 (2.6)	0.375*	0.540	-			
Iron Present	26 (31.7)	18 (40.9)	8 (21.0)	3.713	0.053	M>F			
Iron Tools	17 (20.7)	12 (27.2)	5 (13.1)	2.472	0.115	-			
Iron Freq. (<5 pcs.)	21 (25.6)	14 (31.8)	7 (18.4)	1.921	0.165	-			
Iron Position (Arms)	7 (8.5)	5 (11.3)	2 (5.2)	0.348*	0.555	-			
Shell Present	8 (9.7)	4 (9.0)	4 (10.5)	0.024*	0.876	-			
Shell Jewellery	8 (9.7)	4 (9.0)	4 (10.5)	0.024*	0.876	-			
Shell Freq. (<500 pcs.)	8 (9.7)	4 (9.0)	4 (10.5)	0.024*	0.876	-			
Shell Position (Skull)	3 (3.6)	-	3 (7.8)	-	-	-			

Shell Bangle Present	4	(4.8)	4	(9.0)	-	-	-	-	-
Shell Bangle Material (Trochus)	1	(1.2)	1	(2.2)	-	-	-	-	-
Shell Bangle Freq. (<5 pcs.)	4	(4.8)	4	(9.0)	-	-	-	-	-
Stone Present	7	(8.5)	1	(2.2)	6	(15.7)	3.917*	0.073	F>M
Stone Jewellery	6	(7.3)	-	-	6	(15.7)	-	-	-
Stone Freq. (<5 pcs.)	7	(8.5)	1	(2.2)	6	(15.7)	3.917*	0.073	F>M
Stone Position (Hand)	1	(1.2)	-	-	1	(2.6)	-	-	-
Agate Present	4	(4.8)	-	-	4	(10.5)	-	-	-
Agate Freq. (<5 pcs.)	4	(4.8)	-	-	4	(10.5)	-	-	-
Agate Position (Skull)	4	(4.8)	-	-	4	(10.5)	-	-	-
Carnelian Present	3	(3.6)	-	-	3	(7.8)	-	-	-
Carnelian Freq. (<5 pcs.)	3	(3.6)	-	-	3	(7.8)	-	-	-
Glass Present	5	(6.0)	2	(4.5)	3	(7.8)	0.029*	0.864	-
Glass Freq. (<5 pcs.)	4	(4.8)	2	(4.5)	2	(5.2)	0.132*	0.716	-
Glass Position (Skull)	3	(3.6)	2	(4.5)	1	(2.6)	0.017*	0.896	-
Bone/Tooth Present	1	(1.2)	-	-	1	(2.6)	-	-	-
Bone/Tooth Jewellery	1	(1.2)	-	-	1	(2.6)	-	-	-
Bone/Tooth Freq. (<5 pcs.)	1	(1.2)	-	-	1	(2.6)	-	-	-
Bone/Tooth Position (Skull)	1	(1.2)	-	-	1	(2.6)	-	-	-

<1 = less than 1%; Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years); Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

7.6.2 *Material Culture (Mortuary Suite #5) – The Bronze Age*

Table 7.5.2 shows a greater range of statistically significant results in comparison to the Neolithic period where material culture is considered. As observed in the Neolithic mortuary evidence in the Bronze Age continues to show a statistically significant association of individuals with grave goods although at this time it is adults of both age classes, in comparison to children in the Neolithic, that are universally buried with an artefact of some type ($X^2=13.907$, $p=0.000$) and, to a lesser degree, of a ceramic artefact. Evidence from aggregated data (Table 7.5) is mirrored here with the elderly showing a statistically significant relationship with Type 1a bowls and the normative positioning of ceramic artefacts at the head. Subadults, in the Bronze Age, are associated with being the most likely age class to be buried with low frequencies of ceramic items. Adult males are most likely to be buried with ceramic artefacts at the head.

Changing mortuary patterns from the Bronze Age show an association by age-at-death with shell and stone artefacts. In both instances it is adult age classes that are most frequently buried with these artefact types with the elderly invariably specifically targeted at burial. The elderly from the Bronze Age at Ban Non Wat are more frequently associated with shell, generally shell jewellery, and the deposition of shell artefacts primarily shell bead types, at the subjects head. The elderly were also found to have been to have a relationship with shell bangles, in low numbers, manufactured from *Trochus* sp. Adults were recovered more frequently with 'low' levels (<500pcs per person) of shell, commonly loose shell beads, in their graves.

Statistical results demonstrate a relationship between the elderly and the presence of stone artefacts in low frequencies and with stone jewellery. The elderly also have a relationship with stone bangles in low frequencies at Ban Non Wat during the Bronze Age.

7.6.3 *Material Culture (Mortuary Suite #5) – The Iron Age*

Table 7.5.3 shows a reversion back to Type 7a vessels, as seen in the Neolithic, being recovered most frequently. Although not significant, the proportion of elderly buried with this artefact suggests a potential relationship between this item and the older cohort. Children continue to be most frequently associated with ceramic artefacts in low numbers at burial as observed previously and this continues in the Iron Age. Adult females demonstrate a relationship with ceramics in low frequencies.

The Iron Age continues to see elderly subjects, as a unique cohort, afforded seemingly selective mortuary treatment in relation to a number of outcomes used in this research. This includes the deposition of spindle whorls in their graves and the inclusion of iron artefacts, at the arms, of any type in their burials. Table 7.5.3 shows a potential link between sex and the presence of iron (males) and stone artefacts (females), in low quantities, in graves.

TABLE 7.6: MEAN TOTALS OF MATERIAL CULTURE AND FAUNA BY AGE-AT-DEATH AND SEX – BAN NON WAT – AGGREGATED DATA

	Age			Sex		
	SA (n=162)	YA (n=241)	OA (n=56)	M (n=135)	F (n=133)	
Outcome	obs. n 0	obs. n 0	obs. n 0	obs. n 0	obs. n 0	
Ceramics	615 143 (4.3)	1661209 (7.9)	417 50 (8.3)	1156120 (9.6)	808 113 (7.1)	
Bronze	45 11 (4.0)	83 15 (5.5)	1 1 (1.0)	23 8 (2.8)	7 4 (1.7)	
Iron	9 4 (2.2)	101 27 (3.7)	9 6 (1.5)	58 18 (3.2)	14 8 (1.7)	
Shell	844644 (191.5)	97011 107 (906.6)	22545 23 (980.2)	45000 64 (703.1)	74539 61 (1221.9)	
Shell Bead	836040 (209.0)	95738 81 (1181.9)	22296 18 (1238.6)	44325 50 (886.5)	73705 48 (1535.5)	
Shell Bangle	74 15 (4.9)	793 57 (13.9)	219 14 (15.6)	588 34 (17.2)	411 34 (12.0)	
Stone	21 18 (1.1)	96 53 (1.8)	62 15 (4.1)	80 29 (2.7)	56 33 (1.6)	
Agate	2 2 (1.0)	22 6 (3.6)	4 2 (2.0)		7 5 (1.4)	
Carnelian	-	5 2 (2.5)	5 2 (2.5)	-	10 4 (2.5)	
Glass	71 4 (17.7)	360 4 (90.0)	85 1 (85.0)	3 2 (1.5)	288 2 (144.0)	
Bone/Tooth	17 5 (3.4)	8 5 (1.6)	1 1 (1.0)	5 2 (2.5)	3 3 (1.0)	
Pig	43 39 (1.1)	63 62 (1.0)	12 12 (1.0)	32 31 (1.0)	37 37 (1.0)	
Unionidae	67 48 (1.3)	135 80 (1.6)	29 20 (1.4)	91 48 (1.8)	67 47 (1.4)	
Bovid	2 2 (1.0)	17 17 (1.0)	4 4 (1.0)	12 12 (1.0)	6 6 (1.0)	
Fish	95 40 (2.3)	186 64 (2.9)	73 22 (3.3)	137 44 (3.1)	100 33 (3.0)	

Obs. = observed number from total sample; n = number of samples with material culture type or fauna species; ; SA = Subadult (<14.9 years); YA = Younger Adult (15–39.9 years); OA = Older Adult (40 or more years)

TABLE 7.6.1: MEAN TOTALS OF MATERIAL CULTURE AND FAUNA BY AGE-AT-DEATH AND SEX – BAN NON WAT - NEOLITHIC

Outcome	Age				Sex			
	SA (n=162)		YA (n=241)		OA (n=56)		M (n=135)	
	obs. n	0	obs. n	0	obs. n	0	obs. n	0
Ceramics	40	19 (2.1)	46	17 (2.7)	15	10 (1.5)	25	13 (1.9)
Shell	-		485	8 (60.6)	42	2 (21.0)	265	6 (44.1)
Shell Bangle	-		1	1 (1.0)	-		-	
Stone	2	2 (1.0)	4	4 (1.0)	-		4	4 (1.0)
Bone/Tooth	1	1 (1.0)	-		-		-	
Pig	-		4	1 (4.0)	1	1 (1.0)	4	4 (1.0)
Unionidae	3	3 (1.0)	10	4 (2.5)	4	4 (1.0)	7	5 (1.4)
Fish	1	1 (1.0)	12	1 (12.0)	2	1 (2.0)	11	2 (5.5)
							1	1 (1.0)
							7	5 (1.4)
							3	2 (1.5)

Obs. = observed number from total sample; n = number of samples with material culture type or fauna species; ; SA = Subadult (<14.9 years); YA = Younger Adult (15-39.9 years); OA = Older Adult (40 or more years)

7.6.4 *Assessment of mean number of grave good categories by class*

In addition to the assessment by mean seen at Chapters Six, Eight and Nine this chapter also considers the effects of mean ratios by age and sex across the Neolithic to the Iron Age at the site. As observed at the other sites under review, where age as a factor is elevated, subadults demonstrate minimal evidence for being assigned greater frequencies of specific material types in comparison to adults. Where aggregated material types are explored subadults, as observed at Noen U-Loke (see Chapter Nine), display through mean scores, a heightened association with bone artefacts. In contrast, mean evidence at Table 7.6 shows that older adults have a greater propensity for having a relationship with a range of material types in greater quantities, per person, in comparison to their younger cohorts. Although minimal, the elderly are buried with higher frequencies of ceramics and fish in their graves. Similarly, the elderly, in contrast to subadults, appear to be afforded equal status to younger adults in relation to the frequency of glass artefacts in their burials. However, Table 7.6 provides evidence of deliberate behaviour at burial by surviving community members related to older adults and the distribution of shell artefacts generally but specifically beads and bangles and stone.

As noted at Noen U-Loke, where sex is reviewed in relation to mean ratios, there appears to be a clear delineation between the quantum of aggregated material types deliberately deposited with males and females at Ban Non Wat. Whereas at Noen U-Loke neither sex appeared to have a greater quantum of ceramics distributed in their graves at Ban Non Wat the mean evidence suggests males, collectively, had greater quantities of ceramics included in their graves than females. Further, Table 7.6 shows a clear distinction between males and bronze, iron and stone artefacts as well as shell bangles. Females, ostensibly through the volume of beads in their burials, have a greater relationship with shells and glass in comparison to their male counterparts. As noted before, only females at Ban Non Wat, from the sample used, were buried with agate and carnelian. Aggregated data on materials does not indicate any significant activity, where mean scores are considered, in relation to sex in its association with fauna.

7.6.5 *Assessment of mean number of grave good categories by class – Neolithic*

In contrast to the aggregated data at Table 7.6 above the numerical data from the Neolithic demonstrates significantly less activity by age-at-death and sex in relation to the two cohorts under examination. Table 7.6.1 shows, where there is a deviancy from relatively similar levels of mean scores, that it is the younger adult cohort that are related to higher frequencies of specific material types per person, in comparison to the old and young in the Neolithic at Ban Non Wat. This applies to the distribution and volume of ceramics, shell, pig and fish. Similarly, where sex is explored there is little activity, in relation to mean scores, between females and males. Where mean scores do indicate differential treatment, it can be observed that a small number of females in the Neolithic are buried with increased levels of shell artefacts in comparison to males.

TABLE 7.6.2: MEAN TOTALS OF MATERIAL CULTURE AND FAUNA BY AGE-AT-DEATH AND SEX – BAN NON WAT – BRONZE AGE

Age			Sex		
	SA (n=162)	YA (n=241)	OA (n=56)	M (n=135)	F (n=133)
Outcome	obs. n 0	obs. n 0	obs. n 0	obs. n 0	obs. n 0
Ceramics	433 80 (5.4)	1218 127 (9.5)	285 26 (10.9)	863 69 (12.5)	615 69 (8.9)
Bronze	4 4 (1.0)	10 5 (2.0)	-	9 4 (2.2)	1 1 (1.0)
Shell	8441 40 (211.0)	96510 91 (1060.5)	22500 19 (1184.2)	44730 54 (828.3)	74269 53 (1401.3)
Shell Bangle	71 13 (5.4)	783 51 (15.3)	216 12 (18.0)	583 30 (19.4)	409 32 (12.7)
Stone	15 12 (1.2)	63 39 (1.6)	62 13 (4.7)	75 24 (3.1)	38 26 (1.4)
Bone/Tooth	1 1 (1.0)	6 3 (2.0)	1 1 (1.0)	5 2 (2.5)	2 2 (1.0)
Pig	28 25 (1.1)	35 34 (1.0)	9 9 (1.0)	20 19 (1.0)	23 23 (1.0)
Unionidae	49 33 (1.4)	89 45 (1.9)	20 11 (1.8)	65 28 (2.3)	42 26 (1.6)
Bovid	1 1 (1.0)	4 4 (1.0)	1 1 (1.0)	2 2 (1.0)	3 3 (1.0)
Fish	40 21 (1.9)	80 32 (2.5)	31 11 (2.8)	57 22 (2.5)	50 19 (2.6)

Obs. = observed number from total sample; n = number of samples with material culture type or fauna species; ; SA = Subadult (<14.9 years); YA = Younger Adult (15-39.9 years); OA = Older Adult (40 or more years)

TABLE 7.6.3: MEAN TOTALS OF MATERIAL CULTURE AND FAUNA BY AGE-AT-DEATH AND SEX – BAN NON WAT – IRON AGE

Outcome	Age						Sex	
	SA (n=162)		YA (n=241)		OA (n=56)		M (n=135)	
	obs. n	0	obs. n	0	obs. n	0	obs. n	0
Ceramics	142	45 (3.1)	397	69 (5.7)	117	15 (7.8)	268	37 (7.2)
Bronze	41	7 (5.8)	73	10 (7.3)	1	1 (1.0)	14	4 (3.5)
Iron	9	4 (2.2)	101	27 (3.7)	9	6 (1.5)	58	18 (3.2)
Shell	5	4 (1.2)	16	8 (2.0)	3	2 (1.5)	5	4 (1.2)
Shell Bangle	3	2 (1.5)	9	5 (1.8)	3	2 (1.5)	5	4 (1.2)
Stone	4	4 (1.0)	29	10 (2.9)	10	2 (5.0)	1	1 (1.0)
Agate	2	2 (1.0)	22	6 (3.6)	4	2 (2.0)	-	-
Carnelian	-	-	5	2 (2.5)	5	2 (2.5)	-	-
Glass	71	4 (17.7)	360	4 (90.0)	85	2 (42.5)	3	2 (1.5)
Bone/Tooth	15	3 (5.0)	1	2 (2.0)	1	1 (1.0)	-	-
Pig	15	14 (1.0)	24	24 (1.0)	2	2 (1.0)	8	8 (1.0)
Unionidae	15	12 (1.2)	36	29 (1.2)	5	5 (1.0)	19	15 (1.2)
Bovid	1	1 (1.0)	13	13 (1.0)	3	3 (1.0)	10	10 (1.0)
Fish	58	18 (3.2)	94	29 (3.2)	40	10 (4.0)	69	20 (3.4)

Obs. = observed number from total sample; n = number of samples with material culture type or fauna species; SA = Subadult (<14.9 years); YA = Younger Adult (15-39.9 years); OA = Older Adult (40 or more years)

7.6.6 Assessment of mean number of grave good categories by class – Bronze Age

Table 7.6.2 shows that, in no instance, were subadults in the Bronze Age deposited with significantly greater mean quantities of the materials reviewed than adults. However, the Bronze Age notes emerging patterns, as observed in the aggregated data at Table 7.6, of differential behaviour affecting older adults. As evidenced at Table 7.6.2, the elderly demonstrates a significant relationship, based on mean number of material types per person with ceramics, shell, including shell bangles and stone. There is minimal evidence that age is a factor in the quantum of fauna types, except perhaps the numbers of fish included in the graves of adults of both class, in the Bronze Age at Ban Non Wat. Where sex is considered as a defining characteristic, males can be observed to have a greater association with ceramics, stone and shell bangles with females being buried with greater volumes of shell beads. Males also demonstrate a higher mean in association with the number of Unionidae bivalves included in their burials.

7.6.7 Assessment of mean number of grave good categories by class – Iron Age

Following an examination of the mean score of specific material types, Table 7.6.3 notes another shift in the behaviour provided to buried individuals in the Iron Age from those at the Bronze Age and the Neolithic. Where in the Bronze Age the elderly were found to be buried with higher volumes of a range of material types in comparison to their younger cohorts, in the Iron Age a shift of behaviour notes generally, a heightened association of younger adults with the material types under analysis. Table 7.6.3 demonstrates, per burial, a significantly higher number of ceramic and stone items with elderly subjects with younger adults displaying a greater relationship with bronze, iron, shell, agate and glass. Subadults, as reflected at Table 7.6 in the aggregated data, are buried with a greater volume, per person, of bone items in comparison to adults in the Iron Age. It is worth noting, while not predominating the sample, the mean scores associated with subadults in relation to bronze and iron in the Iron Age show an increase in the materials distribution in comparison to older adults. Although, older adults display a higher mean association with fish numbers in burials all three cohorts demonstrate, relatively consistently, high numbers of fish deposited in graves.

Where sex is explored, it is observed that males are likely to be buried with greater quantities of ceramic, bronze and iron artefacts with females demonstrating a greater likelihood of being buried with higher frequencies of stone and glass in comparison to their male counterparts. It is in the Iron Age where only females, from the sample used, were buried with agate and carnelian artefacts. Pigs are predominantly found, in high numbers, in the graves of females in the Iron Age.

TABLE 7.7: NON-NORMATIVE OUTCOMES BY AGE-AT-DEATH – BAN NON WAT

Outcome	Age							Comparisons	
	Total (n=459)	SA (n=162)	YA (n=241)	OA (n=56)	X ²	P	(SA, YA, OA)	(X ² with Bonferroni correction)	
	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)					
Semi-Flexed	27 (5.8)	21 (12.9)	6 (2.4)	-	17.000	0.000	SA>YA		
Flexed	57 (12.4)	49 (30.2)	7 (2.9)	1 (1.7)	69.795*	0.000	SA>YA>OA		
Skull Position (Right of midline)	14 (3.0)	1 (0.6)	12 (4.9)	1 (1.7)	4.914*	0.085	-		
Skull Position (Left of midline)	25 (5.4)	2 (1.2)	18 (7.4)	5 (8.9)	7.063*	0.029	OA>YA>SA		
Hand Position (Pelvis)	102 (22.2)	19 (11.7)	69 (28.6)	14 (25.0)	16.298	0.000	YA>OA>SA		
Orientation (90°)	19 (4.1)	5 (3.0)	6 (2.4)	8 (14.2)	16.634	0.000	OA>SA>YA		
Orientation (180°)	38 (8.2)	6 (3.7)	29 (12.0)	3 (5.3)	8.18*	0.016	YA>OA>SA		
Whole of Animal	42 (9.1)	12 (7.4)	19 (7.8)	11 (19.6)	8.473	0.014	OA>YA>SA		
Fauna Position (Legs)	47 (10.2)	11 (6.7)	26 (10.7)	10 (17.8)	5.712	0.057	-		
Fish Type (<i>Anabas</i> sp.)	44 (9.5)	11 (6.7)	23 (9.5)	10 (17.8)	5.882	0.052	-		
Fish Type (<i>Hemibagrus</i> sp.)	37 (8.0)	7 (4.3)	20 (8.2)	10 (17.8)	10.327	0.005	OA>YA>SA		
Ceramic Type 2	57 (12.4)	12 (7.4)	31 (12.8)	14 (25.0)	11.934	0.002	OA>YA>SA		
Ceramic Type 3b	57 (12.4)	10 (6.1)	42 (17.4)	5 (8.9)	11.997	0.002	YA>OA>SA		
Ceramic Type 5	141 (30.7)	40 (24.6)	87 (36.0)	14 (25.0)	6.905	0.031	-		
Ceramic Type 7a	97 (21.1)	43 (26.5)	42 (17.4)	12 (21.4)	4.834	0.089	-		
Ceramic Type (Lid)	28 (6.1)	24 (14.8)	3 (1.2)	1 (1.7)	30.218*	0.000	SA>OA>YA		
Ceramic Freq. (6-10pcs.)	91 (19.8)	22 (13.5)	58 (24.0)	11 (19.6)	6.703	0.035	-		
Ceramic Freq. (11-15pcs.)	30 (6.5)	5 (3.0)	20 (8.2)	5 (8.9)	4.906	0.086	-		
Ceramic Freq. (16+pcs.)	35 (7.6)	5 (3.0)	23 (9.5)	7 (12.5)	7.886	0.019	-		
Ceramic Position (Abdomen)	42 (9.1)	7 (4.3)	29 (12.0)	6 (10.7)	7.119	0.028	-		
Ceramic Position (Arms)	53 (11.5)	10 (6.1)	36 (14.9)	7 (12.5)	7.344	0.025	-		

Ceramic Position (Legs)	93 (20.2)	12 (7.4)	65 (26.9)	16 (28.5)	25.676	0.000	OA>YA>SA
Ceramic Position (Feet)	177 (38.5)	49 (30.2)	102 (42.3)	26 (46.4)	7.630	0.022	-
Incised Ceramics	41 (8.9)	10 (6.1)	21 (8.7)	10 (17.8)	7.014	0.029	-
Shell Freq. (1500+pcs)	18 (3.9)	1 (0.6)	14 (5.8)	3 (5.3)	5.708*	0.057	-
Shell Position (Arms)	55 (11.9)	5 (3.0)	39 (16.1)	11 (19.6)	19.303	0.000	OA>YA>SA
Shell Bead Type (Necklace)	30 (6.5)	4 (2.4)	19 (7.8)	7 (12.5)	6.616*	0.036	OA>YA>SA
Shell Bead Freq. (1500+pcs.)	17 (3.7)	1 (0.6)	13 (5.3)	3 (5.3)	5.082*	0.078	-
Shell Bangle Freq. (16+pcs.)	22 (4.7)	2 (1.2)	16 (6.6)	4 (7.1)	5.428*	0.066	-
Stone Type (Worked Stone)	34 (7.4)	7 (4.3)	20 (8.2)	7 (12.5)	4.647	0.097	-
Sex							
	Total (n=268)	Male (n=135)	Female (n=133)				Comparisons
	Obs. (%)	Obs. (%)	Obs. (%)		X²	P	X²
Orientation (136-179°)	21 (7.8)	15 (11.1)	6 (4.5)		3.179	0.074	M>F
Disp. Container (Wood Coffin)	13 (4.8)	10 (7.4)	3 (2.2)		2.817*	0.093	M>F
Ceramic Type (Type 5 Jar)	95 (35.4)	61 (45.1)	34 (25.5)		11.272	0.000	M>F
Ceramic Freq. (6-10pcs.)	63 (23.5)	39 (28.8)	24 (18.0)		3.799	0.051	M>F
Ceramic Position (Abdomen)	31 (11.5)	11 (8.1)	20 (15.0)		3.109	0.077	F>M

Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9 years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)
 Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X² Pearson's uncorrected (Yate's corrected designated with *)
 Bold denotes significance (P < 0.05); Post hoc testing carried out using Bonferroni's correction where appropriate

7.7 Significant non-normative mortuary variables

The range of normative behaviour from Ban Non Wat is explored in Sections 7.2 to 7.6. Section 7.7 explores non-normative, or atypical, mortuary behaviours with respect to age and sex. The complete range of outcomes, normative and atypical, are in Appendix 2.

It can be observed from Table 7.7 that primarily subadults were buried in a flexed or semi-flexed position across the entirety of the cemetery's use. Semi-flexed burials are often associated with subadults ($X^2=17.000$, $p=0.000$) and particularly those aged between 0 to 4.9 years (18/21, 85.7%). The same pattern occurs in relation to flexed burials in relation to subadults ($X^2=69.795^*$, $p=0.000$). However, the majority of flexed burials are associated with foetal and neonate subadults (43/57, 75.4%), statistically significant for foetal burials ($X^2=60.564^*$, $p=0.000$). A moderate proportion of the sample had their hands positioned at the pelvis, which occurs more often with adults, and younger adults in particular ($X^2=16.298$, $p=0.000$). No specific age range of the younger adults appears selectively exposed to this practice ($X^2=3.444^*$, $p=0.178$). Of the atypical orientations identified at Ban Non Wat, it is older and younger adults, respectively, that are deposited in non-normative orientations. Adult males are more frequently oriented between 136-179° than females. Again, although not statistically significant, adult males were the group most likely to be buried in a wood coffin from the sample.

Table 7.7 shows in all instances where significant, or potentially significant, behaviour occurs in relation to the presence of faunal remains included in funerary furniture that it is older adults that appear most related with these practices at Ban Non Wat. Although present at Noen U-Loke, the practice of including whole animals, usually juvenile pigs, is more evident at Ban Non Wat. Of the modest number of burials which contain whole animals it is older adults, proportionately, that are most frequently associated ($X^2=8.473$, $p=0.014$) with one burial (B105) from the Bronze Age containing a complete rat. Figure 7.6 shows a comparison by site where whole animals are included in burials. Figure 7.6 shows that, invariably, adults are more frequently associated with this behaviour with Ban Non Wat demonstrating the highest occurrence of this practice. While it is important to express the deposition of whole animal species between site's here, greater discussion on the relationship between humans and animals, as potential indicators of identity, can be found at Section 11.2.3.

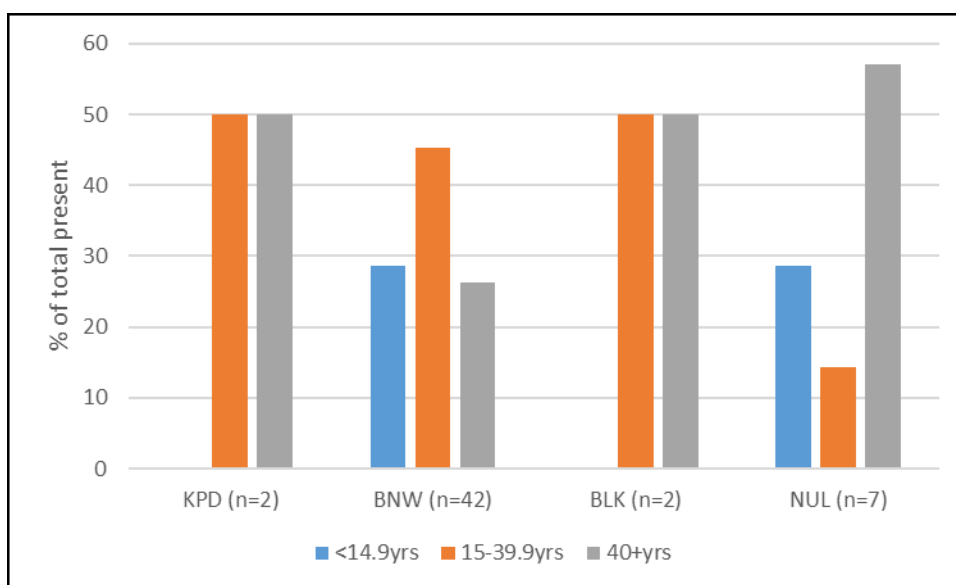


FIGURE 7.6: Comparison of the presence of complete faunal skeletal remains

KPD = Khok Phanom Di; BNW = Ban Non Wat; BLK = Ban Lum Khao; NUL = Noen U-Loke

Older adults with whole animal skeletons were found (6/11, 54.5%) mainly at the early period of the Iron Age. As seen at Table 7.4, fish, mainly *Channa* sp., were recovered from a moderate number of burials. Table 7.7 shows, again in relation to older adults, that *Hemibagrus* sp. (red-tailed catfish), and to a lesser extent *Anabas* sp. (climbing perch), were proportionately more likely to be included in these graves.

Finally, the remaining significant, and potentially significant, atypical mortuary behaviours relate to material culture outcomes primarily in relation to ceramics, shell and stone. At a general level, as observed in Table 7.7, adults in comparison to subadults are more frequently exposed to the ceramic, shell and stone artefact outcomes. For the elderly this occurs in association with Type 2 vessels (restricted vessels with everted rim, oval body and cord-marked) ($X^2=11.934$, $p=0.002$), the presence of incised ceramic items ($X^2=7.014$, $p=0.029$) and the positioning of ceramic artefacts at the feet ($X^2=7.630$, $p=0.022$). Subadults are most frequently associated with individual ceramic lids and, to a lesser extent, with Type 7a vessels. The presence of sizeable quantities of shell artefacts, clearly through the presence of beads is again more frequently found with adults of both age cohorts. The elderly are proportionately, most likely to be associated with shell bead necklaces and to have shell artefacts positioned at, near or under their arms. There is a potential significance between the elderly and worked stone artefacts at Ban Non Wat ($X^2=4.647$, $p=0.097$). Adult males were most frequently buried with Type 5 jars and, to a

TABLE 7.7.1: NON-NORMATIVE OUTCOMES BY AGE-AT-DEATH – BAN NON WAT BY TEMPORAL PERIOD

Age – Neolithic									Comparisons
	Total (n=66)	0-14.9yrs (n=22)	15-39.9yrs (n=31)	40+yrs (n=13)					(SA, YA, OA)
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P			(X ² with Bonferroni correction)
Type 1b Bowl	9 (13.6)	7 (31.8)	1 (3.2)	1 (7.6)	6.814*	0.033			SA>OA>YA
Ceramic Lid	8 (12.1)	6 (27.2)	2 (6.4)	-	2.88*	0.089			-
Ceramic Dec. (Cordmarked)	40 (60.6)	18 (81.8)	14 (45.1)	8 (61.5)	7.248	0.026			-
Age – Bronze Age									
	Total (n=244)	0-14.9yrs (n=91)	15-39.9yrs (n=127)	40+yrs (n=26)					
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P			
Semi-Flexed	19 (7.7)	14 (15.3)	5 (3.9)	-	8.732	0.000			SA>YA
Flexed	15 (6.1)	15 (16.4)	-	-	-	-			-
Ceramic Type 2	57 (23.3)	12 (13.1)	31 (24.4)	14 (53.8)	18.836	0.000			OA>YA>SA
Ceramic Type 3b	56 (22.9)	10 (10.9)	41 (32.2)	5 (19.2)	13.822	0.000			YA>OA>SA
Ceramic Freq. (16+pcs.)	31 (12.7)	5 (5.4)	11 (8.6)	5 (19.2)	6.944	0.031			-
Ceramic Position (Abdomen)	13 (5.3)	1 (1.0)	11 (8.6)	1 (3.8)	4.629*	0.098			-
Ceramic Position (Arms)	22 (9.0)	3 (3.2)	17 (13.3)	2 (7.6)	5.424*	0.066			-
Ceramic Position (Legs)	42 (17.2)	7 (7.6)	29 (22.8)	6 (23.0)	9.232	0.009			OA=YA>SA
Incised Ceramics	34 (13.9)	7 (7.6)	18 (14.1)	9 (34.6)	12.235	0.002			OA>YA>SA
Shell Freq. (1500+pcs)	18 (7.3)	1 (1.0)	14 (11.0)	3 (11.5)	6.528*	0.038			OA=YA>SA
Shell Position (Arms)	48 (19.6)	4 (4.3)	35 (27.5)	9 (34.6)	19.792*	0.000			OA>YA>SA

Shell Bead Type (Necklace)	26 (10.6)	3 (3.2)	18 (14.1)	5 (19.2)	6.942*	0.031	OA>YA>SA
Shell Bead Freq. (1500+pcs.)	17 (6.9)	1 (1.0)	13 (10.2)	3 (11.5)	5.873*	0.053	-
Shell Bead Pos. (Pelvis)	22 (9.0)	5 (5.4)	12 (9.4)	5 (19.2)	4.704	0.095	-
Stone Type (Worked Stone)	25 (10.2)	4 (4.3)	15 (11.8)	6 (23.0)	6.334*	0.042	OA>YA>SA
Fauna Burial Pos. (Legs)	25 (10.2)	8 (8.7)	11 (8.6)	6 (23.0)	5.211	0.073	-
Fish Type (<i>Hemibagrus</i> sp.)	23 (9.4)	4 (4.3)	13 (10.2)	6 (23.0)	6.355*	0.041	OA>YA>SA
Sex – Bronze Age							
Total (n=145)	Male (n=71)	Female (n=74)	Comparisons				
Outcome	Obs. (%)	Obs. (%)	Obs. (%)		X²	P	X²
Ceramic Type 5	71 (48.9)	44 (61.9)	27 (36.4)		9.418	0.002	M>F
Ceramic Pos. (Arms)	19 (13.1)	13 (18.3)	6 (8.1)		3.312	0.068	M>F
Ceramic Dec. (Paint)	10 (6.8)	8 (11.2)	2 (2.7)		2.913*	0.087	M>F
Shell Bead Type (Belt)	13 (8.9)	2 (2.8)	11 (14.8)		5.055*	0.024	F>M
Excavation Square (C5)	8 (5.5)	1 (1.4)	7 (9.4)		3.093*	0.078	F>M
Cultural Layer (4.5)	29 (20.0)	19 (26.7)	10 (13.5)		3.974	0.046	M>F
Age – Iron Age							
Total (n=149)	0-14.9yrs (n=49)	15-39.9yrs (n=83)	40+yrs (n=17)				
Outcome	Obs. (%)	Obs. (%)	Obs. (%)		X²	P	
Semi-Flexed	8 (5.3)	7 (14.2)	1 (1.2)	-	7.105*	0.007	SA>YA
Flexed	18 (12.0)	18 (36.7)	-	-	-	-	-
Orientation (180°)	34 (22.8)	5 (10.2)	26 (31.3)	3 (17.6)	6.732*	0.034	-
Type 1c bowl	29 (19.4)	4 (8.1)	21 (25.3)	4 (23.5)	4.768*	0.092	-
Ceramic Freq. (6-10 pcs.)	42 (28.1)	8 (16.3)	29 (34.9)	5 (29.4)	5.288	0.071	-

Ceramic Pos. (Legs)	46 (30.8)	4 (8.1)	33 (39.7)	9 (52.9)	16.384*	0.000	OA>YA>SA
Ceramic Pos. (Feet)	48 (32.2)	6 (12.2)	34 (40.9)	8 (47.0)	13.573	0.001	OA>YA>SA
Sex – Iron Age							
	Total (n=82)	Male (n=44)	Female (n=38)				
Outcome	Obs. (%)	Obs. (%)	Obs. (%)		X²	P	Comparisons
Ceramic Type 5	20 (24.3)	15 (34.0)	5 (13.1)		4.845	0.027	M>F
Ceramic Freq. (6-10pcs.)	29 (35.3)	21 (47.7)	8 (21.0)		6.347	0.011	M>F

Note: The n value for all outcome suites under analysis is the same at Ban Non Wat; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X² Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance (P < 0.05); Post hoc testing carried out using Bonferroni's correction where appropriate.

lesser extent, to be buried with increased levels of ceramic artefacts than their female counterparts. Females had ceramic artefacts more frequently positioned at their abdomen.

7.7.1 *Significant non-normative mortuary variables – Neolithic, Bronze Age and Iron Age*

Table 7.7.1 provides an overview of significant and potentially significant statistical results in relation to non-normative outcomes from the Neolithic to the Iron Age at Ban Non Wat. Minimal non-normative activity occurs in the Neolithic and that which does occur only pertains to the distribution of select ceramic items. Table 7.7.1 shows that subadults in the Neolithic demonstrate a statistically significant association with Type 1b bowls as applied in this study. Children are also more frequently associated with cordmarked pottery and incidences of isolated ceramic lids deposited in graves. There were no instances where sex was an influencing factor in relation to atypical mortuary behaviour in the Neolithic.

As observed from the other sites under review, and as occurs here at Ban Non Wat, subadults are predominantly associated at burial in a semi-flexed style and exclusively with a flexed style at the Bronze and Iron Ages at the site. Table 7.7.1 shows some select atypical outcomes in relation to the elderly age class. For atypical activity in the Bronze Age this includes a variety of results related to the type, frequency or positioning of material culture fashioned of ceramic, shell or stone. In some instances, the statistically significant relationship is shared with the younger adult cohort in opposition to subadults such as hands at the pelvis, the positioning of ceramics at the legs and the incidence where high volumes (1500+ pcs. per person) of shell occur. However, preliminary statistical results demonstrate a relationship between the elderly and Type 2 jars, high frequencies (16+ per person) of ceramic items deposited in graves, incised ceramic wares, shell necklaces, worked stone, *Hemibagrus* sp. fish (catfish) and the positioning of shell at the pelvis and fauna, generally, at the legs. Where there was no relationship between sex and atypical mortuary behaviour in the Neolithic there is some minimal evidence at the Bronze Age with males more frequently buried with the relatively plain Type 5 jars in comparison to females. Males are also more frequently found with painted vessels.

Females, in the Bronze Age, were more frequently buried with shell beads. Finally, in addition to the established relationship between children and atypical funerary styles Table 7.7.1 also suggests that there is a relationship between the elderly and the deposition of ceramic items, of any type, at either the subject's legs or feet in the Iron Age. Younger adults at the Iron Age have a greater likelihood of being buried with Type 1c bowls and for being buried with increased totals of ceramic artefacts (6-10 pcs. per person). As at the Bronze Age (see Sex at Table 7.7.1) adult males, in addition to burial with higher frequencies of ceramic artefacts, have a statistically significant relationship with Type 5 jars.

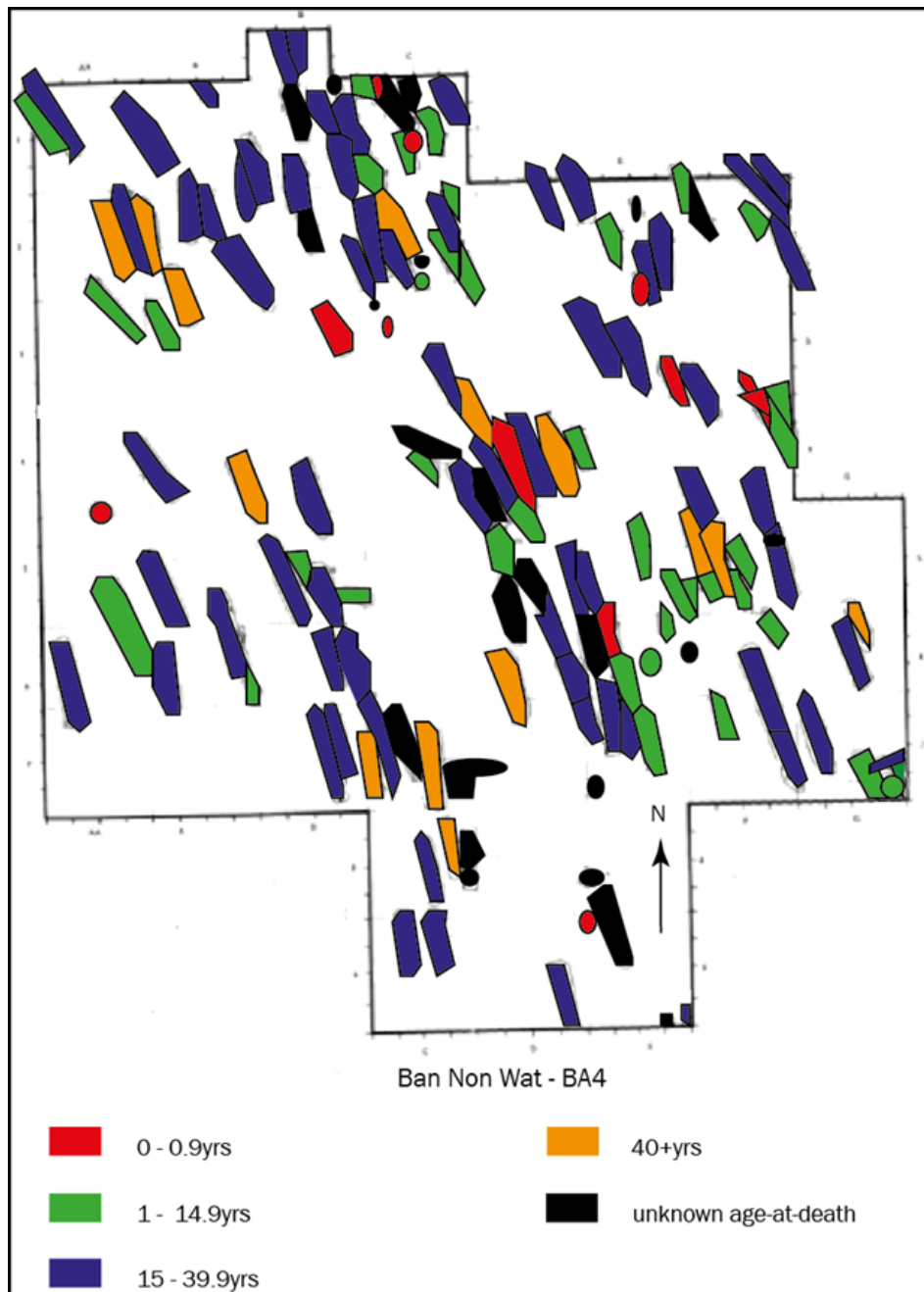


FIGURE 7:7: Mortuary Phase Bronze Age 4 (adapted from Higham 2012p: 249)

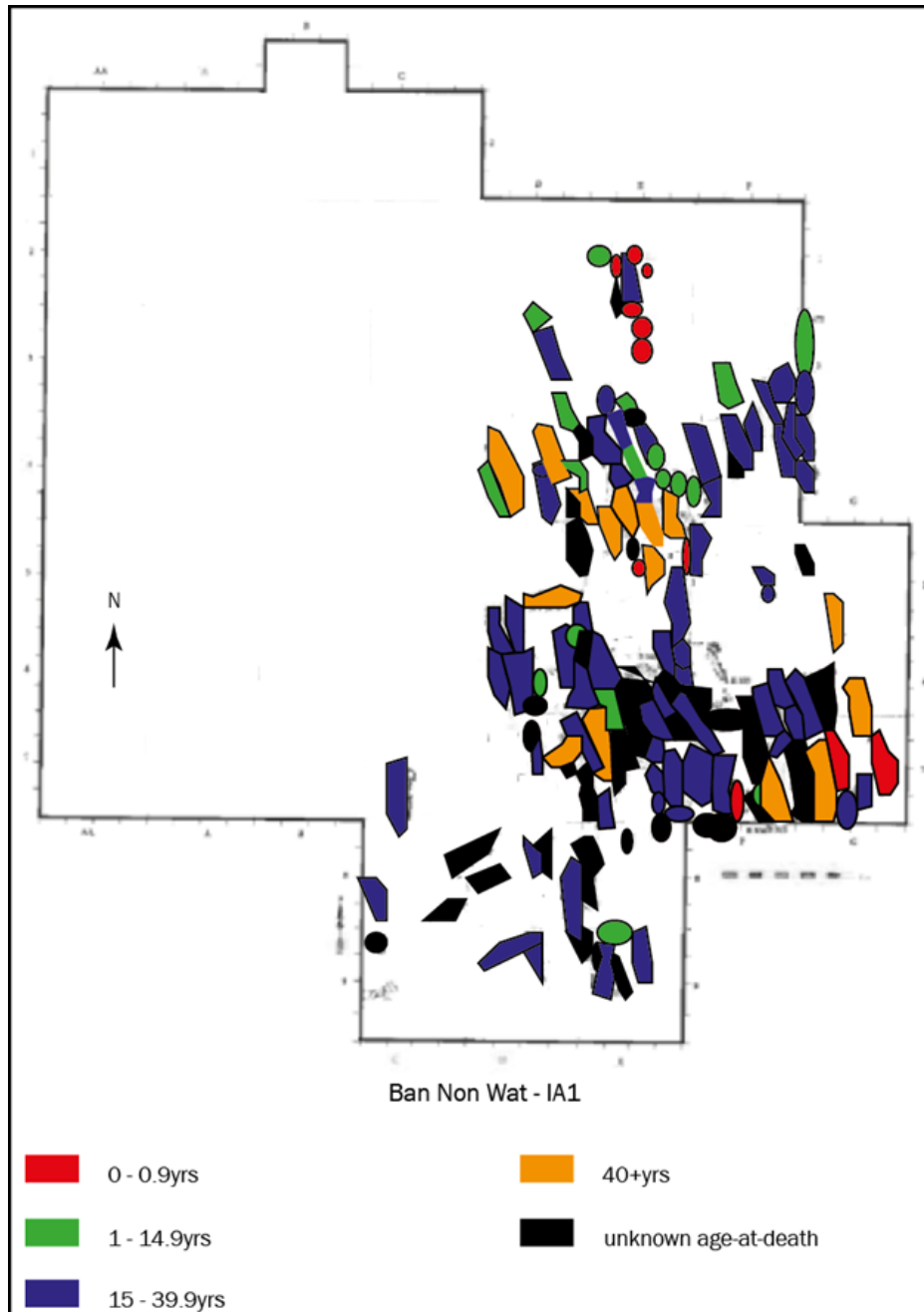


FIGURE 7.8: Mortuary Phase Iron Age 1 (adapted from Higham 2012a: 275)

7.8 Spatial Relationship of Burials (Suite #6)

As evidenced at the other sites under review, mortuary sequences at Ban Non Wat are separated by differing funerary traditions and the deposition of differing types of material culture across mortuary phases (Higham and Higham, 2009b). This includes varying practices of including flexed or non-flexed burials at different phases; the practice of clustered or burials in specific periods; an increase in association with exotic or standardised (i.e., Phimai Black ceramics) artefacts; and in increased variability in 'wealth' over time. As before, Figures 7.6 to 7.7 were taken from previously published material with illustrative super-positioning of burials by age categories added for the purposes of this study. The demarcation, in a northern orientation in original published maps, has been retained. Vertical spatial data was explored through a review of which age cohort was buried in a specific cultural layer and to investigate if evidence supported that subadults or the elderly were statistically most likely to be buried at the inception or terminal point of a cultural layer. A consideration of burials in the horizontal spectrum reviewed which sector (i.e., 1-45°, 91-135° etc.) a burial was predominantly positioned. Five layers were identified at the site (see Chapter Four).

Unlike at Khok Phanom Di, there is some evidence to suggest that age was a potential factor in the determination of the spatial location of subjects, horizontally and vertically, at Ban Non Wat. Horizontally, across the cemetery as a whole, a small distribution of the subadult population (8/162, 4.9%), primarily at the latter part of the Bronze Age (BA4), was located at grid C1 (8/11, 72.2%) at the northern tip of the baulk ($X^2=3.684^*$, $p=0.054$). On the other hand, older adults, again in small numbers (D4 6/26, 23.0%; E5 6/22, 27.2%) on the horizontal, demonstrated a potential statistical association with grids D4 ($X^2=4.737$, $p=0.093$) and E5 ($X^2=4.974$, $p=0.083$), in the central area of the baulk in a north-easterly position in comparison to other age cohorts at the site. The inclusion of older adult burials at this area occurred mainly in the early Iron Age (c. 420-150BCE). Analysis of atypical outcomes (see Table 7.7.1) shows that adult females were more frequently found at grid square C5.

An expanded consideration of burials, beyond the established excavation grid, on the horizontal plane was approached through an investigation of which sector (i.e., 1-45°, 91-135° etc.) burials were predominantly physically positioned. The predominant sector for burials in this instance was between 91-135° (86/459, 18.7%), but no age cohort showed any statistical association with this octant ($X^2=1.040$, $p=0.594$). Away from the normative, younger adults aged 15-39.9 years, had a statistically significant likelihood of being buried in an area between 181-225° on the horizontal plane ($X^2=11.493^*$, $p=0.003$) and, to a lesser degree, between 136-179° ($X^2=4.923$, $p=0.085$). Subadults, also, demonstrated a slight statistical probability of being buried in the sector between 1-45° ($X^2=4.788$, $p=0.091$). A consideration of the spatial location of burials, by period was also taken. Preliminary results, at the Bronze Age, suggested subadults may have been selectively buried in an area between 91-135° ($X^2=10.458^*$, $p=0.005$) and the elderly between 181-225° ($X^2=11.071^*$, $p=0.003$) during this Age. Similarly, at the Iron Age it was observed that, at a preliminary statistical level, that subadults may have more frequently been buried on the horizontal between 1-45° ($X^2=13.013^*$, $p=0.001$) with the elderly, as opposed to children in the Bronze Age, being buried between 91-135° ($X^2=8.919$, $p=0.011$).

A consideration of the deposition of burials in the vertical showed little in the way of statistical significance except for two instances relating to burial placement affecting older adult burials. The layer (layer 4.3) where the greatest number of burials from the sample (57/459, 12.4%) were recovered demonstrated a potential statistical association with elderly subjects ($X^2=5.031$, $p=0.080$). A small proportion of the sample (25/459, 5.4%) was at layer 5.2 with the elderly (7/25, 28.0%) demonstrating a statistically significant likelihood for being buried at the layer ($X^2=6.379^*$, $p=0.041$). As a general observation related to the fourteen burial phases at Ban Non Wat it was noted that an elderly burial was the initial (BA2 and BA4 Cluster D) or terminal (Neolithic 2 and BA4 Cluster D) burial in two instances. This contrasts with

subadults, usually aged 0-0.9 years., being the initial burial across five phases (Flexed, Neolithic 1, BA4 Cluster C, Iron Age 1 and Iron Age 2) and the terminal burial in six phases.

7.9 Summary

Chapter Seven summarised the results from the site of Ban Non Wat. Normative behaviour, as defined from the sample used in the study, was explored primarily in relation to the broad age cohorts outlined. Normative mortuary behaviour at Ban Non Wat during the Neolithic observed the presence of individuals buried in single graves in an extended supine fashion. This primarily continues as the normative in the Bronze and Iron Ages with the only variation noting a variance in increasing numbers of burials in extended fashion in later periods in comparison to the Neolithic. The Bronze Age burials demonstrate an increase in likelihood of individuals having hands placed at the pelvis as opposed to the normative anatomical position witnessed in the other periods at Ban Non Wat. Shallow graves are the most commonly found throughout the sites use. Normative orientation shifts across time at Ban Non Wat. Where no clear orientation dominates funerary practices in the Neolithic this shifts dramatically towards burial orientation in a NNW direction in the Bronze Age. While this orientation still remains dominant in the Iron Age nearly a quarter of burials during this period are buried directly opposite in a southerly direction. The inclusion of faunal remains in burials increases over time at Ban Non Wat and, in some instances, appears to be preferentially associated with older actors. The presence of low numbers of grave goods is most common throughout the sites use with ceramic artefacts being most frequently recovered from burials in the Bronze Age. Where ceramic bowls were found in nearly half of the burials in the Bronze Age this changes at the Iron Age with the deposition of a ceramic jar predominates.

It could be observed that behaviour, by age-at-death, alternated between adults or subadults being the significant aged cohort under review. It is adults, however, of both age categories being applied that are most frequently associated with significant mortuary outcomes at this site. Sex as a factor affecting mortuary behaviour was also explored in some instances. The analysis showed that age was an important factor in the determination of mortuary treatment, normative and atypical, of the subject by living community members through the period of time in the cemetery. Funerary practices in the Neolithic at Ban Non Wat deviated markedly with later phases of occupation where greater evidence of social change in relation to potential hierarchy and inequality. Further discussions, leveraging Regionality Theory, on mortuary variability between Khok Phanom Di and Ban Non Wat during the Neolithic are at Chapter Twelve. The onset of the Bronze Age also observes the introduction of material culture commonly recovered from other cemeteries locations across the region.

Results: Ban Lum Khao

8.1 Introduction

The results of the analysis from the Bronze Age site of Ban Lum Khao are presented in this chapter. The approach and outcomes explored are discussed at Chapter Five. Consideration is given to an understanding of normative mortuary behaviour at the site followed by a focus on the outcomes explored and the relationship between primary cohorts with normative mortuary behaviour. As published health data from Ban Lum Khao is situated at a population level, and does not include individual health indices, a consideration of poor health affecting mortuary treatment (Mortuary Suite #4) has not been included in this chapter in relation to subjects from Ban Lum Khao (see vignettes in Chapters Six and Nine).

8.2 Normative Mortuary Variables

Table 8.1 shows a range of outcomes of inferred normative behaviour from the site. Across the sample population the majority of individuals are exposed to burial in an extended manner (82.2%). The majority, excluding those in jar burials, are supine (86.9%). Burials are most commonly (45.7%) oriented at 136-179° (south south-eastern), mainly from mortuary phase (MP) 1 and MP2 and are buried in shallow graves (86.9%). All burials from MP1 and MP3 have shallow graves from 0-25cm with the variation in depths occurring only in MP2. It was common for individuals to frequently have faunal remains (43.9%), most frequently pig or bivalve, and deposited in association with the skull. While pig and Unionidae have been recovered from burials in all mortuary phases the deliberate placement of faunal remains in the predominant position at the subject's skull occurs only at mortuary phases 2 and 3.

Most individuals were buried with a grave good of some type (83.1%) most commonly being ceramic (77.5%) or shell (26.1%) and stone artefacts (17.7%). Several burials display evidence of having the feet crossed at Ban Lum Khao. Where visible, the positioning of the hands at the pelvis dominates mortuary practices at the site (10.2%). As at the other sites under review it was observed that hands are most frequently positioned in an anatomical position. Practices (placing of hands at the pelvis) observed from Ban Lum Khao is likely to be indicative of an alternative funerary custom.

TABLE 8.1: BURIAL OUTCOMES OF HIGHEST FREQUENCIES AT BAN LUM KHAO (N=107)

	Outcome	Obs. (%)	Outcome	Obs. (%)	Outcome	Obs. (%)
Burial of Human Remains	Single Burial	96 (89.7)	Supine Burial	93 (86.9)	Ochre Present	7 (6.5)
	Multiple Burial	9 (8.4)	Extended Burial	88 (82.2)	Ochre Application (skull)	4 (3.7)
	MB Style (3+ ind.)	3 (2.8)	Skull Position (Anat.)	22 (20.5)	Extra Clay Present	4 (3.7)
	Feet Pos. (Crossed)	15 (14.0)	Hand Pos. (Pelvis)	11 (10.2)	Orientation (136-179°)	49 (45.7)
Grave Layout	Disposal Container	14 (13.0)	Jar Burial	14 (13.0)	Grave Depth (0-25cm)	93 (86.9)
Fauna	Fauna Present	47 (43.9)	Pig Position (Skull)	8 (7.4)	Fish Present	9 (8.4)
	Fauna Pos. (Skull)	15 (14.0)	Unionidae Present	20 (18.6)	<i>Channa</i> sp.	6 (5.6)
	Pig Present	19 (17.7)	Unionidae (Skull)	7 (6.5)		
	Grave Good Present	89 (83.1)	Shell Present	28 (26.1)	Shell Bangle Freq. (1-5 pcs.)	15 (14.0)
Material Culture	Ceramic Good	83 (77.5)	Shell Jewellery	26 (24.2)	Stone Present	19 (17.7)
	Ceramic (1-5 pieces)	57 (53.2)	Shell Freq. (1-5 pcs.)	25 (23.3)	Worked Stone (Adze etc.)	10 (9.3)
	Ceramic Pos. (Feet)	30 (28.0)	Shell Position (Hand)	8 (7.4)	Stone Freq. (Low - 1-5 pcs.)	19 (17.7)
	Ceramic Decoration	65 (60.7)	Shell Beads Present	14 (13.0)	Stone Position (Hand)	6 (5.6)
	Slipped Dec. Style	64 (59.8)	Loose Shell Beads	8 (7.4)	Stone Bangle Present	9 (8.4)
	Whorl	5 (4.6)	Beads (1-500 pcs.)	12 (11.2)	Stone Bangle Freq. (1-5 pcs.)	9 (8.4)
	Clay Pellet	7 (6.5)	Beads Pos. (Skull)	6 (5.6)	Bone/Tooth Present	8 (7.4)
	Anvil	2 (1.8)	Shell Bangle Present	16 (14.9)	Bone/Tooth Tool	5 (4.6)
	Bronze Present	6 (5.6)	Bangle (Trid./Troch.)	5 (4.6)	Bone/Tooth Freq. (1-5 pcs.)	8 (7.4)
	Cult. Layer (2.8; 3.1)	15 (14.0)	Row Burial	83 (77.5)	Cemetery Location (45-90°)	17 (15.8)

Ob = observed number from total sample identified; % = percentage of sample – totals include zero counts (0) of unknown variable types; Artefacts recovered from grave fill excluded from analysis

MB = Multiple Burial; Pos. = Position; Anat. = Anatomical; Dec = Decoration; Freq. = Frequency; Trid. = Tridacna; Troch. = Trochus

8.3 Burial of Human Remains (Mortuary Suite #1)

Though all age categories have instances of hands being placed at the pelvis it is the elderly, statistically, that are most likely to be exposed to this behaviour from this small sample ($X^2=11.04^*$, $p=0.003$). This relationship with the elderly also occurs in relation to the subject's feet being crossed ($X^2=6.257^*$, $p=0.043$). Although the practice of hands being placed at the pelvis occurs at all sites under review of varying frequency Figure 8.1 shows that older adults, with the exception of Ban Non Wat, were subject to this behaviour at moderate to high numbers (Khok Phanom Di: 41.7%; Ban Lum Khao: 54.5%; Noen U-Loke: 66.6%; Ban Non Wat: 13.7%). Subadults at Ban Lum Khao were not frequently exposed to this custom. Discussion on inter-site practices related to limb placement can be found at Section 11.2.1.4.

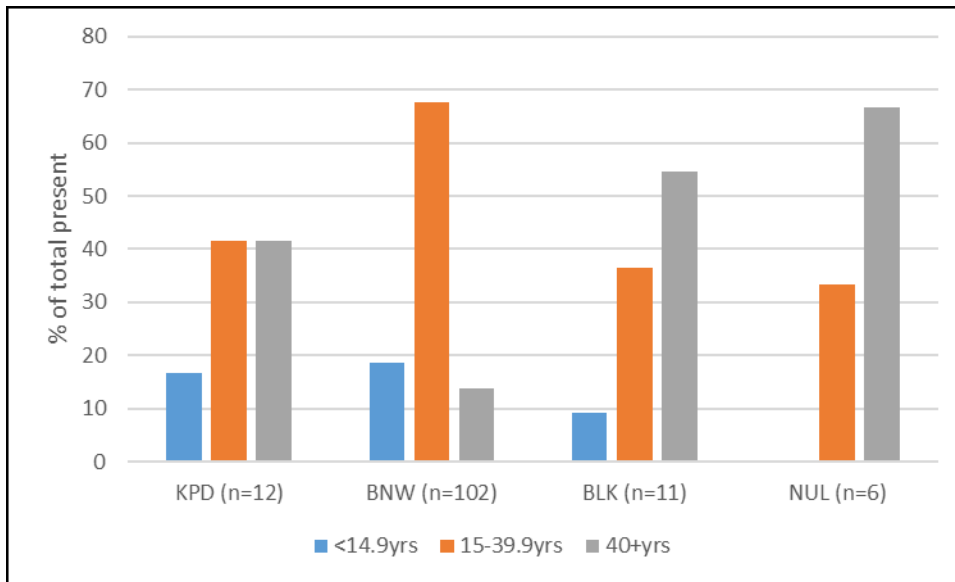


FIGURE 8.1: Position of Hand – At, under, on pelvis

KPD = Khok Phanom Di; BNW = Ban Non Wat; BLK = Ban Lum Khao; NUL = Noen U-Loke

While the presence of ochre in burials continues at Ban Lum Khao the frequency of occurrence, in comparison to other sites in the region such as Ban Non Wat or Khok Phanom Di, is relatively low. Sex is not a factor in relation to Suite #1 activities at Ban Lum Khao with only one outcome, single burial, demonstrating a potential difference between males and females.

Normative orientation at Ban Lum Khao (136-179°) positions the individual towards the adjacent Prasat stream and in the direction of the Mun River and an elevated upland region of the area. Older adults are the most likely cohort to be buried in this orientation although with no statistically significant association. Figure 8.2 shows where the same orientation occurs at Ban Non Wat and Noen U-Loke that the younger adult cohort is more frequently associated with this orientation. However, the proportionate sample sizes from Ban Non Wat and Noen U-Loke are significantly less than at Ban Lum Khao. While it is important to briefly look at, and compare, this aspect of funerary behaviour at this juncture a more detailed inter-site comparison will be found in relation to orientation at Sections 11.2.1.2.

TABLE 8.2: SUMMARY OF SUITE #1 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – BURIAL OF HUMAN REMAINS

Age										Comparisons
	Total (n=107)	SA (n=51)	YA (n=38)	OA (n=18)						(SA, YA, OA)
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P				(X ² with Bonferroni correction)
Single Burial	96 (89.7)	47 (92.1)	33 (86.8)	16 (88.8)	0.683	0.710				-
Multiple Burial (MB)	9 (8.4)	2 (3.9)	5 (13.1)	2 (11.1)	1.396*	0.497				-
MB Style (3+ individuals)	3 (2.8)	-	2 (5.2)	1 (5.5)	0.805*	0.668				-
Supine Burial	107 (100.0)	51 (100.0)	38 (100.0)	18 (100.0)	0	1.000				-
Extended Burial	88 (82.2)	32 (62.7)	38 (100.0)	18 (100.0)	25.77*	0.000				OA=YA>SA
Skull Position (Anatomical)	22 (20.5)	9 (17.6)	8 (21.0)	5 (27.7)	0.845	0.655				-
Hand Position (Pelvis)	11 (10.2)	1 (1.9)	4 (10.5)	6 (33.3)	11.04*	0.003				OA=YA>SA
Feet Position (Crossed)	15 (14.0)	3 (5.8)	6 (15.7)	6 (33.3)	6.257*	0.043				OA>YA>SA
Ochre Present	7 (6.5)	2 (3.9)	4 (10.5)	1 (5.5)	0.761*	0.683				-
Ochre Application (skull)	4 (3.7)	2 (3.9)	1 (2.6)	1 (5.5)	0.141*	0.931				-
Extra Clay Present	4 (3.7)	3 (5.8)	1 (2.6)	-	0.243*	0.885				-
Orientation (136-179°)	49 (45.7)	19 (37.2)	20 (52.6)	10 (55.5)	2.905	0.233				-
Sex										
	Total (n=56)	Male (n=26)	Female (n=30)							Comparisons
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P					X ²
Single Burial	49 (87.5)	25 (96.1)	24 (80.0)	3.323	0.068					M>F
Multiple Burial (MB)	7 (12.5)	1 (3.8)	6 (20.0)	2.01*	0.156					-
MB Style (3+ individuals)	3 (5.3)	-	3 (10.0)	1.129*	0.287					-
Supine Burial	56 (100.0)	26 (100.0)	30 (100.0)	0	1.000					-
Extended Burial	56 (100.0)	26 (100.0)	30 (100.0)	0	1.000					-
Skull Position (Anatomical)	13 (23.2)	5 (19.2)	8 (26.6)	0.432	0.511					-

Hand Position (Pelvis)	10	(17.8)	4	(15.3)	6	(20.0)		0.01*	0.920	-
Feet Position (Crossed)	12	(21.4)	4	(15.3)	8	(26.6)		0.49*	0.483	-
Ochre Present	5	(8.9)	4	(15.3)	1	(3.3)		1.226*	0.268	-
Ochre Application (skull)	2	(3.5)	2	(7.6)	-			0.681*	0.409	-
Extra Clay Present	1	(1.7)	-		1	(3.3)		0.005*	0.943	-
Orientation (136-179°)	30	(53.5)	11	(42.3)	19	(63.3)		2.476	0.115	-

Note: The n value for all outcome suites under analysis is the same at Ban Lum Khao; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X² Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance (P < 0.05); Post hoc testing carried out using Bonferroni's correction where appropriate.

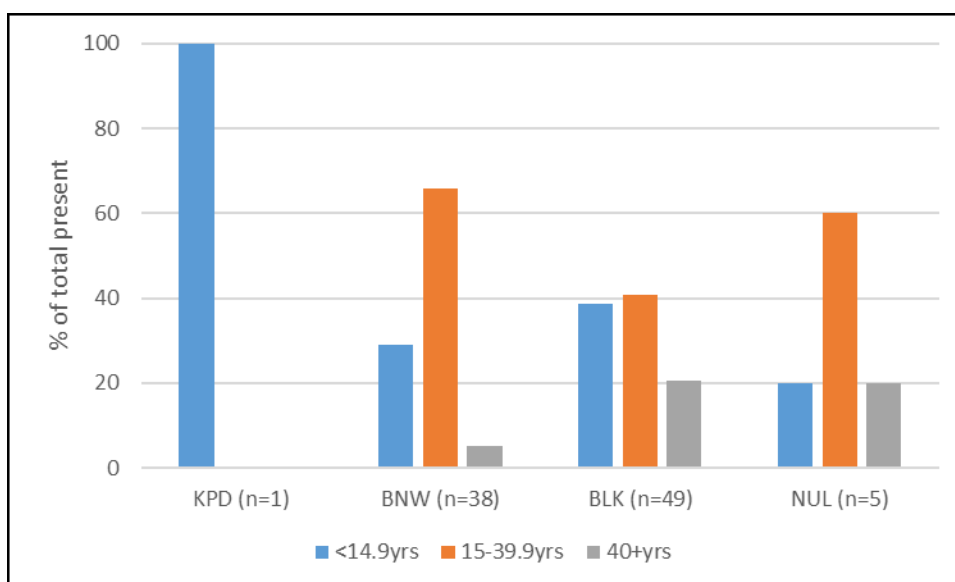


FIGURE 8.2: Orientation of burials – 136-179°

KPD = Khok Phanom Di; BNW = Ban Non Wat; BLK = Ban Lum Khao; NUL = Noen U-Loke

8.3.1 Field Anthropology

As discussed at Chapter Four (see Section 4.6.3) previous research from Ban Lum Khao has explored mortuary practices from a position that included consideration of field anthropology methods (Willis and Tayles, 2009). Previous research found, from a sample of 26 burials, two practices with one group (n=14, nine females; five males) showing evidence of being wrapped where the second group (n=12, 11 females; one male) showed evidence of coffin burial (Willis and Tayles, 2009).

This research adopted the framework for analysis established by Harris and Tayles (2012: 232) for its purposes (see Chapter Four, Section 5.9). A total of 28/107 (26.1%) of the sample were considered assessable either from photographic evidence (Willis, pers.comm.) or pictorial data from the original manuscript (Higham and Thosarat, 2004c). A total of 7/28 assessed individuals were subadults with the youngest being aged 1-4.9 years with most aged five or older. Of the remaining adults 9/28 (32.1%) were aged 40 or more. Exposure to wrapping, in one form or another, or burial in a narrow coffin occurred at MP2 (n=21/28) but could also be observed from MP1 and MP3. Older adults (five males, four females) were most frequently exposed to this behaviour in MP2 (n=7/9). While not significant, of the 21 adults exposed to this potential behaviour the majority 13/21 (61.9%) were females.

Following Harris and Tayles (2012) approach only six of nine potential outcomes were observed following analysis (see Figure 8.3). These included variations on the application of loose and/or tight durable and non-durable wrapping or burial in a narrow coffin. The most frequent response (10/28, 35.7%) was non-specific and indicated constriction in either loose or tight non-durable wrapping, tight wrapping or in a narrow coffin ($X^2 = 3.691^*$, $p=0.157$). Style 8 containment were performed on the elderly most frequently (4/9, 44.4%) also with no statistically significant association ($X^2 = 2.39^*$, $p=0.302$).

Style 2 = tight durable wrapping; Style 3 = loose non-durable wrapping / narrow coffin; Style 5 = narrow coffin; Style 6 = tight non-durable wrapping; Style 8 = tight durable or non-durable wrapping / narrow coffin; and Style 9 = loose or tight non-durable wrapping / tight durable wrapping or narrow coffin

8 RESULTS: BAN LUM KHAO

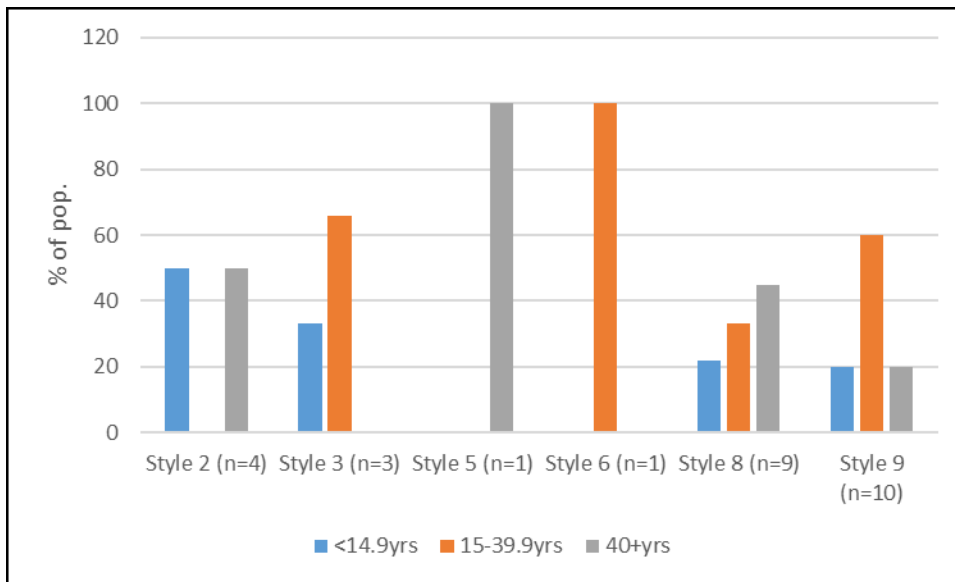


FIGURE 8.3: Potential containment styles at Ban Lum Khao

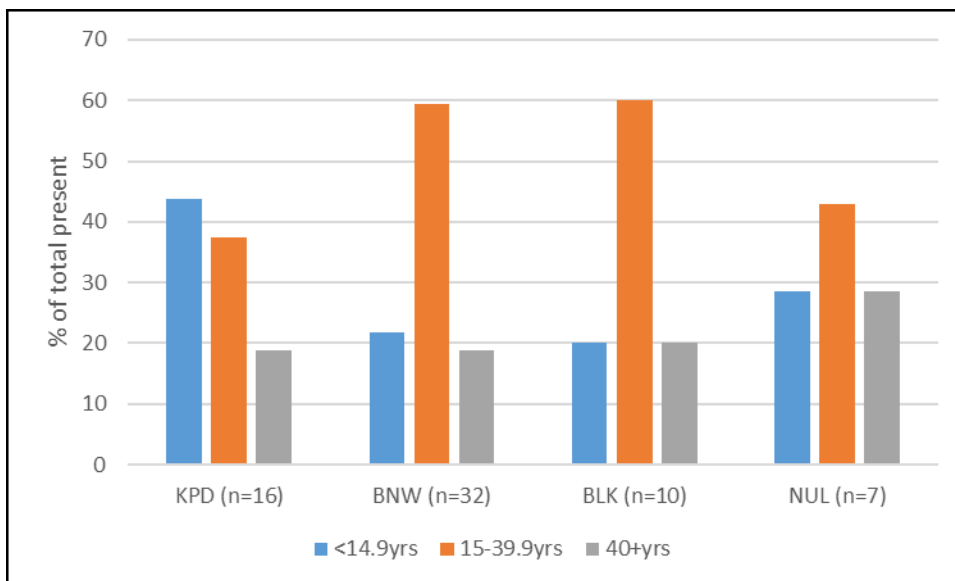


FIGURE 8.4: Comparison by those in loose/tight non-durable, or tight wrapping, or a narrow coffin (Style 9)

A comparison of similar behaviour from other sites, by age, is at Figure 8.4. Age profiles, other than for Khok Phanom Di, suggest relatively consistent trends in the number of subadults and older adults exposed to Style 9 containment behaviour at the sites under review (see Section 11.2.1.3 for further discussion).

8.4 Characteristics of Grave Environment (Mortuary Suite #2)

Table 8.3 observes 16.8% of the sample from Ban Lum Khao were buried/constrained within a permanent (i.e., jar burial) or non-permanent (i.e., animal hide) artefact. Subadults are most frequently exposed to these practices with 88.8% associated with a disposal container. Only neonates and infants were subject to jar burial. The remaining two subadults, both older children aged between 1-9 years, associated with a disposal container were buried with animal hide. All four burials with evidence of animal hide occurred at MP3 whereas all jar burials occurred at MP2 during the period of greatest activity in the cemetery. The two adult females buried with animal hide in MP3 were aged in their 20s and 30s. Again, as with activities related to Suite #1, sex does not appear to be a factor in the determination of applying specific mortuary treatment with individuals.

Figure 8.5 demonstrates that, with the exception of Noen U-Loke, shallow burial depths were the most common at the sites under review including Ban Lum Khao. Figure 8.5 shows that subadults at the Neolithic site of Khok Phanom Di were significantly more likely to be buried in a shallow grave in contrast to adults at the site. Whereas the age profile of those receiving this treatment is markedly different

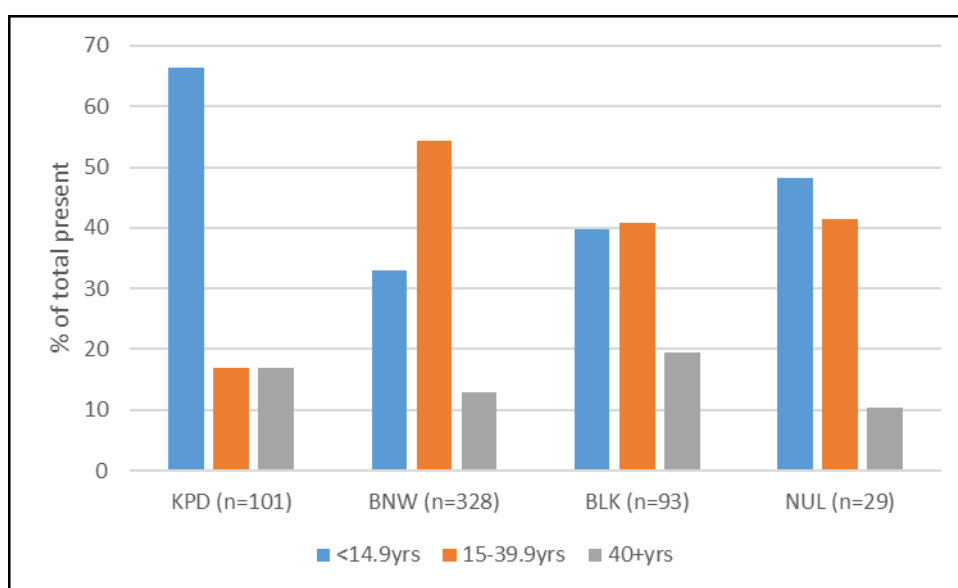


FIGURE 8.5: Comparison of sites by shallow grave depth
KPD = Khok Phanom Di; BNW = Ban Non Wat; BLK = Ban Lum Khao; NUL = Noen U-Loke

TABLE 8.3: SUMMARY OF SUITE #2 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX – CHARACTERISTICS OF THE GRAVE

Age	Total (n=107)	SA (n=51)	YA (n=38)	OA (n=18)		Comparisons
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P
Disposal Container Present	18 (16.8)	16 (31.3)	2 (5.2)	-	12.099*	0.002
Jar Burial	14 (13.0)	14 (27.4)	-	-	14.345*	0.000
Grave Depth (0-25cm)	93 (86.9)	37 (72.5)	38 (100.0)	18 (100.0)	17.687	0.000
Sex						
	Total (n=56)	Male (n=26)	Female (n=30)			Comparisons
	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P	X ²
Disposal Container Present	2 (3.5)	-	2 (6.6)	0.383*	0.536	-
Jar Burial	-	-	-	-	-	-
Grave Depth (0-25cm)	56 (100.0)	26 (100.0)	30 (100.0)	0	1.000	-

Note: The n value for all outcome suites under analysis is the same at Ban Lum Khao; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X² Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance (P < 0.05); Post hoc testing carried out using Bonferroni's correction where appropriate.

at the Bronze Age at Ban Lum Khao with all adults, with no exceptional treatment being afforded to any adult age category, being buried in shallow graves. Only subadults, at MP2, are buried in graves of moderate depth. Of these only one individual, buried at the terminal period of the cemeteries use is aged 1-4.9 years with the remaining being either foetal or aged 0-0.9 years. While a brief engagement with shallow burial depths was approached here a more comprehensive discussion with this aspect of funerary behaviours at an inter-site level can be found at Section 11.2.2.2.

8.5 Faunal Remains (Mortuary Suite #3)

Almost half of individuals were buried with faunal remains at Ban Lum Khao. As stated the predominant taxon deposited included pig and/or a bivalve of the Unionidae family, most frequently *Hyriopsis bialatus*, *Pseudodon* sp., *Pilsbryconcha* sp. and *Cristaria plicata*. However, additional faunal taxonomies recovered *in situ* from burials includes birds, mongoose, deer, fish, frog, turtle, dog and gastropods (Higham, 2004e, Thosarat, 2004). Additionally, an abundance of species, including bovid, were recovered from a range of non-mortuary contexts including pits from the basal layer of the site.

Table 8.4 shows that no specific age category is afforded select or preferential behaviour in association with the presence of faunal remains. Similarly, of the adults buried with faunal remains the evidence does not indicate select behaviour towards males or females. The most common position for faunal remains to be deposited in the burial was at, under or beside the individual's skull with subadults and adults of all ages being exposed to this behaviour.

A high number of younger adults in comparison to subadults and older adults, were buried with pig remains. The inclusion of pig remains with adults across these age ranges occurs in all mortuary phases at Ban Lum Khao. The inclusion of pig remains in burials of older adults, echoing the pattern seen below of subadults in relation to their relationship with Unionidae sp., also only occurs in MP2 and only includes female subjects.

Subadults are most frequently exposed to this burial with Unionidae. While not present in the single foetal burial from the sample, all other subadult age ranges have Unionidae included. All instances where Unionidae are deposited with subadult burials occur at MP2. Albeit in small frequencies, where sex is considered, again we note a change in behaviours with nearly all males having Unionidae deposited in MP1 but with all females being deposited with this artefact in MP2.

Table 8.4 shows that no older adults had fish of any kind included in their burial. This excludes the inclusion of fish in grave fill. The inclusion of fish in younger adult graves occurs only at MP1 and MP2, primarily at MP2. With the small number of subadults affected this also occurs mainly at MP2 with one instance occurring at MP3.

8.6 Material Culture (Mortuary Suite #5)

A broad range of material culture, locally sourced or exotic, was recovered from burials at Ban Lum Khao (Chang, 2004, Higham, 2004c). In many instances the number of artefacts recovered from burials is significantly less than that recovered from non-mortuary settings (e.g., pellets 7/332 (2.1%), whorls 6/96 (6.2%), burnishing stones 1/7 (14.2%)). While recognising the importance of items from non-mortuary settings to understanding a population's development and behaviour this study places greater, and in many instances exclusive, emphasis on artefacts recovered from mortuary settings and the individual/cohorts in association.

TABLE 8.4: SUMMARY OF SUITE #3 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – FAUNAL REMAINS

Age										Comparisons	
	Total (n=107)	SA (n=51)	YA (n=38)	OA (n=18)						(SA, YA, OA)	
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P				(X ² with Bonferroni correction)	
Fauna Present	47 (43.9)	21 (41.1)	19 (50.0)	7 (38.9)	0.911	0.634				-	
Fauna Position (Skull)	15 (14.0)	5 (9.8)	7 (18.4)	3 (16.6)	0.743*	0.689				-	
Pig Present	19 (17.7)	5 (9.8)	11 (28.9)	3 (16.6)	4.27*	0.118				-	
Pig Position (Skull)	8 (7.4)	2 (3.9)	5 (13.1)	1 (5.6)	1.555*	0.459				-	
Unionidae Present	20 (18.6)	12 (23.5)	4 (10.5)	4 (22.2)	1.679*	0.431				-	
Unionidae Position (Skull)	7 (6.5)	2 (3.9)	3 (7.8)	2 (11.1)	0.319*	0.852				-	
Fish Present	9 (8.4)	4 (7.8)	5 (13.1)	-	0.218*	0.640				-	
<i>Chama</i> sp.	6 (5.6)	3 (5.8)	3 (7.8)	-	0.003*	0.956				-	
Sex											
	Total (n=56)	Male (n=26)	Female (n=30)							Comparisons	
	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P					X ²	
Fauna Present	26 (46.4)	11 (42.3)	15 (50.0)	0.331	0.565					-	
Fauna Position (Skull)	10 (17.8)	3 (11.5)	7 (23.3)	0.639*	0.424					-	
Pig Present	14 (25.0)	5 (19.2)	9 (30.0)	0.862	0.353					-	
Pig Position (Skull)	6 (10.7)	2 (7.6)	4 (13.3)	0.061*	0.804					-	
Unionidae Present	8 (14.2)	4 (15.3)	4 (13.3)	0.027*	0.869					-	

Unionidae Position (Skull)	5	(8.9)	3	(11.5)	2	(6.6)		0.028*	0.867	-
Fish Present	5	(8.9)	2	(7.6)	3	(10.0)		0.028*	0.867	-
<i>Channa</i> sp.	3	(5.3)	2	(7.6)	1	(3.3)		0.016*	0.899	-

Note: The n value for all outcome suites under analysis is the same at Ban Lum Khao; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X² Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance (P < 0.05); Post hoc testing carried out using Bonferroni's correction where appropriate.

Artefacts included a broad variety of ceramic vessels, some lidded, of various forms and function (i.e., storage vessel, cooking vessel, and mortuary vessel), clay pellets, ceramic anvils, whorls, moulds, figurines, beads, bangles and rings. The presence of clay pellets, anvils and spindle whorls is linked with economic activities at the site including hunting practices and textile and ceramic manufacturing. Where evidence can be observed ceramic moulds were designed to form bronze objects such as arrowheads (Higham, 2004c). Sharing similarities, in practice if not form, with the site of Ban Na Di some burials were deposited with ceramic bovid figurines (Higham, 2004c).

Table 8.5 shows that the majority of burials (83.1%) had some item of grave good. Sex does not appear, statistically, to be a factor in the distribution of normative practices in relation to material culture at Ban Lum Khao. The most commonly identifiable position for ceramic wares to be deposited is at the subject's feet with the elderly predominantly associated with this behaviour ($X^2=8.17$, $p=0.016$) (see Table 8.5 post hoc outcomes). The Type 6 jar (restricted vessel with everted rim, oval body and flat base), adopted in this study and applied to the sites of Ban Lum Khao, Ban Non Wat and Noen U-Loke, was most frequently encountered in burials (22.4%). Subadults are buried, equally with younger adults, with spindle whorls used in the manufacturing of textiles.

It was relatively common for ceramic vessels included in burial suites to be decorated (60.7%) in a range of forms including slipped, cord-marked, impressed, incised or with suspension holes. Figure 8.6 shows a comparative view between sites, based on age-at-death, for those burials that have a decorated ceramic vessel in an incised style in association. While the frequencies remain relatively low it is evident that patterns of inclusion vary between each site. Trends for the inclusion of incised vessels at Ban Lum Khao show that subadults (10/16, 62.5%) with greatest frequency. Older adults at Ban Lum Khao, Ban Non Wat and Khok Phanom Di are less likely to have this decorative style applied to pottery deposited in their graves. While in low numbers it can be seen that only subadults and older adults at Noen U-Loke are deposited with incised ceramic vessels (see Sections 11.2.5.2. to 11.2.5.5 for further discussion at an inter-site level of funerary behaviour related to material culture).

TABLE 8.5: SUMMARY OF SUITE #5 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – MATERIAL CULTURE

Age										Comparisons	
	Total (n=107)	0-14.9yrs (n=51)		15-39.9yrs (n=38)		40+yrs (n=18)				(SA, YA, OA)	
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P	(X ² with Bonferroni correction)		
Grave Good Present	89 (83.1)	37 (72.5)	35 (92.1)	17 (94.4)			7.915	0.019	-		
Ceramic Good Present	83 (77.5)	36 (70.5)	32 (84.2)	15 (83.3)			2.736	0.254	-		
Type 6 Jar	24 (22.4)	10 (19.6)	10 (26.3)	4 (22.2)			0.312*	0.855	-		
Ceramic Frequency (<5 pieces)	57 (53.2)	29 (56.8)	19 (50.0)	9 (50.0)			0.505	0.776	-		
Ceramic Position (Feet)	30 (28.0)	11 (21.5)	9 (23.6)	10 (55.5)			8.17	0.016	OA>YA>SA		
Ceramic Decoration Present	65 (60.7)	29 (56.8)	24 (63.1)	12 (66.6)			0.68	0.711	-		
Whorl	6 (5.6)	3 (5.8)	3 (7.8)	-			0.003*	0.956	-		
Clay Pellet	7 (6.5)	3 (5.8)	3 (7.8)	1 (5.5)			0.103*	0.949	-		
Anvil	2 (1.8)	-	2 (5.2)	-			-	-	-		
Bronze Present	6 (5.6)	5 (9.8)	1 (2.6)	-			0.824*	0.364	-		
Shell Present	28 (26.1)	13 (25.4)	10 (26.3)	5 (27.7)			0.037	0.981	-		
Shell Jewellery	26 (24.2)	12 (23.5)	10 (26.3)	4 (22.2)			0.016*	0.992	-		
Shell Freq. (<5 pcs.)	25 (23.3)	12 (23.5)	8 (21.0)	5 (27.7)			0.31	0.856	-		
Shell Position (Hand)	8 (7.4)	5 (9.8)	2 (5.2)	1 (5.5)			0.197*	0.906	-		
Shell Beads Present	14 (13.0)	6 (11.7)	5 (13.1)	3 (16.6)			0.067*	0.967	-		
Loose Shell Beads	8 (7.4)	4 (7.8)	2 (5.2)	2 (11.1)			0.091*	0.955	-		
Shell Beads Freq. (<500 pcs.)	12 (11.2)	6 (11.7)	3 (7.8)	3 (16.6)			0.292*	0.864	-		
Shell Beads Position (Skull)	6 (5.6)	2 (3.9)	2 (5.2)	2 (11.1)			0.368*	0.831	-		
Shell Bangle Present	16 (14.9)	8 (15.6)	6 (15.7)	2 (11.1)			0.025*	0.987	-		
Shell Bangle Material (Tridacna)	5 (4.6)	2 (3.9)	2 (5.2)	1 (5.5)			0.196*	0.906	-		
Shell Bangle Freq. (<5 pcs.)	15 (14.0)	8 (15.6)	6 (15.7)	1 (5.5)			0.509*	0.775	-		

Stone Present	19 (17.7)	4 (7.8)	8 (21.0)	7 (38.8)	7.041*	0.029	OA>YA>SA
Worked Stone (Adze etc.)	10 (9.3)	3 (5.8)	3 (7.8)	4 (22.2)	2.539*	0.280	-
Stone Freq. (<5 pcs.)	19 (17.7)	4 (7.8)	8 (21.0)	7 (38.8)	7.041*	0.029	OA>YA>SA
Stone Position (Hand)	6 (5.6)	1 (1.9)	3 (7.8)	2 (11.1)	1.005*	0.605	-
Stone Bangle Present	9 (8.4)	-	5 (13.1)	4 (22.2)	0.224*	0.636	-
Stone Bangle Freq. (<5 pcs.)	9 (8.4)	-	5 (13.1)	4 (22.2)	0.224*	0.636	-
Bone/Tooth Present	8 (7.4)	2 (3.9)	6 (15.7)	-	2.439*	0.118	-
Bone/Tooth Tool	5 (4.6)	1 (1.9)	4 (10.5)	-	1.614*	0.203	-
Bone/Tooth Freq. (<5 pcs.)	8 (7.4)	2 (3.9)	6 (15.7)	-	2.439*	0.118	-
Sex							
	Total (n=56)	Male (n=26)	Female (n=30)				Comparisons
	Obs. (%)	Obs. (%)	Obs. (%)		X ²	P	X ²
Grave Good Present	52 (92.8)	24 (92.3)	28 (93.3)		0.022	0.882	-
Ceramic Good Present	47 (83.9)	22 (84.6)	25 (83.3)		0.017	0.896	-
Ceramic Frequency (<5 pieces)	28 (50.0)	14 (53.8)	14 (46.6)		0.287	0.592	-
Ceramic Position (Feet)	19 (33.9)	8 (30.7)	11 (36.6)		0.216	0.642	-
Ceramic Decoration Present	36 (64.2)	16 (61.5)	20 (66.6)		0.16	0.689	-
Whorl	2 (3.5)	1 (3.8)	1 (3.3)		0.383*	0.536	-
Clay Pellet	4 (7.1)	1 (3.8)	3 (10.0)		0.138*	0.710	-
Anvil	2 (3.5)	1 (3.8)	1 (3.3)		0.383*	0.536	-
Shell Present	15 (26.7)	6 (23.0)	9 (30.0)		0.34	0.559	-
Shell Jewellery	14 (25.0)	6 (23.0)	8 (26.6)		0.096	0.756	-
Shell Freq. (<5 pcs.)	13 (23.2)	5 (19.2)	8 (26.6)		0.432	0.511	-
Shell Position (Hand)	3 (5.3)	1 (3.8)	2 (6.6)		0.016*	0.899	-
Shell Beads Present	8 (14.2)	4 (15.3)	4 (13.3)		0.027*	0.869	-

Loose Shell Beads	8	(14.2)	2	(7.6)	6	(20.0)	0.865*	0.352	-
Shell Beads Freq. (<500 pcs.)	6	(10.7)	3	(11.5)	3	(10.0)	0.061*	0.804	-
Shell Beads Position (Skull)	4	(7.1)	3	(11.5)	1	(3.3)	0.447*	0.503	-
Shell Bangle Present	8	(14.2)	3	(11.5)	5	(16.6)	0.027*	0.869	-
Shell Bangle Material (Tridacna)	3	(5.3)	-		3	(10.0)	-	-	
Shell Bangle Freq. (<5 pcs.)	7	(12.5)	2	(7.6)	5	(16.6)	0.369*	0.543	-
Stone Present	15	(26.7)	4	(15.3)	11	(36.6)	2.223*	0.135	-
Worked Stone (Adze etc.)	7	(12.5)	1	(3.8)	6	(20.0)	2.01*	0.156	-
Stone Freq. (<5 pcs.)	15	(26.7)	4	(15.3)	11	(36.6)	2.223*	0.135	-
Stone Position (Hand)	5	(8.9)	2	(7.6)	3	(10.0)	0.028*	0.867	-
Stone Bangle Present	9	(16.0)	3	(11.5)	6	(20.0)	0.245*	0.620	-
Stone Bangle Freq. (<5 pcs.)	9	(16.0)	3	(11.5)	6	(20.0)	0.245*	0.620	-
Bone/Tooth Present	6	(10.7)	1	(3.8)	5	(16.6)	1.241*	0.265	-
Bone/Tooth Tool	4	(7.1)	-		4	(13.3)	-	-	
Bone/Tooth Freq. (<5 pcs.)	6	(10.7)	1	(3.8)	5	(16.6)	1.241*	0.265	-

Note: The n value for all outcome suites under analysis is the same at Ban Lum Khao; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance (P < 0.05); Post hoc testing carried out using Bonferroni's correction where appropriate

8 RESULTS: BAN LUM KHAO

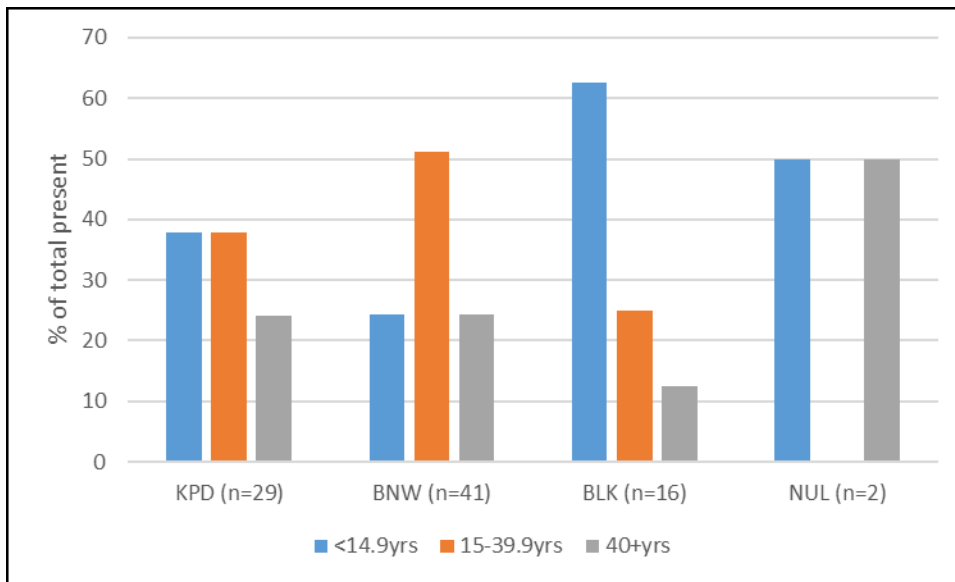


FIGURE 8.6: Comparison of burials with ceramic vessels with incised decoration
KPD = Khok Phanom Di; BNW = Ban Non Wat; BLK = Ban Lum Khao; NUL = Noen U-Loke

While situated in the Bronze Age there is minimal evidence supporting the presence of bronze or copper alloy at Ban Lum Khao with only fragments or amorphous aggregations being recovered from burials (Higham and Thosarat, 2004b). What data that is present indicates an association between bronze and the young. The sole piece of bronze jewellery, recovered from a non-mortuary setting and in a fragmentary condition, is considered to be either a bangle or earrings (Higham, 2004: 228). Evidence suggests that subadults are the cohort that is mainly associated with bronze at the site. When subadults were examined in isolation it was found that older children, aged 10-14.9 years, were most frequently associated with bronze. Older adults are not associated with metal.

Shell artefacts, in a variety of forms, are present in a moderate number of burials. It was common for shell artefacts from burials to be manufactured in the form of jewellery (26/28, 92.8%). Shell forms recovered from Ban Lum Khao were as disc beads, bangles, earrings or as worked shell artefacts (Chang, 2004). Predominant shell species used for the manufacture of artefacts include *Tridacna* sp., *Trochus* sp. and *Anadara* sp. but cowrie has also been recovered. Generally, shell artefacts primarily through the form of bangles, were positioned most commonly at or near the subjects hand. This varied where disc beads were considered in isolation with beads being most frequently recovered from the vicinity of the individual's skull. As with ceramic artefacts it is observed, where present, that low frequencies, as defined by this study, of shell artefacts (<500 pcs.) were associated with burials.

Stone artefacts were recovered from a low number of burials from the site (17.7%) and are statistically most likely to be associated, in low numbers, with elderly subjects ($X^2=7.041^*$, $p=0.029$). Stone artefact forms include adzes, blade fragments, beads and bangles. Stone for adzes are believed to be sourced from the surrounding Phetchabun uplands (Higham, 2004c). The limited number of beads are constructed of marble or serpentine (Chang, 2004: 224). All stone bangles were constructed from marble and, predominantly, were deposited in burials. Worked stone artefacts such as adzes are the most common type recovered from burials. Again reflecting the frequency of marble bangles the most common position of stone artefacts was at or near the subject's hand. Although not significant, female subjects were most frequently buried with stone artefacts. Only adults are buried with stone bangles.

An extensive range of worked bone artefacts (i.e., adze, points, awls, chisels) were recovered from non-mortuary settings but only limited numbers recovered from burials. In addition two ivory bangle fragments, burnt ivory, turtle carapace and worked antler were recovered from both mortuary and non-mortuary contexts (Chang, 2004, Higham, 2004c). However, only a low number of burials (7.4%) from Ban Lum Khao had bone/tooth material associated. Although younger adults were more frequently associated with this material than subadults the statistical evidence does not infer selective behaviour. Table 8.5 shows that the elderly cohort did not have bone/tooth material deposited in their burials. Where sex is considered it can be observed that adult females are more frequently buried with this type of material culture and exclusively with bone/tooth tools.

8.6.1 Assessment of mean number of grave good categories by class

Consideration was given to the mean, by age and sex, on select material culture and faunal remains present at Ban Lum Khao. This aspect of analysis only included those burials which contained relevant material types and excluded those where the material was absent.

Table 8.6 shows that the distribution of ceramic wares was spread evenly, relatively, between subadults and younger adults as well as males and females. Where ceramics are present in burials younger adults have the highest mean number in comparison to the elderly and the young. This group also, based on the mean distribution of artefact types examined, exhibits a propensity to be buried with a greater quantum of shell beads and stone, particularly stone bangles. Although subadults, of the age classes, have the greatest number of burials with a ceramic item this group has the lowest mean for this outcome. Where sex is examined it is females, per burial, that are shown to have the most significant relationship based on the associated mean with ceramic items.

Table 8.6 observes minimal significant mean activity in relation to subadults with evidence of this cohort being afforded elevated exposure only to the highest quantity of fish in comparison to adults at Ban Lum Khao. Similarly, older adults, based on mean scores, exhibit a relationship with higher quantities of shell bangles in comparison to subadults and younger adults.

Where sex is reviewed, excluding ceramic artefact quantities, in this context it can be observed that the majority of the mean results between males and females are relatively similar with the exception being the heightened number of shell bangles with males and shell beads with females.

TABLE 8.6: MEAN TOTALS OF MATERIAL CULTURE AND FAUNA BY AGE-AT-DEATH AND SEX – BAN LUM KHAO

Age	Sex									
	SA (n=51)		YA (n=38)		OA (n=18)		Male (n=26)		Female (n=30)	
Outcome	obs.	n ()	obs.	n ()	obs.	n ()	obs.	n ()	obs.	n ()
Ceramics	138	36 (3.8)	174	33 (5.2)	66	15 (4.4)	97	22 (4.4)	143	26 (5.5)
Bronze/Copper	6	5 (1.2)	3	1 (3.0)	-		-		3	1 (3.0)
Shell Bead	287	6 (47.8)	341	25 (682.4)	214	3 (71.3)	1000	4 (250.0)	262	64 (656.5)
Shell Bangle	12	8 (1.5)	9	6 (1.5)	14	2 (7.0)	15	3 (5.0)	8	5 (1.6)
Stone	4	4 (1.0)	14	8 (1.7)	8	7 (1.1)	5	4 (1.2)	17	11 (1.5)
Stone Bangle	-		9	5 (1.8)	5	4 (1.2)	4	3 (1.3)	10	6 (1.6)
Bone/Tooth	2	2 (1.0)	6	6 (1.0)	-		1	1 (1.0)	5	5 (1.0)
Pig	5	5 (1.0)	13	11 (1.1)	3	3 (1.0)	6	5 (1.2)	10	9 (1.1)
Unionidae	12	11 (1.1)	4	4 (1.0)	5	4 (1.2)	5	4 (1.2)	4	4 (1.0)
Fish	13	4 (3.2)	6	5 (1.2)	-		3	2 (1.5)	3	3 (1.0)

Obs. = observed number from total sample; n = number of samples with material culture type or fauna species; ; SA = Subadult (<14.9 years); YA = Younger Adult (15-39.9 years); OA = Older Adult (40 or more years)

8.7 Significant non-normative mortuary variables

An examination of non-normative mortuary outcomes enabled further consideration of behaviour at Ban Lum Khao. Results in Table 8.7 reflect those behaviours that are, or demonstrate potential, statistical significance or where the practice is unique to a single age cohort as defined by this study.

Table 8.7 shows that the presence of flexed and/or semi-flexed burials is only associated with subadults with these practices occurring only in MP2. Where flexed burials were investigated in isolation it is found that this behaviour is almost exclusively (n=13/14, 92.8%) associated with individuals aged under one. Semi-flexed burials occur in subadults of all age ranges.

Grave depths were normally shallow at the site. The remaining 14/107 (13.0%) individuals not buried in shallow graves, only subadults, were buried at a depth between 26-50cm. Of the subadults buried at the moderate depth, 13/14 (92.8%) were aged under one year, and only occur at MP2. Where faunal remains are concerned it is only where the presence of animal forelimbs occur that the potential for statistical significance is evident. Forelimbs and hindlimbs, often of juvenile pigs, were recovered from several burials at Ban Lum Khao with younger adults most frequently associated with this artefact type.

Where non-normative material culture is considered at Ban Lum Khao it is only ceramic material that shows significance in relation to both age and sex-based cohorts under review. This includes evidence that younger and older adults have a statistically significant likelihood to being buried with an increased (six-ten pcs.) number of ceramic items in contrast to subadult subjects. Older adults show a greater statistical probability to have a ceramic artefact buried at, near or under their feet at Ban Lum Khao. Males are moderately more likely to be buried with a Type 4e jar.

8.8 Spatial Relationship of Burials (Mortuary Suite #6)

The spatial distribution of human burials at Ban Lum Khao was explored to investigate if subadults and/or older adults are deposited, horizontally or vertically, at specific locations across the cemetery. Higham and Thosarat (2004: 23) express each of the three mortuary phases as differentiated by a range of physical and cultural variables. Original maps from Ban Lum Khao display a southern orientation but, in the interest of consistency, a northern orientation was superimposed on all cemetery maps, where required, from the four sites under review. The same approach to spatial analysis, as outlined at Chapter Six, was adopted. This included an analysis on which excavation square the subject, by age-at-death, was buried and in their association with specific cultural layers. Figures 8.7 - 8.9 show the distribution, by age, of burials at Ban Lum Khao.

There was minimal evidence, vertically or horizontally, from this study supporting selective behaviour, based on the categories adopted, in relation to the spatial distribution of burials at Ban Lum Khao as was found in previous research (Higham and O'Reilly, 2004). Only subadults, across MP2, show a potential significance for inclusion in row burials found at this phase.

TABLE 8.7: NON-NORMATIVE OUTCOMES BY AGE-AT-DEATH – BAN LUM KHAO

Outcome	Age						Comparisons	
	Total (n=107)	0-14.yrs (n=51)	15-39.yrs (n=38)	40+yrs (n=18)			(SA, YA, OA)	
	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P	(X ² with Bonferroni correction)	
Semi-Flexed	5 (4.6)	5 (9.8)	-	-		-		
Flexed	14 (13.0)	14 (27.4)		-			-	
Moderate Depth (26-50cm)	14 (13.0)	14 (27.4)	-	-		-		
Animal Forelimb	16 (14.9)	3 (5.8)	10 (26.3)	3 (16.6)	5.657*	0.059	-	
Ceramic Freq. (6-10pcs.)	21 (19.6)	5 (9.8)	11 (28.9)	5 (27.7)	5.97	0.05	-	
Ceramic Position (Feet)	30 (28.0)	11 (21.5)	9 (23.6)	10 (55.5)	8.17	0.016	OA>YA>SA	
Row Burial	83 (77.5)	44 (86.2)	25 (65.7)	14 (77.7)	5.252	0.072	-	
Sex								
Type 4e jar	Total (n=56)	Male (n=26)	Female (n=30)			Comparisons		
	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P	X ²		
	9 (16.0)	7 (26.9)	2 (6.6)	2.868*	0.090	M>F		

Note: The n value for all outcome suites under analysis is the same at Ban Lum Khao; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance (P < 0.05); Post hoc testing carried out using Bonferroni's correction where appropriate.

A goodness-for-fit reveals that males (8/10, 80.0%) have a statistically significant probability for being buried in Grid Square A1:C in comparison to females ($X^2=3.996^*$, $p=0.045$). Where burials in the horizontal spectrum were reviewed, via sector (i.e., 1-45°, 91-135° etc.), it was males (6/7, 85.7%) that demonstrated a potential significance for being buried between 91-135° ($X^2=3.323^*$, $p=0.068$).

Consideration was given to the incipient and terminal burial of each phase or, in relation to MP2, row. Younger adults are the final burials in MP1 (B71) and MP3 (B24 and B25). The elderly initial and terminal row burials from MP2 with older adults being the deepest, burial from Rows 2, 3 and 4 and the final burial from Rows 2 and 5. Subadults are the first burials at Row 1 and final burials at Rows 1 and 4.

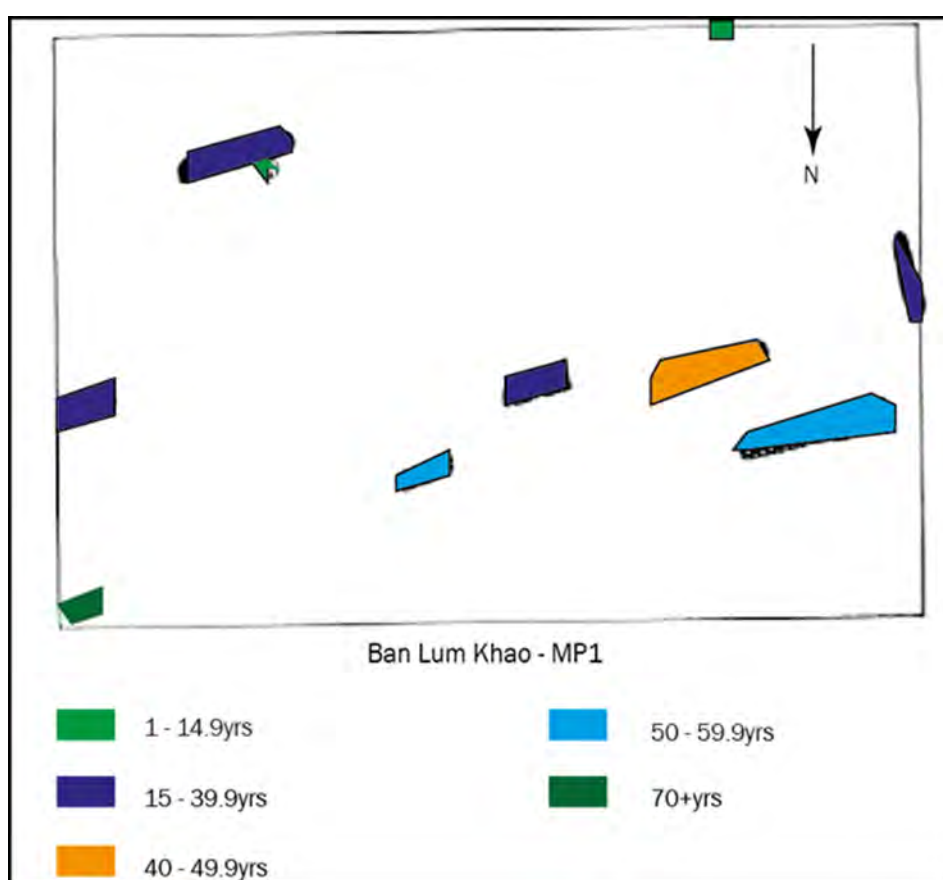


FIGURE 8.7: Ban Lum Khao, Mortuary Phase 1 (adapted from Higham 2004b: 23)

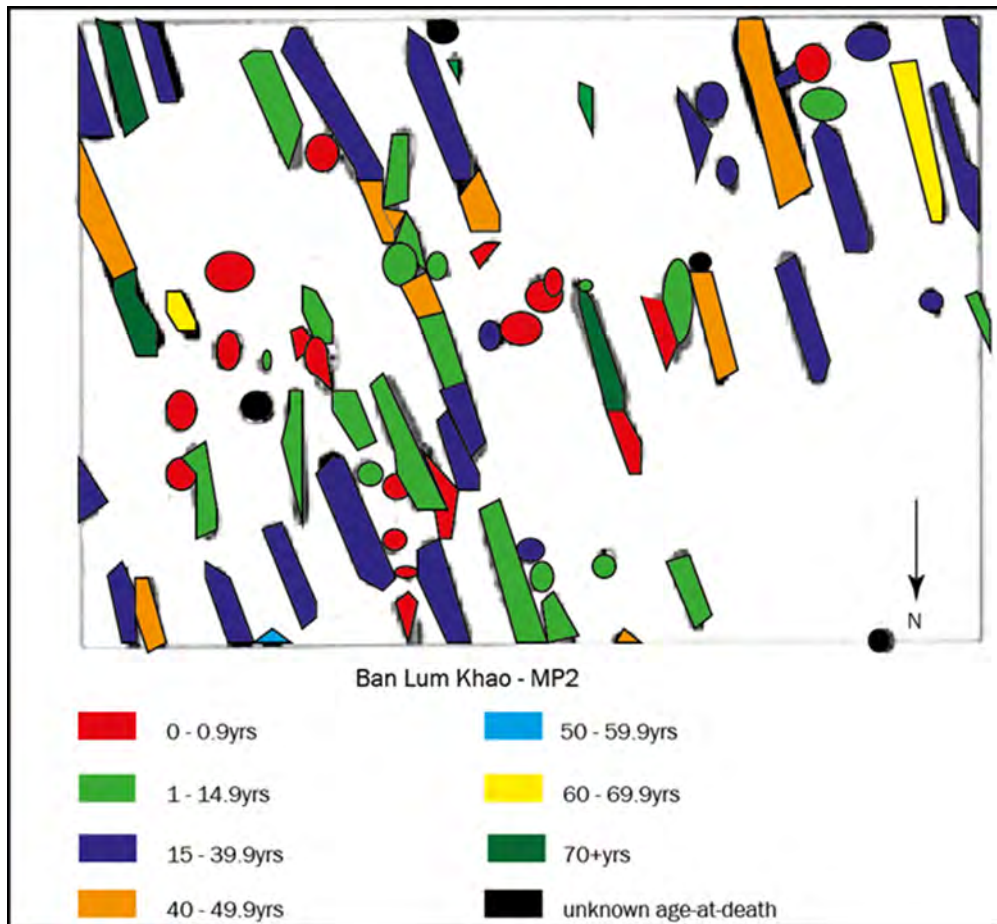


FIGURE 8.8: Ban Lum Khao, Mortuary Phase 2 (adapted from Higham and Thosarat 2004b: 33)

8.9 Summary

Chapter Eight summarised the results of analysis upon the site of Ban Lum Khao. The chapter captured the normative behaviour at the site, as defined through mortuary variables used in this study, and further refined an analysis of normative behaviour across several broad suites of activity by age-at-death and sex. The analysis found that age, particularly mature age (younger adults and older adults), was an important factor in determining how each age-based cohort were treated, at the time of their death, by surviving community participants. Normative mortuary behaviour at Ban Lum Khao observed the deposition of individuals in single extended burials and most frequently oriented 136-179°. Low numbers of ceramic grave goods were most frequently found in burials. While not common pig and Unionidae were the most prevalent species encountered. Non-normative practices observed the presence of flexed or, more frequently, semi-flexed burials affecting subadults in graves of moderate depth and increasing quantities of ceramic artefacts in a moderate number of adult graves.

As with the other sites under review, in varying degrees, it can be observed that biological sex, again, does not appear to be an overwhelmingly influential factor in the application of a range of mortuary actions. While not discussed here it could be observed that the minimal statistically significant behaviour at Ban Lum Khao is associated with adults with subadults exclusively exposed to some outcomes such

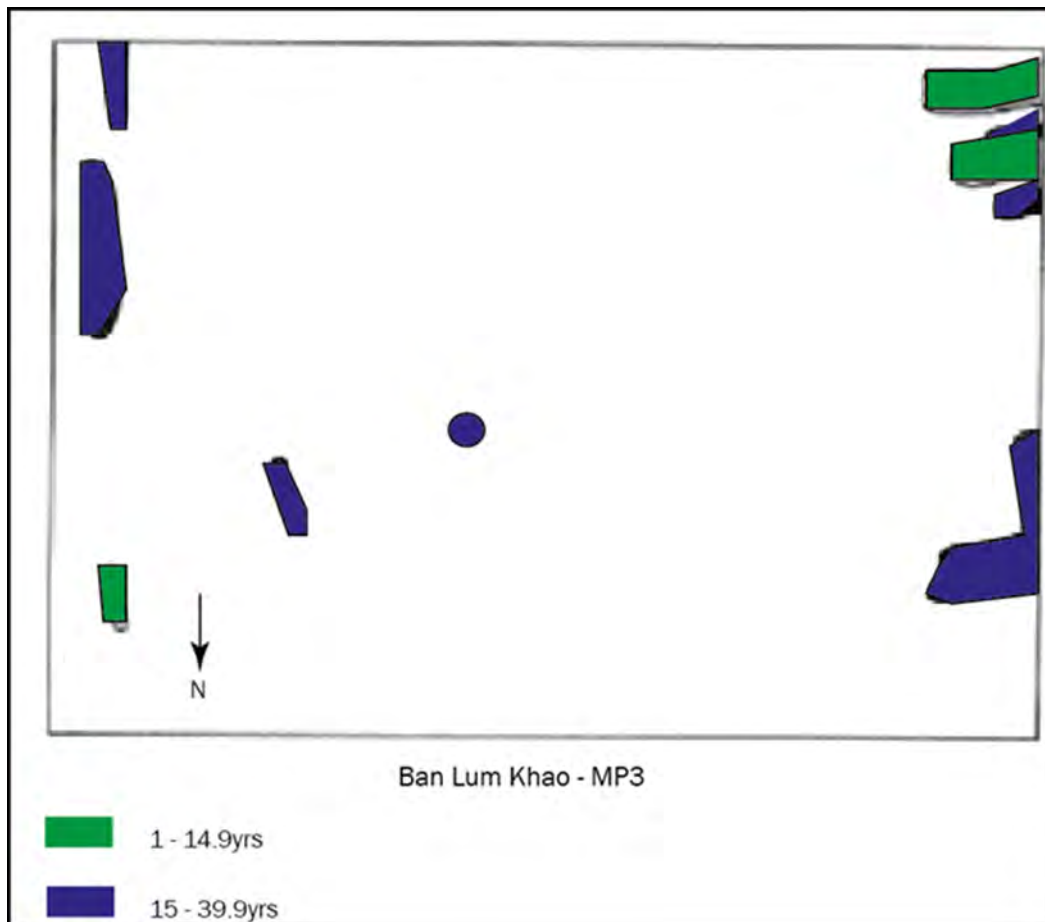


FIGURE 8.9: Ban Lum Khao, Mortuary Phase 3 (adapted from Higham and Thosarat 2004a: 99)

as jar burial, flexed, semi-flexed and burial in graves of moderate depth. It was observed that older adults are either exclusively buried with, or excluded from, burial with some material culture types and frequencies. Discussion on the results from this chapter are found in Chapter Eleven.

Results: Noen U-Loke

9.1 Introduction

The results of the analysis from the Iron Age site of Noen U-Loke are presented in this chapter. As with Chapters Six through Eight, the approach and outcomes applied to the analysis are discussed at Chapter Five. A general overview of Noen U-Loke is at Chapter Four. The discussion of results from Noen U-Loke establishes normative behaviour at the site, within the parameters of applied outcomes, and a focus on how the elderly and young fit into this framework. Consideration of how each cohort is exposed to atypical mortuary behaviour is also applied. As at Chapter Six (see Section 6.6), as individual health indices were recorded by primary researchers, an exploration of health (Mortuary Suite #4) as potentially affecting mortuary treatment was carried out on select burials from this site (Tayles et al., 2007).

9.2 Normative Mortuary Variables

Normative behaviour at Noen U-Loke is outlined at Table 9.1. As with the other sites under review the outcome frequencies expressed in tables may not always reflect observations from original research (e.g., seven burials at Noen U-Loke with carnelian reduced to five subjects in sample etc.). Inconsistent frequencies reflect a reduction in sample sizes from populations, with the exception of Khok Phanom Di, if subjects were unable to be assigned an age-at-death and were not included in the sample under review.

Table 9.1 shows that single burials were the most common with subjects primarily buried in a supine and extended position. A small number of burials (19.6%) were deposited in double/multiple burial plots where the presence of adults of an unknown sex and accompanying juvenile, in modest numbers (6.5%), were the most frequently encountered. Where provenance allowed the positioning of the skull, hands and feet in anatomical position was most frequently encountered. A total of 79/107 (73.8%) of the sample had an identifiable orientation assigned with the majority (24.3%) being oriented in a northerly direction.

TABLE 9.1: BURIAL OUTCOMES OF HIGHEST FREQUENCIES AT NOEN U-LOKE (N=107)

Suite of Activity	Outcome	Obs. (%)	Outcome	Obs. (%)	Outcome	Obs. (%)
Burial of Human Remains	Single Burial	86 (80.3)	Supine Burial	81 (75.7)	Ochre Present	2 (1.8)
	Multiple Burial	21 (19.6)	Extended Burial	82 (76.6)		
	MB Style (adult/juvenile)	7 (6.5)	Skull Position (Anatomical)	37 (34.5)		
	MB Position (above and supine)	6 (5.6)	Hand Position (Anatomical)	27 (25.2)		
	Orientation (0/360°)	26 (24.2)	Feet Position (Anatomical)	21 (19.6)		
	Disposal Container Present	29 (27.1)	Rice Burial	27 (25.2)	Fire/Hearth/Pit	10 (9.3)
Grave Layout	Jar Burial	24 (22.4)	Grave Depth (26-50cm)	68 (63.5)		
	Fauna Present	27 (25.2)	Pig Position (Arms)	3 (2.8)	Fish Present	12 (11.2)
Fauna	Fauna Position (with artefacts)	5 (4.6)	Unionidae Present	7 (6.5)	<i>Channa</i> sp.	9 (8.4)
	Pig Present	11 (10.2)	Unionidae Position (artefacts)	2 (1.8)		
	Grave Good Present	96 (89.7)	Iron Tool	22 (20.5)	Agate Freq. (Low – 1-5 pcs.)	26 (24.3)
Material Culture	Ceramic Good Present	72 (67.2)	Iron Freq. (Low – 1-5 pcs.)	27 (25.2)	Agate Position (Skull)	22 (20.5)
	Ceramic Frequency (Low – 1-5 pieces)	70 (65.4)	Iron Position (Skull/Hand)	8 (7.4)	Carnelian Present	5 (4.6)
	Ceramic Position (Skull)	26 (24.2)	Shell Present	6 (5.6)	Carnelian Position (Skull)	3 (2.8)
	Ceramic Decoration Present	58 (54.2)	Shell Jewellery	6 (5.6)	Glass Present	39 (36.4)
	Cord-Marked Decoration Style	42 (39.2)	Shell Freq. (Low – 1-500 pcs.)	6 (5.6)	Glass Freq. (Low – 1-5 pcs.)	25 (23.3)
	Whorl	13 (12.1)	Shell Position (Skull)	4 (3.7)	Glass Position (Skull)	17 (15.8)
	Bronze Present	64 (59.8)	Stone Present	31 (28.9)	Bone/Tooth Present	3 (2.8)

Suite of Activity	Outcome	Obs. (%)	Outcome	Obs. (%)	Outcome	Obs. (%)
	Bronze Jewellery	61 (57.0)	Stone Jewellery	31 (28.9)	Bimetal Present	23 (21.4)
	Bronze Freq. (Low – 1-5 pcs.)	30 (28.0)	Stone Freq. (Low – 1-5 pcs.)	28 (26.1)		
	Bronze Position (Hand)	40 (37.3)	Stone Position (Skull)	25 (23.3)		
	Iron Present	27 (25.2)	Agate Present	29 (27.1)		
Spatial	Cultural Layer (4.6)	16 (14.9)	Clustered Burial	64 (59.8)	Cemetery Location (181-225°)	22 (20.5)

Ob = observed number from total sample identified; % = percentage of sample – totals include zero counts (0) of unknown variable types; Artefacts recovered from grave fill excluded from analysis

The presence of disposal containers were recorded from 27.1% of the sample with the majority (24/29, 82.7%) being deposited in jar burials. The remaining burials exposed to the presence of disposal containers show evidence of the use of animal hide and clay coffins (Talbot, 2007). This population also practiced the deliberate burial of select individuals, from mortuary phase (MP) 3, in graves containing large quantities of rice chaff (white silicified). A moderate number of burials, from MP3 onwards, were exposed to this mortuary practice (27/107, 25.2%) (Higham and Thosarat, 2007a, Higham and Thosarat, 2007d, Talbot, 2007). This practice is not recorded from the other sites under review. The normative burial depth recorded from the site was in the 'moderate' range of 26-50cm (63.5%).

The inclusion of faunal remains in burial was not common (25.2%) (Higham and Thosarat, 2007d, McCaw, 2007c). Animal species, or elements of therein, deposited in burials include, for example, pig (*S. scrofa*), bovid (*B. bubalis*), deer (*C. eldi*), tiger (*P. tigris*), dog (*C. familiaris*) and Unionidae sp. (McCaw, 2007b, McCaw, 2007a). Where pig was recovered from burials the carcass frequently reflected the presence of juvenile pig specimens. A continuation of an exploration of the presence of Unionidae species in burials found that (6.5%) contained this taxa. Unionidae is present in all layers at Noen U-Loke where the genus *Pseudodon* sp., *Hyriopsis* sp., *Ensidents* sp. and *Pilsbryoconcha* sp. were recovered with Unionidae constituting less than 1.0% of shellfish (224/30833) excavated from the site. Of the small number of burials that contained fish species the most frequently associated type included in graves was *Channa* sp. (8.4%).

A high proportion (89.7%) of the sample was buried with a grave good. In many instances this included the presence of a ceramic object, most frequently a jar, but also included bronze, iron, stone including agate and, to a lesser degree, carnelian and glass artefacts. While in small numbers and reflecting a shift in material culture deposited in burials in the Neolithic and Bronze Age, shell and bone/teeth artefacts were also recovered (Chang, 2007, Higham, 2007a, Talbot, 2007).

The ceramic assemblage from Noen U-Loke comprises over three-hundred vessels recovered from mortuary and non-mortuary settings (Voelker, 2007). A majority of the assemblage is Phimai Black vessels with pottery forms of all types including jars, bowls, pedestalled vessels, anvils, bangles and pellets. Of the identifiable pottery vessels recovered, and continuing to broadly apply the identification framework of type from vessels recovered from Ban Non Wat and Ban Lum Khao (see Sarjeant, 2010), a restricted 7a type vessel with a round body, everted rim and cord-marking was the most frequently observed (24/107, 22.4%). To a lesser degree pottery types frequently exposed included type 7b jars and 1a bowls. Excepting two occasions ceramic artefacts, in low numbers of no more than five artefacts, were included in the individual's grave. While ceramic objects were most frequently deposited at the skull (24.2%) they were also recorded from individual's arms (10.2%), legs (10.2%) and trunk (11.2 %). Spindle whorls were recorded from each layer at the site with highest frequencies, both in mortuary and non-mortuary settings, at layer four (Higham, 2007a). Although sixteen burials were recorded with spindle whorls only 13/16 (81.2%) were assigned an age and included in this sample (see Table 9.1). Decorative pottery styles include slipped, burnished, cord-marked and, minimally, incised and impressed with 39.2% burials containing cord-marked pottery.

The presence of metal artefacts, in comparison to other sites under review, is relatively common at Noen U-Loke with artefacts recovered from mortuary and non-mortuary settings of bronze, iron, lead, gold and silver as well as bimetallic rings constructed of a bronze core and iron sheathe (Chang, 2007). Iron at the site appears to have been mainly used for functional items through the presence of tools or weapons. With bronze having ornamental value given its profligacy in the form of jewellery. Bronze artefacts, in the form of rings, torcs, belts and earplugs, were relatively common as inclusion in the sample from Noen U-Loke (59.8 %) (Chang, 2007). While the most frequently encountered, less than half of those burials which contain bronze have it in low frequencies between one to five pieces (30/64,

46.8%). Of these burials the majority (57.0%) contain, in one form or another but frequently a ring or bangle, an item of bronze jewellery. In comparison to the presence of bronze in burials iron was only recovered from a modest number of graves (25.2%) with iron tools deposited the most frequently (20.5%). In all instances iron was deposited in low numbers in graves.

Stone is a moderately common material to encounter in burials (28.9%) with all instances, where a stone artefact was recovered, having an item of an ornamental function. Stone in mortuary and non-mortuary settings is found in the form of jewellery (necklaces/pendants, beads, bangles) and tools (adzes). Agate (27.1%), or less commonly, carnelian (4.6%) was excavated. The presence of agate artefacts, as pendants and beads, constituted the majority of stone artefacts included in burials in this sample where carnelian was styled as beads. Adzes were associated with features across all layers at the site. Where present, stone artefacts were primarily recovered in low frequencies of less than five pieces associated and were invariably positioned at, or near, the skull. Glass was also found in a moderate number of burials (36.4%), predominantly in the vicinity of the individual's neck/skull, and always in the form of glass beads of various colour and form. The limited number of bone artefacts associated with burials were in the form of ivory bangles and bone beads with glass beads.

The period of highest mortuary activity occurred at MP4 being a period dominated by the nucleation of burials in concentrated areas across the cemetery. This behaviour is also found in MP3 but ends by MP5. The intensity of inhumations peaks at layer 4.6 in MP4, a layer comprised of features found within other cultural substrate including burnt clay and rice, pits, postholes and clay floors, with 14.9% burials deposited. Burials were recovered from the majority of areas across the excavation grid with the greatest number of burials (20.5%) removed from a zone located SSW (181-225°) on the grid.

9.3 Burial of Human Remains (Mortuary Suite #1)

Table 9.2 shows that sex is not a factor affecting select burial behaviour. However, Table 9.2 supports that age was. As seen at other sites under review the majority of burials were afforded a single burial in supine fashion. Where burials are deposited in an extended position it can be observed that older adults were universally laid out in this manner. The most commonly associated orientation of burials was in a northerly aspect (0/360°) with slightly less than a quarter of sample interred in this direction with subadults most frequently oriented in this direction ($\chi^2=9.63^*$, $p=0.008$). Infants (17/20, 85.0%) are most frequently oriented in this direction.

TABLE 9.2: SUMMARY OF SUITE #1 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – BURIAL OF HUMAN REMAINS

Age										Comparisons	
	Total (n=107)	SA (n=51)	YA (n=35)	OA (n=21)						(SA, YA, OA)	
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P				(X ² with Bonferroni correction)	
Single Burial	86 (80.3)	41 (80.3)	28 (80.0)	17 (80.9)	0.008	0.996	-			-	
Multiple Burial (MB)	21 (19.6)	10 (19.6)	7 (20.0)	4 (19.0)	0.098*	0.952	-			-	
MB Style (adult/juvenile)	7 (6.5)	4 (7.8)	2 (5.7)	1 (4.7)	0.042*	0.979	-			-	
MB Position (head-to-toe)	6 (5.6)	4 (7.8)	1 (2.8)	1 (4.7)	0.361*	0.834	-			-	
Supine Burial	105 (98.1)	50 (98.0)	34 (97.1)	21 (100.0)	0.589	0.744	-			-	
Extended Burial	82 (76.6)	27 (52.9)	34 (97.1)	21 (100.0)	30.614	0.000	OA>YA>SA				
Skull Position (Anatomical)	37 (34.5)	4 (7.8)	20 (57.1)	13 (61.9)	27.642*	0.000	OA>YA>SA				
Hand Position (Anatomical)	27 (25.2)	2 (3.9)	16 (45.7)	9 (42.8)	20.495*	0.000	YA>OA>SA				
Feet Position (Anatomical)	21 (19.6)	1 (1.9)	16 (45.7)	4 (19.0)	22.536*	0.000	YA>OA>SA				
Orientation (0/360°)	26 (24.2)	20 (39.2)	4 (11.4)	2 (9.5)	9.63*	0.008	SA>YA>OA				
Ochre Present	2 (1.8)	-	-	2 (9.5)	-	-					
Sex											
	Total (n=43)	Male (n=23)	Female (n=20)							Comparisons	
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P	X ²					
Single Burial	36 (83.7)	18 (78.2)	18 (90.0)	1.082	0.298	-				-	
Multiple Burial (MB)	7 (16.2)	5 (21.7)	2 (10.0)	0.392*	0.531	-				-	

MB Style (adult/juvenile)	1	(2.3)	1	(4.3)	-			-	-	
MB Position (head-to-toe)	1	(2.3)	1	(4.3)	-			-	-	
Supine Burial	42	(97.6)	22	(95.6)	20	(100.0)		0.89	0.345	-
Extended Burial	42	(97.6)	22	(95.6)	20	(100.0)		0.89	0.345	-
Skull Position (Anatomical)	25	(58.1)	11	(47.8)	14	(70.0)		2.161	0.141	-
Hand Position (Anatomical)	19	(44.1)	11	(47.8)	8	(40.0)		0.266	0.606	-
Feet Position (Anatomical)	15	(34.8)	8	(34.7)	7	(35.0)		0	1.000	-
Orientation (0/360°)	6	(13.9)	3	(13.0)	3	(15.0)		0.066*	0.797	-
Ochre Present	2	(4.6)	2	(8.6)	-			-	-	

Note: The n value for all outcome suites under analysis is the same at Noen U-Loke; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

9.3.1 Field Anthropology

Following the application of criterion established by Harris and Tayles (2012) this research found that a small number of the sample was assessable for field anthropology purposes (33/107, 30.8%). This totals one less, due to sampling criteria, than previous research where thirty-four burials were examined (Willis and Tayles, 2009).

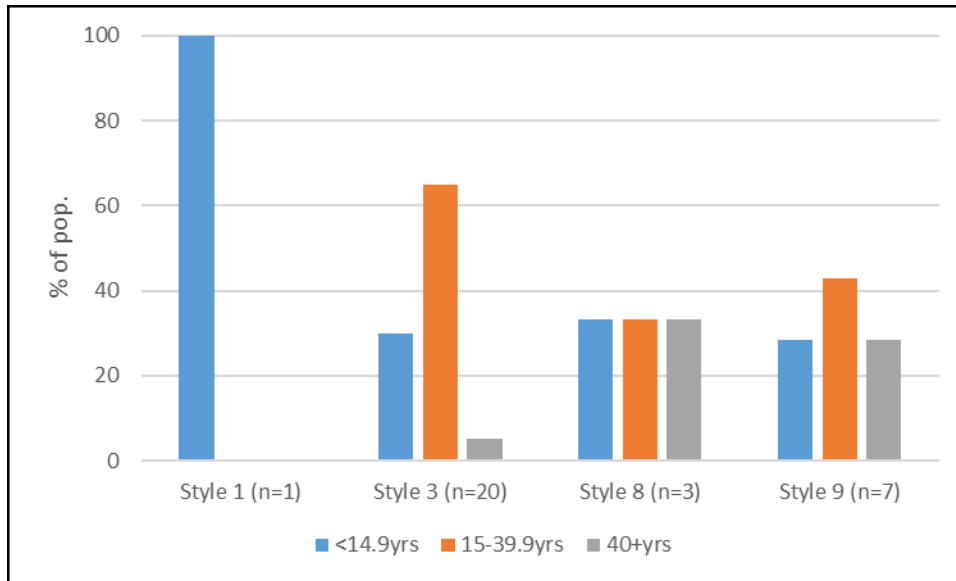


FIGURE 9.1: Potential containment styles at Noen U-Loke

Style 1 = wide coffin; Style 3 = loose non-durable wrapping; Style 8 = tight durable or non-durable wrapping / narrow coffin; and Style 9 = loose or tight non-durable wrapping / tight durable wrapping.

Observations suggested that loose non-durable wrapping (Style 3) was the most prevalent (22/33, 66.6%) and is statistically associated with younger adults ($X^2=7.023^*$, $p=0.029$). No age cohort was statistically associated with any of the remaining three containment styles inferred through analysis. See Section 11.2.1.3. for discussion on comparative inter-site constriction practices.

9.4 Characteristics of Grave Environment (Mortuary Suite #2)

Table 9.3 shows that there is little supporting statistical evidence in relation to either age-at-death or sex of a specific cohort demonstrably in association with the outcomes explored here. It is observed that subadults are significantly associated with disposal containers, but this is clearly affected by the presence of neonates and infants interred in jar burials. The remaining outcomes demonstrate no statistical significance by age-at-death or sex. By the criterion applied here, graves of moderate depth (63.5%) predominate at Noen U-Loke. Although all age categories are afforded moderate grave depth it is subadults and elderly adults that are most likely to be buried to this depth.

TABLE 9.3: SUMMARY OF SUITE #2 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – CHARACTERISTICS OF THE GRAVE

Age										Comparisons		
	Total (n=107)		SA (n=51)		YA (n=35)		OA (n=21)					(SA, YA, OA)
Outcome	Obs. (%)		Obs. (%)		Obs. (%)		Obs. (%)		X ²	P		(X ² with Bonferroni correction)
Disposal Container Present	29 (27.1)		25 (49.0)		2 (5.7)		2 (9.5)		20.828*	0.000		SA>OA>YA
Jar Burial	24 (22.4)		24 (47.0)		-		-		-	-		-
Rice Burial	27 (25.2)		10 (19.6)		11 (31.4)		6 (28.5)		1.692	0.429		-
Grave Depth (26-50cm)	68 (63.5)		34 (66.6)		20 (57.1)		14 (66.6)		0.922	0.630		-
Fire/Hearth/Pit Present	10 (9.3)		2 (3.9)		6 (17.1)		2 (9.5)		2.984*	0.224		-
Sex												
	Total (n=43)		Male (n=23)		Female (n=20)							Comparisons
	Obs. (%)		Obs. (%)		Obs. (%)				X ²	P		X ²
Disposal Container Present	3 (6.9)		2 (8.6)		1 (5.0)				0.016*	0.899		-
Jar Burial	-		-		-				-	-		-
Rice Burial	14 (32.5)		6 (26.0)		8 (40.0)				0.943	0.331		-
Grave Depth (26-50cm)	25 (58.1)		13 (56.5)		12 (60.0)				0.053	0.817		-
Fire/Hearth/Pit Present	4 (9.3)		3 (13.0)		1 (5.0)				0.144*	0.704		-

Note: The n value for all outcome suites under analysis is the same at Noen U-Loke; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance (P < 0.05); Post hoc testing carried out using Bonferroni's correction where appropriate.

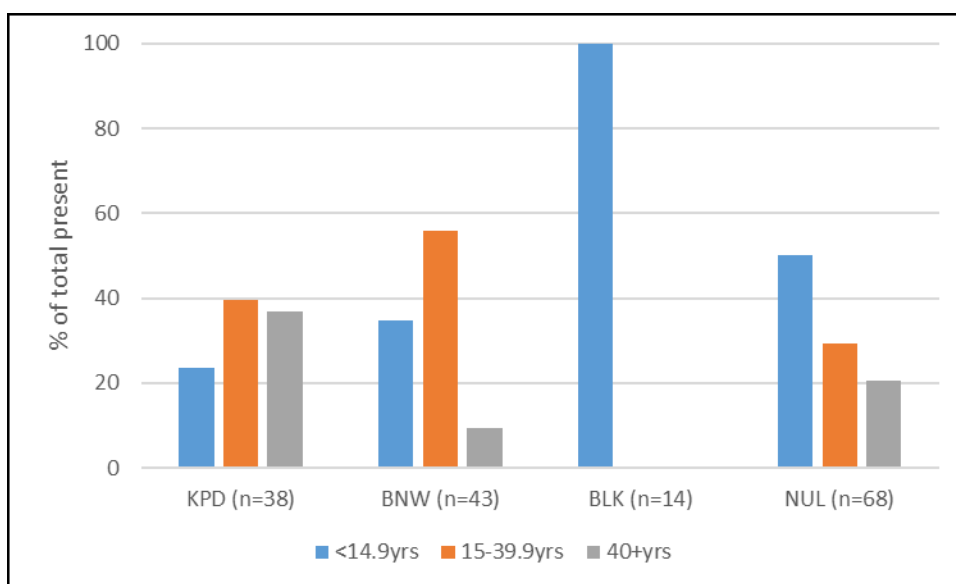


FIGURE 9.2: Comparison of moderate (26-50cm) grave depths between sites
KPD = Khok Phanom Di; BNW = Ban Non Wat; BLK = Ban Lum Khao; NUL = Noen U-Loke

Figure 9.2 illustrates the disproportionate number of burials at a moderate depth at Noen U-Loke in comparison to the other sites under review. It demonstrates, as seen at Chapter Eight, that only subadults were buried at a moderate depth at Ban Lum Khao. See Section 11.2.2.2. for greater discussion on burial depths at an inter-site level.

As noted, a small proportion of the sample was buried in rice burials. This analysis observed that all age categories used were exposed to this behaviour with neither age nor sex, from the perspective of the entire sample, appearing to influence which subjects were afforded a burial of this type.

9.5 Faunal Remains (Mortuary Suite #3)

A small proportion of the sample was buried with a faunal remain present in the grave (25.2%). This excludes the volume of species recovered from cultural layers and features but not in association with mortuary remains (McCaw, 2007c, McCaw, 2007b, McCaw, 2007a, Thosarat, 2007). Broadly across all age categories under examination, faunal remains were most commonly recovered from the earliest layers of the site (MP2) prior to the burial of individuals in nucleated groups. Females in the sample are more frequently buried with fauna but no statistically significant probability was found. Although not statistically significant in most cases older adults at a general level appear to be increasingly likely to be associated with fauna in comparison to the other categories under review. This is most visible in relation to the presence of pig remains ($X^2=11.702^*$, $p=0.002$) and reflects the behaviour observed at Khok Phanom Di in relation to pig remains. Unionidae (e.g., *Pseudodon* sp., *Hyriopsis* sp. etc.) were recovered from a range of features and across all cultural layers and not solely in association with mortuary contexts (McCaw, 2007b)ure”}}.

TABLE 9.4: SUMMARY OF SUITE #3 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – FAUNAL REMAINS

Outcome	Age						Comparisons	
	Total (n=107)	SA (n=51)	YA (n=35)	OA (n=21)				(SA, YA, OA)
	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P		(X ² with Bonferroni correction)
Fauna Present	27 (25.2)	13 (25.4)	6 (17.1)	8 (38.0)	3.057	0.216	-	
Fauna Position (with artefacts)	5 (4.6)	3 (5.8)	-	2 (9.5)	0.002*	0.964	-	
Pig Present	11 (10.2)	2 (3.9)	2 (5.7)	7 (33.3)	11.702*	0.002	OA>YA>SA	
Pig Position (Arms)	3 (2.8)	-	1 (2.8)	2 (9.5)	0.211*	0.645	-	
Unionidae Present	7 (6.5)	5 (9.8)	1 (2.8)	1 (4.7)	0.738*	0.691	-	
Unionidae Pos. (with artefacts)	2 (1.8)	2 (3.9)	-	-		-	-	
Fish Present	12 (11.2)	5 (9.8)	4 (11.4)	3 (14.2)	0.071*	0.965	-	
<i>Chama</i> sp.	9 (8.4)	3 (5.8)	3 (8.5)	3 (14.2)	0.565*	0.753	-	
Sex								
Outcome	Total (n=43)	Male (n=23)	Female (n=20)					Comparisons
	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P	X ²		
Fauna Present	12 (27.9)	5 (21.7)	7 (35.0)	0.935	0.333	-		
Fauna Position (with artefacts)	2 (4.6)	-	2 (10.0)	-	-			
Pig Present	9 (20.9)	3 (13.0)	6 (30.0)	0.975*	0.323	-		
Pig Position (Arms)	3 (6.9)	2 (8.6)	1 (5.0)	0.016*	0.899	-		
Unionidae Present	1 (2.3)	-	1 (5.0)	-	-			

Unionidae Pos. (with artefacts)	-	-	-	-	-	-	-	-	-
Fish Present	5 (11.6)	4 (17.3)	1 (5.0)		0.62*	0.431	-		
<i>Channa</i> sp.	5 (11.6)	4 (17.3)	1 (5.0)		0.62*	0.431	-		

Note: The n value for all outcome suites under analysis is the same at Noen U-Loke; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance ($P < 0.05$); Post hoc testing carried out using Bonferroni's correction where appropriate.

9.6 Health Case Studies (Mortuary Suite #4)

A review of palaeohealth from Noen U-Loke is at Chapter Four. Biological analysis from Noen U-Loke is available for review (Nelsen et al., 2001, Tayles, 2003, Tayles and Buckley, 2004, Tayles et al., 2007, Cox et al., 2011). This section, as at Chapter Six, explores the relationship that poor health may have had on mortuary behaviour in relation to six individuals (3 subadults; 3 older adults) from the site.

9.6.1 Health Profile #7 (Burial 41)

The subadult, burial 41 (B41), was an older child assigned a biological age-at-death of 10-14.9 years. B41 is associated with MP Cluster 3A which comprises six individuals (2 subadults, 4 adults) with two males and two females present (Higham and Thosarat, 2007h). This subadult is one of two terminal burials, the other being an elderly adult male, in Cluster 3A. Though no grave cuts were visible researchers postulated, based on normative grave depths at the site (26-50cm), Cluster 3A would have occupied layers 4.4-4.7 and are dated to CE0-200 (Higham and Thosarat, 2007h, Higham and Thosarat, 2007j).

Preservational quality of bone across MP3 and MP4 was mixed and was especially poor where silicified rice was included in burials resulting in the demineralisation of bone. Preservation of B41 was good (Tayles et al., 2007). Abnormal eruption of dentition occurs where the crown of the right central maxillary incisor of B41 is right angled lingually towards the root resulting in no bone covering the root and the adjacent lateral incisor being absent. This effect may have resulted from an impact in the child's early development (Tayles et al., 2007). Caries was present on two deciduous and one permanent tooth and evidence of hypoplasia and enamel defects on incisors and canines (Tayles et al., 2007). Evidence of spondylolysis was observed at vertebrae L5 (Tayles et al., 2007). Spondylolysis may not have presented painfully for the subject but may have limited activity levels brought about by back or leg pain.

MP3 sees the commencement of clustered burial groups of which B41 is part (Higham and Thosarat, 2007h, Talbot, 2007). B41 is part of a double burial with an adult male who is positioned prone, only one of three such burials, above the subadult. Normative mortuary treatment includes primary, extended and supine burial and the burial includes grave goods (glass beads, shell bangle) and faunal remains including pig and fish. Although outside the normative 0/360° orientation the child is oriented in the normative (46-89° - north-east) for the cluster.

9.6.2 Health Profile #8 (Burial 97)

The subadult, burial 97 (B97), was a child assigned a biological age-at-death between 1.5 to 3 years (Tayles et al., 2007). B97, temporally, is associated with MP4. However, unlike the majority of individuals in this phase B97 is not included in a nucleated burial cluster (Higham and Thosarat, 2007i). MP4 contains four burial clusters (4A-4D) and non-clustered burials (n=nine) and is dated between CE200-400 (Talbot, 2007). A right-angled linear array (n=6) of postholes are within close proximity to this individual at the north-eastern edge of the baulk (Higham and Thosarat, 2007j).

Diagnostic analysis has revealed a variety of pathologies at Noen U-Loke. These include leprosy, tuberculosis and cerebral palsy for example (Tayles and Buckley, 2004, Tayles et al., 2007). Skeletal evidence, through differential femoral morphology, flexion of the left foot and non-anthropogenic flexing at the elbows, resulted in a diagnosis of cerebral palsy for B97 (Tayles et al., 2007). Cerebral palsy refers to a range of disorders affecting mobility (muscle movement/control, posture and balance) and, potentially, result in sensory or intellectual impairments and epilepsy. Although very young, this child had survived beyond the initial year of life where, at Noen U-Loke, infant mortality was very high. The survival of this infant, as postulated in regards to a quadriplegic male from Neolithic Vietnam, infer

deliberate compassionate care within this community over the individual's short life (Tayles et al., 2007, Tilley and Oxenham, 2016). Although no carious lesions are associated with this individual localised enamel hypoplasia was recorded from a deciduous canine.

As stated, B97 was buried outside a formalised burial cluster at MP4. Normative burial practices include single burial in a supine position. Grave goods were present with the subject being buried with an agate bead and three ivory bangles on each arm. Ivory was recovered from mortuary and non-mortuary contexts with this being the only individual buried with this material (Chang, 2007). B97 was not oriented in the normative 0/360° position but in the second most frequent 46--89° position. The normative orientation at MP4 lies towards 0/360° (Higham, 2002). A flexed burial position was precipitated by the individuals overarching physical condition.

9.6.3 Health Profile #9 (Burial 57.1)

The subadult, burial 57.1 (B57.1), was an older child assigned a biological age-at-death of 12-14.9 years (Tayles et al., 2007). B57.1 is associated with MP5 (CE250-400) which, of this sample, comprises 28 individuals (14 subadults, 14 adults) with an identifiable six males and two females present. Tightly nucleated clustering ends at MP5 although evidence of the grouping of some burials from this phase continues (Higham, 2002, Higham and Thosarat, 2007g, Talbot, 2007). The child, part of a double burial with B57.2, an adult in their 20s of an unknown sex, is the terminal burial in the phase and only 55cm below datum (Higham and Thosarat, 2007k).

Deviations in mortuary practices between MP4 and MP5 include the cessation of silicified rice in graves, stylistic change in ceramic manufacture, a reduction in bronze and an increase in the variability of iron artefacts (Higham, 2002, Higham, 2007b, Higham and Thosarat, 2007g, Talbot, 2007).

Skeletal elements of B57.1 are limited but well preserved (Tayles et al., 2007). Calculus was recorded from dentition with linear enamel hypoplasia also observed from canines (Tayles et al., 2007). Where non-health characteristics are reviewed this burial falls outside normative behaviour through its presence as a double burial, its grave depth, lack of faunal remains and its unknown orientation. However, commonalities with burials across the site, generally, and across the phase, specifically, demonstrate conformity to many aspects of normative behaviour including inhumation style and the presence of iron, bronze and bimetallic artefacts.

9.6.4 Health Profile #10 (Burial 49)

The elderly female adult, burial 49 (B49), was originally assigned a biological age-at-death in their 40s (Tayles et al., 2007). Age was re-evaluated using the Cave/Oxenham (2016) method and the individual was reassigned to the oldest age category (70s). B49 is associated with MP3B which comprises, of this sample, 14 individuals (two subadults, 12 adults) with five males and six females present (Higham and Thosarat, 2007a). This individual is the terminal burial of the cluster at a depth of 2.92m which is effectively contemporaneous with the burial of the adult male B50 (2.91m).

Preservational quality of skeletal material of B49 was poor due to her inclusion in a rice burial which demineralised bone (Higham and Thosarat, 2007a). Dentition shows evidence of calculus and left lateral maxillary incisors are missing from B49 (Tayles et al., 2007). Alternative propositions to cultural ablation of dentition at Noen U-Loke include agenesis and suggest, as isotopic values support, the presence of a relatively small, isolated and homogenous population at this site (Nelsen et al., 2001, Cox et al., 2011).

Although the subject falls outside normative orientation for the site it sits within that of all Cluster 3B burials between 46-89°. Many features of the burial were difficult to assess due to its disturbed nature. However, burial remains include an association with stone (agate, carnelian), glass, bronze (bangles) and juvenile pig remains (Higham and Thosarat, 2007a). Cluster 3B contained bronze bangles, carnelian beads and the inclusion of rice burials although these features were absent from Cluster 3A.

9.6.5 Health Profile #11 (Burial 94)

Burial 94 (B94), an elderly male adult, was assigned a biological age-at-death in the 40s. This age range was retained following the application of the Cave/Oxenham model. B94 belongs to MP Cluster 4A (c. CE200-400) which comprises nine individuals (three subadults, six adults) with two males and three females present. This male along with three other burials (e.g., B112) are detached and slightly south of the major cluster at 4A (Higham and Thosarat, 2007b). B94, buried at 2.58m, was in the middle of the sequence of burials that form this cluster.

Preservation of this incomplete individual was poor (Tayles et al., 2007). The individual was recorded with a range of dental pathologies including caries, calculus an incidence of ante-mortem tooth loss and six periapical cavities suggesting the presence of an infection (Tayles et al., 2007). As observed with B49 this individual is missing all lateral incisors which may indicate cultural behaviour (ablation) or agenesis (Nelsen et al., 2001). Isotopic values place this individual within the average range at the site in regard to diet and mobility and may support an inference of agenesis (Cox et al., 2011). Bioarchaeological analysis found similar manifestations of remodelling and porosity at the clavicles and skull of B94 to infer a diagnosis, potentially, of leprosy as observed with B42 (Tayles and Buckley, 2004, Tayles et al., 2007).

MP4 Cluster A burials contain a broad range of grave goods in comparison to other clusters at the site (Talbot, 2007). This individual was exposed to normative single burial in an extended fashion. Counter to the normative across the site, generally, and, specifically to the burial cluster, this individual is oriented between 46-89° (Higham and Thosarat, 2007b). Grave goods included glass, agate (beads) and bronze rings (Higham and Thosarat, 2007b). This grave did not contain faunal remains and the subject was not exposed to the normative grave depth of 26-50cm.

9.6.6 Health Profile #12 (Burial 12)

Burial 12 (B12), an elderly adult female, was assigned a biological age-at-death in their 40s (Tayles et al., 2007). Age was re-evaluated, following the Cave and Oxenham method, and the subject was reassigned an age across the 50s. B12 is associated with MP5 (CE250-400) which, of this sample, comprises 28 individuals (14 subadults, 14 adults) with an identifiable six males and two females present. B94 is buried in the middle of the sequence at MP5 at a depth of 93cm. While clustered burials cease at MP5, Higham and Thosarat (2007: 223) infer that B12 may have been included in an aggregated deposition with three other burials at this time based on depth and orientation (315-359°).

The general health of this individual, based on skeletal evidence, was relatively good for their age. Although there is some evidence for arthritis in the feet the majority of conditions are evident from dentition through the presence of calculus and, potentially, agenesis of the third molars (Tayles et al., 2007, Cox et al., 2011). This individual was also missing their right lateral incisors from both the maxilla and mandible.

B12 was afforded normative mortuary treatment through a range of features in the grave including primary single burial in an extended fashion and laid out anatomically. Of the common grave goods present this individual, as opposed to the other five burials discussed in this section (9.6), had ceramic

artefacts included in their grave furniture in addition to bronze and iron. This individual was not buried at a typical (26-50cm) depth or buried with faunal remains. Although not oriented in the normative 0/360° for the site the 315-359° orientation was constant across MP5. This is one of six burials from MP5 which contain the iron 'tool kit' comprising an iron blade and sickle (Higham and Thosarat, 2007g, Talbot, 2007).

9.7. Material Culture (Mortuary Suite #5)

There is an extensive range of material artefacts recovered from Noen U-Loke reflecting the industrial and economic significance of the site. Table 9.5 shows that the majority of burials in this sample from Noen U-Loke were deposited with a grave good (89.7%) with females in the sample always buried with a grave good.

Ceramic artefact types excavated from Noen U-Loke include spindle whorls, ceramic anvils, pellets, clay bangles and a variety of ceramic vessels (i.e., bowls, jars etc.) (Higham, 2007a). Of artefact types recovered from graves, ceramic goods were the most prevalent artefact. Including the presence of jar burials, it was observed that subadults under one (<one year at death) were most commonly associated with a ceramic artefact (32/36, 88.8%). The most frequently encountered ceramic vessel types were 7a jars (everted rim, round body, cord-marked) and type 1a bowls (simple unrestricted). Table 9.5 shows that ceramic artefacts, primarily, are deposited in low quantities (<five). Adults generally, but older adults specifically, are more likely to have a ceramic artefact deposited in the normative position at, near or under the skull ($\chi^2=6.24$, $p=0.044$). This continues where older adults are statistically most likely to be buried with a spindle whorl included in their funerary furniture.

TABLE 9.5: SUMMARY OF SUITE #5 (NORMATIVE OUTCOMES BY AGE-AT-DEATH AND SEX) – MATERIAL CULTURE

	Age						Comparisons	
	Total (n=107)	SA (n=51)	SA (n=35)	OA (n=21)			(SA, YA, OA)	
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P	(X ² with Bonferroni correction)	
Grave Good Present	96 (89.7)	46 (90.1)	31 (88.5)	19 (90.4)	0.076	0.962	-	
Ceramic Good Present	72 (67.2)	36 (70.5)	22 (62.8)	14 (66.6)	0.568	0.752	-	
Ceramic Frequency (<5 pieces)	70 (65.4)	36 (70.5)	21 (60.0)	13 (61.9)	1.171	0.556	-	
Ceramic Position (Skull)	26 (24.2)	7 (13.7)	11 (31.4)	8 (38.0)	6.24	0.044	-	
Type 7a Jar	24 (22.4)	11 (21.5)	9 (25.7)	4 (19.0)	0.082*	0.959	-	
Ceramic Decoration Present	38 (35.5)	20 (39.2)	12 (34.2)	6 (28.5)	0.77	0.680	-	
Whorl	13 (12.1)	1 (1.9)	6 (17.1)	6 (28.5)	8.347*	0.015	OA>YA>SA	
Bronze Present	64 (59.8)	23 (45.0)	26 (74.2)	15 (71.4)	8.823	0.012	YA>OA>SA	
Bronze Jewellery	61 (57.0)	20 (39.2)	26 (74.2)	15 (71.4)	12.632	0.001	YA>OA>SA	
Bronze Freq. (<5 pcs.)	30 (28.0)	11 (21.5)	14 (40.0)	5 (23.8)	3.726	0.155	-	
Bronze Position (Hand)	40 (37.3)	11 (21.5)	17 (48.5)	12 (57.1)	10.823	0.004	OA>YA>SA	
Iron Present	27 (25.2)	9 (17.6)	12 (34.2)	6 (28.5)	3.2	0.201	-	
Iron Tool	22 (20.5)	7 (13.7)	10 (28.5)	5 (23.8)	2.97	0.226	-	
Iron Freq. (<5 pcs.)	27 (25.2)	9 (17.6)	12 (34.2)	6 (28.5)	3.2	0.201	-	
Iron Position (Skull)	8 (7.4)	2 (3.9)	4 (11.4)	2 (9.5)	0.814*	0.665	-	
Bimetal Ring	23 (21.4)	12 (23.5)	9 (25.7)	2 (9.5)	1.34*	0.511	-	

Shell Present	6 (5.6)	1 (1.9)	1 (2.8)	4 (19.0)	5.653*	0.059	OA>YA=SA
Shell Jewellery	6 (5.6)	1 (1.9)	1 (2.8)	4 (19.0)	5.653*	0.059	OA>YA=SA
Shell Freq. (<500 pcs.)	6 (5.6)	1 (1.9)	1 (2.8)	4 (19.0)	5.653*	0.059	OA>YA=SA
Shell Position (Skull)	4 (3.7)	-	-	4 (19.0)	-	-	
Stone Present	31 (28.9)	8 (15.6)	14 (40.0)	9 (42.8)	8.411	0.014	OA>YA>SA
Stone Jewellery	31 (28.9)	8 (15.6)	14 (40.0)	9 (42.8)	8.411	0.014	OA>YA>SA
Stone Freq. (<5 pcs.)	28 (26.1)	8 (15.6)	12 (34.2)	8 (38.0)	5.65	0.059	-
Stone Position (Skull)	25 (23.3)	6 (11.7)	10 (28.5)	9 (42.8)	8.819	0.012	OA>YA>SA
Agate Present	29 (27.1)	8 (15.6)	12 (34.2)	9 (42.6)	6.917	0.031	-
Agate Freq. (<5 pcs.)	26 (24.3)	8 (15.6)	10 (28.5)	8 (38.0)	4.577	0.101	-
Agate Position (Skull)	22 (20.5)	5 (9.8)	9 (25.7)	8 (38.0)	8.135	0.017	OA>YA>SA
Carnelian Present	4 (3.7)	-	3 (8.5)	1 (4.7)	0*	1.000	-
Carnelian Position (Skull)	3 (2.8)	-	2 (5.7)	1 (4.7)	0*	1.000	-
Glass Present	39 (36.4)	13 (25.4)	16 (45.7)	10 (47.6)	5.072	0.079	-
Glass Freq. (<5 pcs.)	25 (23.3)	7 (13.7)	13 (37.1)	5 (23.8)	6.36	0.041	-
Glass Position (Skull)	17 (15.8)	4 (7.8)	7 (20.0)	6 (28.5)	3.761*	0.152	-
Bone/Tooth Present	3 (2.8)	1 (1.9)	-	2 (9.5)	0.658*	0.417	-
Sex							
Total (n=43)	Male (n=23)		Female (n=20)		Comparisons		
Obs. (%)	Obs. (%)		Obs. (%)		X ²	P	X ²

9 RESULTS: NOEN U-LOKE

Grave Good Present	39 (90.6)	19 (82.6)	20 (100.0)		3.835	0.050	F>M
Ceramic Good Present	29 (67.4)	14 (60.8)	15 (75.0)		0.973	0.323	-
Ceramic Frequency (<5 pieces)	26 (60.4)	13 (56.5)	13 (65.0)		0.322	0.570	-
Ceramic Position (Skull)	14 (32.5)	6 (26.0)	8 (40.0)		0.943	0.331	-
Type 7a Jar	11 (25.5)	5 (21.7)	6 (30.0)		0.383	0.536	-
Ceramic Decoration Present	14 (32.5)	6 (26.0)	8 (40.0)		0.943	0.331	-
Whorl	10 (23.2)	4 (17.3)	6 (30.0)		0.377*	0.539	-
Bronze Present	31 (72.0)	14 (60.8)	17 (85.0)		3.096	0.078	F>M
Bronze Jewellery	31 (72.0)	14 (60.8)	17 (85.0)		3.096	0.078	F>M
Bronze Freq. (<5 pcs.)	14 (32.5)	7 (30.4)	7 (35.0)		0.102	0.749	-
Bronze Position (Hand)	24 (55.8)	10 (43.4)	14 (70.0)		3.051	0.080	F>M
Iron Present	12 (27.9)	6 (26.0)	6 (30.0)		0.081	0.775	-
Iron Tool	9 (20.9)	5 (21.7)	4 (20.0)		0.056*	0.812	-
Iron Freq. (<5 pcs.)	12 (27.9)	6 (26.0)	6 (30.0)		0.081	0.775	-
Iron Position (Skull)	2 (4.6)	1 (4.3)	1 (5.0)		0.39*	0.532	-
Bimetal Ring	10 (23.2)	6 (26.0)	4 (20.0)		0.012*	0.912	-
Shell Present	4 (9.3)	2 (8.6)	2 (10.0)		0.144*	0.704	-
Shell Jewellery	4 (9.3)	2 (8.6)	2 (10.0)		0.144*	0.704	-
Shell Freq. (<500 pcs.)	4 (9.3)	2 (8.6)	2 (10.0)		0.144*	0.704	-
Shell Position (Skull)	4 (9.3)	2 (8.6)	2 (10.0)		0.144*	0.704	-

Stone Present	21 (48.8)	8 (34.7)	13 (65.0)		3.909	0.048	F>M
Stone Jewellery	21 (48.8)	8 (34.7)	13 (65.0)		3.909	0.048	F>M
Stone Freq. (<5 pcs.)	18 (41.8)	8 (34.7)	10 (50.0)		1.018	0.312	-
Stone Position (Skull)	17 (39.5)	5 (21.7)	12 (60.0)		6.551	0.010	F>M
Agate Present	19 (44.1)	7 (30.4)	12 (60.0)		3.792	0.051	F>M
Agate Freq. (<5 pcs.)	16 (37.2)	7 (30.4)	9 (45.0)		0.971	0.324	-
Agate Position (Skull)	22 (51.1)	5 (21.7)	17 (85.0)		17.134	0.000	F>M
Carnelian Present	4 (9.3)	2 (8.6)	2 (10.0)		0.144*	0.704	-
Carnelian Position (Skull)	3 (6.9)	2 (8.6)	1 (5.0)		0.016*	0.899	-
Glass Present	21 (48.8)	11 (47.8)	10 (50.0)		0.02	0.887	-
Glass Freq. (<5 pcs.)	10 (23.2)	5 (21.7)	5 (25.0)		0.064	0.800	-
Glass Position (Skull)	13 (30.2)	7 (30.4)	6 (30.0)		0.001	0.974	-
Bone/Tooth Present	2 (4.6)	2 (8.6)	-		-	-	

Note: The n value for all outcome suites under analysis is the same at Noen U-Loke; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance (P < 0.05); Post hoc testing carried out using Bonferroni's correction where appropriate.

Metal, primarily bronze, is relatively common from mortuary contexts but other metals, including iron, composites (bronze and iron), lead, silver and gold, were also recovered. There is considerable evidence of metal casting industry at Noen U-Loke including a range of artefacts associated with firing techniques (i.e., pipes etc.), slag, burnt floors and a variety of metal objects (Connelly, 2007, Higham, 2007a, Higham and Thosarat, 2007j, Higham and Thosarat, 2007k). Artefacts include weapons (knives, points), tools (sickles, hoes etc.) and jewellery (Chang, 2007, Connelly, 2007, Higham, 2007a). Younger adults have a statistically significant relationship where bronze, including bronze jewellery, occurs and females were more frequently buried with this artefact type. Bronze, particularly bronze jewellery in the form of rings (bimetallic, finger, toe), bangles, anklets, earrings/plugs, belts, bells and torcs, are the most prevalent grave good deposited. All groups were represented in association with bronze bangles and bronze rings. In all cases where iron was recovered it was found in low numbers (<five pieces per person). Table 9.5 shows that a small proportion of the sample (21.4%) was buried with bimetallic rings. Bimetallic rings were only found from burials at MP4 and MP5.

Shell artefacts, primarily crafted from *Tridacna* sp., excavated from the site were in the form of bangles, beads, earrings and earplugs (Chang, 2007). Where there is no evidence to support that sex was a factor in the inclusion of shell artefacts in a subjects grave there is tacit evidence suggesting age-at-death may have been. From a very small sample it appears that elderly subjects were, potentially, more likely to be buried with shell artefacts ($X^2=5.653^*$, $p=0.059$).

Stone, primarily through the presence of agate jewellery, was recovered from a moderate number of burials (28.9%). Stone artefacts in the form of agate pendants and beads, carnelian beads, slate bangles and adzes were excavated from the site (Higham, 2007a, Theunissen, 2007). Adults, broadly, are more frequently buried with stone artefacts, ostensibly jewellery, than subadults with older adults, statistically, having the greatest likelihood of being associated with these artefacts ($X^2=8.411$, $p=0.014$) and in low (<five) frequencies ($p=0.059$). This trend continues between adults, generally, and older adults to a lesser degree where agate was recovered. The high frequency of agate in the form of necklace and/or pendant supports the association of older adults with stone, and agate specifically, positioned at the skull. Evidence also supports females are frequently associated with stone jewellery positioned at the subjects' skull. Of the small sample that were included in the study only adult burials contained carnelian.

Glass beads appear to have had their placement precipitated by an individual's age-at-death and not their sex. Again however, it is adults that are more frequently associated with this material culture in comparison to subadults.

9.7.1 Assessment of mean number of grave good categories by class

Where age, as a defining characteristic, is highlighted Table 9.6 demonstrates some activity related to the key cohorts of the elderly and the young under examination in this study. Mean scores at Table 9.6 show that subadults, in some instances where only small numbers of burials are associated, were recovered with greater quantities, per individual, of bone artefacts but share a relatively similar exposure to glass artefacts with the elderly. Table 9.6 shows that the remaining activity, based on age, revolves around younger and older adults.

Whereas in the Bronze Age at Ban Lum Khao it was the young that demonstrated, based on mean scores, a relationship with being buried with higher quantities of fish, in the Iron Age at Noen U-Loke it is the elderly that display a significantly higher mean score with fish than both children and younger adults. The old at Noen U-Loke were also found with greater mean frequencies of other materials in comparison to children and younger adults. In addition to the higher mean average in associated with

glass, and shared with subadults, the elderly Table 9.6 also reveals a relationship between those elderly burials which contain shell, iron, bimetallic artefacts and bronze earrings.

Where sex as a factor is considered, Table 9.6 exhibits a relative divide between the association of males and females with specific material types. For males, mean ratios at Table 9.6, show an association with bronze (i.e., bangles and rings), shell and specifically shell beads and glass. The quantum of fish included in male burials at Noen U-Loke is significantly greater than females. Alternatively, average men scores with females demonstrate a greater quantum of bronze earrings, bimetallic artefacts and stone, especially agate, items.

9.8 Significant non-normative mortuary variables

Following from a review of normative behaviour across sections 9.1 to 9.6 this section explores non-normative mortuary behaviour only by age-at-death (Appendix 2). Table 9.7 shows only subadults were exposed to flexed burial position with all, bar one burial, being aged under one year. The remaining changes, where Suite #1 activities (Burial of Human Remains) are concerned, affect the orientation of adults. The second and third most prevalent orientations, after 0/360°, are in a north-eastern (46-89°) and southern direction (180°) respectively. Table 9.7 shows that elderly adults are the most likely to be exposed to burial in a north-eastern orientation with the majority (6/11, 54.5%) occurring in MP3. Of less significance is adults, aged 15 to 39.9 years, buried in a southerly orientation.

The remaining significant non-normative relate to material culture categories with older adults being the age cohort most closely associated with the identified outcomes relating to ceramic artefact position and bronze artefacts. Of these positions only the elderly were identified as having a significant association with ceramic artefacts at the trunk/abdomen ($X^2=8.331^*$, $p=0.015$) and at, near or under the arms ($X^2=6.783^*$, $p=0.033$). Elderly subjects are statistically more likely to be buried with bronze rings and, while only demonstrating a potential significance, with bronze bangles. This heightened association aligns with the potential significance of elderly subjects with very high numbers, as defined here, of bronze artefacts.

Further analysis of atypical mortuary behaviour by sex revealed that females were increasingly likely to have ceramic artefacts positioned at their trunk/abdomen and to be buried more frequently with bronze rings than their male counterparts.

9.9 Spatial Relationship of Burials (Mortuary Suite #6)

The identification and separation of the five mortuary phases at Noen U-Loke is precipitated by differential material culture and changing mortuary practices (e.g., clustered and non-clustered phases). Figures 9.3 to 9.6 were taken from original published sources with super-positioning of burials by colour included for the purposes of this research. Original maps from Noen U-Loke are oriented in a northern direction and Figures 9.3 to 9.6, retain a northern directional arrow for consistency across all sites under review.

TABLE 9.6: MEAN TOTALS OF MATERIAL CULTURE AND FAUNA BY AGE-AT-DEATH AND SEX – NOEN U-LOKE

Outcome	Age			Sex		
	SA (n=51)	YA (n=35)		OA (n=21)		F (n=20)
	obs. n ()	obs. n ()		obs. n ()		obs. n ()
Ceramics	82 37 (2.2)	68 23 (2.9)		41 14 (2.9)	45 14 (3.2)	40 15 (2.6)
Bronze Bangle	129 15 (8.6)	253 16 (15.8)		87 11 (7.9)	205 10 (20.5)	121 13 (9.3)
Bronze Ring	20 9 (2.2)	320 18 (17.7)		119 11 (10.8)	231 10 (23.1)	141 11 (12.8)
Bronze Earring	13 10 (1.3)	14 11 (1.2)		35 7 (5.0)	6 3 (2.0)	33 10 (3.3)
Iron	12 9 (1.3)	17 12 (1.4)		13 6 (6.5)	10 6 (1.6)	12 6 (2.0)
Bi-metal	20 10 (2.0)	18 11 (1.6)		12 2 (6.0)	5 3 (1.6)	18 6 (3.0)
Shell	1 1 (1.0)	1 1 (1.0)		51 4 (12.7)	46 2 (23.0)	5 2 (2.5)
Shell Bead	-	-		50 3 (16.6)	46 2 (23.0)	4 1 (4.0)
Stone	12 8 (1.5)	96 14 (6.8)		21 9 (2.3)	15 8 (1.8)	100 13 (7.6)
Agate	12 8 (1.5)	91 12 (7.5)		19 9 (2.1)	12 7 (1.7)	96 12 (8.0)
Carnelian	-	5 3 (1.6)		1 1 (1.0)	3 2 (1.5)	3 2 (1.5)
Glass	415 13 (31.9)	440 16 (27.5)		311 10 (31.1)	451 11 (41.0)	288 10 (28.8)
Bone/Tooth	6 1 (6.0)	-		7 2 (3.5)	7 2 (1.3)	-
Pig	2 2 (1.0)	2 2 (1.0)		7 7 (1.0)	3 3 (1.0)	6 6 (1.0)
Unionidae	6 5 (1.2)	-		1 1 (1.0)	-	1 1 (1.0)
Fish	10 5 (2.0)	4 4 (1.0)		35 3 (11.6)	36 4 (9.0)	1 1 (1.0)

Obs. = observed number from total sample; n = number of samples with material culture type or fauna species; ; SA = Subadult (<14.9 years); YA = Younger Adult (15-39.9 years); OA = Older Adult (40 or more years)

TABLE 9.7: NON-NORMATIVE OUTCOMES BY AGE-AT-DEATH – NOEN U-LOKE

Age								Comparisons
	Total (n=107)	SA (n=51)	YA (n=35)	OA (n=21)				(SA, YA, OA)
Outcome	Obs. (%)	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P		(X ² with Bonferroni correction)
Flexed	24 (22.4)	24 (47.0)	-	-	-	-		
Orientation (180°)	8 (7.4)	1 (1.9)	6 (17.1)	1 (4.7)	4.953*	0.084		-
Orientation (46-89°)	23 (21.4)	3 (5.8)	9 (25.7)	11 (52.3)	16.744*	0.000		OA>YA>SA
Ceramic Type (Lid)	8 (7.4)	8 (15.6)	-	-	-	-		
Ceramic Position (Abdomen)	12 (11.2)	1 (1.9)	5 (14.2)	6 (28.5)	8.331*	0.015		OA>YA>SA
Ceramic Position (Arms)	11 (10.2)	3 (5.8)	2 (5.7)	6 (28.5)	6.783*	0.033		OA>YA=SA
Bronze Frequency (16+ pcs.)	15 (14.0)	3 (5.8)	6 (17.1)	6 (28.5)	4.831*	0.089		-
Bronze Ring	38 (35.5)	9 (17.6)	18 (51.4)	11 (52.3)	13.588	0.001		OA=YA>SA
Bronze Bangle	42 (39.2)	15 (29.4)	15 (42.8)	12 (57.1)	5.081	0.078		-
Cemetery Location (91-135°)	13 (12.1)	2 (3.9)	8 (22.8)	3 (14.2)	5.334*	0.069		-
Cemetery Location (136-179°)	8 (7.4)	2 (3.9)	6 (17.1)	-	2.876*	0.089		-
Cemetery Location (315-359°)	5 (4.6)	5 (9.8)	-	-	-	-		
Sex								
	Total (n=43)	Male (n=23)	Female (n=20)					Comparisons
	Obs. (%)	Obs. (%)	Obs. (%)	X ²	P			X ²
Ceramic Position (Abdomen)	7 (16.2)	1 (4.3)	6 (30.0)			0.063		F>M
Bronze Earring	13 (30.2)	3 (13.0)	10 (50.0)			0.021		F>M

Note: The n value for all outcome suites under analysis is the same at Noen U-Loke; SA = Subadults (0-14.9years); YA = Younger Adults (15-39.9 years); OA = Older Adults (40 or more years)

Obs. = observed number from total sample identified; % = percentage of variable sample – totals include zero counts (0) of outcomes; X2 Pearson's uncorrected (Yate's corrected designated with *)

Bold denotes significance (P < 0.05); Post hoc testing carried out using Bonferroni's correction where appropriate.

Vertical analysis explored horizontal and vertical aspects of the cemetery configuration. Vertical analysis explored burial in relation to identified cultural layers and which burials were buried at the incipient and terminal points of phases and nucleated clusters. Horizontal analysis explored which sector (i.e., 135-179°, 225-269° etc.) burials were deposited. Six depositional sequences were identified at the site and three vegetative phases. Only one burial was deposited in the late Bronze Age (MP1) and the remaining across four phases in the Iron Age. In no instance, where burials on the horizontal are considered, were children or the elderly found in a specific section of the cemetery. Younger adults, at a preliminary level, held a potential statistically significant relationship with being buried between 91-135° ($X^2=5.334^*$, $p=0.069$) and 136-179° ($X^2=2.876^*$, $p=0.089$).

Based on the actual burial depth of the subject (i.e., 1.77m, 0.77m etc. below datum), across the five mortuary phases including the nucleated burial clusters, the elderly and subadults predominate as either an incipient or terminal burial. Subadults are, independently, the initial burial at MP3A, MP3B, MP4B and MP4D and at MP5, simultaneously, with an adult (15-39.9 years) in a double burial. Subadults are the terminal burial, independently, at MPs 4B and 4C and, simultaneously (not a double burial) as an older adult at 3A.

Although the cohort is the smallest in the sample older adults, like subadults, were observed to be the incipient or terminal burial frequently. The elderly from the sample were the initial burial at MP2 and MP4C but were the terminal burial, independently, at MP2, MP3B and MP4A with, as stated above at 3A with a subadult. Other than the isolated incidence of five subadults being the sole burials interred within the sector spanning 315-359° there was no evidence that the elderly or subadults were buried, horizontally, in any specific part of the cemetery at Neon U-Loke. Of the five burials located at this sector four were under one year of age, were secondary burials (jar burials) and were positioned in the atypical flexed position.

9.10 Summary

Chapter Nine summarised the results of analysis from Noen U-Loke following the identification of normative and statistically significant atypical behaviour at the site. Primarily, the analysis afforded a comparative approach by age-at-death and sex although, in some instances, this deviated to only focus on the primary cohorts under examination. Normative mortuary behaviour observed the deposition of individuals in single burials of moderate depth, laid out anatomically, in an extended and supine fashion. Only three quarters of the population were assigned an orientation. While potentially an artefact of the recovery process at excavation, the low proportion of any single orientation suggests this aspect of funerary treatment may not have featured as strongly in this local belief system in contrast to other sites reviewed. The inclusion of a grave good, most frequently of ceramic or bronze, was common.

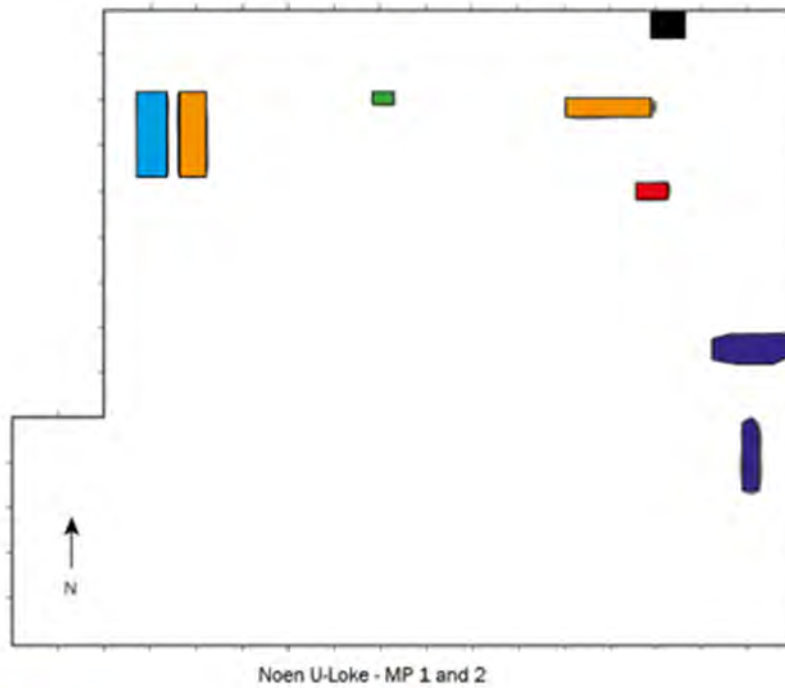


FIGURE 9.3: Mortuary Phase 1 and 2 at Noen U-Loke (adapted from Higham and Thosarat 2007f: 143)

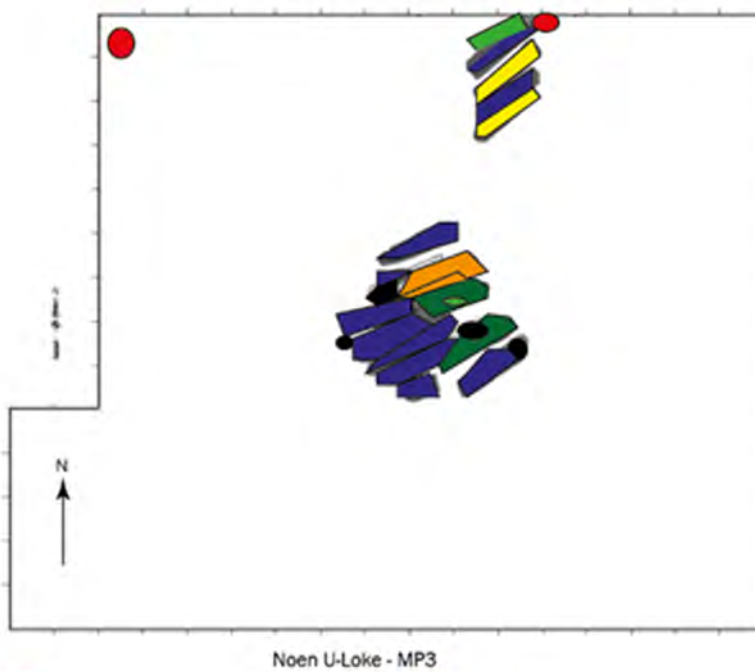


FIGURE 9.4: Mortuary Phase 3 at Noen U-Loke (adapted from Higham and Thosarat 2007h: 153)

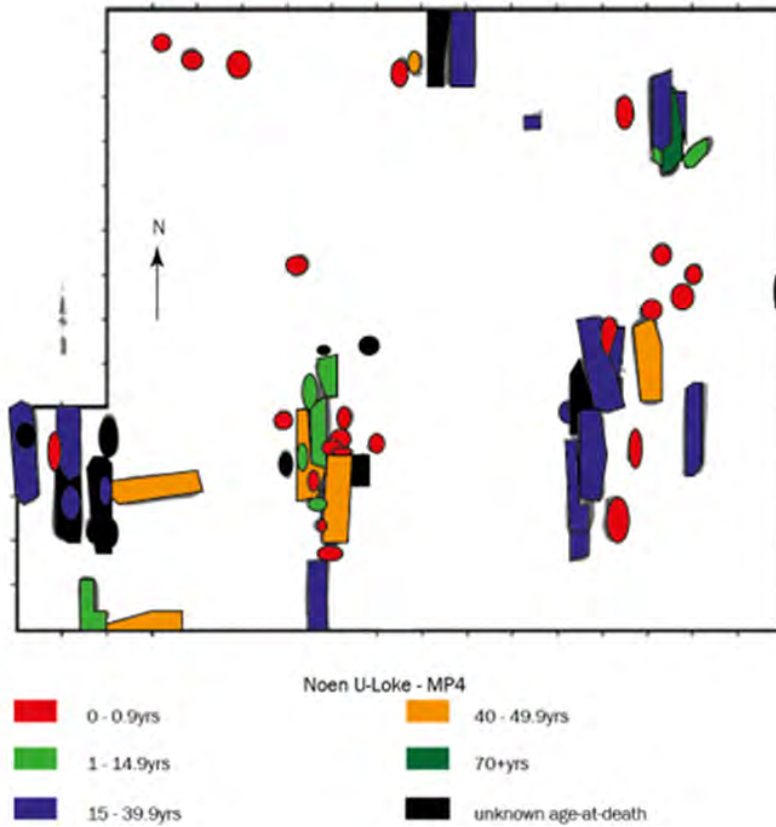


FIGURE 9.5: Mortuary Phase 4 at Noen U-Loke (adapted from Higham and Thosarat 2007b: 173)

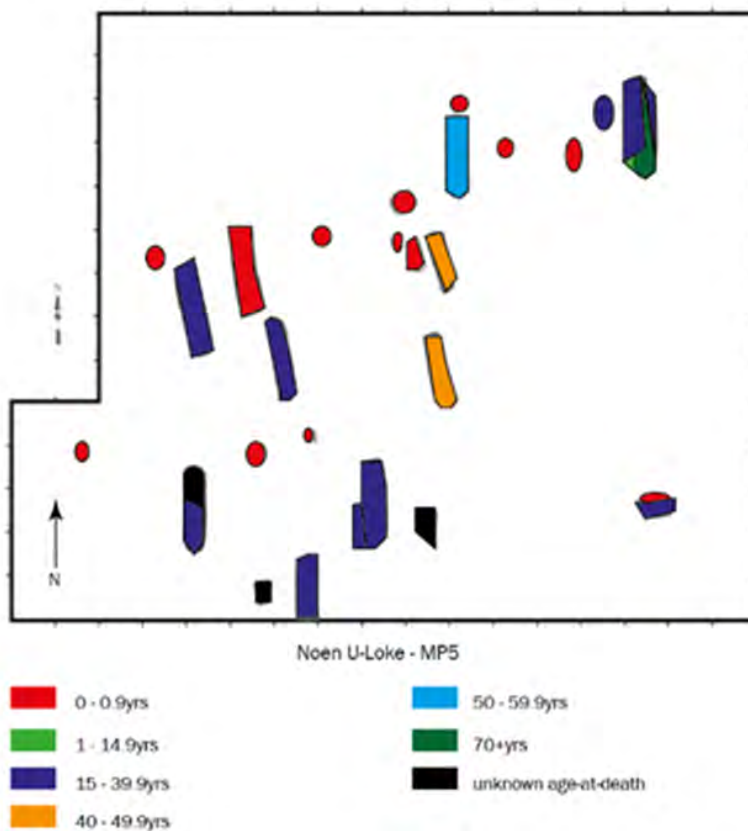


FIGURE 9.6: Mortuary Phase 5 at Noen U-Loke (adapted from Higham and Thosarat 2007g: 223)

As observed at Chapters Six through Eight it could be observed that age was a factor in the determination of mortuary practices observed by participating agents. While the younger adult (15-39.9 years) cohort is most frequently associated with the abundant copper-based bronze artefacts it was observed that older adults are most frequently affiliated with outcomes from Mortuary Suites 1 (Burial of Human Remains), 3 (Faunal Remains) and 5 (Material Culture).

In contrast to evidence from the other sites under review the results from Noen U-Loke demonstrate a greater relationship of sex, particularly adult females, with a range of material culture variables that are normative and non-normative. Chapter Ten will explore a temporal analysis of trends, by age and sex, in relation to a series of transformed and non-transformed mortuary variables to observe broad patterns of behaviour over time. This approach was achieved through the application of a regression analysis under a Generalised Linear Model.

Results: Generalised Linear Modelling

10.1 Introduction

The following chapter explores the potential interaction with independent or interacting categorical variables (i.e., age-at-death and sex) with specific explanatory variables (see Section 5.14.2) in the Neolithic, Bronze and Iron Ages. The chapter sets out a consideration of a range of explanatory variables to explore broad mortuary activity in each period from the sites under review. Explanatory variables include non-transformed and transformed mortuary variables. Results at Table 10.1 to 10.3 reviewing proportions of ceramic artefacts *includes* all material types (i.e., shell, bone etc.) whereas results in relation to other materials (i.e., bone, shell etc.) *excludes* ceramic artefacts from analysis (i.e., identified as ‘n.c.’ in tables 10.1 to 10.3). This approach was adopted to explore the distribution of material types with, and without, the ubiquitous ceramic item so frequently recovered from mortuary settings in Southeast Asian sites. The quantum of aggregated artefacts (i.e., one to five items etc.) was explored to identify increasing/decreasing ‘wealth’ by age-at-death or sex. The rationale and number of burials associated with the Neolithic, Bronze and Iron Age is set out at Chapter Five.

10.2 The Neolithic

The results of the Generalized Linear Modelling (GLM) tests from the Neolithic are found in Table 10.1. The sample from the Neolithic comprises all burials from Khok Phanom Di and those burials from Ban Non Wat’s Neolithic mortuary phases. Burials included from Ban Non Wat also comprise those identified as flexed by primary researchers (Higham and Wiriyaaromp, 2010a). Tables 10.2 and 10.3 show the estimated mean of each variable by age and sex as proportions. GLM results at Table 10.1 show, where statistically significant results occur, that age-at-death in comparison to sex continues to be a defining characteristic in mortuary treatment. There are no instances of statistically significant behaviour in the Neolithic where the categorical variables of age and sex interact.

Table 10.1 reflects that a number of transformed and non-transformed explanatory variables demonstrate statistically significant behaviour by age. Non-transformed variables include the presence of grave goods, the presence of double burials and interment in shallow graves. The expanded sample from the Neolithic continues to show that adults, generally (82/137, 59.8%), but younger adult more specifically (48/137, 35.0%) being most likely to be buried with a grave good, of any type, in their grave in comparison to subadults. The sample also shows that subadults (31/48, 64.5%) are increasingly likely to be included in graves which contain two or more burials. Finally, where non-transformed mortuary variables occur it is both subadults (81/154, 52.5%) and younger adults (50/154, 32.4%) that are most frequently recovered from shallow graves.

TABLE 10.1: TEST OF GLM MODEL EFFECTS – NEOLITHIC

Grave Goods Present			Multi-Component			Exotic			1-5 items			6-10 items			11-15 items			
Source	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p
Age	14.11	2	0.000	0.75	2	0.687	8.23	2	0.016	12.48	2	0.002	0.29	2	0.863	0.13	2	0.933
Sex	2.42	1	0.120	0.24	1	0.624	0.07	1	0.788	2.41	1	0.120	0.79	1	0.374	0.00	1	0.947
Age*Sex	0.01	1	0.919	1.04	1	0.306	0.62	1	0.428	1.38	1	0.239	1.81	1	0.178	0.02	1	0.879
16 Items			Ceramics (<50%)			Ceramics (51-99%)			Ceramics (100%)			Bone (<50% (n.c.))			Bone (51-99% (n.c.))			
Source	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p
Age	0.06	2	0.968	3.95	2	0.138	4.13	2	0.126	2.68	2	0.261	8.08	2	0.018	0.32	2	0.849
Sex	0.04	1	0.828	1.99	1	0.158	2.32	1	0.127	7.83	1	0.005	0.04	1	0.837	0.04	1	0.841
Age*Sex	0.01	1	0.990	1.39	1	0.237	0.01	1	0.895	0.70	1	0.402	0.28	1	0.594	0.01	1	0.888
Bone (100% (n.c.))			Shell to (50% (n.c.))			Shell (51-99% (n.c.))			Shell (100% (n.c.))			Stone (<50% (n.c.))			Stone (51-99% (n.c.))			
Source	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p
Age	2.81	2	0.245	3.29	2	0.193	0.78	2	0.675	2.62	2	0.269	2.58	2	0.275	1.74	2	0.419
Sex	2.06	1	0.151	0.03	1	0.852	0.25	1	0.617	3.60	1	0.058	0.02	1	0.879	0.01	1	0.925
Age*Sex	0.07	1	0.785	2.72	1	0.099	0.13	1	0.711	0.36	1	0.544	0.18	1	0.666	0.03	1	0.852
Stone (100% (n.c.))			Eastern Orientation			Flexed/Semi-Flexed			Multiple Burial			Shallow Grave						
Source	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p			
Age	1.42	2	0.491	9.43	2	0.009	27.74	2	0.000	6.01	2	0.049	10.50	2	0.005			
Sex	0.02	1	0.879	0.11	1	0.731	2.61	1	0.106	0.00	1	0.954	17.74	1	0.000			
Age*Sex	0.05	1	0.823	0.38	1	0.535	0.40	1	0.525	0.52	1	0.471	0.43	1	0.510			

Assemblages: Khok Phanom Di, Ban Non Wat (i.e. Flexed Burials and Neolithic mortuary phases 1 and 2); d.f.= degree of freedom; n.c. = no ceramics (ceramics in burial excluded from analysis); * = “by” (i.e. age by sex); Bold indicates statistically significant differences a p<0.05

TABLE 10.2: ESTIMATED SAMPLE MEANS: PERIOD BY AGE

Grave Goods Present			Multi-Component			Exotic			1-5 items			6-10 items			11-15 items			
Period	SA	YA	OA	SA	YA	OA	SA	YA	OA	SA	YA	OA	SA	YA	OA	SA	YA	OA
Neolithic	0.50	0.76	0.75	0.18	0.21	0.24	0.09	0.21	0.26	0.43	0.70	0.62	0.06	0.07	0.08	-	0.01	0.02
Bronze Age	0.84	0.97	1.00	0.12	0.17	0.27	0.17	0.36	0.47	0.54	0.35	0.40	0.18	0.30	0.31	0.04	0.07	0.09
Iron Age	0.93	0.83	0.90	0.03	0.10	0.09	0.13	0.25	0.36	0.60	0.30	0.27	0.18	0.33	0.18	0.07	0.09	0.12
16 Items			Ceramics (<50%)			Ceramics (51-99%)			Ceramics (100%)			Bone (<50% (n.c.))			Bone (51-99% (n.c.))			
Period	SA	YA	OA	SA	YA	OA	SA	YA	OA	SA	YA	OA	SA	YA	OA	SA	YA	OA
Neolithic	0.01	0.01	0.02	0.11	0.21	0.20	0.11	0.21	0.11	0.19	0.26	0.31	0.01	0.12	0.02	0.03	-	0.02
Bronze Age	0.07	0.23	0.15	0.06	0.18	0.18	0.34	0.45	0.54	0.39	0.27	0.22	0.02	0.05	-	-	0.01	-
Iron Age	0.05	0.12	0.33	0.23	0.21	0.39	0.08	0.27	0.12	0.49	0.31	0.24	0.01	0.01	0.03	0.01	-	-
Bone (100% (n.c.))			Metals (<50% (n.c.))			Metals (51-99% (n.c.))			Metals (100% (n.c.))			Shell to (50% (n.c.))			Shell (51-99% (n.c.))			
Period	SA	YA	OA	SA	YA	OA	SA	YA	OA	SA	YA	OA	SA	YA	OA	SA	YA	OA
Neolithic	0.02	0.07	0.02	-	-	-	-	-	-	-	-	-	0.05	0.12	0.13	0.02	0.01	0.04
Bronze Age	-	0.01	-	0.06	0.10	0.11	0.01	0.01	-	0.04	-	-	0.07	0.08	0.15	0.06	0.17	0.13
Iron Age	0.01	-	-	0.01	0.07	0.06	0.08	0.09	0.33	0.24	0.31	0.27	0.01	0.06	0.03	0.01	0.01	0.03
Shell (100% (n.c.))			Stone (<50% (n.c.))			Stone (51-99% (n.c.))			Stone (100% (n.c.))			Eastern Orientation			Flexed/Semi-Flexed			
Period	SA	YA	OA	SA	YA	OA	SA	YA	OA	SA	YA	OA	SA	YA	OA	SA	YA	OA
Neolithic	0.14	0.23	0.13	0.03	0.09	0.08	-	0.01	0.06	0.05	0.07	0.11	0.70	0.78	0.95	0.37	0.06	0.04
Bronze Age	0.21	0.28	0.36	0.06	0.22	0.15	0.01	0.01	0.06	0.02	0.08	0.06	0.25	0.41	0.20	0.33	0.02	-
Iron Age	0.03	0.04	-	0.08	0.09	0.30	-	0.03	0.03	0.02	0.02	-	0.21	0.51	0.57	0.49	0.01	-

Period	Multiple Burial			Shallow Grave																
	SA	YA	OA	SA	YA	OA														
Neolithic	0.28	0.12	0.20	0.75	0.78	0.51														
Bronze Age	0.02	0.06	-	0.83	0.96	0.90														
Iron Age	0.09	0.16	0.12	0.25	0.33	0.27														

Assemblages: (1) Neolithic – Khok Phanom Di, Ban Non Wat (Flexed, Neolithic mortuary phase 1 and 2); (2) Bronze Age – Ban Lum Khao, Ban Non Wat (Bronze Age mortuary phases); (3) Iron Age – Noen U-Loke, Ban Non Wat (Iron Age mortuary phases); SA = subadult (0-14.9 years of age), YA = Younger Adult (15-39.9 years of age), OA = Older Adult (40+ years of age); n.c. = no ceramics (ceramics in burial excluded from analysis)

TABLE 10.3: ESTIMATED SAMPLE MEANS: PERIOD BY SEX

	Grave Goods Present		Multi-Component		Exotic		1-5 items		6-10 items		11-15 items	
Period	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Neolithic	0.82	0.69	0.21	0.25	0.22	0.25	0.73	0.59	0.10	0.05	0.01	0.01
Bronze Age	0.98	0.97	0.16	0.22	0.38	0.39	0.38	0.35	0.33	0.27	0.05	0.09
Iron Age	0.84	0.86	0.10	0.10	0.31	0.26	0.27	0.30	0.25	0.32	0.15	0.05
	16 Items		Ceramics (<50%)		Ceramics (51-99%)		Ceramics (100%)		Bone (<50% (n.c.))		Bone (51-99% (n.c.))	
Period	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Neolithic	-	0.03	0.15	0.26	0.22	0.11	0.40	0.15	0.08	0.07	-	0.01
Bronze Age	0.20	0.23	0.14	0.22	0.50	0.44	0.26	0.26	0.05	0.02	-	0.01
Iron Age	0.15	0.20	0.22	0.29	0.24	0.23	0.27	0.30	0.03	-	-	-
	Bone (100% (n.c.))		Metals (<50% (n.c.))		Metals (51-99% (n.c.))		Metals (100% (n.c.))		Shell to (50% (n.c.))		Shell (51-99% (n.c.))	
Period	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Neolithic	0.08	0.01	-	-	-	-	-	-	0.12	0.13	0.03	0.01
Bronze Age	0.01	-	0.10	0.10	0.01	0.01	-	-	0.07	0.12	0.17	0.16
Iron Age	-	-	0.08	0.05	0.17	0.14	0.25	0.33	0.06	0.04	0.01	0.01
	Shell (100% (n.c.))		Stone (<50% (n.c.))		Stone (51-99% (n.c.))		Stone (100% (n.c.))		Eastern Orientation		Flexed/Semi-Flexed	
Period	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Neolithic	0.12	0.26	0.08	0.09	0.03	0.03	0.08	0.09	0.84	0.86	0.01	0.09
Bronze Age	0.27	0.32	0.19	0.22	0.03	0.02	0.10	0.06	0.42	0.30	0.01	0.02
Iron Age	0.01	0.04	0.18	0.11	0.03	0.02	0.03	-	0.51	0.54	0.01	-

	Multiple Burial		Shallow Grave																
Period	Female	Male	Female	Male															
Neolithic	0.15	0.15	0.47	0.88															
Bronze Age	0.07	0.02	0.98	0.91															
Iron Age	0.18	0.11	0.29	0.33															

Assemblages: (1) Neolithic – Khok Phanom Di, Ban Non Wat (Flexed, Neolithic mortuary phase 1 and 2); (2) Bronze Age – Ban Lum Khao, Ban Non Wat (Bronze Age mortuary phases); (3) Iron Age – Noen U-Loke, Ban Non Wat (Iron Age mortuary phases); n.c. = no ceramics (ceramics in burial excluded from analysis)

Transformed explanatory variables showing significant results by age include the presence of exotic artefacts in graves, burial in either a flexed or semi-flexed fashion and in a broad easterly orientation, very low quantities of grave goods and where bone/tooth artefacts make up less than 50 per cent of grave goods where ceramic artefacts have been excluded. Where exotic items were recovered from graves it was adults (26/36, 72.2%), generally, but older adult subjects specifically (12/36, 33.3%) that were frequently buried with this artefact type. Older adults (43/169, 25.4%) were also commonly found in the broad easterly orientation during this period in comparison to subadults and younger adults. Subadults (40/46, 86.9%) in the Neolithic were frequently recovered in a flexed or semi-flexed position. The younger adult cohort is associated with low quantities (one to five pieces each) of grave goods (45/120, 37.5%) and where bone artefacts, excluding ceramic objects, make up less than half of artefacts deposited in the grave (8/11, 72.7%).

Where sex is reviewed, as an independent categorical variable, it can be observed that female subjects (23/31, 74.1%) are statistically most likely to be buried with ceramic artefacts as the only artefact in their grave in the Neolithic. Whereas male subjects (14/21, 66.6%) have a statistically significant probability of being included in graves with only shell objects, of any type, where ceramic artefacts have been excluded from analysis. While only potentially statistically significant Table 10.1 observes that adult males (46/73, 63.0%) in the Neolithic are more frequently buried in shallow graves in comparison to female subjects from both Khok Phanom Di and Ban Non Wat.

10.3 The Bronze Age

Table 10.4 shows the results of GLM testing of the sample from the Bronze Age. The expanded sample includes those burials from Ban Lum Khao and from Bronze Age mortuary phases (n=five) at Ban Non Wat. GLM results at Table 10.4 shows that, neither sex as an independent variable or age*sex as interacting variables demonstrate statistically significant behaviour where transformed and non-transformed explanatory variables are explored. Age however, appears significant in association with a number of variables. As in the Neolithic period, Table 10.4 reflects that several transformed and non-transformed explanatory variables demonstrate statistically significant behaviour by age in the Bronze Age. Non-transformed variables include the presence of grave goods and burial in shallow graves. While high proportions of all three age cohorts are buried with grave goods it is the older adult cohort (44/315, 13.9%) that were always interred with an artefact of any type in the Bronze Age. Adults of both cohorts (190/308, 61.6%) are most frequently associated with burial in shallow graves with younger adults (150/308, 48.7%) the most common and demonstrating the greatest statistical likelihood of this treatment.

Table 10.4 observes that transformed explanatory variables with statistically significant results by age include the presence of exotic artefacts in graves, burial in either a flexed or semi-flexed fashion and in a broad easterly orientation and very low to moderate and/or very high quantities of grave goods. This also includes the presence of ceramic artefacts in any of the three proportionate categories (i.e., <50%, 51-99% and 100%) and where shell artefacts make up more than 50 per cent and stone makes up less than half of grave goods where ceramic artefacts have been excluded.

TABLE 10.4: TEST OF GLM MODEL EFFECTS – BRONZE AGE

Grave Goods Present				Multi-Component			Exotic			1-5 items			6-10 items			11-15 items		
Source	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p
Age	12.85	2	0.002	5.63	2	0.060	19.99	2	0.000	10.63	2	0.005	6.29	2	0.043	1.71	2	0.423
Sex	0.01	1	0.936	1.36	1	0.242	0.02	1	0.871	0.19	1	0.656	1.01	1	0.313	0.92	1	0.337
Age*Sex	0.01	1	0.995	2.29	1	0.130	0.918	1	0.338	0.20	1	0.654	1.65	1	0.199	0.33	1	0.564
16 Items				Ceramics (<50%)			Ceramics (51-99%)			Ceramics (100%)			Bone (<50% (n.c.))			Bone (51-99% (n.c.))		
Source	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p
Age	13.93	2	0.000	9.54	2	0.008	6.58	2	0.037	6.94	2	0.031	1.92	2	0.382	0.04	2	0.977
Sex	0.41	1	0.520	2.36	1	0.124	0.54	1	0.461	0.02	1	0.887	1.63	1	0.201	0.02	1	0.864
Age*Sex	0.57	1	0.450	0.93	1	0.334	0.07	1	0.779	0.54	1	0.460	0.01	1	0.977	0.01	1	0.971
Bone (100% (n.c.))				Metals (<50% (n.c.))			Metals (51-99% (n.c.))			Metals (100% (n.c.))			Shell to (50% (n.c.))			Shell (51-99% (n.c.))		
Source	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p
Age	0.04	2	0.977	1.76	2	0.414	0.29	2	0.864	0.16	2	0.919	3.18	2	0.204	8.39	2	0.015
Sex	0.02	1	0.870	0.01	1	0.971	0.01	1	0.955	-	-	-	1.27	1	0.258	0.01	1	0.904
Age*Sex	0.01	1	0.972	0.26	1	0.604	0.01	1	0.999	0.00	1	1.000	0.07	1	0.782	0.82	1	0.362
Shell (100% (n.c.))				Stone (<50% (n.c.))			Stone (51-99% (n.c.))			Stone (100% (n.c.))			Eastern Orientation			Flexed/Semi-Flexed		
Source	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p
Age	3.84	2	0.146	13.49	2	0.001	3.85	2	0.145	4.41	2	0.110	11.05	2	0.004	30.66	2	0.000
Sex	0.46	1	0.496	0.40	1	0.522	0.52	1	0.470	1.17	1	0.278	3.14	1	0.076	0.01	1	0.935
Age*Sex	0.12	1	0.728	0.02	1	0.882	0.01	1	0.936	1.34	1	0.246	3.73	1	0.053	0.01	1	0.996

Source	Multiple Burial			Shallow Grave																
	Wald X ²	d.f.	p	Wald X ²	d.f.	p														
Age	2.36	2	0.306	11.46	2	0.003														
Sex	2.91	1	0.088	3.78	1	0.052														
Age*Sex	0.01	1	0.950	0.12	1	0.726														

Assemblages: Ban Lum Khao, Ban Non Wat (i.e. Bronze Age mortuary phases); d.f.= degree of freedom; n.c. = no ceramics (ceramics in burial excluded from analysis); * = “by” (i.e. age by sex); Bold indicates statistically significant differences a p<0.05

Similarly to observations from the Neolithic, Table 10.4 captures that adults (78/102, 76.4%) broadly, but older adults more frequently (21/102, 20.5%), were buried with exotic artefact types to each site. Although only potentially significant, older adults (12/56, 21.4%) were most likely to be buried with a multi-component artefact (i.e., necklace, bead shroud etc.) than their younger counterparts. As in the Neolithic, subadults (47/51, 92.1%) were more frequently found in a flexed or semi-flexed position with no burials from the older adult cohort recovered in either of these styles. Where ceramic artefacts were the only grave good deposited *in situ*, it was subadults (56/109, 51.3%) that were most commonly associated with this treatment. Conversely, it is adults (37/46, 80.4%), equally of both cohorts, that had statistically significant relationship with ceramic artefacts constituting less than half of their grave furniture and older adults (24/144, 16.6%) that had ceramic artefacts constituting more than half of their grave furniture. Where the younger adult cohort was commonly recovered with low quantities of grave goods in the Neolithic, the evidence from the Bronze Age notes a shift in this trend. Subadults (77/151, 50.9%) demonstrate a statistically significant association with low (<5 pcs. each) artefact quantities whereas adults are shown to be buried with moderate (61/87, 70.1%) quantities in the same period. The younger adult class (37/54, 68.5%) is found to be with very high quantities of grave goods in the Bronze Age. Younger adults (64/109, 58.7%) were frequently buried in an easterly orientation and, where ceramic artefacts were excluded from analysis, were more commonly found with stone artefacts constituting less than half (35/51, 68.6%) and shell artefacts (28/43, 65.1%) comprising more than half of their grave goods.

Although only potentially statistically significant, and where sex is reviewed independently, it is shown that only females demonstrate an association with some of the transformed and non-transformed variables applied. This includes burial in a shallow grave (102/190, 53.6%) which is a different trend to that observed in the Neolithic. Females are also more frequently buried in an easterly orientation (44/73, 60.2%) than their male counterparts and to be included in graves containing two or more individuals (8/10, 80.0%).

10.4 The Iron Age

The results of the GLM tests from the Iron Age are found in Table 10.5. The sample from the Iron Age comprises all burials from Noen U-Loke and those burials from Ban Non Wat's Iron Age mortuary phases. GLM results from the Iron Age at Table 10.5 show that sex, as an independent explanatory variable, only demonstrates potential statistical significance in relation to one criterion being high quantities of grave goods deposited with females (9/13, 69.2%). Statistically significant results through the interaction of age and sex are more prevalent in the Iron Age in comparison to the Neolithic and Bronze Age. This manifests in relation to older adult females in all three instances and their association with exotic artefacts at each site and where, following the exclusion of ceramic items, stone objects constitute less than half, and metal objects comprise more than half, of grave goods recovered.

As with both the Neolithic and Bronze Age it is age, as an independent explanatory variable, that most frequently encountered statistically significant results from the Iron Age. In this instance only transformed variables show significant results. These include the presence of select exotic items to each locale, the presence of flexed/semi-flexed burials, burial orientation in an easterly direction, the proportion of some artefact types associated with age cohorts and the quantum of grave goods deposited in burials. Where the Neolithic and Bronze Age showed both adult cohorts, but more specifically the elderly in association with exotic artefacts, in the Iron Age it is solely older subjects (12/50, 24.0%) that are most frequently exposed to, and have a statistically significant relationship with, exotic items.

Although both the younger and older adult cohorts are more likely to be buried in the broad easterly orientation adopted in this aspect of analysis in comparison to subadults in the Iron Age, reverting back

to the trend observed from the Neolithic, it is older adults (19/89, 21.3%) that are most commonly found in this manner. Further, it is older adults, where ceramic artefacts are excluded from analysis, that have stone artefacts (10/28, 35.7%) which comprise less than half and metal artefacts (11/29, 37.9%) making up more than half of their grave goods across this period.

As in the Neolithic and Bronze Age it was subadults (50/51, 98.0%) that were more frequently found in flexed or semi-flexed positions with no older adults buried in either style. Similar to that observed in the Bronze Age, where ceramic objects were the sole artefact type deposited in the burial, it was subadults (50/87, 57.4%) that demonstrated a statistically significant with this behaviour. The younger adult cohort (26/39, 66.6%) is more frequently associated where ceramic artefacts constitute more than half of the subjects grave goods. Reflecting the pattern observed from the previous two periods it is subadults (61/98, 62.2%) that, if buried with grave goods, were exposed most frequently to the lowest quantum of artefacts (<5 pieces each) in the grave. However, a deviation occurs where moderate and very high counts of artefacts occur in contrast to the earlier periods. Where moderate numbers of grave goods (six-ten pieces each) occur it is the younger adult cohort (31/56, 55.3%) that are statistically associated with this behaviour with the older adult cohort (11/29, 37.9%) having a statistically significant relationship with very high (16 or more pcs. each) quantities of artefacts recovered from burials.

10.5 Summary

Chapter Ten summarised the results of statistical testing through the application of a Generalised Linear Model to the sample used in this study. The use of a GLM enabled an alternative approach to data in comparison to the goodness-for-fit tests executed across Chapters Six to Nine. This chapter primarily tested a limited range of explanatory variables to explore aspects of burial behaviour and the proportion and distribution of broad material types. This was executed at a temporal level. Statistical results through the GLM continue to support that age, independently, was more frequently found to be the major defining characteristic that is associated with statistically significant behaviour rather than sex or the interaction of sex, age. The next chapter, Chapter Eleven, will provide an opportunity to discuss the implications of the results of analysis and consider the implications for this research at a broader level within the discipline.

TABLE 10.5: TEST OF GLM MODEL EFFECTS – IRON AGE

Grave Goods Present			Multi-Component			Exotic			1-5 items			6-10 items			11-15 items			
Source	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p
Age	4.15	2	0.125	3.18	2	0.204	8.25	2	0.016	21.38	2	0.000	6.25	2	0.044	0.55	2	0.757
Sex	0.13	1	0.714	0.01	1	0.993	0.32	1	0.571	0.16	1	0.685	0.63	1	0.425	2.93	1	0.087
Age*Sex	0.35	1	0.550	1.64	1	0.200	6.32	1	0.012	0.22	1	0.632	0.37	1	0.538	0.25	1	0.614
16 Items			Ceramics (<50%)			Ceramics (51-99%)			Ceramics (100%)			Bone (<50% (n.c.))			Bone (51-99% (n.c.))			
Source	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p
Age	14.28	2	0.000	4.18	2	0.123	12.03	2	0.002	9.91	2	0.007	0.78	2	0.674	0.03	2	0.983
Sex	0.53	1	0.463	0.79	1	0.373	0.01	1	0.936	0.16	1	0.685	0.05	1	0.815	-	-	-
Age*Sex	0.03	1	0.850	1.16	1	0.281	0.32	1	0.571	0.99	1	0.319	0.01	1	0.993	0.00	1	1.000
Bone (100% (n.c.))			Metals (<50% (n.c.))			Metals (51-99% (n.c.))			Metals (100% (n.c.))			Shell to (50% (n.c.))			Shell (51-99% (n.c.))			
Source	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p
Age	0.03	2	0.983	3.79	2	0.150	12.81	2	0.002	1.00	2	0.605	2.40	2	0.301	0.78	2	0.674
Sex	-	-	-	0.35	1	0.554	0.15	1	0.698	0.94	1	0.332	0.36	1	0.545	0.12	1	0.910
Age*Sex	0.00	1	1.000	0.66	1	0.414	3.20	1	0.074	0.59	1	0.441	0.08	1	0.770	0.06	1	0.805
Shell (100% (n.c.))			Stone (<50% (n.c.))			Stone (51-99% (n.c.))			Stone (100% (n.c.))			Eastern Orientation			Flexed/Semi-Flexed			
Source	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p	Wald X ²	d.f.	p
Age	0.14	2	0.932	10.30	2	0.006	0.17	2	0.916	0.24	2	0.887	22.34	2	0.000	19.85	2	0.000
Sex	0.69	1	0.404	1.24	1	0.264	0.02	1	0.871	0.05	1	0.815	0.09	1	0.763	0.04	1	0.829
Age*Sex	0.01	1	0.987	8.19	1	0.004	0.02	1	0.873	0.01	1	0.909	0.45	1	0.501	0.02	1	0.880

Source	Multiple Burial			Shallow Grave																
	Wald X ²	d.f.	p	Wald X ²	d.f.	p														
Age	1.67	2	0.433	1.41	2	0.493														
Sex	1.24	1	0.264	0.29	1	0.587														
Age*Sex	0.01	1	0.969	0.23	1	0.628														

Assemblages: Noen U-Loke, Ban Non Wat (i.e. Iron Age mortuary phases); d.f.= degree of freedom; n.c. = no ceramics (ceramics in burial excluded from analysis); * = "by" (i.e. age by sex); Bold indicates statistically significant differences a p<0.05

Discussion:

Age as a Characterisation of Identity in Southeast Asia

11.1 Introduction

The main purpose of this research was to explore the potential for variation in age-based identity, explicitly of subadults and the elderly, among four prehistoric Thai cemetery populations. The four sites were occupied across the archaeologically defined periods of the Neolithic, Bronze Age, and Iron Age (Shoocongdej, 2015, White, 2017) on mainland Southeast Asia. This approach was taken to examine possible changes in attitude towards both the young (<14.9 years) and elderly (40+ years), over a period of more than two millennia, as reflected through mortuary behaviour. In this context, age manifests as an aspect of the individual's identity in the life course at a fixed point in time (their death) (Harré, 1991, Davies, 2002). Specific aims (see Section 1.2) of the research related to the consideration of attitudes and perceptions of the surviving community to each primary cohort; their relationship with normative and/or atypical mortuary behaviours; an exploration of potential transitional ages across the lifespan indicating movement from one age-based identity to another; and what other socially constructed identities, as a by-product of the explicit objectives of this research, could be inferred from available data was taken.

To achieve the objectives of this research a mortuary analysis was undertaken. The mortuary analysis undertook a biosocial approach towards understanding identity by examining population level data in relation to a range of material features to explore the age-based identity of the young and old. Chapter Five outlined the broad suites of mortuary activity reviewed in relation to each of the three broad age cohorts. Normative and non-normative mortuary behaviours were to see if further aspects of identity could be correlated with the age-based groups under review.

This research applied the Cave and Oxenham (2016) method to facilitate potential revised age-at-death assessments of older individuals from Khok Phanom Di, Ban Lum Khao and Noen U-Loke. This approach enabled, where assessable molars were present, a discrete mortuary analysis of this cohort, normally invisible beyond the typical cut-off in bioarchaeology (Walker et al., 1988, Schmitt et al., 2002). A tooth wear analysis was not performed on the sample from Ban Non Wat and preliminary age-at-death assessments were adopted for this research.

This chapter discusses the results, presented in Chapters Six to Ten to 10, with respect to the dissertation objectives set out in Chapter One and begins with a discussion on the evidence from the identified mortuary data on the potential age-based identity of the sample of subadults and the elderly (Section 11.2). The exploration of select burial treatment from the subadult and elderly adult cohorts was undertaken to ascertain if certain age sub-categories (i.e., foetal, older children, 50s, 60s etc.) were included or excluded from certain funerary practices. Notable burials or significant funerary behaviours that added further context to the experience, perception, or treatment in relation to youthfulness or advancing age were also included in this aspect of the discussion where relevant. The study was deliberately set out to enable comparative analysis between sites in order to explore subadult and elderly adult mortuary treatment contemporaneously between sites (i.e., Khok Phanom Di vs Ban Non Wat in the Neolithic etc.); and the general trend relating to the identity of subadults and the elderly across prehistoric Thailand over time. The discussion on differential patterns of mortuary behaviour between subadult and older adult cohorts enabled greater commentary on attitudes to age, whether

regarding youthfulness or increasing age, across the lifespan in ancient Southeast Asia. Section 11.3 moves towards a broader engagement with the evidence and its overarching themes and trends.

11.2 Childhood and Elderly Identities in Mainland Southeast Asia

The following sub-sections look to explore the overall results of the findings from each of the mortuary suites of activity in relation to the young and old. This broad approach was taken as the evidence in relation to the potential age-based identity of each cohort. Interpretations of data was not straightforward with evidence of considerable variability to each cohort being present and suggesting that changing funerary practices are visible indices of differential identity within each group. Section 11.2 adopts the same mortuary framework for discussion as set out in Chapters Five through Ten. The initial commentary related to human burials (Suite #1) followed by reviews of results regarding Grave Characteristics (Suite #2), Fauna (Suite #3), health vignettes (Suite #4) and material culture (Suite #5). As minimal evidence of spatial activity in relation to the primary cohorts under review was noted, this is not discussed.

Sex, as a potential identity construct (cultural/biological) is not discussed in detail due the study's primary focus on age-identities but also due to the dearth of telling information in relation to sex. The potentiality of a gender identity at the sites under review, whether in relation to diet at Ban Lum Khao or material culture at Khok Phanom Di is documented and discussed elsewhere (Higham and Bannanurag, 1990, Domett, 2002, Higham, 2002). The secondary focus on sex-identity, recognising that an individual's identity is influenced and constructed by many factors, including gendered sex, enabled a contrasting perspective to age-identity from which to observe and discuss processes affecting identity. Previous research into gender on the Southeast Asian mainland suggests that funerary behaviour at some locales may have been influenced by this aspect of identity (Chang, 1996, Bacus, 2006, Andaya, 2007, Bacus, 2007). In contrast to age, this research found only scattered evidence to suggest that the sex of some adult subjects was an important element in the determination of mortuary treatment. This study, through secondary design, expands our awareness of a sex identity in the region and provides insight into its significance as a potential biosocial construct. Where, as a cautious approach, it can be seen from the results that males, in limited context, are more frequently buried with some material items at Khok Phanom Di, Ban Lum Khao and Ban Non Wat (i.e., male – shell, ceramics; female – shell) to a lesser degree, the evidence from Noen U-Loke suggests a transition in funerary behaviour, and a shift in identity, with females more frequently aligned with some artefact types at this time. The shift in behaviour at Noen U-Loke does not align with that from Ban Non Wat at the same time and suggests, from this aspect of social development, that each community had differential views towards a gendered sex-identity, as exhibited through funerary behaviour, at the same time with evidence from Noen U-Loke suggesting an elevated status of females in comparison to males. This study's findings support the view of a potential gender association between females and ceramic anvils and males and turtle carapaces at Khok Phanom Di as previously reported (Higham and Thosarat, 2004c).

Given the wide casting of suites of numerous funerary variables, there was an expectation that no identity indicator would consistently be visible across the sites in relation to the primary cohorts. This is predicated on the observation that there is clear variation culturally, technologically, and, to a lesser degree, environmentally, between and within each site and period. Such expectations precipitate the notion that such disparate populations across a deep timespan were unlikely to adhere to common funerary traditions. A preliminary viewpoint, instead, assumed that potential identity indices would likely occur in a non-uniform manner indicating differential identity markers, by site and over time. Initial research aspirations sought, at a minimum, to demonstrate evidence that age was a significant social construct within each community. Basically, was there even a recognition of a 'child' or an 'elderly' age category, as viewed through the funerary traditions on display? Following such a result, if found,

would be the consequential factors relating to individual cohort significance over time, variability by site, the potentiality of transitional or transcendent age barriers and the possibility of identifying the social, cultural, and ritual significance of each group through said mortuary behaviour.

In summary, the evidence, seen from Section 11.2.1 onwards related to the data results, suggests, as a key finding, that biosocial age, more so than sex, appears to have been a defining characteristic driving social identity at death. The data suggests that age may well have been a key element in structuring the social organisation of each community to variable degrees. The results identify that potential age thresholds are identified for the very young and older children in some instances; between adults and subadults at its most expansive level and; with variability, towards elderly actors. Due to the approach taken, mortuary variability was visible in relation to several suites of activity but especially in relation to burial behaviour, the grave setting and material culture (i.e. faunal remains, artefacts). There was minimal evidence of burial differentiation based on age where space was explored and, due to the small sample, health.

11.2.1 The Burial of Human Remains

As observed in the results a small number of funerary variables from Suite #1, primarily related to body deposition and anatomical positioning of the feet and skull, provided evidence that requires some discussion. The results from the sample show that single, supine, and extended are the dominant deposition types at each site with, in some cases, statistically significant outcomes supporting dominant patterns based on age. This reflects the dominant form of deposition seen throughout the Southeast Asian mainland (Bayard, 1984, Higham, 1989, Higham, 1996, Pietrusewsky and Douglas, 2001, Higham, 2002, Mornais, 2007, O'Reilly and Shewan, 2016). Nearly all burials are supine at Khok Phanom Di with more than three quarters of burials identified as single and extended. A greater proportion of the burial population, seen in the aggregated results, from Ban Non Wat are deposited in this manner with adults, of either category, favoured, in contrast to children, to be buried in an extended fashion. Where the proportion of single and supine burials remains constant, the analysis shows variation between periods at Ban Non Wat in relation to extended burials with adults, during the Bronze and Iron Ages, reflecting similar levels seen in the aggregated data but not in the Neolithic. Where elderly adults are most likely to be exposed to extended burial practices, slightly more than a quarter of the subadult population are similarly treated suggesting differential attitudes to each cohort in the Neolithic precipitated the normative, dominant adult/child split seen in later periods. Of the three sites studied on the Khorat Plateau the evidence from the Neolithic at Ban Non Wat related to extended burials as a single aspect of mortuary analysis, is seen as an outlier as data from Ban Lum Khao and Noen U-Loke reflects that from Ban Non Wat in the Bronze and Iron Ages. Burial disturbance and alternate funerary practices, especially the presence of flexed and semi-flexed burials, influenced the variable positioning of feet and crania seen across each site. The general trend reflects, as seen above, the association with adults of either age group in an extended burial style leading to the dominance of anatomical positioning. Deviations to this pattern occur at Khok Phanom Di and Ban Lum Khao which sees younger and older adults, respectively, predisposed to having feet crossed at burial and may relate to constriction practices at each site. The Generalised Linear Modelling shows that children are strongly correlated with flexed and semi-flexed burials throughout the periods examined, suggesting that this was a meaningful identity marker for this cohort. Moving beyond the flexed burials from the Neolithic at Ban Non Wat, older adults from the sample were never afforded this depositional practice.

Multiple burial practices are a relatively common feature of cemetery sites throughout prehistoric Southeast Asia (Higham and Kijngam, 1984, Higham, 2002, Ninh, 2005, Dzung, 2009). A preliminary supposition in this age-based study was that, where multiple burials were present, that subadults, especially those aged under one year of age, may dominate this aspect of analysis. While the results

showed that multiple (double/triple) burial practices were a feature at each site the analysis, demonstrating variability but no statistically significant results from each site, challenged this initial stance. As such, the evidence suggests that localised value systems were in place where this practice is featured. At Khok Phanom Di it was mainly subadults and the elderly that constituted the total (25.9%) of individuals exposed to multiple burial practices with neonates most frequently buried together at the third mortuary phase in the site. Although the aggregated data from Ban Non Wat shows a small proportion of the sample (5.6%) exposed to this practice it is seen that multiple burial practices were most commonly found in the Neolithic (10/66, 15.1%) here suggesting that the practice was more common in the Neolithic than the Bronze Age. The small sample from Ban Non Wat shows that no older adults or children were exposed to multiple burial practices in the Neolithic and Iron Ages respectively. This suggests differential attitudes to this aspect of mortuary behaviour, based on age, occurring over time. Localised traditions in relation to this practice are further supported from Ban Lum Khao and Noen U-Loke. Where only a small number of the sample is afforded multiple burial at Ban Lum Khao the data shows an increase in multiple burials during the Iron Age. While children were certainly present in multiple burials at each site, excluding Iron Age Ban Non Wat, it's clear that subadults were not a universal inclusion in multiple burials. Broad trends, seen through Generalised Linear Modelling, from the Neolithic show that subadults were most frequently included in multiple burials although adults, of both age groups, are represented. The study shows that the distribution of those associated with multiple burial practices changes dramatically over time and suggests either a regional significance for this behaviour or a change in its meaning as an identity marker, such as whether its association with some burials afforded those individuals with differential, or atypical, status. Moving on, the remaining commentary in Section 11.2.1, engages with those other aspects of Suite #1 funerary activities that may provide greater insight into behaviour related to each cohort under review.

11.2.1.1 *Ochre*

This study observed that the application or deposition of ochre is a highly variable aspect of funerary practice at each site with evidence suggesting localised beliefs (see Chapter Twelve) surrounding the inclusion of this material in the mortuary process. Localised practices observe, most commonly, the deposition of ochre within the grave itself but note, at Khok Phanom Di the application of this material directly on the skeletal remains. While ochre is absent from the Neolithic sample at Ban Non Wat, it is a commonly applied feature of mortuary practices at Khok Phanom Di showing a clear relationship with elderly subjects at that time. Although elderly subjects in the sample are most frequently buried with ochre at Khok Phanom Di, it is younger adults that are most frequently exposed to its normative application across the entirety of the skeleton. Perhaps this further reinforces the significance of ochre as a marker of differential identity within the population and observes older subjects were afforded, for unknown reasons, exposure to differential burial practices where this material was used. The marked discrepancy between both sites during the Neolithic, especially as the majority of subadults *not* buried with ochre were primarily in the foetal/infant (0-0.9 years) sub-group, may have possibly been used to mark a transitional phase related to identity or personhood status at Khok Phanom Di. Differential behaviour in the Neolithic suggests the development of localised beliefs in relation to ochre in this period. Relative parity is reached within, if not between, age groups in the Bronze Age in relation to the presence of ochre where, at Ban Non Wat, a marked shift in attitudes occurred in relation to this material and its inclusion in funerary practices. The possibility of an attitudinal deviation is based on the visible increase, from the Neolithic (0.0%) to the Bronze Age (28.6%), of ochre in burials. This deviation suggests, whether driven internally or affected by external factors, that ochre, although not clearly associated with a specific age group, became more significant as an identity marker within the mortuary context from this time. Further change occurred in the Iron Age, with no subadults from the sample buried with ochre at Noen U-Loke and less than a quarter buried with the substance at Ban Non

Wat during the same period. This deviates from earlier evidence and shows a shift in comparison to adult cohorts and suggests, if ochre remained an important aspect of mortuary traditions at Ban Non Wat, of an alteration in the identity of subadults with only a select few being exposed to this treatment.

Ochre is a common, but not universal, feature of mortuary practices in Southeast Asia (Higham, 2002, O'Reilly, 2007, Higham, 2012a, Higham et al., 2014a, Oxenham et al., in review-b). The persistent presence of ochre, as with other aspects of funerary traditions (e.g., Incised and Impressed (I&I) pottery, Unionidae bivalves, jar burials, animal remains) found across select burials at sites in Southeast Asia hints at the presence of a broader, and shared, pan-regional funerary institution. If such common traditions existed, why does the presence of specific material culture, such as ochre, only apply to some members of a community? Does this reflect differential status within, or across communities, or does the presence of such items suggest a relationship with an exchange, or migratory, network or hint at economic specialisation? It is worth noting the distribution of ochre at Ban Non Wat is frequently deposited as a triumvirate of artefacts (i.e., Unionidae, animal bone (often juvenile pig), ochre with/near/under a ceramic vessel) which was sometimes expanded to include grey clay at the subject's head or feet. The application of the recently developed Assemblage Theory (Crellin, 2017, Fowler, 2017, Hamilakis and Jones, 2017) may provide future researchers an insight into the distribution, and potential identity, of burials with this triumvirate of artefacts at Ban Non Wat.

11.2.1.2 Orientation

Orientation, deeply rooted in approaches to funerary behaviour in archaeological discourse, is frequently explored in mortuary analyses as contributing to a meaningful insight into a population's belief systems and social organisation (Rose, 1922, Binford, 1971, Saxe, 1971, Shorto, 1978, Carr, 1995, Raven, 2005). Predicates on the significance of orientation in archaeological discourse relate to the association of the dead with cardinal points, with the setting/rising sun, ancestral linkages, reincarnation or cosmological beliefs (Rose, 1922, Binford, 1971, Saxe, 1971, Carr, 1995). Several different orientations were deemed normative from each site with evidence from Ban Non Wat showing differences, in the normative orientation, between periods and suggesting variable approaches to this aspect of funerary practice. While not undertaken here, this research would encourage future studies which incorporate a viewshed approach linking the subject's orientation with features in the landscape (i.e., Geographical Information Systems) as a useful, and complementary, avenue for expanding the discipline's understanding of the significance of orientation in funerary contexts in prehistoric Southeast Asia.

Of the twelve potential orientation outcomes (see Appendix 2), seven occur at Khok Phanom Di with an E-NE orientation most common (106/154, 68.8%) and occurring most frequently across mortuary phases two to four. All age categories are exposed to this orientation with older children most likely to be afforded this orientation in the terminal mortuary phase. Burial within a 46°-90° orientation constitute the majority (125/154, 81.1%) of all burials at Khok Phanom Di indicating the significance of this direction to the community across the entirety of the site's occupation. Younger adults, especially, are most frequently oriented in a pure easterly direction.

Aggregated data from Ban Non Wat shows a NNW orientation was most common (207/459, 45.0%). This commonality reflects orientation practices from the Bronze Age (151/244, 61.8%), and to a lesser degree, the Iron Age (53/149, 35.5%) with orientation in the Neolithic most frequently located towards an NE-SE (46°-135°) direction (28/66, 42.4%) suggesting differential attitudes towards orientation practices over time at the site. Non-normative orientations, being an easterly and southerly direction, from aggregated data are associated with adults, old and young respectively, with each orientation. Of the twelve assessable orientations (0/360°, 45°, 46-89° etc.), nine were employed in the Neolithic and primarily swept across a broad easterly direction with older adults having a statistically significant

association with the normative direction at this time although the normative represents only a small proportion of the Neolithic population at Ban Non Wat. An expression of a dominant orientation, in this instance in a NNW (315°–360°) direction (166/244, 68.0%), is again visible in the Bronze Age where, again, nine of the potential assessable outcomes are used. Mortuary traditions contrast significantly between the Neolithic and Bronze Age at Ban Non Wat with evidence suggesting, most specifically at the second mortuary phase in the Bronze Age, for increasing social complexity occurring through time. Clear divisions in the normative orientation between both periods at Ban Non Wat suggests, if orientation was a meaningful aspect of the funerary process, that the community underwent a significant break from earlier traditions displayed in the Neolithic. The expanded sample also shows a shifting attitude towards age and a normative orientation in the Bronze Age with elderly subjects no longer afforded select, or preferential, association with the normative behaviour of an increased sample. Seven of the twelve assessable orientations are exploited in the Iron Age but, contrasting with behaviours noted in the Neolithic and Bronze Age, the research noted two dominant orientations emerging at this period being an NNW direction (68/149, 45.6%) and an oppositional SSE direction (56/149, 37.5%) with younger adults showing some propensity for the southern orientation. This evolution during the Iron Age marks another change in societal attitudes towards orientation over the occupation of Ban Non Wat although, other than some evidence from the Neolithic and Iron Age, that age is a factor in the determination of exposure to a specific orientation.

At Ban Lum Khao, only six assessable orientations were exploited with the normative being in an SSE (49/107, 45.7%) direction. Adults, generally, especially elderly adults are more likely to be buried in the normative but not significantly in comparison to children. Only fourteen remaining assessable burials were found in the five alternative orientations suggesting that an SSE orientation was significant to this community in terms of its relationship with the immediate or surrounding landscape and its relevance to dominant philosophical-religious beliefs at Ban Lum Khao. Further, the variation to the orientation at Ban Non Wat during the Bronze Age suggests localised traditions in regard to funerary practices occurring at each neighbouring community.

Funerary practices at Noen-Loke in regard to orientation bear some resemblance with Ban Non Wat during the Iron Age with two dominant orientations present. The data demonstrated that nine assessable orientations were used across the site's occupation with the normative seen as being northerly (26/107, 24.2%). Age does appear to be a factor in the appropriation of the dominant orientation with subadults, most specifically infants, exposed to this behaviour. A relationship of subadults of any age differs markedly from the other sites reviewed where adults, if it occurs at all, are most likely to be buried in a normative orientation. The results related to atypical orientation shows an almost equal proportion of the sample (23/107, 21.4%) buried in a NE orientation. Age again appears to be a factor in the determination of exposure to this orientation where, in this instance, it is older adults, most frequently in the third mortuary phase where rice burials occur, oriented in this direction. That younger adults, during the Iron Age at Ban Non Wat, held a dominant relationship for the second most common orientation, in contrast to that from Noen U-Loke, further suggests the development of locally developed value systems where orientation occurs and hints at potential identity markers, based on age and this variable, between sites.

11.2.1.3 Constriction Practices

An expanding body of research in the region, field anthropology, has focussed on natural and cultural factors affecting post-mortem, movement (e.g., body, artefacts) in order to reconstruct burial contexts (Cophey, 2007, Willis and Tayles, 2009, Harris and Tayles, 2012, Harris et al., 2016). In addition to direct evidence for constriction practices at each site through the presence of mediums such as coffins (wood, clay), biers and/or wrapping (e.g., tapa, shrouds) (e.g. Higham and Bannanurag, 1990, Cameron, 2000,

Higham, 2011a) our understanding of constriction practices at Ban Lum Khao, Noen U-Loke and Ban Non Wat have benefitted from focussed field anthropology studies (Willis and Tayles, 2009, Harris and Tayles, 2012, Harris et al., 2016). This research, through an analysis of pictorial evidence, adopted the secondary approach to field anthropology to examine if select funerary practices were being afforded to age-based cohorts under review. Constriction practices were inferred in terms of the use of burial shrouds, coffins, and/or the positioning of skeletal elements in non-anatomical, often aggregated, positions. Within this approach, the Harris and Tayles (2012) method for analysis, which finds the potentiality for several constrictive outcomes, was adopted. In summary, the evidence provides evidence to suggest, specifically in the northeast, that differing binding practices, as a potential identity marker, were influenced by age. Where the data suggests some potential correlation with these factors, there is a rise in increasing social complexity in that region where funerary evidence indicates the emergence of social elites initially at Ban Non Wat during the Bronze Age and later at Noen U-Loke in the Iron Age.

At Khok Phanom Di more than a third of the sample (40.2%) showed evidence for being constricted with several restrictive styles being adopted. Of these, burial in loose non-durable material (36/62, 58.0%) or burial in loose/tight non-durable material, tight durable material, or burial in a narrow coffin (16/62, 25.8%) was most common. Although not statistically significant, the results showed that the very young (0-0.9 years) were most commonly associated with the loose non-durable style and, to a lesser degree, the elderly with the more open styling in the second mortuary phase. Although the evidence indicates constriction practices were relatively widespread at Khok Phanom Di, the results render it difficult to ascertain that any specific age class was preferentially buried in a specific constriction style at the site.

Harris and Tayles (2012) have previously examined 133 burials from Ban Non Wat to observe changing patterns in type, and frequency, of constriction practices leading into the Iron Age. From an increased sample size (198/459 vs 133/427 burials), where eight of nine potential outcomes (see Figure 7.3 for a description of constriction styles) were observed, two styles, loose non-durable (Style 3) and tight durable/non-durable wrapping/narrow coffin (Style 8), were the most frequently encountered. The evidence found in this study suggests that constriction practices featured in the mortuary process occur most frequently in the Bronze Age and become less frequent by the Iron Age. Younger adults were seen to have a potentially significant relationship with Style 3 constriction practices during the Bronze Age. Perhaps indicating an alternative identity marker, this study showed a relationship between some older subjects, in contrast to subadults and younger adults, and constriction Style 8 in the Bronze Age. There is a possibility, as an elite class emerges in the Bronze Age at Ban Non Wat, that differential binding practices may have been employed to mark specific adult identities.

Constriction practices at Ban Lum Khao have been previously reported (Willis and Tayles, 2009). From a slightly expanded sample of that originally viewed at Ban Lum Khao (28 burials instead of 26), this study found little evidence, from the six of nine potential outcomes visible, that age was important in the application of specific constriction styles at Ban Lum Khao.

Similar to Ban Non Wat and Ban Lum Khao, a field anthropology approach has been undertaken at Noen U-Loke with evidence showing similarities to that seen from the wrapped group at Ban Lum Khao (Willis and Tayles, 2009). From a slightly reduced sample investigated from Noen U-Loke (33 burials instead of 34), from four of nine potential constriction outcomes, some statistically significant association with the loose non-durable wrapping style (Style 3) and the younger adult cohort was observed. Of those younger adults that had sex assigned, where Style 3 occurred, the majority (7/9, 77.7%) were males with the process mainly practiced in the latter (MP4 and 5) funerary phases (11/13, 84.6%).

11.2.1.4 Limb Placement

Given the high frequency of extended/supine burials at each site, skeletal elements (or limbs) were, naturally, placed in anatomical positions. Alternative non-normative placement positions (see Appendix 2) explored included an examination of the crossing of feet or hands at the pelvis, whether consequential, or independent of, local constriction practices, employed at each site. These variables were investigated as a conduit to potential age-based identity markers at death. While not common practice, research has shown the deliberate crossing of feet in burial contexts has a deep history in Southeast Asia (Oxenham et al., in review-a). Where the crossed feet variable occurs, the results showed this occurring as an atypical practice within a small part of the sample, mainly younger adults from Khok Phanom Di (6.4%). Possibly reflecting the disturbed nature of burials, this variable, present only in a small proportion of the sample at Ban Lum Khao (15/107, 14.0%), was identified as normative with older adults. The general trend is that, where the custom of crossing feet within the grave occurs, it is an adult practice. While only one aspect of funerary treatment of the corpse, it may be worth noting that an elderly female subject from Noen U-Loke, thought potentially to have been murdered and exposed to a range of select mortuary practices, potentially indicating an atypical or deviant identity, had her feet crossed at burial (Tayles, 2003).

Notable deviations of placing hands, non-normatively, at the pelvis was found at Khok Phanom Di, Ban Non Wat and Ban Lum Khao and potentially indicates localised preferences in regard to this variable. Placing hands at the pelvis has been identified from other locations in Southeast Asia (Sørensen and Hatting, 1967, Chang, 1996). Only a modest proportion of the sample from Khok Phanom Di (7.7%) and Ban Lum Khao (10.2%) have hands arranged at the pelvis with, in both instances, elderly subjects most likely to be buried in this style. A statistically significant relationship between hand arrangement at the pelvis and elderly subjects is seen at Ban Lum Khao. To a lesser degree, this is also visible at Khok Phanom Di. This changes at Ban Non Wat where aggregated data shows younger adults being buried with hands at the pelvis, although those elderly associated are roughly proportionate. Evidence from Khok Phanom Di and Ban Lum Khao suggests this practice may have been primarily afforded to elderly individuals of a differential status at death. Alternatively, results from Ban Non Wat suggest, at least for a period, and in contrast to that from its neighbour in the Bronze Age at Ban Lum Khao, that this custom was more frequently afforded to adults but fell out of favour, or social memory, by the Iron Age. While not consistent across all three sites, the evidence does indicate that older subjects are more regularly subjected to this custom in all instances. Although variation occurs regarding both the placement of hands and feet *in situ*, the limited data here suggests that each practice, if considered a relevant aspect of expressing an individual's identity at death, was used as an additional feature to articulate differences between adults and younger subjects at death.

11.2.2 Characteristics of the Grave

Following the preceding section which discussed those results from the initial suite of activities (Suite #1 – Human Burials), the current section will explore the results related to the grave. Broadly, this suite of variables examined the use of disposal containers, including jar burials, grave depths, and those features, such as pits and hearths. The singular application of rice burials at Noen U-Loke, where large volumes of unsilicified rice was included in the grave, was also explored here (e.g., Higham and Thosarat, 2007a). Results indicate that neither age nor sex was a factor in the exposure of an individual to a rice burial at Noen U-Loke. A consideration of fire/pit/hearth features did not demonstrate any statistically significant activity related to age at Khok Phanom Di, Ban Non Wat or Noen U-Loke. This research has taken the position that funerary processes that include one of these features contained an archaeologically visible performative and sensory element that may have provided additional insight into identity at each site (Berggren and Stutz, 2010, Hamilakis, 2012). General trends with respect to

funerary features (i.e. hearths, pits) indicate that in all instances each age category was exposed, but that its frequency decreased over time. The greatest presence of these funerary features occurs in the Neolithic (Khok Phanom Di – 29.8%; Ban Non Wat – 37.8%) and more than halves by the Iron Age (Ban Non Wat – 14.7%; Noen U-Loke – 9.3%). It is unclear if the relative commonality of funerary features (i.e., hearths etc.) in earlier periods reflected its importance, as part of the funerary process, in the Neolithic or, alternatively, its limited use in later periods demonstrated the potentiality of an elevated status of those who were exposed to it. Perhaps, as increasing social complexity developed into the Iron Age, the practice's significance changed over time and was used to express inequality and prestige. Only in one instance, from the Neolithic at Ban Non Wat, is there a suggestion that elderly subjects were more frequently exposed to funerary features in the mortuary process but, again, both subadults and younger adults are also afforded this treatment at this time.

11.2.2.1 Jar Burial

Jar burials are almost ubiquitous across mainland and island Southeast Asia and are most commonly demonstrated through the deposition of a corpse within a single (generally ceramic) vessel (e.g., Higham, 1984, Indrawooth, 1997, Tayles et al., 1997, Higham, 2002, Ninh, 2005, Dzung, 2009, Reinecke, 2009, Glover and Dung, 2011). An alternative to this form of jar burial include the conjoining (rim-to-rim) of two vessels (e.g., Ban Non Wat B266 – see Figure 11.1) which, potentially, could indicate some symbolic, deviant or metaphoric significance, where a subject's head is enclosed by a, or covered with, an upended vessel (seen at Khok Phanom Di, Ban Non Wat and Noen U-Loke) (Källén and Vinterhav, 2003, Tayles, 2003, Ninh, 2005, Higham and Thosarat, 2007c, Higham et al., 2014a) although this style of jar burial, as a separate entity, was not included in the analyses. What remains ambiguous, due to the random, non-patterned, nature of this practice is why certain individuals are selected for inclusion in jar burials while others, of the same age and frequently within the same burial phase, are excluded. While clearly associated even if at a peripheral level, and therefore included, within the broader cemetery space it can be asked if the presence of jar burials holds



FIGURE 11.1: Jar Burial (B266) from Ban Non Wat (Photo: Higham, C.F.W. 2012. Retrieved from South East Asian Archaeology Data <https://drive.google.com/drive/u/0/folders/0BwyPRRjONdiFc0pQM3VTS09VVTA>)

some element of symbolic significance that demonstrates either inclusion or exclusion (marginalisation) from the cemetery population and relate to the individual's identity. For example, Tayles (2003) reported on an elderly woman (B99) from Noen U-Loke (Mortuary Phase 4B) who demonstrated evidence of severe cranial trauma, had her skull placed in a jar and was surrounded by many (n=14) subadult burials. There

is a possibility that the atypical aspects of this burial, including the severe trauma associated, indicate the subject's identity in the funerary sphere.

Jar burials are present at each of the sites reviewed with variable approaches to their inclusion further enhancing the proposition of locally developed attitudes towards their use in the funerary sphere. For instance, the singular subadult jar burial recovered from a circular grave at Khok Phanom Di was associated with the fifth mortuary phase (see Figure 11.2). The fifth phase sees the cessation of clustered burial units seen previously in the second to fourth mortuary periods and marks a shift in funerary practices that include burials of extreme wealth. While the presence of a single



FIGURE 11.2: Jar Burial (B14) from Khok Phanom Di (Photo: Higham, C.F.W. 1990. Retrieved from South East Asian Archaeology Data <https://drive.google.com/drive/u/0/folders/0BwyPRRjONdiFTXBqam91Mjh0d0U>)

jar burial prohibited a formal analysis, it is worth noting that the jar burial, itself one of the poorest from the phase, is expressed as conjoined vessels with Higham and Bannanurag (1990: 330) recording one unique and one plain vessel used that may, through their dichotomous expression, symbolically communicate meaning to the broader community during this transitional phase.

Aggregated data from Ban Non Wat shows jar burials occurring in a small proportion (10.8%) of the sample. An exploration of the data demonstrates that subadults, primarily those aged 0-0.9 years, are almost exclusively exposed to jar burial with only two younger adults afforded jar burial, in large funerary urns, in the Neolithic. Jar burial frequencies fluctuate between periods at Ban Non Wat. A quarter (25.7%) of the sample, including more than two thirds (68.1%) of the children, in the Neolithic are buried in such a container. This quantum contrasts sharply with the single jar burial at Khok Phanom Di during the same period. This decreases significantly in the Bronze Age where only 16.4% of children, constituting 6.1% of the sample, were subject to jar burial reflecting a change in attitudes to this element of the mortuary process before ameliorating somewhat during the Iron Age (subadults - 36.7%). Given the marked increase in social complexity, most specifically in the second mortuary phase during the Bronze Age, does the heightened visibility of jar burials of a select few children in the Bronze Age enhance their social identity at death by elevating, or reinforcing, their separation from more commonly executed practices on subadults at the time. Further evidence for localised development in regard to funerary practices can be seen at Ban Lum Khao contrasts with that from Ban Non Wat during the Bronze Age. At Ban Lum Khao 13.0% of the sample, comprising more than a quarter (27.4%) of the subadult population, is subject to this funerary process. Only those infants aged 0-0.9 years are provided with a jar burial which occurs solely during the second mortuary phase. Attitudinal shifts in relation to disposal containers over time are visible where only children, aged 1-9.9 years, were buried in animal hide shrouds in the terminal, third, phase. The increased frequency of jar burials seen at Ban Non Wat during the Iron Age is reflected at Noen U-Loke where nearly a quarter of the population (22.4%), comprising almost half of the subadult sample (47.0%), was buried in this manner.

Just as other aspects of the mortuary process, such as constriction methods, may require considerable preparation (e.g., shrouds, coffins), planning and hint at the presence of specialised practitioners so too does the presence of a jar burial. As with constrictive practices, it is imagined, in addition to its potential symbolic and philosophical-religious significance, that the use of a jar burial would have played towards a greater performative element of funerary practices and may have enhanced, or altered, the social

identity of the deceased, prior to in the preparatory phase, and at the point of their burial (Mitchell, 2006, Davis et al., 2016). Further, as discussed in relation to ochre, the consistent presence of jar burials across the region over time speaks to the presence of a pan-regional funerary institution, where a small, select range of funerary practices are executed in association with select burials at a broad number of locations.

11.2.2.2 *Burial Depth*

Shallow graves were most commonly encountered at Khok Phanom Di (65.5%), Ban Non Wat (71.4%) and Ban Lum Khao (86.9%) with Noen U-Loke (27.1%) being the exception to this pattern. Where approximately half the adults, and most frequently males, are buried in shallow graves at Khok Phanom Di it is children (77.9%), most commonly those aged 0-0.9 years (83.5%) that are buried in shallow graves. Conversely, adults at this site are four times more likely than subadults to be buried at a deeper (26-50cm), moderate depth, in comparison to children. Fluctuations in the number of shallow burials at Ban Non Wat continue to suggest that approaches to funerary practices underwent ongoing change at this site. Where children predominate in relation to shallow burials at Khok Phanom Di it is adults, perhaps more so the elderly that are subjected to shallow burial in the Neolithic at Ban Non Wat. These patterns alter at the Bronze Age where, although shallow burials continue to dominate, no specific age cohort is found in association with this aspect of funerary practice. Interestingly, while the general pattern seen in the Bronze Age at Ban Non Wat continues into the Iron Age with no specific age cohort associated with shallow burial, this period sees a significantly lower proportion (37.5%) at this normative depth. Instead, the Iron Age sees relative parity between shallow, moderate, and deep graves indicating further deviations to normative practices at the site as time progressed. No specific age cohort is preferentially associated with graves of increased depth at the Iron Age at Ban Non Wat.

At Ban Lum Khao, all adults are buried in shallow graves with only children, primarily those aged 0-0.9 years (13/14, 92.8%) in the second mortuary phase, buried at slightly deeper moderate grave depths. It is striking to note that some fourteen subadults at Ban Lum Khao, in contrast to that of a single subadult from Ban Non Wat, were afforded burial in a grave of moderate depth at a time where one site (Ban Lum Khao) is considered less wealthy and does not demonstrate increasing social complexity, as seen with evidence of transegalitarianism at the same time at Ban Non Wat. Yet here we see that some children, notwithstanding in the context of an arbitrary variable and albeit from a small sample, predominantly aged 0-0.9 years (primarily 2nd and 3rd burial rows), were afforded increased energy expenditure in relation to grave preparation. Finally, it is only at Noen U-Loke where moderate depth graves are the norm, but no age class is significantly associated with this feature although the young and old are, proportionately, most frequently found at this depth.

The Generalised Linear Modelling noted a transition in behaviour between the Neolithic and Bronze Ages with older adults, across all age categories (i.e., 40s, 50s etc.) most frequently associated with graves of moderate or greater depth during the Neolithic, specifically Khok Phanom Di, in comparison to both younger cohorts. This may suggest an elevated status was afforded to older adults over time if greater grave depth was considered a status signifier. Interestingly, evidence from the Bronze Age shows a marked difference based on age with most burials deposited in shallow graves. As there were no older adults from Ban Non Wat during the Neolithic buried in moderate or deep graves, this may reflect a shift in status based on increasing age over time in relation to this variable or relate to regional variation in funerary practices between the Gulf of Siam and Northeast Thailand.

11.2.3 Faunal Remains

Faunal remains, of various taxa, form part of the broader suite of material culture, along with ochre, jar burials and Incised and Impressed ceramics that may constitute a larger, pan-regional, mortuary tradition across Southeast Asia. Faunal remains may have some symbolic or metaphoric meaning within, or shared across, communities and relate to an individual's identity. Other than shellfish taxa, this research initially sought to explore a broader range of identified fauna within graves (e.g., bird, deer, turtle etc.). The limited frequency of some fauna types precluded statistical analyses, but the most commonly encountered species relate to mammals (i.e., pig, bovid), fish and shellfish (i.e., Unionidae). Future work, adopting the Assemblage Theory (Crellin, 2017, Fowler, 2017, Hamilakis and Jones, 2017), may glean further information on the relationship between these lesser seen species in relation to their human counterparts.

This study noted that more than half (55.1%) of the sample from Khok Phanom Di were buried with fauna. With relative parity, younger and older adults were statistically more likely than subadults to be buried with fauna generally, but it is older adults that most commonly had fish deposited in their grave. From a small sample, only adults were buried with pig and Unionidae at Khok Phanom Di. Where it has been seen that Unionidae are often found only in mortuary contexts (Ross and Oxenham, 2017) it was found at this site that the shell species was also used in a utilitarian fashion as shell knives during the third mortuary phase which marks a series of agricultural and technological changes at the site (Higham, 1993c, Higham and Thosarat, 2004c). Where children are associated with faunal remains there is no clear age category, perhaps indicating a lack of a transitional age barrier marking a shift into adulthood.

Where aggregated data shows similar levels of exposure to fauna at Ban Non Wat, an examination of individual periods shows variability at the site over time. Further, where evidence from Khok Phanom Di suggested a relationship between adults, generally, and fauna, similar patterns are not observed at Ban Non Wat in the Neolithic. Instead, we see a marked decline in the inclusion of fauna where only the deposition of Unionidae eclipses that seen at Khok Phanom Di. Once again, these differences highlight the suggestion of regional approaches to funerary practices between Central and Northeast Thailand. This is reflected at Ban Lum Khao and None U-Loke where, although at lesser frequency than Ban Non Wat during the corresponding periods, there is a limited use of faunal remains in burial contexts. The Bronze and Iron Age at Ban Non Wat see a spike related to the inclusion of fauna of all types reviewed (i.e., fish, pig, Unionidae) as well as bovids. In the Iron Age there is a relationship between adults and bovids and adult females and pigs. Where aggregated data, reflecting the normative from the Neolithic and Iron Age, show that *Channa* sp. (snakehead fish) is the most commonly deposited fish in graves, this study showed that *Clarias* sp. (airbreathing catfish) was most frequently recovered in the Bronze Age, perhaps reflecting environmental change and/or localised significance of this species at the time.

Research continues to demonstrate the importance of the human/animal dyad from the funerary sphere (Bamber, 1987, Antoni, 1982, Taylor, 2000, Wessing, 2006, Bond and Worley, 2009). Where there are faunal remains deposited in a grave, the significance (i.e., symbolic, political, and performative) and consideration of each inclusion as an identity marker is possible and speaks towards a broader relationship between humans and animals. Where in some instances the presence of single faunal remains in mortuary settings may indicate the subject's identity at an intimate, or individualistic, level as an offering or token of affection, the presence of a multitude of fauna speaks to status, prestige, largesse, inequality, and the expression of power via feasting (Hayden, 2001a, Hayden, 2003, Higham, 2012h, Higham, 2012e, Higham, 2012f, Verhoeven, 2012). While feasting, and its subsequent relationship to social complexity is undoubtedly a possibility in some instances, there are many instances where faunal elements, unless in association with decomposed foodstuffs, are included in limited numbers

and may not constitute what would be considered a feast. Feasting practices, and its subsequent public demonstration of wealth and largesse, have been used to argue for social complexity (Battaglia, 1992, Hayden, 2001a, Hayden, 2001b, Hayden, 2003, Janowski, 2007) as is the case of transegalitarianism at Ban Non Wat (Higham, 2011a). Feasting practices, as vehicles of social inclusivity, largesse or power are not without risk which can relate to the availability (i.e., seasonality, storage issues), preparation and delivery of appropriately sanctioned foodstuffs for consumption or symbolic/metaphoric destruction (Smith, 2015).

11.2.4 Health

In Chapters Six and Nine a case study approach to analysing potential relationships between poor health and normative or atypical mortuary treatment was undertaken in relation to subadults and the elderly. Inspired by the method of Appleby (2010, 2017), where the approach focussed upon elderly subjects, this study sought to identify if the physical and/or functional effects of age could have influenced funerary behaviour. As well as individual health profiles the literature was examined to see if additional information related to individual burials and their health could be ascertained. Ban Lum Khao and Ban Non Wat were not addressed as individual health profiles from each site is not currently available, although there are instances where individual health profiles are discussed in the literature. The vignettes developed were used to explore if there were any indications of atypical burial treatment present possibly related to poor health of these twelve burials.

The evidence obtained, especially in relation to the three subadults from Khok Phanom Di, did not find a correlation between poor health and atypical burial treatment. All three subadults selected demonstrated evidence of anaemia and a range of other poor health indicators. Yet, except for some minimal differences visible with B150 (i.e., flexed burial, alternative orientation in MP1), possibly suggestive of a differential identity, all burials were generally afforded a normative burial treatment in their respective mortuary phases and sub-groups. This differs somewhat to the subadults examined at Noen U-Loke, albeit from an older subadult sub-group. The most obvious, identified and discussed previously by Tayles et al. (2007), was a young child with cerebral palsy in the fourth mortuary phase (B97). This child, like that of a handful of other burials identified by Higham (2007), was not included in a burial cluster during this phase, fell outside normative orientation and was the only burial deposited with an ivory artefact at the site (Chang, 2007). This is the only individual with this pathology at Noen U-Loke and the other miscellaneous MP4 burials do not demonstrate severe pathologies that may explain exclusion from normative clustered burial during this period and may add weight to the potential, along with those also excluded (predominantly very young children), of a differential identity. However, the presence of B97 within the formalised cemetery location suggests that this individual, perhaps influenced by their condition, was recognised as a member of the community (i.e., care-giving over several years) but may have held a differential personhood status or social identity resulting in atypical mortuary treatment (Gardeła and Duma, 2013).

The two remaining subadults, both identified as older children, were primarily identified as normative burials with, as in the case of B57.1, only minimal deviation from typical behaviour. Of note, while not related directly to the child, is the relationship of B41 with a prone adult burial (B44) on top of the child. There are three prone burials at Noen U-Loke with one individual, not B44, found with an arrowhead lodged in the body and identified as evidence of violence. Prone burials are part of the suite of deviant burial types frequently discussed in the literature and are explained as occurring to confuse the corpse and may relate to necrophobia or fear of the dead (Tsaliki, 2008). It is suggested that prone burials should be considered as unusual and are grouped with other restricted burial styles such as weighted, restrained, or decapitated burials that includes those individuals buried in graves of unusual depth (Aspöck, 2008, Tsaliki, 2008). Deviant burials, such as that of the prone adult may speak to the

individual's social identity or reflect aspects of identity affected by the manner of their death where, as an example, it sat outside societal norms or expectations (Shay, 1985, Aspöck, 2008, Weiss-Krejci, 2008, Sherwood, 2009). In addition to Noen U-Loke, prone burials have been recovered from the neighbouring site of Ban Non Wat (Harris et al., 2016, Harris and Tayles, 2012). The positioning of the prone body, a rare adult without any grave goods from the sample, over the subadult may suggest that the child, itself, was deliberately weighed down by this individual and speak more towards the conjoined identity of the subadult and adult in this instance. The evidence from subadults alone, even from such a small sample, indicates the potentiality of health as a useful indices of mortuary behaviour with evidence of regional variance between Khok Phanom Di and Noen U-Loke. Contrary to what is observed with subadults, there is minimal evidence to clearly suggest that the older adults reviewed, at both Khok Phanom Di and Noen U-Loke, were subject to atypical mortuary treatment.

11.2.5 Material Culture

Material remains (excluding fauna) deposited with human burials provided a wealth of results which speak to potential identity markers in relation to the young and old with age, rather than sex, appearing to be a defining characteristic of burial identity at Khok Phanom Di, Ban Lum Khao, Ban Non Wat and Noen U-Loke. Potential indicators of an age-identity may be present where a group is clearly associated with specific material types or, less commonly, where they are excluded from burial with certain material culture. General observations broadly note a deviation in funerary practice between children and adults. There is also substantive evidence, in some instances, for an inference of an elevated, or differential, status based on advanced age.

11.2.5.1 Generalised Linear Modelling – Material Culture

The Generalised Linear Model (GLM) testing, enabling a broader exploration of funerary behaviours across regions in prehistoric Thailand, examined a number of transformed and non-transformed categories that lie within the wheelhouse of Suite #5 (Material Culture). Variables explore patterns related to the presence of material culture, exotic items, multi-component items, artefact quantities and the proportion (under 50.0%, between 51-99% and 100%) of materials within graves. Given the commonality of ceramic artefacts in Southeast Asian sites, investigations of bone, stone, shell and metal did not incorporate ceramic wares. This approach was taken to explore potential age or sex-based identities in relation to each material independent of ceramics. There was minimal evidence for sex, or the interaction of sex and age, being an influencing factor under GLM testing.

Where the presence of grave goods was explored there is clear evidence for a transformation in the social identity of subadults over time. Contrasting attitudes between subadults and adults is most visible in the Neolithic where half the sample at this time were buried with an artefact of any type compared to three quarters of the adult sample. When seen in relation to artefact quantities, the trends suggest that the personhood status of an adult required, as a minimum, that the individual was buried with at least a single item in contrast to children during the Neolithic. Interestingly these trends change through time with a greater proportion of children receiving a grave good at death. The increase in the number of children exposed to low quantities of grave goods rises, a process that continues into the Iron Age, whereas in the Bronze Age it's noted that adults, in some cases at a statistically significant level, are buried with increasingly greater numbers of grave goods. If grave goods have the potential to be an indicator of status or identity, or at least influence it, the study shows a transition in behaviour between periods where, in the Neolithic, it is suggested that there was a desire with the adult population to include at least a single grave good in the burial that may relate to their personhood status. The changes observed from this aspect of funerary treatment in the Bronze and Iron Ages correlates with increasing social complexity in the region and may indicate select, or differential, status based on advancing age.

Elderly adults, consistently across all three periods, are the age class most frequently exposed to burial with a grave good perhaps indicating some aspect of their transformed social identity at death within each community. By the Iron Age, elderly adults, contrasting with younger adults in the Bronze Age, are most likely to be buried with the highest quantity of grave goods which perhaps hints at a change in the status of this group or reflect changing social responsibilities (e.g., ancestor worship) in the treatment of older subjects at this time. Different approaches to grave good quantities may reflect regional contrasts between Central and Northeast Thailand, attained status achieved throughout the individual's life or speak towards a transcendent identity at death.

In terms of exotic items, a cautious approach to their definition under the GLM was taken. Materials, originally proposed as exotic but subsequently questioned, such as glass at Noen U-Loke, were excluded from this category due to the ambiguity continuing to surround this material and its provenance (Theunissen, 2007, Theunissen et al., 2000). Most commonly accepted exotic materials, as appropriate, relate to non-local stone or marine shell as examples. Although there remains a clear difference between adults and subadults across all three time periods it is elderly adults that show the clearest association with exotic artefacts as defined here. The presence of exotic materials and artefacts within graves suggests, due to the significance of funerary settings for sustaining or redefining social agendas and identities, these artefacts may have been prescribed with some value within each community. Whether the value related to the artefact's significance regarding social memory (Chesson, 2001, Kuijt, 2008) or as an aspect of the individual's identity, it is perhaps informative that they are so frequently found with elderly subjects. The heightened presence of exotic items with the old, in contrast with that of younger adults across all three periods, may suggest an expression of the transformed, perhaps elevated, social identity of the individual at death, have biographical import that speaks to the experiences, roles, or engagements of the individual across their life, or simply reflect its acquisition and association with the deceased and communicate social inequality and individual prestige through the funerary process. An identification of exotic materials remains an important component of analysis related to social development in prehistoric Southeast Asia (Miksic, 2000, Theunissen et al., 2000, Vincent, 2003, Higham et al., 2011a, Higham, 2011d, O'Reilly, 2014, Carter, 2015). Suggestions that localised elites may have controlled access to exotic material has been promoted (e.g. Higham and Rispoli, 2014). If accepted, the presence of exotic items with the elderly, most strikingly from the Bronze Age, further supports the suggestion that advancing age, either based on a differential age-based personhood status or through the acquisition of social standing or capital, provided elite status to some and that this prestige, or inequality, was expressed through the funerary process. Future work, again perhaps through the application of the recently developed Assemblage Theory, may provide greater insight into the association of exotic material and identity groups.

Trends over time in relation to specific material (ceramics, shell etc.) provided minimal evidence that any specific age class was preferentially deposited with categories reviewed. Exceptions, however, do occur in the Neolithic (bone/teeth), Bronze (ceramics, stone, shell) and Iron Age (ceramics, metals, stone). Significant activity occurred most commonly in relation to ceramics where its inclusion as the sole grave item with children increases exponentially by the Iron Age contrasting with that of adults, generally and may speak towards a younger individual's evolving social identity if the localised value of the artefact type is significant at Ban Non Wat and Noen U-Loke. Where metals (bronze, bimetallic artefacts, iron, tin, gold, silver, lead) are present most notable activity, further suggesting differential social identity in the Northeast based on age, occurs where metal artefact types comprise more than half of grave goods (excluding ceramics) in regard to the elderly group. The testing shows a third of the elderly sample at the Iron Age in association with metal in contrast to younger cohorts. While the association may reflect craft specialisation or social roles across life it is doubtful, especially as this artefact type becomes more commonplace within the funerary sphere, that this age class, across both

Ban Non Wat and Noen U-Loke, were so disproportionately related to these materials. The potentiality of an elevated value ascribed to metal artefacts may be due to its durability or specialised function within the social (exchange, craft specialisation) or philosophical-religious arenas (ritual activities). Moving on from evidence related to the GLM testing the discussion now focuses on normative and atypical results from each site starting from Khok Phanom Di in the Neolithic to Noen U-Loke in the Iron Age.

11.2.5.2 *Khok Phanom Di*

The general trend seen with the results in relation to normative and atypical mortuary variables scrutinised is that adults are invariably more likely associated with material culture in contrast to subadults. The underlying theme, then, is that adults have, as a minimum where material culture is concerned, a differential identity at death relative to children as expressed through funerary practices. While in some part this may reflect a series of socially constructed identities of the living subject, such as occupation, status, gender or philosophical-religious role, the evidence demonstrates some variability within, and across, adult cohorts. We can see this, primarily with the younger adult group, through the association of some age classes with some materials as opposed others which may hint towards alternative identities. Younger adults were associated with a raft of materials (grave goods generally, ceramics, stone, bone) to suggest a differential identity of this class in contrast to both subadults and older adults. At Khok Phanom Di there is both a general trend of a division between subadults but also within the adult cohort to suggest differential age-identities. Taken further, the results from the material culture category indicate that once an adulthood personhood status was obtained, social attitudes towards ageing were conveyed, and potentially experienced, differently based on age at the site. The differences between both adult age classes contrasts, in part, with results seen from the other sites that suggests the funerary process communicated a different view of the individual's social identity in terms of differential grave inclusions.

Atypical, and singular, burial behaviour related to elderly subjects is found where ceramic vessels are placed upside down, or act to cover, an individual's face. This occurs at Khok Phanom Di (B102), Ban Non Wat (B78 and B466 (see Figure 11.3)) and Noen U-Loke (B99) and may suggest that these elderly individuals were cast with a different, somewhat unique, social identity at their death which precipitated the obscuring of their countenance. While future research may be more forthcoming on the meaning behind such atypical funerary treatment, it is tentatively proposed here that the covering of the facial visage of select elderly actors may relate to how the population interpreted, and communicated, the subject's social identity in a culturally appropriate way to engage (or exclude) the individual actor at a communal and demonstrably performative level. Notable burial behaviour was found in some instances with subadults as well from Khok Phanom Di. For example, in the initial mortuary phase it is an infant (B151), aged 0-0.9 years, that is the first grave to have clearly been wrapped/constricted and have ochre applied (Higham and Bannanurag 1990: 146). This initial mortuary phase also sees a solitary squatted burial (B150) of a child aged 1-4.9 years, at the site. It is interesting to consider that while two aspects of the funerary ritual presented here (ochre use and constriction) were adopted frequently, the other (squatting), was never applied again. Perhaps these divergencies in funerary practice see the communication of the social identity at death of each child by the site's initial settlers but, as new social identities were realised, the expression of practices were retained or shed. Or, more simply, that the presence of the single squatting burial may have reflected the dominant philosophical-religious worldview of the primary mourners in that initial mortuary period prior to this changing with subsequent generations as they adapted to their new environment. Squatting burials are not common in Neolithic (and later) Thailand with a single squatting burial (B133) being found from the initial burial phase at neighbouring Nong Nor (Higham and Thosarat, 1997b). Squatting burials are more commonly reported from pre-Neolithic sites in the region (Oxenham, 2016, Oxenham et al., in review-a, Oxenham et al., in review-b).

The distribution of some material culture types hints at the potential for a transitional, or transcendent, age barrier associated with some individuals. For example, older children, aged 10-14.9 years, are more than twice as likely (68.1% vs 32.8%) to be buried with a grave good of any type in contrast to children younger than this. This contrast with younger subadult counterparts extends to the older children class with ceramic and stone artefacts of any type. As age categories were predicated on physiological determinants, evidence of visible transitional age markers may affect our understanding of social identities, and by proxy social development, at a site. The risk is that solitary, or a few, indices may mislead interpretations of a changing personhood status from juvenile to adult. Here we see that many older children, at levels slightly lower than both adult cohorts and at relatively similar levels witnessed in the Generalised Linear Model testing from the Neolithic, were afforded social recognition through the presence of a grave good. This suggests, at least through this aspect of the mortuary process, that a biosocial categorisation of adulthood at Khok Phanom Di may have extended downward to the oldest child age group. General trends seen from the data were not linear where, it was noted, there was a disparity in grave wealth at mortuary phase three, with most subadults (85.7%), in contrast to that of adults (74.7%), buried with material culture. Generally, this phase, specifically MP3B, marks a series of changes within the site including potential evidence of inter-group migration, environmental flux, emergent agricultural practices, and evolving ceramic traditions (Ceramic period 2 to Ceramic Period 3) (Higham and Thosarat, 2004c, Bentley et al., 2007). This transitional period may, briefly, mark a period of differential status with respect to subadults, as seen generally at the site where material culture is examined, were perceived differently to adults.



FIGURE 11.3: Burial (B466) with ceramic vessel over face from Ban Non Wat (Photo: Higham, C.F.W. 2012. Retrieved from South East Asian Archaeology Data <https://drive.google.com/drive/u/0/folders/0BwyPRRjONdiFc0pQM3VTS09VVTA>)

11.2.5.3 Ban Non Wat

Further enhancing the idea for the potentiality of regional variation related to funerary practices between Central and northeast Thailand comes from results related to material culture in the Neolithic at Ban Non Wat. Where adults, generally, but most specifically the younger adult age class (15-39.9 years), were invariably more frequently exposed to many normative and non-normative materials at Khok Phanom Di (Central Thailand), it is subadults that demonstrate some relationships with normative and non-normative material types, specifically ceramics that included the pedestalled bowl, at Ban Non Wat during the same period. This only reflects those child burials from Neolithic mortuary phases One and Two as no subadult flexed burials were afforded a grave good. To a lesser degree, we also saw a greater

likelihood of older subjects, in contrast to younger adults from Khok Phanom Di, during the Neolithic at Ban Non Wat being buried with certain artefact types which also contrasts with behaviour seen at Khok Phanom Di. Where Khok Phanom Di showed some potentiality for a transitional age barrier related to older children, there was no evidence of any specific age sub-category from the Neolithic sample that demonstrated a meaningful relationship with material culture. These results suggest that there were different social identities, most specifically regarding the young, being communicated regarding these age classes to that witnessed at Khok Phanom Di and that once an adulthood personhood status was attained at Ban Non Wat the individual was subject to differential funerary treatment at death, at least where material culture was expressed.

The trends seen in the Neolithic regarding potential age-based identities are completely overturned in the Bronze Age at Ban Non Wat. Where subadults, and to a lesser degree the elderly, were more predominately associated with material culture in the Neolithic, the emergence of new social identities at death based on age during the Bronze Age occur, with adults receiving select behaviour where funerary processes include the deposition of material culture types. Relative parity between both adult age classes is seen in relation to several material categories (grave goods in general, ceramics and shell). However, it is the oldest age group that is most clearly afforded preferential association with funerary categories that relate to material culture type, function (jewellery, worked artefact), frequency, and position. The Bronze Age at Ban Non Wat, it is hypothesised, sees the emergence of social elites in association with increasing social complexity where resources, including exotic material and water, were controlled by select individuals (Higham, 2011a, O'Reilly, 2014). From a funerary perspective, this is most notable from the second mortuary phase where social aggrandizers, as part of the suggested transegalitarian social development phase, used funerary processes to demonstrate social inequality (Higham, 2011a). The results seen here, casting an extra dimension on social developments reported in relation to the Bronze Age, suggest that the elderly cohort may well have constituted some of the social elites during this time. This is not to suggest, as it is not universal across the age class, that all elderly subjects would have been included within the elite enclave where burials, such as B253 (BNW MP3A), were seen to be the poorest of their group. But, given the relationship with the elderly and a high number of material culture categories, advancing age, perhaps through the acquisition of material capital or social standing, may have contributed towards an individual's social identity at death and the expression of their funerary treatment.

Results from the Iron Age at Ban Non Wat demonstrate yet another change in social attitudes towards age, witnessed through funerary practices, as a structuring element of social organisation in the community. Where the Neolithic saw the pre-eminence of children, and the Bronze Age the status of the elderly, the Iron Age witnesses no specific age cohort being substantively related to a range of material types. Instead, there is a reduction in numbers of material categories (primarily ceramic-based normative and non-normative) where the elderly dominate, and relative parity being realised between both adult age categories with respect to ceramic and metal (iron) variables. The significant relationship between children and low frequencies of ceramics reflects evidence from the GLM which indicated subadults were increasingly likely to be buried with small frequencies of items at the Iron Age. While minimal, and only potentially statistically significant, there is a relatively equivalent level of activity, where material culture is explored, related to sex and age at Ban Non Wat during this time. Where, across normative and atypical burial variables, adults, but more specifically the elderly, show some evidence of select, or preferential, funerary treatment within this suite of variables, it is equally notable that sex is also a factor. This evidence suggests that the community, even as it moved towards greater social complexity in the Iron Age, was continuing to evolve, at least where material culture is examined, in a non-linear fashion to what appeared to have occurred in previous periods. The results suggest that an adult personhood status, particularly that of an elderly subject in the Bronze Age, continued to be significant

but the articulation of an individual's status, based on increasing age, was no longer a primary driver in the determination of funerary treatment as observed previously. While not significant, the results suggest that a gender identity, not seen strongly from Ban Lum Khao or the earlier periods at Ban Non Wat where material culture was explored, was beginning to emerge at Ban Non Wat during the Iron Age as an important factor in the expression of an individual's social identity.

11.2.5.4 *Ban Lum Khao*

The results related to material culture demonstrate a continuation in the expression of normative and non-normative material culture more commonly, albeit in fewer burial categories, with the elderly, than with younger age classes at Ban Lum Khao. This is from a site that is considered to be less wealthy than that of the neighbouring community of Ban Non Wat during the Bronze Age (Higham, 2011a). Although not supported by post-hoc analysis, the results from Ban Lum Khao echo that of Ban Non Wat with adults, equally, more so than subadults, being more frequently buried with a grave good although the quantum of all age groups buried with a grave good is less than that from Ban Non Wat. This may simply reflect the contemporaneous poverty, relative to Ban Non Wat, expressed at Ban Lum Khao in the funerary sphere or hint at broader underlying issues related to the expression of identity, or the memorialisation of the dead, within this community.

11.2.5.5 *Noen U-Loke*

Interesting deviations from funerary trends, where age and sex-identities manifest differently as structuring influences in the development and expression of social organisation, are seen at Noen U-Loke. Recognising that sex (masculine/feminine) is a limiting proxy for a gender identity which comprises so many other elements of a constructed social identity (Gilchrist, 1999, Díaz-Andreu, 2005, Zosuls et al., 2008, Bussey, 2011), the potentiality for some evidence of a clear delineation in gendered funerary behaviours, becomes clearer in the Iron Age at Noen U-Loke. Where there are occasional correlations between adult females and some funerary behaviours, this is most evident at Noen U-Loke in the Iron Age. At Ban Non Wat during the Iron Age, it was seen, to a limited degree that males and females distinguished in terms of some material cultural goods. At Noen U-Loke this gendered distinction in terms of some grave goods is accentuated relative to Ban Non Wat. It would seem that as social organisation becomes more complex during the transition from the Bronze to Iron Age (Onsuwan, 2003, O'Reilly, 2008, O'Reilly, 2014, O'Reilly, 2015), that there are indications of a gender identity emerging (Bacus, 2006, Bacus, 2007). The relationship between sex and certain material culture types may speak to some level of the individual's identity within the public, and/or funerary, domain which was more relevant to their social identity which was less visible from the earlier two periods.

Age-based data related to material culture, conversely, shows some similarities between Ban Non Wat and Noen U-Loke during the Iron Age. Specifically, this relates to the adult association with bronze, stone and, to a lesser degree, glass. These findings may indicate, broadly, relative continuity in societal attitudes in relation to age and funerary treatment where material culture is deposited in the grave with each neighbouring community. As noted previously, this may suggest that once an adult personhood status was achieved, some individuals were afforded select, and potentially preferential, funerary treatment in comparison to others. The elderly are more frequently found with spindle whorls and shell artefacts and to have some artefact types positioned at the skull. It is also the case that the youngest (0-0.9 years) were more frequently buried with some form of ceramic (88.8%), which may indicate a personhood status that set them apart from older children.

This marks the completion of the discussion focussed on individual mortuary suites of activity reviewed with the following section continuing and expanding upon the results to discuss general observations,

as related to the primary aims of the research, in regards to the identity of the young and the old from the sites examined.

11.3 Subadults and the Elderly Overview

Age, as a biosocial construct, remains a key defining characteristic, in conjunction with a range of other biosocially constructed identities that continues to provide insight into an individual's social identity and a community's social organisation over time (Sherman, 1994, Kaufman and Elder Jr, 2002, Kaufman and Elder Jr., 2003, Lucy, 2005, Gowland, 2009, Appleby, 2010, Appleby, 2011, Fahlander, 2013). Other aspects of an individual's constructed identity could relate to gender, ethnicity, status or power (i.e., legal, familial, economic, marital, political, philosophical-religious etc.) (e.g., Sofaer Derevenski, 1997b, Gilchrist, 1999, McHugh, 1999, Fowler, 2004, Babić, 2005, Díaz-Andreu, 2005, Kaufman and Morgan, 2005, Venn et al., 2011, Fowler, 2012, Fowler, 2013b, Fowler, 2013a, Marshall, 2013, Buch, 2015). A subject's biosocial age-identity will influence a complex interplay of non-fixed societal transactions as the individual forms, negotiates, transitions, and transforms, through one meaningfully and socially constituted age stage to the next over their lifespan (Joyce, 2000, Kaufman and Elder Jr., 2003, Lucy, 2005, Mann, 2007, Baxter, 2008, Appleby, 2010, Juárez and Gayet, 2014). A biosocial age identity also affects (i.e., conforming/compliance; defying/rejecting) how the individual experiences and perceives of themselves and behaves in relation to social conventions and social institutions within that specific cultural milieu (McPherson, 1990, Sofaer Derevenski, 2000, Kamp, 2001, Baxter, 2005, Baxter, 2008, Romero, 2008, Wiersma and Dupuis, 2010, Marshall and Bengston, 2011).

Social interactions, and the development of an age-identity across the lifespan, do not occur in isolation or in a vacuum (Lillehammer, 1989, McPherson, 1990, Parke et al., 2008, McIntyre and Edwards, 2009, Marshall and Bengston, 2011). The identity of an individual is formed in reference to a series of evolving relationships regarding how the actor engages, understands, influences, conforms or rejects conventions within their social environment (McPherson, 1990, Vignoles, 2011). This includes their relationship with social institutions, material culture and the dead (Brück, 2004, Pikrayi, 2007, Berzonsky, 2011, Bussey, 2011, Scabini and Manzi, 2011, Skorikov and Vondracek, 2011). The individual's engagement, and understanding of, each relationship at a functional, innovative, symbolic, and/or metaphoric level is, in turn, influenced by their biosocially constructed identity and how they relate to, or accept, it (Kaufman and Morgan, 2005, McAdams, 2011). A subject's age-identity is exposed to influences from other social actors who are also negotiating through, engaging with, or rejecting, prescribed social conventions and behaviours in relation to age at a specific time. As such, the influence of another actor's worldview in relation to age-based behavioural expectations, or other constructed identities, in the context of their own experience has the potential to reinforce, or challenge, the self-perception of the individual regarding their own age-identity. Social institutions too have the potentiality to be undergoing ideological realignment across the individual's lifespan due to a variety of cultural, technological, environmental, or philosophical-religious factors which may also directly influence the subjects perceived age-identity (Settersten and Mayer, 1997, Parke et al., 2008). In this context, an institution's expectation of socially appropriate age-based behaviours may alter across the individual's lifespan. From the perspective of mortuary behaviour and its relationship with social memory, either through the application of funerary practices or in the memorialisation of the deceased, the manifestation and expression of an individual's age-identity is unlikely to be static (Kuijt, 2008, Ekengren, 2013, Crellin, 2017). Funerary practices performed on the deceased are progressively reinterpreted and memorialised in an evolving social environment. In this context, the purpose of a single burial is demonstrative of an individual's identity and the memory and strategic social intent of those administering the funerary process at that time (Battaglia, 1992, Kaufman and Morgan, 2005, Kuijt, 2008, Nilsson Stutz, 2010, Sayer, 2010, Robb, 2013).

Under ideal circumstances identity studies would observe changes in a subject's identity transitioning across their lifespan. Such approaches may facilitate the identification of an actor's submission, manipulation, or rejection of, prescribed behaviours associated with specific, or multiple, biosocially constructed identity types (Alberti, 2005, Sofaer, 2006, Wesselmann and Williams, 2017). Archaeological identity analyses are challenging as they are limited to engaging with the subject at their death and therefore, through their fixed nature, do not see identity transformations that occur across the lifespan (Gilchrist, 2000, Gilchrist, 2007, Torres-Rouff and Knudson, 2017).

The non-uniformity present in mortuary contexts, and the subsequent meting out of select behaviour within and across discrete units, suggests the presence of differential social identities. At death, aspects of the individual's social identity are intentionally projected (or repressed) publicly (Sofaer, 2006, Tsaliki, 2008, Stutz and Tarlow, 2013). In so doing, elements of social and philosophical-religious order, as interpreted by burial practitioners, are conveyed, or implied through their presence/absence. The individual's social identity at death, both communal and personal, can be expressed (or destroyed/lost) and understood through a raft of funerary systems (Brück, 2004, Tsaliki, 2008, Králová, 2015). Our discourse is rife with examples of those systems which apply to a wide range of verbal and non-verbal communication strategies that are embedded with meaning that reinforce expressions of social identity, social cohesion, and societal durability during an event (a death) that is disruptive to the established social order (Kearl, 1989, Bell, 1992, Leming and Dickenson, 2009, Verhoeven, 2012).

While the study of individual discrete burials can provide insight into a range of features, most benefit has been derived from the structured cemetery environment (Kearl, 1989, Parker Pearson, 1999, Sayer, 2010). The cemetery environment, as a reference point through its formalised and idealised design, has the potential to communicate a range of features of the ritual behaviour and the organisation of a community observed through its meaning-making towards the dead either as individuals or collective units (Bell, 1992, Parker Pearson, 1999, Parker Pearson, 2000, Verhoeven, 2012, Holloway et al., 2013). In this context, the deceased individual, dependent on a range of dominant social, cultural, or ritual factors, has the potential to have their identity renegotiated and transformed through their mortuary treatment from the moment of their death (e.g. Kearl, 1989, Jacobi, 2003, Sayer, 2010). Notwithstanding, the subject's death-identity may potentially commence its transformation where the cessation of life (social death) is inevitable such as with respect to severe physical or mental illness (Smith, 2006b, Weicht, 2013, Králová, 2015). This transformation of social identity can relate to a range of behaviours exhibited upon the deceased, their access to normative funerary practices and exclusion/inclusion in formal cemetery locations (Finlay, 2000, Tsaliki, 2008, Murphy, 2011b, Murphy, 2011a, Perego, 2014, Wesselmann and Williams, 2017). This transformation of identity may also be applicable to participants who engaged in the funerary process where individuals, or groups renegotiate or transition into a new social role following the death (Rosenblatt, 1997, Leming and Dickenson, 2009, Jakoby, 2012).

The four sites reviewed in this dissertation contained formalised cemeteries containing over a thousand burials laid out in a variety of forms and demonstrating a broad range of behaviours. This research has explored and discussed a number of these elements that include inclusion/exclusion (i.e., good/bad deaths etc.) and equality/inequality (i.e., normative/atypical burial treatment) and a range of performative and ritual behaviours associated with the transformative social nature of the dead (see Chapter Two).

A challenge of this mortuary study, mindful of its potential redundancy from each population, related to ascribing value, whether in relation to material culture or funerary practices, to the mortuary data under review. These concerns centred on the potential biases of contemporary perceptions in relation to quality and value and how this may affect the interpretation of results. Further, these concerns recognise that local funerary practices may render some features, such as material culture, archaeologically

invisible due to their deliberate destruction, decomposition, consumption, or implementation away from the grave site (Malinowski, 1983, Brück, 2004, Dietler, 2012). Locally deposited artefacts, especially those potentially of moderate to high value, may constitute the act and display of debt giving (Battaglia, 1992) in a public setting or, conversely, hold a different meaning in the mortuary context in contrast to that found in non-mortuary settings (Trubitt, 2003, Osborne, 2004, Pikrayi, 2007). Alternatively, the associated risk of, perhaps erroneously, allocating prestige to select manufacturing specialisations (e.g., ceramics), and through them an inference of equivalency in relation to the value of objects produced under their stewardship, has the potential to bias an understanding of social organisation and, at least from a funerary perspective, the broader narrative being communicated.

Does the relative commonality of ceramic items, even exquisitely ornate and beautifully produced pieces, render them less valuable than an item that is exotic to, or rare within, specific geographic locales or does the item, either due to its quality, durability or symbolic/metaphoric meaning hold greater import. Could it be both? Does the presence of stone, sourced from considerable distances from the site, and suggestive of the presence of exchange networks, hold greater value irrespective whether the artefact is rudimentary, recycled or of high quality? Such perspectives, while potentially relevant to a mortuary analysis exploring aspects of identity, overlook the potentiality of changing value ascribed to material items through time. For instance, does an external recognition of value, perhaps through an exchange network, have the potential to elevate, or degrade, an item's value based on foreign equivalences independent of local views (Renfrew, 2001)? In a mortuary context, does an item's value change through its funerary interaction with certain actors (the dead or the living); or does the manner of its inclusion, as part of the formal funerary process as opposed to a personal affectation, also influence an item's value. Suffice to say, while value and its associated meaning continue to dominate many aspects of mortuary analyses, there remains considerable ambiguity surrounding the issue.

Feeding into the common theme related to value and prestige present in the Southeast Asian archaeological discourse is that of exotic materials, where the presence of exotic items is promoted to suggest aspects of social complexity regarding inequality, hierarchy and exchange (Miksic, 2000, Higham, 2012a, O'Reilly, 2014, Higham and Rispoli, 2014, O'Reilly, 2015). While the above views are accepted as the consensus position, further research has suggested general assumptions on exotic item provenance may not be definitive and that some materials may have a local origin (Theunissen, 2007, Theunissen et al., 2000, Carter, 2015). These findings may facilitate a reconsideration of established views regarding an internally driven social development related to exotic materials, exchange, wealth, and status for future research. Suffice to say, while there remains a need for continued robust debate on the issue of value in archaeological settings, this research takes the view that certain material types, through their inclusion in funerary constructs, are likely to have an inherent value ascribed to them and potentially be imbued with some intrinsic, symbolic, or metaphoric significance for attendant mourners and the broader community under investigation. An example of this would be the increased commonality of bone/tooth artefacts, most commonly buried with adults, at Khok Phanom Di in comparison to the northeast sites. We can also see that some material types, such as bone or shell, diminish in frequency in mortuary contexts going into the Iron Age, suggesting shifting attitudes towards the inclusion/exclusion of some materials over time.

The spheres of activity surrounding death and burial have been a central aspect of archaeological discourse since its foundation (Trigger, 1989, Parker Pearson, 1999). Drawn from a variety of disciplines, our engagement with and understanding of ancient social traditions and practices continues to grow and become more sophisticated. The archaeological discourse on death, and its related epistemology of burial traditions (i.e., rituals, practices etc.), has been influenced by the social sciences, biology and psychology that have, in turn, provided insights into the individual and collective rationale/response following a death event over time (Parker Pearson, 1999, Sandstrom, 2005, Smith, 2006a, Stanley and

Wise, 2011, Tritt et al., 2012, Králová, 2015, Belmi and Pfeffer, 2016, Major et al., 2016, Wesselmann and Williams, 2017). This study has engaged with a number of these issues, primarily in regard to the primary cohorts under review, related to an overarching discourse on death including ritual and social aspects of funerary practices; agency; deviant burial; a fear of death and its psychological/emotional repercussions (e.g. Dobres and Robb, 2000, Hodder, 2000b, Hodder, 2000a, Bandura, 2001, Hoskins, 2006, Tsaliki, 2008, Taubman-Ben-Ari, 2009, Harper, 2010, Wong and Tomer, 2011, Beit-Hallahmi, 2012, Tritt et al., 2012, Crandall and Martin, 2014). Within this context, burial practices, orchestrated and performed to play into a broader social and philosophical-religious narrative, are meaningfully constituted, sanctioned, and interpretively realised in relation to the identity of the individual and the population as it mitigates the risk to social stability following a death event (Parker Pearson, 1999, Aspöck, 2008, Tsaliki, 2008, Fowler, 2013b, Perego, 2014). The social death, following actual death, would likely see the individual's identity transformed into an idealised state based upon many factors such as memory (burial traditions linked, not independent, inter-/intra site level), belief and social values (Garwood, 2012, Robb, 2013, Králová, 2015, Wesselmann and Williams, 2017). For the purposes of this study, through its primary focus on age as a biosocial identity construct, I looked to see if the idealised identities of aggregated age-groups were enhanced, or lost, at death.

As a consideration, this research embraced the idea that the death of any community member from the modestly sized sites under review had the potential to reverberate socially across each population. Chapter Two, from a contemporary perspective, noted some elements of grief that relate to the death of young or older subjects although the elderly subjects so frequently encountered in archaeological settings are potentially younger than those discussed in clinical settings. A consideration of emotion, at least as part of, or in addition to, funerary structures or traditions, is not without risk especially where broad cohorts, as taken in this research, are analysed as a bloc. Within such a bloc, as seen here, is a high degree of mortuary variability within, as well as across sites, regarding the age-based cohorts. However, the same degree of mortuary variability within age-based cohorts demonstrates the presence of selective behaviour in relation to some, or large numbers of, burials and indicates, through differential mortuary behaviour, that all deaths are not equal within a community at any given time. In addition to the complex socio-cultural and philosophical-religious aspects at work in relation to the identity of the deceased, it is the view here that emotion (publicly prescribed and/or personal) may have also influenced the funerary process and may offer an alternative explanation where atypical or singular funerary activities are visible. Grief, in a funerary context, could be related to culturally constituted and socially sanctioned behaviours relating to power and/or status or fall into the realm of the personal (i.e., public demonstrations of grief, gift-giving, eulogy, sensory manipulation etc.) (Hamilakis, 2012, Jakoby, 2012, Verhoeven, 2012, Davis et al., 2016). Emotions associated with grief are difficult to identify in archaeological settings due to the ambiguous, non-universal, nature of emotion which is influenced by a complex range of factors related to memory, meaning (i.e. meaning-making), experience, society, culture, and biology (Thoits, 1989, Tarlow, 2000, Tarlow, 2012, Cannon and Cook, 2015). However, the presence of atypical, deviant, burials, may suggest localised views, based on extant belief systems, regarding select individuals and their social identity affecting, ultimately, treatment at death. While there is some value to taking a cautious approach in including emotion in archaeological discourse (Tarlow, 2000, Tarlow, 2012), it is the view here that the inclusion of a burial within a formalised community cemetery, irrespective of the relative funerary treatment of that individual, demonstrates some level of social inclusiveness and meaning-making and suggests, at some level, the death resonates socially and may be part of the expression of funerary practices communicated through normative and atypical burial behaviours.

Objective: Attitudes and perceptions of the elderly and the young

Drawing on the results of the analyses, there are a raft of funerary practices that indicate select traditions related to age. As a determinant of behaviour, the broad trends observed through the mortuary analysis show that age was perceived, at a social and philosophical-religious level, with greater variability, certainly in contrast to that of sex, which seems to suggest that each community viewed, and treated individuals differently based largely on their age. Although other studies have reviewed the potentiality of age at each of the sites examined, this study has striven to include a concentrated focus on the elderly, in addition to the typical division of subadults and adults previously researched (Higham and O'Reilly, 2004, Higham and Thosarat, 2004c, Talbot, 2007). At its highest level, and in support of previous research, the findings indicate that age was an important determinant in social organisation in the communities under review and that it remained so, independent of visible fluctuations in behaviour, over time.

Objective: Transitional age barriers across the life cycle

Categorisations of an age-identity are visible in terms of the broad biological age ranges adopted here. The inclusion of an exploration of advancing age facilitates a more holistic approach to understating social organisation and development across each site (Lucy, 2005, Appleby, 2010, Appleby, 2017). More nebulous, however, are clearly identifiable transitional age barriers that show a clear, consistent, distinction in funerary behaviour with specific age classes across time and at each site. In general, it can be cautiously suggested that there appears to be an increased variability of mortuary practices in relation to adult cohorts, rather than subadults, over time. Where funerary practices reflect *shared* behaviours between adult age groups, it is suggested that a general adulthood personhood status had greater social significance than the expression of an elderly adult personhood status at that time and in relation to each specific practice (i.e., material culture, faunal remains etc.). Although evidence of parity between both adult cohorts is visible in relation to specific mortuary behaviours and each cohort, a view that suggests the potentiality of a transitional age division in some circumstances between adults is based on repeated trends which demonstrate the presence of variance between the older and younger group.

Alternatively, evidence shows that that the experience of adulthood, once this personhood status was obtained, was not always expressed equally in the funerary sphere. Instead, the inference here is that the transition, from a younger adult to an older adult personhood status, was socially recognised, and potentially valued. That, perhaps because of an advanced age, some older individuals were afforded a different social identity and select funerary treatment. Where this select, potentially elevated or atypical, burial behaviour occurs may reflect an emotional, personal or communal (good/bad death), response to the death of an older adult in comparison to younger actors at the same time. Unfortunately, this study was not able to identify if certain mortuary practices were preferentially allocated to a specific biological age sub-category (40s, 50s, 60s and 70+ years). This could be an artefact of the small sample sizes associated with each sub-group that rendered the determination of statistically significant activity difficult to identify. Alternatively, this could suggest, irrespective of the subjects increasing age, that once a specific age barrier was transcended, and where an older age-identity was socially realised, that meaningful normative and atypical funerary treatment was rendered regardless of increasing age.

Objective: Socially Constructed Identities

There are certainly some mortuary behaviours, both within each site and from broader trends seen in the Generalised Linear Modelling, to suggest some behaviours are invariably only generally found with the subadult age class. Most frequently, this refers to the application of jar burial or, for older subadults, burial in a flexed or semi-flexed position but there is also exposure to other practices within the subadult cohort. In the northeast, at Ban Lum Khao (92.8%), Ban Non Wat (75.4%) and Noen U-Loke

(62.1%), it is foetal and neonatal subadults that are most frequently found in a flexed position. The same trend was not visible from Khok Phanom Di (18.7%) in Central Thailand. The association of flexed burial practices with this age group from each neighbouring site suggests that, at death, this depositional feature may have formed an aspect of the identity of the very young with, perhaps, bodies deliberately placed in a stylistic position deliberately representative, or reminiscent, of a foetal position. At Noen U-Loke the normative northern orientation (0-360°) affects a relatively small proportion of the sample (24.2%). Subadults constitute the majority of burials oriented in this manner where foetal and neonatal children, mainly found from mortuary burial clusters 4B (Higham and Thosarat, 2007c) and 4C (Higham and Thosarat, 2007d), are most frequently affiliated. In comparison to the other sites reviewed, the orientation at Noen U-Loke is relatively anomalous due to its distribution where relatively equal parts of the sample are deposited in alternative orientations. The concentrated orientation of the very young in these clusters may suggest, within the corporate group that constituted each burial cluster, that this aspect of funerary treatment on this age class was an important aspect of their identity. As stated previously, future research incorporating a viewshed approach to the surrounding landscape may provide further insight into the relationship of this group with the surrounding landscape. Within the subadult age-group from Khok Phanom Di there are variances in behaviour, most frequently related to the youngest subgroup (0-0.9 years of age) and the eldest group aged 10-14.9 years with some material culture types that may mark, in relation to some individuals, a transitional age marker that signifies differential identity and personhood status. Why these potential transcendent age, or personhood, barriers are not applied universally across a single age class (all 10-14.9 year-olds) remains unclear. Perhaps their expression (presence/absence) may be due to the individual's association, or relation, to specific sub-groups in life such as through filial ties, occupational status or through an ascribed social status or identity (McHugh, 1999, Chesson, 2001, Kaufman and Morgan, 2005, Skorikov and Vondracek, 2011, Fowler, 2012). Although a universally applied transitional age is not visible from each site, it seems possible that each population adopted, based on localised social value systems, funerary practices to communicate this feature to some degree to certain members of the subadult population. Although impossible to test, the expression of notable funerary behaviour affecting foetal or neonatal subjects may, in part, be driven by factors related to maternal/parental attachment and the grief response following the death of the infant.

Although this study has shown that age appears to have been an important determinant related to social development and individual identity, the results indicate an age-identity was not equally significant at all locations reviewed. The evidence from Ban Lum Khao suggests, across multiple suites of activity (i.e., fauna, material culture), that there are far fewer direct indications that age (or sex), was a driver of social identity at death in contrast to that witnessed at Ban Non Wat, Noen U-Loke and Khok Phanom Di. Even at its most basic level this suggests, where an age-identity is concerned, a certain homogeneity at Ban Lum Khao in contrast to a heterogeneous recognition of this aspect of individual identity at Ban Non Wat, Khok Phanom Di or Noen U-Loke. Conversely, as seen above, the correlation of sex in relation to the mortuary suites of activity reviewed demonstrated relative homogeneity in behaviour especially in the Neolithic and Bronze Age across all sites where it appears a socially communicated gender identity may have emerged at the Iron Age. The evidence suggests an attitudinal transition, as expressed through the individual's mortuary treatment based on their sex, had occurred where specific sex groups are most frequently associated with discrete materials.

11.4 Summary

The application of an identity analysis using biosocial age in an archaeological context, as a focal aspect of mortuary mediated social (and/or ritual) behaviour, is both informative and problematic. An age-based identity study, especially one focussed upon individuals at both ends of the age spectrum, allows some insight into a community's social organisation and its perception and behaviour towards individuals

across the lifespan. Negative aspects of such an approach include the observation that individuals within a funerary environment are likely to have their identity idealised and/or transformed by attendant mourners for a variety of social, personal and ritual reasons. As such, the social identity of the subject gleaned from the mortuary environment may not accurately represent the individual's personae across the lifespan. Also, the aggregation of a sample into biological age groups risks failing to capture singular or notable burial treatment afforded to individuals.

Studies related to the elderly, until the relative recent past, have been challenging due to a range of methodological, and perhaps ideological, barriers. While it is recognised that a focus on this single aspect of an individual's identity (age) is potentially limiting, due to the other myriad of conflicting and competing (bio)social identity markers such as gender, status or ethnicity, a decision to target and include the elderly had the possibility of expanding our understanding of perceptions to life and death in the region. Similarly, the approach to include subadults as a primary focus of the study allowed a mirror to be held up towards each community to consider views on the death-identity of cohorts who encompass the extreme boundaries of age both within a community and across sites that were occupied contemporaneously.

This chapter has discussed a broad range of features related to the subject's age-identity following their death in relation to the mortuary suites of activity employed in this study. Overall the study has identified that age was a key component, certainly more so than sex, of an individual's identity and, through its significance in a funerary context, a population's social and philosophical-religious complexity. Further, the evidence suggests that the influence of an age-identity is not consistently observed across all sites independent of time, suggesting that each community may have viewed age (as an identity marker) in variable ways and, through this, supports claims for the existence of (semi)autonomous communities in Southeast Asia at the time in question.

Although not uniform, a clear differentiation is visible, at its broadest level, between adults and children, with those subadults aged at, near or under one year of age as well as those in the oldest age subcategory (10-14.9 years), subject to the greatest funerary variability, which may relate to their personhood status from the time of their death. The inclusion of an elderly cohort has been most telling with repeated evidence suggesting that this group at the very least held an equal, but more frequently elevated, status across a variety of mortuary suites over time which clearly supports the importance of including this cohort, as a separate body of enquiry, in future investigations of socio-political development and complexity.

The next chapter, as outlined at Chapter One, will explore two theoretical social models, namely Regionality Theory and Resilience Theory, as a potential explanatory framework for discussing social differentiation, as observed in mortuary contexts, and through these social identities in Southeast Asia through time.

Regionality and Resilience Theories in the Context of Southeast Asia

12.1 Introduction

Following a discussion on the primary objectives and findings of this research seen in the last chapter, this chapter seeks to explore the applicability of two emerging social theories in relation to the trajectory of social development in Southeast Asia in the context of the results of this research. Archaeological research benefits from the adoption of theoretical models developed in other disciplines such as the sciences and social sciences to further its awareness of organisational complexity, change or stasis. This dissertation explored a range of theoretical models as a means of understanding social complexity and the subsequent differential mortuary treatment in Southeast Asia. Following a review of potentially relevant social theories for a Southeast Asian context, this chapter provides an overview of a Regionality Theory (Section 12.2) and a Resilience Theory (Section 12.3) as it pertains to each relevant location.

As outlined in Chapter Four, a considerable body of work in relation to the organisation and complexity of life in ancient mainland Southeast Asia has been under development for several decades (e.g., Coedès, 1968, Solheim II, 1968, Higham, 1989, Glover, 1991, Bellwood, 1992, Higham and Thosarat, 1994, White, 1995, Glover et al., 1996, Higham, 1996, O'Reilly, 2000, O'Reilly, 2003, Higham, 2002, Su et al., 2004, Bellwood, 2005, Higham, 2011c, Higham et al., 2011b, Higham et al., 2011c, Higham and Xie, 2011, Higham, 2013, O'Reilly, 2014, Pryce et al., 2014, O'Reilly, 2015, Higham, 2017, White, 2017). Chapter Four discussed the influence of several factors as key drivers of localised, or inter-linked, social development such as migration, exchange, agriculture, the environment, and technology (e.g., Theunissen et al., 2000, Bellwood, 2005, Bentley et al., 2005, Lertrit et al., 2008, Murillo-Barraso et al., 2010, Higham and Rispoli, 2014, King et al., 2013, King et al., 2014, Matsumura and Oxenham, 2014, Shoocongdej, 2015, Castillo et al., 2016, Oxenham and Buckley, 2016, Higham, 2017). The first part of this chapter briefly discusses the applicability of a Regionality Theory for mainland Southeast Asia most specifically in the context of differing mortuary behaviour between Central Thailand (Khok Phanom Di) and Northeast Thailand (Ban Non Wat) during the Neolithic. The following section, primarily focussing on mortuary developments from Ban Non Wat, Ban Lum Khao and Noen U-Loke in Northeast Thailand, examines the applicability of a Regionality Theory in association with those sites.

12.2 Regionality Theory

Regionality Theory was developed in relation to mobile pastoralists in Eurasia to understand and explain evidence of widespread exogamy and complex spatial and temporal distribution of exotic goods in the region (Frachetti, 2008, Frachetti, 2010, Frachetti, 2012). A Regionality model contextualises how the process of the interaction and maintenance of human relationships may act as a possible means to understand social complexity between discrete and independent communities (Frachetti, 2010, Frachetti, 2012). These human relationships are explored through the examination of regional exchange, such as through specialist trade and the exchange of exotic materials and goods, and the movement of people, knowledge, and ideas (Frachetti, 2010, Frachetti, 2012, Weiberg, 2017). It was suggested that mobility, as it applies to the transmission and exchange of materials, ideas, and people, within and across autonomous and independent zones was a key factor in the development of this expansive social model (Frachetti, 2008, Frachetti, 2010). Because of the extensive mobility of the region's occupants, materials (locally sourced and becoming exotic through exchange), technological refinements or

advancements, ideologies, and philosophical-religious beliefs, engendered a social system which eclipsed localised boundaries and extended beyond immediate geographical landscapes and acted to create a fluid, shifting organisational model predicated on exchange (i.e., people, ideas, beliefs, goods etc.) (Frachetti, 2008, Frachetti, 2010, Frachetti, 2012, Weiberg, 2017). From a mortuary perspective, explorations into potential regional links could determine if material items and funerary practices are expressed similarly, or preferentially, *in situ* within the cemetery environment under the rubric that ideological and philosophical-religious beliefs, shared and adopted across boundaries, may be observed in the funerary sphere and serve as a visible link between communities (Koryakova and Kohl, 2000, Frachetti, 2010, Weiberg, 2017). This includes a consideration of the shared social and symbolic meaning (or value) of objects (Frachetti, 2012). A Regionality model would ideally incorporate several social, economic, and technological factors in addition to that of funerary behaviour as an expression of ideology, memory and belief, to look at processes of interaction and exchange as drivers of social complexity or shared institutional practices.

Southeast Asian populations in the Neolithic and Bronze Age are generally characterised as autonomous to some degree of another (Higham, 1989). Yet archaeological studies have found a range of activities and materials that demonstrate some linkage and commonalities between populations that may lend towards a consideration, beyond the fluid heterarchical model, of an expanded regionality approach in relation to social complexity (White, 1995, Onsuwan, 2003, Higham and Rispoli, 2014). For example, in Central Thailand, there are similarities in behaviour between Khok Phanom Di and the Bronze Age site of Nong Nor, most significantly regarding ceramic traditions, to support inferences of a linkage between both communities (Higham, 2004f, Sarjeant, 2010, Bellwood et al., 2011). From a funerary context, notwithstanding infant burial practices at the terminal phase of the sequence at Khok Phanom Di hinting of a shared ideology with Nong Nor (Halcrow et al., 2008), studies show little similarity between both sites with burials from Nong Nor not demonstrating the same complexity or wealth as that found in the fifth and sixth mortuary phases at Khok Phanom Di (Chang, 1996). White (1995) suggests that the singular or individualised nature of some burials from Ban Kao mirrors those found at Khok Phanom Di and marks these individuals as having differential, perhaps elevated, status. Similarities in material culture (e.g., Incised and Impressed (I&I) ceramics) from Khok Phanom Di has also been identified in areas beyond its immediate vicinity across the region at other Neolithic locations (Higham, 2002, Rispoli et al., 2013, Higham and Rispoli, 2014). In the northeast, researchers have identified links between a range of sites immediately in the Upper Mun River Valley and beyond that relate, explicitly or inferentially, to the exchange of materials across communities (e.g., salt, copper) (Rispoli et al., 2013, Higham and Rispoli, 2014, O'Reilly, 2015). All this being said, these links found across the region, of which these are only a few select examples, suggest a Regionality Theory approach for prehistoric Southeast Asia should at least be considered. Where this study was focussed on age-based identity, it would encourage future research to engage more centrally with this area of interest.

Initial steps investigating funerary practices were taken from Khok Phanom Di (Central Thailand) and Ban Non Wat (Northeast Thailand) to explore the possibility of regional variation during the Neolithic. This approach was taken as material culture has indicated similarities between these sites during this period (Higham, 2004f). In summary, this brief overview found some evidence to suggest regional variation in the expression of human burial between each region. The differing expression may potentially indicate different meaning and/or social memories aligned with specific identity groups in each independent region. The results found greatest variation where material culture, faunal remains and human burial practices variables were explored.

First, the ubiquitous jar burial, so common throughout mortuary settings in the region and frequently containing infants (Indrawooth, 1997, Halcrow et al., 2008, Dzung, 2009, Glover and Dung, 2011), is expressed differently between both sites with only a single child being buried in this manner at Khok

Phanom Di in comparison to a quarter of the sample from Ban Non Wat. This research already noted (Section 11.2.2) the exceptional nature of the single jar burial from the fifth mortuary phase at Khok Phanom Di with the unusual circular grave and burial style casting this individual in a unique light. That the jar burial is associated with the fifth mortuary phase, a period that sees burial practices break sharply from norms found previously and following this phase, suggests that the expression of individual identities was undergoing significant flux at this time and may have been driven internally or influenced by external factors through contact or exchange. The alternative expression of subadult burial is seen at Ban Non Wat during the Neolithic where it is deemed socially meaningful and appropriate to include more than two-thirds of the subadults, in addition to two younger adults, in jar burials. Given that subadults constitute such a large proportion of the population at Khok Phanom Di it is unlikely, as seen at Ban Kao for example (Sørensen and Hatting, 1967), that subadult jar burials were interred elsewhere at the site. Instead, it appears that each community viewed social identities in drastically differing ways in the Neolithic. Jar burials are replete with symbolic significance (i.e., returning to the womb, fear of the dead etc.), are highly labour intensive (i.e., ritual planning, preparation, and execution) and suggest the select identification of certain actors that demonstrate some socially defined characteristics for inclusive treatment. Continued research into the potentiality on the social identity of jar burials in Southeast Asia, as well as its use in other regions and temporal periods, would be beneficial to archaeological discourse.

Similar disparities are seen in relation to the use of ochre between both sites (see Section 11.2.1). Where ochre was a common feature of burials, frequently associated with elderly actors at Khok Phanom Di, it is absent at Ban Non Wat. That each region, at least during the Neolithic, held divergent views on the communication of individual identities at death can be seen with the emergent significance of ochre at Ban Non Wat during the Bronze and Iron Ages. This suggests, much as an evolution on the application of jar burials changed over time at Ban Non Wat, that the community held, then changed, its views on the appropriateness and meaning of ochre with some individuals during the Neolithic, in contrast with Khok Phanom Di, where ochre was not viewed as a meaningful component of the mortuary ritual.

Further suggestions of an ideological divide in institutionalised burial variables being memorialised and expressed are found in relation to flexed and semi-flexed burials at both sites during the Neolithic. Where flexed burials are relatively common at Ban Non Wat (36.3%) they occur among a small minority of the sample from Khok Phanom Di (9.0%). Conversely, the results found no burials from Ban Non Wat in the semi-flexed position in contrast to a small proportion at Khok Phanom Di (7.1%). This suggests, where this aspect of the funerary process was performed to express some aspect of the individual's social identity that each community may have held differing views on the application of each practice and, by extension, individuals that each practice was applied to.

While faunal remains are present in graves at both sites, the inclusion of specific taxa varies which suggests that each population, either due to environmental/economic or ideological reasons, viewed the significance of each species differently whether as part of a funerary feast or as an individual offering potentially imbued with symbolic or metaphoric significance. Data suggests attitudes to the inclusion of specific fauna at each site indicates that individual, or collective, identity was different at each site during the Neolithic. For example, we can see funerary practices in the northeast visibly differentiate between those subadult and adult actors buried with fauna in comparison to the relative parity seen at Khok Phanom Di. This is seen most clearly in relation to pig species and the inclusion of fish at Khok Phanom Di. Tellingly, where Unionidae bivalves were present at both sites in relatively similar levels, their use in non-mortuary contexts as a shell knife at Khok Phanom Di (Higham, 1993c), contrasts to that of many sites across prehistoric Thailand which exploit this species predominantly for mortuary purposes (Ross and Oxenham, 2017) and suggests each population perceived the symbolic or ritualistic

significance of this material differently. This proposition is further reinforced through the absence of children with this material at Khok Phanom Di in contrast to that at Ban Non Wat.

Where material culture is explored, the evidence again shows, at least where age is explored as a meaningful social indicator that material artefacts, as markers of an individual's social identity, were used differently in each region. This again suggests, through differential funerary expression that each community viewed, and treated, its deceased in divergent ways during the Neolithic. For example, where grave goods are allocated to a high proportion of burials at Khok Phanom Di (60.3%) and Ban Non Wat (71.2%) it is adults at the latter, and children at the former, that are most likely to be buried with a grave good of any type. These trends are also reflected where ceramic artefacts are present. Further, where variability in relationships between specific age cohorts and material culture variables occurs at Khok Phanom Di, at Ban Non Wat it is noted that some cohorts are excluded from exposure to certain materials. This includes, albeit from small samples, subadults with shell artefacts and the elderly with bone/teeth and stone artefacts.

While it is recognised that funerary practices will vary in their design and application between locations, it is suggested that there may have been fundamental differences in attitudes towards the dead expressed in each community in each region. In the future, a more expansive study incorporating an analysis of the full suite of factors (i.e., migration, exchange, influence of metallurgy, funerary customs) would provide clearer insight into the effectiveness and accuracy of a Regionality model across, or within, certain confines of Southeast Asia. In the context of this study, in its limited scope, a Regionality model was explored only in relation to funerary behaviour between Khok Phanom Di and Ban Non Wat during the Neolithic but shows positive results and suggests this theoretical model may be applicable in this region.

12.3 Resilience Theory

The preceding section explored the potentiality of Regionality Theory in a Southeast Asian context using mortuary data from two sites occupied during the Neolithic period. Shifting direction, this current section seeks to explore the value of Resilience Theory in relation to the sites reviewed. Each of the sites underwent significant social change, as witnessed through mortuary variability, over the period of its occupation. Of the four sites, only Ban Non Wat spanned the entirety of the periods reviewed, with the occupation of the remaining sites terminating at the completion of their respective era.

The development of a Resilience Theory in an archaeological context emerged from an ecological outlook that seeks to explore human adaptation to environmental change (Redman, 2005). In this context, a population's adaptive response will determine the continuity or dissolution of a community (Redman, 2005, Thompson and Turck, 2009, Gronenborn et al., 2014, Weiberg, 2017). Human resilience, or lack thereof, to inevitable environmental flux may be explored to understand why some communities persist under extreme duress and others do not. In this, a population subject to environmental disruption, initiating an adaptive strategy towards maintaining its structure and identity, reorganises, and fundamentally retains, its idealised primary identity throughout an ongoing change process (Redman, 2005, Thompson and Turck, 2009, Weiberg, 2017).

A Resilience Theory approach recognises the likelihood of cycles of environmental change *and* constancy that necessitate flexibility, adaptability, resilience, and memory in order to withstand the effects of disrupted systems (Redman, 2005, Thompson and Turck, 2009, Gronenborn et al., 2014). It has been suggested that the application of Resilience Theory can bridge a range of discrete, often conflicting, theories found in processual and post-processual approaches in archaeological discourse, including that in relation to agency or ecosystems (Thompson and Turck, 2009, Gronenborn et al., 2014). Resilience

Theory is dominated by a four-staged adaptive cycle encompassing exploitation; conservation; release; and reorganisation and is expressed as a cyclic figure-eight with each arc acting as each stage of the continuous sequence (Redman, 2005, Thompson and Turck, 2009, Weiberg, 2017). An adaptive cycle approach realises that environments are dynamic systems, at macro and micro-levels, and are subject to sudden and dramatic shifts that affect homeostatic continuity (Redman, 2005). The first two stages have been referred to as periods of connectedness and the remaining stages connected to phases of social release. The visibility of behaviours and practices from earlier phases within a landscape (i.e., settlement, cemetery) contribute to the strategic management of communities to mitigate risk and endure over time (Weiberg, 2017). Although relatively new to archaeological discourse in understanding social complexity, the model has been applied to gain insight into groups at different stages of social development in disparate regions (Redman, 2005, Thompson and Turck, 2009, Gronenborn et al., 2014, Weiberg, 2017).

The implementation of resilience strategies, as seen through the adaptive cycle, is reliant on social memory as a stabilising force to interpretively realise and express organisational and/or institutional structures (Redman, 2005, Thompson and Turck, 2009, Pillatt, 2012). Mortuary behaviour, as witnessed through social memory, acts to generate identity, links the past to the present, and communicates through its ritual and relational activity of significance (or at least perceived to be significant) by a community (Battaglia, 1992, Chesson, 2001, Kuijt, 2008, Sayer, 2010). The funerary sphere is a space where a series of processes are applied, in conjunction with social memory and social identity, to mitigate risk and manage, reinforce and/or transform social cohesion (Bell, 1992, Parker Pearson, 1999, Hayden, 2003, Smith, 2015). But, as alluded to in relation to age-identities, the effects of agency and the experiential engagement with funerary practices, through social memory, is not fixed but alters over time to reflect a continuous interpretive movement regarding how funerary practices are expressed, perceived, and remembered (Sayer, 2010). Consequently, each new phase of reorganisation, as proposed through Resilience Theory, would likely see a shift in behaviour that would reflect an interpretive approach that would be a conglomeration of old and/or new funerary practices (Redman, 2005, Thompson and Turck, 2009). As a result, these permutations would influence, based on the interpretive effects of an evolving social memory, the transformation of individual identities (i.e., gender, age, status etc.). Over time, where a community has endured, and survived over considerable time, these changes in identity may be archaeologically visible to examination.

Significant environmental change occurred in the Gulf of Siam (Khok Phanom Di) and on the Khorat Plateau (Ban Lum Khao, Ban Non Wat, Noen U-Loke) coinciding with the period of occupation at each site. As such, a consideration of Resilience Theory in the social development of each community is addressed here. In some respects, based on the previous environmental and geomorphological reports published to date, in sites such as Khok Phanom Di (Thompson, 1996), Ban Non Wat (Boyd, 2007, Boyd and Habberfield-Short, 2007, McGrath et al., 2008, Kanthilatha et al., 2017, Kanthilatha et al., 2014) or Noen U-Loke (Boyd, 2007, Boyd and Habberfield-Short, 2007), the groundwork for a consideration of a Resilience Theory in prehistoric Thailand, as applicable to each site and across the region more broadly is underway (Boyd and Chang, 2010).

Environmentally, in part, the effects of sea-level regression on a hunter-gatherer community from Georgia, USA, where a Resilience Theory approach was applied, mirrors that of Khok Phanom Di with significant ecological changes correlated with visible evidence for significant social change in the cemetery population (Thompson and Turck, 2009). Situated within an estuarine environment, and subject to risks associated with living in a dynamic ecosystem, there is some evidence to suggest the application of Resilience Theory (adaptive cycle) would be relevant to this site. Stratigraphic evidence reveals environmental changes, at least in part, being a catalyst for shifting social attitudes to identity (Higham et al., 1992). Like Noen U-Loke below, much of the cemetery sample at Khok Phanom Di falls

into MPs 2-4 where nucleated clustered burial spaces occur with minimal evidence (e.g., Khok Phanom Di B33 – subadult burial) for exclusion outside these zones. However, the shifting environmental setting (i.e., mangal to freshwater conditions) aligns with evidence of changing attitudes to identity with the correlation of some gendered burials exclusively associated with specific material types (e.g., males and turtle carapaces) as well as the introduction of exotic materials to the site (Higham et al., 1992, Higham, 1993a, Moore, 1993, Higham and Thosarat, 2004c). Isotopic (Bentley et al., 2007) and petrographic analyses (i.e., Ceramic Periods 1-3) (Vincent, 2003, Vincent, 2004) suggests the migratory influx of people and ideas into the site which likely influenced social memory and funerary practices. MP4 marks a shift towards the greater individualisation of burials and is seen as a transitional phase moving from tightly nucleated clusters towards the distinctly singular graves characteristic of MP5 where the environmental trajectory ameliorated briefly to resemble the mangal/coastal ecology, linked with the emerging drier interior landscape, of earlier phases. The two terminal mortuary phases (6 and 7) sees further alterations in funerary behaviour with the emergence of mortuary structures and, like Noen U-Loke, a division of wealth between two corporate groups when the landscape had turned brackish (Higham et al., 1992, Higham and Thosarat, 2004c).

Situated close to a broad floodplain, Noen U-Loke experienced significant environmental flux (Boyd and Habberfield-Short, 2007). This environmental volatility was recorded from a range of palynological and sedimentary data with the most pertinent response to these risks in non-mortuary contexts being in the form of moated features related to water management at increasingly arid, at risk, sites (O'Reilly, 2014). Similarly, during the long period of occupation at Ban Non Wat, palynological and sedimentary studies indicate similar behaviours taking place in relation to an increasingly precipitous environment requiring significant water management practices to ameliorate, or at least strategically navigate through, periods of increased environmental risk (Boyd and Habberfield-Short, 2007, Rispoli et al., 2013, O'Reilly, 2014, Duke et al., 2016). A series of structural changes in funerary practices are visible throughout the occupancy of Ban Non Wat, including: (1) the incipient flexed burials during the Neolithic, a period which sees the inclusion of young adults (n=two) deposited in jar burials; (2) an increased expression of individualisation and ostentatious wealth in the Bronze Age (specifically BA MP2); and (3) the identification of two broad funerary groups (i.e., northern and southern) in the Iron Age and including one phase, Iron Age MP2, predominantly occupied by subadult jar burials (Higham and Wiriyaromp, 2010a, Higham and Wiriyaromp, 2010b, Higham, 2012h, Higham, 2012e, Higham, 2012f, Higham, 2012b). The suggestion of a transegalitarian period at BA MP2 is underpinned by environmental risk where an inferred water shortage and social control through water management in generating and/or stabilising a surplus, and in some funerary contexts demonstrating power and wealth through largesse, is an important social driver which in turn influences attitudes towards identity (individual and corporate).

At Noen U-Loke, although many of the broad features of normative burial are present, studies have shown a variety of material artefacts, sometimes exotic, being added to funerary furniture and a 'wealth' discrepancy between the two major groups (i.e., eastern vs western) at the site (O'Reilly, 2000). Where mortuary phase one at Noen U-Loke comprises only a single burial, phases two through to four constitute clustered burial formations with a deviation from this behaviour occurring from the fourth phase (i.e., miscellaneous burials) and into the final, fifth, phase where inhumations are set out loosely, like other north-eastern sites, in rows (Higham and Thosarat, 2007f, Higham and Thosarat, 2007h, Higham and Thosarat, 2007a, Higham and Thosarat, 2007b, Higham and Thosarat, 2007c, Higham and Thosarat, 2007d, Higham and Thosarat, 2007e, Higham and Thosarat, 2007i, Higham and Thosarat, 2007g). The deviation in funerary behaviour, where some burials are excluded from interment in clustered zones suggests incipient social change in the community, with primarily subadults including the child with cerebral palsy being spatially isolated with respect to most of the burials in MP4. The miscellaneous

burials from MP4, before the expression of a new funerary strategy emerges at MP5, suggests some factor perhaps in correlation with environmental hardship, brought about either changing attitudes to those seven individuals (i.e., two adults; five subadults), or marks a shift in identity for the community more broadly.

In the limited scope of the sites reviewed, this research sought to briefly explore the potentiality of Resilience Theory as a means of understanding social development in Southeast Asia. The evidence suggests that environmental factors were likely influencing the social evolution and philosophical-religious and physical sustainability of each site as expressed through their funerary practices related to individual, group and collective identity. As with a Regionality Theory, this research would value add to future studies that focussed specifically on this social theory to further understand its applicability and relevance for social organisation and development in prehistoric Southeast Asia.

12.4 Summary

Two emerging social theories were explored as potential vehicles, or drivers, for providing new insight into the social development and organisation of communities across Southeast Asia. The consideration of a Regionality Theory, through a comparison between the Neolithic sites of Khok Phanom Di and Ban Non Wat, found sufficient differences through mortuary traditions at each site, despite evidence of potential contact/linkages between each community during this period, to suggest that regional variation, and its consequent variation in perceiving and treating individuals through the funerary process, was present. Similarly, a consideration of Resilience Theory in relation to funerary practices at Khok Phanom Di, Noen U-Loke and Ban Non Wat provides some evidence that environmental volatility may have been an important determinant in social behaviour and identity formations within each community. Further work, implementing the full range of characteristics identified as pertinent to each model, will be required to discover if either theoretical approach is relevant and applicable for the social evolution of populations throughout prehistoric Southeast Asia.

The final chapter will review the overarching objectives of this dissertation and conclude discussions on each in relation to findings of the research. The potential of age-identity, especially in relation to the elderly and the young, as an indicator of social change will be also be discussed.

13

Conclusion

The initial genesis for this research came from a realisation, most specifically regarding elderly actors but also the young, that an age-identity could have been a visible agent influencing social behaviour in prehistoric Thailand. In the context of very detailed and extensive publications of a suite of cemetery sites in ancient Thailand it became clear that a structured mortuary analysis of this material could provide insights into questions surrounding biosocial age, and to a lesser degree biosocial sex, in the region over time. Moreover, a focus on the elderly in ancient mainland Southeast Asia provided the opportunity to examine if there were singular perceptions, seen through funerary treatment, towards this particular group. The approach to include subadults in the analysis allowed consideration of an age-identity across the lifespan. Four sites, and the subsequent burials, covering the period from the Neolithic to the Iron Age (c. 2000BCE-CE400) from Central and North-eastern Thailand were examined.

The classification of age, in a biosocial sense, remains problematic due to the non-universal definition and understanding of this construct (Kamp, 2001, Lucy, 2005, Gilchrist, 2007, Crawford and Lewis, 2008, Gowland, 2009, Appleby, 2010). This dissertation adopted a complementary approach to age definitions of subadults, adults, including elderly cohorts, using bioarchaeological studies from Southeast Asia with subadults categorised as being aged at, or younger than, 14.9 years; younger adults aged at, or younger than, 39.9 years and the elderly as from 40 years of age. The threshold of the subadult and elderly categories reflects biological processes related to dentition and skeletal degeneration (Mays, 1998, Schmitt et al., 2002, Cattaneo, 2009, Nawrocki, 2010, Smith, 2010, Purves et al., 2011, Wood and Cunningham, 2011). This dissertation also explored sub-groups within the subadult and elderly adult age categories (see Section 5.2.1) to determine if specific age categories were exposed/denied access to, or afforded select, funerary treatment. This study took the position that individuals unable to be assigned an age-at-death, which included a large number from the Ban Non Wat sample, were excluded from the analysis.

The ascendancy of a gendered approach to archaeology, first with second-wave then third-wave approaches, was central to the growth of studies related to gender in prehistory (Gilchrist, 1999, Díaz-Andreu, 2005, Gilchrist, 2007, Geller, 2009). The initial focus of this new research centred on females (Spector, 1983, Conkey and Spector, 1984, Conkey and Gero, 1991) but was subsequently followed over time by other identities that also included studies related to subadults and the elderly (see Chapter Three) (Lillehammer, 1989, Sofaer Derevenski, 1994a, Welinder, 2001). A gendered approach to archaeology and its subsequent development and application of relevant theoretical models has been influential in elevating an awareness of the contribution and identity, including age-identity, of various groups in the past (e.g., Lillehammer, 1989, Lillehammer, 2000, Ardren, 2006, Lillehammer, 2008, Gowland, 2009, Gowland, 2017). While research focussed upon subadults has gained meaningfully significant momentum in recent decades in archaeological discourse (Lillehammer, 2015), including in Southeast Asia (Halcrow et al., 2008, Oxenham et al., 2008a, Oxenham et al., 2008b, Halcrow et al., 2012, Halcrow et al., 2016), the same cannot be stated in regards to the elderly (Ross and Oxenham, 2016).

The central focus of this research was to explore the age-identity of the young and old in Mainland Southeast Asia in order to understand differential attitudes, if visible, to each group over time. The focus of these primary age cohorts sought to explore if the collective social identity of each group was enhanced or diminished at their death. The analysis on a subject's social identity at their death was underscored by the most commonplace (normative) burial practices and considered if collective (age-group cohort) exposure to normative practices demonstrated a high degree of social recognition

and inclusion. An age-identity articulates with social memory and underlying value and belief systems related to death, meaning-making and corporate (group) resilience and sustainability, and is affected by living community members as well as being influenced by the agency of the deceased. An age-identity is underpinned, but not constituted solely of, the individual's biology as well as being influenced by cultural, social, ideological, and psychological factors within the context of a given population (Lucy, 2005, Knudson and Stojanowski, 2008, Torres-Rouff and Knudson, 2017).

Biological markers of age, sanctioned within a given population, and possibly affecting the identity status of the individual, could include the onset and transition through puberty; sexual maturity; reproductive cessation; menopause (as a process); or physical maturity and/or decline affecting productive functionality (Crews, 2003, Lucy, 2005, Crawford and Lewis, 2008, Gowland, 2009, Hazzard, 2009, Sowers, 2009, Appleby, 2010, Melby and Lampl, 2011, Appleby, 2017). Such biological changes could precipitate the inclusion or exclusion of actors within a range of social, ritual and cultural activities. Social age may be directly, or indirectly, linked to biological aspects of the individual. Social age is also influenced by socially defined (implicit and/or explicit) age barriers that impact on the individual's personhood status within the group (i.e. family, friends, community) and precipitate the commencement or conclusion of societal practices (Sofaer Derevenski, 1997b, Gilchrist, 1999, Kamp, 2001, Lucy, 2005, Fowler, 2012, Buch, 2015). For example, an elderly subject in contemporary Western society, invariably older than the subjects under review in archaeological contexts, may often be viewed and treated negatively (see Chapters One and Three) and/or burdensome. Such perceptions may manufacture a stereotype that supports and conforms to these preconceived stigmas in a youth-centric Western society (Gilleard, 2005, Victor, 2005, Carney and Gray, 2015). However, this socially projected viewpoint may not match up to how the elderly individual perceives of themselves in regards to their identity as they reflect, or build upon, their experiences and contribution to relationships and society (Kaufman and Elder Jr, 2002, Kaufman and Elder Jr, 2003, Mann, 2007, Powell and Gilbert, 2009, Carney and Gray, 2015).

The same viewpoint can be ascribed to perceptions of children where the self-realisation of the individual may transcend, through their experiential engagement with their social setting, the strictures, and expectations of the social body (Lillehammer, 1989, Sofaer Derevenski, 1994a, Lillehammer, 2000, Baxter, 2005, Baxter, 2008, Montgomery, 2009). Underscoring the effects of biosocial age identifiers is that societal attitudes towards age themselves are not fixed and the perceptions and behavioural expectations to an individual based on their age is likely changing over time due to a range of evolving factors (i.e., economic, migratory, technological, ritual, and cultural). Regarding the elderly we can see, dependent on the cultural context, that demographic trends indicate significant decreases in infant mortality and increased longevity (Harper, 2006, Vaupel, 2010, Leeson, 2015, Pakulski, 2016). Consequent impacts following these demographic shifts, interacting with a range of evolving social, economic and familial parameters, have included changing attitudes, largely negative from a Western perspective, in relation to this cohort (Jensen and Oakley, 1982-83, Johnson, 2005, Lucy, 2005, Appleby, 2010, Liechty and Yarnal, 2010, Fealy et al., 2012). Chapter Three noted, in a similar vein, evidence for changing attitudes towards, and perceptions of, childhood through history (Ariès, 1962, Heywood, 2001, Bakke, 2005, Baxter, 2005).

The opportunity to explore individuals defined in an archaeological context of being at either a young or an advanced age provides a platform to gain a holistic understanding on the organisation of ancient populations. Where proven regarding the elderly, such an approach rejects outright the assumption that the perception and attitudes towards ageing was experienced similarly, even at death, once the threshold of an adult personhood status was attained. Instead, the approach taken here, while open to the potential age-identity of all actors from aggregated factions, looks to identify additional layers of social complexity through funerary customs. To observe, and suggest, those individuals of advanced, or younger, age were perceived and treated differently at least from the point of death. Given the results found here it is hoped that future practitioners would extend their own investigations to include a

meaningful consideration of the elderly cohort, in addition to other age-identities currently included, to obtain a deeper insight into the overarching social development of a population/region within, and through, time. While identity studies, under optimal conditions, would focus upon many social constructs to avoid the risk of bias and the idealisation of a select characteristic, in this case age, the lack of research focussed on the elderly in prehistory, both at a regional and global level, in archaeological discourse renders such an approach, even as an initial step undertaken here, necessary. Future research may have the scope to factor other aspects of identity, beyond sex and age, in a Southeast Asian context to obtain a deeper understanding of the identities of the peoples that occupied this region in prehistory.

The trajectory of funerary practices is relatively different between the sites reviewed where an age-identity was explored. There was considerable evolution of social behaviour, as seen through mortuary practices, within and across the sites reviewed. In Central Thailand long periods of occupation at the Neolithic site of Khok Phanom Di or the Bronze Age site of Nong Nor end abruptly after several centuries. In the northeast different patterns of occupation and development is seen with some sites (Ban Lum Khao) surviving briefly over a few centuries. Ban Non Wat the site was occupied across the Neolithic to the Iron Age and experienced significant social flux observed through evolving funerary traditions. In a non-linear fashion, communities that commenced in relatively egalitarian and heterarchical social frameworks in the Neolithic and Bronze Ages moved towards greater hierarchy and social inequality in the Iron Age. Interspersed within these periods was evidence of social experimentation for some community members, through public displays of power, wealth, and largesse, to promote some aspect of their social identity. This is seen most prominently in the Bronze Age at Ban Non Wat but this dissertation would encourage further study related to transegalitarianism at Khok Phanom Di, for example, where similarly individualised and wealthy burials, occurring concurrently with the Neolithic at Ban Non Wat, are present. Two social theories were discussed that may help explain drivers of social change in Southeast Asia. The first, Regionality Theory, indicates that funerary practices in Central Thailand differ markedly from that at Ban Non Wat in the northeast indicating that regional variation, despite some tentative links being present between both sites (Higham, 2004f, Sarjeant, 2010, Rispoli et al., 2013, Oxenham et al., 2015), in relation to age-identity was present. Further, environmental factors, through Resilience Theory, were also explored as potential factors to explore visible signs of alterations in identity, as presented through a funerary act in both regions reviewed. Future work is encouraged in relation to each social theory to determine its relevance and applicability to understanding social complexity and development in Southeast Asia.

The objectives of the research were developed to explore differential attitudes and behaviour towards the young and old at each site. The data presented and discussed here demonstrates that the elderly in particular, at least from the sites reviewed here, were frequently afforded either comparative, or elevated, status to/with other younger adults from the time of their death. Although heterogeneous, the analysis supports the view that age was a defining characteristic in the expression and performance of philosophical-religious beliefs at each community with further evidence that attitudes and practices on individual age-identity cohorts fluctuated, sometimes quite dramatically, from the Neolithic through to the Iron Age. The evidence, especially where elderly subjects are concerned suggests this cohort, at least at their death, were given selectively preferential treatment and that their extreme, or advancing, age was a significant social factor in relation to their mortuary treatment. While a transitional age for elderly subjects, adults generally in truth, was difficult to assess the evidence suggests, most specifically in regard to foetal, perinatal or neonatal infants, that a transitional age after one year of life afforded the individual differential personhood status with mortuary behaviour, more greatly in alignment with the adult cohorts, being visible from this point onwards.

While theoretical development of new approaches, such as the bioarchaeology of care (Tilley, 2015, Tilley and Oxenham, 2011, Tilley and Oxenham, 2016, Vlok et al., 2017), enables greater scrutiny of

individual subjects and, through inference, their identity through the care they receive within their social context, the majority of identity studies in archaeology investigate broader cohorts, as a whole, to extrapolate and infer how specific groups (i.e. gender groups, ethnic groups, age groups etc.) were perceived and treated at death (e.g. Sofaer Derevenski, 1994a, Gillespie, 2001, Fowler, 2004, De Lucia, 2008, Appleby, 2010, Bolger, 2013, Fahlander, 2013, Gowland, 2017). Limitations, and the risks associated, with such approaches are frequently discussed in archaeological discourse and are equally relevant to the mortuary analysis undertaken here. For instance, the transformed, often idealised, construction of the funerary environment, and the deceased within, may be non-representative of the actual individual and therefore provide misleading evidence of the subject and, more broadly, the under arching social mechanics at play.

It is also recognised that the individual subject, as a unit of interest and discourse, may risk being lost, or misrepresented, following the aggregation of population-level data (Fahlander, 2013). To some degree this is visible here where, in some instances, there is little differentiation between elderly and younger adult cohorts in association with a variety of mortuary variables. This may indicate that, where this occurs, a common adulthood personhood status may be more meaningful than a social structure that places greater significance on increasing age. The same potentially misrepresentative risk could also be considered to apply where the heuristic aggregation of data occurs, under the rubric of the Neolithic, Bronze or Iron Ages in Southeast Asia, despite there being no universal uptake or corroborating moment where technologies, ideologies and behaviours identified with each period were adopted (Shoocongdej, 2015, White, 2017). Similarly, the aggregation of population units into discrete bioarchaeologically defined age categories may also be problematic, misleading and limiting in relation to the community under review. Even if pertinent, the analysis of a collective identity also risks subsuming those discrete individuals, potentially acting outside prescribed normative behaviour, that catalyse change, subtly or dramatically, into the social body.

Research focussed on subadults has been ongoing for three decades now and continues, through the application of increasingly sophisticated methodological and theoretical narratives, to provide greater insight on issues related to this group. It is the view here however, where an age-identity is concerned, that research related to elderly cohorts is the most pressing with evidence suggesting this cohort may suffer, in part, from intrinsic, largely negative, cultural perceptions that are pervasive in public rhetoric and methodological barriers extant in archaeological practice. From an archaeological perspective, at least in the confines of existing methodological constraints, the elderly that is subjected to bias in contemporary discourse bears little relevance, either at a social (functional), psychological or physiological (degenerative) level, to the subject group at hand which, in our own context, is still aged from approximately their fourth decade rather than, twice that, in their seventies or eighties. Consequently, not only are potential biases misguided but they also fail to see the potentiality of this cohort for providing a deeper understanding of social complexity in the past and ameliorate any biases or shortcomings in emerging research streams. A recent upsurge in studies that seek to engage with, or refine existing, methodological age-at-death barriers, such as that adopted here, is encouraging and be applicable to the development of social theories related to ageing and social organisation, palaeodemography and palaeohealth. The adoption and application of these new methodologies in future research would be invaluable through the testing and refinement of each method to further bioarchaeological knowledge and expand the disciplines engagement with an under-explored cohort; the elderly.

This research has fulfilled its objectives in providing a detailed analysis, and an extensive discussion of, the age-identity of subadults and the elderly in two regions, Central and Northeastern Thailand, spanning the Neolithic to Iron Age. This dissertation has provided a detailed discussion and interpretation of data extrapolated from mortuary information at an inter-site, as well as temporal, level. Each site

has demonstrated, to varying degrees, that age was an important factor in the population's social development with considerable heterogeneity visible over time. Where funerary treatment of children contrasts, sometimes significantly, with adults the evidence has also shown that the elderly cohort, as defined here, was invariably exposed to select funerary practices which suggest, for both cohorts, that the age-identity of each group affected their status at death. This research provides insight, most significantly in relation to the elderly, into our knowledge of social complexity in Mainland Southeast Asia that, it is hoped, may be applicable in the extension of related work in other regions and periods.

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Appendix 1: Reallocated Adult Age Categories

Site	Burial Number	Original Age Range	Wear Score Average	New Age Range
KPD	8	15-19.9yrs	3.17	15-19.9yrs
	92	15-19.9yrs	3.19	
	117	15-19.9yrs	3.25	
	64	20-29.9yrs	3.31	
	140	15-19.9yrs	3.5	
	36	20-29.9yrs	3.5	
	44	15-19.9yrs	3.5	
BLK	49	20-29.9yrs	3.38	
	25	15-19.9yrs	3.46	
NUL	61	20-29.9yrs	3.25	
	4	15-19.9yrs	3.33	
KPD	147	15.19-9yrs	3.72	20-29.9yrs
	22	20-29.9yrs	3.72	
	35	20-29.9yrs	3.75	
	60	15.19-9yrs	3.75	
	73	20-29.9yrs	3.75	
	13	30-39.9yrs	3.83	
	19	20-29.9yrs	3.94	
	103	20-29.9yrs	3.95	
	112	40-49.9yrs	4	
	57	20-29.9yrs	4	
	120	20-29.9yrs	4.19	
BLK	27	15.19-9yrs	3.9	
	10	40-49.9yrs	4.13	
	61	15.19-9yrs	4.18	
	79	20-29.9yrs	4.32	
	46	20-29.9yrs	4.39	
	82	20-29.9yrs	4.43	
	19	20-29.9yrs	4.53	
	39	20-29.9yrs	4.66	
	33	20-29.9yrs	5	

APPENDIX 1: REALLOCATED ADULT AGE CATEGORIES

Site	Burial Number	Original Age Range	Wear Score Average	New Age Range
	42	20-29.9yrs	5	
NUL	5	20-29.9yrs	3.5	
	74	20-29.9yrs	3.5	
	40	20-29.9yrs	3.63	
	50	20-29.9yrs	3.75	
	67	20-29.9yrs	4.3	
	68	20-29.9yrs	4.31	
	69	20-29.9yrs	4.58	
	33	20-29.9yrs	4.6	
KPD	86	20-29.9yrs	4.25	30-39.9yrs
	24	20-29.9yrs	4.33	
	94	30-39.9yrs	4.5	
	25	15-19.9yrs	4.56	
	83	30-39.9yrs	4.67	
	79	40-49.9yrs	4.75	
	109	30-39.9yrs	4.88	
BLK	17	20-29.9yrs	5.08	
	52	20-29.9yrs	5.14	
	71	20-29.9yrs	5.16	
	67	20-29.9yrs	5.33	
	30	30-39.9yrs	5.45	
	51	20-29.9yrs	5.75	
	77	20-29.9yrs	5.92	
	109	20-29.9yrs	6	
NUL	44	20-29.9yrs	4.67	
	60	20-29.9yrs	4.75	
	48	20-29.9yrs	5	
	36	20-29.9yrs	5.09	
	30	20-29.9yrs	5.13	
	59	20-29.9yrs	5.25	
KPD	87	20-29.9yrs	4.92	40-49.9yrs
	76	30-39.9yrs	5	
	90	20-29.9yrs	5	
	102	30-39.9yrs	5.13	
	142	30-39.9yrs	5.25	

KENNETH WILLIAM ROSS

Site	Burial Number	Original Age Range	Wear Score Average	New Age Range
	30	30-39.9yrs	5.25	
BLK	28	30-39.9yrs	6.6	
	44	30-39.9yrs	6.63	
	59	30-39.9yrs	6.63	
	48	40-49.9yrs	7	
	57	30-39.9yrs	7	
NUL	15	30-39.9yrs	5.4	
	62	30-39.9yrs	5.58	
	8	20-29.9yrs	5.67	
	27	30-39.9yrs	5.88	
KPD	39	20-29.9yrs	5.31	50-59.9yrs
	31	20-29.9yrs	5.38	
	77	20-29.9yrs	5.38	
	47	20-29.9yrs	5.42	
	129	20-29.9yrs	5.5	
	4	20-29.9yrs	5.5	
	131	20-29.9yrs	5.63	
	72	30-39.9yrs	5.88	
BLK	64	40-49.9yrs	7	
	98	30-39.9yrs	7.13	
	94	30-39.9yrs	7.16	
NUL	12	40-49.9yrs	6.19	
	1	30-39.9yrs	6.32	
	26	20-29.9yrs	6.66	
KPD	132	30-39.9yrs	6	60-69.9yrs
	58	30-39.9yrs	6	
	74	40-49.9yrs	6	
	100	30-39.9yrs	6.44	
	40	30-39.9yrs	6.5	
BLK	86	40-49.9yrs	7.25	
	7	40-49.9yrs	7.5	
NUL	37	40-49.9yrs	6.95	
	42	40-49.9yrs	7.13	
KPD	42	30-39.9yrs	7	70+yrs
	26	30-39.9yrs	7.25	

APPENDIX 1: REALLOCATED ADULT AGE CATEGORIES

Site	Burial Number	Original Age Range	Wear Score Average	New Age Range
	28	20-29.9yrs	7.5	
	115	30-39.9yrs	8.19	
BLK	93	40-49.9yrs	7.56	
	89	30-39.9yrs	7.69	
	21	30-39.9yrs	8.35	
	65	40-49.9yrs	9.63	
NUL	66	30-39.9yrs	7.5	
	49	30-39.9yrs	9	
	35	30-39.9yrs	9.06	
KPD - Khok Phanom Di				
BLK - Ban Lum Khao				
NUL - Noen U-Loke				

Appendix 2: Funerary Variable Descriptions

The following burial variable comprise the types, and descriptions, of information considered in association with each individual from each site under review. Unknown variable types in association with burials and material culture deposited in grave fill were captured in preliminary reviews of data but excluded from further analysis due to lack of clarity in relation to material type and/or provenance.

While other data types are likely to be associated with burial variable descriptors this research has limited the inclusion of variable types, where appropriate, to categories identified from each of the four sites under review.

Khok Phanom Di (KPD); Ban Non Wat (BNW); Ban Lum Khao (BLK); Noen U-Loke (NUL)

APPENDIX 2: FUNERARY VARIABLE DESCRIPTIONS

Burial of Human Remains

Primary Burial – Yes / No
 Secondary Burial – Yes / No
 Secondary Burial Process

1. Exposure and Jar Burial
2. Exposure and Bundled Burial
3. Exposure and Platform Burial

Single Burial – Yes / No
 Multiple Burial – Yes / No
 Multiple Burial Style

1. Double – Male adult/subadult
2. Double – Adult of same sex and age category
3. Multiple – 3-6 burials
4. Double – Female adult/subadult
5. Double – Adult of same sex but different age category
6. Double – Adult of same age but different sex category
7. Double – Adult of unknown age/male
8. Double – Adult of different age and sex category
9. Double – subadults of different age category
10. Double – Adult of unknown age/female
11. Double – subadult of same age category
12. Double – Adults of unknown age category
13. Double – Adult of unknown age/subadult

Multiple Burial Position

1. Unknown burial position
2. Supine burials with a burial directly above
3. Adjacent in supine position
4. Positioned head-to-toe
5. Both burials bundled/wrapped
6. Jar burial included
7. Both burials flexed/semi-flexed
8. A burial directly above with one supine and one prone

Burial Deposition

1. Supine
2. Seated/Sitting
3. Prone
4. Deposited on left side

Burial Position

1. Extended
2. Semi-flexed
3. Flexed (135-180°)
4. Unknown

Skull Position

1. Anatomical
2. Anterior and to right of midline
3. Anterior and to left of midline
4. Inferior and towards trunk
5. Unknown

Arms/Hand Position

1. Anatomical
2. On/under pelvis
3. At sternum/abdomen
4. Unknown

Feet Position

1. Anatomical
2. Feet crossed
3. Unknown

Orientation

1. 0/360°
2. 90°
3. 180°
4. 270°
5. 1-45°
6. 46-89°
7. 91-135°
8. 136-179°
9. 181-225°
10. 226-269°
11. 271-315°
12. 316-359°
13. Unknown

Body Preparation

1. Painting/Ochre
2. Bundled
3. Wrapping
4. Unknown

Ochre Present – Yes / No

Ochre Application

1. Entire body
2. Skull only
3. Partial coverage (upper body only)
4. Partial coverage (lower body only)
5. Grave fill
6. Associated directly with another artefact
7. Unknown
8. At, near or under skull
9. At, near or under trunk/torso
10. At, near or under arms
11. At, near or under pelvis
12. At, near or under hand
13. At, near or under legs
14. At, near or under feet

Wrapping Present – Yes / No

Wrapping Material

1. Bark cloth/tapa
2. Cloth/Fabric
3. Bamboo
4. Unknown

Ablation – Yes / No

Extra Clay Present – Yes / No

Extra Clay Colour

1. Grey
2. Red
3. Orange
4. Unknown

Extra Clay Position

1. Fill
2. Associated directly with another artefact
3. Unknown
4. At, near or under skull
5. At, near or under trunk/torso
6. At, near or under arms
7. At, near or under pelvis
8. At, near or under hands
9. At, near or under legs
10. At, near or under feet

Field Anthropology Considerations

Individual Assessable – Yes / No

Graphic/Image observations (taken from Harris and Tayles, 2012: 232)

1. Pelvis disarticulated or lateral fall of patellae
2. Constriction observable
3. Have one or both patellae fallen medially between the lower limbs
4. Does the constriction conform to the body shape
5. Are one or both patellae articulated in an unstable position on the medial aspect of the lower limb
6. Is the *effet de parois* (wall effect) box shaped
7. evidence of grave cut outside constriction

Potential Burial Behaviour

1. wide coffin
2. tight durable wrapping
3. loose non-durable wrapping
4. tight durable wrapping or narrow coffin
5. narrow coffin
6. tight non-durable wrapping
7. loose non-durable wrapping or tight non-durable wrapping
8. tight non-durable wrapping, tight durable wrapping or narrow coffin
9. loose non-durable wrapping, tight non-durable wrapping, tight durable wrapping or narrow coffin

Multiple Burial Initial/Deepest Orientation

Characteristics of Grave Layout

Jar Burial – Yes / No

Rice Burial – Yes / No

Disposal Container Present – Yes / No

Disposal Container Description

1. Animal hide
2. Jar burial
3. Fibrous shroud
4. Wood coffin
5. Clay coffin
6. Mortuary structure/platform
7. Unknown

APPENDIX 2: FUNERARY VARIABLE DESCRIPTIONS

Grave Depth

1. Shallow (0-25cm)
2. Moderate (26-50cm)
3. Deep (51+cm)
4. Unknown

Fire/Hearth/Pit Present – Yes / No

Fire/Hearth/Pit Remains

1. Pit
2. Shell midden
3. Fire/Hearth
4. Animal hide

Fire/Hearth/Pit Position

1. 0/360°
2. 90°
3. 180°
4. 270°
5. 1-45°
6. 46-89°
7. 91-135°
8. 136-179°
9. 181-225°
10. 226-269°
11. 271-315°
12. 316-359°
13. Unknown

Faunal Remains

Fauna Present – Yes / No

Faunal Element

1. Hindlimb
2. Forelimb
3. Valve
4. Dentition
5. Animal skull only
6. Whole of Animal
7. Other element (e.g. scapula, carapace etc.)
8. Antler/Horn
9. Gastropod

Fauna Burial Position

1. Fill
2. Associated directly with another artefact
3. Unknown

4. At, near or under skull
5. At, near or under trunk/torso
6. At, near or under arms
7. At, near or under pelvis
8. At, near or under hands
9. At, near or under legs
10. At, near or under feet

Pig Present – Yes / No

Pig Position

1. Fill
2. Associated directly with another artefact
3. Unknown
4. At, near or under skull
5. At, near or under trunk/torso
6. At, near or under arms
7. At, near or under pelvis
8. At, near or under hands
9. At, near or under legs
10. At, near or under feet

Unionidae Present – Yes / No

Unionidae Position

1. Fill
2. Associated directly with another artefact
3. Unknown
4. At, near or under skull
5. At, near or under trunk/torso
6. At, near or under arms
7. At, near or under pelvis
8. At, near or under hands
9. At, near or under legs
10. At, near or under feet

Bovid Present – Yes / No

Bovid Position

1. Fill
2. Associated directly with another artefact
3. Unknown
4. At, near or under skull
5. At, near or under trunk/torso
6. At, near or under arms
7. At, near or under pelvis
8. At, near or under hands
9. At, near or under legs
10. At, near or under feet

Cervid Present – Yes / No

Cervid Position

1. Fill
2. Associated directly with another artefact
3. Unknown
4. At, near or under skull
5. At, near or under trunk/torso
6. At, near or under arms
7. At, near or under pelvis
8. At, near or under hands
9. At, near or under legs
10. At, near or under feet

Fish Present – Yes / No

Fish Taxon

1. *Channa* sp.
2. *Clarias* sp.
3. *Monopterus* sp.
4. *Wallagonia*/*Mystus* sp.
5. *Anabas* sp.
6. *Hemibagrus* sp.

Fish Position

1. Fill
2. Associated directly with another artefact
3. Unknown
4. At, near or under skull
5. At, near or under trunk/torso
6. At, near or under arms
7. At, near or under pelvis
8. At, near or under hands
9. At, near or under legs
10. At, near or under feet

Dog Present – Yes / No

Material Culture

Grave Good Present – Yes / No

Ceramic Good Present – Yes / No

Ceramic Type Present (BLK; BNW and NUL only – assessment of forms taken from Sarjeant 2010 and Barribeau 2011)

1. Bowl (simple unrestricted vessel)
2. Pedestalled bowl (simple unrestricted vessel with pedestal)

3. Bowl (simple unrestricted vessel with lip and ridge)
4. Bowl (Simple unrestricted vessel with inverted rim and pedestal)
5. Bowl (Phimai Black simple unrestricted vessel)
6. Jar (Restricted vessel with everted rim, oval body and cord-marking)
7. Jar (Restricted vessel with everted rim, oval body and carination)
8. Jar (Restricted vessel with everted rim, oval body, carination, cord-marking)
9. Jar (Restricted vessel with everted rim, oval body, carination, and pedestal)
10. Jar (Restricted vessel with large everted rim and oval body)
11. Jar (Restricted vessel with large everted rim, oval body and cord-marking)
12. Jar (Restricted vessel with large everted rim, oval body and pedestal)
13. Jar (Restricted vessel with large everted rim, oval body, cord-marking, and pedestal)
14. Jar (Restricted vessel with large everted rim, oval body, lugs, and pedestal)
15. Jar (Small restricted vessel with everted rim)
16. Jar (Restricted vessel with everted rim, oval body and flat base)
17. Jar (Restricted vessel with everted rim, round body and cord-marking)
18. Jar (Restricted vessel, everted rim, round body, carination, and cord-marking)
19. Jar (Restricted vessel with large everted rim, round body, carination, and cord-marking)
20. Jar (Restricted vessel with everted rim, flat lip, vertical neck, round body, and cord-marking)
21. Jar (Restricted egg-shaped burial vessel)
22. Unknown type
23. Platter (simple unrestricted vessel with pedestal)
24. Urn (restricted vessel with everted rim, square body)
25. Pellet
26. Spindle Whorl
27. Clay Jewellery (e.g. ring, bracelet)
28. Clay tube
29. Anvil
30. Clay roller

APPENDIX 2: FUNERARY VARIABLE DESCRIPTIONS

31. Mould	4. At, near or under skull
32. Unique Vessel	5. At, near or under trunk/torso
33. Lid (frequently associated with mortuary vessels)	6. At, near or under arms
34. Basin	7. At, near or under pelvis
35. Pedestalled Urn (restricted vessel with everted rim, square body)	8. At, near or under hands
	9. At, near or under legs
	10. At, near or under feet
Ceramic Type Present (KPD only – taken from Vincent 2004)	Ceramic Decoration Present – Yes / No
	Ceramic Decoration Style
1. Bowl 1a	1. Slipped
2. Bowl 1b	2. Cord-marked
3. Bowl 1c	3. Incised
4. Bowl 1d	4. Impressed
5. Bowl 1e	5. Holes present (e.g. suspension, ventilation etc.)
6. Bowl 1f	6. Painted
7. Bowl 1g	7. Burnished
8. Bowl 1h	
9. Bowl 1i	
10. Jar 2a	Whorl Present – Yes / No
11. Jar 2b	Clay Pellet Present – Yes / No
12. Jar 2c	Anvil Present – Yes / No
13. Jar 2d	Conical Roller Present – Yes / No
14. Jar 2e	Bronze Present – Yes / No
15. Jar 2f	Bronze Type Present
16. Jar 2g	1. Bronze Tools
17. Jar 2h	2. Bronze Jewellery
18. Jar 2i	3. Bronze Weapons
19. Jar 2j	4. Bronze Fragments (e.g. slag etc.)
20. Platter 3a	5. Other bronze object
21. Platter 3b	6. Unknown bronze
22. Platter 3c	
23. Platter 3d	Bronze Frequency
24. Platter 3e	Low (1-5 pieces)
25. Unique shaped vessel	Moderate (6-10 pieces)
26. Egg shaped vessel	High (11-15 pieces)
	Very High (16+ pieces)
Ceramic Frequency	Bronze Position
1. Low (1-5 pieces)	1. Fill
2. Moderate (6-10 pieces)	2. Associated directly with another artefact
3. High (11-15 pieces)	3. Unknown
4. Very High (16+ pieces)	4. At, near or under skull
Ceramic Burial Position	5. At, near or under trunk/torso
1. Fill	6. At, near or under arms
2. Associated directly with another artefact	7. At, near or under pelvis
3. Unknown	8. At, near or under hands
	9. At, near or under legs

10. At, near or under feet

Iron Present – Yes / No

Iron Type Present

1. Iron Tools
2. Iron Jewellery
3. Iron Weapons
4. Iron Fragments (e.g. slag etc.)
5. Other iron object
6. Unknown iron

Iron Frequency

1. Low (1-5 pieces)
2. Moderate (6-10 pieces)
3. High (11-15 pieces)
4. Very High (16+ pieces)

Iron Position

1. Fill
2. Associated directly with another artefact
3. Unknown
4. At, near or under skull
5. At, near or under trunk/torso
6. At, near or under arms
7. At, near or under pelvis
8. At, near or under hands
9. At, near or under legs
10. At, near or under feet

Shell Present – Yes / No

Shell Type Present

1. Shell Tools
2. Shell Jewellery
3. Worked shell
4. Other shell object
5. Unknown shell object

Shell Frequency

1. Low (1-500 pieces)
2. Moderate (501-1000 pieces)
3. High (1001-1500 pieces)
4. Very High (1501+ pieces)

Shell Position

1. Fill

2. Associated directly with another artefact

3. Unknown

4. At, near or under skull

5. At, near or under trunk/torso

6. At, near or under arms

7. At, near or under pelvis

8. At, near or under hands

9. At, near or under legs

10. At, near or under feet

Shell Bead Present – Yes / No

Shell Bead Type Present

1. Shell bead necklace
2. Shell bead belt
3. Shell bead garment
4. Shell bead shroud/veil
5. Loose shell beads

Shell Bead Frequency

1. Low (1-500 pieces)
2. Moderate (501-1000 pieces)
3. High (1001-1500 pieces)
4. Very High (1501+ pieces)

Shell Bead Position

1. Fill
2. Associated directly with another artefact
3. Unknown
4. At, near or under skull
5. At, near or under trunk/torso
6. At, near or under arms
7. At, near or under pelvis
8. At, near or under hands
9. At, near or under legs
10. At, near or under feet

Shell Bangle Present – Yes / No

Shell Bangle Material

1. *Tridacna* sp.
2. *Conus* sp.
3. *Trochus* sp.
4. Other shell material
5. Unknown shell

Shell Bangle Frequency

1. Low (1-5 pieces)

APPENDIX 2: FUNERARY VARIABLE DESCRIPTIONS

2. Moderate (6-10 pieces)
3. High (11-15 pieces)
4. Very High (16+ pieces)

Shell Bangle Position

1. Fill
2. Associated directly with another artefact
3. Unknown
4. At, near or under skull
5. At, near or under trunk/torso
6. At, near or under arms
7. At, near or under pelvis
8. At, near or under hands
9. At, near or under legs
10. At, near or under feet

Stone Present – Yes / No

Stone Type Present

1. Stone Jewellery
2. Unworked stone object
3. Worked stone (e.g. crucible, adze etc.)
4. Unknown stone object

Stone Frequency

1. Low (1-5 pieces)
2. Moderate (6-10 pieces)
3. High (11-15 pieces)
4. Very High (16+ pieces)

Stone Position

1. Fill
2. Associated directly with another artefact
3. Unknown
4. At, near or under skull
5. At, near or under trunk/torso
6. At, near or under arms
7. At, near or under pelvis
8. At, near or under hands
9. At, near or under legs
10. At, near or under feet

Agate Present – Yes / No

Agate Frequency

1. Low (1-5 pieces)
2. Moderate (6-10 pieces)
3. High (11-15 pieces)

4. Very High (16+ pieces)

Agate Position

5. Fill
6. Associated directly with another artefact
7. Unknown
8. At, near or under skull
9. At, near or under trunk/torso
10. At, near or under arms
11. At, near or under pelvis
12. At, near or under hands
13. At, near or under legs
14. At, near or under feet

Carnelian Present – Yes / No

Carnelian Frequency

1. Low (1-5 pieces)
2. Moderate (6-10 pieces)
3. High (11-15 pieces)
4. Very High (16+ pieces)

Carnelian Position

1. Fill
2. Associated directly with another artefact
3. Unknown
4. At, near or under skull
5. At, near or under trunk/torso
6. At, near or under arms
7. At, near or under pelvis
8. At, near or under hands
9. At, near or under legs
10. At, near or under feet

Stone Bangle Present – Yes / No

Stone Bangle Frequency

1. Low (1-5 pieces)
2. Moderate (6-10 pieces)
3. High (11-15 pieces)
4. Very High (16+ pieces)

Stone Bangle Position

1. Fill
2. Associated directly with another artefact
3. Unknown
4. At, near or under skull
5. At, near or under trunk/torso

6. At, near or under arms
7. At, near or under pelvis
8. At, near or under hands
9. At, near or under legs
10. At, near or under feet

Glass Bead Present – Yes / No

Glass Bead Frequency

1. Low (1-5 pieces)
2. Moderate (6-10 pieces)
3. High (11-15 pieces)
4. Very High (16+ pieces)

Glass Bead Position

1. Fill
2. Associated directly with another artefact
3. Unknown
4. At, near or under skull
5. At, near or under trunk/torso
6. At, near or under arms
7. At, near or under pelvis
8. At, near or under hands
9. At, near or under legs
10. At, near or under feet

Bone/Tooth Present – Yes / No

Bone/Tooth Type Present

1. Bone/Tooth Tool
2. Bone/Tooth Weapon
3. Bone/Tooth Jewellery
4. Bone/Tooth Figurine
5. Unworked Bone/Tooth
6. Unknown Bone/Tooth object

Bone/Tooth Frequency

1. Low (1-5 pieces)
2. Moderate (6-10 pieces)
3. High (11-15 pieces)
4. Very High (16+ pieces)

Bone/Tooth Position

1. Fill
2. Associated directly with another artefact
3. Unknown
4. At, near or under skull
5. At, near or under trunk/torso
6. At, near or under arms
7. At, near or under pelvis
8. At, near or under hands
9. At, near or under legs
10. At, near or under feet

Appendix 3: Burials by site including those excluded from analysis

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
Khok Phanom Di	KPDB1	5-9.9 yrs	subadult	Y
	KPDB10	1-4.9 yrs	subadult	Y
	KPDB100	60-69.9 yrs	male	Y
	KPDB101	1-4.9 yrs	subadult	Y
	KPDB102	40-49.9 yrs	female	Y
	KPDB103	20-29.9 yrs	male	Y
	KPDB104	0-0.9 yrs	subadult	Y
	KPDB105	0-0.9 yrs	subadult	Y
	KPDB106	0-0.9 yrs	subadult	Y
	KPDB107	40-49.9 yrs	female	Y
	KPDB108	0-0.9 yrs	subadult	Y
	KPDB109	30-39.9 yrs	female	Y
	KPDB11	10-14.9 yrs	subadult	Y
	KPDB110	30-39.9 yrs	female	Y
	KPDB111	0-0.9 yrs	subadult	Y
	KPDB112	20-29.9 yrs	female	Y
	KPDB113	40-49.9 yrs	female	Y
	KPDB114	0-0.9 yrs	subadult	Y
	KPDB115	70+ yrs	male	Y
	KPDB116	0-0.9 yrs	subadult	Y
	KPDB117	15-19.9 yrs	male	Y
	KPDB118	0-0.9 yrs	subadult	Y
	KPDB119	0-0.9 yrs	subadult	Y
	KPDB12.1	10-14.9 yrs	subadult	Y
	KPDB12.2	5-9.9 yrs	subadult	Y
	KPDB120	20-29.9 yrs	male	Y
	KPDB121	1-4.9 yrs	subadult	Y
	KPDB122	50-59.9 yrs	female	Y
	KPDB123	1-4.9 yrs	subadult	Y
	KPDB124	0-0.9 yrs	subadult	Y
	KPDB125	0-0.9 yrs	subadult	Y

KENNETH WILLIAM ROSS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	KPDB126	0-0.9 yrs	subadult	Y
	KPDB127	0-0.9 yrs	subadult	Y
	KPDB128	0-0.9 yrs	subadult	Y
	KPDB129	50-59.9 yrs	male	Y
	KPDB13	20-29.9 yrs	female	Y
	KPDB130	0-0.9 yrs	subadult	Y
	KPDB131	50-59.9 yrs	male	Y
	KPDB132	60-69.9 yrs	male	Y
	KPDB133	0-0.9 yrs	subadult	Y
	KPDB134	0-0.9 yrs	subadult	Y
	KPDB135	0-0.9 yrs	subadult	Y
	KPDB136	0-0.9 yrs	subadult	Y
	KPDB137	5-9.9 yrs	subadult	Y
	KPDB138	0-0.9 yrs	subadult	Y
	KPDB139	0-0.9 yrs	subadult	Y
	KPDB14	1-4.9 yrs	subadult	Y
	KPDB140	15-19.9 yrs	female	Y
	KPDB141	0-0.9 yrs	subadult	Y
	KPDB142	40-49.9 yrs	female	Y
	KPDB143	0-0.9 yrs	subadult	Y
	KPDB144	0-0.9 yrs	subadult	Y
	KPDB145	5-9.9 yrs	subadult	Y
	KPDB146	0-0.9 yrs	subadult	Y
	KPDB147	20-29.9 yrs	male	Y
	KPDB15	30-39.9 yrs	female	Y
	KPDB150	1-4.9 yrs	subadult	Y
	KPDB151	0-0.9 yrs	subadult	Y
	KPDB152	30-39.9 yrs	male	Y
	KPDB153	0-0.9 yrs	subadult	Y
	KPDB154	20-29.9 yrs	female	Y
	KPDB16	1-4.9 yrs	subadult	Y
	KPDB17	10-14.9 yrs	subadult	Y
	KPDB18	40-49.9 yrs	female	Y
	KPDB19	20-29.9 yrs	female	Y
	KPDB2	0-0.9 yrs	subadult	Y

APPENDIX 3: BURIALS BY SITE INCLUDING THOSE EXCLUDED FROM ANALYSIS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	KPDB20	10-14.9 yrs	subadult	Y
	KPDB21	5-9.9 yrs	subadult	Y
	KPDB22	20-29.9 yrs	male	Y
	KPDB23	30-39.9 yrs	male	Y
	KPDB24	30-39.9 yrs	male	Y
	KPDB25	30-39.9 yrs	female	Y
	KPDB26	70+ yrs	female	Y
	KPDB27	40-49.9 yrs	female	Y
	KPDB28	70+ yrs	male	Y
	KPDB29	20-29.9 yrs	male	Y
	KPDB3	0-0.9 yrs	subadult	Y
	KPDB30	40-49.9 yrs	male	Y
	KPDB31	50-59.9 yrs	female	Y
	KPDB32	10-14.9 yrs	subadult	Y
	KPDB33	1-4.9 yrs	subadult	Y
	KPDB34	0-0.9 yrs	subadult	Y
	KPDB35	20-29.9 yrs	female	Y
	KPDB36	15-19.9 yrs	female	Y
	KPDB37	5-9.9 yrs	subadult	Y
	KPDB38	30-39.9 yrs	male	Y
	KPDB39	50-59.9 yrs	female	Y
	KPDB4	50-59.9 yrs	female	Y
	KPDB40	60-69.9 yrs	female	Y
	KPDB41	0-0.9 yrs	subadult	Y
	KPDB42	70+ yrs	male	Y
	KPDB43	30-39.9 yrs	male	Y
	KPDB44	15-19.9 yrs	male	Y
	KPDB45	40-49.9 yrs	female	Y
	KPDB46	0-0.9 yrs	subadult	Y
	KPDB47	50-59.9 yrs	female	Y
	KPDB48	0-0.9 yrs	subadult	Y
	KPDB49	0-0.9 yrs	subadult	Y
	KPDB5.1	0-0.9 yrs	subadult	Y
	KPDB5.2	0-0.9 yrs	subadult	Y
	KPDB50	0-0.9 yrs	subadult	Y

KENNETH WILLIAM ROSS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	KPDB51	0-0.9 yrs	subadult	Y
	KPDB52	0-0.9 yrs	subadult	Y
	KPDB53	0-0.9 yrs	subadult	Y
	KPDB54	0-0.9 yrs	subadult	Y
	KPDB55	0-0.9 yrs	subadult	Y
	KPDB56	40-49.9 yrs	female	Y
	KPDB57	20-29.9 yrs	male	Y
	KPDB58	60-69.9 yrs	female	Y
	KPDB59	0-0.9 yrs	subadult	Y
	KPDB6	0-0.9 yrs	subadult	Y
	KPDB60	20-29.9 yrs	female	Y
	KPDB61	40-49.9 yrs	female	Y
	KPDB62	0-0.9 yrs	subadult	Y
	KPDB63	1-4.9 yrs	subadult	Y
	KPDB64	15-19.9 yrs	female	Y
	KPDB65	0-0.9 yrs	subadult	Y
	KPDB66	0-0.9 yrs	subadult	Y
	KPDB67	30-39.9 yrs	male	Y
	KPDB68	0-0.9 yrs	subadult	Y
	KPDB69	0-0.9 yrs	subadult	Y
	KPDB7	1-4.9 yrs	subadult	Y
	KPDB70	0-0.9 yrs	subadult	Y
	KPDB71	0-0.9 yrs	subadult	Y
	KPDB72	50-59.9 yrs	male	Y
	KPDB73	20-29.9 yrs	female	Y
	KPDB74	60-69.9 yrs	male	Y
	KPDB75	0-0.9 yrs	subadult	Y
	KPDB76	40-49.9 yrs	male	Y
	KPDB77	50-59.9 yrs	female	Y
	KPDB78	0-0.9 yrs	subadult	Y
	KPDB79	30-39.9 yrs	female	Y
	KPDB8	15-19.9 yrs	male	Y
	KPDB80	0-0.9 yrs	subadult	Y
	KPDB81	0-0.9 yrs	subadult	Y
	KPDB82	0-0.9 yrs	subadult	Y

APPENDIX 3: BURIALS BY SITE INCLUDING THOSE EXCLUDED FROM ANALYSIS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	KPDB83	30-39.9 yrs	female	Y
	KPDB84	0-0.9 yrs	subadult	Y
	KPDB85	0-0.9 yrs	subadult	Y
	KPDB86	30-39.9 yrs	male	Y
	KPDB87	40-49.9 yrs	female	Y
	KPDB88	0-0.9 yrs	subadult	Y
	KPDB89	0-0.9 yrs	subadult	Y
	KPDB9	30-39.9 yrs	male	Y
	KPDB90	40-49.9 yrs	male	Y
	KPDB91	40-49.9 yrs	male	Y
	KPDB92	15-19.9 yrs	male	Y
	KPDB93	40-49.9 yrs	male	Y
	KPDB94	30-39.9 yrs	female	Y
	KPDB95	0-0.9 yrs	subadult	Y
	KPDB96	1-4.9 yrs	subadult	Y
	KPDB97	0-0.9 yrs	subadult	Y
	KPDB98	0-0.9 yrs	subadult	Y
	KPDB99	0-0.9 yrs	subadult	Y
Ban Lum Khao	BLKB1	5-9.9 yrs	subadult	Y
	BLKB10	20-29.9 yrs	female	Y
	BLKB100	5-9.9 yrs	subadult	Y
	BLKB101	5-9.9 yrs	subadult	Y
	BLKB102	5-9.9 yrs	subadult	Y
	BLKB103	Foetal	subadult	Y
	BLKB104	0-0.9 yrs	subadult	Y
	BLKB105	0-0.9 yrs	subadult	Y
	BLKB106	1-4.9 yrs	subadult	Y
	BLKB107	0-0.9 yrs	subadult	Y
	BLKB108	5-9.9 yrs	subadult	Y
	BLKB109	30-39.9 yrs	male	Y
	BLKB11	1-4.9 yrs	subadult	Y
	BLKB110	1-4.9 yrs	subadult	Y
	BLKB111	1-4.9 yrs	subadult	Y
	BLKB112	10-14.9 yrs	subadult	Y
	BLKB12	0-0.9 yrs	subadult	Y

KENNETH WILLIAM ROSS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BLKB13	1-4.9 yrs	subadult	Y
	BLKB14	0-0.9 yrs	subadult	Y
	BLKB15	5-9.9 yrs	subadult	Y
	BLKB16	0-0.9 yrs	subadult	Y
	BLKB17	30-39.9 yrs	female	Y
	BLKB18	20-29.9 yrs	male	Y
	BLKB19	20-29.9 yrs	female	Y
	BLKB2	1-4.9 yrs	subadult	Y
	BLKB20	20-29.9 yrs	female	Y
	BLKB21	70+ yrs	female	Y
	BLKB22	Unknown	Unknown (adult)	N
	BLKB23	20-29.9 yrs	male	Y
	BLKB24	20-29.9 yrs	male	Y
	BLKB25	15-19.9 yrs	male	Y
	BLKB26	1-4.9 yrs	subadult	Y
	BLKB27	20-29.9 yrs	male	Y
	BLKB28	40-49.9 yrs	male	Y
	BLKB29	0-0.9 yrs	subadult	Y
	BLKB3	0-0.9 yrs	subadult	Y
	BLKB30	30-39.9 yrs	male	Y
	BLKB31	40-49.9 yrs	male	Y
	BLKB32	0-0.9 yrs	subadult	Y
	BLKB33	20-29.9 yrs	female	Y
	BLKB34	30-39.9 yrs	female	Y
	BLKB35	1-4.9 yrs	subadult	Y
	BLKB36.1	Unknown	female	N
	BLKB36.2	Unknown	male	N
	BLKB37	30-39.9 yrs	male	Y
	BLKB38	30-39.9 yrs	female	Y
	BLKB39	20-29.9 yrs	female	Y
	BLKB4	1-4.9 yrs	subadult	Y
	BLKB40	30-39.9 yrs	female	Y
	BLKB41	5-9.9 yrs	subadult	Y
	BLKB42	20-29.9 yrs	female	Y
	BLKB43	0-0.9 yrs	subadult	Y

APPENDIX 3: BURIALS BY SITE INCLUDING THOSE EXCLUDED FROM ANALYSIS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BLKB44	40-49.9 yrs	male	Y
	BLKB45	30-39.9 yrs	female	Y
	BLKB46	20-29.9 yrs	female	Y
	BLKB47	30-39.9 yrs	male	Y
	BLKB48	40-49.9 yrs	male	Y
	BLKB49	15-19.9 yrs	female	Y
	BLKB5	1-4.9 yrs	subadult	Y
	BLKB50	0-0.9 yrs	subadult	Y
	BLKB51	30-39.9 yrs	female	Y
	BLKB52	30-39.9 yrs	female	Y
	BLKB53	40-49.9 yrs	female	Y
	BLKB54	5-9.9 yrs	subadult	Y
	BLKB55	15-19.9 yrs	male	Y
	BLKB56	5-9.9 yrs	subadult	Y
	BLKB57	40-49.9 yrs	female	Y
	BLKB58	0-0.9 yrs	subadult	Y
	BLKB59	40-49.9 yrs	male	Y
	BLKB60	0-0.9 yrs	subadult	Y
	BLKB61	20-29.9 yrs	female	Y
	BLKB62	0-0.9 yrs	subadult	Y
	BLKB64	50-59.9 yrs	female	Y
	BLKB65	70+ yrs	male	Y
	BLKB66	5-9.9 yrs	subadult	Y
	BLKB67	30-39.9 yrs	male	Y
	BLKB68	1-4.9 yrs	subadult	Y
	BLKB7	60-69.9 yrs	female	Y
	BLKB70	0-0.9 yrs	subadult	Y
	BLKB71	30-39.9 yrs	male	Y
	BLKB72	20-29.9 yrs	female	Y
	BLKB73	0-0.9 yrs	subadult	Y
	BLKB74	5-9.9 yrs	subadult	Y
	BLKB75	40-49.9 yrs	female	Y
	BLKB76	0-0.9 yrs	subadult	Y
	BLKB77	30-39.9 yrs	female	Y
	BLKB78	1-4.9 yrs	subadult	Y

KENNETH WILLIAM ROSS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BLKB79	20-29.9 yrs	female	Y
	BLKB8	30-39.9 yrs	male	Y
	BLKB80	20-29.9 yrs	female	Y
	BLKB81	20-29.9 yrs	female	Y
	BLKB82	20-29.9 yrs	male	Y
	BLKB83	1-4.9 yrs	subadult	Y
	BLKB84	0-0.9 yrs	subadult	Y
	BLKB85	20-29.9 yrs	female	Y
	BLKB86	60-69.9 yrs	male	Y
	BLKB87	1-4.9 yrs	subadult	Y
	BLKB88	10-14.9 yrs	subadult	Y
	BLKB89	70+ yrs	male	Y
	BLKB9	0-0.9 yrs	subadult	Y
	BLKB90	10-14.9 yrs	subadult	Y
	BLKB91	0-0.9 yrs	subadult	Y
	BLKB92	20-29.9 yrs	female	Y
	BLKB93	70+ yrs	male	Y
	BLKB94	50-59.9 yrs	male	Y
	BLKB95	20-29.9 yrs	male	Y
	BLKB96	40-49.9 yrs	male	Y
	BLKB97	10-14.9 yrs	subadult	Y
	BLKB98	50-59.9 yrs	female	Y
	BLKB99	10-14.9 yrs	subadult	Y
Ban Non Wat	BNWB1	0-0.9 yrs	subadult	Y
	BNWB10	30-39.9 yrs	male	Y
	BNWB100	0-0.9 yrs	subadult	Y
	BNWB101	Unknown	Unknown (adult)	N
	BNWB102	Unknown	subadult	N
	BNWB103	1-4.9 yrs	subadult	Y
	BNWB104	Unknown	Unknown (adult)	N
	BNWB105	40-49.9 yrs	female	Y
	BNWB106	Unknown	female	N
	BNWB107	Unknown	Unknown (adult)	N
	BNWB108	Unknown	Unknown (adult)	N
	BNWB109	0-0.9 yrs	subadult	Y

APPENDIX 3: BURIALS BY SITE INCLUDING THOSE EXCLUDED FROM ANALYSIS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB11	40-49.9 yrs	male	Y
	BNWB110	Foetal	subadult	Y
	BNWB111	Unknown	Unknown (adult)	N
	BNWB112	Foetal	subadult	Y
	BNWB113	0-0.9 yrs	subadult	Y
	BNWB114	30-39.9 yrs	female	Y
	BNWB115	Unknown	Unknown (adult)	N
	BNWB116	1-4.9 yrs	subadult	Y
	BNWB117	Unknown	Unknown (adult)	N
	BNWB118	0-0.9 yrs	subadult	Y
	BNWB119	Unknown	Unknown (adult)	N
	BNWB12	40-49.9 yrs	male	Y
	BNWB120	30-39.9 yrs	Unknown (adult)	Y
	BNWB121	20-29.9 yrs	female	Y
	BNWB122	0-0.9 yrs	subadult	Y
	BNWB123	30-39.9 yrs	male	Y
	BNWB124	30-39.9 yrs	female	Y
	BNWB126	30-39.9 yrs	male	Y
	BNWB127	Unknown	male	N
	BNWB128	Unknown	Unknown (adult)	N
	BNWB129	Unknown	female	N
	BNWB13	20-29.9 yrs	Unknown (adult)	Y
	BNWB130	1-4.9 yrs	subadult	Y
	BNWB131	30-39.9 yrs	Unknown (adult)	Y
	BNWB132	15-19.9 yrs	female	Y
	BNWB133	Unknown	Unknown (adult)	N
	BNWB134	30-39.9 yrs	male	Y
	BNWB135	40-49.9 yrs	female	Y
	BNWB136	30-39.9 yrs	female	Y
	BNWB137	Unknown	Unknown (adult)	N
	BNWB138	Unknown	Unknown (adult)	N
	BNWB139	10-14.9 yrs	subadult	Y
	BNWB14	30-39.9 yrs	male	Y
	BNWB140	Unknown	Unknown (adult)	N
	BNWB141	5-9.9 yrs	subadult	Y

KENNETH WILLIAM ROSS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB142	Unknown	Unknown (adult)	N
	BNWB143	40-49.9 yrs	male	Y
	BNWB144	20-29.9 yrs	female	Y
	BNWB145	30-39.9 yrs	male	Y
	BNWB146	1-4.9 yrs	subadult	Y
	BNWB147	30-39.9 yrs	female	Y
	BNWB148	5-9.9 yrs	subadult	Y
	BNWB149	1-4.9 yrs	subadult	Y
	BNWB15	20-29.9 yrs	Unknown (adult)	Y
	BNWB150	30-39.9 yrs	male	Y
	BNWB151	Unknown	female	N
	BNWB152	20-29.9 yrs	female	Y
	BNWB153	30-39.9 yrs	female	Y
	BNWB154	40-49.9 yrs	female	Y
	BNWB155	30-39.9 yrs	male	Y
	BNWB156	Unknown	Unknown (adult)	N
	BNWB157	5-9.9 yrs	subadult	Y
	BNWB158	20-29.9 yrs	male	Y
	BNWB159	30-39.9 yrs	male	Y
	BNWB16	30-39.9 yrs	female	Y
	BNWB160	40-49.9 yrs	female	Y
	BNWB161	30-39.9 yrs	female	Y
	BNWB162	1-4.9 yrs	subadult	Y
	BNWB163	1-4.9 yrs	subadult	Y
	BNWB164	Unknown	Unknown (adult)	N
	BNWB165	1-4.9 yrs	subadult	Y
	BNWB166	30-39.9 yrs	female	Y
	BNWB167	Unknown	female	N
	BNWB168	5-9.9 yrs	subadult	Y
	BNWB169	0-0.9 yrs	subadult	Y
	BNWB17	30-39.9 yrs	male	Y
	BNWB170	0-0.9 yrs	subadult	Y
	BNWB171	Unknown	Unknown (adult)	N
	BNWB172	Unknown	female	N
	BNWB173	0-0.9 yrs	subadult	Y

APPENDIX 3: BURIALS BY SITE INCLUDING THOSE EXCLUDED FROM ANALYSIS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB174	20-29.9 yrs	Unknown (adult)	Y
	BNWB175	Foetal	subadult	Y
	BNWB176	Unknown	Unknown (adult)	N
	BNWB177	Unknown	female	N
	BNWB178	20-29.9 yrs	female	Y
	BNWB179	0-0.9 yrs	subadult	Y
	BNWB18	Foetal	subadult	Y
	BNWB180	0-0.9 yrs	subadult	Y
	BNWB181	0-0.9 yrs	subadult	Y
	BNWB182	20-29.9 yrs	female	Y
	BNWB183	1-4.9 yrs	subadult	Y
	BNWB184	20-29.9 yrs	female	Y
	BNWB185	20-29.9 yrs	male	Y
	BNWB186	30-39.9 yrs	female	Y
	BNWB187	20-29.9 yrs	Unknown (adult)	Y
	BNWB188	20-29.9 yrs	female	Y
	BNWB189	10-14.9 yrs	subadult	Y
	BNWB19	5-9.9 yrs	subadult	Y
	BNWB190	20-29.9 yrs	female	Y
	BNWB191	Unknown	male	N
	BNWB192	0-0.9 yrs	subadult	Y
	BNWB193	0-0.9 yrs	subadult	Y
	BNWB194	20-29.9 yrs	female	Y
	BNWB195	0-0.9 yrs	subadult	Y
	BNWB196	20-29.9 yrs	female	Y
	BNWB197	30-39.9 yrs	male	Y
	BNWB198	Unknown	subadult	N
	BNWB199	Unknown	Unknown (adult)	N
	BNWB2	0-0.9 yrs	subadult	Y
	BNWB20	20-29.9 yrs	male	Y
	BNWB200	Unknown	Unknown (adult)	N
	BNWB201	30-39.9 yrs	male	Y
	BNWB202	Unknown	Unknown (adult)	N
	BNWB203	20-29.9 yrs	Unknown (adult)	Y
	BNWB204	Unknown	Unknown (adult)	N

KENNETH WILLIAM ROSS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB205	Unknown	Unknown (adult)	N
	BNWB206	Unknown	Unknown (adult)	N
	BNWB207	30-39.9 yrs	Unknown (adult)	Y
	BNWB208	20-29.9 yrs	Unknown (adult)	Y
	BNWB209	Unknown	Unknown (adult)	N
	BNWB21	30-39.9 yrs	female	Y
	BNWB210	30-39.9 yrs	male	Y
	BNWB211	30-39.9 yrs	male	Y
	BNWB212	20-29.9 yrs	male	Y
	BNWB213	1-4.9 yrs	subadult	Y
	BNWB214	40-49.9 yrs	male	Y
	BNWB215	30-39.9 yrs	male	Y
	BNWB216	40-49.9 yrs	female	Y
	BNWB217	Unknown	Unknown (adult)	N
	BNWB218	30-39.9 yrs	female	Y
	BNWB219	20-29.9 yrs	male	Y
	BNWB22	30-39.9 yrs	female	Y
	BNWB220	Unknown	Unknown (adult)	N
	BNWB221	10-14.9 yrs	subadult	Y
	BNWB222.1	40-49.9 yrs	female	Y
	BNWB222.2	15-19.9 yrs	male	Y
	BNWB223	40-49.9 yrs	female	Y
	BNWB224	20-29.9 yrs	female	Y
	BNWB225	40-49.9 yrs	Unknown (adult)	Y
	BNWB226	40-49.9 yrs	female	Y
	BNWB227	30-39.9 yrs	female	Y
	BNWB228	30-39.9 yrs	male	Y
	BNWB229	20-29.9 yrs	male	Y
	BNWB23	20-29.9 yrs	Unknown (adult)	Y
	BNWB230	20-29.9 yrs	male	Y
	BNWB231	30-39.9 yrs	male	Y
	BNWB232	Unknown	Unknown (adult)	N
	BNWB233	40-49.9 yrs	male	Y
	BNWB234	30-39.9 yrs	female	Y
	BNWB235	10-14.9 yrs	subadult	Y

APPENDIX 3: BURIALS BY SITE INCLUDING THOSE EXCLUDED FROM ANALYSIS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB236	10-14.9 yrs	subadult	Y
	BNWB237	30-39.9 yrs	female	Y
	BNWB238	40-49.9 yrs	female	Y
	BNWB239	20-29.9 yrs	male	Y
	BNWB24	30-39.9 yrs	male	Y
	BNWB240	Unknown	Unknown (adult)	N
	BNWB241	30-39.9 yrs	Unknown (adult)	Y
	BNWB242	Unknown	female	N
	BNWB243	40-49.9 yrs	female	Y
	BNWB244	Unknown	female	N
	BNWB245	Unknown	subadult	N
	BNWB246	30-39.9 yrs	female	Y
	BNWB247	30-39.9 yrs	female	Y
	BNWB248	20-29.9 yrs	male	Y
	BNWB249	30-39.9 yrs	female	Y
	BNWB25	30-39.9 yrs	male	Y
	BNWB250	40-49.9 yrs	male	Y
	BNWB251	Unknown	Unknown (adult)	N
	BNWB252	Unknown	Unknown (adult)	N
	BNWB253	40-49.9 yrs	male	Y
	BNWB254	Unknown	Unknown (adult)	N
	BNWB255	20-29.9 yrs	male	Y
	BNWB256	30-39.9 yrs	female	Y
	BNWB257	30-39.9 yrs	female	Y
	BNWB258	Unknown	Unknown (adult)	N
	BNWB259	20-29.9 yrs	female	Y
	BNWB26	20-29.9 yrs	female	Y
	BNWB260	30-39.9 yrs	male	Y
	BNWB261	30-39.9 yrs	male	Y
	BNWB262	Unknown	female	N
	BNWB263	30-39.9 yrs	female	Y
	BNWB264	20-29.9 yrs	male	Y
	BNWB265	20-29.9 yrs	male	Y
	BNWB266	Foetal	subadult	Y
	BNWB267	Unknown	Unknown (adult)	N

KENNETH WILLIAM ROSS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB268	Unknown	subadult	N
	BNWB269	Unknown	Unknown (adult)	N
	BNWB27	Unknown	Unknown (adult)	N
	BNWB270	30-39.9 yrs	male	Y
	BNWB271	1-4.9 yrs	subadult	Y
	BNWB272	20-29.9 yrs	male	Y
	BNWB273	Unknown	female	N
	BNWB274	1-4.9 yrs	subadult	Y
	BNWB275	20-29.9 yrs	female	Y
	BNWB276	20-29.9 yrs	male	Y
	BNWB277	10-14.9 yrs	subadult	Y
	BNWB278	40-49.9 yrs	Unknown (adult)	Y
	BNWB279	Unknown	Unknown (adult)	N
	BNWB28	30-39.9 yrs	male	Y
	BNWB280	10-14.9 yrs	subadult	Y
	BNWB281	30-39.9 yrs	male	Y
	BNWB282	0-0.9 yrs	subadult	Y
	BNWB283	Unknown	Unknown (adult)	N
	BNWB284	Unknown	Unknown (adult)	N
	BNWB285	20-29.9 yrs	male	Y
	BNWB286	20-29.9 yrs	female	Y
	BNWB287	40-49.9 yrs	female	Y
	BNWB288	20-29.9 yrs	female	Y
	BNWB289	Unknown	Unknown (adult)	N
	BNWB29	30-39.9 yrs	male	Y
	BNWB290	30-39.9 yrs	male	Y
	BNWB291	40-49.9 yrs	female	Y
	BNWB292	30-39.9 yrs	female	Y
	BNWB293	1-4.9 yrs	subadult	Y
	BNWB294	40-49.9 yrs	female	Y
	BNWB295	0-0.9 yrs	subadult	Y
	BNWB296	20-29.9 yrs	male	Y
	BNWB297	5-9.9 yrs	subadult	Y
	BNWB298	1-4.9 yrs	subadult	Y
	BNWB299	5-9.9 yrs	subadult	Y

APPENDIX 3: BURIALS BY SITE INCLUDING THOSE EXCLUDED FROM ANALYSIS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB3	30-39.9 yrs	male	Y
	BNWB30	30-39.9 yrs	female	Y
	BNWB300	40-49.9 yrs	female	Y
	BNWB301	40-49.9 yrs	male	Y
	BNWB302	1-4.9 yrs	subadult	Y
	BNWB303	Unknown	male	N
	BNWB304	30-39.9 yrs	male	Y
	BNWB305	Unknown	Unknown (adult)	N
	BNWB306	30-39.9 yrs	male	Y
	BNWB307	Unknown	subadult	N
	BNWB308	Unknown	Unknown (adult)	N
	BNWB309	Unknown	Unknown (adult)	N
	BNWB31	1-4.9 yrs	subadult	Y
	BNWB310	Unknown	Unknown (adult)	N
	BNWB311	20-29.9 yrs	male	Y
	BNWB312	20-29.9 yrs	female	Y
	BNWB313	Unknown	subadult	N
	BNWB314	0-0.9 yrs	subadult	Y
	BNWB315	40-49.9 yrs	male	Y
	BNWB316	Unknown	Unknown (adult)	N
	BNWB317	20-29.9 yrs	Unknown (adult)	Y
	BNWB318	40-49.9 yrs	female	Y
	BNWB319	30-39.9 yrs	female	Y
	BNWB32	30-39.9 yrs	female	Y
	BNWB320	30-39.9 yrs	male	Y
	BNWB321	15-19.9 yrs	Unknown (adult)	Y
	BNWB322	20-29.9 yrs	female	Y
	BNWB323	Unknown	female	N
	BNWB324	30-39.9 yrs	female	Y
	BNWB325	30-39.9 yrs	male	Y
	BNWB326	40-49.9 yrs	female	Y
	BNWB327	30-39.9 yrs	female	Y
	BNWB328	20-29.9 yrs	female	Y
	BNWB329	15-19.9 yrs	Unknown (adult)	Y
	BNWB33	1-4.9 yrs	subadult	Y

KENNETH WILLIAM ROSS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB330	Unknown	male	N
	BNWB331	1-4.9 yrs	subadult	Y
	BNWB332	20-29.9 yrs	Unknown (adult)	Y
	BNWB333	30-39.9 yrs	male	Y
	BNWB334	Unknown	female	N
	BNWB335	Unknown	male	N
	BNWB336	Unknown	male	N
	BNWB337	30-39.9 yrs	male	Y
	BNWB338	Unknown	male	N
	BNWB339	Unknown	Unknown (adult)	N
	BNWB34	Unknown	Unknown (adult)	N
	BNWB340	Unknown	male	N
	BNWB341	30-39.9 yrs	male	Y
	BNWB342	10-14.9 yrs	subadult	Y
	BNWB343	0-0.9 yrs	subadult	Y
	BNWB344	Unknown	Unknown (adult)	N
	BNWB345	20-29.9 yrs	male	Y
	BNWB346	0-0.9 yrs	subadult	Y
	BNWB347	Unknown	Unknown (adult)	N
	BNWB348	20-29.9 yrs	male	Y
	BNWB349	Unknown	Unknown (adult)	N
	BNWB35	0-0.9 yrs	subadult	Y
	BNWB350	Unknown	male	N
	BNWB351	Unknown	male	N
	BNWB352	40-49.9 yrs	male	Y
	BNWB353	Unknown	Unknown (adult)	N
	BNWB354	20-29.9 yrs	Unknown (adult)	Y
	BNWB355.1	20-29.9 yrs	male	Y
	BNWB355.2	20-29.9 yrs	female	Y
	BNWB356	40-49.9 yrs	female	Y
	BNWB357	20-29.9 yrs	male	Y
	BNWB358	Unknown	Unknown (adult)	N
	BNWB359	Unknown	Unknown (adult)	N
	BNWB36.1	40-49.9 yrs	female	Y
	BNWB36.2	30-39.9 yrs	male	Y

APPENDIX 3: BURIALS BY SITE INCLUDING THOSE EXCLUDED FROM ANALYSIS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB360	30-39.9 yrs	male	Y
	BNWB361	30-39.9 yrs	male	Y
	BNWB362	40-49.9 yrs	male	Y
	BNWB363	Unknown	Unknown (adult)	N
	BNWB364	20-29.9 yrs	male	Y
	BNWB365	40-49.9 yrs	male	Y
	BNWB366	Unknown	Unknown (adult)	N
	BNWB367	20-29.9 yrs	male	Y
	BNWB368	Foetal	subadult	Y
	BNWB369	0-0.9 yrs	subadult	Y
	BNWB37	0-0.9 yrs	subadult	Y
	BNWB370	Unknown	Unknown (adult)	N
	BNWB371	20-29.9 yrs	female	Y
	BNWB372	Unknown	Unknown (adult)	N
	BNWB373	40-49.9 yrs	female	Y
	BNWB374	15-19.9 yrs	male	Y
	BNWB375	Unknown	Unknown (adult)	N
	BNWB376	1-4.9 yrs	subadult	Y
	BNWB377	Unknown	Unknown (adult)	N
	BNWB378	30-39.9 yrs	male	Y
	BNWB379	Unknown	male	N
	BNWB38	1-4.9 yrs	subadult	Y
	BNWB380	30-39.9 yrs	female	Y
	BNWB381	1-4.9 yrs	subadult	Y
	BNWB382	30-39.9 yrs	Unknown (adult)	Y
	BNWB383	30-39.9 yrs	female	Y
	BNWB384	20-29.9 yrs	Unknown (adult)	Y
	BNWB385	30-39.9 yrs	female	Y
	BNWB386	20-29.9 yrs	male	Y
	BNWB387	Unknown	Unknown (adult)	N
	BNWB388	Unknown	Unknown (adult)	N
	BNWB389	Unknown	Unknown (adult)	N
	BNWB39	0-0.9 yrs	subadult	Y
	BNWB390	30-39.9 yrs	female	Y
	BNWB391	Unknown	Unknown (adult)	N

KENNETH WILLIAM ROSS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB392	30-39.9 yrs	male	Y
	BNWB393	Unknown	Unknown (adult)	N
	BNWB394	1-4.9 yrs	subadult	Y
	BNWB395	Unknown	Unknown (adult)	N
	BNWB396	0-0.9 yrs	subadult	Y
	BNWB397	1-4.9 yrs	subadult	Y
	BNWB398	30-39.9 yrs	male	Y
	BNWB399	Unknown	Unknown (adult)	N
	BNWB4	0-0.9 yrs	Unknown (adult)	Y
	BNWB40	0-0.9 yrs	subadult	Y
	BNWB400	1-4.9 yrs	subadult	Y
	BNWB401	1-4.9 yrs	subadult	Y
	BNWB402	Unknown	Unknown (adult)	N
	BNWB403	1-4.9 yrs	subadult	Y
	BNWB404.1	40-49.9 yrs	male	Y
	BNWB404.2	30-39.9 yrs	male	Y
	BNWB405	20-29.9 yrs	female	Y
	BNWB406	0-0.9 yrs	subadult	Y
	BNWB407	40-49.9 yrs	female	Y
	BNWB408	30-39.9 yrs	male	Y
	BNWB409	1-4.9 yrs	subadult	Y
	BNWB41	Unknown	Unknown (adult)	N
	BNWB410	30-39.9 yrs	female	Y
	BNWB411	Unknown	Unknown (adult)	N
	BNWB412	0-0.9 yrs	subadult	Y
	BNWB413	Unknown	Unknown (adult)	N
	BNWB414	1-4.9 yrs	subadult	Y
	BNWB415	1-4.9 yrs	subadult	Y
	BNWB416	20-29.9 yrs	female	Y
	BNWB417	Unknown	male	N
	BNWB418	Unknown	Unknown (adult)	N
	BNWB419	20-29.9 yrs	female	Y
	BNWB42	Unknown	Unknown (adult)	N
	BNWB420	5-9.9 yrs	subadult	Y
	BNWB421	1-4.9 yrs	subadult	Y

APPENDIX 3: BURIALS BY SITE INCLUDING THOSE EXCLUDED FROM ANALYSIS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB422	20-29.9 yrs	Unknown (adult)	Y
	BNWB423	1-4.9 yrs	subadult	Y
	BNWB424	Unknown	Unknown (adult)	N
	BNWB425	1-4.9 yrs	subadult	Y
	BNWB426	1-4.9 yrs	subadult	Y
	BNWB427	40-49.9 yrs	female	Y
	BNWB428	1-4.9 yrs	subadult	Y
	BNWB429	20-29.9 yrs	Unknown (adult)	Y
	BNWB43	Unknown	Unknown (adult)	N
	BNWB430	20-29.9 yrs	female	Y
	BNWB431	40-49.9 yrs	male	Y
	BNWB432	Unknown	Unknown (adult)	N
	BNWB433	20-29.9 yrs	male	Y
	BNWB434	1-4.9 yrs	subadult	Y
	BNWB435	10-14.9 yrs	subadult	Y
	BNWB436	30-39.9 yrs	male	Y
	BNWB437	Unknown	Unknown (adult)	N
	BNWB438	30-39.9 yrs	male	Y
	BNWB439	30-39.9 yrs	male	Y
	BNWB44	1-4.9 yrs	subadult	Y
	BNWB440	40-49.9 yrs	female	Y
	BNWB441	1-4.9 yrs	subadult	Y
	BNWB442	Unknown	Unknown (adult)	N
	BNWB443	15-19.9 yrs	male	Y
	BNWB444	5-9.9 yrs	subadult	Y
	BNWB445	20-29.9 yrs	male	Y
	BNWB446	20-29.9 yrs	male	Y
	BNWB447	Unknown	Unknown (adult)	N
	BNWB448	1-4.9 yrs	subadult	Y
	BNWB449	30-39.9 yrs	female	Y
	BNWB45	5-9.9 yrs	subadult	Y
	BNWB450	0-0.9 yrs	subadult	Y
	BNWB451	Foetal	subadult	Y
	BNWB452	1-4.9 yrs	subadult	Y
	BNWB453	1-4.9 yrs	subadult	Y

KENNETH WILLIAM ROSS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB454	40-49.9 yrs	female	Y
	BNWB455	20-29.9 yrs	male	Y
	BNWB456	30-39.9 yrs	female	Y
	BNWB457	1-4.9 yrs	subadult	Y
	BNWB458	5-9.9 yrs	subadult	Y
	BNWB46	Unknown	Unknown (adult)	N
	BNWB460	40-49.9 yrs	female	Y
	BNWB461	30-39.9 yrs	female	Y
	BNWB462	0-0.9 yrs	subadult	Y
	BNWB463	30-39.9 yrs	female	Y
	BNWB464	20-29.9 yrs	female	Y
	BNWB465	Unknown	Unknown (adult)	N
	BNWB466	40-49.9 yrs	male	Y
	BNWB467	Unknown	Unknown (adult)	N
	BNWB468	0-0.9 yrs	subadult	Y
	BNWB469	0-0.9 yrs	subadult	Y
	BNWB47	Unknown	Unknown (adult)	N
	BNWB470	20-29.9 yrs	female	Y
	BNWB471	30-39.9 yrs	female	Y
	BNWB472	10-14.9 yrs	subadult	Y
	BNWB473	20-29.9 yrs	male	Y
	BNWB474	20-29.9 yrs	female	Y
	BNWB475	Unknown	Unknown (adult)	N
	BNWB476	15-19.9 yrs	male	Y
	BNWB477	30-39.9 yrs	male	Y
	BNWB478	30-39.9 yrs	female	Y
	BNWB479	1-4.9 yrs	subadult	Y
	BNWB48	20-29.9 yrs	male	Y
	BNWB480	20-29.9 yrs	Unknown (adult)	Y
	BNWB481	5-9.9 yrs	subadult	Y
	BNWB482	30-39.9 yrs	male	Y
	BNWB483	1-4.9 yrs	subadult	Y
	BNWB484	5-9.9 yrs	subadult	Y
	BNWB485	20-29.9 yrs	female	Y
	BNWB486	30-39.9 yrs	Unknown (adult)	Y

APPENDIX 3: BURIALS BY SITE INCLUDING THOSE EXCLUDED FROM ANALYSIS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB487	20-29.9 yrs	female	Y
	BNWB488	1-4.9 yrs	subadult	Y
	BNWB489	40-49.9 yrs	female	Y
	BNWB49	Unknown	subadult	N
	BNWB490	10-14.9 yrs	subadult	Y
	BNWB491	1-4.9 yrs	subadult	Y
	BNWB492	30-39.9 yrs	female	Y
	BNWB493	1-4.9 yrs	subadult	Y
	BNWB494	Unknown	male	N
	BNWB495	40-49.9 yrs	female	Y
	BNWB496	1-4.9 yrs	subadult	Y
	BNWB497	30-39.9 yrs	male	Y
	BNWB498	0-0.9 yrs	subadult	Y
	BNWB499	0-0.9 yrs	subadult	Y
	BNWB5	Unknown	male	N
	BNWB50	Unknown	subadult	N
	BNWB500	Foetal	subadult	Y
	BNWB501	Unknown	female	N
	BNWB502	Unknown	Unknown (adult)	N
	BNWB503	20-29.9 yrs	male	Y
	BNWB504	1-4.9 yrs	subadult	Y
	BNWB505	Unknown	Unknown (adult)	N
	BNWB506	15-19.9 yrs	Unknown (adult)	Y
	BNWB507	20-29.9 yrs	Unknown (adult)	Y
	BNWB508	20-29.9 yrs	female	Y
	BNWB509	0-0.9 yrs	subadult	Y
	BNWB51	20-29.9 yrs	female	Y
	BNWB510	30-39.9 yrs	male	Y
	BNWB511	5-9.9 yrs	subadult	Y
	BNWB512	5-9.9 yrs	subadult	Y
	BNWB513	0-0.9 yrs	subadult	Y
	BNWB514	1-4.9 yrs	subadult	Y
	BNWB515	0-0.9 yrs	subadult	Y
	BNWB516	5-9.9 yrs	subadult	Y
	BNWB517	Unknown	female	N

KENNETH WILLIAM ROSS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB518	0-0.9 yrs	subadult	Y
	BNWB519	1-4.9 yrs	subadult	Y
	BNWB52	20-29.9 yrs	female	Y
	BNWB520	20-29.9 yrs	male	Y
	BNWB521	Unknown	subadult	N
	BNWB522	20-29.9 yrs	male	Y
	BNWB523	1-4.9 yrs	subadult	Y
	BNWB524	0-0.9 yrs	subadult	Y
	BNWB525	0-0.9 yrs	subadult	Y
	BNWB526	1-4.9 yrs	subadult	Y
	BNWB527	5-9.9 yrs	subadult	Y
	BNWB528	Unknown	subadult	N
	BNWB529	30-39.9 yrs	male	Y
	BNWB53	20-29.9 yrs	Unknown (adult)	Y
	BNWB530	0-0.9 yrs	subadult	Y
	BNWB531	15-19.9 yrs	female	Y
	BNWB532	1-4.9 yrs	subadult	Y
	BNWB533	20-29.9 yrs	male	Y
	BNWB534	20-29.9 yrs	female	Y
	BNWB535	20-29.9 yrs	female	Y
	BNWB536	1-4.9 yrs	subadult	Y
	BNWB537	30-39.9 yrs	female	Y
	BNWB538	Unknown	Unknown (adult)	N
	BNWB539	30-39.9 yrs	male	Y
	BNWB54	Unknown	Unknown (adult)	N
	BNWB540	30-39.9 yrs	female	Y
	BNWB541	5-9.9 yrs	subadult	Y
	BNWB542	20-29.9 yrs	female	Y
	BNWB543	1-4.9 yrs	subadult	Y
	BNWB544	20-29.9 yrs	male	Y
	BNWB545	40-49.9 yrs	male	Y
	BNWB546	0-0.9 yrs	subadult	Y
	BNWB547	30-39.9 yrs	male	Y
	BNWB548	1-4.9 yrs	subadult	Y
	BNWB549	20-29.9 yrs	male	Y

APPENDIX 3: BURIALS BY SITE INCLUDING THOSE EXCLUDED FROM ANALYSIS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB55	20-29.9 yrs	female	Y
	BNWB550	Foetal	subadult	Y
	BNWB551	0-0.9 yrs	subadult	Y
	BNWB552	Unknown	Unknown (adult)	N
	BNWB553	30-39.9 yrs	male	Y
	BNWB554	20-29.9 yrs	female	Y
	BNWB555	20-29.9 yrs	male	Y
	BNWB556	30-39.9 yrs	female	Y
	BNWB557	40-49.9 yrs	female	Y
	BNWB558	40-49.9 yrs	male	Y
	BNWB559	1-4.9 yrs	subadult	Y
	BNWB56	Unknown	Unknown (adult)	N
	BNWB560	Foetal	subadult	Y
	BNWB561	40-49.9 yrs	female	Y
	BNWB562	30-39.9 yrs	male	Y
	BNWB563	Unknown	subadult	N
	BNWB564	30-39.9 yrs	male	Y
	BNWB565	0-0.9 yrs	subadult	Y
	BNWB566	30-39.9 yrs	male	Y
	BNWB567	0-0.9 yrs	subadult	Y
	BNWB568	20-29.9 yrs	female	Y
	BNWB569	20-29.9 yrs	female	Y
	BNWB57	Unknown	Unknown (adult)	N
	BNWB570	40-49.9 yrs	male	Y
	BNWB571	40-49.9 yrs	male	Y
	BNWB572	10-14.9 yrs	subadult	Y
	BNWB573	Unknown	Unknown (adult)	N
	BNWB574	Unknown	male	N
	BNWB575	Unknown	male	N
	BNWB576	30-39.9 yrs	male	Y
	BNWB577	Unknown	Unknown (adult)	N
	BNWB578	Unknown	Unknown (adult)	N
	BNWB579	30-39.9 yrs	female	Y
	BNWB58	Unknown	Unknown (adult)	N
	BNWB580	30-39.9 yrs	male	Y

KENNETH WILLIAM ROSS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB581	Unknown	Unknown (adult)	N
	BNWB582	Unknown	Unknown (adult)	N
	BNWB584	1-4.9 yrs	subadult	Y
	BNWB585	Unknown	male	N
	BNWB586	Unknown	Unknown (adult)	N
	BNWB587	20-29.9 yrs	male	Y
	BNWB588	30-39.9 yrs	female	Y
	BNWB589	Unknown	Unknown (adult)	N
	BNWB59	Unknown	Unknown (adult)	N
	BNWB590	Unknown	Unknown (adult)	N
	BNWB591	Unknown	Unknown (adult)	N
	BNWB592	20-29.9 yrs	female	Y
	BNWB593	20-29.9 yrs	Unknown (adult)	Y
	BNWB594	5-9.9 yrs	subadult	Y
	BNWB595	Unknown	Unknown (adult)	N
	BNWB596	Unknown	Unknown (adult)	N
	BNWB597	Foetal	subadult	Y
	BNWB598	Unknown	Unknown (adult)	N
	BNWB599	Unknown	male	N
	BNWB6	20-29.9 yrs	female	Y
	BNWB60	0-0.9 yrs	subadult	Y
	BNWB600	20-29.9 yrs	female	Y
	BNWB601	30-39.9 yrs	male	Y
	BNWB602	15-19.9 yrs	male	Y
	BNWB603	40-49.9 yrs	female	Y
	BNWB604	Unknown	Unknown (adult)	N
	BNWB605	20-29.9 yrs	male	Y
	BNWB606	Unknown	Unknown (adult)	N
	BNWB607	Unknown	Unknown (adult)	N
	BNWB608	Unknown	Unknown (adult)	N
	BNWB609	Unknown	Unknown (adult)	N
	BNWB61	20-29.9 yrs	female	Y
	BNWB610	30-39.9 yrs	female	Y
	BNWB611	20-29.9 yrs	male	Y
	BNWB612	Unknown	Unknown (adult)	N

APPENDIX 3: BURIALS BY SITE INCLUDING THOSE EXCLUDED FROM ANALYSIS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB613	20-29.9 yrs	male	Y
	BNWB614	1-4.9 yrs	subadult	Y
	BNWB615	30-39.9 yrs	male	Y
	BNWB616	20-29.9 yrs	male	Y
	BNWB617	Unknown	Unknown (adult)	N
	BNWB618	40-49.9 yrs	female	Y
	BNWB619	Unknown	Unknown (adult)	N
	BNWB62	Unknown	Unknown (adult)	N
	BNWB620	Unknown	Unknown (adult)	N
	BNWB621	Unknown	Unknown (adult)	N
	BNWB622	0-0.9 yrs	subadult	Y
	BNWB623	Unknown	Unknown (adult)	N
	BNWB624	30-39.9 yrs	female	Y
	BNWB625	Unknown	Unknown (adult)	N
	BNWB626	20-29.9 yrs	male	Y
	BNWB627	Unknown	Unknown (adult)	N
	BNWB628	40-49.9 yrs	female	Y
	BNWB629	Unknown	Unknown (adult)	N
	BNWB63	Unknown	male	N
	BNWB630	1-4.9 yrs	subadult	Y
	BNWB631	30-39.9 yrs	male	Y
	BNWB632	20-29.9 yrs	male	Y
	BNWB633	20-29.9 yrs	female	Y
	BNWB634	Unknown	Unknown (adult)	N
	BNWB635	30-39.9 yrs	female	Y
	BNWB636	0-0.9 yrs	subadult	Y
	BNWB64	20-29.9 yrs	male	Y
	BNWB65	Unknown	subadult	N
	BNWB66	Unknown	Unknown (adult)	N
	BNWB67	30-39.9 yrs	female	Y
	BNWB68	20-29.9 yrs	female	Y
	BNWB69	20-29.9 yrs	male	Y
	BNWB7	0-0.9 yrs	subadult	Y
	BNWB70	20-29.9 yrs	male	Y
	BNWB71	40-49.9 yrs	female	Y

KENNETH WILLIAM ROSS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	BNWB72	Unknown	Unknown (adult)	N
	BNWB73	40-49.9 yrs	Unknown (adult)	Y
	BNWB74	1-4.9 yrs	subadult	Y
	BNWB75	Unknown	male	N
	BNWB76	Unknown	female	N
	BNWB77	1-4.9 yrs	subadult	Y
	BNWB78	40-49.9 yrs	female	Y
	BNWB8	0-0.9 yrs	subadult	Y
	BNWB80	1-4.9 yrs	subadult	Y
	BNWB81	Unknown	Unknown (adult)	N
	BNWB82	Unknown	Unknown (adult)	N
	BNWB83	20-29.9 yrs	female	Y
	BNWB84	1-4.9 yrs	subadult	Y
	BNWB85	Unknown	Unknown (adult)	N
	BNWB86	20-29.9 yrs	male	Y
	BNWB87	1-4.9 yrs	subadult	Y
	BNWB88	Unknown	Unknown (adult)	N
	BNWB89	20-29.9 yrs	female	Y
	BNWB9	40-49.9 yrs	male	Y
	BNWB90	30-39.9 yrs	male	Y
	BNWB91	0-0.9 yrs	subadult	Y
	BNWB92	20-29.9 yrs	female	Y
	BNWB93	30-39.9 yrs	female	Y
	BNWB94	Unknown	Unknown (adult)	N
	BNWB95	0-0.9 yrs	subadult	Y
	BNWB96	Unknown	Unknown (adult)	N
	BNWB97	Unknown	Unknown (adult)	N
	BNWB98	0-0.9 yrs	subadult	Y
	BNWB99	Unknown	Unknown (adult)	N
Noen U-Loke	NULB1	50-59.9 yrs	male	Y
	NULB10	40-49.9 yrs	female	Y
	NULB100	0-0.9 yrs	subadult	Y
	NULB102	0-0.9 yrs	subadult	Y
	NULB103	0-0.9 yrs	subadult	Y
	NULB104	20-29.9 yrs	female	Y

APPENDIX 3: BURIALS BY SITE INCLUDING THOSE EXCLUDED FROM ANALYSIS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	NULB105	Unknown	male	N
	NULB106	0-0.9 yrs	subadult	Y
	NULB107	20-29.9 yrs	male	Y
	NULB108	40-49.9 yrs	female	Y
	NULB11	0-0.9 yrs	subadult	Y
	NULB110	40-49.9 yrs	female	Y
	NULB111	20-29.9 yrs	male	Y
	NULB112	1-4.9 yrs	subadult	Y
	NULB113	20-29.9 yrs	female	Y
	NULB114	30-39.9 yrs	female	Y
	NULB115	0-0.9 yrs	subadult	Y
	NULB116	0-0.9 yrs	subadult	Y
	NULB117	1-4.9 yrs	subadult	Y
	NULB118.1	Unknown	Unknown (adult)	N
	NULB118.2	15-19.9 yrs	Unknown (adult)	Y
	NULB119	0-0.9 yrs	subadult	Y
	NULB12	50-59.9 yrs	female	Y
	NULB120	0-0.9 yrs	subadult	Y
	NULB121	0-0.9 yrs	subadult	Y
	NULB122	5-9.9 yrs	subadult	Y
	NULB123	0-0.9 yrs	subadult	Y
	NULB125	Unknown	Unknown (adult)	N
	NULB126	0-0.9 yrs	subadult	Y
	NULB127	40-49.9 yrs	male	Y
	NULB13	0-0.9 yrs	subadult	Y
	NULB14	30-39.9 yrs	male	Y
	NULB15	40-49.9 yrs	female	Y
	NULB16	20-29.9 yrs	female	Y
	NULB17	0-0.9 yrs	subadult	Y
	NULB18	0-0.9 yrs	subadult	Y
	NULB19	0-0.9 yrs	subadult	Y
	NULB2	0-0.9 yrs	subadult	Y
	NULB21	Unknown	Unknown (adult)	N
	NULB22	1-4.9 yrs	subadult	Y
	NULB24	0-0.9 yrs	subadult	Y

KENNETH WILLIAM ROSS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	NULB25	1-4.9 yrs	subadult	Y
	NULB26	50-59.9 yrs	male	Y
	NULB27	40-49.9 yrs	male	Y
	NULB28	Unknown	subadult	N
	NULB29	Unknown	subadult	N
	NULB3	0-0.9 yrs	subadult	Y
	NULB30	30-39.9 yrs	female	Y
	NULB31	10-14.9 yrs	subadult	Y
	NULB32	30-39.9 yrs	male	Y
	NULB33	20-29.9 yrs	male	Y
	NULB34	1-4.9 yrs	subadult	Y
	NULB35	70+ yrs	female	Y
	NULB36	30-39.9 yrs	female	Y
	NULB37	60-69.9 yrs	female	Y
	NULB38	0-0.9 yrs	subadult	Y
	NULB39	20-29.9 yrs	male	Y
	NULB4	15-19.9 yrs	Unknown (adult)	Y
	NULB40	20-29.9 yrs	female	Y
	NULB41	10-14.9 yrs	subadult	Y
	NULB42	60-69.9 yrs	male	Y
	NULB43	0-0.9 yrs	subadult	Y
	NULB44	30-39.9 yrs	male	Y
	NULB45	20-29.9 yrs	male	Y
	NULB46	1-4.9 yrs	subadult	Y
	NULB48	30-39.9 yrs	female	Y
	NULB49	70+ yrs	female	Y
	NULB5	20-29.9 yrs	male	Y
	NULB50	20-29.9 yrs	male	Y
	NULB51	5-9.9 yrs	subadult	Y
	NULB52	40-49.9 yrs	female	Y
	NULB53	Unknown	Unknown (adult)	N
	NULB54	40-49.9 yrs	Unknown (adult)	Y
	NULB55	Unknown	Unknown (adult)	N
	NULB56	0-0.9 yrs	subadult	Y
	NULB57.1	10-14.9 yrs	subadult	Y

APPENDIX 3: BURIALS BY SITE INCLUDING THOSE EXCLUDED FROM ANALYSIS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	NULB57.2	20-29.9 yrs	Unknown (adult)	Y
	NULB58	0-0.9 yrs	subadult	Y
	NULB59	30-39.9 yrs	Unknown (adult)	Y
	NULB6	0-0.9 yrs	subadult	Y
	NULB60	30-39.9 yrs	male	Y
	NULB61	15-19.9 yrs	male	Y
	NULB62	40-49.9 yrs	female	Y
	NULB63	0-0.9 yrs	subadult	Y
	NULB64	Unknown	female	N
	NULB65	Unknown	male	N
	NULB66	70+ yrs	male	Y
	NULB67	20-29.9 yrs	Unknown (adult)	Y
	NULB68	20-29.9 yrs	male	Y
	NULB69	20-29.9 yrs	male	Y
	NULB7	0-0.9 yrs	subadult	Y
	NULB70	1-4.9 yrs	subadult	Y
	NULB71	0-0.9 yrs	subadult	Y
	NULB72	Unknown	Unknown (adult)	N
	NULB73	30-39.9 yrs	Unknown (adult)	Y
	NULB74	20-29.9 yrs	male	Y
	NULB75	15-19.9 yrs	Unknown (adult)	Y
	NULB76	30-39.9 yrs	Unknown (adult)	Y
	NULB77	Foetal	subadult	Y
	NULB78	30-39.9 yrs	Unknown (adult)	Y
	NULB79	0-0.9 yrs	subadult	Y
	NULB8	40-49.9 yrs	Unknown (adult)	Y
	NULB81	0-0.9 yrs	subadult	Y
	NULB82	30-39.9 yrs	female	Y
	NULB84	Unknown	male	N
	NULB85	0-0.9 yrs	subadult	Y
	NULB86	20-29.9 yrs	male	Y
	NULB87	20-29.9 yrs	Unknown (adult)	Y
	NULB88	0-0.9 yrs	subadult	Y
	NULB89	Foetal	subadult	Y
	NULB9	0-0.9 yrs	subadult	Y

KENNETH WILLIAM ROSS

Site	Burial ID	Age-at-Death	Sex	Used in Analysis (Y/N)
	NULB90	0-0.9 yrs	subadult	Y
	NULB91	0-0.9 yrs	subadult	Y
	NULB92	1-4.9 yrs	subadult	Y
	NULB93	0-0.9 yrs	subadult	Y
	NULB94	40-49.9 yrs	male	Y
	NULB96	Unknown	Unknown (adult)	N
	NULB97	1-4.9 yrs	subadult	Y
	NULB98	40-49.9 yrs	Unknown (adult)	Y
	NULB99	40-49.9 yrs	female	Y